en

Operating instructions

Hydraulic excavator / Material handler
R 9250

from serial number 13466

Document identification

Order number:	10069862
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Author:	LFR - Technical documentation department

Product identification

Manufacturer:	LIEBHERR France SAS.
Type:	R 9250
Type no.:	437
Conformity:	CE

Address

Liebherr France SAS.
2 avenue Joseph Rey
B.P 90287 F - 68005 Colmar Cedex

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Machine data

Please fill in the following data when you receive your machine.

This will also be of use to you when ordering replacement parts.

Vehicle ident. number:

WLHZ . . . . . ZK . . . . . .

Construction year:

. . . .

First start-up date:

. . / . . / . .

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Preface

These operating instructions have been written for the **machine operator** and for the **maintenance personnel** of the machine.

They contain:

– the technical data.
– the safety requirements.
– the operating instructions.
– the maintenance instructions.

The operating instructions are to be read and used carefully by all persons who carry out work with or on the machine before putting the machine into service for the first time and later, at regular intervals.

Work with or on the machine includes, for example:

– **Operation** including setting up and equipping, rectifying malfunctions during the course of work, resolving production dropouts, care, disposal of operating and process materials.
– **Maintenance**, including maintenance, inspection and repair work.
– **Transportation** or loading the machine.

The operating instructions allow the machine operator to familiarize himself with the machine more easily and prevent malfunctions occurring due to improper operation.

The observance of the operating and maintenance instructions by maintenance personnel:

– increases reliability in use.
– extends the service life of your machine.
– reduces repair costs and downtime.

The operating instructions belong with the machine. Place a copy in an easily reached position on the cab storage shelf.

The operating and maintenance instructions should also incorporate information on current national regulations for accident prevention and protection. In addition to the operating instructions and legally binding regulations on accident prevention which apply in the user country and at point of use, authorized specialist rules for safe and correct working procedures are also to be observed.

These operating and maintenance instructions contain all the information required for operating and maintaining your machine.

– Some illustrations in these operating instructions may depict details and working devices which differ to your machine.
– In some illustrations, protective devices and covers have been removed in the interests of better presentation.
– Improvements, which are always being incorporated into our machines, may result in changes to your machine which are not yet indicated in these operating instructions.

However, should you require any further explanations or information, LIEBHERR's technical documentation, sales school and customer service departments are

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available for your convenience.

You will appreciate that LIEBHERR warranty claims made on the basis of improper operation, unsatisfactory maintenance, use of unauthorized operating materials or non-adherence to safety regulations cannot be recognized.

LIEBHERR will annul any and all obligations incurred by LIEBHERR and / or its dealerships, such as guarantee commitments, service contracts etc. without prior notice in the event that replacement parts other than original LIEBHERR parts or parts purchased from LIEBHERR are used for maintenance or repair work.

Modifications, conditions, copyright

We reserve the right to make modifications without prior notice in the course of technical developments.

The information and illustrations contained in these operating instructions may neither be copied and distributed, nor used for the purposes of competition. All rights are expressly reserved in accordance with copyright laws.

The warranty and liability conditions of LIEBHERR's general business conditions will not be enlarged upon through the above information.

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Content

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1 Product description

1.1 Assembly - overview

This section comprises an overview of the machine and descriptions of the components shown.

1.1.1 Machine and construction equipment

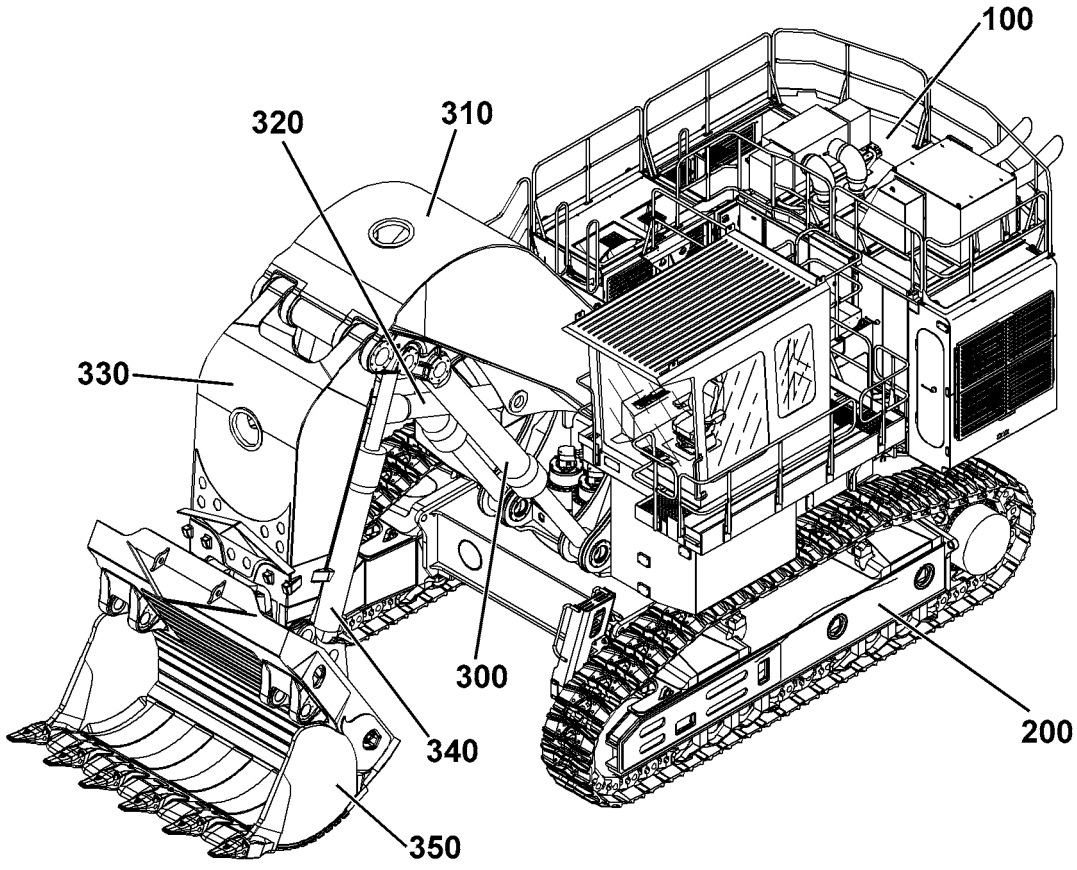

Fig. 1-1 *Machine and construction equipment*

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

1.1.2 Uppercarriage

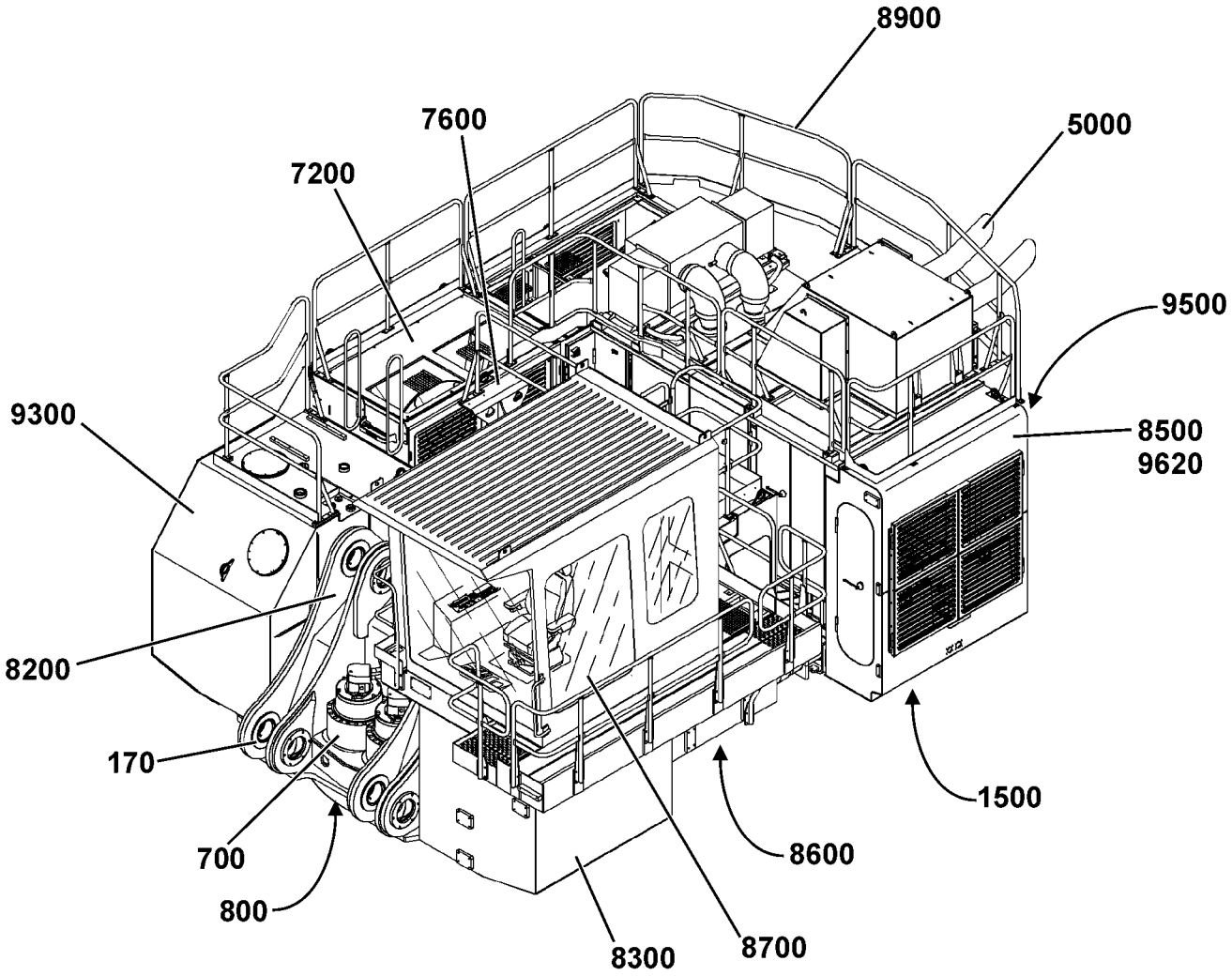

Fig. 1-2 *Upper carriage*

170 Steel bushing
700 Swing gear transmission
800 Swing ring
1500 Service station
5000 Powerpack
7200 Oil radiator installation
7600 Control valve installation
8200 Rotating deck
8300 Cab elevation
8500 Coachbuilding
8600 Lower covering
8700 Cab
8900 Catwalk
9300 Hydraulic tank installation
9500 Counterweight installation
9620 Tool kit

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1.1.3 Undercarriage

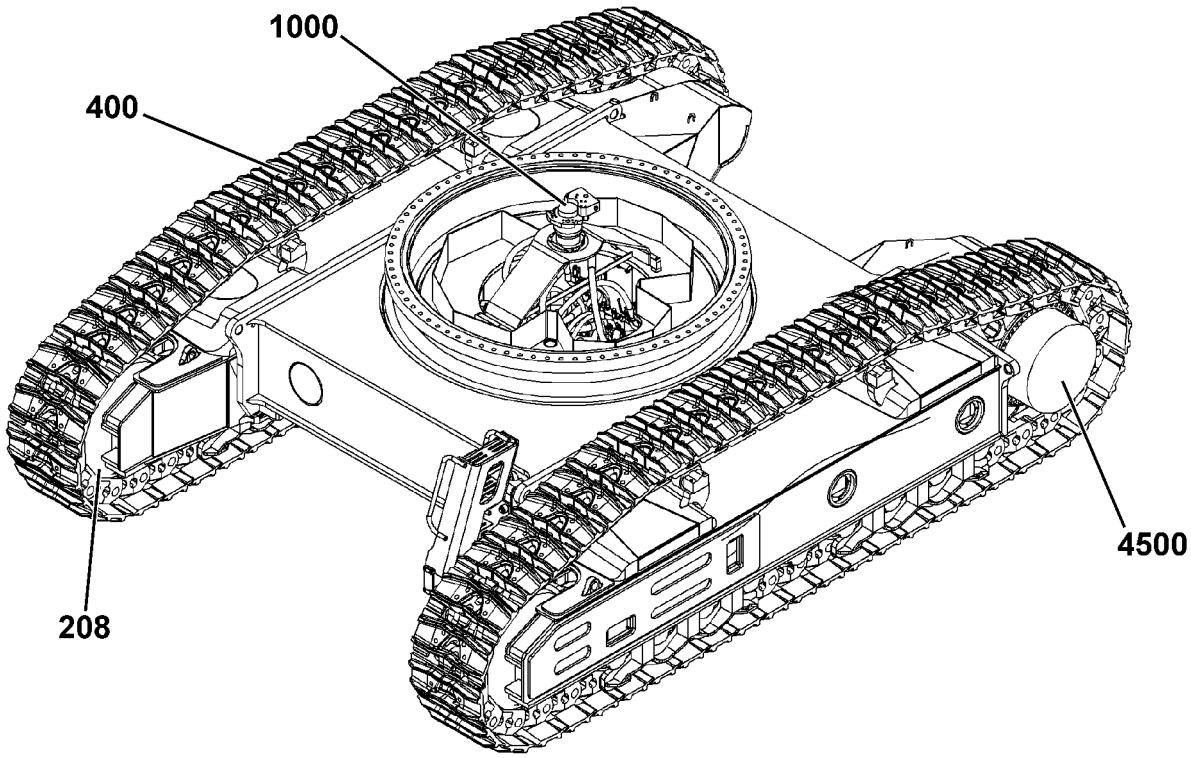

Fig. 1-3 *Under carriage*

208 Leading wheel
400 Crawlers
1000 Rotary connection
4500 Travelling mechanism with tumbler wheel

1.2 Technical data

This should be taken from the accompanying technical description.

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2 Safety information, signs

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 avoiding 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 89 / 655 / EEC contains the minimum safety information applicable to the owner.

2.1 Symbols in the operating instructions

Work processes and actions that could cause danger are accompanied by safety information in these operating instructions. This safety information describes 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 significance:

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.

▶ This symbol identifies an action.
The machine operator or the maintenance personnel should be active at this location and carry out the action described.

↳ This symbol means “Carry out an activity".
If the machine operator or maintenance personnel have carried out the activities described in an action, the result of this action will be described here.

Following these notes does not relieve you of responsibility for following additional rules and guidelines!

Additional points that should be noted are:

– the safety regulations which apply on site,
– statutory road traffic regulations,
– the guidelines provided by professional associations.

2.2 Use in accordance with the regulations

– The hydraulic excavator is a machine with work equipment (eg. hoe type bucket, grab, bucket attachment) designed to detach, lift, transport and shake off earth, stones and other materials, while the transportation of the load itself usually takes place without moving the machine. Moving the machine when it is carrying a load must be carried out while observing the appropriate safety measures (see section "Notes for safe working").
– Machines used for hoisting are subject to specific conditions and must be fitted with the stipulated safety devices (see section “Hoisting work”).
– Other or additional usage, eg. for demolition work or transfer work, requires special equipment and may also require special safety devices. These devices (eg. tree grab, demolition hammer, concrete cutter etc.) may only be attached and used with approval and in accordance with the original manufacturer of the device.
– Transporting persons is not deemed to be in accordance with regulations. The manufacturer is not liable for damage resulting from this action. The user is solely responsible for the risk incurred.
– Observing the operating instructions and the inspection / maintenance instructions is also deemed to be appropriate use in accordance with regulations.

2.3 Safety instructions

2.3.1 General safety instructions

– Please familiarize yourself with the operating instructions before starting up the machine.
– Ensure that you have obtained, read and understood any additional instructions relating to special accessories for the machine.
– Only specifically authorized persons may operate, maintain or repair the machine. The legal minimum age is to be adhered to.
– Only employ trained or appropriately instructed personnel. Clearly establish which personnel are responsible for operating, setting up, maintaining and repairing the machine. Give personnel the power to refuse to carry out unsafe instructions by third parties. This also applies in relation to traffic regulations.
– Only permit apprentices and personnel who are in training or who have only general training to operate on the machine under the constant supervision of an

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experienced member of staff.

– As far as possible, monitor personnel to ensure that they are adhering to safe working practices, are aware of risks and are observing the operating instructions.
– Wear safe work clothes when you are working on or with the machine. Avoid wearing rings, watches, ties, scarves, open jackets and loose clothing. There is a risk of injury from, for example, becoming stuck or being drawn in.
– Protective goggles, safety helmets, safety shoes and gloves, reflective vests and ear protection etc. are required for specific jobs.
– Ensure that you obtain information on any special safety regulations for the job site from the site foreman.
– Always tilt up the safety lever before leaving the operator's seat.
– When getting in and out, do not hold on to the steering column, control panel or joystick. Doing this could cause unintentional movement, which could result in an accident.
– Never jump from the machine; use the steps, ladders, gangplanks and supporting straps provided for this purpose.
– Face the machine when getting in or out and always use three-point support, i.e. two hands and one foot or two feet and one hand must always be in contact with the access system at the same time.
– Familiarize yourself with the location of the emergency exit through the front window.
– In the absence of any other instructions, proceed as follows for all maintenance and repair work:
  • switch off the machine on firm, level ground and anchor the grab in the ground.
  • place all operating levers into neutral and tilt the safety lever up.
  • switch off the engine and remove the start key.
– Before touching any parts of the hydraulic circuits, you must also operate all pilot control devices (joystick and pedals) in all directions with the start key in contact position 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.
– Secure all loose parts on the machine.
– Never operate a machine before carrying out a careful inspection tour and checking whether any warning signs are missing or illegible.
– Respect all danger and safety instructions.
– For special applications the machine must be equiped with specific safety equipments. Work only if they are mounted and functional.
– Do not carry out any modifications, alterations or conversions to the machine which may affect safety without the express permission of the manufacturer. This also applies for the installation of safety devices and valves and for welding work on load-bearing parts.
– It is forbiden to repair the cab.
– Not original equipment and component parts or such kind, wich has generaly not been validated by LIEBHERR for installation or extension, has not to be installed or added onto the excavator without previous written agreement of LIEBHERR. Wherefore the necessary technical documentations has to be at LIEBHERR's disposal.

2.3.2 Avoidance of crushing and burns

– Do not work beneath the equipment if it is not safely positioned on the ground or supported.

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- Do not use any damaged or insufficient load-bearing take-up materials, such as ropes or chains.
- Wear work gloves when working with wire cables.
- When working on the equipment, never use your fingers to locate bores; use the correct punch for the procedure.
- Ensure that no objects enter the fan when the engine is on. The fan will eject or destroy these objects and will itself be damaged.
- The engine cooling system is hot and pressurized when near operating temperature. Avoid coming into contact with coolant carrying parts. There is a risk of sustaining burns.
- Only check the coolant when the sealing cap of the expansion container has cooled to a point where it is possible to touch it. Then turn the cap carefully to let off the overpressure.
- Engine and hydraulic oil are hot when near operating temperature. Avoid coming into contact with hot oil or oil-bearing parts.
- Wear protective goggles and gloves when working on the battery. Avoid sparks and naked flames.
- Never permit the grab to be guided by hand by auxiliary personnel.
- When reaching into the engine compartment, always secure the side doors against unintentional closing by positioning the supports provided for this purpose.
- Never lay under the machine if it is raised with work equipment and has not been correctly and securely supported with hardwood beams.

2.3.3 Avoidance of fire and explosions

- Switch off the engine when refuelling.
- Do not smoke or use a naked flame when refuelling and charging the batteries.
- Always start the engine in accordance with the operating instructions.
- Check the electrical system regularly.
- Have all faults, such as loose connections, blown fuses and lamps and clogged or abraded cables rectified by personnel.
- Do not transport any combustible liquids anywhere on the machine other than in the tanks provided for this purpose.
- Check all lines, hoses and screwed joints regularly for leakage and damage.
- Rectify leakages immediately and replace damaged components.
- Oil spraying out of leaking areas can easily cause a fire.
- Ensure that all holds and shields are correctly installed to guard against vibration, abrasion and heat accumulation.
- Do not use cold start materials (ether) in the vicinity of heat sources, naked flames or in inadequately ventilated areas.
- Do not use any starting aids containing ether to start diesel engines with preheating or flame glow systems. There is a risk of EXPLOSION.
- Familiarize yourself with the location and operation of fire extinguishers on the machine and with local fire warning and fire abatement options.
- The possibility exists to install an extinguisher into the driver's cab.
- Covers and boxes locks have to be unlocked, to facilitate the fight against fire in case of.

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2.4 Signs on the machine

2.4.1 Introduction

The machine displays several types of signs:

- **Safety plates** provide warnings relating to dangers of accidents which could result in serious injury or death.
- **Information plates** indicate specific points relating to the operation, maintenance and characteristics of the machine.
- **Nameplates** are attached to components for which the machine number must be provided when ordering spare parts.

Danger!
Non-observance of **safety plates** can result in serious injury or death.

▶ Check warning plates regularly to ensure that they are complete and clearly legible.

▶ Replace missing or illegible safety plates immediately.

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2.4.2 Arrangement of signs

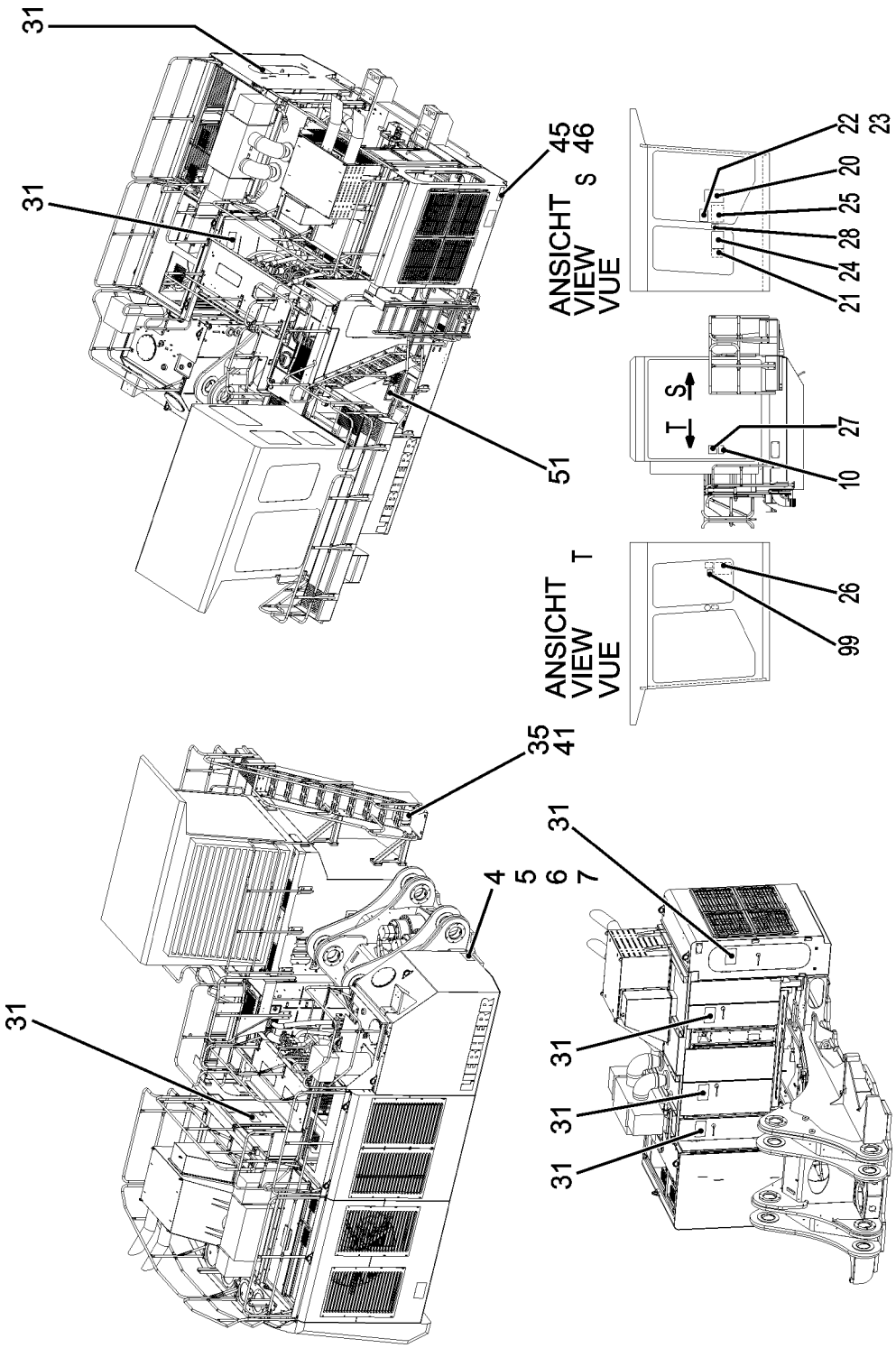

Fig. 2-1 *Arrangement of signs on the machine*

5	Typeplate LFR	**25**	Label key
6	Nameplate LAM	**26**	Label security shut off valve
7	Typeplate LFR	**27**	Warning label
10	Label external start	**28**	Label security lever
20	Label switchboard	**31**	Banning label

21	Label filling volume	**41**	Label safety ladder
22	Label control symbol	**46**	Label emergency stop
23	Label control symbol	**51**	Label manual unlock of the ladder
24	Lubrification drawing	**99**	Label "CE"

2.4.3 Explanation of signs

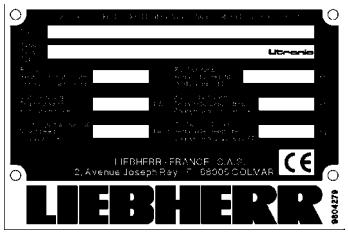

Plate 5: Typeplate LFR (Liebherr France) "CE"

This typeplate displays the following information:

– Vehicle identification number
– Type
– Construction year
– Engine output
– Top speed
– Permissible overall weight
– Permissible axle load, front
– Permissible axle load, rear

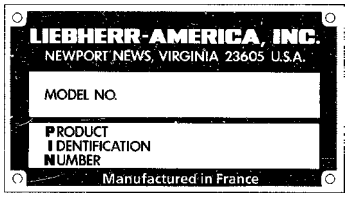

Plate 6: Nameplate LAM (Liebherr America)

This nameplate displays the following information:

– Type
– Vehicle identification number

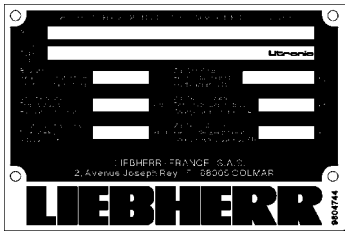

Plate 7: Typeplate LFR (Liebherr France)

This typeplate displays the following information:

– Vehicle identification number
– Type
– Construction year
– Engine output
– Top speed
– Permissible overall weight
– Permissible axle load, front

Permissible axle load, rear

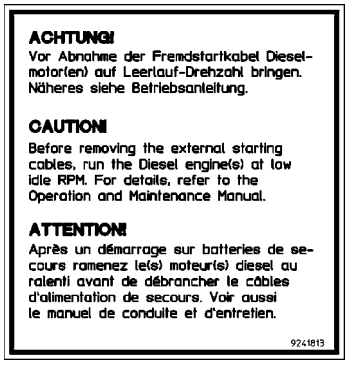

Plate 10: Label external start

The information in the operating instructions must be carefully noted when starting externally.

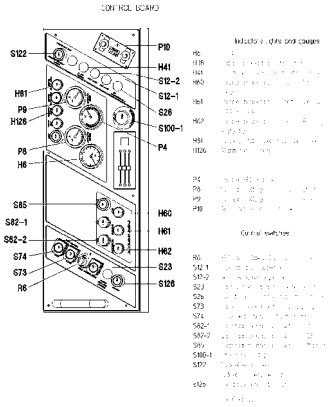

Plate 20: Label switchboard

The label switchboard indicates and locates the indicators lights and gauges, and the control switches.

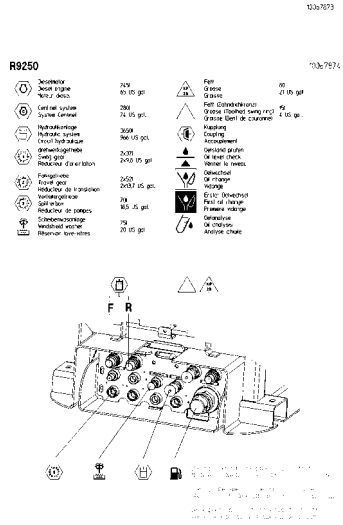

Plate 21: Label filling volume

The label filling volume indicates the drain and the refilling of the major components on the service trap, and indicates the fluids quantities (the given quantities are only guidelines. Check fluid level after each change or refilling).

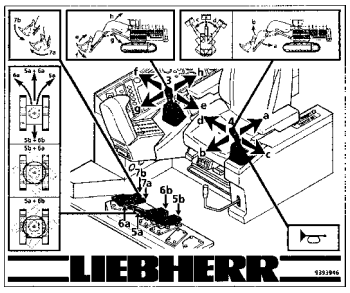

Plate 22: Label control symbol (with shovel bucket)

Describes the functions of the operating devices which are not labelled for a excavator with a shovel bucket.

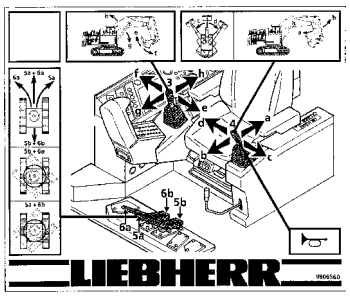

Plate 23: Label control symbol (with backhoe bucket)

Describes the functions of the operating devices which are not labelled for a excavator with a backhoe bucket.

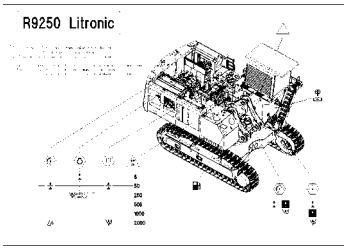

Plate 24: Lubrification drawing

Displays the relevant capacities and the change intervals, grease quality, fill and lubrication positions.

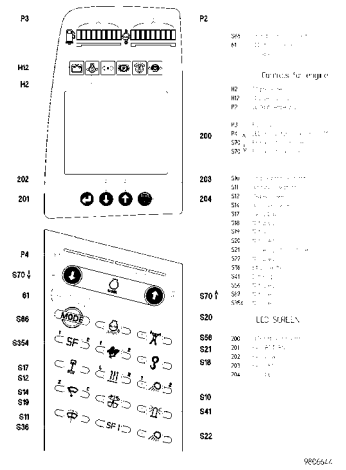

Plate 25: Label key

The label key displays the keys of the control unit and of the monitoring display.

Plate 26: Label shut off valve

The information in the operating instructions must be carefully noted before first use.

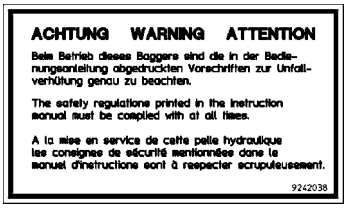

Plate 27: Warning label

IThe information in the operating instructions must be carefully noted.

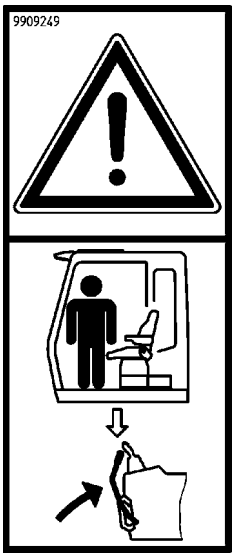

Plate 28: Label security lever

Pull the security lever up fully before leaving the operator's seat.

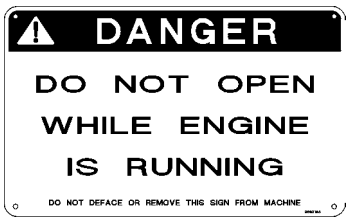

Plate 31: Banning label

The engine hood may only be opened when the engine is switched off.

Plate 41: Label safety ladder

This label indicates the safety ladder.

Plate 46: Label emergency stop

This label indicates the emergency stop.

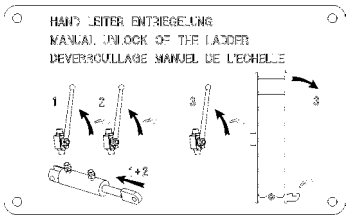

Plate 51: Label manual unlock of the ladder

This label explains how to unlock manually the ladder.

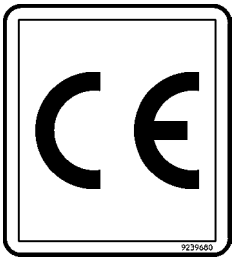

Plate 99: Label "CE"

3 Control and operation

3.1 Operating and control elements

3.1.1 Overview of the operator's standing position

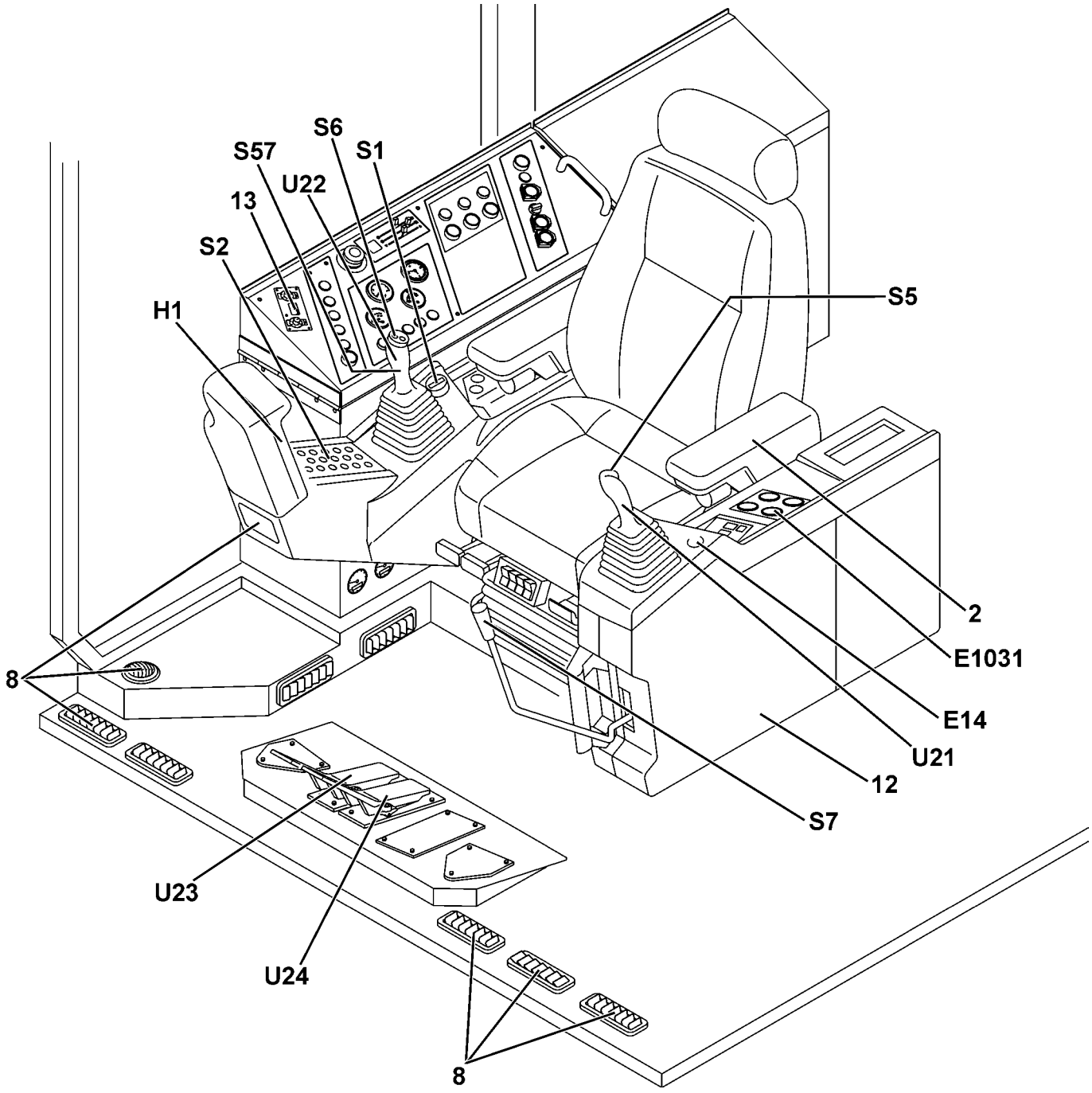

Fig. 3-1 *Operator's standing position*

2 Arm rests
8 Heater vent
12 Fuse box
13 Heating / air conditioning system
E14 Cigarette lighter
E1031 Central lubrication control
H1 Monitoring display
S1 "Contact" key
S2 Switching unit
S5 Switch / horn
S6 Switch / float position attachment
S7 Safety lever / servo control
S57 Swing brake
U21 Left joystick
U22 Right joystick
U23 Pedal for right travel gear
U23 Pedal for left travel gear

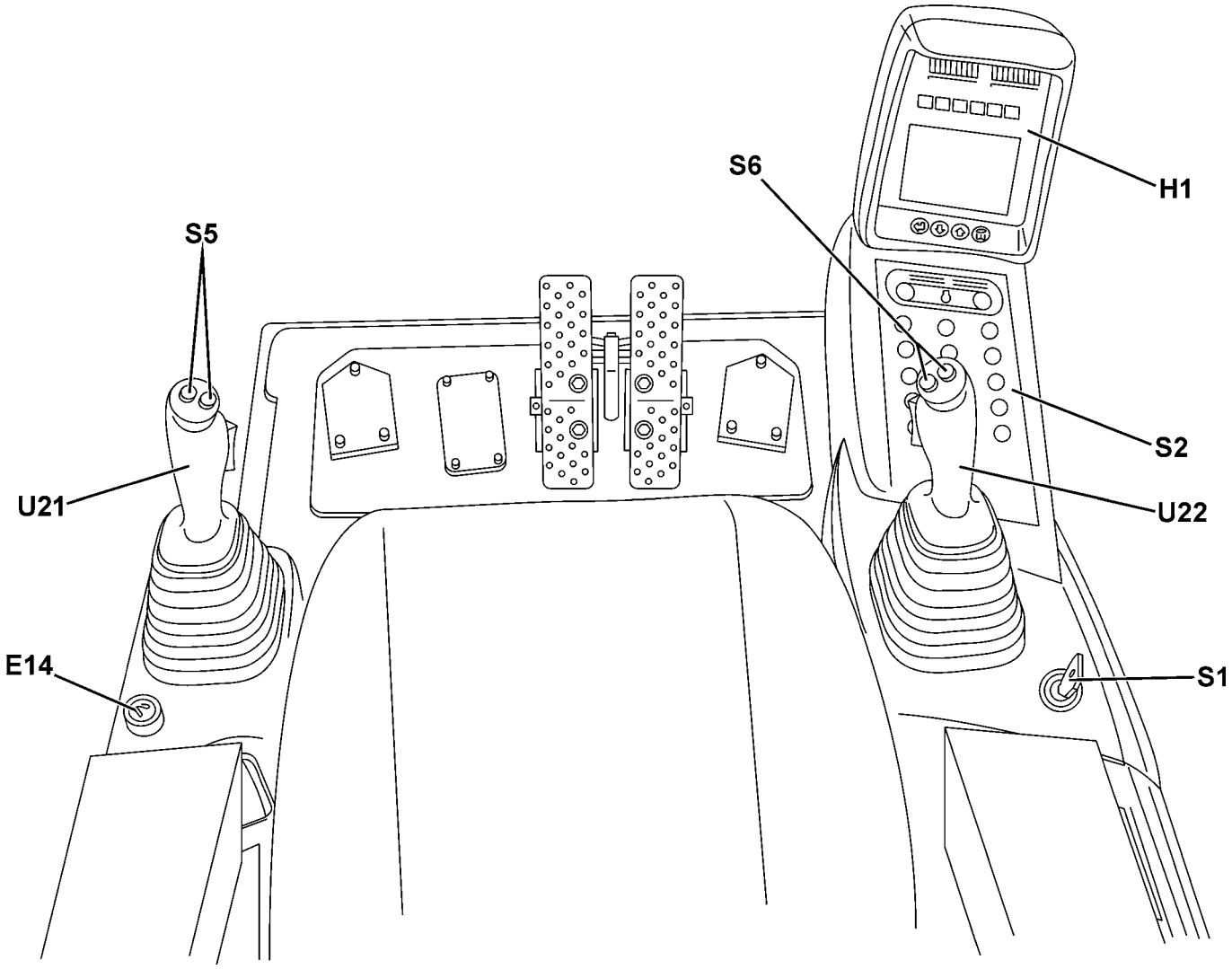

Fig. 3-2 *Operator's standing position, seen from the operator's point of view*

E14 Cigarette lighter
H1 Monitoring screen
S1 Ignition switch
S2 Keyboard
S5 Switch / horn
S6 Switch / float position attachment
U21 Left joystick
U22 Right joystick

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3.1.2 Arrangement of joystick

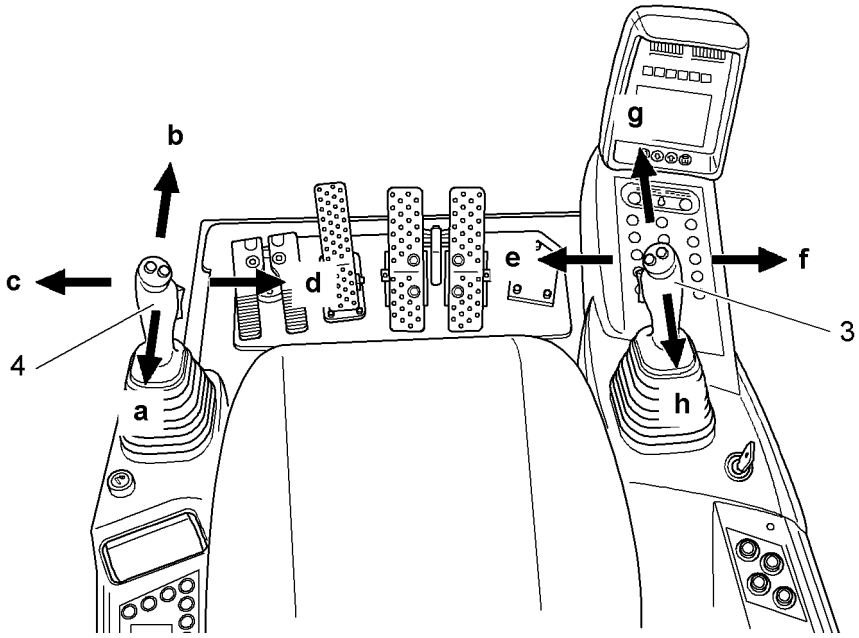

Fig. 3-3 *Joystick, right (**3**) and left (**4**)*

Standard control

The left joystick (**4**) controls the stick and slewing movements.

– Direction of movement **a** and **b**: Stick is drawn in or out.
– Direction of movement **c** and **d**: Upper carriage is rotated to the left or to the right.

The right joystick (**3**) controls the boom or bucket and grab movements.

– Direction of movement **e** and **f**: Bucket will be tilted up or down, grab will close or open.
– Direction of movement **g** and **h**: Boom will be raised or lowered.

Note !
From delivery, the machine is equipped with the standard control system correponding to the norm ISO. Nevertheless, the machine can be equipped with a commutation circuit allowing the use of a special control system (for example LIEBHERR control system).

3.1.3 Keyboard

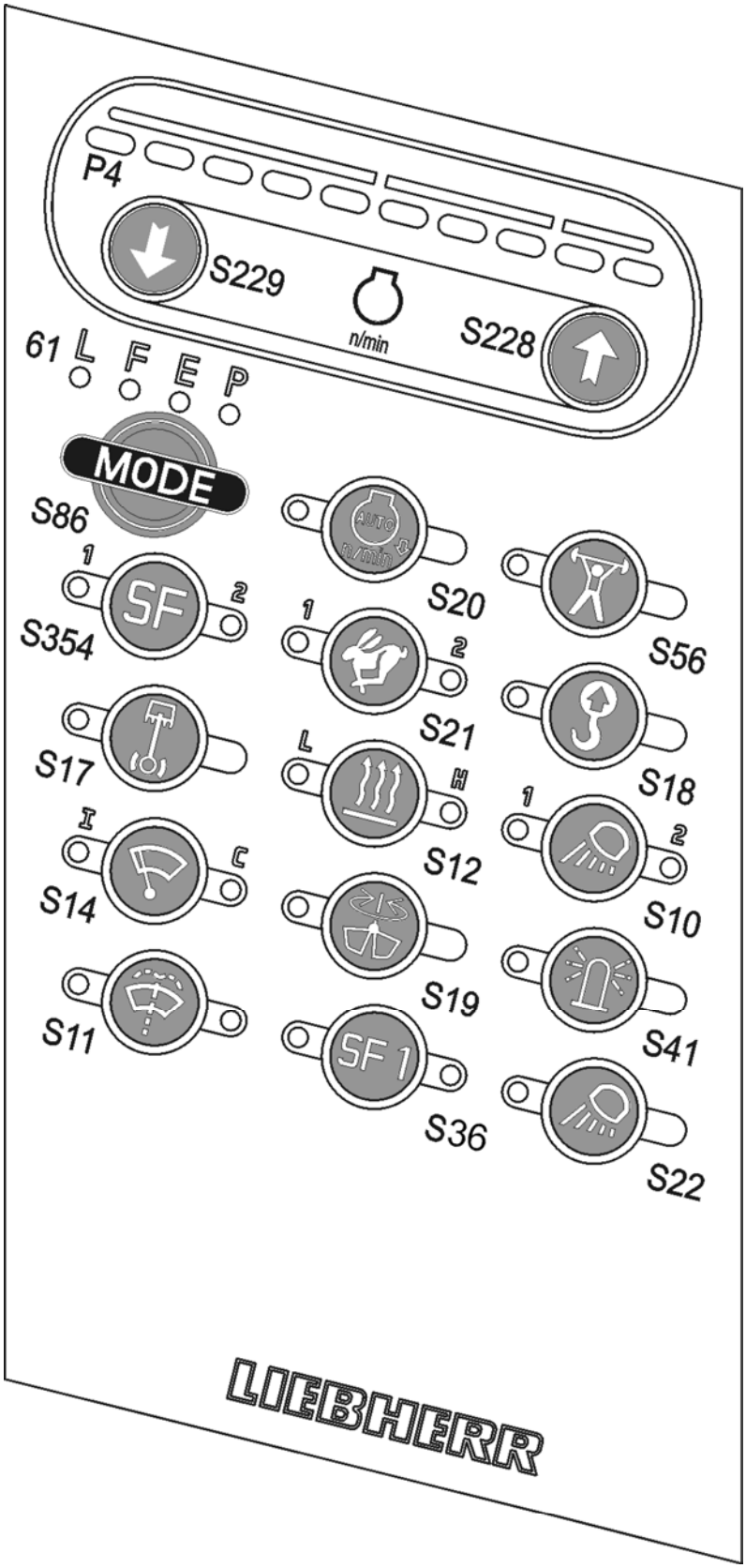

Fig. 3-4 *Excavator keyboard*

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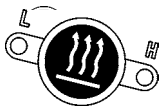
S10 - Floodlight / Equipment headlight

- ▶ Press the switch.
  - ↳ Driving light is activated.
  - ↳ LED 1 in the switch illuminates.
- ▶ Press switch again.
  - ↳ Driving light is deactivated.
  - ↳ LED 1 in the switch goes out.
  - ↳ Equipment headlight is activated.
  - ↳ LED 2 in the switch illuminates.
- ▶ Press switch again.
  - ↳ Driving light and equipment headlight are switched on.
  - ↳ LEDs 1 and 2 in the switch illuminate.
- ▶ Press switch again.
  - ↳ Driving light and equipment headlight are switched off.
  - ↳ LEDs 1 and 2 in the switch go out.

S11 – Windshield washer installation

- ▶ Press and hold button.
  - ↳ Washing water will be sprayed onto the windscreen through the outlet nozzles.
  - ↳ The windscreen washer runs continuously.
- ▶ Release the button.
  - ↳ Washing water will be stopped.
  - ↳ **Windshield** washer will run continuously for approx. another 3 seconds.



S12 – Heater

- ▶ Press switch.
  - ↳ Heater fan will be switched to stage 1.
  - ↳ LED L in the switch illuminates.
- ▶ Press switch again.
  - ↳ Heater fan will be switched to stage 2.
  - ↳ LED H in the switch illuminates.
  - ↳ LED L in the switch goes out.
- ▶ Press switch again.
  - ↳ Heater fan will be turned off.
  - ↳ LED H in the switch goes out.

S14 – Windscreen washer

- ▶ Press switch.
  - ↳ Intermittent setting is activated.
  - ↳ LED I in the switch illuminates.
- ▶ Press switch again.
  - ↳ Continuous operation is activated.
  - ↳ LED C in the switch illuminates.
  - ↳ LED I in the switch goes out.
- ▶ Press switch again.
  - ↳ Windscreen washer is switched off.
  - ↳ LED C in the switch goes out.

S17 – Swing gear brake

▶ Press switch.
  ↳ Slewing gear brake is engaged.
  ↳ Upper carriage is locked.
  ↳ LED in the switch illuminates.

▶ Press switch again.
  ↳ Slewing gear brake is released.
  ↳ LED in the switch goes out.

S18 – Overload warning device (optional extra)

▶ Press switch.
  ↳ Overload warning device is activated.
  ↳ LED in the switch illuminates.

▶ Press switch again.
  ↳ Overload warning device is deactivated.
  ↳ LED in the switch goes out.

❑ No overload warning device is built in.

▶ Press switch.
  ↳ The symbol for "No overload warning device is present" appears on the monitoring screen.

  ↳ LED in the switch illuminates.

▶ Press switch again.
  ↳ The symbol for "No overload warning device is present" goes out.
  ↳ LED in the button goes out.

S19 – No function

↳

S20 – Automatic idling

▶ Press switch.
  ↳ Automatic idling is activated.
  ↳ LED in the switch illuminates.

▶ Press switch again.
  ↳ Automatic idling is deactivated.
  ↳ LED in the switch goes out.

S21 - High speed gear

▶ Press the switch.
  ↳ Transfer from normal drive to fast drive is activated.
  ↳ LED 1 in the switch illuminates.

While driving, the machine will automatically transfer from normal drive to fast drive. LED 2 illuminates after transfer to fast drive.

▶ Press switch again.
  ↳ Transfer from normal drive to fast drive is deactivated.
  ↳ LED 1 in the switch goes out.

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S22 - Additional headlight (optional extra)

▶ Press the switch.
↳ Additional headlight is switched on.
↳ LED in switch illuminates.

▶ Press switch again.
↳ Additional headlight is switched off.
↳ LED in the switch goes out.

S36 – Special function 1 (optional extra)

Configuration and activation according to kit.

S41 – Dome light

▶ Press switch.
↳ The interior lights are switched on.

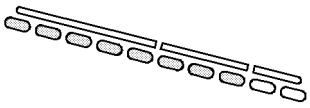
▶ Press switch again.
↳ The interior lights are switched off.

S56– No function

S86– Mode selection, speed adjustment

Four different modes can be selected by pressing the switch. The currently active mode will be displayed under the letter on the LED.

– **L**: LIFT mode (speed level 5)
– **F**: FINE mode (speed level 10)
– **E**: ECO mode (speed level 8)
– **P**: POWER mode (speed level 10)



P4– Engine speed display

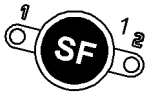
The speed range of the diesel engine is displayed in 10 levels.

S228 – Increase speed

▶ Press switch.
↳ Speed will be increased by one level.
↳ A second LED to the right illuminates in display P4.

S229 – Decrease speed

▶ Press switch.
↳ Speed will be decreased by one level.
↳ A second LED from the right goes out in display P4.



S354– Super Finish (quantity reduction)

▶ Press switch.
↳ The quantity reduction set using the operator's menu is active.
↳ LED 1 in the switch illuminates.
↳ The symbol ® appears in the TI field, if quantity reduction <= 99%

▶ Press switch again.
↳ Quantity reduction is deactivated.
↳ LED 1 in the switch goes out.
↳ If the symbol turns black 🗁 = 100%

3.1.4 Monitoring display

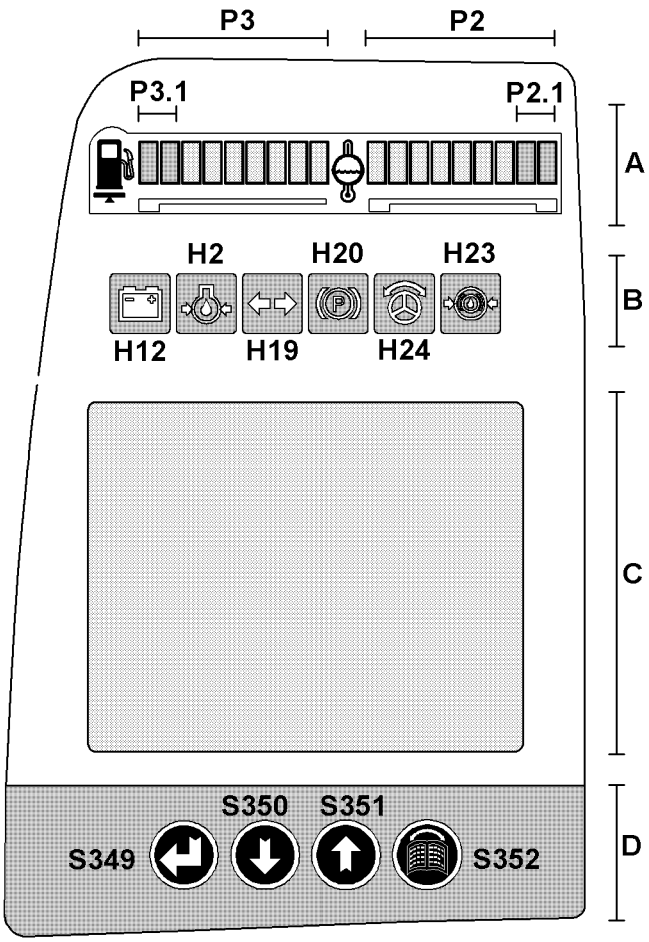


Fig. 3-5 *Monitoring display*

A	Analog indicator	**H24**	No function
B	Check display	**P2**	Coolant temperature display
C	Main screen	**P2.1**	Coolant temperature display red area
D	Menu control, screen	**P3**	Fuel level display
H2	Indicator light, engine oil pressure	**P3.1**	Fuel level display red area
H12	Indicator light, battery	**S349**	Back button
H19	No function	**S350**	Down button
H20	No function	**S351**	Up button
H23	No function	**S352**	Menu button

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3.1.4.1 Area A: Diesel engine monitoring

P2 –Diesel engine coolant temperature display

The display must be in the green area when operating the machine.

In the event of overheating (over 98 ºC = 204°F), the red LEDs **P2.1** at the end of indicator **P2** will flash.

The buzzer in the cab also sounds.

When this Indicator light illuminates, the error will be saved as error code **E 503**.

▶ The red indicator protection H62 on the control board will light up.

▶ The Quantum system will cause an engine shutdown.

▶ Find and rectify the cause of the problem.

P3 – Fuel level display

The LED indicator lights show the fuel level. When the both red light P3.1 light up, about 10% to 20% fuel are left in the tank as reserves.

H2 –Indicator light, low engine oil pressure

The Indicator light illuminates if the engine oil pressure drops below a given value when the machine is operating.

The buzzer in the cab also sounds.

When this Indicator light illuminates, the error will be saved as error code **E 501**.

▶ The red indicator protection H62 on the control board will light up.

▶ The Quantum system will cause an engine shutdown.

▶ Find and rectify the cause of the problem.

H12 –Indicator light, battery charge

The Indicator light illuminates if the ignition key is placed in the contact position.

The Indicator light goes out as soon as the engine is started.

When the machine is operating, this Indicator light illuminates if the V-belt alternators or the electrical charging system are defective.

▶ Bring the engine to a low idle immediately.

▶ Allow the engine to idle for approximately 5 seconds.

▶ Switch off the engine.

▶ Rectify the error.

H19 – No function

H20 –No function

H23 – No function

H24 – No function

3.1.4.2 Area B: Menu control for screen

Fig. 3-6 *Screen menu control*

The screen can be operated using the following 4 buttons:

– **S349**: **Back** button
– **S350**: **Down** button
– **S351**: **Up** button
– **S352**: **Menu*** button

* = Change from main to submenus

These buttons can be used to jump from the operator's menu to the submenus or to move from page to page.

3.1.4.3 Area C: Screen

To change the screen contrast:

▶ Press button **Menu** and arrow button **Up** (higher contrast) or **Down** (lower contrast) simultaneously.
↳ The value set will be saved.

To alter the brightness of the main screen:

▶ Press button **Back** and arrow button **Up** (brighter) or **Down** (darker) simultaneously.
↳ The value set will be saved.

Note!
A light sensor built in to the top left of the monitoring screen controls the illumination on the main screen, dependent on the brightness of the environment. Tracking is carried out using the buttons and originating from the basic setting. Illumination will be automatically reduced in conditions of low environmental brightness.

To change the brightness and the contrast setting to the works setting:

▶ Turn off the ignition.

▶ Press and hold the **Up** and **Down** buttons simultaneously.

▶ Turn on the ignition again.

▶ Release the buttons once the automatic check is completed.

3.1.5 Main screen

The main screen appears when the machine has been switched on and remains on display until the screen is changed over to the menu selection screen using the **Menu**

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button.

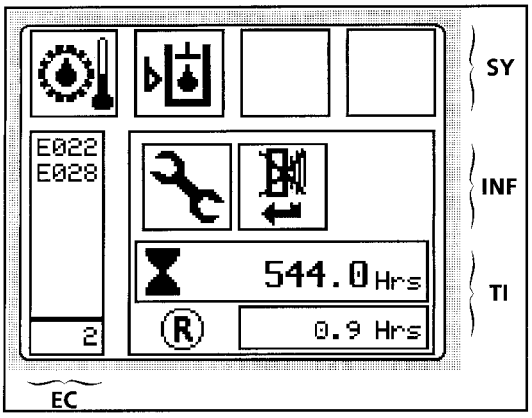

Fig. 3-7 *Main screen*

EC	Cable error display	**SY**	Symbols
INF	Information	**TI**	Time

3.1.5.1 Main screen design

SY field

The uper field of the monitor shows, on the one hand warning and indicator symbols, on the other hand a clock, if no more than 4 warning symbols are shown. Should more than two symbols be shown, so the clock is no more displayed and up to four symbols can be diplayed simultaneously in the field SY

If more than 4 symbols must be displayed, the symbols will be shift to the left by one symbol every 10 seconds (see chapter 3.1.5.3, "Warning symbols in the SY field" on page 12).

EC field

The EC window displays the error codes for electrical faults which occur in the excavator's electronics system (line errors, sensor errors etc.). A maximum of 7 error codes are displayed simultaneously. If there are more than these 7 errors present, an arrow which points to where the other error codes are located will be displayed next to the error code window.

▶ Press the **Up** or **Down** button.
  ↳ The error code window will be shifted in the direction selected in the error code list.

INF field

The INF field displays information temporarily, in both text and graphic form.

If more than 3 symbols are to be displayed, the symbols will shift one symbol to the left approx. every 10 seconds.

The information is displayed in graphic or text form and indicates specific operating states on the machine. (see chapter 3.1.5.4, "Information symbols in the INF field" on page 15).

TI field

The machine operating hours and the daily operating hours counter are displayed

bottom right in this field.

The ® symbol indicates that a quantity limitation is active for the pumps (see "Status of hydraulic pumps and electrical inputs and outputs menu" on page 20).

3.1.5.2 Menu navigation in the event of an error display

If an error is recognized as “new” in the SY field, the user is returned to the main screen. The relevant error display is activated.

Depending on the error (level of urgency), the buzzer will sound either continuously or in short consecutive bursts. This symbol will be displayed in the INF field.

Danger!
If the error displayed is not rectified immediately, this could lead to persons sustaining injury or the machine being damaged.

- ▶ Rectify / have the error rectified immediately.
- ▶ To switch off the buzzer, press the **Back** button.
  ↳ The error will be acknowledged and stored.

3.1.5.3 Warning symbols in the SY field

Each of the symbols which follow will be assigned an error code in the form “E 5xx”. Each error which occurs will be stored via the relevant error code.

E 501–Low engine oil pressure

(see page 2)

E 502–Coolant low

This symbol appears if the coolant level drops below the minimum level.

The buzzer sounds simultaneously.

- ▶ Bring the engine to a low idle immediately.
- ▶ Switch the engine off as quickly as possible.
- ▶ Localise the leak and carry out repairs.

Caution!

This monitoring device acts as an increased level of security in case of larger amounts of water loss (eg. hose rupture). It does not relieve the operator or maintenance personnel from the responsibility of regularly checking the coolant level in the equalizing reservoir.

E 503 –Engine coolant overheat

This symbol appears simultaneously with the **P2** coolant temperature display.

E 540 –Engine coolant pressure

This symbol appears simultaneously with the red indicator protection **H62** if the coolant pressure is too low.

- ▶ See Cummins Operation Maintenance Manual.
- ▶ Locate the reason for the trouble and get it repaired.

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E 597 –Manifold overheat

This symbol appears simultaneously with the red indicator protection **H62** if the manifold temperature is too high (above 104°C=220°F).

▶ See Cummins Operation Maintenance Manual.

▶ Locate the reason for the trouble and get it repaired.

E 506 –Oil in splitterbox is overheating

This symbol appears if the oil temperature in the splittebox exceeds 85°C (185°F)

▶ Turn the engine off.

▶ Find and correct the problem (splitterbox cooler dirty, ...).

E 562 –Low oil level in splitterbox

This symbol appears if the oil level drops below the minimum level.

▶ Turn the engine off.

▶ Find and repair a possible leak.

▶ Add oil until the level is correct.

E 564 –High oil level in splitterbox

This symbol appears if the oil level in the splitterbox is above the maximum level.

▶ Turn the engine off.

▶ Find and repair the problem.

It is possible that too much oil has been added, or the oil level might have increased due to hydraulic oil entering via a defective pump shaft seal.

E 591 –Splitterbox oil pressure low

This symbol appears if the splitterbox oil pressure drops below 0.2 bar.

▶ Stop operation and turn the engine off.

▶ Find and correct the problem.

E 504 –Low hydraulic oil level

This symbol appears if the oil level in the hydraulic tank drops below the minimum level. At the same time, the pump are automatically returned to minimum flow.

▶ Turn the engine off.

▶ Find and repair the cause of the oil loss.

▶ Add hydraulic oil via the service flap or via one of the return filters.

E 505 –High hydraulic oil temperature

This symbol appears if the hydraulic oil temperature in the tank exceeds 98°C (208°F).

▶ Stop operation.

▶ Continue to let the engine run in high idle and wait until the symbol disappears.

If necessary.

▶ Turn the engine off.

▶ Find and correct the problem (oil cooler dirty, blower or thermostat defective, ...).

E 566 - E 567 - E 568 – Main pumps are contaminated

This symbol appears if metallic particles have been deposited on the contamination switch of one of the main pumps (the pump number appears in the top corner of the symbol).

- ▶ Stop operation and turn the engine off.
- ▶ Notify the maintenance personnel.

E 572 - E 573 –Swing pumps are contaminated

This symbol appears if metallic particles have been deposited on the contamination switch of one of the swing pumps (the pump number appears in the top corner of the symbol).

- ▶ Stop operation and turn the engine off.
- ▶ Notify the maintenance personnel.

E 578 - E 579 - E 580 – Main pumps overheat

This symbol appears if the temperature on one of the main pumps increases above 92°C (198°F) (the pump number appears in the top corner of the symbol).

- ▶ Turn the engine off.
- ▶ Find and correct the problem.

E 584 - E 585 –Swing pumps overheat

This symbol appears if the temperature on one of the swing pumps increases above 92°C (198°F) (the pump number appears in the top corner of the symbol).

- ▶ Turn the engine off.
- ▶ Find and correct the problem.

E 592 –Low oil level in the Centinel System (otional)

This symbol appears if the oil level in the Centinal tank drops below the minimum level.

- ▶ See Cummins Operation Maintenance Manual.
- ▶ Full the Centinel tank as soon as possible.

E 593 –High fuel temperature

This symbol appears simultaneously with the red indicator protection H62 if the fuel temperature is too high (above 104°C=220°F).

- ▶ See Cummins Operation Maintenance Manual.
- ▶ Locate the reason for the trouble and get it repaired.

E 594 –High fuel rail pressure

This symbol appears simultaneously with the red indicator protection H62 if the fuel rail pressure exceeds a normal limit .

- ▶ See Cummins Operation Maintenance Manual.
- ▶ Locate the reason for the trouble and get it repaired.

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E 595 –High blow-by pressure

This symbol appears simultaneously with the red indicator protection H62 if the blow-by pressure exceeds a normal limit .

▶ See Cummins Operation Maintenance Manual.

▶ Locate the reason for the trouble and get it repaired.

E 596 –Low engine oil level

This symbol appears simultaneously with the red indicator protection H62 if the engine oil level drops below the minimum level.

▶ See Cummins Operation Maintenance Manual.

▶ Full the engine oil tank.

E 598 –Oil change required

This symbol appears simultaneously with the red indicator protection H62 if an engine oil change is required.

▶ Do it as soon as possible.

3.1.5.4 Information symbols in the INF field

Service due

This symbol appears if a service interval is due.

▶ Switch on the ignition.
↳ The service interval to be carried out will be displayed for approx. 10 seconds in place of the overall operating hours.

Acknowledge error

This symbol appears if a machine error (**E5xx**) has occurred and the buzzer sounds simultaneously.

3.1.5.5 Getting information from the operator's menu on the main screen

Main screen menu selection

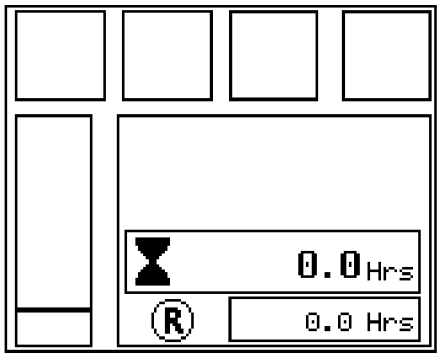


Fig. 3-8 *Main screen*

❑ To change to the operator's menu, the main screen must be visible.

▶ Press the **Menu** button on the main screen.
↳ The list of accessible menus is displayed.

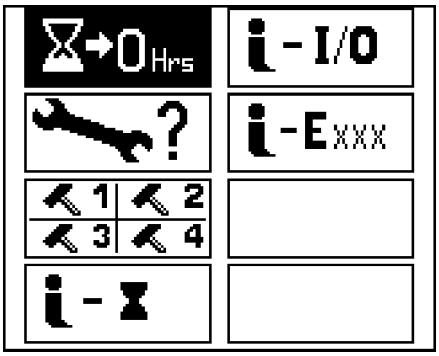


Fig. 3-9 *Menu selection in the operator's menu.*

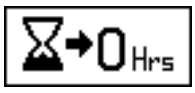
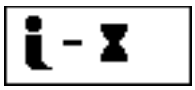
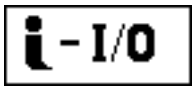
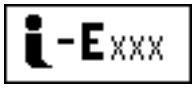
To select the operator's menu:

▶ Press arrow key **Down** or **Up**.
↳ The following or previous operator's menu will be displayed on screen with a black background.

❑ The selected menu is displayed with a black background, the **Reset daily operating hours** menu is used here as an example.

▶ Press the **Menu** button again.
↳ The submenu for the function selected is displayed.

▶ Press the **Back** button again.
↳ The submenu will be aborted.

Symbol	Description
	Reset daily operating hours counter
	Confirm service interval
	Select quantity limitation relating to attachments (eg. hammer)
	Operating hours and device data
	Status of hydraulic pumps and electrical inputs and outputs
	Recorded and stored errors
	Immobilizer (must be activated by LIEBHERR customer service using a service connector)

Tab. 3-1

Tab. 3-2 *Overview of menu options*

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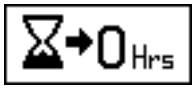


Reset daily operating hours counter menu

The daily operating hours counter can be reset to 0 using this menu.

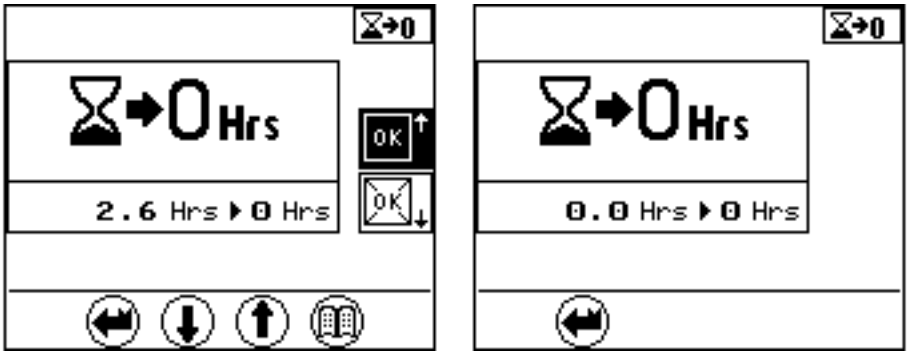


Fig. 3-10 *Resetting the daily operating hours counter*

To set the daily operating hours counter to 0:

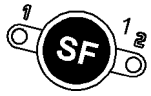
▶ Press the **Up** arrow key.
↳ The OK which is not crossed out will be displayed with a black background.

▶ Press the **Menu*** button.
↳ The operating hours will be reset to 0.
↳ The arrow key symbols **Up** and **Down** and the **Menu** symbol will no longer be displayed.

To exit the menu:

▶ Press the **Back** button.
↳ The submenu will be aborted.

To set the work speed:



❑ Press switch **S354**.

▶ Press the **Up** or **Down** arrow key.
↳ Set the desired work speed. The quantity can be limited to up to 50 % of the maximum capacity.

▶ Press the **Back** button.
↳ The submenu will be aborted.
↳ The selected work speed is activated.
↳ LED 1 in switch **S354** illuminates.
↳ The symbol ® appears in the S1 field on the main screen (see Fig. 3-8)

▶ Press switch **S354**.
↳ Quantity reduction is deactivated.
↳ LED 1 in the switch goes out.
↳ The symbol turns black ● = 100%

Confirm service interval menu

This menu is used for information on service intervals and to confirm service work which has been carried out.

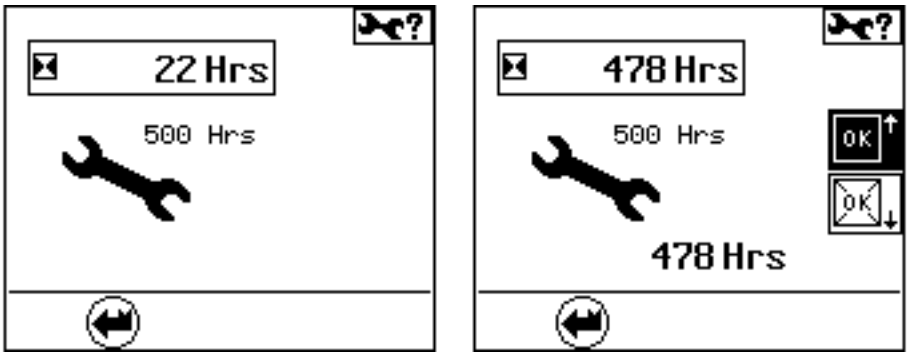


Fig. 3-11 *Service intervals menu*

The operating hours of the next service interval (in this example, “500 Hrs”) and the current operating hours (“478 Hrs”) are displayed in the menu.

A pending service interval can be confirmed a maximum of 50 operating hours before the service interval is due.

When this time period has been reached a query will appear to ask whether the service work has been carried out.

❑ Service work carried out.

▶ Press the **Up** arrow key.
↳ The OK which is not crossed out will be displayed with a black background.

▶ Press the **Menu** button.
↳ The current operating hour will be confirmed as the last service interval carried out.

❑ Service work not carried out.

▶ Press the **Back** button.
↳ The submenu will be aborted.

Allocation of quantity limitation options to external input I1 menu

(Kit input; for example, activation of the hammer pedal)

Predefined quantity limitations have been assigned in this menu.

The arrow opposite the symbol represents the current selection.

In the example (see Fig. 3-12), quantity 2 is active if the specified attachment is serviced.

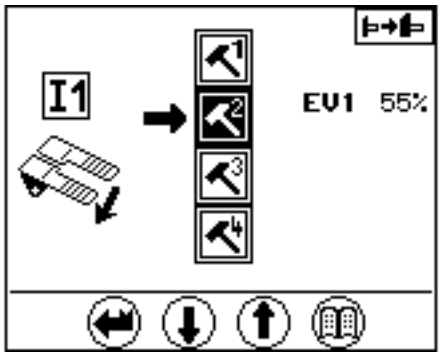


Fig. 3-12 *Work equipment quantity limitation menu*

▶ Press the **Up** or **Down** arrow key.
↳ A different, predefined quantity (1-4) can be assigned (e g. when work

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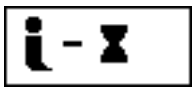
equipment is changed).

▶ Press the **Menu** button.
↳ The selection is confirmed. The arrow displays the current selection.

To exit the menu:

▶ Press the **Back** button.
↳ The submenu will be aborted.



Operating hours menu

Pages 1 to 2 provide an overview of the operating hours of individual units, processes and operating types.

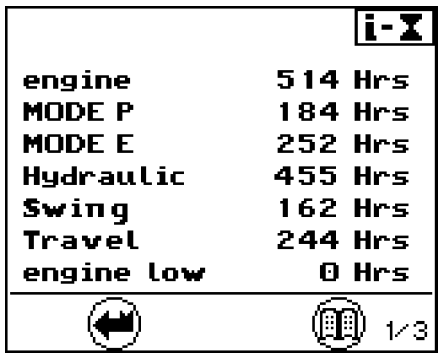


Fig. 3-13 *Engine service life menu (example)*

Page 1 provides the service life in hours for:
– Diesel engine
– Diesel engine in P mode (RPM stage 10)
– Diesel engine in E mode (RPM stage 8)
– Hydraulic operation
– Swing movements
– Travel movements
– Diesel at low idle

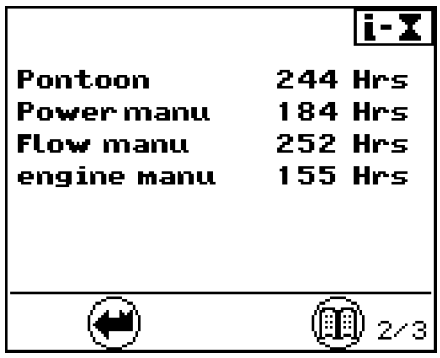


Fig. 3-14 *Operating hours menu*

▶ Press the **Menu** button.
↳ Page 2 is displayed.

The screen (page 2/3) indicates the operating hours for :
– Pontoon operation
– Safety operation for pump power control
– Safety operation for pump flow control

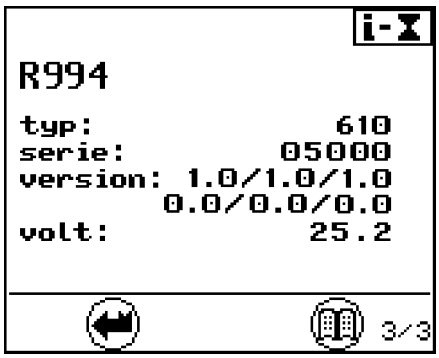


Fig. 3-15 Technical data

▶ Press the **Menu** button again.
↳ Page 3 is displayed.

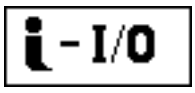
The technical data menu, page 3, provides information on :

– The excavator type, including type and serial number (type, series)
– The design condition of the control which is currently built in (ver)
– The current operating voltage (volt)

▶ Press the **Menu** button again.
↳ Page 1 is displayed.

To exit the menu:

▶ Press the **Back** button.
↳ The submenu will be aborted.



Status of hydraulic pumps and electrical inputs and outputs menu

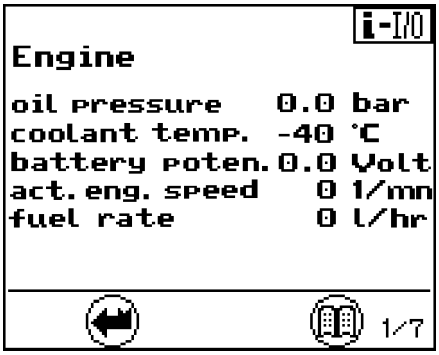


Fig. 3-16 Quantum system menu

Page 1 provides information from the Quantum system of the engine.

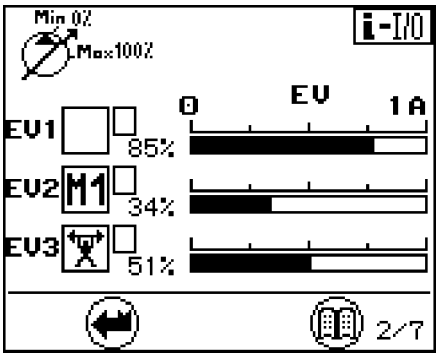


Fig. 3-17 Quantity limitation menu

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▶ Press the **Menu** button again.
↳ Page 2 is displayed.

This screen gives information about the operating position of the hydraulic pumps. It gives the following indications for each working pumps :

▶ If the flow limitation is activated for the pump. If it occurs, the symbol "R" is displayed in the field TI, see main screen. The screen 2/7 shows an example with the flow limitation M1 activated, which limits the pump P1 to 34% of the maximum flow. Should several flow limitations be actuated at the same time, so the one with the smallest flow value has priority.

▶ The graphic bar with electric current value indicates for the pump the amount of the momentary flow control signal.

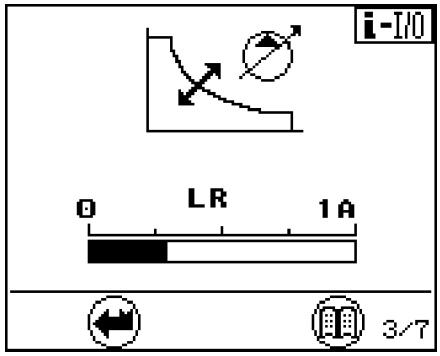

Fig. 3-18 *LR magnet menu*

▶ Press the **Menu** button again.
↳ Page 3 is displayed.

The present LR solenoid current (current value for power control) is showed on screen 3.

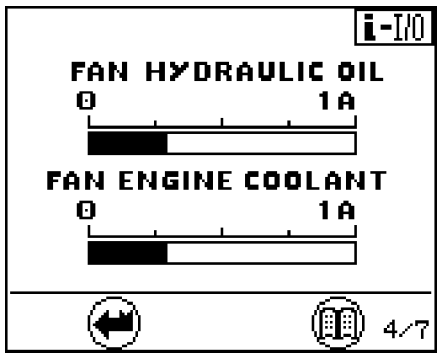

Fig. 3-19 *Fan speed current values menu*

▶ Press the **Menu** button again.
↳ Page 4 is displayed.

The screen 4 indicates for the fan pumps the amount of the momentary flow control signal.

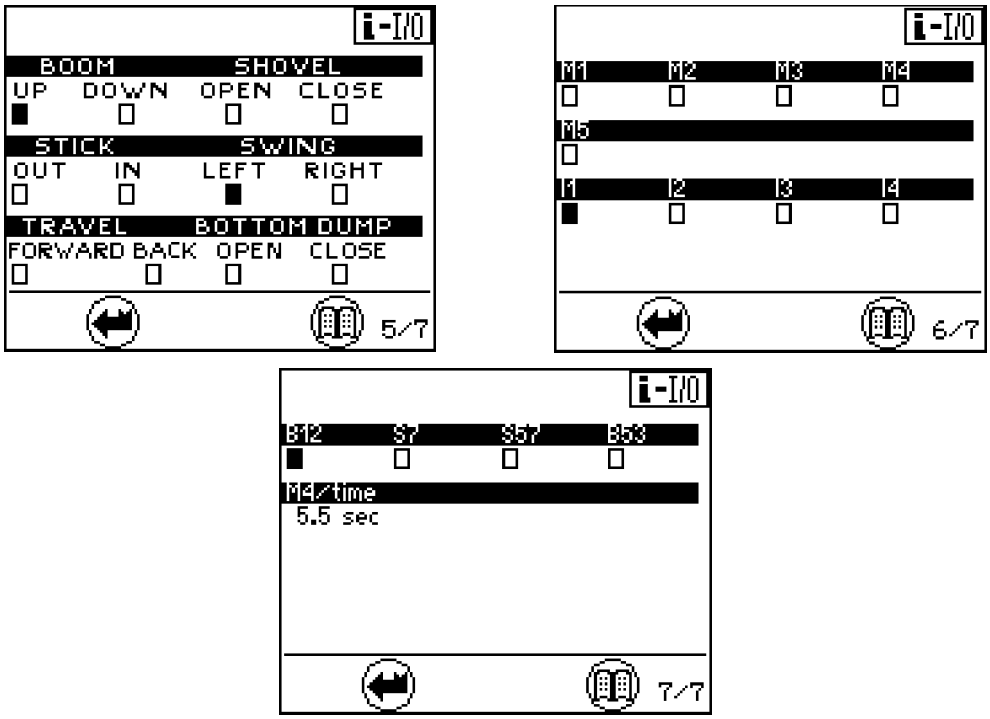

Fig. 3-20 *Electrical inputs*

▶ Press the **Menu** button again.
↳ Page 5 is displayed.

▶ Press the **Menu** button again.
↳ Page 6 is displayed.

▶ Press the **Menu** button again.
↳ Page 7 is displayed.

Pages 5, 6 and 7 provide an overview of the status of different electrical inputs.

A "□" means "Input not active".

A "■"means "Input active".

An "NC" beneath the terminal designation means that the software for the relevant input has been deactivated.

The status of the inputs can be changed using the menu "set data" - "set E-code".

The screen 5 indicates the status of the inputs for the different movements.

The screen 6 indicates the status of the flow limitation. M1, M2, ... correspond to machine specific (internal) oil flow limitations. I1, I2, ... correspond to predefined oil flow limitations (see also menu "set option").

The screen 7 indicates the status other inputs. For the frequency inputs B53 and B12, the signs "■" means that a significant frequency is recognised by the system

B12	Engine RPM sensor	**B53**	Swing motor sensor
S7	Safety lever servo control	**S57**	Swing brake

To exit the menu:

▶ Press the **Back** button.
↳ The submenu will be aborted.

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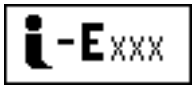


Error menu (operating errors and electrical system errors)

Fig. 3-21 *Recorded errors menu*

There are 3 selection options in this menu:

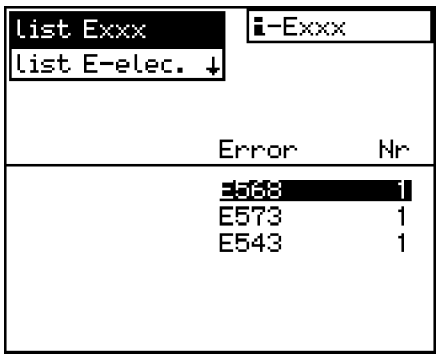
– By selecting **list Exxx**, machine errors recorded by the sensors are listed.
– By selecting **list E-elec**, all main screen cable errors stored when operating are listed.
– By selecting **list S-Exxx**, all errors which appeared when the service connector was connected are listed.

To select the desired error type:

▶ Press the **Down** or **Up** arrow key.
↳ The following or preceding error type will be displayed with a black background.

▶ Press the **Menu** button.
↳ The submenu on a black background will be displayed.
↳ If more than 6 error codes are present, arrow key **Down** or **Up** can be used to scroll to the next page.

Machine error list Exxx:



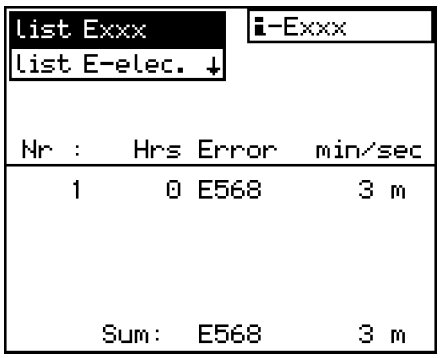


Fig. 3-22 *Error list (Fig. left) and Error occurrence (Fig. right) menu*

▶ Select **list Exxx**.

▶ Press the **Menu** button.
↳ The first page of the submenu appears.

All errors and their error codes are listed on the first page.

▶ Use the **Down** or **Up** arrow key to select the error code desired.

▶ Press the **Menu** button again.
↳ The second page of the submenu appears.

Operating hours and the duration of the first and last ten occurrences of the error

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selected will be listed on the second page.

▶ Press the **Back** button.
↳ The first page of the submenu appears.

▶ Press the **Back** button again to select another error type or press the **Down** or **Up** arrow key to select a new error code.

s*: Error was indicated by a buzzer and was acknowledged using the **Back** button. The duration is given in seconds.

m*: Error was indicated by a buzzer and was acknowledged using the **Back** button. The duration is given in minutes.

Note!
Only operating errors with an error code **E 5xx** will be displayed in the **list Exxx** menu.

Cable error list E-elec.:

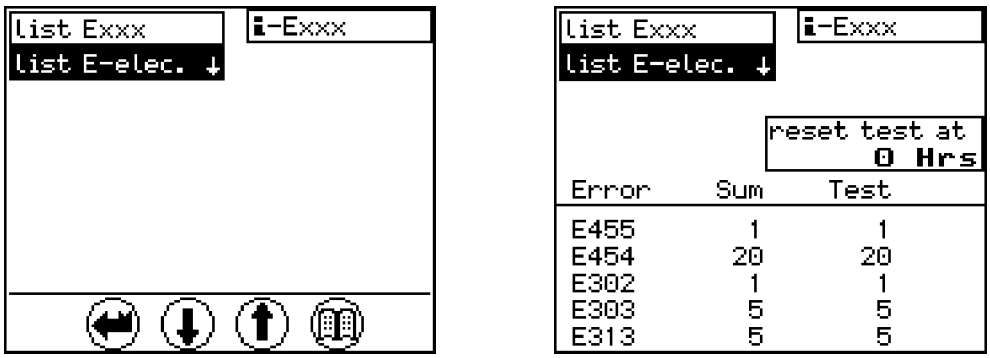


Fig. 3-23 Occurrence of electrical error (Fig. left) and Error statistics (Fig. right)

▶ Select **Cable error list E-elec.**:

▶ Press the **Menu** button.
↳ The submenu appears.

The column "Sum" shows the number of all errors that were ever noted.

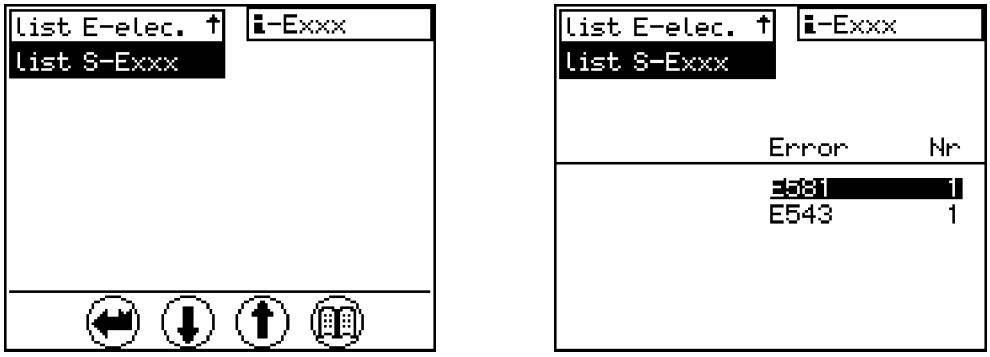
The column "Test" shows the number of errors occurred since the last deletion of this test error memory listing.

The operating hours above the test column show the operating hour when the last test memory was deleted (reset).

Press the **Back** button.

↳ A different error type may be selected.

Other errors list S-Exxx:



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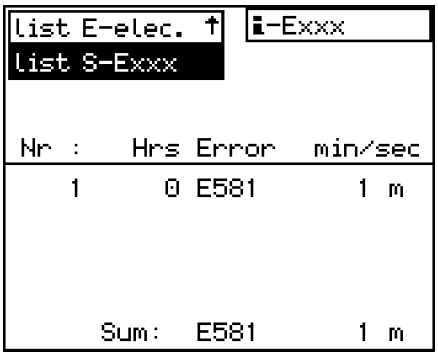

Fig. 3-24 *Call up service operation error list menu*

Selecting "list S-Exxx" also shows the errors according to the list in pages (see "Warning symbols in the SY field" on page 12), but this time only the errors that occurred during "service operation".

For each error, an overview can be shown and paged in just like for the "list-Exxx" selection. The column "Sum" shows the number of all errors that were ever noted.

3.2 Access and equipment of the cab

3.2.1 Entering or leaving the cab

3.2.1.1 Climbing up

Caution!
Entering or leaving the cab incorrectly could lead to injury.

- ▶ Ensure that the safety lever is always in its highest position when entering or leaving the cab.
- ▶ Always use the handholds provided for the purpose when entering or leaving the machine.
- ▶ Do not hold onto the controls to steady yourself.
- ▶ Never jump from the machine.

Cab:

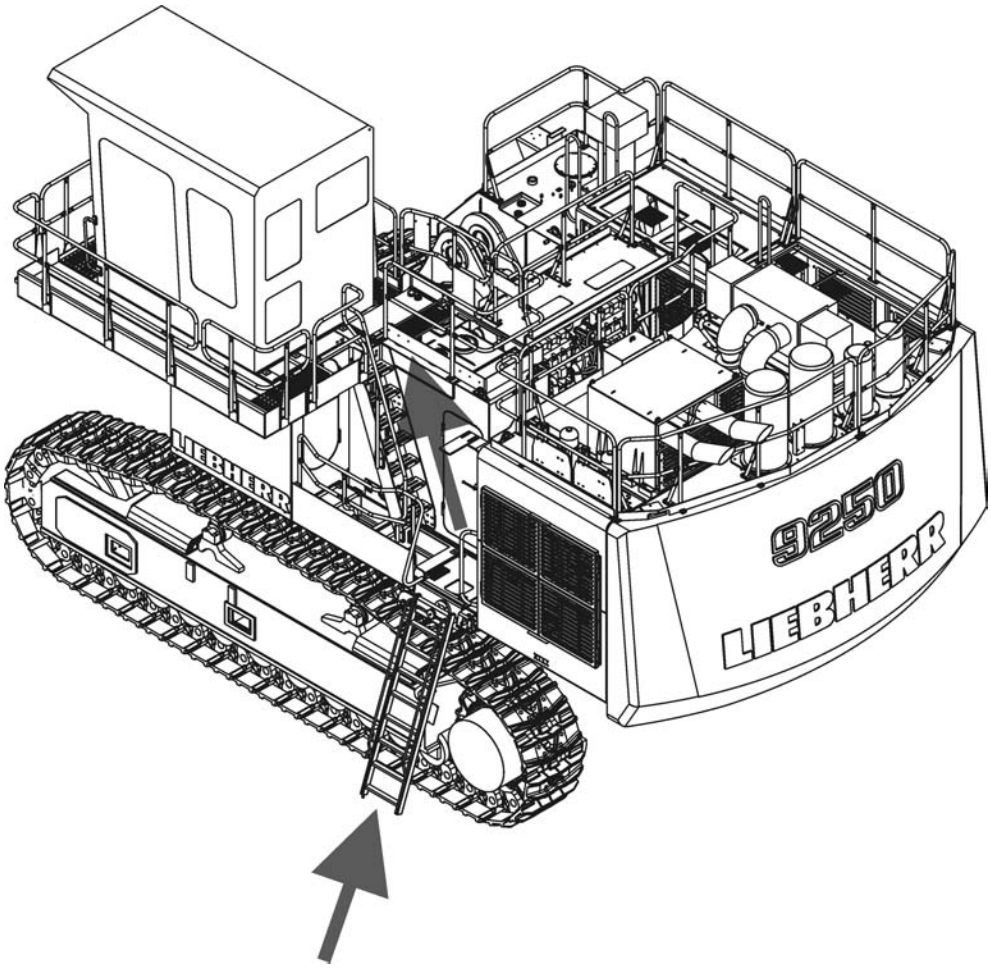

Fig. 3-25 *Climb up using the handholds*

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3.2.1.2 Getting in

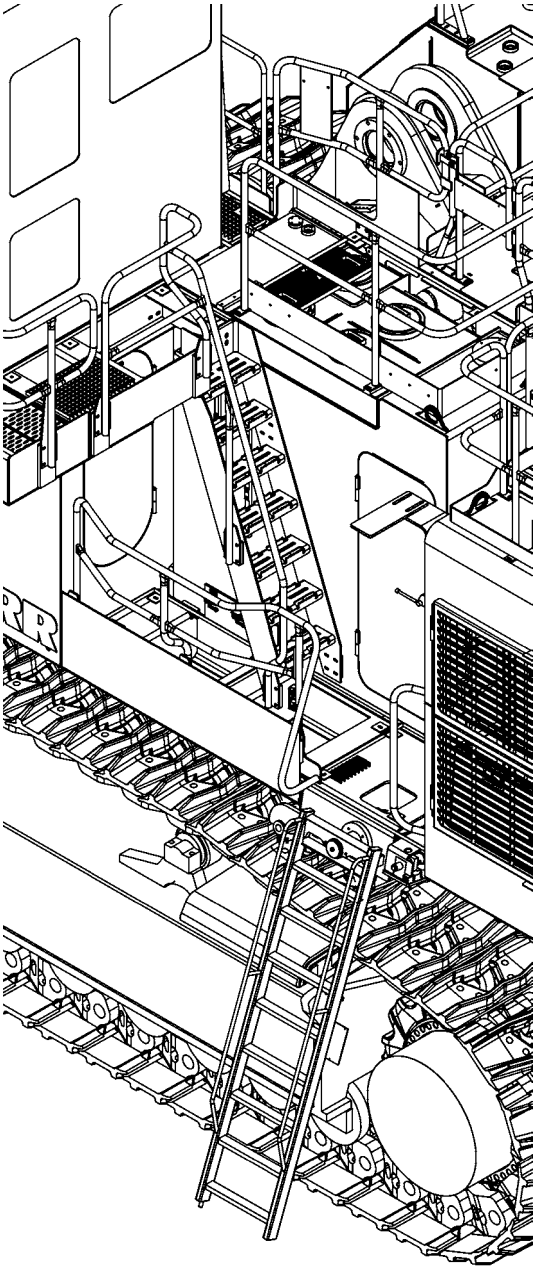

Fig. 3-26 *Access ladder*

If the ladder is in its lowest position and the excavator isn't running, you can climb up on the machine.

- ▶ Climb in with the ladders and with your face towards the ladders and use the provided handholds.
- ▶ On the cabin catwalk, open the door.
- ▶ Go in the cabin and sit in the operator's seat
- ▶ Adjust the seat and steering column if necessary.

3.2.1.3 Getting out

- ▶ Switch off the machine and push the safety lever up.

- ▶ Open the door fully.
- ▶ Go out of the cabin on the cabin catwalk.
- ▶ Close the door;
- ▶ Go down with your face towards the ladders, and use the appropriate handholds.

3.2.1.4 Access ladder

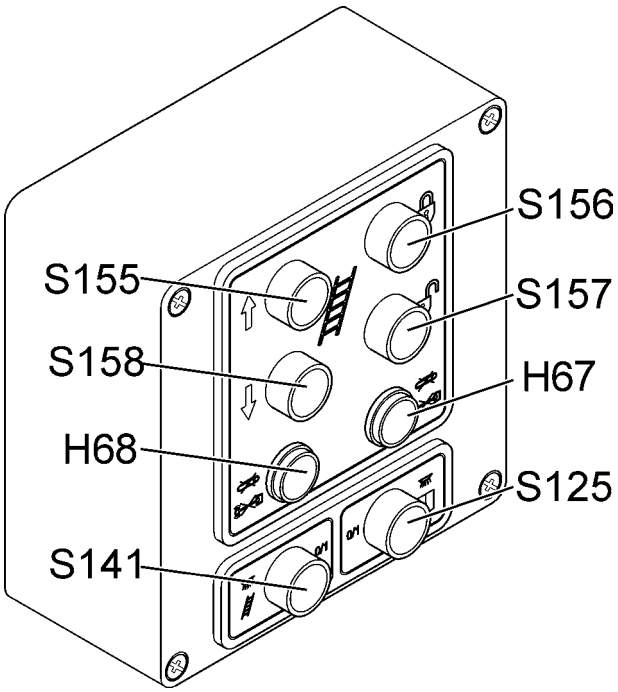

Fig. 3-27 *E1022-1 Control box / access ladder*

H67 Control light red / ladder not locked
H68 Control light red / ladder not in upper stop position
S125 Switch / lighting of cab access
S141 Switch / lighting of main ladder
S155 Push-button / access ladder up
S156 Push-button / access ladder locking
S157 Push-button / access ladder unlocking
S158 Push-button / access ladder down

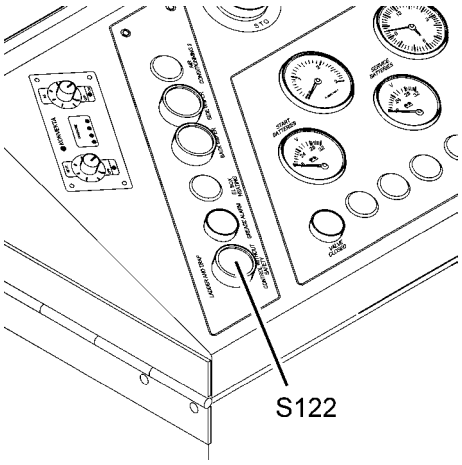

Fig. 3-28 *Control panel*

The access ladder can be swung either into lower position to permit access to the

uppercarriage or into upper position during operation via an hydraulic cylinder.

Before operating the machine, the ladder must be fully raised to the uppercarriage and locked in place.

The ladder can be extended and retracted from the uppercarriage via the control box E1022-1, which is installed to the catwalk next to upper ladder section leading to the cab.

Danger!.

Never actuate the ladder if you or a third person are on or in immediate proximity of the ladder!

To bring the ladder into lower position :

- ▶ Push the switch S157 to unlock the ladder (the red indicator light H67 will go on).
- ▶ Push the switch S158 to swing the ladder until it has reached the lowest position (the red indicator H68 is on).

To bring the ladder into upper position (working position) :

- ▶ Push the switch S155 until the ladder has reached its top position (i.e. the red indicator light H68 goes out).
- ▶ Push the switch S156 to lock the ladder (when locked the red indicator light H67 goes out).

Caution!.

For safety reason, the excavator can only be operated if the ladder is locked in its top position. Otherwise, the red indicator light goes on. This means that the swing and travel movements remain locked.

This safety measure can be momentarily by-passed by pushing and holding the button S122 at the right front of the control panel.

The ladder can only be locked after it has reached its upper stop position (H68 is off).

The ladder can only be swung up or down when the locking device is in unlocked position (H67 is on).

3.2.2 Safety lever

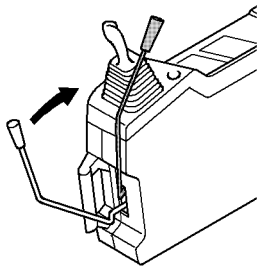

Fig. 3-29 *Safety lever*

For safety purposes, the left control panel is provided with a safety lever.

Caution!
The safety lever must always be pushed up into its highest position (see arrow) when entering or exiting the cab.

When the safety lever is pushed up, the pilot control circuit is disconnected. This means that:

– No work movements can be carried out when pilot control devices, e g. the joystick or foot pedals, are operated.
– The slewing gear brake is locked (LED in switch **S17** illuminates).
– It is not possible to release the slewing gear brake using switch **S17**.

When the safety lever is pushed (push up / push down) to its lowest position, the slewing gear brake and the LED in switch **S17** will return to their original states and the pilot control devices will be active.

▶ Before the operator starts working, he must push the safety lever down into its lowest position while seated in the operator's seat.

3.2.3 Operator's seat

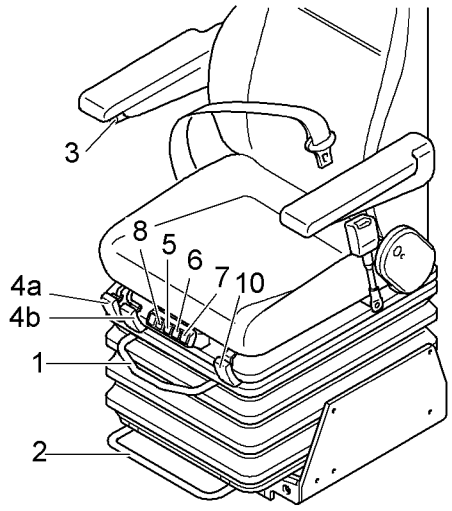

Fig. 3-30 *Standard operator' seat*

1	Set horizontal, upper	**4a**	Set seat inclination, front	**7**	Set lumbar support
2	Set horizontal, lower	**4b**	Set seat inclination, rear	**8**	Seat heating
3	Adjust armrests	**6**	Set lumbar support	**10**	Set backrest

The operator's seat should be set up before starting the machine; this means that:

– The diesel engine may not be started.
– The safety lever must be pushed up.

This will avoid unexpected movement of the machine.

3.2.3.1 Setting the armrests

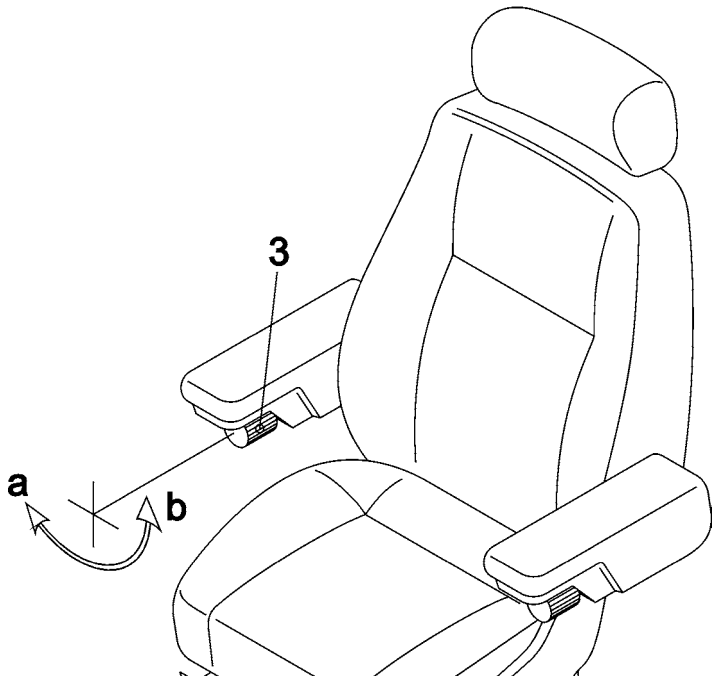

Fig. 3-31 *Setting the armrests*

- ▶ Turn the knurled head screw **3** on the armrest in direction **a**.
  ↳ The armrests incline upwards.
- ▶ Turn the knurled head screw **3** on the armrest in direction **b**.
  ↳ The armrests incline downwards.

3.2.3.2 Setting the seat and backrest

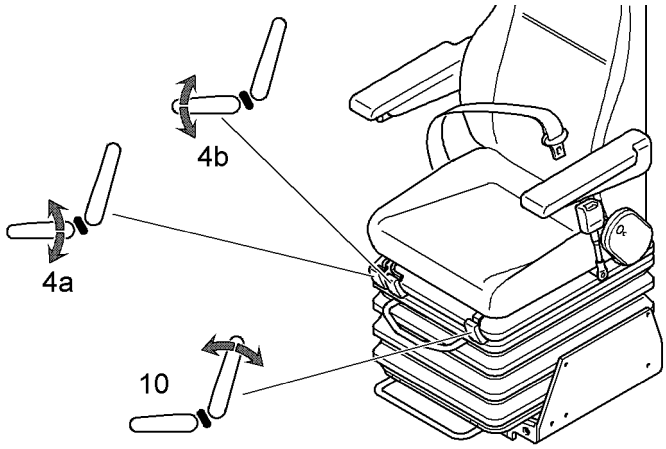

Fig. 3-32 *Setting the seat and backrest*

- ▶ Rear seat inclination: Pull lever **4a** up, set the inclination and release the lever.
- ▶ Front seat inclination: Pull lever **4b** up, set the inclination and release the lever.
- ▶ Backrest: Pull lever **10** up, set the inclination and release the lever.

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3.2.3.3 Setting the horizontal seat position

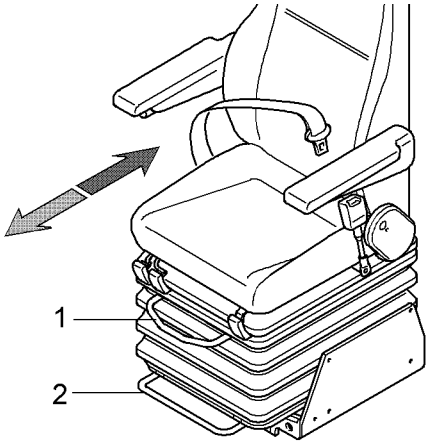

Fig. 3-33 *Setting the horizontal*

- ▶ Pull up the lever **1** to push the operator's seat in the horizontal direction.
- ▶ Pull up the lever **2** to push the operator's seat and control panels in the horizontal direction.

3.2.3.4 Setting the vibration damping and lumbar support, switching on the seat heating (air-cushioned operator's seat, optional extras)

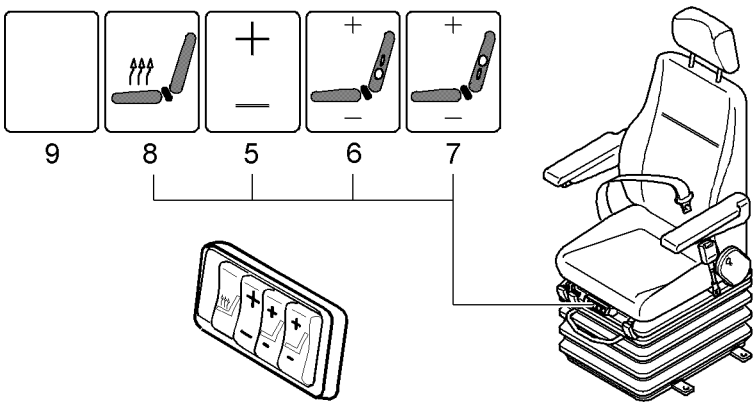

Fig. 3-34 *Switch bar on the air-cushioned operator's seat*

To set the vibration damping:

- ▶ Press button **5** (**+** or **-**) and set the vibration system according to body weight.

To set the lumbar support:

- ▶ Press button **6** (**+** or **-**) to inflate or deflate the lower lumbar chamber.
- ▶ Press button **7** (**+** or **-**) to inflate or deflate the upper lumbar chamber.

To set the seat heating:

- ▶ Use switch **8** to switch the seat heating on or off.

The seat heating switches off automatically when the temperature set is reached.

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3.2.3.5 Putting on / releasing the safety belt

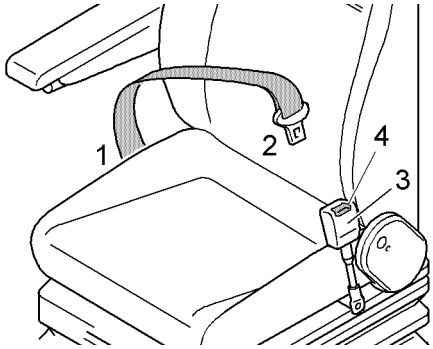

Fig. 3-35 *Safety belt*

The safety belt is automatic. It is not necessary to adjust the length of the belt.

- ▶ Pull the belt and buckle **2** out of the roller mount **1**.
  - ⇘ If pulled out of the roller mount sharply, the belt may lock.
- ▶ Push the buckle into the belt lock **3** until it fastens.

Danger!
The safety belt is designed to protect the operator.

- ▶ Before starting the machine, always fasten the safety belt.
- ▶ Ensure that the safety belt is not twisted when it is fastened.
- ▶ To ensure your safety, check the condition, function and fastening of the belt regularly and replace any damaged parts without delay.

- ▶ To open lock **4**, push down on the belt lock using your thumbs.
  - ⇘ The safety belt will slide automatically back into the roller mount **1**.

3.2.3.6 Vibration damping

The seat complies with ISO 7096.

If the machine is used in accordance with regulations, the values of the vibration damping transferred by the operator's seat are less than or equal to the tested excitation vibration for the relevant machine class in accordance with ISO 7096.

The values for vibration accelerations a_{zw}, measured in accordance with ISO 2631-1, therefore comply with the requirements for protection against whole body vibration set out in EN 474-1.

3.2.4 Adjusting of the auxiliary seat

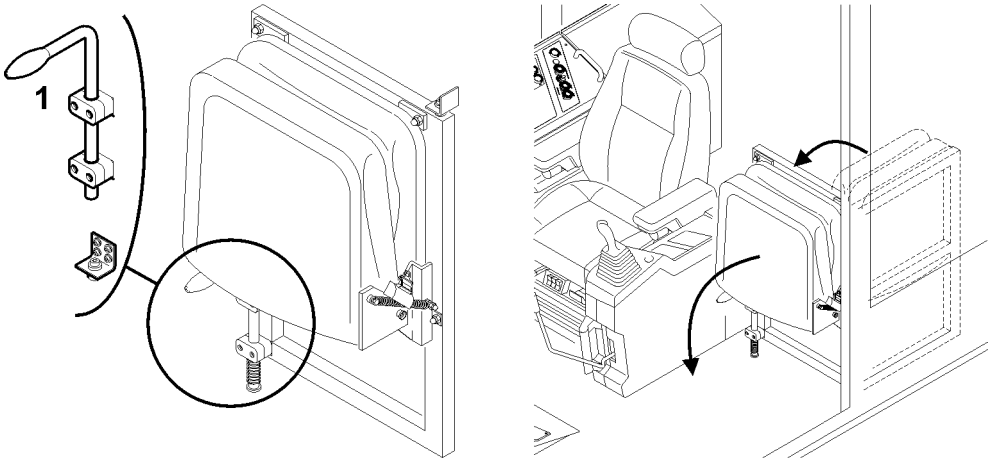

Fig. 3-36 *Auxiliary seat*

The lever **1** serves to lock the auxiliary seat into position either beside the operator's seat or against the cab's wall.

To rotate the seat,

▶ Pull the lever **1**.

To seat,

▶ Pull down the seating.

Note
When there is no one on this auxiliary seat, the seating must be pulled up and the seat in position lock against the cab's wall.

3.2.5 Sunshade

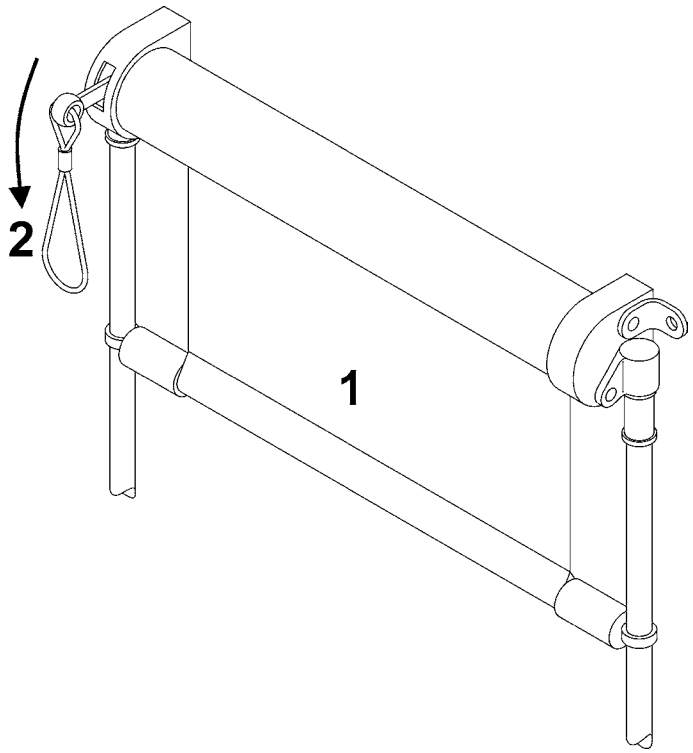

Fig. 3-37 *Windscreen and side windows sunshade*

The cab is provided with three sunshades, located on the windscreen and on the two side windows.

Windscreen

- ▶ Pull the sunshade down using the cross strut on the sunshade **1**.
  - ↳ The sunshade can be set for individual use.
- ▶ Pull out on the string **2**.
  - ↳ The sunshade rolls itself up.

Side windows

- ▶ Pull the sunshade down using the cross strut on the sunshade **1**.
  - ↳ The sunshade can be set for individual use.
- ▶ Pull out on the string **2**.
  - ↳ The sunshade rolls itself up.

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3.2.6 Emergency exit

3.2.6.1 rear door

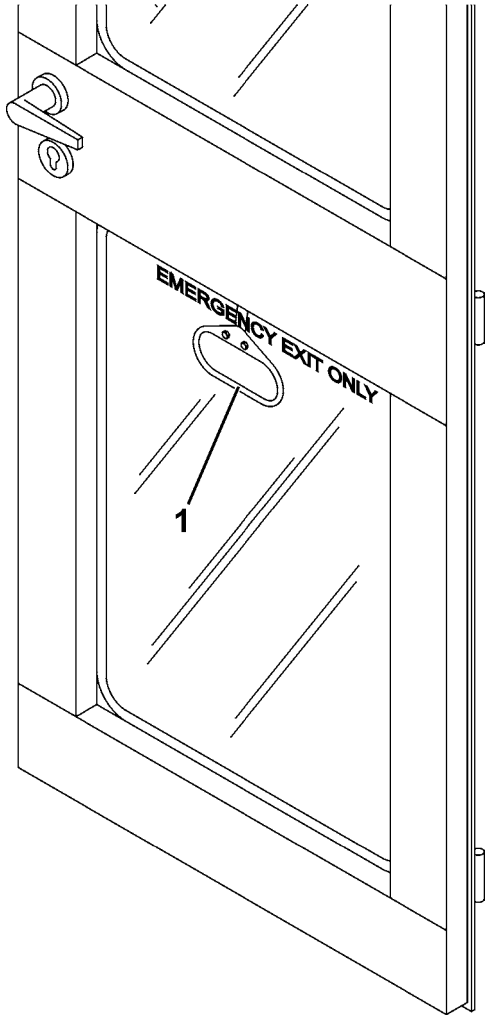

Fig. 3-38 *Emergency exit – rear door*

By pulling the handle **1** on the interior of the inferior window of the cabin door, the rubber weatherstrip can be released and removed.

▶ In case of emergency, pull the rubber weatherstrip out of the entire area of the window and push out the window.

3.2.6.2 Side window

The rear left window is equipped with the same system as the rear door.

▶ By pulling the handle on the interior of the rear left window, the rubber weatherstrip can be released and removed.

▶ In case of emergency, pull the rubber weatherstrip out of the entire area of the window and push out the window.

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3.2.7 Interior lightings

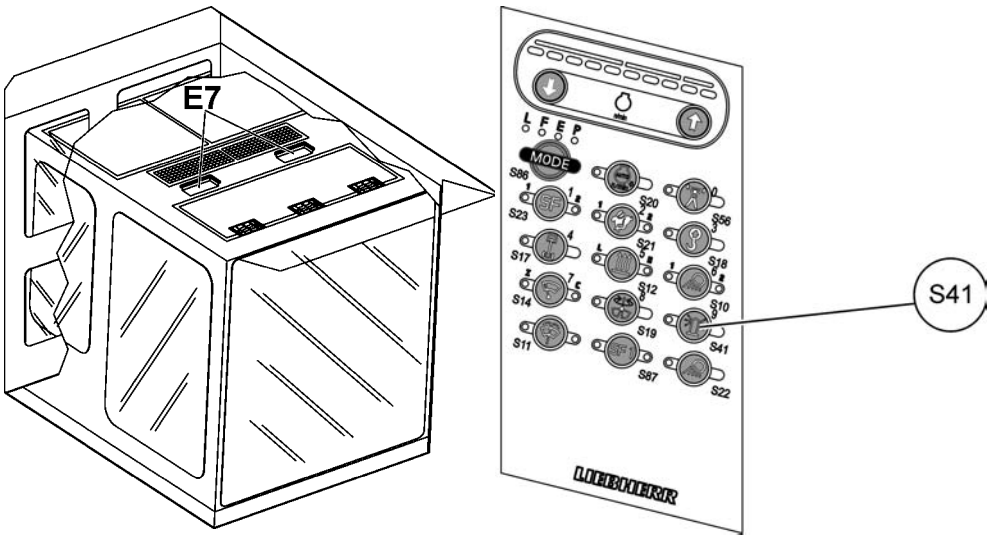

Fig. 3-39 *Interior lightings*

The interior lightings are switched on using the switch S41 on the Keypad.

▶ Press the switch S41.
↳ The lights **E7** are switched on.

▶ Press the switch S41 again.
↳ Interior lighting **E7** are switched off.

3.2.8 Windscreen wiper

3.2.8.1 Windscreen wiper

When the ignition is switched on, pressing switch **S14** will activate the windscreen wiper.

▶ Press switch.
↳ Intermittent switching
↳ LED I in the switch illuminates.

▶ Press switch again.
↳ Continuous operation.
↳ LED C in the switch illuminates.
↳ LED I in the switch goes out.

▶ Press switch again.
↳ Windscreen wiper is switched off.
↳ LED C in the switch goes out.

Setting the interval time for the intermittent switching

The interval time can be set when the ignition is on by pressing switch **S14**.

❑ Press the switch until the windscreen wiper is switched off (LED I in switch goes out)

▶ Press and hold switch.
↳ LED I in the switch flashes.

▶ Release the switch when the desired interval time has been reached.
↳ The interval time can be set to between 2 and 10 seconds.

3.2.8.2 Windshield washer installation

When the ignition is switched on, pressing button **S11** will activate the electric windscreen washer installation.

- ▶ Press and hold button.
  - ⇘ Washing water will be sprayed onto the windscreen through the outlet nozzles.
  - ⇘ The windshield washer runs continuously.
- ▶ Release the button.
  - ⇘ Washing water will be stopped.
  - ⇘ Windshield washer will run continuously for approx. another 3 seconds.

3.2.8.3 Windscreen washing fluid container

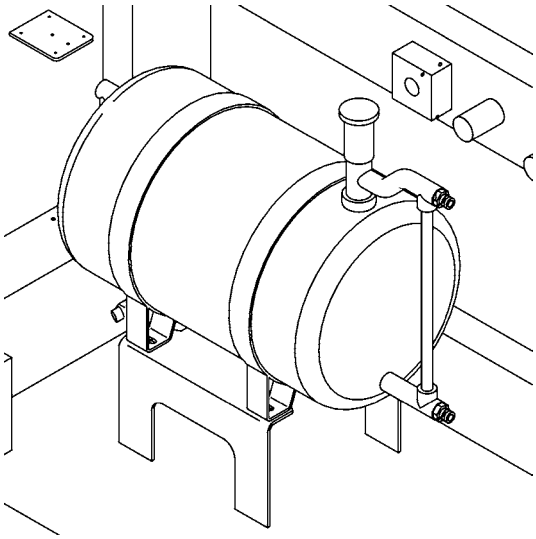

Fig. 3-40 *Windscreen washing fluid container*

The container for the windscreen washing fluid is located under the cabin in the cab elevation.

The container can be refilled via the service trap with ordinary windscreen washing fluid.

Volume: see lubricant chart

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3.2.9 Lighting

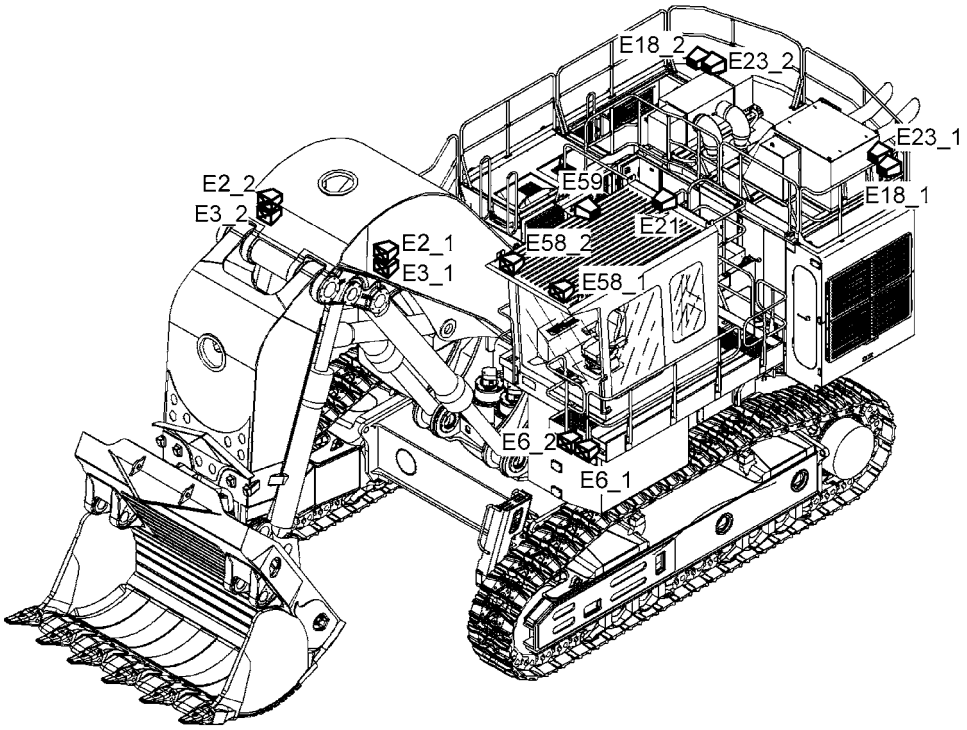

Fig. 3-41 *Arrangement of lighting*

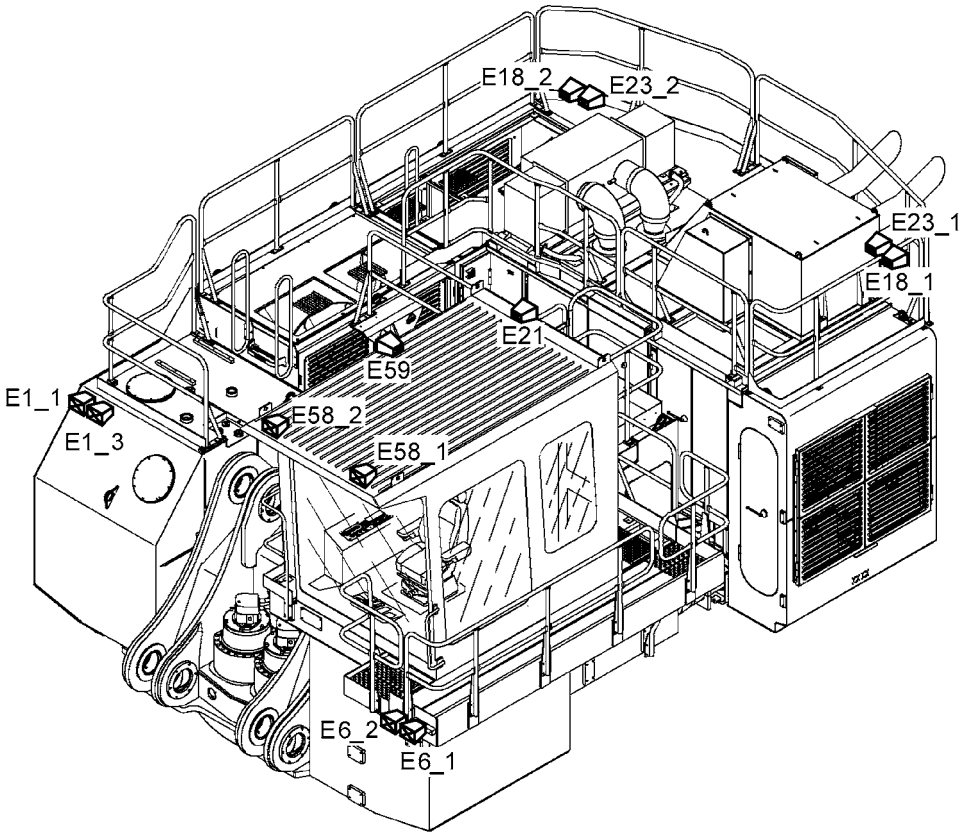

Fig. 3-42 *Arrangement of lighting for the uppercarriage*

E1_1 Fuel tank floodlight
E1_2 Fuel tank floodlight (option, not represented)
E1_3 Fuel tank floodlight
E1_4 Fuel tank floodlight (option, not represented)
E2_1 Equipment floodlight
E2_2 Equipment floodlight
E3_1 Equipment floodlight
E3_2 Equipment floodlight
E4_1 Equipment floodlight (option, not represented)
E4_2 Equipment floodlight (option, not represented)
E5_1 Equipment floodlight (option, not represented)
E5_2 Equipment floodlight (option, not represented)
E6_1 Cabin catwalk floodlight
E6_2 Cabin catwalk floodlight (option, not represented)
E6_3 Cabin catwalk floodlight
E6_4 Cabin catwalk floodlight (option, not represented)
E8_1 Under uppercarriage floodlight (option, not represented)
E8_2 Under uppercarriage floodlight (option, not represented)
E18_1 Counterweight floodlight (option)
E18_2 Counterweight floodlight (option)
E21 Top of cabin floodlight
E23_1 Counterweight floodlight (option)
E23_2 Counterweight floodlight (option)
E58_1 Top of cabin floodlight
E58_2 Top of cabin floodlight
E59 Top of cabin floodlight

3.2.9.1 Equipment lights, fuel tank lights, catwalk lights and top of cabin lights

The fuel tank lights (E1_1, E1_2, E1_3 and E1_4), the catwalk lights (E6_1, E6_2, E6_3 and E6_4) and the top of cabin lights (E58_1 and E58_2) are the driving lights.

The driving lights and the equipment headlights (E2_1, E2_2, E3_1, E3_2, E4_1, E4_2, E5_1 and E5_2) are switched on by pressing switch **S10**.

- ▶ Press the switch.
  - ↳ Driving lights are activated.
  - ↳ LED **1** in the switch illuminates.
- ▶ Press switch again.
  - ↳ Driving light are deactivated.
  - ↳ LED **1** in the switch goes out.
  - ↳ Equipment headlights are activated.
  - ↳ LED **2** in the switch illuminates.
- ▶ Press switch again.
  - ↳ Driving lights and equipment headlights are switched on.
  - ↳ LEDs **1** and **2** in the switch illuminate.
- ▶ Press switch again.
  - ↳ Driving lights and equipment headlights are switched off.
  - ↳ LEDs **1** and **2** in the switch go out.

3.2.9.2 Counterweight headlights and under uppercarriage lights (optional extra)

E8_1 and E8_2 are the under uppercarriage lights, and E18_1, E18_2, E23_1 and E23_2 are the counterweight headlights.

Pressing switch **S22** when the ignition is on switches on the Counterweight

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headlights and the under uppercarriage lights.

▶ Press the switch.
  ↳ Counterweight headlights and the under uppercarriage lights are switched on.
  ↳ LED in switch illuminates.

▶ Press switch again.
  ↳ Counterweight headlights and the under uppercarriage lights are switched off.
  ↳ LED in the switch goes out.

3.2.10 Heating/air-conditioning system

A heater and an air conditioner are installed in the cab as standard equipment.

The heater is installed on the cab floor. The evaporator for the air conditioning system is integrated in the roof of the cab, and the condenser is installed on the engine cooling radiator.

3.2.10.1 Cab ventilation

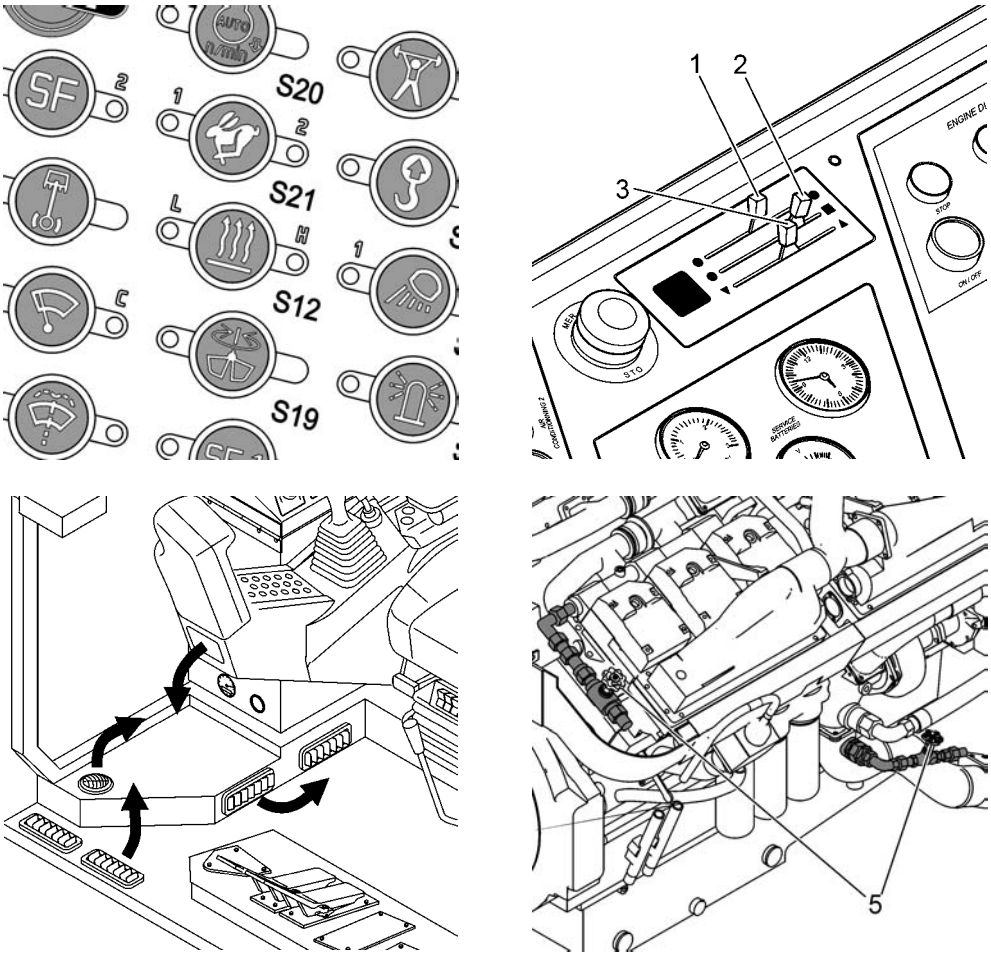

Fig. 3-43 *Ventilation system*

The heater as well as the air conditioner can both be used, at the same time and independently of each other to ventilate the cab.

Ventilation via the heater

For cab ventilation during the summer time, the two coolant shut off valves (pos. 5)

which join the Diesel engine to the cab should be closed.

- ▶ Push the lever 1 all the way forward.
  - ↳ The water supply is closed.
- ▶ Push button S12 to select desired air flow
  - ↳ The fresh air enters into the cab via openings on the steps and via the vents on the left and right front
- ▶ Move the lever 2 to regulate the amount of fresh air / recirculated air coming into the cab.
- ▶ If lever 2 is pushed forward, the fan recirculates the air in the cab.

Ventilation via the air conditioner

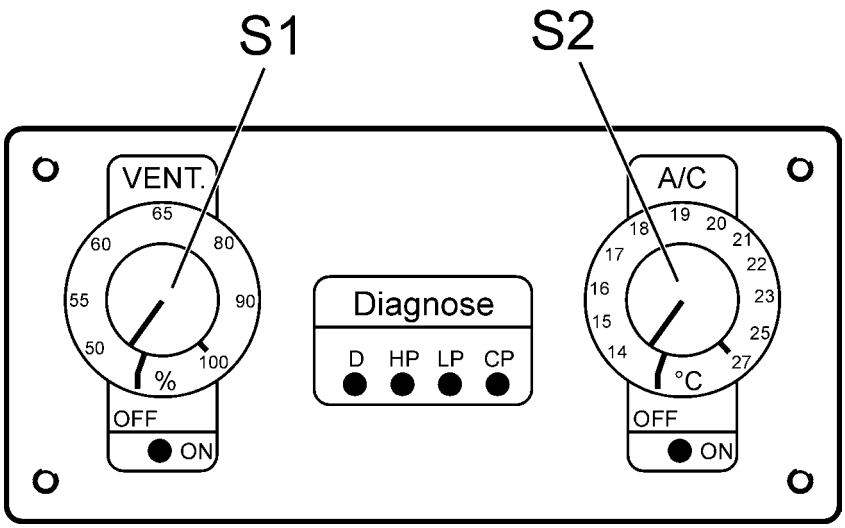

Fig. 3-44 *Air-conditioning system control device*

To ventilate the cab via the evaporator in the roof of the cab.

- ▶ Turn the air conditioner off via button S2.
- ▶ Turn the blower fans on.
- ▶ Select the desired air flow via the rotary switch S1 and the vents of the evaporator.

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3.2.10.2 For heater operation

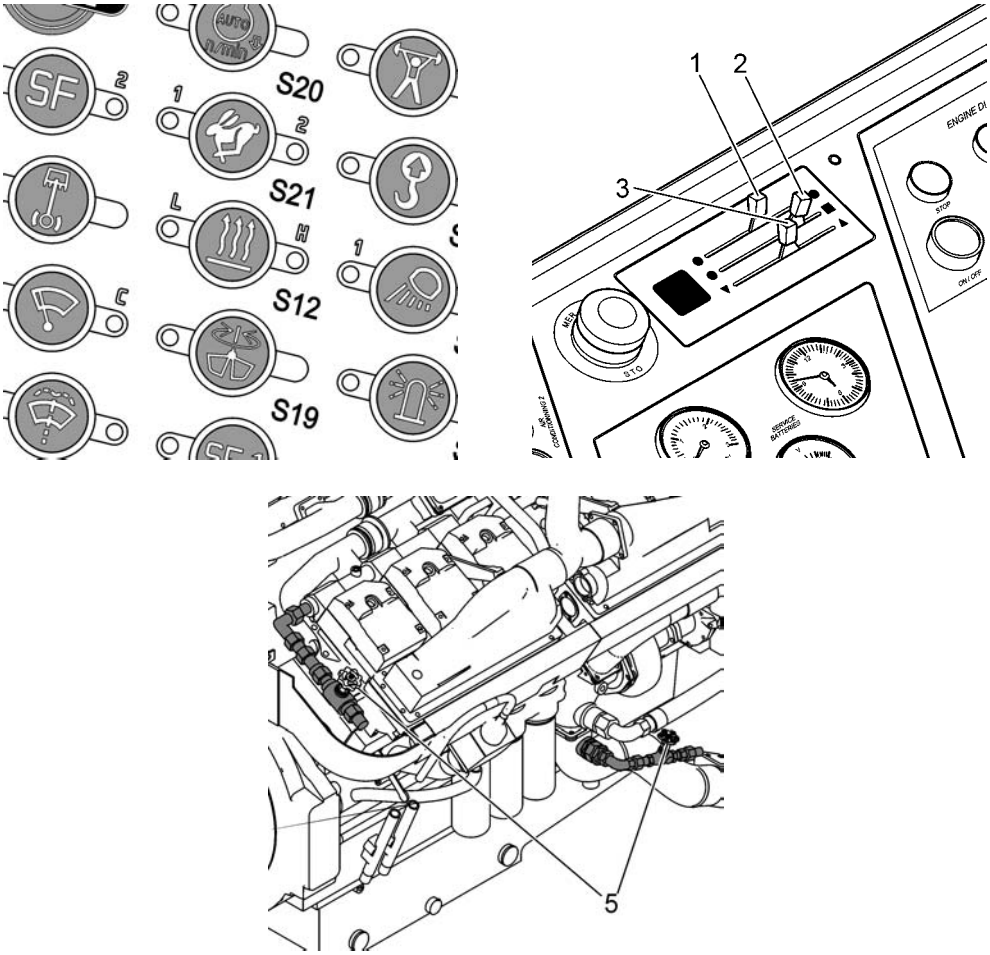

Fig. 3-45 *For heater operation*

- ▶ Open the coolant shut off valves on the Diesel engine.
- ▶ By moving the lever 1.
  - ↳ The amount of water running through the heat exchanger can be regulated.
  - ↳ If the regulator is pushed all the way to the rear, the maximum amount of coolant flows to the heater.
- ▶ Set the desired air flow via button S12.
- ▶ Move the lever 2
  - ↳ The amount of fresh air recirculated and entering the cab is regulated.

Note!
The best heating effect can be reached when the air is recirculated, which means, the lever 2 should be pushed all the way to the front.
In this position, a small amount of outside air is mixed with the recirculating air in the cab.

To quickly defrost the windshield.

- ▶ Direct the warm air flow via the vents to the front,
- ▶ Push the sliding regulator 3 all the way to the rear.
  - ↳ So the maximum air flow is blown via the vents in the step onto the windshield.

When the lever 3 is pushed all the way to the front, part of the warm air flow is blown against the left side window.

3.2.10.3 Overview of the air conditioner

The cab has an air-conditioning system as standard. The air-conditioning system is used to cool and ventilate the cab.

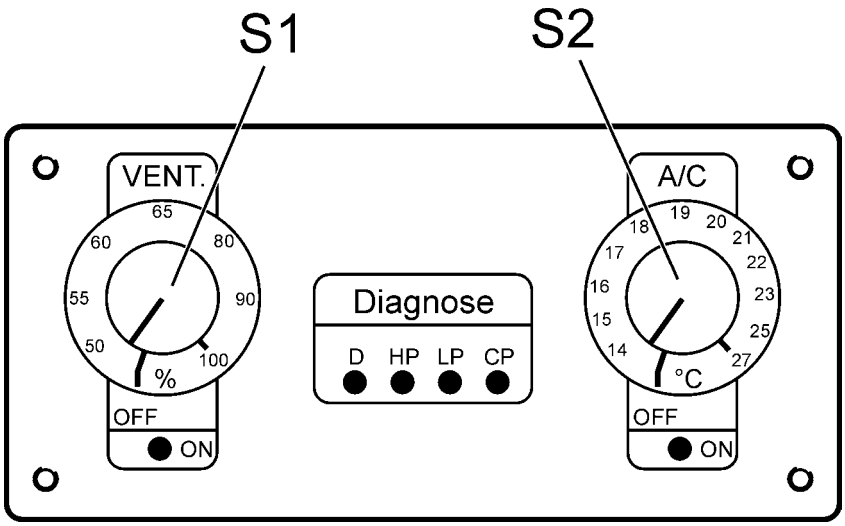

Fig. 3-46 *Air-conditioning system control device*

Control buttons

S1 – Rotary switch / desired air flow
S2 – Rotary switch / desired air temperature

Air conditioner operation

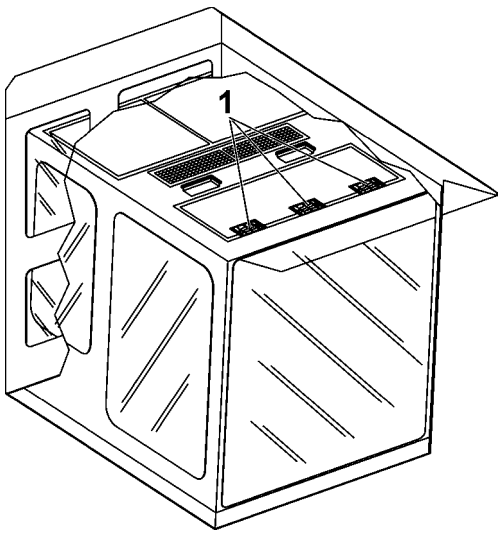

Fig. 3-47 *Vents on the evaporator unit*

To adjust the air conditioner fan.

▶ Use button S1.

The Diesel engine must be running before the air conditioner blower is turned on.

To turn on the air conditioner compressor and the condenser fan.

▶ Use button S2.

▶ The air conditioner can only be turned on if the evaporator fan unit is turned on via button S1.

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To select the desired air flow.

▶ Use the rotary switch S1.

To set the desired air temperature.

▶ Use the rotary switch S2.

To adjust the direction of the cold air flow.

▶ Use the vents on the evaporator unit.

For air conditioner operation during the summer time.

▶ Close preferably the coolant shut off valves on the Diesel engine.

▶ Push the lever all the way to the front.

▶ Turn the heater blower off via button S12.

To dehumidify the air in the operator's cab. In case of very high humidity inside the cab during the colder season.

▶ the air conditioner can be operated for a short while simultaneously with the heater in order to eleminate the excess of humidity and the condensation.

▶ For best efficiency, select a high evaporator air flow via the rotary switch S1 and operate the heater with recirculated air.

3.3 Operation

3.3.1 Safety instructions

3.3.1.1 Bringing the machine safely into service

– Carry out a careful inspection tour around the machine each time before starting it.
– Check the machine for loose bolts, cracks, wear, leakage and damage.
– Never attempt to operate a damaged machine.
– Ensure that any damage is immediately rectified.
– Ensure that all hoods and covers are closed, but that locks are unlocked.
– Ensure that all warning signs are present.
– Keep windows and interior and exterior mirrors clean. Secure doors and windows against unintended movement.
– Ensure that no one is working on or under the machine and warn personnel in the vicinity of the machine that it is about to start by sounding the horn.
– Before starting the machine, adjust the seat, mirrors, armrests and operator's controls in such a way that you are able to work comfortably and safely.
– Acoustic insulation devices on the machine must be set to the insulation position throughout operation.
– Only operate combustion engines and fuel-operated heaters in adequately ventilated spaces. Before starting in closed areas, ensure adequate ventilation. Follow the regulations which apply for the particular area of use.

3.3.1.2 Starting the machine safely

– Before starting, check all control lamps and instruments for correct function, place

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all operator's controls in Neutral and tilt the safety lever up.

– Before starting, sound the horn briefly to alert people in the vicinity of the machine.
– Only start the machine from the driver's seat.
– In the absence of any other instructions, start the engine in accordance with the regulations given in the operating instructions.
– Tilt the safety lever down and then test all display and checking devices.
– In enclosed spaces, only allow the engine to run when there is adequate ventilation. If necessary, open doors and windows to ensure sufficient fresh air supplies.
– Bring the engine and hydraulic oil to operating temperature. Low oil temperatures make the control unit react sluggishly.
– Check that the equipment is operating correctly.
– Move the machine carefully to an open area and then check the function of the running and slewing gear brakes, the steering and the signaling and lighting devices.

3.3.2 Stopping the machine safely

– Only stop the machine on level, firm ground.
– If the machine has to be stopped on an incline, chocks should be used to secure it from rolling away.
– Use the stop bolts to secure the upper structure facing the chassis.
– Lower the equipment and anchor the grab lightly in the ground.
– Depress the parking and slewing brakes.
– Stop the engine in accordance with the operating instructions and tilt the safety lever up before leaving the cab.
– Lock the machine, remove all keys and secure it against unauthorized use.

3.3.2.1 Towing the machine safely

– Always follow the correct procedure: see chapter "Towing the machine" in these operating instructions.
– The machine may only be towed in exceptional circumstances, e.g. in order to move the machine away from an area where it is at risk.
– Before towing, check all attachments and towing devices for safety and stability.
– Towing devices such as bars must have adequate tensile strength and should be secured on the towing hook provided on the undercarriage chassis.
Any damage or accidents which occur while towing the machine are not covered by the manufacturer's guarantee.
– Ensure that there is no one in the vicinity of the towing devices when towing.
– When towing, maintain the correct transport position, permitted speed and route.
– After towing, return the machine to correct operational status.
– When restarting the machine, be sure only to proceed in accordance with the operating instructions.

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3.3.3 Starting / stopping the machine

3.3.3.1 General information

Note!
When using the machine at a specific height above sea level and in connection with certain outside temperatures, the performance and service life of the diesel engine with turbocharging is decisively affected.
Under these conditions, there is also an increased risk of the coolant circuit and the hydraulic oil overheating.

To avoid damaging CUMMINS diesel engines, the engine's power must be reduced when operating in the following environmental conditions (sea level and exterior temperature):

see the Cummins operation and maintenance manual.

3.3.3.2 Activities before starting

Caution!
It is only possible to extinguish a source of fire if it is accessible.

▶ Before starting, unlock all locks on the panelling of the hydraulic excavator.
↳ In the event of fire, the doors can be opened immediately and the fire extinguished.

Arrangement of locks: see Maintenance chapter

Caution!
With the activities referred to below, a machine that is already warm from operating, there is a risk of scalding or burning from hot coolant or oil.

▶ Please ensure that you read the information provided in the Maintenance chapter on carrying out these activities.

Before starting the machine, the following activities should be carried out on a daily basis:

– Check air filters for contamination*.
– Check the oil level in the engine*.
– Check the coolant level in the diesel engine*.
– Check fuel system and fuel level.
– Check the oil in the hydraulic system.
– If required, remove any ice and snow from the engine hood in the area of the cooling and combustion air intake.

* For how to carry out the activities, see the Maintenance chapter.

3.3.3.3 Starting the diesel engine

Ignition key switching positions

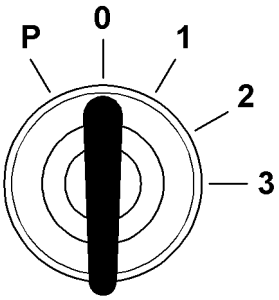

Fig. 3-48 *Ignition switch*

0	Off	**2**	Not used	**P**	Park position
1	Contact position	**3**	Start position		

Switching on the electrical system

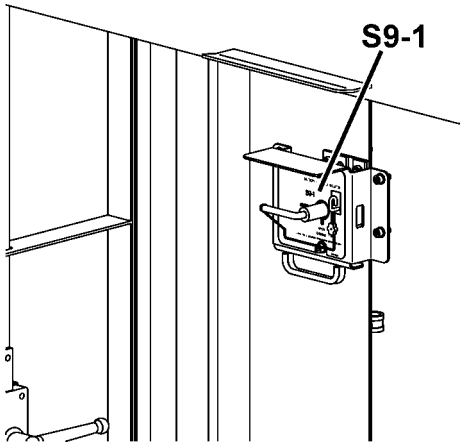

Fig. 3-49 *Main battery switch*

- ❑ The main battery switch S9_1 must be in position open. This battery switch is in the motor room near the splitterbox.

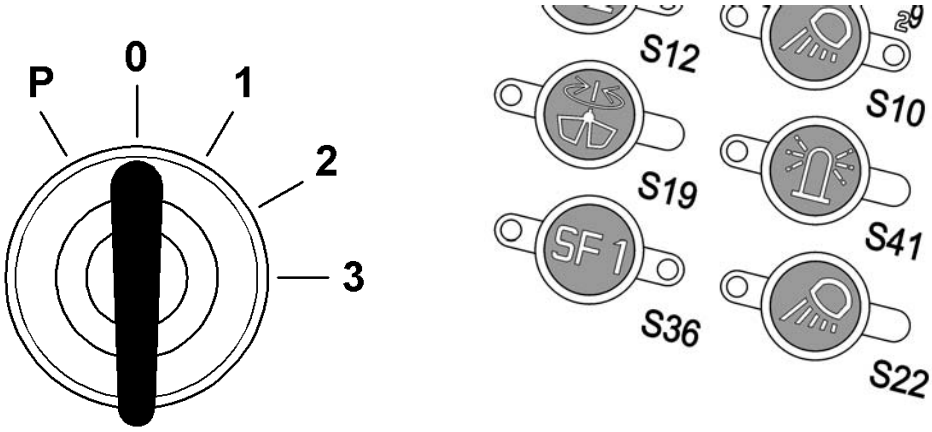

Fig. 3-50

▶ Turn the ignition key to contact position **1**.
  ↳ Immediately after turning the system on, the display and the control unit will run through a self test.
  ↳ Make sure all indicators function properly after turning the electrical system on, i.e. the light emitting diodes (indicator lights and gauges) turn on for a short time then the complete field of the LCD indicator 200 turns momentarily black (the matrix indicator is energised completely for a short time).
  ↳ Only the diode in the button S22 turns not on that time.

Note!
If no automatic check of the keypad and monitoring screen is carried out when the ignition key is in the contact position, check that the main battery switch is set to on.

Service interval display

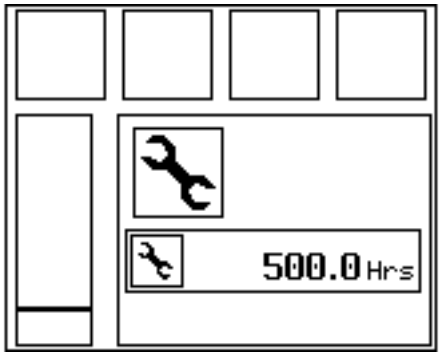

Fig. 3-51 *Service interval request*

After the automatic check, any service interval that may be due will be indicated by a graphic symbol.

In place of the operating hours information, the number of hours relating to the service interval required will now be displayed.

The service interval request will go out after approx. 8 seconds.

3.3.3.4 Starting the engine

Note!
Only operate the starter motor when the diesel engine is off.

▶ Operate the starter motor continuously for no longer than 10 seconds.

▶ If the engine does not start, turn the ignition key back to contact position **0**, before restarting the engine.

▶ And repeat the starting procedure at 20 seconds intervals to allow the starter motor to cool off.

Starting procedure when the exterior temperature is above 0 °C (32 °F)

During the starting procedure of the engine, a starter first drives an engine oil pump to establish the correct lub oil pressure in the engine, before it is being started ("PRELUBE" procedure).

Depending on engine oil temperature, a prelub time of up to 15 seconds might be necessary to obtain the correct pressure. Then the starter stops and after another 3 seconds, the principal starters start the Diesel engine.

If the engine and batteries are in good condition, the engine can be started without

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preheating.

To start the engine :

- ▶ Turn the ignition key to start position **3**.
- ▶ Maintain the key on this position during the prelub time.
- ▶ As soon as the engine is running, release the key.

Starting procedure when the exterior temperature is below 0 °C.

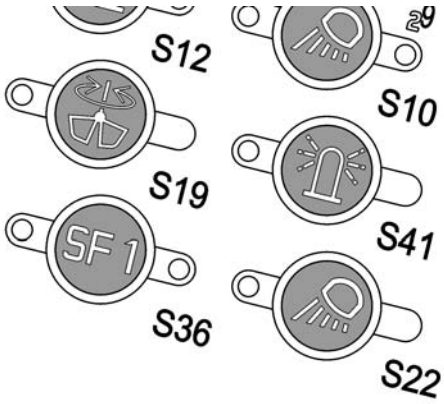

Fig. 3-52 *Control unit*

A cold start system is standard equipment on the engine, which makes it easier to start at low temperatures.

To actuate the cold start system :

- ▶ Press the button SF1 (S36) on the control unit.
- ▶ If the engine will not start, or at the beginning of a starting procedure.
  ↳ Push this button for a few seconds to spray starter fluid into the intake manifold.
- ▶ As soon as the engine turns over, release the button (once the engine is turning, the button is automatically locked).

Engine afterignition

- ▶ Turn the ignition key to position **2** as soon as the engine is running after the starting procedure.
  ↳ Symbol appears on the main screen.
- ▶ Release the ignition key.

Note!
Do not preheat an engine which is at operating temperature.

Starting procedure when the exterior temperature is below -18 °C.

For starting at temperatures below -18 °C, it is recommended to equip the machine with a preheating system in accordance with LIEBHERR.

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3.3.3.5 Speed adjustment and mode functions

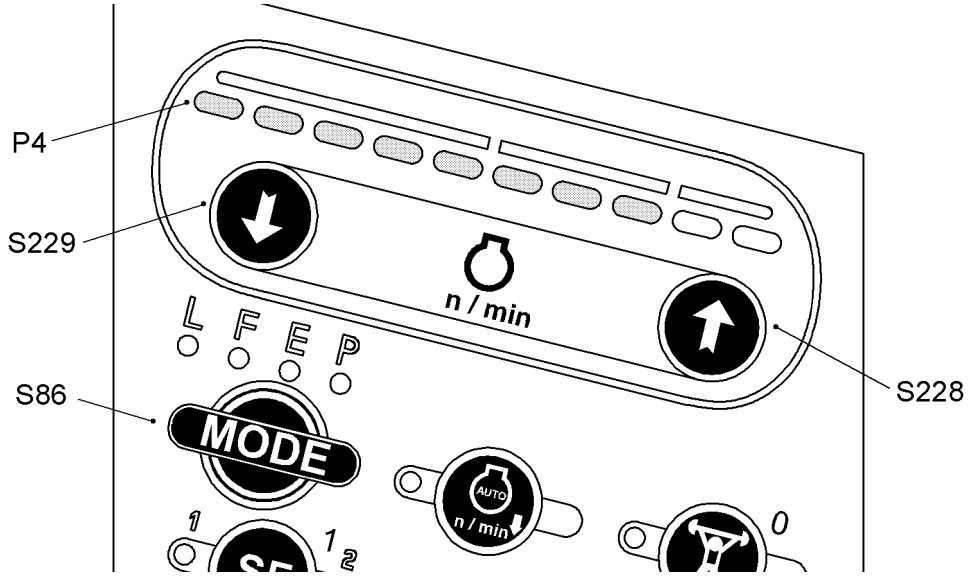


Fig. 3-53 *Speed adjustment and mode functions*

The previously selected engine speed will be displayed on the LED chain **P4**. It is divided into 10 speed levels.

▶ To adjust the engine speed, press arrow keys **S228** or **S229**.
- or -
Press the mode switch **S86**.

Performance selection (adjustment) using the mode button

Four different modes can be selected by pressing switch **S86**.

– **L**: LIFT mode (speed level 5 – sensitive lifting of loads)
– **F**: FINE mode (speed level 10 – skimming work)
– **E**: ECO mode (speed level 8 – economical work)
– **P**: POWER mode (speed level 10)

Using the arrow keys to adjust speed

To increase the speed:

▶ Press switch **S228**.
↳ Speed will be increased by one level.
↳ A second LED to the right illuminates in the **P4** display.

To reduce the speed:

▶ Press switch **S229**.
↳ Speed will be decreased by one level.
↳ A second LED from the right goes out in display **P4**.

A flashing LED above switch **S86** identifies an intermediate stage of the mode selected.

The currently active mode will be displayed under the letter on the LED. The mode selected will be saved 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 speed preselected after the diesel engine has been started will either be at level 1 (low idle on the diesel engine) or at level 3, if a warm-up phase is required for the

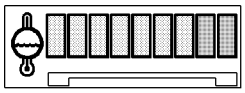
diesel engine.

▶ Press the mode switch **S86**.
  ↳ The mode selected will be used, with the corresponding speed and power.
  ↳ The appropriate LED will illuminate permanently.

In mode **E** (maximum torque) and **P**, the diesel engine works at maximum power. In mode **L** and **F**, the hydraulic power is reduced.

3.3.3.6 Warm-up phase for diesel engine and hydraulic circuit

Diesel engine



With cold engine coolant (temperature below 20 °C), the speed is automatically set at level 3.

This procedure lasts until the coolant has reached 20 °C, but for a maximum of 3 minutes.

▶ Increase the engine strain slowly until the second green LED (from left) illuminates on display unit **P2**.

Note!
Idling for an extended period of time damages the engine.

▶ Switch off the diesel engine if the machine is not being used.

Hydraulic oil

The pump power is automatically limited when the hydraulic oil is cold (temperature below 8 °C).

As soon the hydraulic oil temperature rises above 8 °C, the machine can attain full power.

3.3.3.7 Notes after starting the engine

Danger!
Danger of suffocation.

▶ When operating in enclosed spaces, only run the engine in areas with sufficient ventilation.

▶ Open doors and windows to ensure sufficient supplies of fresh air.

Caution!

▶ Bring the engine and hydraulic oil up to operating temperature. The controls operate sluggishly at low oil temperatures.

▶ Move the machine carefully in an open space to test the function of the chassis and slewing gear brakes.

▶ Check that the equipment is operating perfectly.

3.3.3.8 Switching off the diesel engine

Caution!
The engine could be damaged.

▶ Do not switch off the engine suddenly from full throttle.

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- First use arrow key **S229** to set the engine speed to low idle.
  ↳ Only the LED on the furthest left is now lit on display **P4** (engine speed).
- Allow the diesel engine to run continuously in low idle for another 2-3 minutes.
- Now turn the ignition key to position **0** in order to switch off the engine.
- Remove the ignition key.

3.3.3.9 Jump start procedure

Danger!
When connecting to exterior batteries, old batteries can be subject to increased gas formation.

- Wear protective goggles and gloves whenever jump starting, avoid naked flame and creating any sparks in the vicinity of the flat vehicle battery. RISK OF EXPLOSION!
- Only use jump starting cables with a sufficient cross section. Always follow the established jump starting procedure.

3.3.3.10 Connecting the batteries

- First connect the cable to the positive terminal (+) of the flat battery and then to the positive terminal (+) of the exterior battery.
- Connect the second cable to the negative terminal (-) of the flat battery and then to the negative terminal (-) of the exterior battery.
- Start the engine as described above.

Caution!

- Before removing the jump start cable, be sure to place the diesel engine of the jump started machine into low idle.
- For safety reasons, switch on large consumers such as work headlights, upper carriage lighting etc. to avoid overvoltage. The electronics could otherwise be damaged.

3.3.3.11 Disconnecting the batteries

- First remove the cable from the negative terminal (-) of the exterior battery and then from the negative terminal (-) of the flat battery.
- Remove the second cable from the positive terminal (+) of the exterior battery and then from the positive terminal (+) of the flat battery.
- Check the electrical function of the machine.

For battery care and maintenance, see the chapter “Battery care”.

3.3.4 Emergency operations

3.3.4.1 Engine shut down procedure

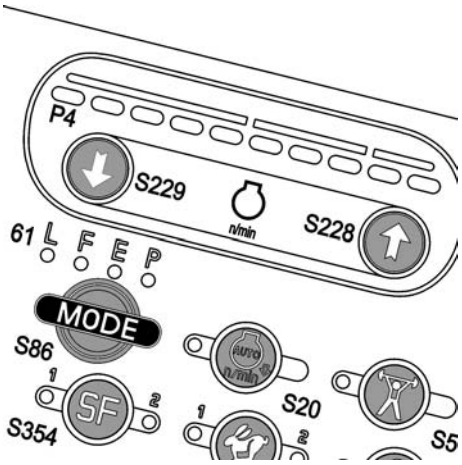

Fig. 3-54 *Excavator keyboard*

Do not suddenly turn the engine off when it is running at high idle.

- ▶ Reduce the engine RPM to low idle via the arrow key S229.
- ▶ Continue to run the engine for 3 - 5 minutes to lower temperature.
- ▶ Then turn the ignition key to the "0" position to turn the engine off and remove the key.

3.3.4.2 Emergency shut down

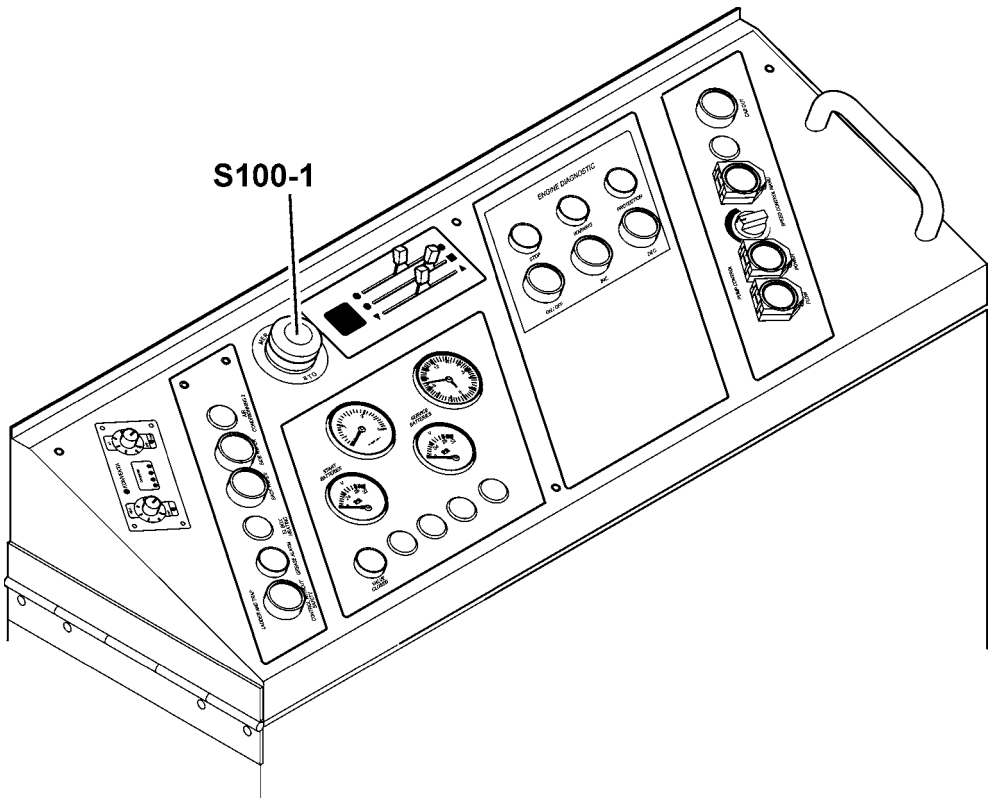

Fig. 3-55 *Cabin emergency off switch*

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For emergency shut down :

▶ Turn the starter key to the "0" position or push one of the emergency off switches S100-1, S100-2, S100-3, S100-4 or S100-5.

▶ This action will shut down the Diesel engine and disconnect the electrical system.

Caution!
Use this shut off method only in emergencies. After an emergency shut down, it is very important to let the engine run again for a short time at low idle after restarting.

▶ Using one of the emergency off switches S100-1, S100-2, S100-3, S100-4 or S100-5 will cause the hydraulic tank to be depressurised quickly.

▶ After a shut down via an emergency off switch, you must unlock it before attempting to restart.

Caution!
You must wait at least ten minutes after an emergency shut down before attempting to restart.

3.3.4.3 Emergency operation of the Diesel engine

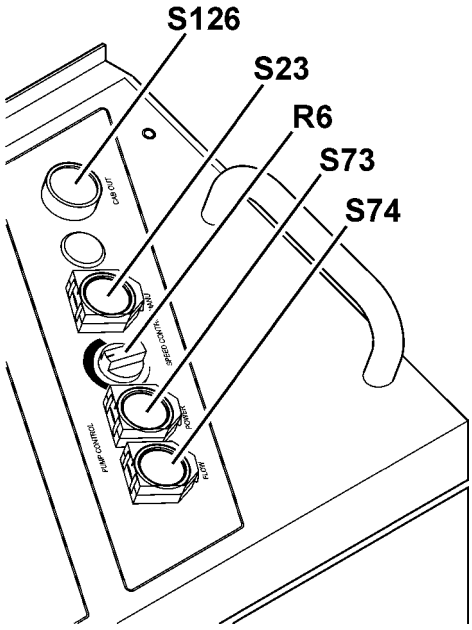

Fig. 3-56 *Control board*

If the engine can not be started, monitored or operated safety due to a functional problem in the control electronic of the excavator, the Diesel engine operation can be continued via the emergency control function.

To turn on the emergency control circuit for Diesel engine

▶ Use button S23.

▶ When the emergency control is turned on, the indicator light in the button is on.

Start the Diesel engine

▶ Turn the throttle control knob R6 fully counterclockwise to low idle RPM.

▶ Then the starting procedure is the same as during the normal starting procedure.

▶ Release the key as soon as the engine starts.

Note!
The engine can not be cranked for more than 10 seconds.
If the engine does not start, wait 20 seconds before restarting.

▶ When the emergency control circuit is turned on, the engine control switches S20, S70 and S86 are not functioning.

▶ All remaining switches on the control panel remain fully functional, if they are not affected by existing problem.

Monitoring the engine

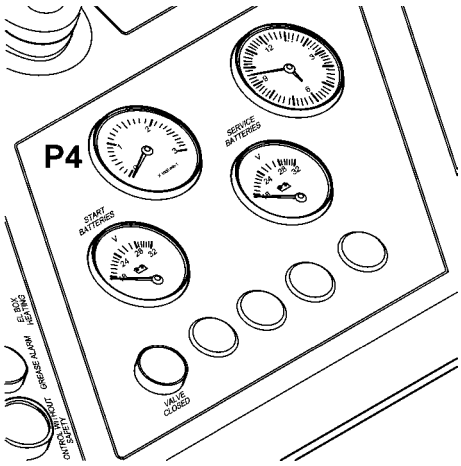

Fig. 3-57 *Indicator P4*

In emergency function, the indicator P4 remains fully functional and must be monitored regularly and carefully, because all remaining indicators and warning symbols may no longer be reliable (depending on the problem) or fully functional.

Turn the Diesel engine off

Caution!

Do not suddenly turn the engine off when it's running at high idle.

▶ Reduce the engine RPM via the rotary switch R6 to low idle.

▶ Continue to run the engine for 3-5 minutes to lower the temperature.

▶ Then turn the ignition key to the "0" position to turn the engine off and remove the key.

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3.3.5 Driving

3.3.5.1 Driving straight ahead

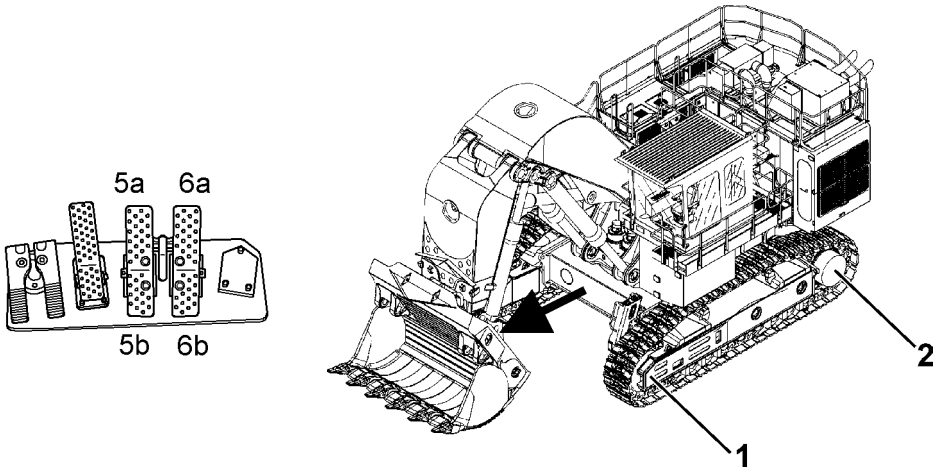

Fig. 3-58 *Driving straight ahead*

1 Idler
2 Sprocket wheel
5a / 5b Pedal for left drive unit
6a / 6b Pedal for right drive unit

Caution!
When driving, the upper carriage must be rotated to the chassis in such a way that when driving forwards, the sprocket wheel **1** is in front and the idler **2** is at the rear.

Driving forwards:

▶ Push both pedals forward (**5a** and **6a**).

Reversing:

Caution!
Before reversing, ensure that the area behind you can be safely entered.

▶ Push both pedals down (**5b** and **6b**).

3.3.5.2 Turning on the spot

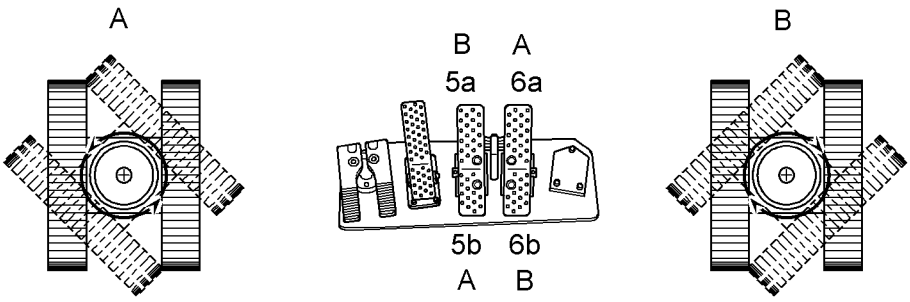

Fig. 3-59 *Turning on the spot*

Turning left (A):

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

Turning right (B):

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

3.3.5.3 Turning with a crawler

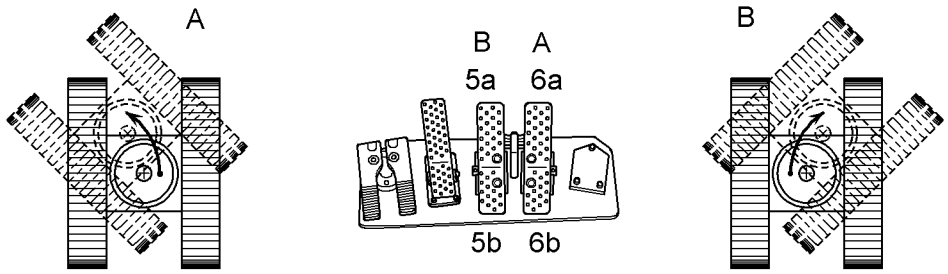

Fig. 3-60 *Turning with a crawler*

Turning to the left (A):

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

Turning to the right (B):

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

Note!
If possible, avoid turning backwards in order to preserve the running gear parts.

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3.3.5.4 Controlling the drive unit manually

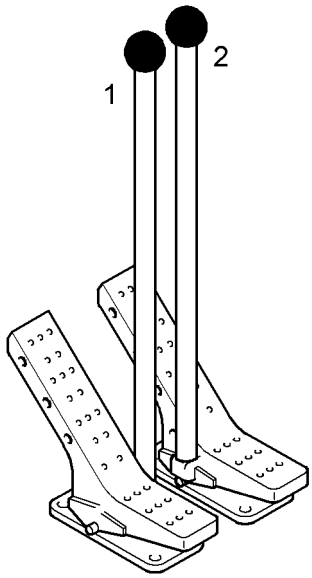

Fig. 3-61 *Manual drive unit control*

❑ Particularly careful driving is required here.

▶ Insert the hand levers (**1** and **2**) available in the tool kit into the pedals for the drive units.
  ↳ The drive units can be operated manually.

Note!
When driving the machine onto or off a low loader, the drive unit must be controlled manually for safety reasons.

3.3.5.5 Controlling the speed

The driving speed is influenced by switch **S21**. The travel motors can be operated in two different positions:

– **Normal drive** (position 1):
  Maximum tensile force of both drive units at moderate speed.
– **Fast drive** (position 2):
  Reduced tensile force of both drive units at maximum speed.

▶ Press switch **S21**.
  ↳ Transfer from normal drive to fast drive is activated.
  ↳ LED 1 in the switch illuminates.

While driving, the machine will automatically switch from normal drive to fast drive as the ground conditions permit. After transferring to fast drive, LED 2 illuminates. If the ground conditions become more difficult again, the system will automatically switch from fast drive to normal drive. LED 1 illuminates.

▶ Press switch **S21**.
  ↳ Transfer from normal drive to fast drive is deactivated.
  ↳ LED 1 in the switch goes out.

When switch **S21** is switched off, the travel motors remain continually in position 1.

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3.3.5.6 Braking the machine

The hydrostatic travelling mechanism of the machine also functions as a service brake.

▶ Disengage the pedals for the drive units.
  ↳ The pedals will return to the neutral position.
  ↳ The travelling mechanism will be stopped.
  ↳ The machine will be braked.

When the pedals for the drive units are in the neutral position, the hydrostatic drive prevents the machine from rolling off.

In the neutral position, the parking brake will be applied automatically after approx. 5 seconds. The work equipment can, however, still be moved.

Caution!
Disengaging the pedals quickly causes the machine to halt abruptly.

▶ Before starting the machine, always fasten the safety belt.

3.4 Working with the machine

3.4.1 Working safely with the machine

– Before you start working, acquaint yourself with the special features of the job site and any special precautions and warning signals. Examples of particular work environments would be on-site or traffic obstructions, the load-carrying capacity of the ground and any requirements to make the job site safe from public use.
– Always maintain a safe distance from overhangs, edges, slopes and unsafe ground.
– Be particularly careful in conditions of reduced visibility and changeable ground conditions.
– Familiarize yourself with the location of power lines on the job site and take particular care when working near them. If necessary, inform the responsible authorities.
– Maintain a safe distance from electrical aerial lines. Do not allow the equipment to come near cables when working near electrical aerial lines. Risk of fatality! Inform yourself about required safety distances.
– The following actions must be carried out in the event of any transfer of electricity:
  • do not move the machine or its equipment,
  • do not leave the driver's control station,
  • warn people standing outside the area not to approach or touch the machine,
  • have the power supply turned off.
– Before moving the machine, always ensure that any attachments are safely secured.
– When driving onto public roads, paths and squares, observe current traffic regulations and if necessary, ensure that the machine has been made safe as per regulations beforehand.
– Always turn on the lights in conditions of poor visibility or darkness.
– Do not permit any passengers in the machine.
– Only work when seated properly and with the safety belt securely fastened.
– Report all function faults and ensure that all necessary repairs are carried out

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immediately.

– Assure yourself that no one is endangered when you start the machine moving.
– Before you start working, test the brake system in accordance with the regulations given in the operating instructions.
– Never leave the driver's seat while the machine is moving.
– Never leave the machine unattended while the engine is running.
– The machine must be positioned, moved and operated in such a way that it is stable and that there is no danger of overturning. Only known loads may be moved with the equipment; this applies particularly when using the grab.
– Position the upper structure in the longitudinal direction when moving and hold the load as close to the ground as possible.
  EXCEPTION: see USE WHEN LOADING AND UNLOADING
– Adjust your driving speed to suit local conditions.
– Avoid any working movements which may tip the machine. Should the machine start to tip or slide sideways, however, turn the upper structure to face downhill and lower the equipment at the same time.
– As far as possible, work downhill or uphill and not side on to the slope.
– Only drive downhill at the permitted speed or you could lose control of the machine.
– Always shift down to a lower running step before a slope. When doing this, the diesel engine must run at maximum speed and the speed may only be reduced using the accelerator pedals.
– When loading a truck, ensure that the truck driver vacates the cab even if a stoneguard is present.
– For demolition work, digging and crane operations etc., always use protective devices specifically designed for the purpose.
– For terrain which is difficult to gain an overview of and whenever necessary, ask for the assistance of a spotter. Only permit one person to give you signals.
– Only permit experienced personnel to attach loads and give signals to the machine operator. The spotter must be positioned within the visual range of the operator or be in voice contact with him.
– Depending on the equipment combination, there is a risk of collision between the work tool and the cab, the cab protection or the boom cylinders. The greatest degree of care must be taken to avoid damage when the hoe teeth come within this area.

3.4.1.1 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.
– Here, the centre of gravity of the machine will be displaced upwards in the vertical direction. The driving characteristics of the machine will thus be influenced persistently, e.g. through reduction of the dynamic stability.
  The following instructions are therefore to be observed at all times:
  • Adjust vehicle handling to suit the altered machine characteristics and environmental conditions.
  • Reduce your speed to prevent the need for sudden braking and steering manoeuvres.
  • Avoid sudden speed changes, such as braking, accelerating and changing direction.
  • Only rotate the upper structure when the chassis is stationary.
  • Only rotate the upper structure after you have picked up the load.

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- Only move the machine when you have picked up and lifted the load and rotated the upper structure to the driving position.
- There is a danger of possible swinging movement and dropping of the load when the equipment is raised.
- A protective grid (FOPS) in accordance with ISO 10262 must be attached to the cab.
- A protective roof (FOPS) in accordance with ISO 10262 must be attached if there is a risk of objects falling from above.
- Only the maximum permissible load may be taken up using the grab.

– NOTE: The weight of absorbent materials, such as logs, is dependent on length, diameter and specific weight. The influencing variables present in a natural product, such as moisture, must be noted.

– Working procedures when using machines with grabs require the machine operator to receive special instruction and training.

– Use as part of the work process is only permitted when the machine operator has sufficient training and practical experience.

3.4.1.2 Safe use of machines with tower elevation

– Due to the tower elevation, the centre of gravity of the machine will be displaced upwards in the vertical direction. The driving and work characteristics of the machine will thus be influenced persistently, e.g. through reduction of the dynamic stability.

– Due to the heightened centre of gravity, the machine must be aligned horizontally before use. In horizontal alignment, the centre of gravity of the upper structure is over the centre of the chassis, which reduces the risk of tilting.

– The machine can still sway and tilt despite being aligned!
The following instructions are therefore to be observed at all times:

When moving the machine:

- Rotate the upper structure parallel to the undercarriage chassis (transport position).
- Draw the equipment as close as possible to the machine.
- Only at this point may the support feet be retracted and the machine moved.
- Moving with loads is not permitted.
- Check the terrain to be covered to ensure that the ground is solid and even. Potholes and uneven surfaces jeopardize the stability of the machine.
- Adjust vehicle handling to suit the altered machine characteristics (high centre of gravity) and environmental conditions.
- Reduce your speed to prevent the need for sudden braking and steering manoeuvres.
- Avoid sudden speed changes, such as braking, accelerating and changing direction.
- Ascending gradients and obstacles may only be approached in the longitudinal direction in order to prevent unacceptable banking of the machine.
- 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 chassis and above the substrate.

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- 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.

3.4.1.3 Additional instructions for machines with rigid driver's cab elevation.

– When getting up or down, position the machine on even, horizontal ground. The upper structure should be positioned with the chassis in such a way that the steps and ladders are aligned with each other.

– Ensure that steps, ladders and hand-rails (grips) are in good condition. In particular, you should ensure that they are free of dirt, oil, ice and snow.
NOTE: To ensure that the doors open properly in all weather conditions, the door seals must be dusted with talc or silicon at least every two months or more often if required. The door hinges and locks should be greased regularly.

– Face the machine when getting in or out and always use three-point support, i.e. two hands and one foot or two feet and one hand must always be in contact with the access system at the same time.

– If you are able to reach the door handle with your free hand, open the doors before you climb any higher. External influences, such as wind, can make it more difficult to open doors. Because of this, always use your hand for control when opening doors. Ensure that the door is latched open to prevent it slamming open and shut.

– Now continue to climb up and sit down in the operator's seat as soon as you enter the cab. Close the doors and fasten the safety belt.

– When getting out of the machine, proceed as carefully as when you climbed into the machine.

– Stop the machine on level, horizontal ground. The upper structure should be positioned with the chassis in such a way that the steps and ladders are aligned with each other.

– Unfasten the safety belt. Position yourself with your face toward the machine when getting out and use three-point support. Climb down until you can close the doors safely. Always use your hand for control when closing the doors.

– Now climb down to the ground.

3.4.1.4 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

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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.
  If such auxiliary systems are not available, regulate speed to avoid "oscillating" the machine.

3.4.2 Operating the swing gear

Caution!
The machine is dispatched as standard with **normal control**.
On request, the machine can be equipped with a control system that deviates from the norm (eg. with LIEBHERR control). The additional operating instructions for this control system apply in this case.

The joystick functions described here refer exclusively to **normal control**.

3.4.2.1 Rotating the upper carriage

The upper carriage is rotated using the left joystick.

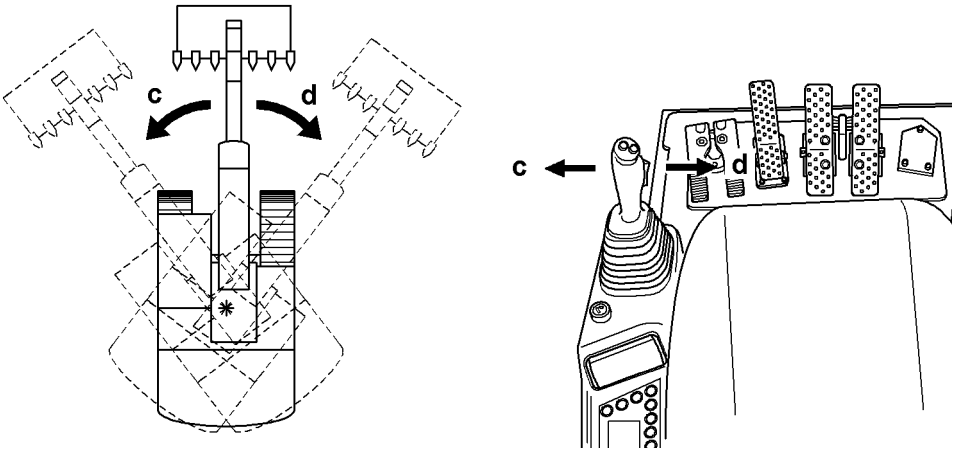

Fig. 3-62 *Rotating the upper carriage*

▶ Push the joystick to the left **c**.

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↳ Upper carriage rotates to the left.

▶ Push the joystick to the right **d**.
↳ Upper carriage rotates to the right.

3.4.2.2 Braking the upper carriage

The machine is equipped with a hydraulic and a mechanical swing gear brake.

Hydraulic slewing gear brake

▶ Move the left joystick **4** to neutral.
↳ Upper carriage will be adequately hydraulically braked.

▶ Move the left joystick **4** in the opposite direction.
↳ Upper carriage will be hydraulically braked to the maximum degree.

Mechanical swing gear brake

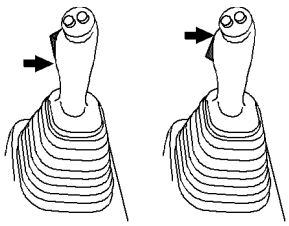
The upper carriage can be locked in any position using this brake.

Caution!
Damage to the machine.

▶ Only lock the mechanical swing gear brake when the upper carriage is stationary.

▶ Press switch **S17**.
↳ Swing gear brake is engaged.
↳ LED in switch illuminates.

▶ Press switch **S17** again.
↳ Swing gear brake is in mode semi-automatic.
↳ LED in the switch goes out.



▶Tilt down the rocker switch **S57**.
↳Slewing gear brake is applied as soon as the uppercarriage speed gets lower than a limit value.

▶Tilt up the rocker switch **S57**.
↳Swing gear brake remains released.

To check the mechanical slewing gear brake:

❑ Upper carriage must be stationary.

▶ Press switch **S17**.
↳ Swing gear brake is engaged.
↳ LED in switch illuminates.

▶ Push the left joystick **4** to the right and then to the left as far as the stop.
↳ Upper carriage may not rotate.
↳ Slewing gear brake function is OK.

3.4.2.3 Positioning swing brake (optional extras)

The positioning swing brake is used for progressive and sensitive braking of the upper carriage.

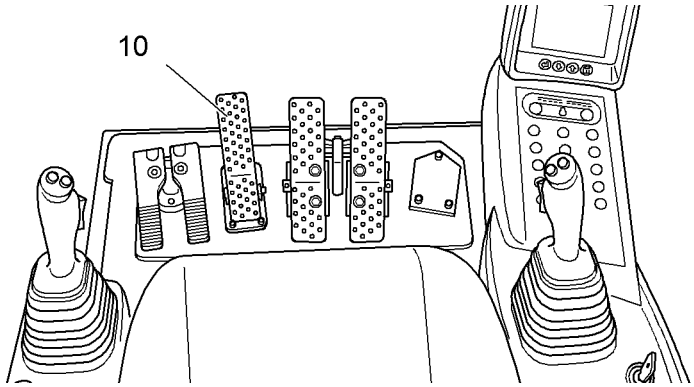


Fig. 3-63 *Positioning swing brake*

Note!
Increased wear.

- ▶ Do not use the positioning swing brake purely as a service brake, but only as a stop and parking brake for the swing gear.
- ▶ Brake the upper carriage hydraulically for preference (by countering).

- ▶ Engage pedal **10**.
  ↳ Upper carriage is located in the desired position after sensitive braking.

3.4.3 Working position

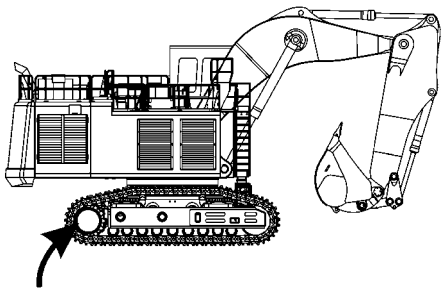


Fig. 3-64 *Working position – machine*

- ❑ Work with the machine is generally to be carried out over the idler.

Note

- ▶ Drive backwards when you are working lengthwise with the backhoe bucket.

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3.4.4 Joystick functions when setting up the machine

Caution!
The machine is dispatched as standard with **normal control**.
On request, the machine can be equipped with a control system that deviates from the norm (eg. with LIEBHERR control). The additional operating instructions for this control system apply in this case.

The joystick functions described here refer exclusively to **normal control**.

3.4.4.1 Operating the stick cylinder

The stick cylinder is operated using the left joystick **4**.

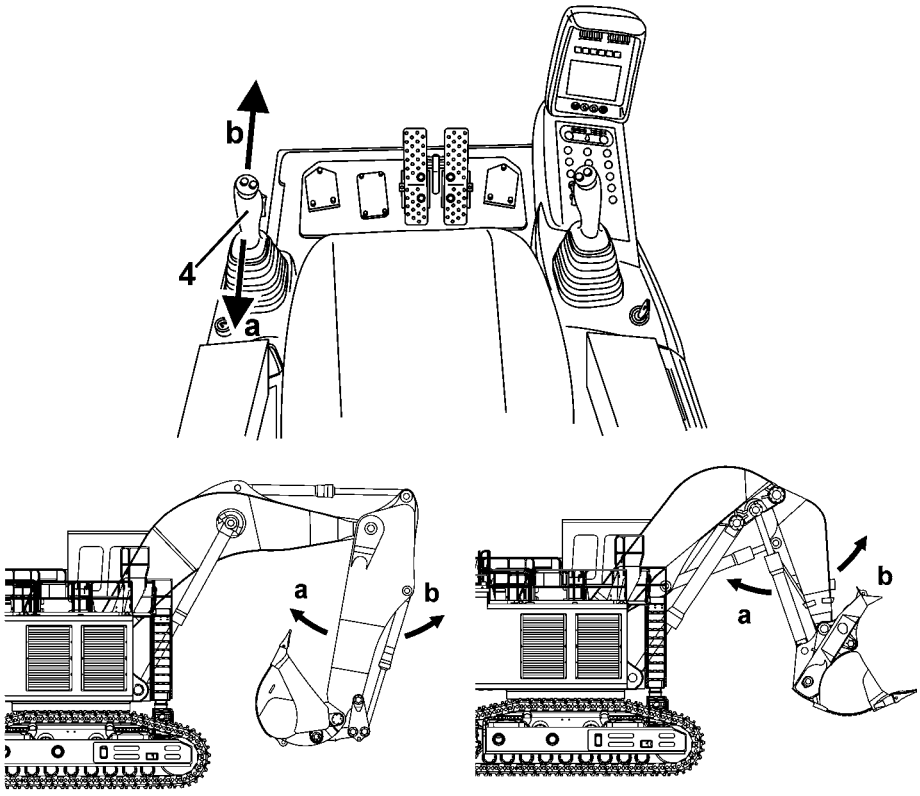

Fig. 3-65 *Operating the stick cylinder*

- ▶ Push the joystick back **a**.
  ↳ Stick will be drawn in.
- ▶ Push the joystick forwards **b**.
  ↳ Stick will be extended.

3.4.4.2 Operating the boom cylinder

The boom cylinder is operated using the right joystick **3**.

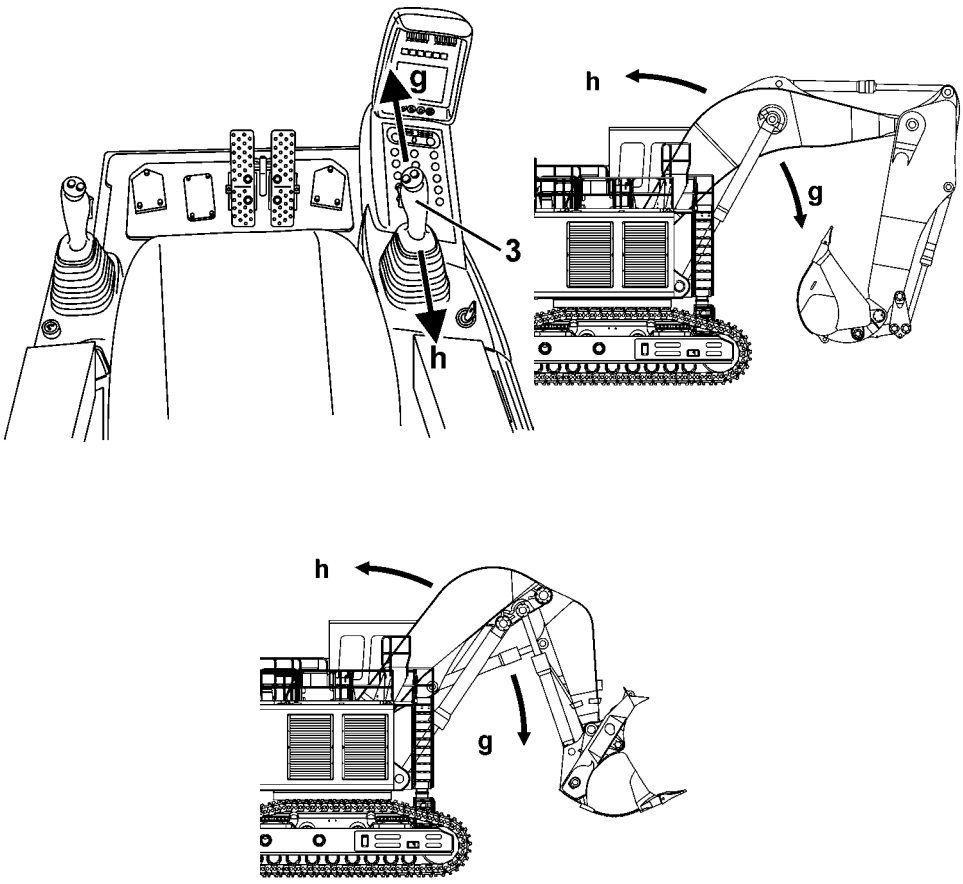

Fig. 3-66 *Operating the boom cylinder*

- ▶ Push the joystick back **g**.
  ↳ Equipment will be raised.
- ▶ Push the joystick forwards **h**.
  ↳ Equipment will be lowered.

3.4.4.3 Operating the bucket

The bucket cylinder is operated using the right joystick **3**.

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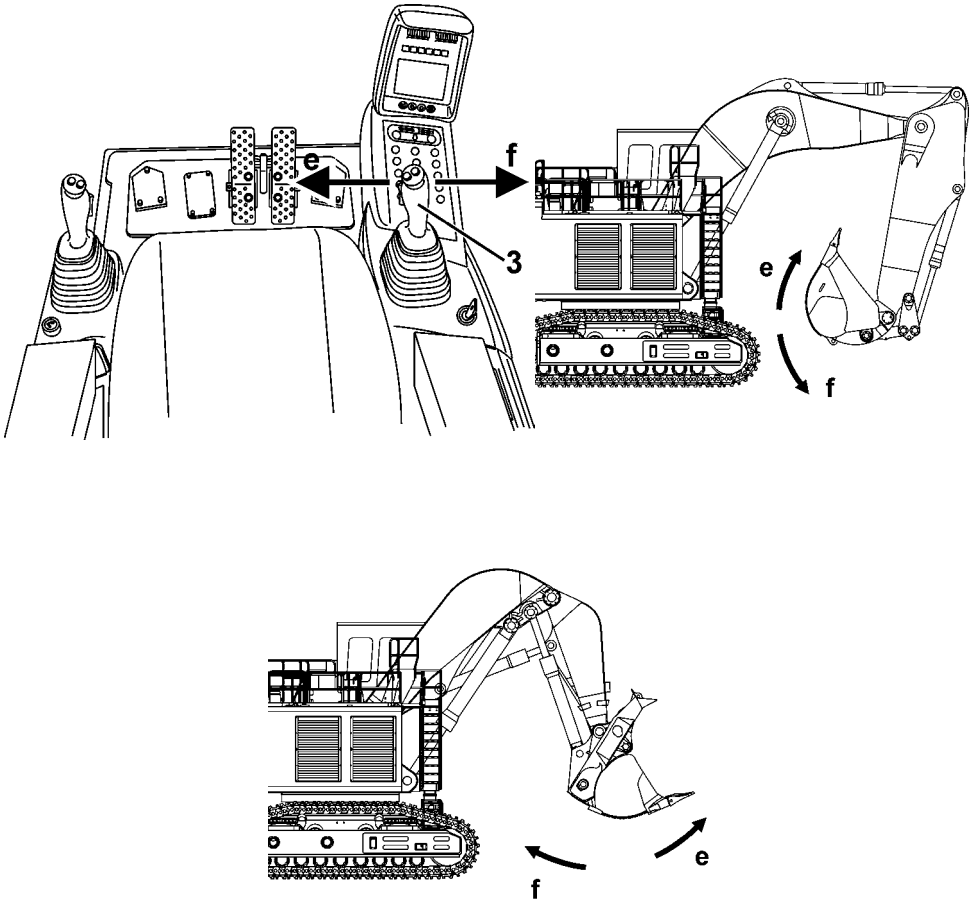

Fig. 3-67 *Operating the bucket cylinder*

- ▶ Push the joystick to the left **e**.
  ↳ Bucket will be tilted inwards.
- ▶ Push the joystick to the right **f**.
  ↳ Bucket will be tilted outwards.

3.4.4.4 Operating the bottom dump shovel bucket

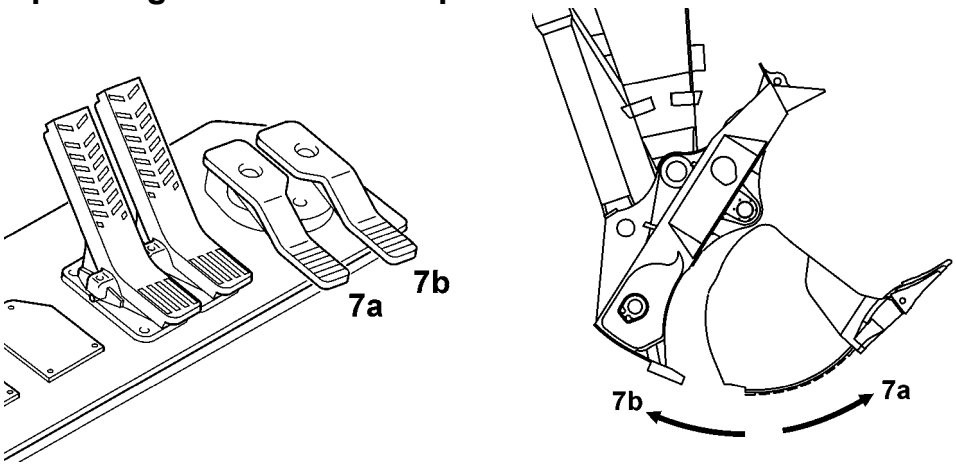

Fig. 3-68 *Operating the bottom dump shovel bucket*

The bottom dump shovel bucket is moved via two pedals, **7a** and **7b**.

- ▶ Push pedal **7a**.

↳ Shovel bucket will be opened.

▶ Push pedal **7b**.
↳ Shovel bucket will be closed.

3.4.4.5 Float position of boom cylinder for bucket operation (optional equipment)

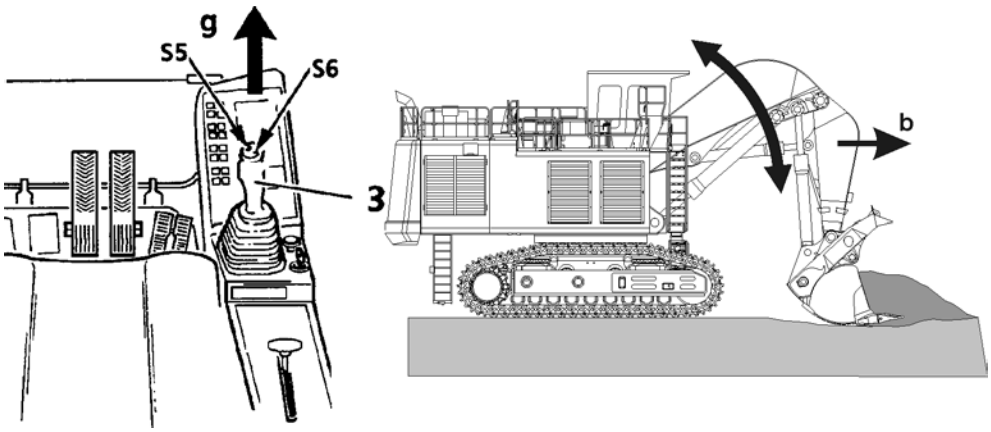

Fig. 3-69 *Float position*

To turn on the float position for the lift cylinders,

▶ Move the right joystick **3** forward,

▶ Push the button **S5** or **S6** on top of the handle on top of handle at the same time.

Now the bucket can be used for grabing work while moving the joystick 4 forward to extend the crowd cylinders.

The attachment can then move freely up or down depending on grade and the bucket will automatically follow the ground contour.

3.4.4.6 Combined movements

Moving a joystick diagonally results in the work functions concerned being combined. This allows different equipment movements to be activated at the same time.

The operator can do the following movements without any additional manipulations.

When the swing movement is actuated, all working functions / movements are possible without affecting the swing movement.

During travel, every attachment movement is possible, but the swing movement has priority. In this case, the travel movement is reduced.

3.4.5 Lowering the work equipment when the engine is not running

In an emergency, the equipment can be lowered when the diesel engine is not running.

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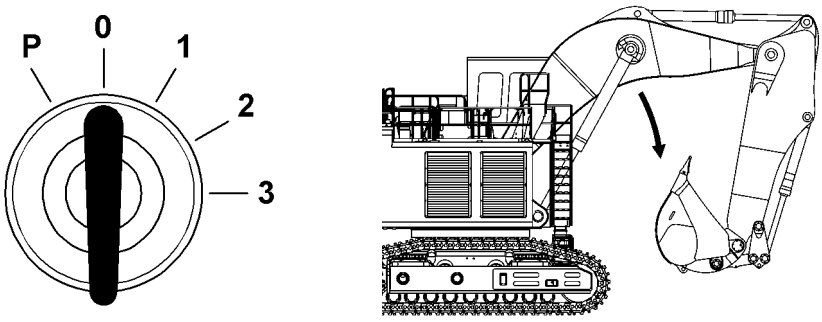

Fig. 3-70 *Lowering the equipment when engine is not running*

▶ Turn the ignition key to contact position **1**.

▶ Operate the joystick or the foot pedals until the equipment has lowered.

Note
The equipment can be lowered because of the control oil unit's pressure reserve. This reserve is limited and is only sufficient for small movements of the pilot control devices.

▶ Only operate the joystick in the directions for lowering the equipment.

3.5 General working methods

3.5.1 Minimum impact working methods for your machine

To increase the service life of the machine and avoid unnecessary damage and the resulting repairs, please note the following points:

– Do not stop the rotary motion of the upper carriage when slewing into a ditch by stopping the equipment on the walls of the ditch.
– Using the machine for applications where the equipment is knocked against the material to be removed, in the longitudinal direction too, is not permitted. Repeatedly hitting the work equipment against rock or other hard material will damage steel parts and machine components.
– With specific combinations of boom, stick and work tool, the work tool could hit or break through into the cab. This could damage the cab and injure the machine's operator.
– Do not attach buckets which are too big or side cutters when using the machine in rocky material. This will extend the work cycles and could result in damage to the bucket and other machine components.
– Please contact your LIEBHERR contractual partner if special teeth are required for heavy or special applications.
– Operating the drag bearing to bore into material is not permitted.
– Do not raise the machine when working. If this should occur, slowly lower the machine to the ground. Do not permit the machine to lower quickly and do not intercept the falling movement using the hydraulics, since this could result in damage to the machine.

3.5.2 Preparatory activities

Danger!
Risk of fatal injury and damage to the machine when working.

- ▶ Observe the safety information “Notes for safe working” at the start of these operating instructions.

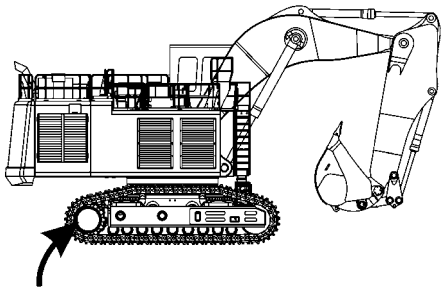

Fig. 3-71 *Working position – machine*

- ▶ Position the machine so that the load material can be taken up above the rigid axle or the idler.
- ▶ For mobile devices, lower the support when possible and lock the oscillating axle.

Danger!
Insufficient support and machine damage.
Do **not** use a dozer blade to support the machine.

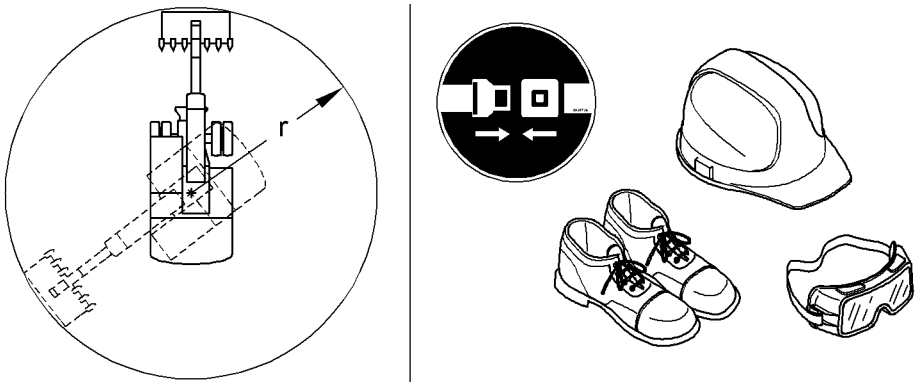

Fig. 3-72 *Safe working*

Danger!
Risk of fatal injury due to rotating the machine.

- ▶ Ensure that nobody stands within the danger area **r** of the machine.

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Caution!
Risk of injury when working.

- ▶ Always wear safety shoes and, particularly when leaving the cab when demolition work is going on, a protective helmet and safety glasses.
- ▶ Always wear the seat belt.
- ▶ Use the horn to give a short warning signal before starting work.

3.5.3 Positioning of the machine

Setting up properly is a pre-requisite to safe efficient loading, and helps maintain stability, power and bench levels. It will also reduce operator fatigue. Position the excavator as close to the working face as safety permits.

Caution!
Always ensure there is sufficient clearance between the counterweight and the face, including allowing for any rocks or material that may fall down.

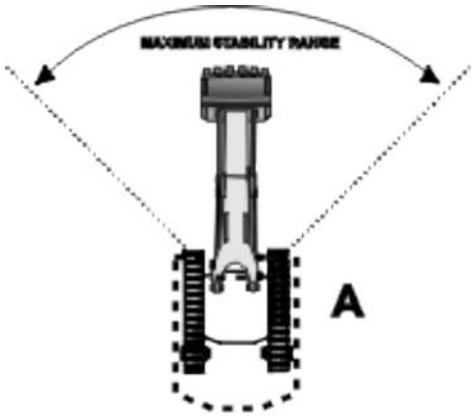

Fig. 3-73 *Recommended digging*

The recommended digging range is about a 90° arc in front of the machine (A).

Note!
Avoid digging at right angles to the tracks.

3.5.4 Working with the backhoe bucket

Danger!
Risk of fatal injury and damage to the machine when moving the backhoe bucket.

- ▶ Ensure that the backhoe bucket is not slewed too close to the cab.
  - ↳ The backhoe bucket could damage the cab and injure the machine's operator.
- ▶ Ensure that nobody is standing within the danger area of the backhoe bucket.

3.5.4.1 Digging

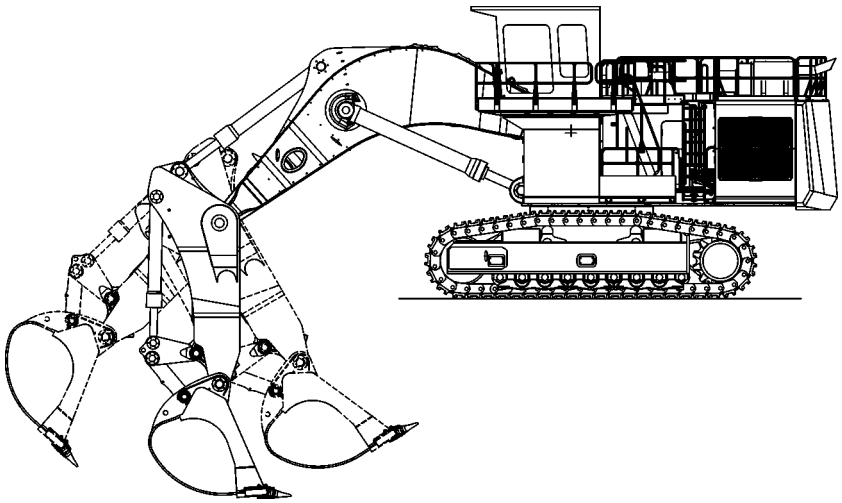

Fig. 3-74 *Optimal angle for digging*

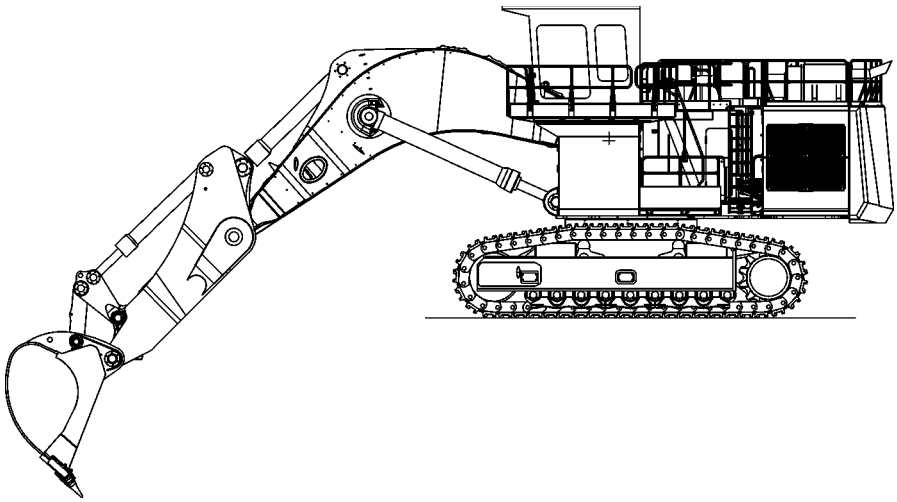

Fig. 3-75 *30° forward to the vertical.*

- ▶ Align the shovel arm in such a way that its underside is at an angle of approx. 30° forward to the vertical.
- ▶ Align the backhoe bucket in such a way that its underside can enter the ground at an angle with the axle of the shovel arm between 10° and 20°.

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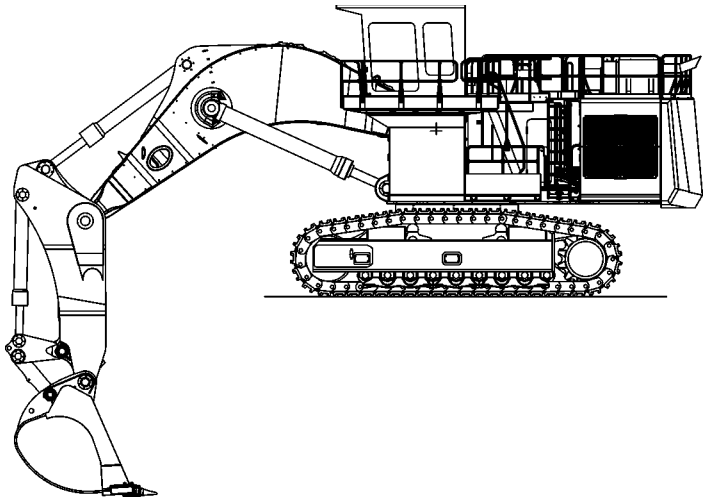

Fig. 3-76 *Taking up grab material*

▶ To lift out the grab material, slowly and evenly slew in the shovel arm.

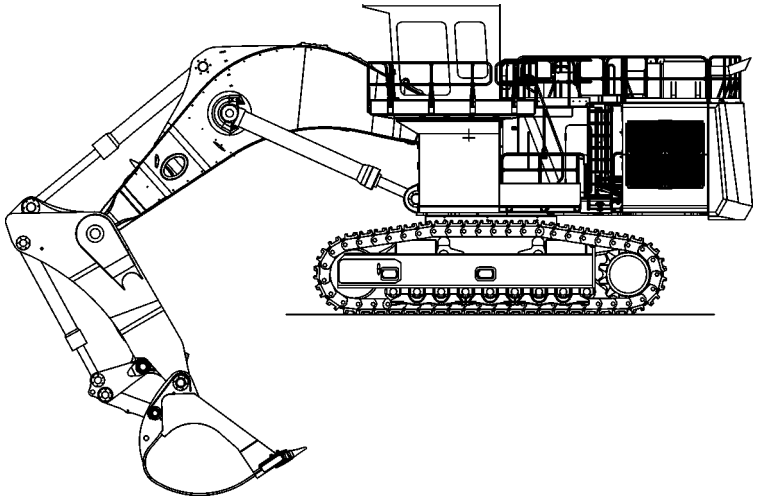

Fig. 3-77 *45° backward to the vertical*

▶ As soon as the shovel arm is at an angle of approx. 45° backward to the vertical, raise the boom slowly and evenly in addition to slewing in the shovel arm and the backhoe bucket. Stopping suddenly will result in impact loads and vibrations.

▶ When the backhoe bucket is full or the shovel arm can no longer be slewed in, raise the boom and backhoe bucket until the filled surface is parallel to the ground.

Note!
For a efficient digging, the depth of the excavated face shouldn't exceed the length of the shovel arm.

3.5.4.2 Loading the transport vehicle

Danger!
Risk of fatal injury due to falling grab material.

- ▶ Do not load the transport vehicle so high that the grab material could drop out over the walls of the vehicle.
- ▶ Ensure that nobody is standing in the danger.
- ▶ Load an occupied truck only if all safety requirements are fulfilled, notably in order to protect the truck operator.
- ▶ Do not slew the equipment over the driver's cab.

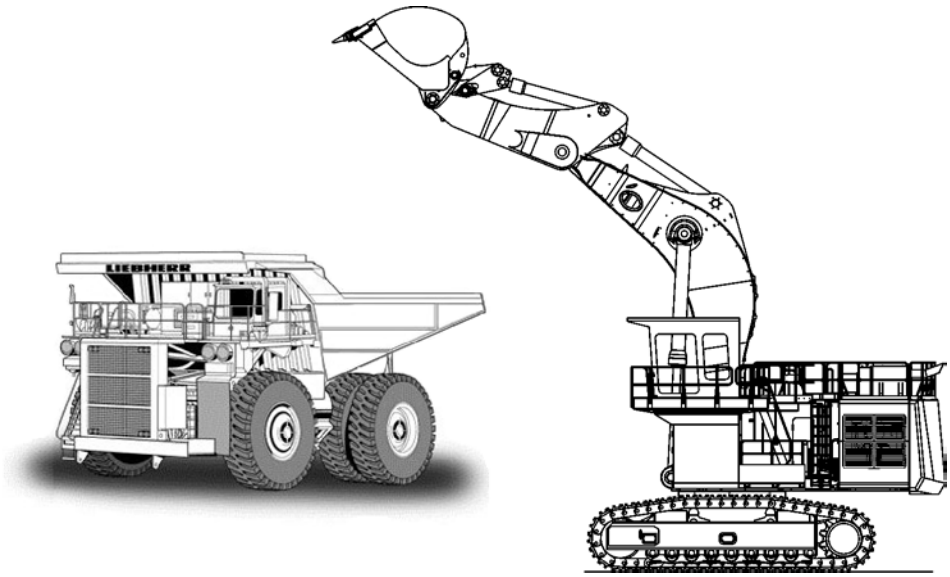

Fig. 3-78 *Emptying grab material*

- ❑ If possible, the machine should stand higher than the transport vehicle to avoid having to lift the grab material unnecessarily.
- ▶ Stop the transport vehicle in a position that allows it to be loaded from the rear or the side.
- ▶ Slew the machine's equipment above the loading area of the transport vehicle.
- ▶ Distribute the grab material evenly over the loading area of the transport vehicle by slewing the backhoe bucket and shovel arm out, slewing the upper carriage and possibly also moving the boom.
- ▶ If the backhoe bucket is not sufficiently emptied or there is still grab material in the backhoe bucket, slew the backhoe bucket in and out several times to loosen the grab material.

3.5.5 Working with the Shovel bucket

3.5.5.1 Digging

To maximise machine power and breakout, maintain grade and fill the bucket, correct digging angles and technique should be used.

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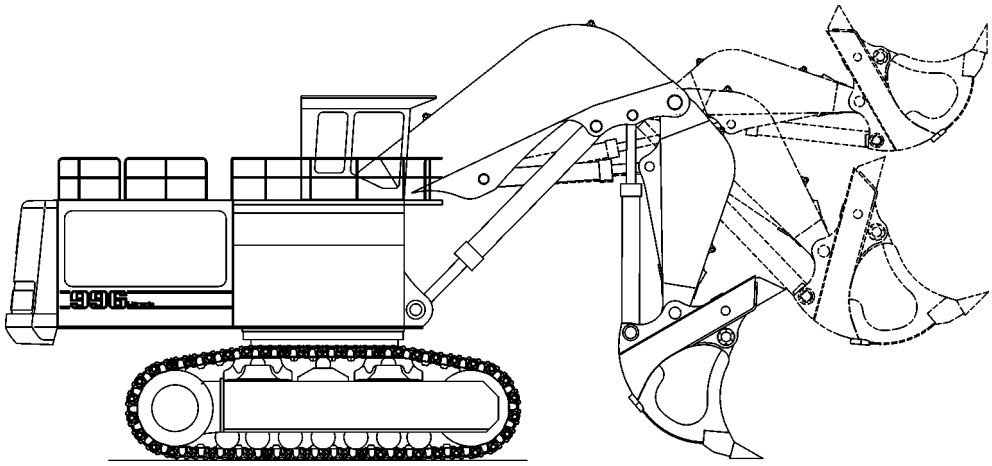

Fig. 3-79 *Digging*

- Most digging should be started with the bucket almost fully crowded back (50mm off stops or end of cylinders).
- When cleaning up or digging at floor level, angle the teeth aggressively to break out any toe that may be encountered.
- Keeping the heel of the bucket off the ground therefore creating a void under the rear of the bucket.
- Operate with the teeth and bucket lip doing all the work.

Note!
Avoid digging at right angles to the tracks.

Caution!

- Each time the stick is crowded back to commence a cut, extreme caution must be taken not to hit the tracks.
- The clam must always be closed when digging, although don't slam it shut. Avoid working on the cylinder limits and bucket stops during the digging cycle. Continual use of these practises will lead to premature failure of seals and O-rings and can cause stress fractures to the clam, stick and bucket and damage to the boom and superstructure.
- Crowd the bucket in (down) while closing the clam. This practise makes use of gravity to help minimise shock loading on the bucket cylinders.
- Never dig, or attempt to bring down any material overhang, with the bucket while the clam is open or partly open.
- Do not attempt to dig or clean the floor or face with the clam open. These practises can cause considerable damage to the clam cylinders.

3.5.5.2 Unload the bucket

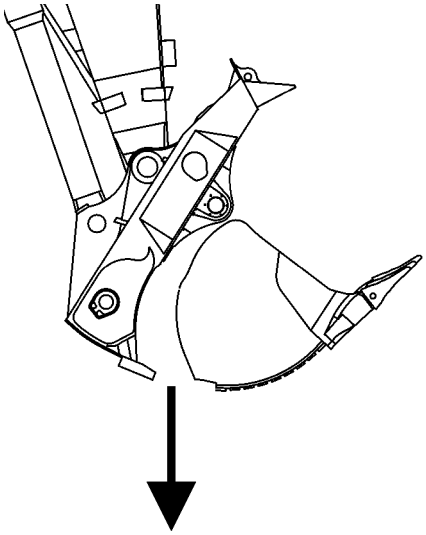

Fig. 3-80 *Unloading of the bucket*

When dumping the load, tip the bucket forward slightly as the clam opens. This helps direct the material to fall centrally into the tray ans avoids spillage.

The position of the bucket backboard when the clam opens, directly affects the position of the load in the tray.

Bucket in ideal position resulting in material falling straight down. Loading centre of the haul truck.

3.6 Transport

3.6.1 Travelling procedures for mining machine

The life expectancy of undercarriage components is based on standard working conditions with a maximum travel ratio of 5% per service meter unit. Working and / or travelling on uneven ground and / or abrassive material will influence the lifetime of the components and attract additional cost for the undercarriage components.

In general travel action has to be kept to the lowest level that is possible. Minimize travelling with turning through a narrow turning circle and long distance travel.

To minimize the travel ratio, professional mine planning with longfront winning sections is preferred. If digging operations at various spots are necessary, a proper short term and long term plan of winning operations has to be employed to guarantee long term use of the excavator at one place before moving to another location.

However, if frequent machine movement is necessary, the following set of procedures defined by LIEBHERR to minimize possible machine damage, downtime and wear have to be taken into consideration.

3.6.1.1 General

In order to move the machine forwards : with the excavator in standard forward position, depress travel pedals all the way forward with the toes. Direction of travel is in the direction of idlers.

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In order to move the machine backwards : with the excavator in standard forward position, depress travel pedals all the way down with the heels. Direction of travel is in direction of the drive sprockets.

3.6.1.2 Moving the machine during loading operations

Moving the machine during loading operations means adjustment of excavator digging and / or truck loading position of some meters.

3.6.1.3 Important procedures

- Before moving the machine, empty the bucket and close up the attachment to a position as close as possible to the excavator undercarriage.
- The practice of placing the attachment on the ground and lifting the machine, then counter turning the undercarriage, is not allowed, because it could cause premature structural damage to the machine.
- If there is a build up of material around the tracks where the machine will not turn, you must move the machine several meters forwards and / or backwards and attempt to turn again.
- If mine safety regulations allow, the operator can use the swing function to assist in turning the tracks, i.e. if turning to the right, swing upper deck to the left and vice versa.

3.6.1.4 Walking the machine over distance

Walking the machine distances means any movement of the machine of more than 100 m or for a time period longer than 3 minutes, whatever comes first.

In addition to above mentioned guidelines, when moving the machine during loading operatins, the following procedures apply :

- It is required to have somebody standby with a heat gun, to monitor the temperature of the drive components, including the track and carrier rollers.
- If temperature of any moving part is growing up about 20°C above ambiant temperature, interrupt travel and only commence again after parts have sufficiently cooled.
- To prevent overheating during travelling or to speed up cooling procedure it is advisable to have a water truck standby, to hose the heating components during travelling or cooling break.
- Move with idler and attachment forwards. Whenever possible, and not to contravene with mine safety regulations, swing whilst travelling to equally load track rollers. However, always ensure that clear forward vision is maintained.

3.6.1.5 Travelling the machine down grades or upgrades

In addition to above mentioned guidelines, when moving the machine during loading operations or when walking the machine distances, the following procedures apply :

- When travelling down grades greater than ten percent, it would be better to walk the machine down with the track motor first, i.e. the machine is moved backwards.
- When travelling up an incline, the final drives must be at the rear of the excavator.
- When walking down from a bench, firstly prepare a ramp, making it no more than a 30° slope (machine must be able to walk up unaided). When moving down the ramp never allow the machine to fall down on the attachment. When walking up the ramp never use attachment to assist the movement by pushing with the hydraulic power of the bucket, stick or booM.

3.6.1.6 Travelling the machine first time

The slide bearing (friction bearing) of the track rollers needs some time for running-in. If the bearing becomes hot at an early stage of machine life, this may cause lubrication problems during further life. Therefore when travelling the machine the machine the first time aside from all above mentioned guidelines it is strongly recommended to move carefully and at reduced speed.

Note!
Warranty may become void if failure to recognize and comply with the recommended travel operating procedures, as outlined in this document, is noted.

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4 Malfunctions

Warning messages and fault messages:

– Various faults are displayed on screen in the form of indicator lights or symbols (see chapter “Control and operating elements”).

– Warning functions can also be supported acoustically (buzzer).

Identifying and rectifying faults and errors:

– Faults can very often be traced back to incorrect operating or maintenance of the machine.
For each fault, therefore, read the relevant chapter in the operating instructions carefully once more.

– Analyse the cause of the fault and rectify it immediately.

– Describe the fault and all accompanying circumstances as precisely as possible if you contact LIEBHERR customer service.
Precise information makes it possible to find and rectify the cause of the fault quickly. Additionally, therefore, precise information on the type and serial number of the machine is also required.

– Do not carry out any work which you have not been trained to do.

Fig. 4-1 *LIEBHERR service*

If the cause of the fault cannot be recognised or rectified using the error codes and fault charts, please consult LIEBHERR customer service.

4.1 Error code charts

Danger!
When switching over to emergency operation, the speed can no longer be changed using the arrow keys on the monitoring screen. The servo control, parking brake and swing gear brake can no longer be activated.

▶ Please also note the subheading “Emergency operations” in the chapter “Operating the machine” in this regard.

4.1.1 Sensors

Error code	Effect	Cause	Measure / remedy
E 004	Coolant level B3 not being monitored.	Accidental ground	Check coolant level, consult LIEBHERR customer service.
E 005		Accidental +	
E 006		Broken wire	
E 007	Coolant temperature B2 not being monitored.	Accidental ground	Check coolant for contamination, consult LIEBHERR customer service.
E 008		Accidental +	
E 009		Broken wire	
E 010	Hydraulic oil level B14 not being monitored.	Accidental ground	Check hydraulic oil level, consult LIEBHERR customer service.
E 011		Accidental +	
E 012		Broken wire	
E 013	Hydraulic oil temperature B67 not being monitored.	Accidental ground	Check coolant for contamination, consult LIEBHERR customer service.
E 014		Accidental +	
E 015		Broken wire	
E 454	Swing speed B53 not being monitored	Accidental +	Consult LIEBHERR customer service.
E 455		Broken wire	
E 455		Accidental ground	
E 456	Fuel level transmitter B1 not being monitored	Accidental ground	Consult LIEBHERR customer service
E 458		Broken wire	

4.1.2 Regulating circuit

Error code	Effect	Cause	Measure / remedy
E 022	Diesel engine speed B12 not being monitoring, Diesel engine speed cannot be adjusted using keyboard, reduced hydraulic power	Accidental ground	Consult LIEBHERR customer service.
E 023		Accidental plus	
E 024		Broken wire	
E 027	Solenoid valve for power control Y4 LR1 not being monitoring	Cable defect	Consult LIEBHERR customer service.
E 030	Output ventilator oil Y10.2 not being monitoring	Cable defect	Consult LIEBHERR customer service.

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Error code	Effect	Cause	Measure / remedy
E 033	Output ventilator water Y10.1 not being monitoring	Cable defect	Consult LIEBHERR customer service.
E 036	Output Y3.1 EL1 not being monitoring	Cable defect	Consult LIEBHERR customer service.
E 039	Output Y3.2 EL2 not being monitoring	Cable defect	Consult LIEBHERR customer service.
E 042	Output Y3.3 EL3 not being monitoring	Cable defect	Consult LIEBHERR customer service.

4.1.3 Keyboard

Error code	Effect	Cause	Measure / remedy
E 302	Coding plug missed in keyboard	No coding plug	Consult LIEBHERR customer service.
E 303	No CAN 1 connection between control unit S2 and circuit board BST	Error detected also if BST is not operative : no power supply, ...)	Consult LIEBHERR customer service.
E 305	No CAN 2 connection between control unit S2 and circuit board ESP01	Error detected also if ESP01 is not operative	Consult LIEBHERR customer service.
E 312	No CAN 1 connection between control unit S2 and E1036 (connection box pump transmitters)	No CAN bus connection	Consult LIEBHERR customer service.
E 313	No CAN 1 connection between control unit S2 and A1020 (FSG plate)	No CAN bus connection	Consult LIEBHERR customer service.

4.1.4 Display

Error code	Effect	Cause	Measure / remedy
E 308	No CAN 2 connection between control unit S2 and display or no function of the control unit	No CAN bus connection	Consult LIEBHERR customer service.

4.1.5 Coding error

Error code	Effect	Cause	Measure / remedy
E 319	Coding BST not compatible with coding control unit S2	Coding error	Consult LIEBHERR customer service.
E 321	Unknown excavator type from BBT	Coding error	Consult LIEBHERR customer service.

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Error code	Effect	Cause	Measure / remedy
E 322	Unknown hardware coding from BST	Coding error	Consult LIEBHERR customer service.

4.1.6 Connection box pump transmitters

Error code	Effect	Cause	Measure / remedy
E 311	No CAN 1 connection on E1036 (connection box pump transmitters)		Consult LIEBHERR customer service.
E 320	No CAN 1 connection between E1036 (connection box pump transmitters) and translater J1939		Consult LIEBHERR customer service.

4.1.7 Error due to warning symbols in SY field

These error codes will not be displayed in the EC field of the operator's menu. They can only be read off the S-Exxx menu list.

Error code	Effect	Cause	Measure / remedy
E 501	Symbol appears	Oil pressure low	See symbol description
E 502	Symbol appears	Coolant level low	See symbol description
E 503	Symbol appears	Coolant overheating	See symbol description
E 504	Symbol appears	Hydraulic oil level low	See symbol description
E 505	Symbol appears	Hydraulic oil overheating	See symbol description
E 506	Symbol appears	Splitterbox oil temperature too high	See symbol description
E 540	Symbol appears	Coolant pressure low	See symbol description
E 562	Symbol appears	Oil level splitterbox low	See symbol description
E 564	Symbol appears	Oil level splittebox high	See symbol description
E 566	Symbol appears	Pump 1 clogged	See symbol description
E 567	Symbol appears	Pump 2 clogged	See symbol description
E 568	Symbol appears	Pump 3 clogged	See symbol description
E 572	Symbol appears	Swing pump 1 clogged	See symbol description
E 573	Symbol appears	Swing pump 2 clogged	See symbol description
E 578	Symbol appears	Overheat pump 1	See symbol description
E 579	Symbol appears	Overheat pump 2	See symbol description
E 580	Symbol appears	Overheat pump 3	See symbol description
E 584	Symbol appears	Overheat swing pump 1	See symbol description
E 585	Symbol appears	Overheat swing pump 2	See symbol description
E 591	Symbol appears	Splitterbox oil pressure low	See symbol description
E 592	Symbol appears	Centinel oil level	See symbol description
E 593	Symbol appears	Fuel temperature	See symbol description

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Error code	Effect	Cause	Measure / remedy
E 594	Symbol appears	Fuel pressure	See symbol description
E 595	Symbol appears	Blowby pressure	See symbol description
E 596	Symbol appears	Engine oil level	See symbol description
E 597	Symbol appears	Manifold temperature	See symbol description
E 598	Symbol appears	Oil change required	See symbol description

4.2 Faults and remedies

4.2.1 Diesel engine and fuel system

Fault / error	Cause	Solution
Diesel engine does not start	Fuel tank almost or completely empty	Fill tank and vent fuel system
	Shut off valve closed	Open the shut off valve
	Fuel filter dirty	Clean or change filter and vent fuel system, drain fuel / clean tank
	Outside temperature below 0°C	For operation under specific climatic conditions, see operating instructions
	Starter motor not drawing through	Check line connections, overhaul starter motor
	Batteries have no power	Charge / replace
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	Bleed 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 white 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

Fault / error	Cause	Solution
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 the shutoff valve
	Hydraulic pumps taking in air	Check oil level in hydraulic tank, check intake lines for leaks
Hydraulic oil temperature too high	Coolant contaminated	Clean coolant
	Fan or fan control defective	Rectify error / consult customer service
Hydraulic oil level too low	Oil loss	Repair leaks, exchange hoses, refill oil via return-line filter
Cannot drive	Push the safety lever up	Push the safety lever down
Swing gear not functioning	No servo control	Push the safety lever down
		Switch on servo control
	Swing gear brake activated	Push the safety lever down
		Release swing gear brake
No working movement	No servo control	Push the safety lever down
		Switch on servo control
	No servo pressure present	Consult customer service
	No pump high pressure present	Consult customer service

4.2.3 Transmission

Fault / error	Cause	Solution
Oil flowing out on track rollers, support rollers or leading wheel	Seal defective	Replace seal

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Fault / error	Cause	Solution
Insufficient crawler tracking on leading wheel	Leading wheel tracking on track roller mounting has too much play	Adjust the leading wheel tracking play
Chain jumps off or over	Chain tension too low / crawler wheel worn	Adjust chain tension
Correctly tensioned crawler losing tension quickly during chain	Chain tensioning cylinder defective	Check chain tensioning cylinder, change if required or seal (only authorized specialist personnel)
Track roller or support roller sticking	Running gear extremely dirty	Clean running gear

4.2.4 Electrical system

Fault / error	Cause	Solution
Battery charge indicator light does not goes out	Drive belt for alternator loose or torn	Tension or replace drive belt
	Alternator defective	Replace alternator
Batteries do not charge or charge poorly	Batteries defective	Replace batteries
	Battery connections dirty / oxidised	Clean battery connections
	Cable loose or damaged	Connect or replace cable
indicator light or display instrument not functioning or functioning incorrectly	Bulb burnt out, display instrument defective	Replace defective part
Some or all functions on instrument panel drop out	Plug connector separated or damaged, earth lead interrupted, short circuit fuse defective	Mount plug connector correctly or change, rectify short circuit, replace fuse or activate overload cut-outs
Servo control cannot be activated using switch	Excavator electrics faulty	Switch on emergency function using switch S73 in the right control panel Caution: Servo circuit and brake circuit can only be switched off using the safety lever. Keypad not functioning. Consult customer service.
Swing gear brake cannot be released using switch		

4.2.5 Heating/air-conditioning system

Fault / error	Cause	Solution
Heating not giving out warm air	Shutoff valves for coolant line on diesel engine closed	Open shutoff valve
	Engine not at operating temperature	Bring engine to operating temperature
Heating fan does not operate	No power supply	Check fuse and wiring / repair
	Fan motor defective	Change fan motor
Only low air flow in cab	Outside air filter / recirculated air filter dirty	Clean air intake opening, replace outside air filter
	Air vent closed	Open air vent

4.2.6 Work equipment

Fault / error	Cause	Solution
Cylinder stretches when loaded	Piston seal in cylinder defective	Overhaul cylinder
Bearing clearance too high on equipment	Bearing points worn out	Replace bearing parts
Bucket does not move	Valve block on tilting cylinder incorrectly switched	Switch over valve block

4.3 Fuses and relays

4.3.1 Power connection box E1003

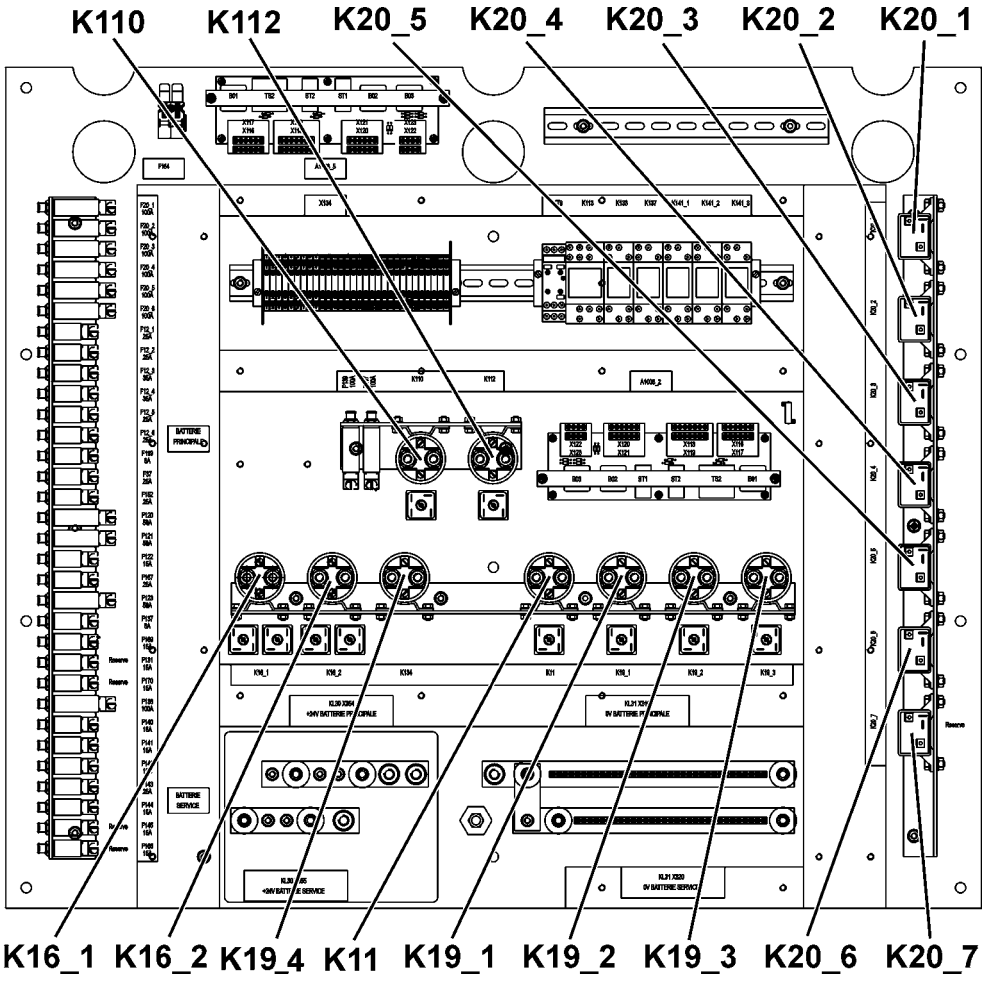

Fig. 4-2 Power connection box E1003

K11	Relais current charging	**K20_2**	Relay attachment flood ligh
K16_1	Startrelay E1003	**K20_3**	Relay fuel tank flood light
K16_2	Startrelay E1003	**K20_4**	Relay hydraulic tank flood light
K19_1	Relay KI15	**K20_5**	Relay counterweight flood light

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K19_2	Relay KI15	**K20_6**	Relay counterweight flood light
K19_3	Relay KI15	**K20_7**	Relay reserve
K19_4	Relay KI15	**K110**	Relay for M10
K20_1	Relay attachment flood light	**K112**	Relay for M11

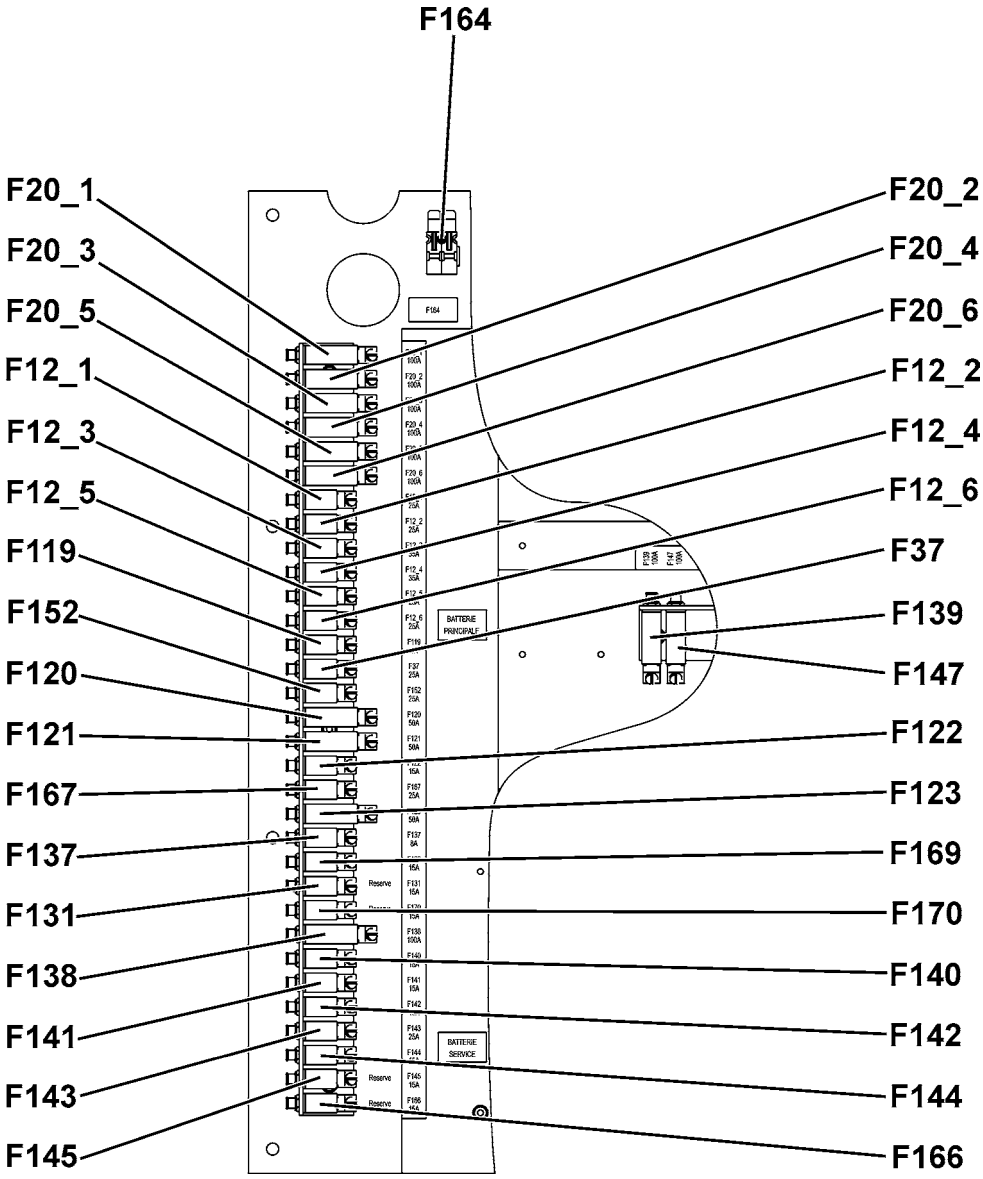

Fig. 4-3 *Fuses of the connection power box*

F12_1	Fuse / attachment floodlight	**F131**	Reserve
F12_2	Fuse / attachment floodlight	**F137**	Fuse / Quantum
F12_3	Fuse / fuel tank floodlight	**F138**	Fuse / service circuit supply
F12_4	Fuse / hydraulic tank floodlight	**F139**	Fuse / M10 supply
F12_5	Fuse / counterweight floodlight	**F140**	Fuse / board
F12_6	Fuse / counterweight floodlight	**F141**	Fuse / E14
F20_1	Fuse / supply cabin KI15	**F142**	Fuse / lighting in elevation
F20_2	Fuse / supply E1005 KI15	**F143**	Fuse / lighting in control valve
F20_3	Fuse / charging current	**F144**	Fuse / ladder / trap door
F20_4	Fuse / KI30 floodlight	**F145**	Reserve

F20_5	Fuse / KI30 counterwght flood.	**F147**	Fuse / M11 supply
F20_6	Fuse / engine	**F152**	Fuse / Quantum
F37	Fuse / ether	**F164**	Fuse / E1003
F119	Fuse / S1 / KI30	**F166**	Reserve
F120	Fuse / air conditionning	**F167**	Fuse / elevation pressure fan
F121	Fuse / air conditionning	**F169**	Fuse / charging
F122	Fuse / option. windshield wiper	**F170**	Reserve
F123	Fuse / supply A1020		

Power connection box E1003 is located under the cabin in the cab elevation.

4.3.2 Cabin connection box E1005

All other fuses and relays are situated on the cabin connection box E1005. The cabin connection box E1005 is located in the cabin, behind the operator's seat.

Danger
Incorrect or bypassed fuses do not offer the machine's operator or the electrical system the required degree of protection.

- ▶ Only use original fuses.
- ▶ Never bypass electrical fuses.

If required, order replacement fuses from LIEBHERR.

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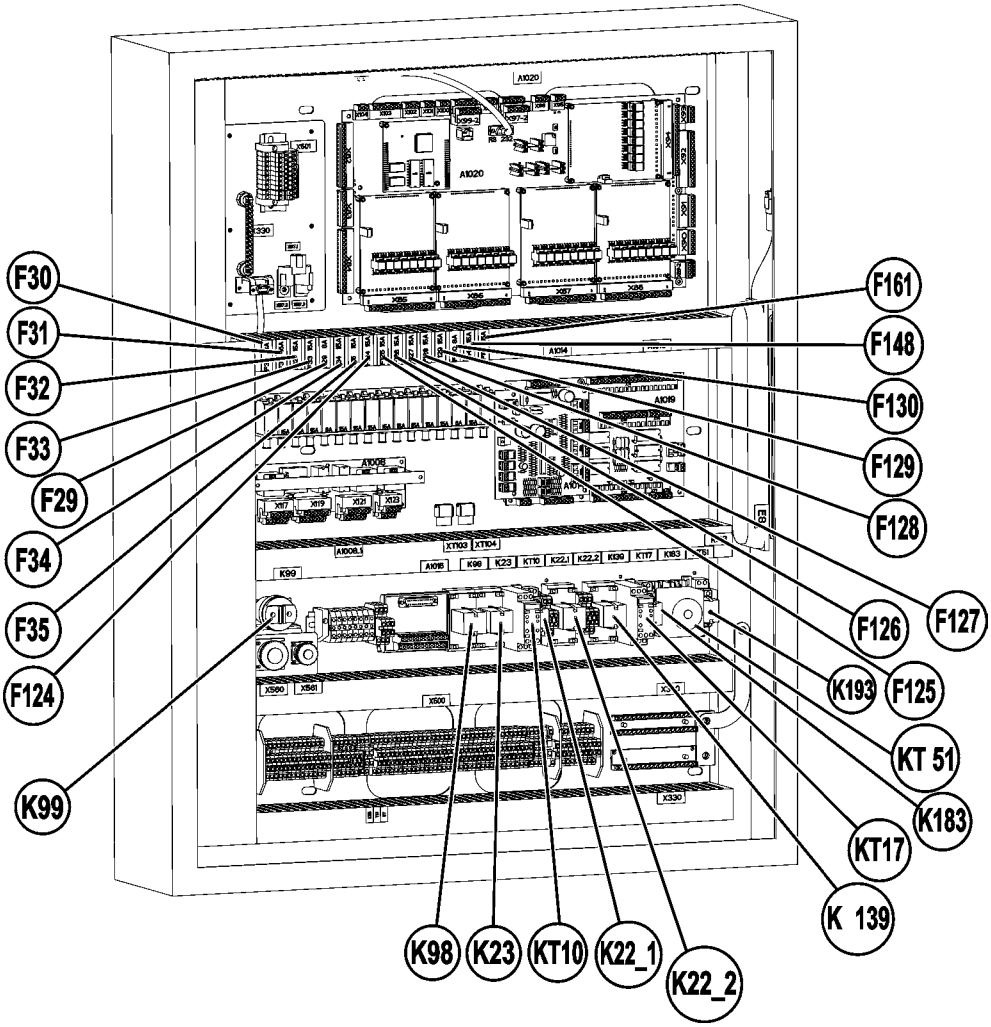

Fig. 4-4 *Fuses and relays, cabin connection box E1005*

F29	Fuse / reserve cameras	**F148**	Fuse / A1019
F30	Fuse / attenu. plate supply res.	**F161**	Fuse / A1036
F31	Fuse / A1020 boom / shovel tilt	**K22_1**	Relay / reserve
F32	Fuse / A1020 stick / swing	**K22_2**	Relay / reserve
F33	Fuse / A1020 travel / trap door	**K23**	Relay second air conditionned
F34	Fuse / A1020 FSG	**K98**	Relay travel alarm
F35	Fuse / A1020 controller FSG	**K99**	Relay supply A1020
F124	Fuse / S7, A1001	**K139**	Relay / pontoon
F125	Fuse / A1019, U16	**K183**	Relay / reserve
F126	Fuse / A1001	**K193**	Relay / reserve
F127	Fuse / greasing	**KT10**	Relay timer emergency stop
F128	Fuse / board	**KT17**	Relay timer / reserve
F129	Fuse / cabin	**KT51**	Relay timer / reserve
F130	Fuse / A1001		

5 Maintenance

5.1 Servicing the machine safely

5.1.1 General safety instructions

- Maintenance and repair work may only be carried out by specially trained personnel.
- Observe statutory timetables or intervals given in the operating instructions for repeat tests / inspections. It is imperative that a suitably equipped workshop is available in order to carry out maintenance work.
- The inspection and maintenance schedule given at the end of these operating instructions defines precisely who is required / permitted to carry out what work. Jobs listed as daily / weekly work may be carried out by the machine's driver or maintenance personnel when they have received appropriate instruction.
  The remaining work may only be carried out by specialist personnel with appropriate training.
- Replacement parts must correspond to the technical requirements determined by the manufacturer. Original replacement parts are always guaranteed to meet these criteria.
- Wear safe work clothes when carrying out maintenance work. Protective glasses and gloves are required in addition to a hardhat and safety shoes for some work.
- Do not permit unauthorised persons to approach the machine during maintenance work.
- Cordon off a wide maintenance area if required.
- Inform operational personnel before starting to carry out any special work and repair work. Designate persons in charge of supervision.
- In the absence of any other information in the operating instructions, carry out all maintenance work on the machine on level, firm ground with the working equipment set aside and the engine switched off.
- Pull out the ignition key and shut off the main battery switch.
- Always tighten any loose screw connections during maintenance and repair work.
- If safety devices have to be dismantled during set-up, maintenance and repair work, they must be immediately reinstalled and checked at the end of the work.
- When carrying out repair work, particularly when working under the machine, hang a “Do not start” warning sign in a clearly visible position on the starting lock. Pull out the start key and shut off the main battery switch.
- Operate combustion motors and fuel operated heaters only in well ventilated areas. Before operating these units, check ventilation.
- In addition, always follow applicable local regulations.

5.1.2 Cleaning

- Clean oil, fuel or care products off the machine before starting maintenance or repair work and pay particular attention to connections and screw fittings.
  Do not use aggressive cleaning products and use lint-free cleaning cloths.
- Do not use aggressive cleaning products or steam jet devices to clean the machine for the first two months after initial set-up of the machine (or after repainting).

– Do not use combustible liquids to clean the machine.
– Before cleaning the machine with water or steam jets (high pressure cleaner) or other cleaning materials:
  • lubricate all bearing points, bolt connections and the rim bearing to prevent water or steam entering the bearing points.
  • cover or glue shut all openings into which for safety or functional reasons water or steam may not be permitted to enter.
    Electric motors, electrical components, control boxes, plug connections and air filters are particularly at risk.
– Ensure that the fire warning systems and fire extinguishers of the engine compartment's temperature sensor do not come into contact with hot cleaning products during cleaning work.
  The fire extinguisher could start.
– If you use a high pressure cleaner with steam or hot water to clean the machine, observe following recommendations :
– the distance between the nozzle and the surface to be cleaned must be no lower than 20 inches
– the water temperature should not exceed 60°c (140°F)
– limit the water pressure to 80 bar maximum (11500 PSI)
– if you employ cleaning fluid, only use neutral cleaning agents such as customary car shampoos diluted to 2 or 3 percent maximum
– After cleaning:
  • remove all covers completely.
  • check all fuel, engine oil and hydraulic lines for leakage, loosened connections, chafing and damage.
  • rectify any defects found immediately.
  • lubricate all bearing points, bolt connections and the rim bearing to displace any water or cleaning products that may have entered.

5.1.3 Crack testing

– Even when the machine is operated carefully, there is a possibility of individual cases of overloading occurring, which could lead to cracks or loose connections. The machine should therefore be checked regularly for cracks, loose connections or other visible damage to maintain operational safety.
– In order to be able to check for cracks, it is essential that the machine is kept clean and cleaned regularly.
– The tests should be carried out in accordance with the monitoring and maintenance plan:
  • every 250 operating hours by the machine owner's maintenance personnel.
  • every 500 operating hours by authorised specialist personnel.
– It is advisable to carry out these tests: supported, on firm, horizontal substrate, with the equipment in longitudinal and cross direction for variable loads. Current accident prevention regulations must be adhered to.
– Special care must be taken when testing load-bearing components, particularly:
  • the steel chassis members and axle and transmission mountings, the support, the lower rim bearing support and tower and ball rim bearing.
  • the steel upper structure members and bearing block for boom and boom cylinder, the upper rim bearing support, the cab mount and the mount for swing gear and ballast.
  • the steel components of the working equipment, e. g. the boom, stay, quick change adaptor, and bucket.
  • hydraulic cylinders, axles, steering, bolts and bolt connections, steps, ladders and mounting elements.

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– The crack test should be carried out visually. If a crack is suspected, the dye penetration test should be carried out as a crack test on areas which do not have good visibility, such as the rim bearing support, in order to increase testing safety.
– Any damage found must be rectified immediately. Welding work on load-bearing parts of the earth-moving machinery, loading devices and transport devices may only be carried out by trained specialist personnel and only in accordance with the accepted rules of welding engineering. In case of doubt, contact the LIEBHERR customer support service to discuss suitable remedies.

5.1.4 Welding, drilling, firing and grinding work

– Any welding on structural parts (as undercarriage, uppercarriage, equipment parts,…) may only be done the manufacturer, or authorized official dealer. If this rule is neglected, the warranty is voided.
– Only carry out welding, drilling, firing and grinding work on the machine with express authorization. Clean dust and combustible materials off the machine and its surrounding areas before welding, drilling, firing or grinding.
Ensure adequate ventilation. Risk of fire or explosion.
– Before welding repairs on other parts, always disconnect the battery. Always remove the negative terminal first and reconnect it last.
– Nevertheless if welding repair should be done on components which may contain inflammable gases (welded counterweight, hydraulic tank, fuel tank, …), these components must be previously and sufficiently ventilated with pressurized air to avoid all fire or explosion hazard
– Before welding, connect the ground cable as close as possible to the welding point, so the welding current will not run through the swing ring, joints, gears, bushings, rubber parts and seals

5.1.5 Process materials

– When working with oils, greases and other chemical substances, observe the appropriate current safety regulations for the product.
– Ensure that process materials and replacement parts are disposed of in a safe and environmentally acceptable manner.
– Take care when handling hot process materials
(Risk of burning and scalding).

5.1.6 Repair work

– Do not attempt to lift heavy parts. Use devices which are suitable for this purpose and which have sufficient load capacity. When replacing single parts and larger subassemblies, carefully secure them on lifting devices them so that they do not present a risk. Only use suitable and correctly functioning lifting devices and load take-up devices with adequate load capacity.
Do not stand or work under swinging loads.
– Do not use lifting devices which are damaged or do not have sufficient load carrying capacity.
Wear work gloves when working with wire cables.
– Only permit experienced personnel to attach loads and give signals to the crane operator. The spotter must be positioned within the visual range of the operator or be in voice contact with him.

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– When working above body height, use safe climbing devices and working platforms which are appropriate for the job.
  Do not use machine parts as climbing devices if they are not designed for this purpose.
  When working at height, wear a harness to prevent falling.
  Ensure that all grips, steps, rails, platforms and ladders are free of dirt, snow and ice.
– Be sure to support yourself safely when working on the equipment (e.g. replacing teeth). Prevent metal touching metal when doing this.
– 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, you must operate all pilot control devices (joystick and pedals) in all directions with the start key in contact position 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.

5.1.7 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.

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– 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.

5.1.8 Hydraulic accumulator

– All work on the hydraulic accumulators must be carried out by trained specialist personnel.
– Inexpert assembly and handling of hydraulic accumulators can cause serious accidents.
– Do not operate damaged hydraulic accumulators.
– Before working on a hydraulic accumulator, you must reduce the pressure in the hydraulic system (hydraulic system including hydraulic tank), as described in these operating instructions.
– Do not carry out welding or soldering or do any mechanical work on the hydraulic accumulator.
  The hydraulic accumulator can be damaged by heat penetration and can be made to rupture by mechanical working. RISK OF EXPLOSION!
– Only charge the hydraulic accumulator with nitrogen. There is a RISK OF EXPLOSION if oxygen or air is used.
– The accumulator body can become hot during operation; there is a risk of burning.
– New hydraulic accumulators must be charged with the pressure required for the purpose of use before installation.
– The operating data (minimum and maximum pressure) are marked permanently on hydraulic accumulators. Ensure that this marking remains visible.

5.1.9 Hydraulic hoses and sheathed cables.

– It is forbidden to carry out repair work on hydraulic hoses and sheathed cables!
– All hoses, sheathed cables and bolt connections must be checked regularly every 2 weeks for externally visible damage and any possible damage must be immediately checked for leakage.
  Never check for leaks with your bare hands, use a sheet of paper or something else.
  Any damaged parts must be removed immediately! Spurting oil can lead to injury and burns.
– Even with correct storage and permitted load, hoses and sheathed cables are subject to the natural aging process. This restricts their duration of use.
  • Incorrect storage, mechanical damage and unauthorized load are the most common causes of failure.
  • In relation to duration of use, current norms, regulations and guidelines pertaining to hoses and sheathed cables at place of use must be adhered to.
  • Use at the limit range of permissible load can shorten duration of use (e.g. high temperatures, frequent movement cycles, extremely high pulse frequencies, multiple shift usage).
– Hoses and sheathed cables should be replaced if the following are found during inspection:
  • Damage to the outer sheath as far as the liner (e.g. chafing, cuts and cracks);
  • Brittleness of the outer sheath (fracture formation in hose material);
  • Deformations which do not correspond to the natural form of the hose or sheathed cable, whether in a unpressurized or pressurized state or on bends e.g.

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sheath separation, blistering;
- Unsealed areas;
- Non-adherence to requirements during installation;
- Damage or deformations to the hose fittings which reduce the tightness of the fittings or the hose / fitting connection;
- Hoses working themselves out of the fittings;
- Corrosion of the fittings which reduces function and tightness;

– When replacing hoses and sheathed cables, use only original replacement parts.

– Install and mount hoses and sheathed cables correctly. Do not mix up the connections.

– The following is to be noted when replacing hoses and sheathed cables:
  - Always ensure that the hoses and sheathed cables are installed free of torsion. For high-pressure hoses, the screws from the half-clamps or full flange must always be attached to both hose ends and should only be tightened afterwards.
  - When tightening the flange on high-pressure hoses and sheathed cables with bent fittings, the side with the bent fitting must always be tightened first and then the side with the straight fitting tightened afterwards.
  - Any mounting clamps which are located in the centre of the hose may only be attached and tightened subsequently.
  - Check daily to ensure that all clamps, covers and protective devices are properly fastened. Doing this will prevent vibration and damage during operation.
  - Install the hoses and sheathed cables in such a way that they cannot chafe on other hoses, sheathed cables or parts.
  - A minimum distance from other parts of approx. half the exterior diameter of the hose is recommended. The distance should not, however, be less than 10 to 15 mm.
  - When replacing the hoses or sheathed cables on moving parts (e.g. from the boom to the stay), check before initial start-up that there are no chafing areas in the entire area of movement.

5.2 Maintenance access doors

5.2.1 Overview of access doors

The machine has 5 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.

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5.2.1.1 Engine room

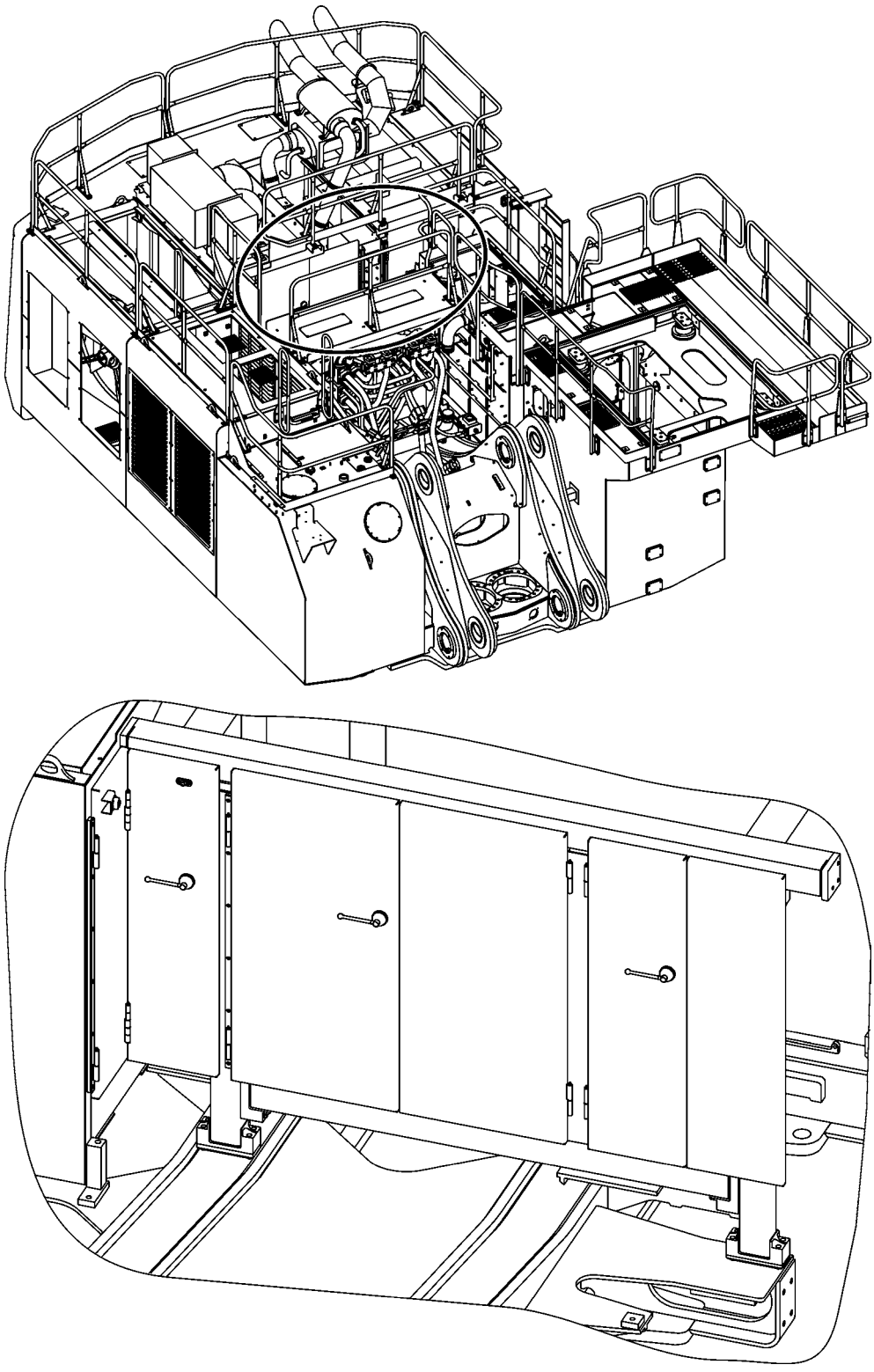

Fig. 5-1 *Access doors for the engine room*

These doors permit to accede to the engine room.

5.2.1.2 Cab elevation and hydraulic tank installation

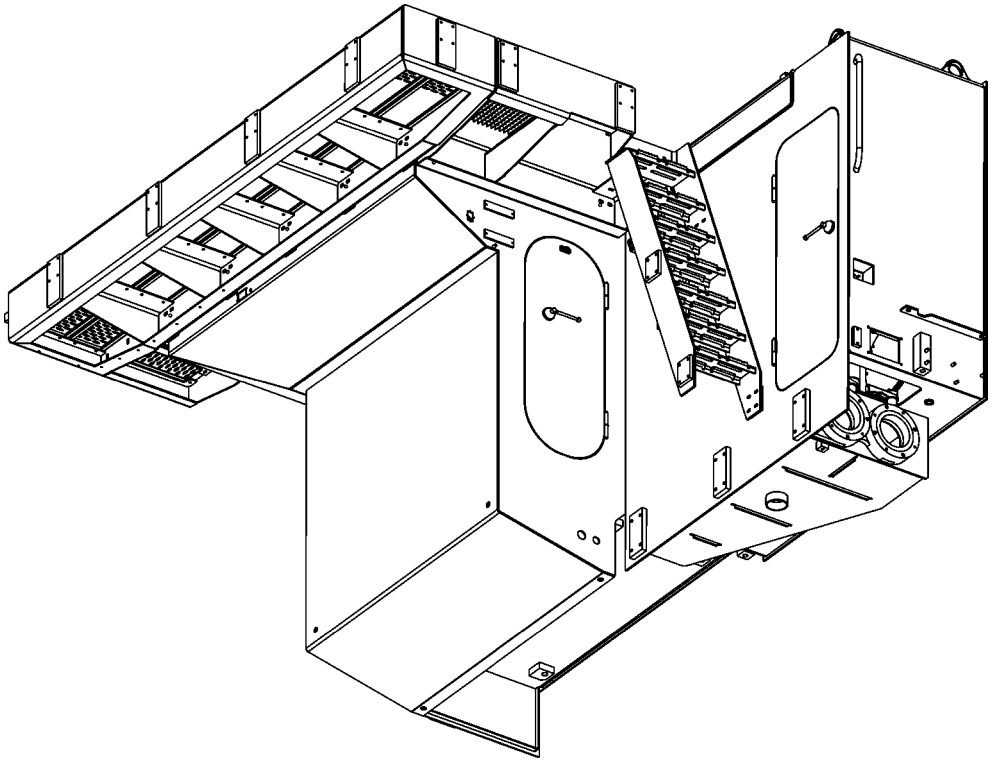

Fig. 5-2 *Access doors for the cab elevation and for the hydraulic tank installation*

The access door for the cab elevation permit to access to the windshield washer tank and to the power connection box E1003.

The access door of the hydraulic tank installation permit to accede to the service batteries.

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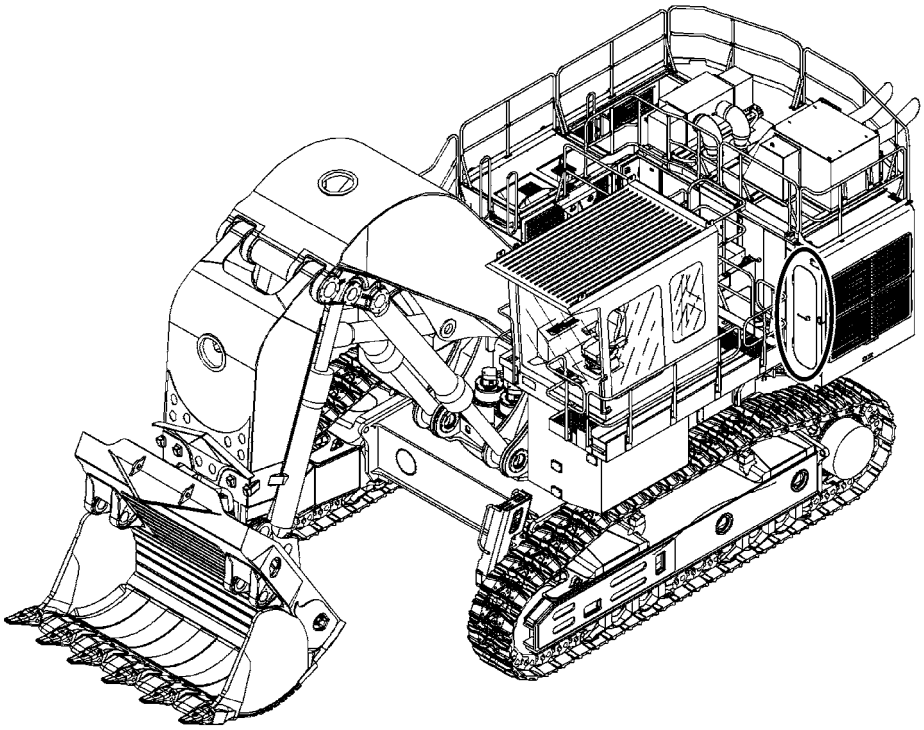
5.2.1.3 Left catwalk



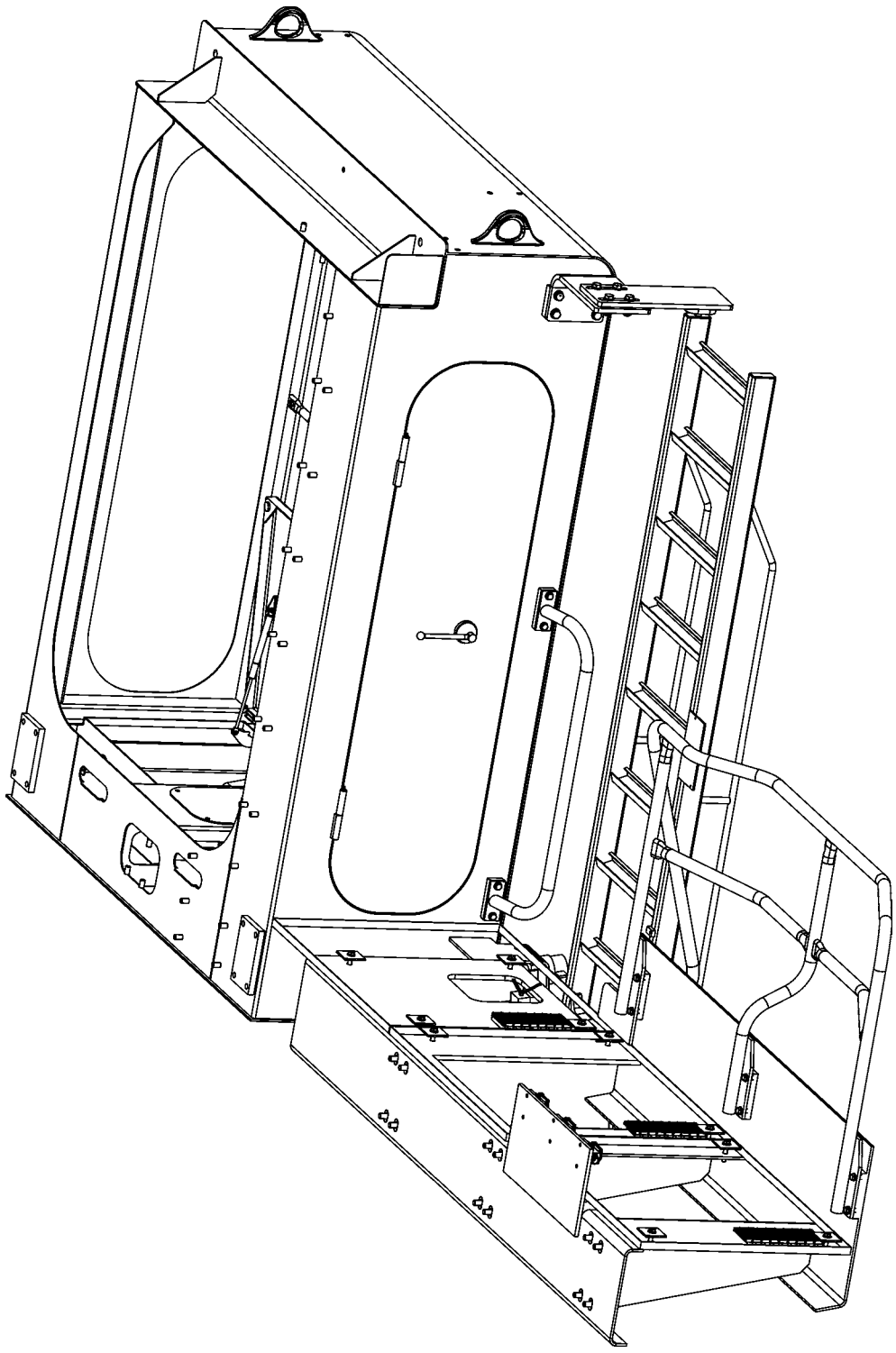


Fig. 5-3 *Access door for the left catwalk*

The access door for the left catwalk permit to access to the main pumps of the excavator, to the splitterbox, to the engine, to the counterweight and to the radiator.

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5.2.1.4 Radiator

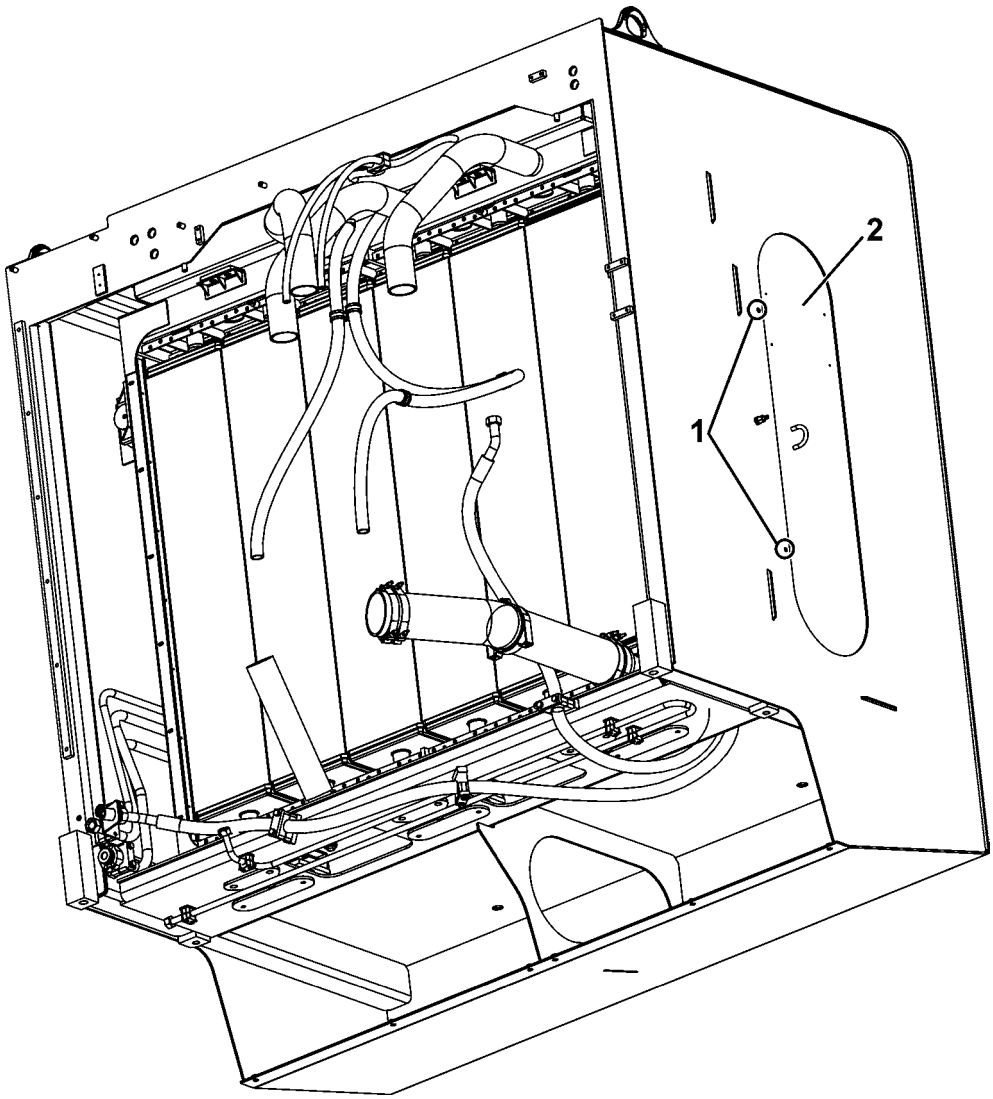

Fig. 5-4 *Access door for the radiator*

To access to the radiator :

- ▶ Unscrew the screw 1.
- ▶ Open the door 2.

5.2.1.5 Main pumps and splitterbox

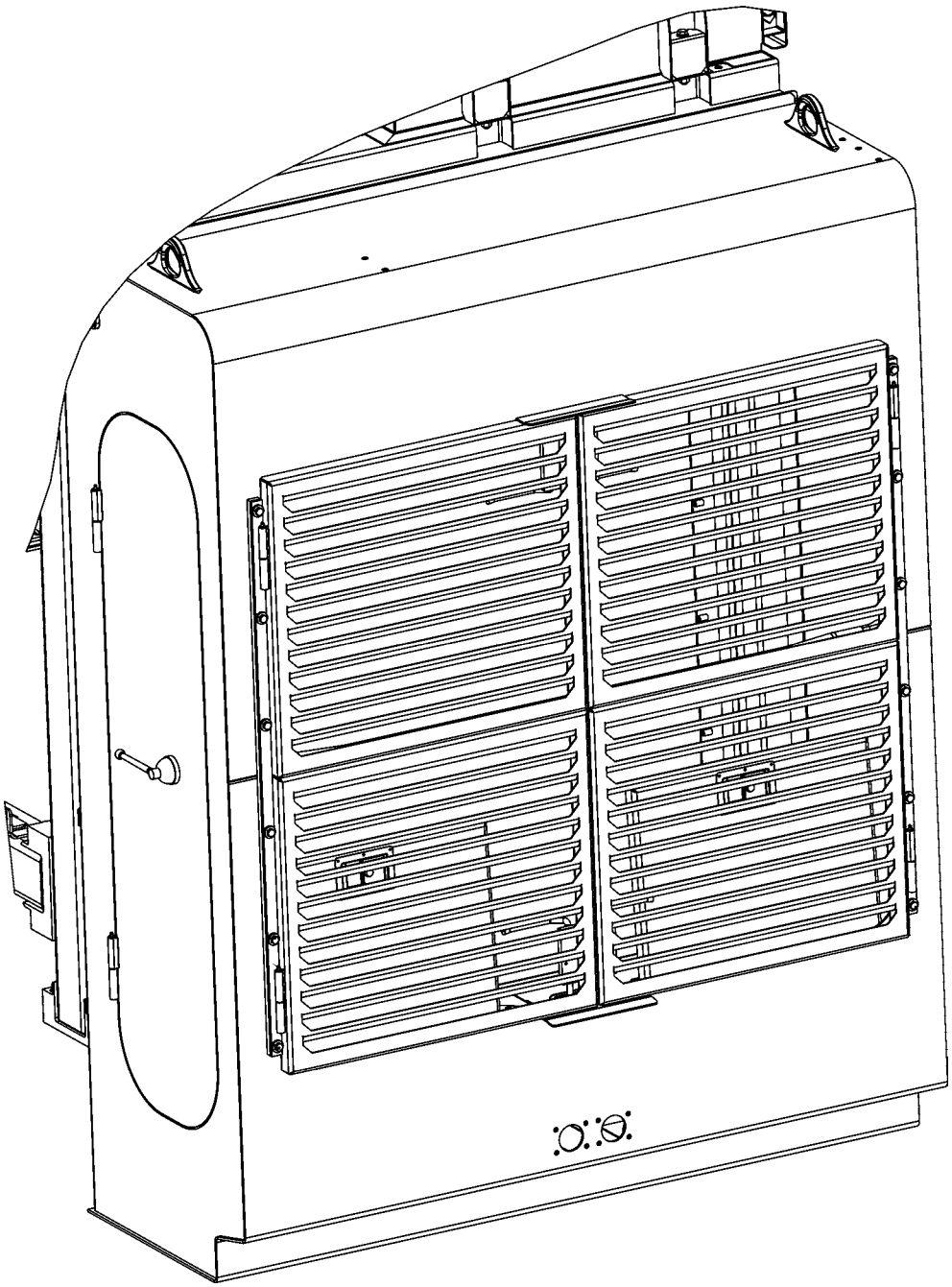

Fig. 5-5 *Access for main pumps and splitterbox*

This access permit to get main pumps or the splitterbox out.

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5.3 Lubricating and operating materials

5.3.1 General information on changing lubricating and operating materials

Note
The quantities given in the lubrication and operating material chart and on the lubrication chart in the cab are only guide values.

- ▶ After each oil change or refill, check the level in the relevant unit.

Note!
Adhering to regulations for lubrication, level checks and operating material changes guarantees a high degree of reliability and a long service life for the machine.
It is particularly important to adhere to the intervals for oil changes and use the lubricant quality indicated.

Note!
Cleanliness is of the utmost importance when changing oil.

- ▶ Clean all filler plugs, filler covers and drain plugs and their surroundings before opening.
- ▶ For preference, drain off oil when it is at operating temperature.
- ▶ Ensure that old oils are collected and disposed of in an environmentally acceptable manner using the removable oil filter cartridges.

Danger!
When checking and changing lubrication and operating materials, ensure that the following precautions are adhered to:

- ▶ Unless otherwise indicated, carry out all work on the machine on level, solid ground and with the engine switched off.
- ▶ Whenever you reach into the engine compartment, always secure the cover and side doors against accidentally falling back or closing.
- ▶ Only refuel the machine when the engine is switched off, do not smoke and avoid naked flame.
- ▶ Turn the main battery switch to position **0** (off) and remove the ignition key.

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5.3.2 Lubrication chart

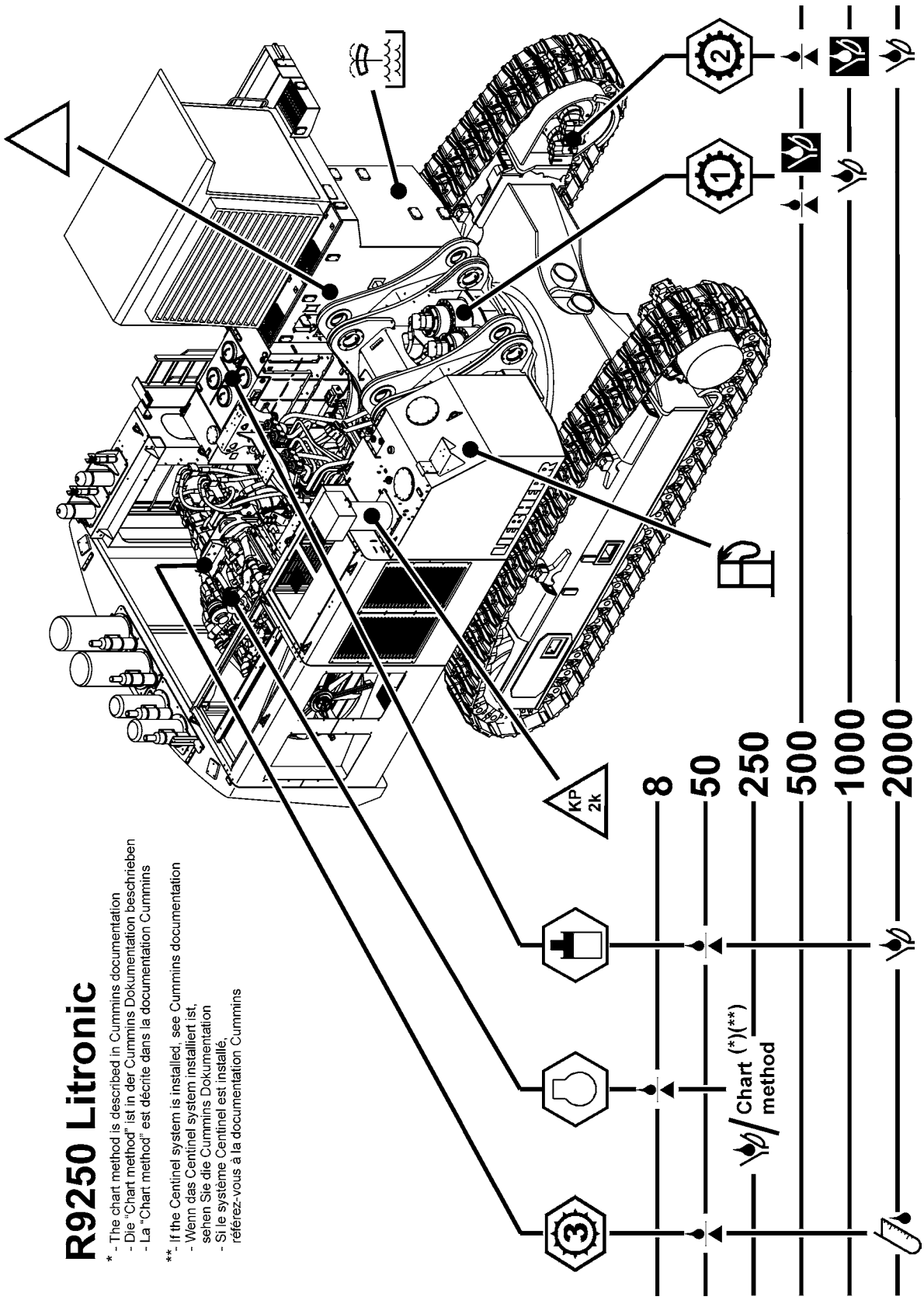

Fig. 5-6 *Lubrication chart - R 9250*

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Symbol	Display	Quantity*
	Diesel engine	245 l
	Engine coolant	280 l
	Hydraulic system	3650 l
	Swing gear	2 x 37 l
	Travel gear	2 x 52 l
	Splitterbox	70 l
	Fuel	5220 l
	Grease / Swing ring teeth	15 l
	Grease	80 l
	Windshield washer	75 l
	Check oil level	
	Oil change	
	First oil change	
	Oil analysis	

Tab. 5-1 *Lubrication chart key*

*the given quantities are only guidelines. Check fluid level after each change or refilling.

5.3.3 The service trap

To simplify the oil change and the refilling procedure, the drain of major components are centrally connected to a service trap.

- The Diesel engine system.
- The splitterbox.
- The fuel tank.
- The hydraulic oil tank.
- The windshield washer fluid tank.
- The grease tank for general lubrication.

▶ The grease tank for swing ring teeth lubrication

Component	Adapter WIGGINS	Flow max.
Splitterbox	C-1807	50 l/mn
Engine oil	OSP 2	50 l/mn
Hydraulic oil	6600 B12	100-200 l/mn
Fuel	ZZ 9A1	400 l/mn
Winshield washer	EC 280 B8	25 l/mn
Principal grease Teeth ring grease	OSP 2 6000 B12	15-30 l/mn Pmi-ni 100 bar

Tab. 5-2 *Major components of the service trap*

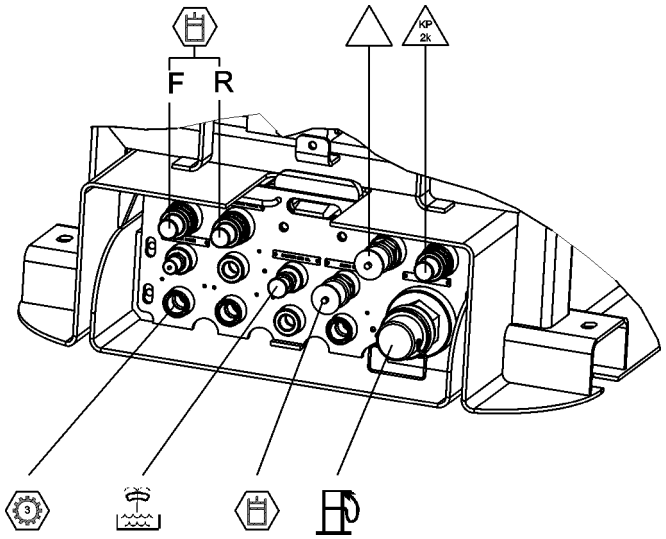

Fig. 5-7 *Major components of the service trap*

5.3.4 Lubricant chart

Designation	Medium	Symbol	Classification	Viscosity	CI *	Quantity
Diesel engine	Engine oil		**See the Operation and Maintenance Manual for CUMMINS engine.**			245 l
Hydraulic tank	Hydraulic oil			SAE 10W SAE 20W-20 SAE 30 SAE 15W40 SAE 10W40 SAE 10W-30	EO 10 EO 20 EO 30 EO 1540 EO 1040 EO 1030	3650 l

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Designation	Medium	Symbol	Classification	Viscosity	CI *	Quantity
Swing gear Travel gear Splitterbox	Swing and travel gear oils Splitterbox oil		API-GL-5 and MIL-L-2105 B, C or D.	SAE 80 SAE 80W90 or SAE 90 SAE 85W140	GO 90	2 x 37 l 2 x 52 l 70 l
Swing ring roller bearing races and general lubrication points	Lubricating grease		Multupurpose grease KP2k or EP2 (extreme pressure N°2 grade)	Consistency 2 NL GI N°2 grade	MPG-A	80 l
Swing ring teeth	Lubricating grease		See lubricant specification	Special grease		15 l
Hinges, joints, locks	Engine oil	-	-	-	-	-
Rubber seal on doors and trim panels	Silicon spray or talc	-	-	-	-	-

Tab. 5-3 *Lubricant chart*

*CI = regulation lubricant for construction machines and vehicles according to the national German construction industry federation (see brochures in Bauverlag GmbH – Wiesbaden and Berlin, Notes on lubrication and operating materials charts).

5.3.5 Operating material chart

Designation	Medium	Symbol	Quantity (litres)*
Fuel tank	**See the Operation and Maintenance Manual for CUMMINS engine.**		5220 l
Engine coolant	**See the Operation and Maintenance Manual for CUMMINS engine.**		280 l
Windshield washer system	Commercially available windshield washer fluid or denatured alcohol	-	75 l
Refrigerating agent for air conditioner	R 134 a	-	6,5 kg
Refrigeror oil in air conditioner compressor	PLANETELF PAG SP 20	-	1 l

Tab. 5-4 *Operating material chart*

5.3.6 Service trap

For safety reasons and ease of maintenance, oil for the connected components should only be drained and refilled via the quick-change couplings in the service trap

However, these components are also equipped with oil drain valves, see description for oil change procedure of these components.

5.3.6.1 To lower and raise the service trap

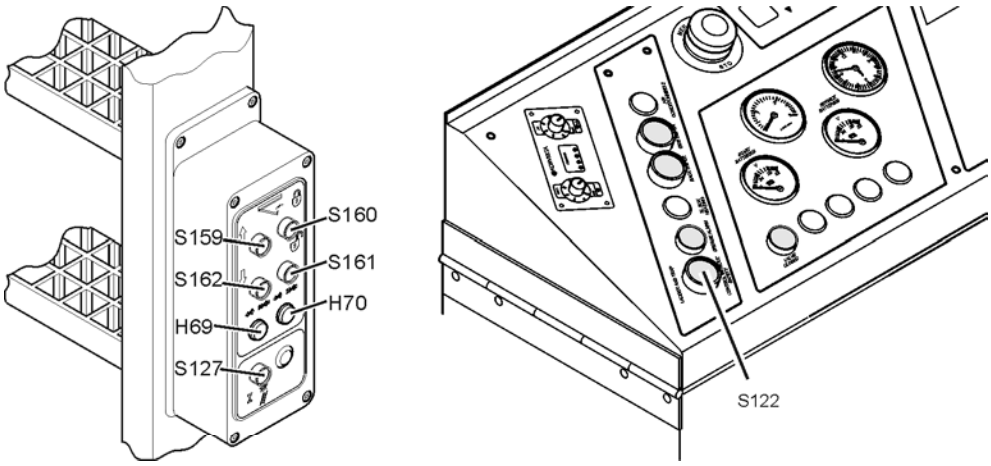

Fig. 5-8 *Control box E1022_2 and control board*

When the service trap is lowered, the service plate is accessible from the ground level.

The service trap can be moved up and down via the 4 push buttons on the control box E1022_2 at the lower end of the access ladder.

The service flap can also be actuated with the engine shut down.

It should only be moved out if the uppercarriage and the undercarriage are aligned.

To lower the service flap from its uppermost position,

- First push the switch **S161** to unlock the flap,
- Then push the switch **S162** to move the flap downward.

To retract the flap,

- First push the switch **S159** until the red indicator light **H69** goes out,
- And then push the switch **S160** to lock the flap until the lock pin has reached its stop position.

The lighting of the red indicator light **H70** shows that the locking pin of the flap is not in end (locked) position.

The lighting of the red indicator light **H69** shows that the flap is not in upper end position.

The locking of the flap via switch **S160** is possible only when light **H69** is out.

Caution!
For safety reasons, the excavator can only be operated if the service flap is locked in its uppermost position. Otherwise the red indicator light **H70** goes on.
This means that the swing and travel movements remain locked.

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However, this safety measure can be bypassed for as long as the button **S122** on the right front instrument panel is depressed.

5.4 Lubricating and operating material specifications

5.4.1 Lubrication oil for the diesel engine

Standard or with the Centinel system.

See the Operation and Maintenance Manual for CUMMINS engine.

5.4.2 Fuel

See the Operation and Maintenance Manual for CUMMINS engine.

5.4.3 Hydraulic oil

5.4.3.1 Mineral oil

Engine oils corresponding to the following specifications and regulations are stipulated:

Single-grade oils:	API - CD / CCMC - D4 / ACEA - E1 Mercedes-Benz regulations, sheet no. 226.0 and 227.0
Multigrade oils	API - CD + SF / CCMC - D5 / ACEA - E3 Mercedes-Benz regulations, sheet no. 227.5 and 228.3

Tab. 5-5 *Stipulated engine oils for use as hydraulic oil*

The engine oil for use as a hydraulic oil can be selected according to the following graphic.

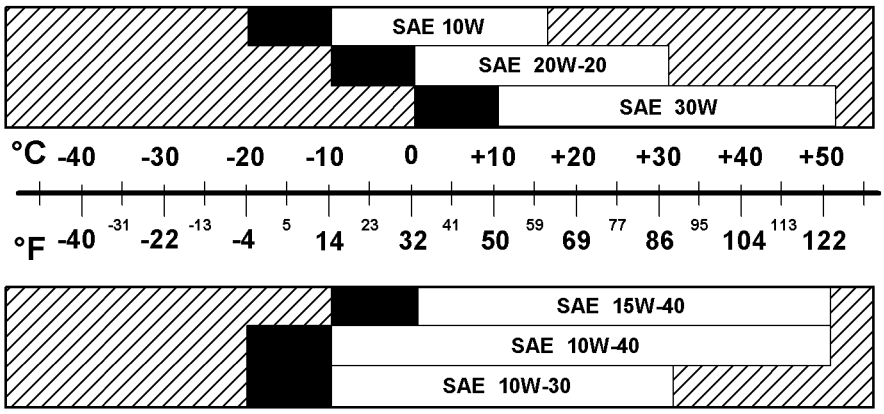

Fig. 5-9 *Engine oils for use as hydraulic oil*

Warm-up specification

At temperatures up to 10 °C below the given limit (black bar), the following warm-up specification applies:

Only adjust the diesel engine after starting to approx. 1 / 2 rated speed. Operate the hydraulic cylinder and motors, move cylinder briefly to the stop. Warm-up duration approx. 10 minutes or until operating temperature is reached.

At even lower temperatures: Preheat hydraulic oil in the tank before starting the engine.

5.4.3.2 Environmentally acceptable hydraulic oils

Note!
Mixing environmentally acceptable hydraulic oils made by different manufacturers and mixing mineral oils with them should be avoided at all times.

The environmentally acceptable hydraulic oils recommended by LIEBHERR are limited to oils with a synthetic ester basis with a viscosity equivalent to ISO VG 46.

The initial oil fill is carried out at the works using an approved list. Any use of an environmentally acceptable hydraulic oil must first be agreed with LIEBHERR.

Plant-based oils are not to be used due to their insufficient temperature properties.

The use of partial flow filters is required.

5.4.3.3 Hydraulic oil monitoring

Note!
Environmentally acceptable hydraulic fluids should generally **be checked** at regular intervals by oil analysis.
Oil analysis is recommended for mineral oils.

▶ Machines in normal use: at least every 500 operating hours.

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5.4.3.4 Hydraulic oil change intervals

Oil changes in pre-set intervals

Note!
Oil change in pre-set intervals are only permitted for mineral oils. When using environmentally friendly hydraulic fluids, oil sample analysis reports must be used to determine the time of the oil change, see "Optimised oil change intervals determined through oil sample analysis reports".

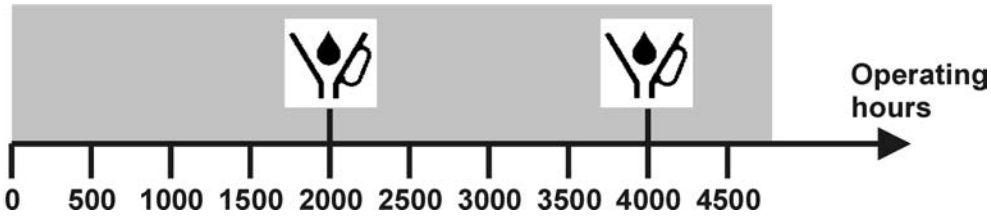

Fig. 5-10 *Changing oil*

Optimised oil change intervals determined through oil sample analysis reports

Use this procedure to take oil samples in pre-set intervals. The intervals may be extended between two oil changes as long as the properties of the oil are still satisfactory. The time when the oil must be changed is determined by the lab report.

LIEBHERR recommends to submit the oil samples to "WEAR-CHECK" for oil analysis. A kit for 6 complete analysis at WEAR-CHECK is available : Id. No. 7018368 (the kit contains the sample containers, documentation, shipping container and oil sample hose). A hand pump is required to take the oil sample, and should be ordered seperately (Id. No. 8145666).

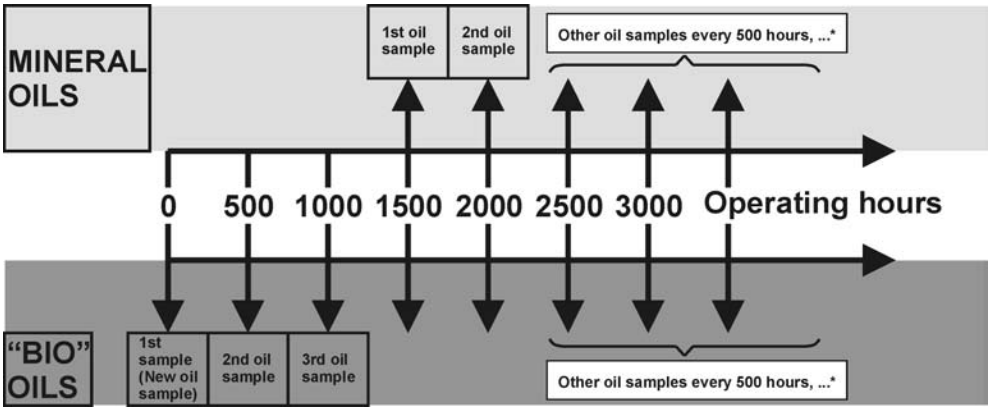

Fig. 5-11 *Taking an oil sample*

5.4.4 Swing and travel gear oils

TUse gear oil meeting specifications API-GL-5 and MIL-L-2105 B, C or D.

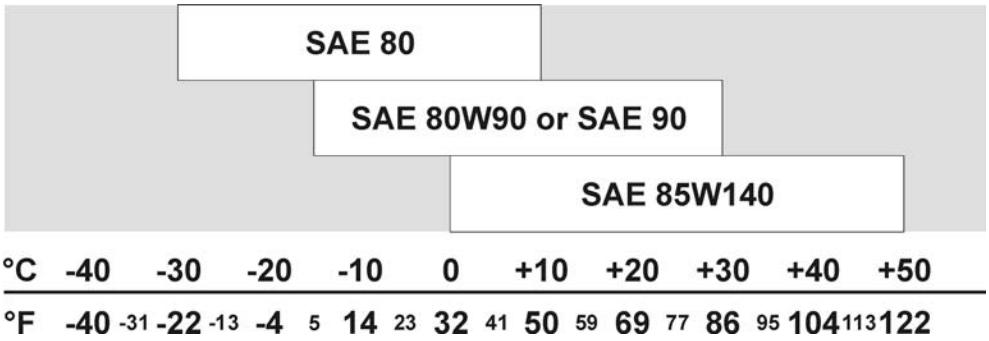

Fig. 5-12 *Engine oils for use as swing and travel gear oils*

5.4.5 Splitterbox oil

Use gear oil with viscosity classification SAE 90 or SAE 80W90 and meeting specifications API-GL-5 and MIL-L-2105 B, C or D.

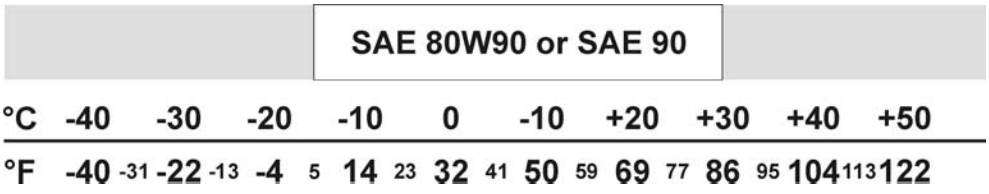

Fig. 5-13 *Engine oils for use as splitterbox oil*

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5.4.6 Lubricating grease and other lubricants

Lubricant	Description / manufacturer
Lubricating grease for the swing ring / general oiling points  **Between 0°C and -15°C (32°F and 5°F)** **Between -15°C and -40°C (5°F and -40°F)**	The grease must correspond with the specification **KP2k**, consistency 2 or NLGI grade in accordance with DIN 51818 and DIN 51825 or EP 2 in accordance with NF-T-60 132. The grease must consist of a lithium complex and have a four ball tester value of at least 2300 N in accordance with DIN 51350 and ASTM D 2596. Use a grease with consistency classification 1 NL GI or EP1 grease. Only employ synthetic greases. We recommand the grease Mobilith SHC 460 or Mobilith SHC PM. LIEBHERR part N° : 8502769 for a 50 kg (110 lbs) container, or 8503731 for a 180 kg (400 lbs) container.
Grease for swing ring teeth 	This grease must comply with following recommendations : ▶ be of consistency classification 2 in NL-GI viscosity per DIN 51818, ▶ have a VKA value of a least 5500N per DIN 51350 or ASTM D 2596, ▶ show a water resistance of 1-90 per DIN 51807. LIEBHERR recommends the use of : Grease MOBILTAC 81, Liebherr order n° : 8503629 for a 50 kg (110 lbs.) barrel
Contact spray for slip rings	Cramolin
Lubricant for pistons, piston nuts and piston bearing installations on the hydraulic cylinders	Gleitmo 800
Special anti-corrosive material for installation areas of sealingelements on hydraulic cylinders	Castrol-Tarp
Anti-corrosion grease for open piston rods (cylinders that do not move often or transportation)	Liebherr special grease CTK

Tab. 5-6 *Lubricating grease and other lubricants*

Coolant

See the Operation and Maintenance Manual for CUMMINS engine.

5.5 Diesel engine

Refer to the CUMMINS Operation and Maintenance Manual for detailed description of maintenance work to be performed.

In addition, accurately observe the following items and perform all maintenance work according to the intervals given in the maintenance schedule.

5.5.1 Checking the oil level in the diesel engine

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

▶ Avoid contact with hot oil and components containing oil, since it could cause severe burns.

❑ The machine must be standing level.

▶ Switch off the engine.

▶ Wait for a few minutes for the oil to collect in the oil pan.

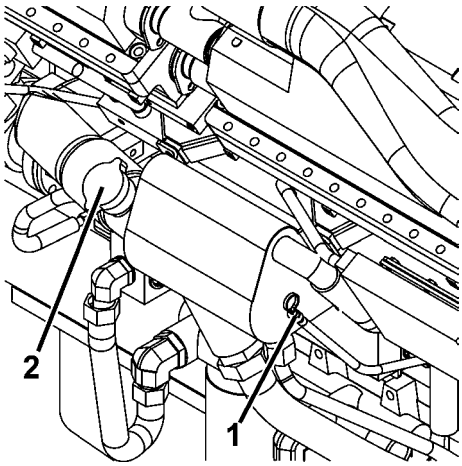

Fig. 5-14 *Oil level markings on the dipstick*

▶ Check the oil level in the engine.
↳ The oil must be between the **min** and **max** marks on the dipstick 1.

5.5.2 Changing the diesel engine oil

Note!

▶ Only carry out the oil change when the engine is warm.

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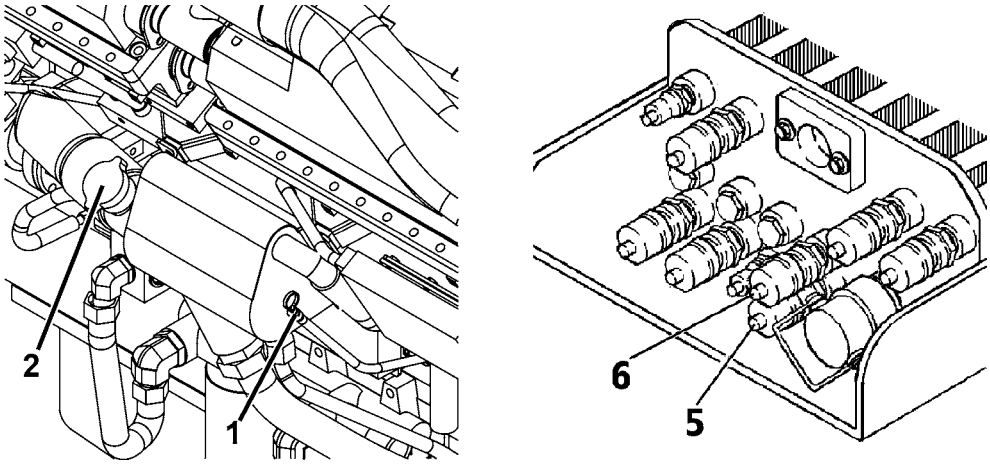

Fig. 5-15 *Filler neck and service trap*

To drain the oil :

- ▶ Drain the engine oil sump.
- ▶ Bring the engine to operating temperature.
- ▶ Drain the oil via the quick change coupling in the service center (pos. 6).
- ▶ As a help way, the oil can also be drained via the drain valve on the oil pan of the Diesel engine.
- ▶ To do so, remove the cap of the drain valve, attach the drain hose (supplied in the toolbox) to the drain valve and drain the oil into a suitable container.
- ▶ Remove the hose, reinstall the cap on the drain valve and add oil via the filler neck 2.

To change the oil filter elements :

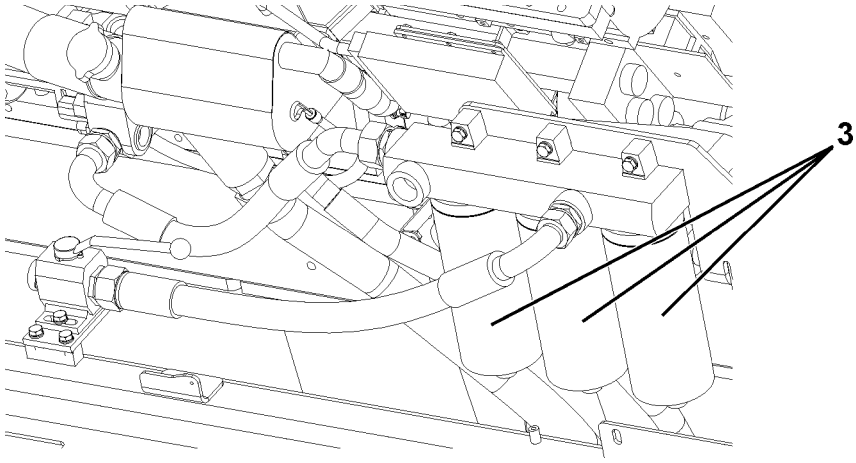

Fig. 5-16 *Oil filter elements*

- ▶ Unscrew and remove the 3 filter elements, pos. 3.
- ▶ Each filter element is a combination oil filter comprising a full flow element and a by-pass element

Danger!
Risk of burning.

- ▶ When removing the engine oil filters, be careful to avoid contact with hot oil, it could cause severe burns.

- ▶ Clean the sealing surfaces on the filter mounts.
- ▶ Lightly lubricate the rubber seal on the new filters with oil.
- ▶ Install and tighten the filters with both hands (see also enclosed CUMMINS engine operation and maintenance manual).
- ▶ Check after every oil change or after adding oil to ensure that the oil level has reached the upper mark on dipstick 1.

5.5.3 Refill the engine oil sump

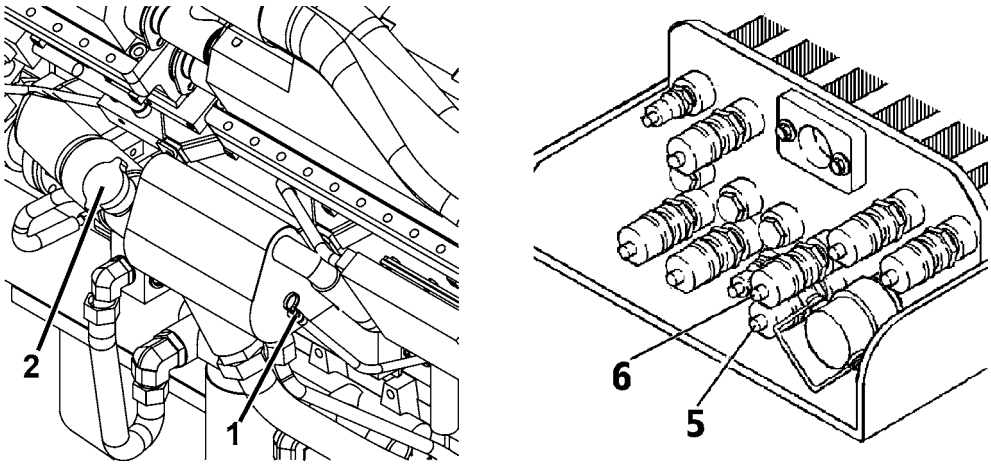

Fig. 5-17 *Filler neck and service trap*

Refill via the quick change coupling 6,

- ▶ Until the max. mark is reached on dipstick 1.
- ▶ A small amount of oil can also be refilled via the filler neck 2, or via the Centinel valve if the excavator is equipped with Centinel system.
- ▶ For oil quantities, oil specifications and oil change intervals, see lubrication and maintenance charts.

Note!
To extend the oil change interval, it is advised to use the chart method of CUMMINS.

5.5.4 Engine and splitterbox mounting screws

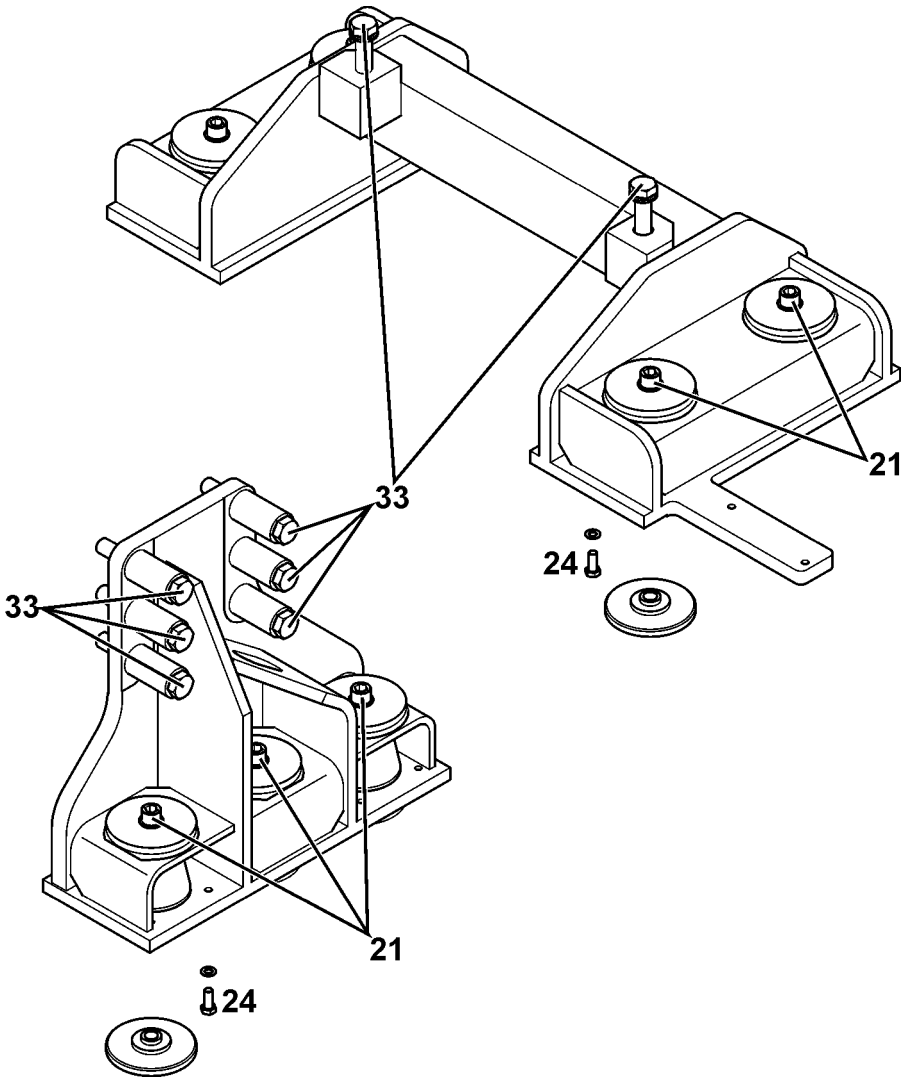

Fig. 5-18 *Engine and splitterbox screws*

Check the mounting screws **2** on the engine brackets and the engine gear mounts regularly for tightness, retorque if necessary.

Tightening torque for screws **21** : 280 Nm (207 ft. lbs.)

Tightening torque for screws **24** : 68 Nm (50 ft. lbs.)

Tightening torque for screws **33** : 560 Nm (413 ft. lbs.)

Caution!
The screws **21** of the rubber mounts must never be tightened as long as the engine and the splitterbox are not firmly fixed together, or if the mounts are pretensioned by any force but the weight of the engine and splitterbox.

Any improper fastening would greatly reduce the expected life of the rubber mounts.

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5.5.5 Splitterbox mounting screws

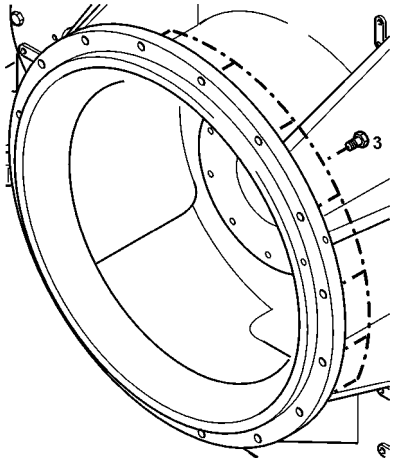

Fig. 5-19 *Splitterbox mounting screws*

Check the tightness of mounting screws **3** from the splitterbox to the Diesel engine SAE housing regularly. Retorque if necessary.

Tightening torque for screws **3** : 117 Nm (87 ft. lbs.)

5.5.6 Elastic bedding of engine and splitterbox - replacement of rubber buffers

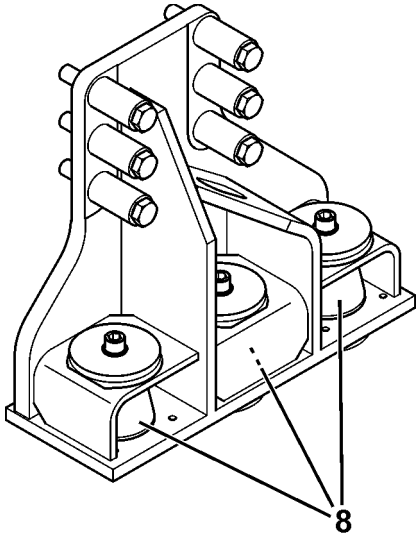

Fig. 5-20 *Rubber buffers*

The four rubber cushions **8** at the front face of engine and the six rubber cushions **8** at the splitterbox side must be checked and replaced at regular intervals.

For maintenance intervals, see maintenance schedule.

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5.5.7 Belt for the 24 V alternator of the Diesel engine

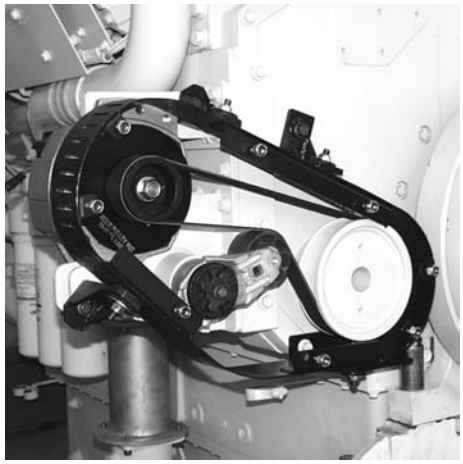

Fig. 5-21 *Belt*

Please refers to the enclosed CUMMINS Operation and Maintenance Manual.

5.6 Cooling system

5.6.1 Checking and cleaning the cooling system

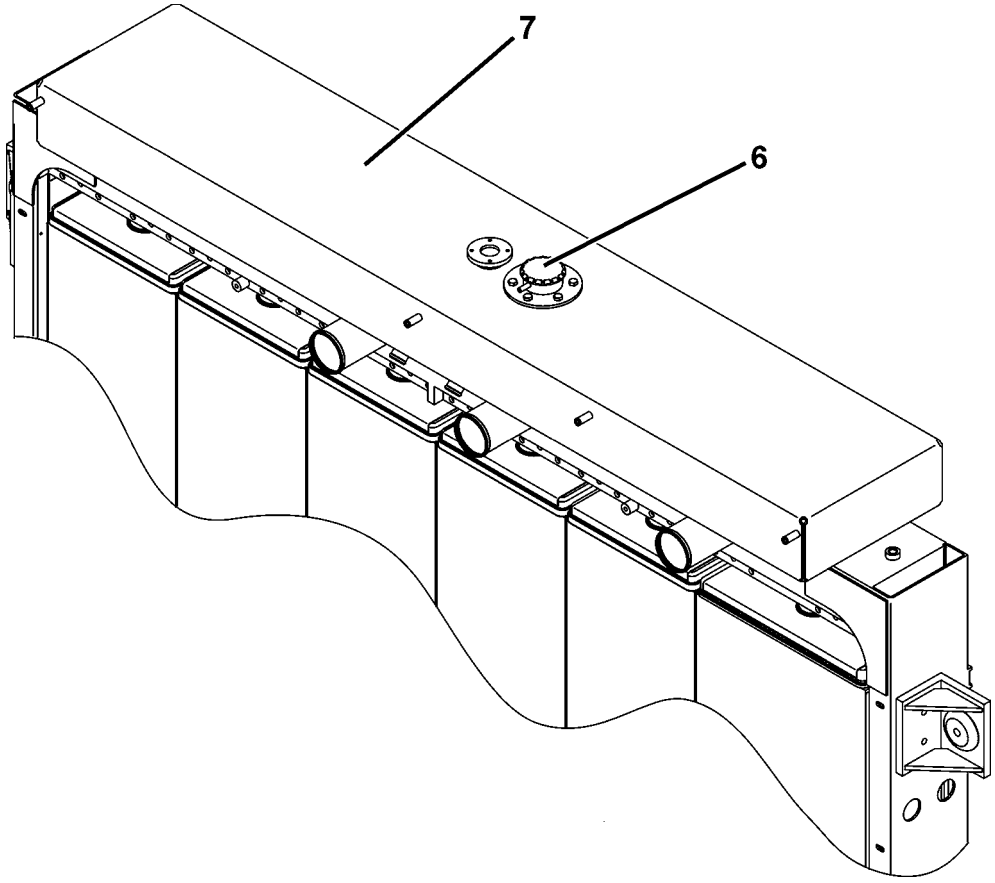

Fig. 5-22 *expansion tank*

Optimal cooling can only be achieved when the cooler is kept clean.

- ▶ Clean the radiator with pressurised air or a stream cleaner, if necessary.
- ▶ If the safety valve of the cooling system in the radiator cap 6 of the expansion tank 7 is leaking, replace the cap.
- ▶ Regularly check the connector hoses between the radiator and the engine, as well as the heater hoses for condition and leaks.
- ▶ Check the tightness of hose clamps.

5.6.2 Checking the coolant level

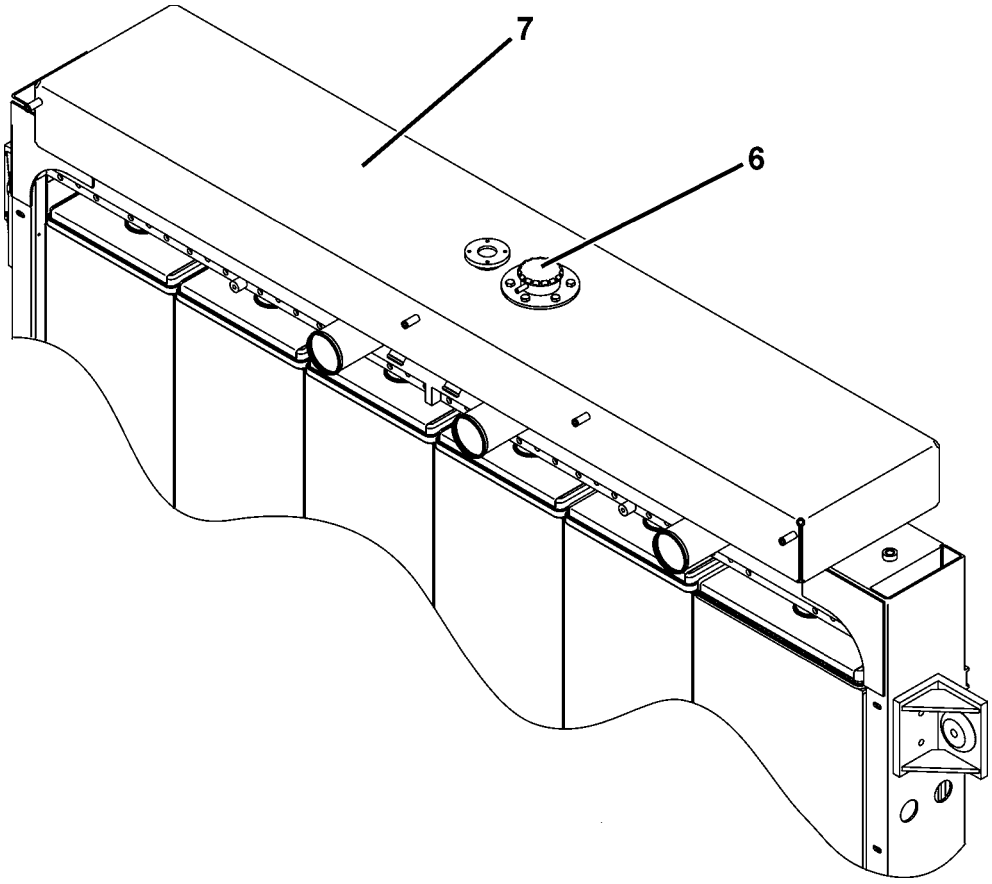

Fig. 5-23 *expansion tank*

Danger!
At near operating temperature, the engine coolant is hot and under pressure.

- ▶ Avoid contact with components containing coolant, since it could cause severe burns.
- ▶ Check coolant level only when the radiator is cool enough to touch.
- ▶ Turn the cap 6 slowly to release pressure.

Check the coolant level when the engine coolant is cold.

- ▶ When cold, the coolant level should not drop below the bottom end of the filler neck under the cap 6 of the expansion tank 7.

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5.6.3 Coolant antifreeze and anti-corrosion fluid

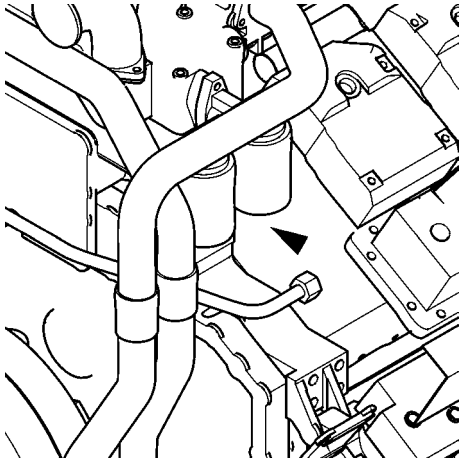

Fig. 5-24 *Coolant filters*

The system must be filled with antifreeze all year round.

Upon dispatch, the coolant contains antifreeze for temperatures up to -35 °C (this is equal to approx. 50 % antifreeze).

Volume: see lubricant chart

The coolant filters installed on the engine contain a corrosion protector.

- ▶ Regularly check the corrosion protection concentration in the coolant circuit.
- ▶ If necessary, corrosion protective additives must be added to the coolant, see Cummins Operation and Maintenance Manual.

5.6.4 Changing the coolant

Danger!
Risk of burning due to hot coolant.

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

Fig. 5-25 *Coolant filters*

The filters contain a paste-like corrosion protection additive, which ensures the proper corrosion protection properties of the coolant.

The filters must be replaced every 250 operating hours

- ▶ Turn the shut off valve on the filter head to the OFF position,
- ▶ Unscrew and remove the filter elements,
- ▶ Lightly oil the seal rings on the new filter element,
- ▶ Screw on the new elements until the seal ring touches the filter housing, and then turn it by hand 1/2 - 3/4 turns (do not use any tools to tighten the filters!)
- ▶ Turn the shutoff valve to the ON position.

For detailed information, refer to the CUMMINS engine operation and maintenance manual.

5.6.4.1 Draining the coolant

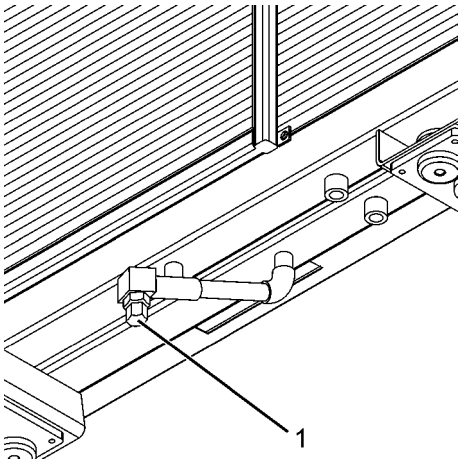

Fig. 5-26 *Draining the coolant*

For coolant change interval, see CUMMINS Operation and Maintenance Manual.

To drain the coolant

The drain plug is located under the radiator (pos. 1).

For the procedure to drain and refill the engine cooling system refer to the CUMMINS engine operation and maintenance manual.

Important!
When refilling the system, make sure that the coolant level should not drop below the bottom end of the filler neck under the cap 6 of the expansion tank 7.

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5.7 Fuel system

Danger!
Risk of explosion!

- ▶ Avoid naked flame when working on the fuel system and when refuelling.
- ▶ Do not smoke.

5.7.1 Refuelling

5.7.1.1 Fuel filler cap

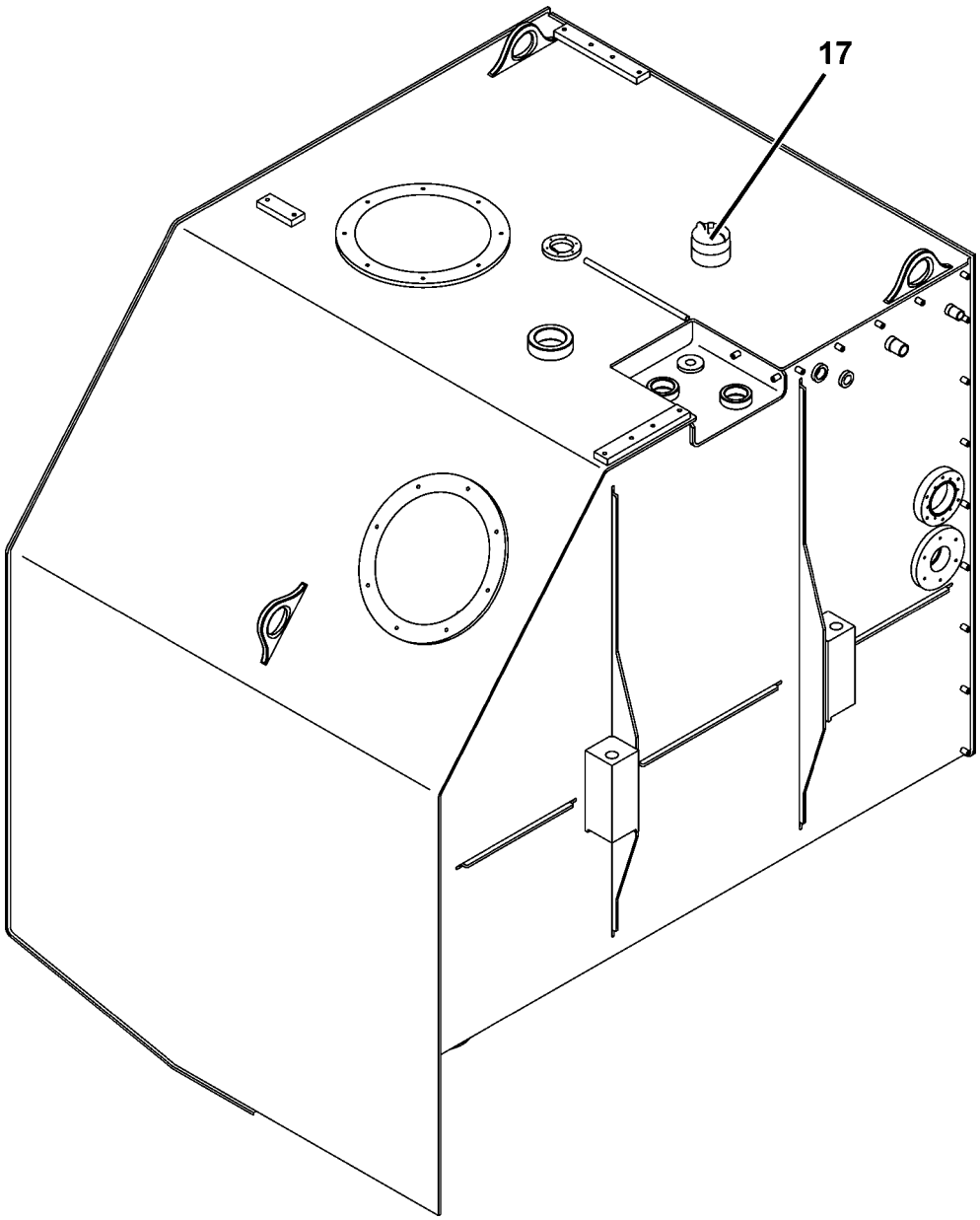

Fig. 5-27 *Fuel filler cap*

- ▶ Unscrew fuel filler cap **17**
- ▶ Add fuel via the filler sieve.

5.7.1.2 Service trap

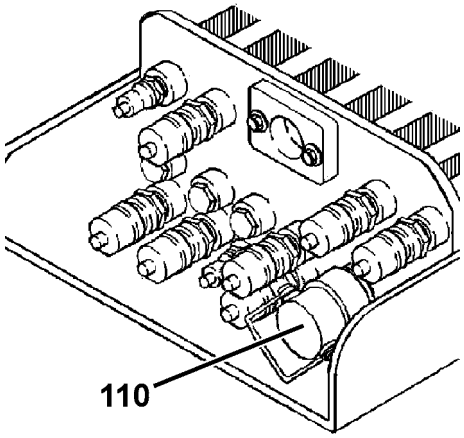

Fig. 5-28 *Service trap*

- ▶ Add fuel via the service trap (pos. 110).

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5.7.2 Draining the fuel tank

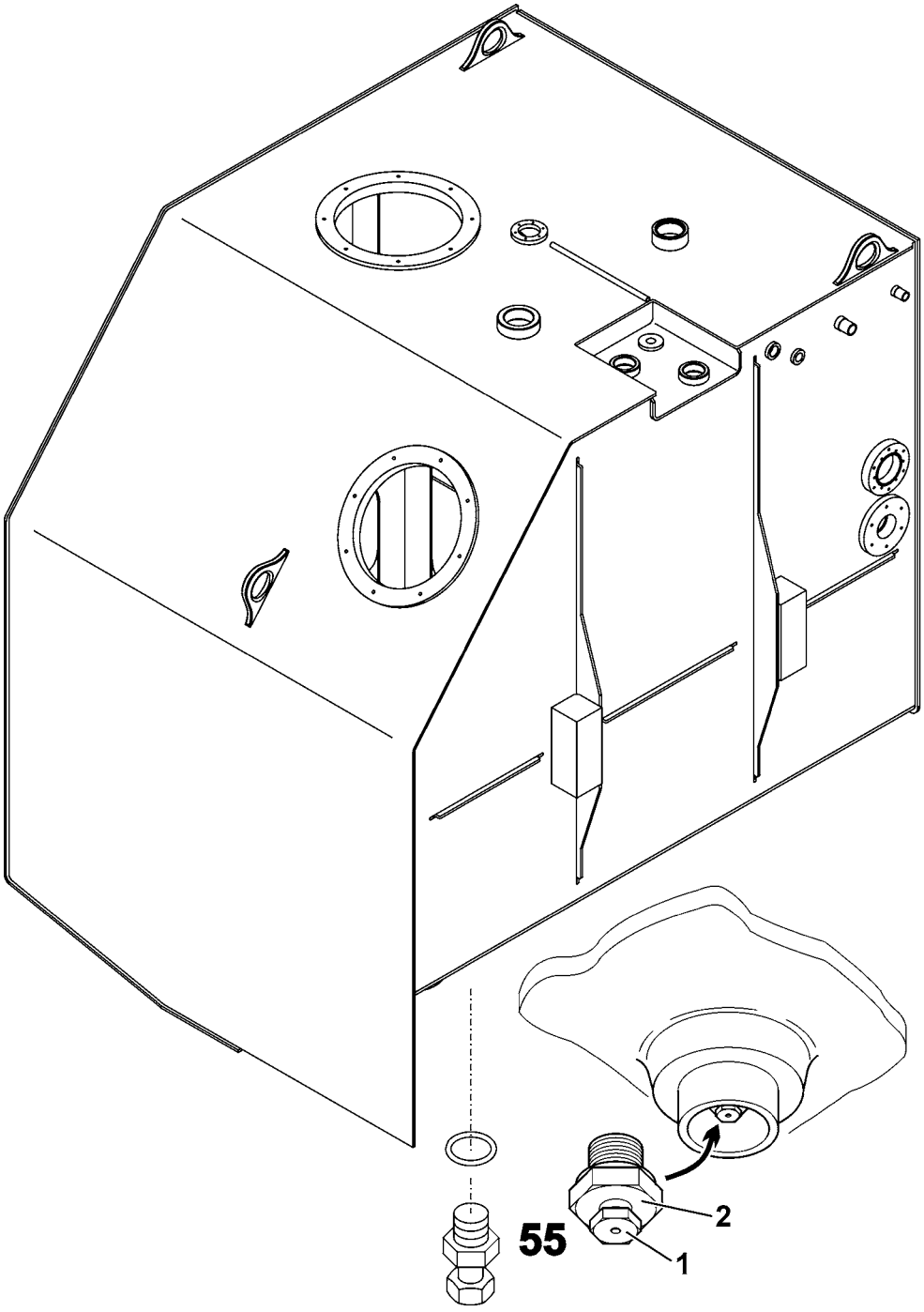


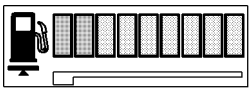
Fig. 5-29 *Draining the fuel tank*

To drain the fuel tank and the fuel system daily:

- ▶ Place a suitable container underneath.
- ▶ Turn the drain plug **1** on the drain valve **55** found on the underside of the fuel tank, on the valve by two turns counterclockwise.
- ▶ Drain off the water until clean fuel starts to come out.
- ▶ Screw drain plug **1** 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.

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5.7.3 Emptying and cleaning the fuel tank

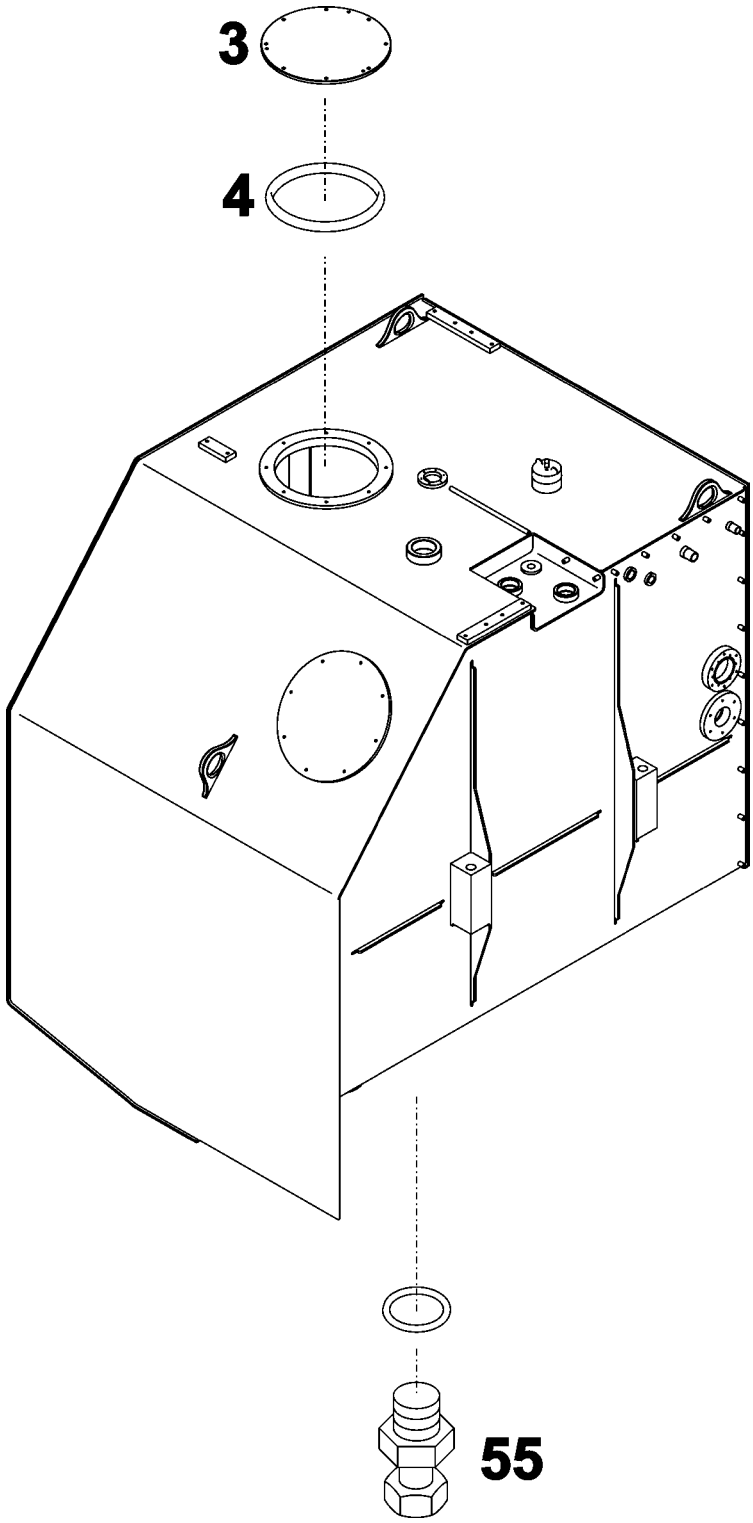

Fig. 5-30 *Fuel tank*

The tank floor is fitted with a drain valve **55**.

- ▶ Place a suitable container underneath.
- ▶ To drain off the water, unscrew the drain plug **1** on the drain valve **28** by two turns until fuel which contains no water comes out.
- ▶ Retighten the plug.

- To empty, remove the cover **3** and the drain valve **55** and collect the fuel in a suitable container.
- Check the fuel tank.
- Wash out the fuel tank.

5.7.4 Draining and changing fuel filter cartridges

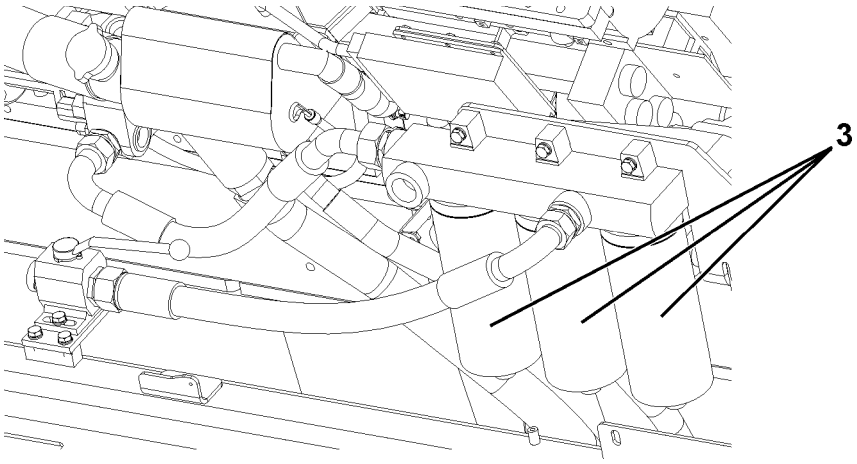

Fig. 5-31 *Fuel filter cartridges*

- Unscrew and remove the 3 filter elements (pos. 3).
- Each filter element is a combination fuel filter comprising a full flow element and a by-pass element.
- Clean the sealing surfaces on the filter mounts.
- Lightly lubricate the rubber seal on the new filters with oil.
- Install and tighten the filters with both hands (see also enclosed CUMMINS engine operation and maintenance manual).

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5.7.5 The air pressure system

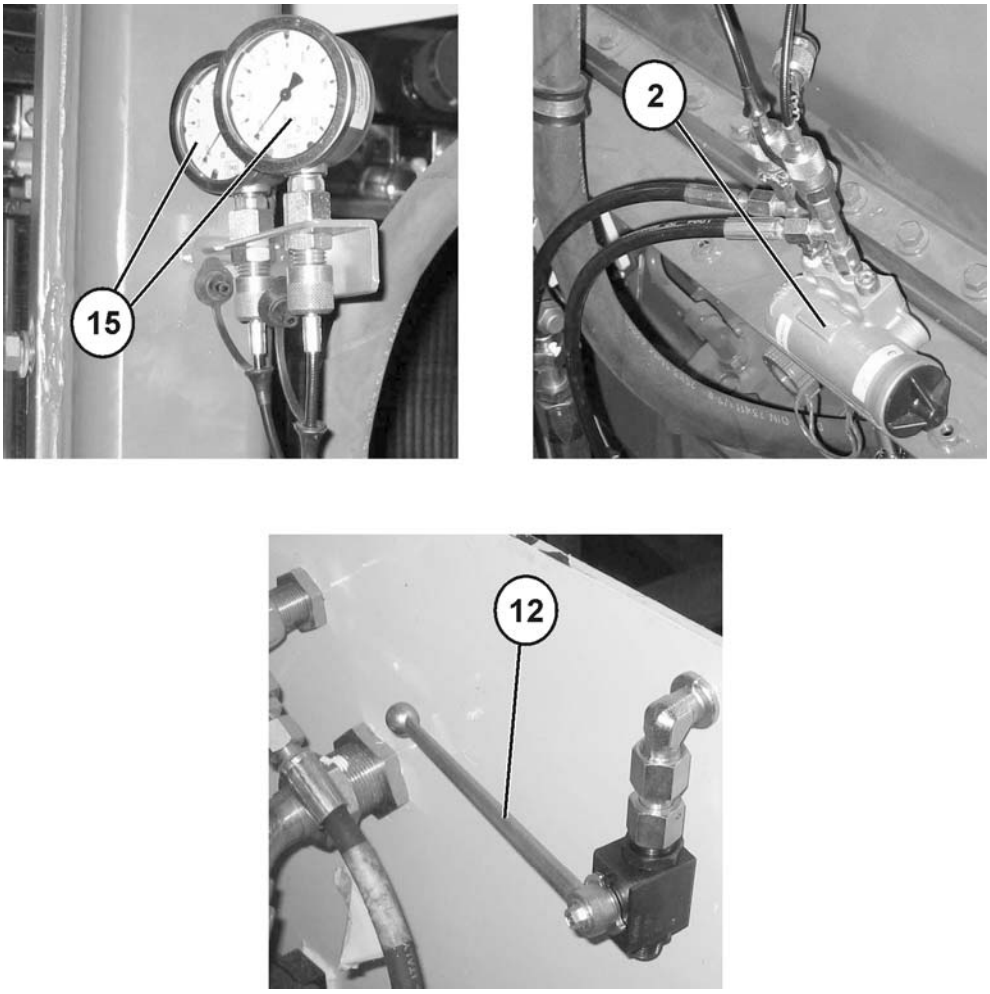


Fig. 5-32 *Air pressure system*

During operation, the pressure on both pressure gauges **15** must be between 6,2 and 7,25 bar.

5.7.5.1 Pressure regulator and compressor

Check if you can hear the pressure regulator **2** at regular intervals click the compressor on and off.

To check, proceed as follows :

- ▶ Run the Diesel engine at low idle,
- ▶ Slowly open the drain valve **12** until the air pressure drops to approx. 6,2 bar.
- ▶ The pressure regulator **2** must now shift the compressor into the working cycle.
- ▶ Continue to run the engine at low idle. When the pressure reaches 7,25 bar, the regulator shifts the compressor to the neutral cycle.

Adjust the pressure regulator if necessary until both, pressures are correct.

For maintenance intervals, refer to the maintenance schedule and to the CUMMINS Operation and Maintenance Manual.

5.7.5.2 The air dryer

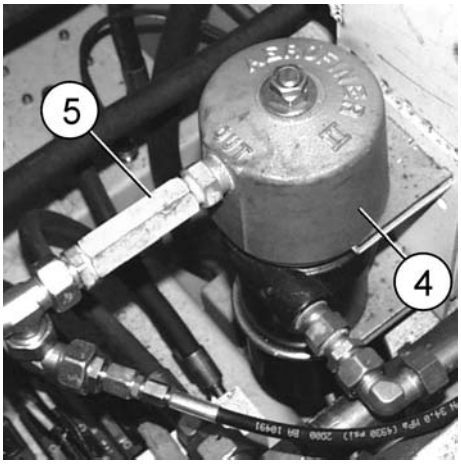
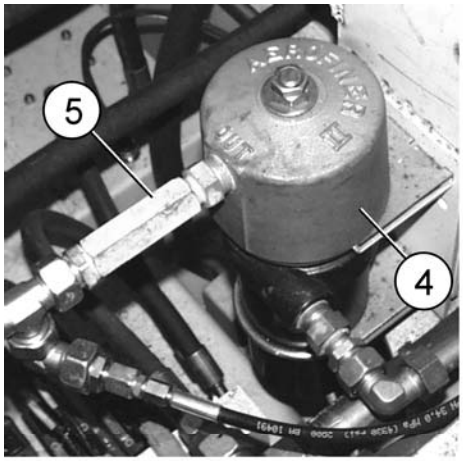


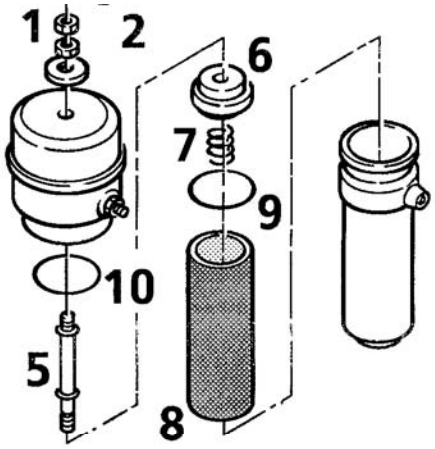
Fig. 5-33 *The air dryer*

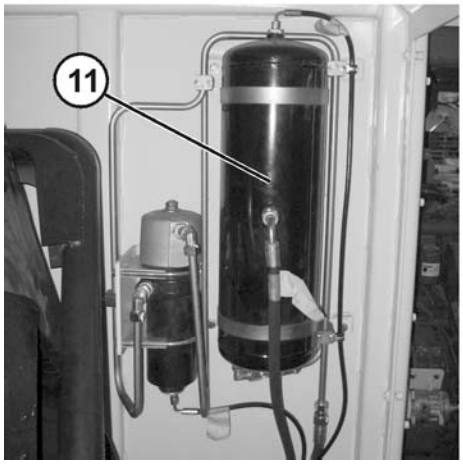
The air dryer **4** in the air pressure circuit dries and filters the pressurised air.

The air filter element must be replaced at intervals specified in the maintenance schedule.

To replace the air cleaner element







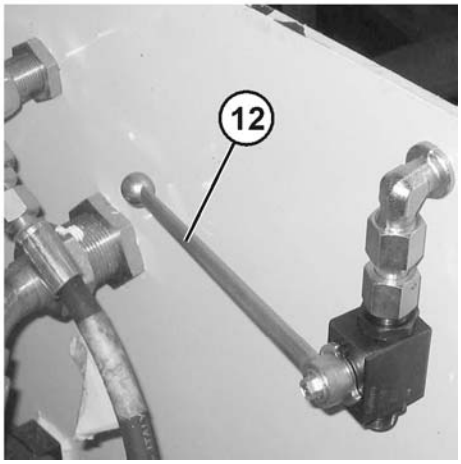


Fig. 5-34 *The air cleaner element*

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- ▶ Relieve the pressure in the air system via the drain valve **12**.
- ▶ Disconnect the air pressure line on the outlet to the air tank **5**.
- ▶ Remove nuts **1** and cover **2**.
- ▶ Unscrew the threaded rod **5**.
- ▶ Remove the centering piece **6** and spring **7**.
- ▶ Slowly pull out the air cleaner cartridge **8**; turn the cartridge back and forth if necessary.
- ▶ Lubricate the o-rings **9** and **10** with oil.
- ▶ Push in the new air filter cartridge, using a turning motion and make sure that the o-ring **9** on the upper end of the cartridge is inserted into the filter housing.
- ▶ Reinstall spring **7**, the centering piece **6**, o-ring **10**, cover 2 and tighten nuts **1**.

5.7.5.3 To drain the air tank

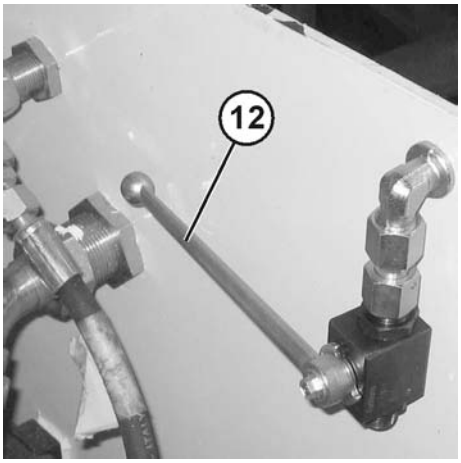

Fig. 5-35 *Drain valve*

We still recommend to drain condensation manually by opening the drain valve **12**, regularly as specified in maintenance schedule.

5.8 Dry air filter

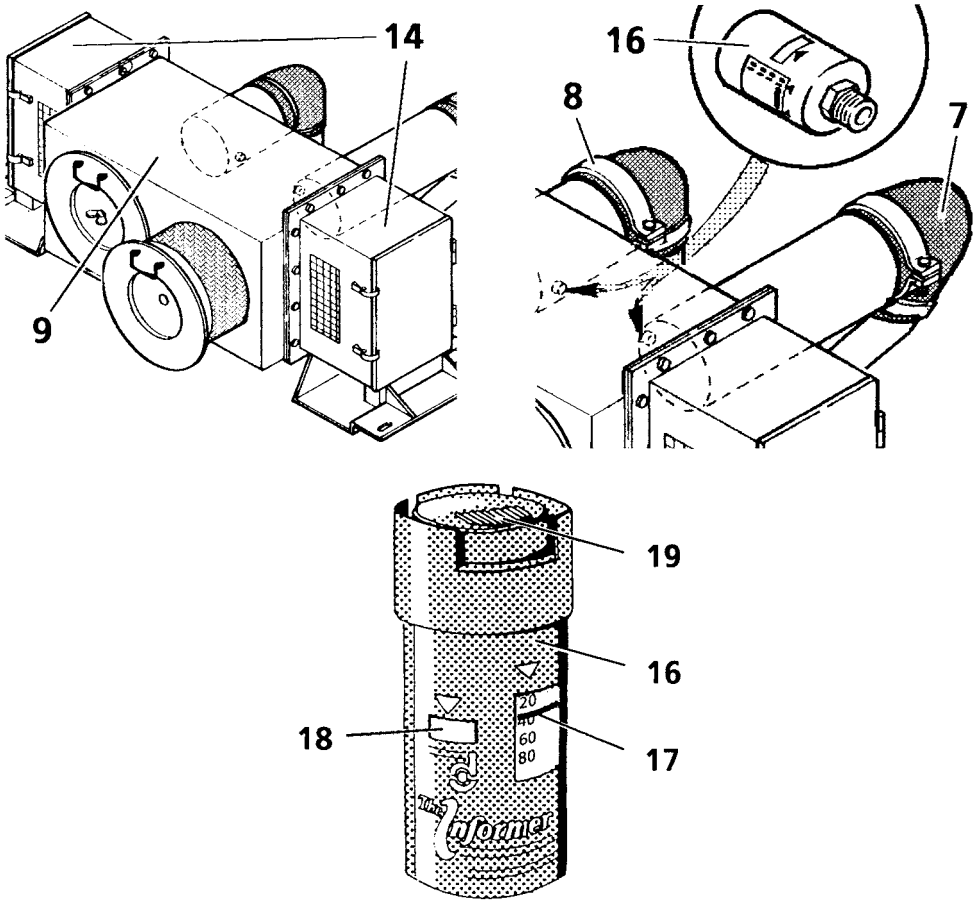

Fig. 5-36 *Air intake system*

Maximum engine protection against premature wear due to dust is only possible if the air intake system and filters are checked and serviced at regular intervals.

The air cleaner with multi cyclone precleaner 14 and fine filter 9 with primary and safety element are designed to give maximum protection at long maintenance intervals.

Maintenance also includes replacing the filter elements.

For safety reasons, we do not recommend to clean the filter elements.

The vacuum indicator (pos. 16) stores the maximum recorded vacuum pressure on the filter outlet, during the diesel engine operation.

When the red stripe (pos. 17) appears in the window 18, the maximum permissible vacuum of 50 mbar has been reached.

At that time, the corresponding primary filter element must be replaced.

To reset the vacuum indicator, press the "Reset" button 19.

We recommend to change the primary filter elements 3 only, when the maximum vacuum pressure has been reached, or at intervals specified in maintenance schedule.

If the elements 3 are removed and installed too often, the seals between the filter elements and the filter housing may be damaged.

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The safety elements 6 should be replaced after the primary elements have been changed three times, or at intervals specified in maintenance schedule.

Before installing a new element, carefully clean the seal and the sealing surface of the filter housing.

The dust in the cyclone precleaner 14 is constantly drawn in by the exhaust system and discharged.

5.8.1 To change the primary filter element

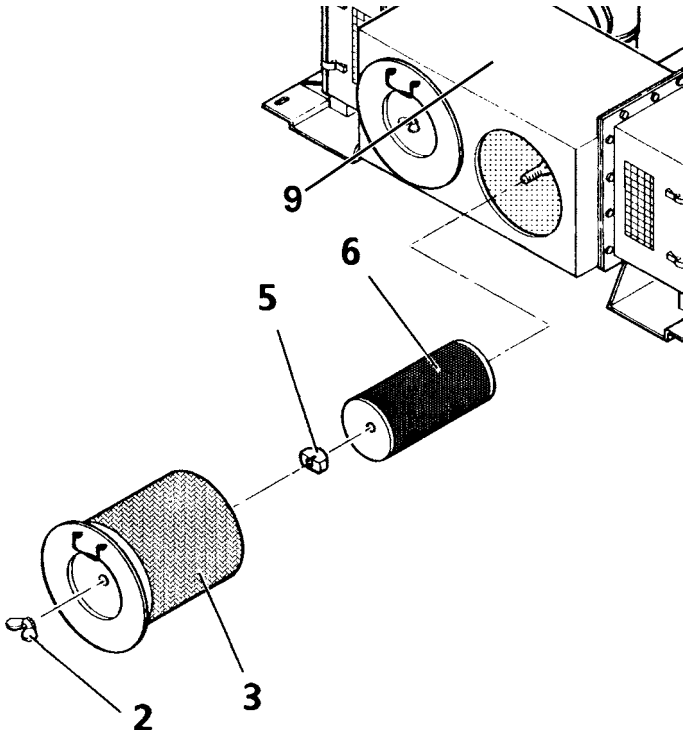

Fig. 5-37 *Primary filter element*

- ▶ Turn the engine off.
- ▶ Remove nuts 2.
- ▶ Remove the dirty primary filter elements 3.
- ▶ Clean the inside of the air filter housing 9.
- ▶ Wipe off the sealing surface in the filter housing with a damp rag.
- ▶ Do not blow out the housing with pressurised air.
- ▶ Insert the new primary filter elements.
- ▶ Make sure they are seated correctly.
- ▶ Tighten nuts 2.

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5.8.2 Changing the safety element

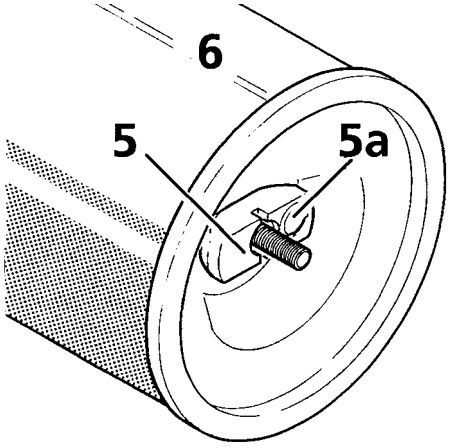

Fig. 5-38 *Safety element*

The safety elements 6 are installed with a special wing nut with built in maintenance indicator (pos. 5).

- ▶ Check the wing nut for tightness.
- ▶ However, if a visual inspection shows that the green dot 5a on the wing nut has turned red, the safety elements should be replaced immediately.

Note!
We recommend that the safety elements are replaced by a qualified maintenance or LIEBHERR service technician.

To remove the safety elements, proceed as follows :

- ▶ Remove the primary elements 3 as outlined before.
- ▶ Remove the special wing nut and take out the safety element 6.
- ▶ Carefully clean the inside of the air filter housing 9 with a damp rag.
- ▶ Clean the sealing surfaces in the housing and check for damage.
- ▶ Carefully insert the new safety elements and secure with the special wing nuts.
- ▶ install the primary filter element 3, as outlined before.

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5.8.3 To clean the air channels for the precleaner

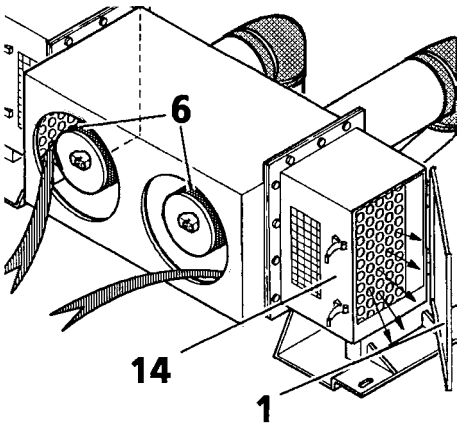


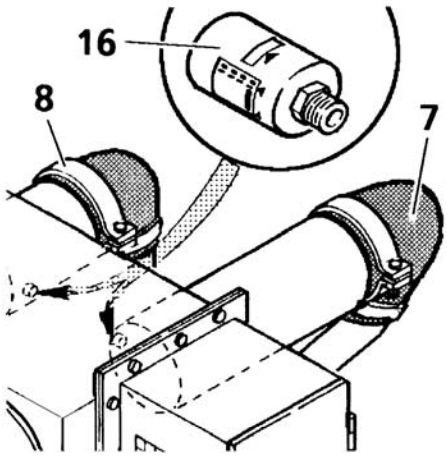
Fig. 5-39 *Air channels for the precleaner*

Check the condition of the air channels in the precleaner 14 at the intervals specified in the maintenance schedule.

- ▶ Open the filter cover 1 and check the channels.
- ▶ If the channels are plugged with dust, use compressed air to blow the channels out from the inside of the filter towards the outside.

Caution!
Do not use steam.
The safety elements 6 must remain in place.
Do not direct the air flow towards the filter elements.

5.8.4 Check the air intake system, hoses, elbows, clamps



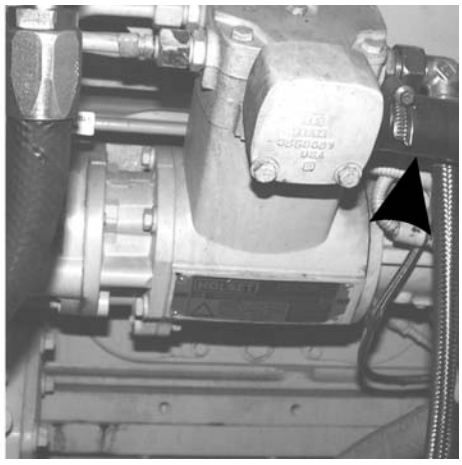


Fig. 5-40 *Rubber hoses*

The rubber hoses and elbows between filter housing end engine (pos. 7) must be checked for damage, wear, tightness and leaks whenever the filter elements are replaced.

- ▶ If necessary, retighten the screws on the clamps 8.

The connection to the air intake side of the air compressor must also be checked for leaks.

▶ If necessary, include the visual inspection of the air intake system in the daily maintenance.

5.9 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 filter
– for changing hydraulic tank air filter
– for cleaning the oil cooler
– for changing the oil must be adhered to.

5.9.1 Preparatory activities

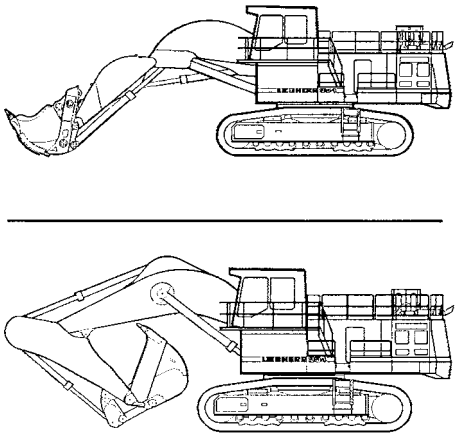


Fig. 5-41 *Machine position for checking the oil level or for adding oil*

When checking the oil level or adding oil :

– Park the machine on level ground.
– Rest the attachment on the ground, with stick and tilt cylinders fully extended, and bucket closed.
– Turn the engine off.

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5.9.2 Checking the oil level in the hydraulic tank

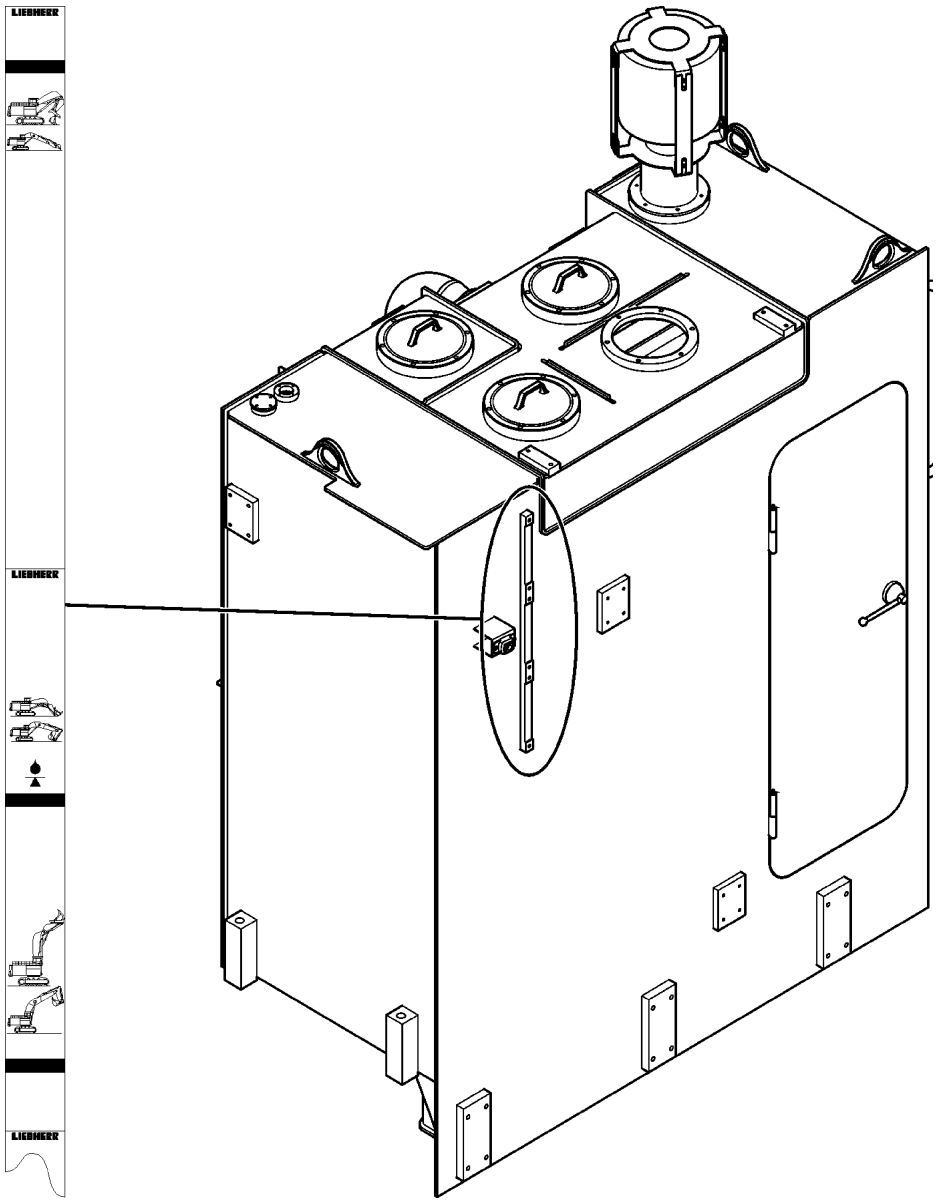

Fig. 5-42 Hydraulic tank oil level

When the machine is in the check position, the level must not lie below the central marking on the inspection window.

▶ If this is not the case, add oil via the service plate coupling or a return filter until the level reaches the center mark.

The upper marking **MAXI** shows the maximum oil level if all cylinders are fully drawn in.

The lower marking **MINI** shows the minimum oil level if all cylinders are fully extended.

If the oil level drops below the lower marking **MINI**, the symbol appears on screen when the lowest quantity is reached.

5.9.3 Depressurising the hydraulic system

Danger!
A fine stream of liquid can penetrate the skin when under high pressure and cause serious injury.

▶ Do not inspect leaks with bare hands.

Note the following points:

❑ The machine must be in the position described above.

▶ Switch off the engine.

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

▶ The hydraulic tank is depressurised automatically thank to the air filter.

Danger!
The hydraulic oil is hot when at operating temperature.

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

5.9.4 Emptying and refilling the hydraulic tank

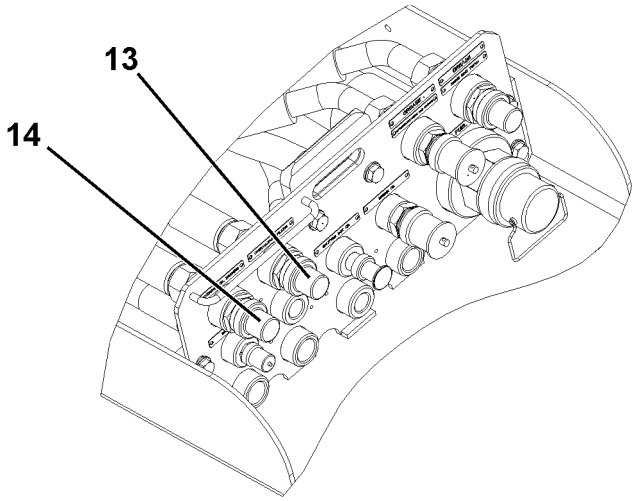

Fig. 5-43 *Front plate*

▶ We recommend to add and to drain the hydraulic oil to the tank only via the coupling **13** and **14** in the service center.

To drain the oil:

▶ Use the coupling **14**.

To refill the hydraulic oil:

▶ Use the coupling **13**.

Caution!

▶ After each hydraulic oil change, vent the hydraulic pumps.

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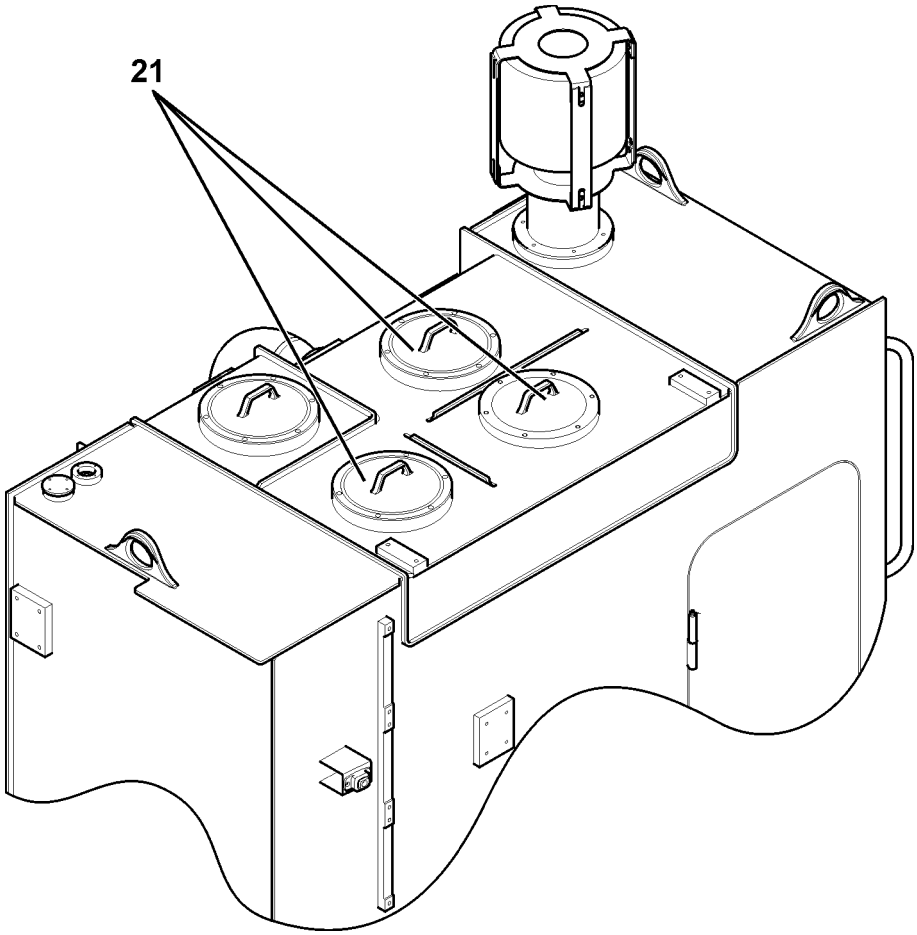

Fig. 5-44 *Covers of the return filter*

As a help way, or for small quantities oil can also be added via the cover **21** of the return filter :

- ▶ Remove one of the covers **21** of the return filters.
- ▶ Add oil via the return filter until the level is exactly at the center mark of the sight gauge.
- ▶ Reinstall the cover **21**.

5.9.5 Return-line filters and air filter

The return-line filters and the air filter are located on the top of the hydraulic tank.

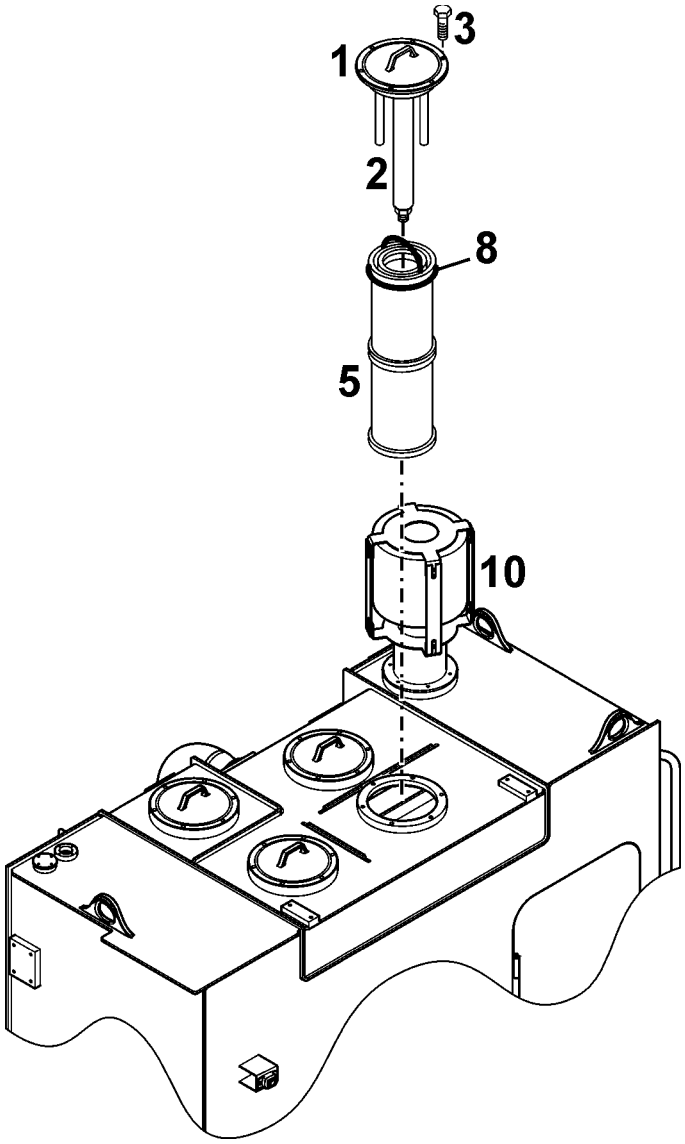

Fig. 5-45 *Return-line filter*

1	Cover	**5**	Filter insert
2	Magnetic rod	**8**	O-ring
3	Hexagon bolt	**10**	Air filter

The magnetic rods **2** of the return-line filter must be cleaned at fixed intervals (see maintenance chart) and the glass fibre filter insert **5** replaced.

To clean the magnetic plug and replace the filter element:

- ▶ Unscrew the screws on the filter cover and lift out cover **1** and magnetic rod **2**.
- ▶ Carefully clean off any dirt sticking to the magnetic rod.
- ▶ Remove the used filter cartridge **2** on the bracket.
- ▶ Insert the new filter cartridge on the bracket vertically into the tank and press down lightly. Then lay the clamp to the side on the tank ring.

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Caution!

▶ Ensure that the filter cartridge is standing vertical in the tank.

▶ Centre the cover unit on the filter insert **5** and position. When doing this, ensure that the sealing **8** is positioned correctly and is in good condition.

Note!
The filler aperture of the hydraulic tank is fitted with a return pipe. This prevents objects getting into the hydraulic tank. The protective cylinder can be removed from the filler aperture if required.

Note!

▶ Each time you replace the filter insert **5**, also replace the pressure filter cartridge that is integrated in the control oil unit.

5.9.6 Servo oil filter

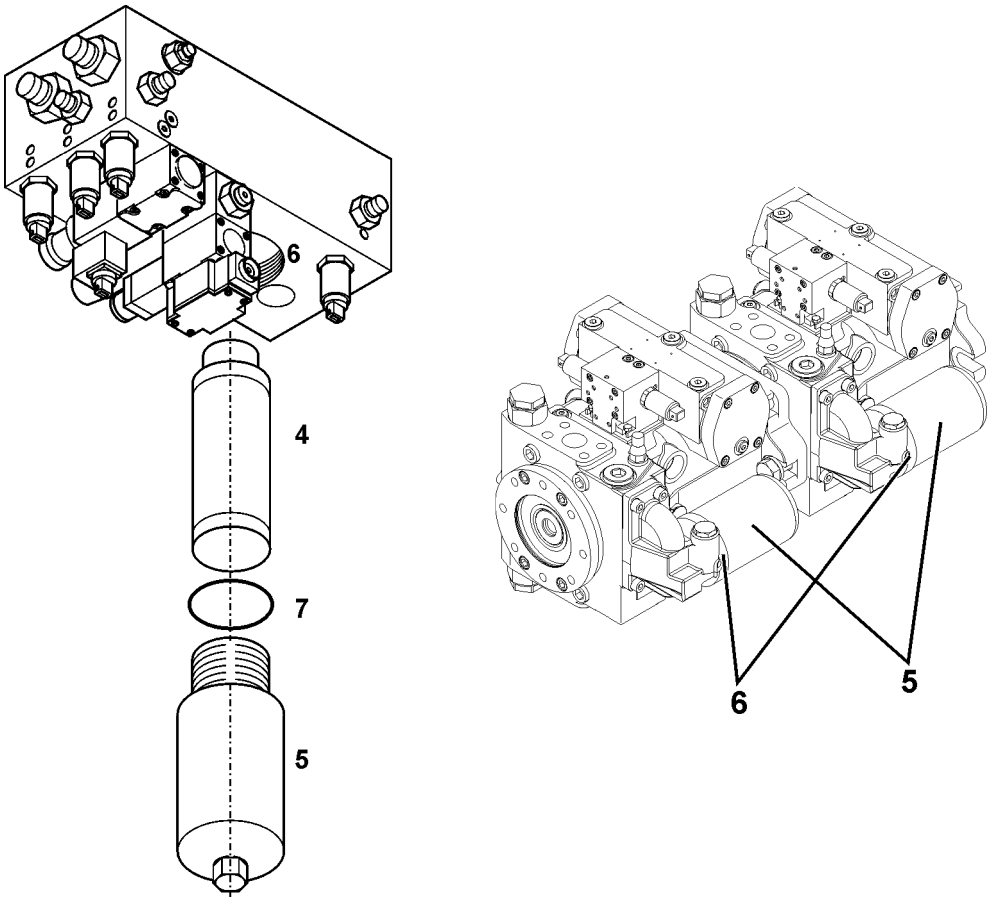

Fig. 5-46 *Control oil unit*

4	Filter element	**6**	Filter head
5	Filter housing	**7**	O-ring

Note!
It is not permitted to clean the filter element.

- Change the filter element each time you open the filter housing.

Three hydraulic filters ensure filtration of the auxiliary circuits :

- Two replenishing oil filter.
- One servo oil filter.

The two replenishing oil filters for the closed swing circuit are located on the swing pump.

The servo oil filter is installed on the frame above the hydraulic pumps.

For the filter change interval, see the maintenance schedule.

To replace the filter element :

- Remove the filter housing 5,
- Take out the filter element 4,
- Clean the filter head 6 and the filter housing 5.
- Insert a new filter element 4,
- Lightly lubricate the threads of the housing,
- Reinstall the filter housing,
- Making sure the O-ring 7 is positioned correctly,
- Tighten the filter housing by hand.

5.9.7 Control circuit

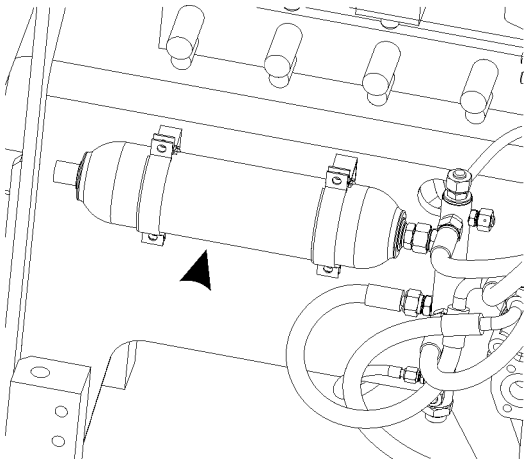

Fig. 5-47 *Accumulator*

The control oil circuit does not require any special maintenance.

- Inspect the pipe network and connections on all units (pressure accumulator, pressure limiting valve, pressure filter etc.) regularly for leaks.

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Danger!
Before working on the control circuit, the control pressure must be depressurized as follows:

- ▶ Lay the work equipment on the ground.
- ▶ Switch off the engine.
- ▶ Operate both joysticks (with ignition key in contact position).

5.9.8 Bleeding the main pumps

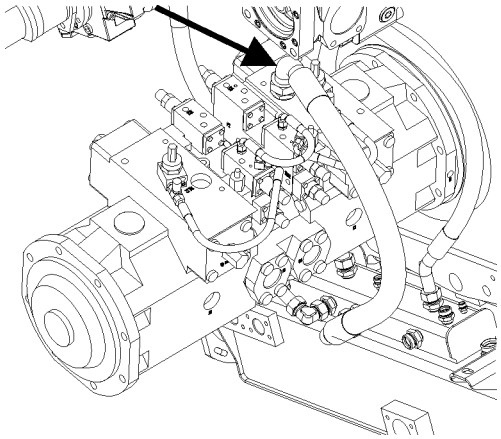

Fig. 5-48 *Working pump*

After working on the pump or after changing oil in the hydraulic system, the hydraulic pump must be bled.

- ▶ Unscrew the leakage oil hose slightly and allow the air to escape.
- ▶ As soon as hydraulic oil flows out densely, close the leakage oil hose again.

Before starting the pump for the first time after repairing or replacing the pump, the pump housing must be filled with hydraulic oil via the same connection.

5.9.9 Bleeding the swing pumps

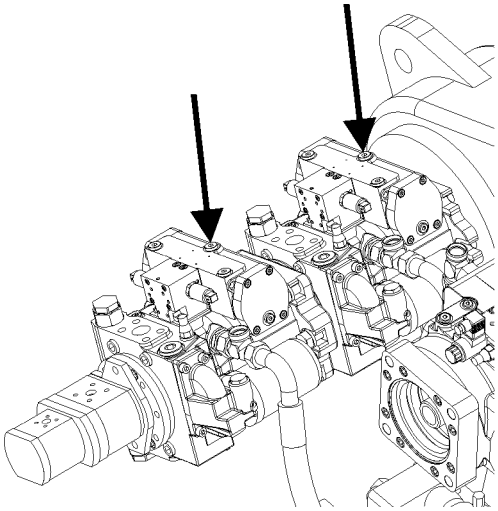

Fig. 5-49 *Swing pumps*

After working on the pump or after changing oil in the hydraulic system, the hydraulic pump must be bled.

- ▶ Unscrew the plugs slightly and allow the air to escape.
- ▶ As soon as hydraulic oil flows out densely, close the plugs again.

Before starting the pump for the first time after repairing or replacing the pump, the pump housing must be filled with hydraulic oil via the same hole.

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5.9.9.1 Unscrew the intake hoses to the pump

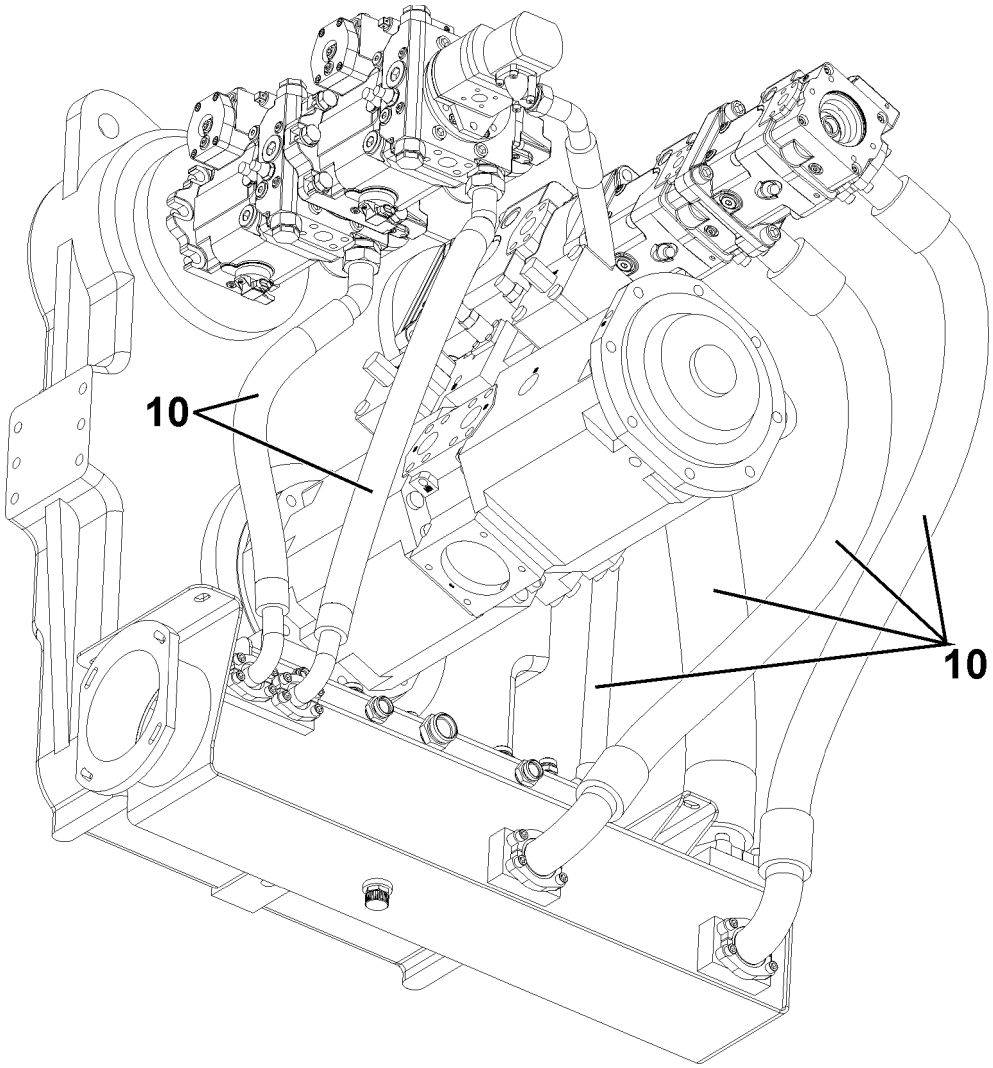

Fig. 5-50 *Pumps aspiration (intake hoses)*

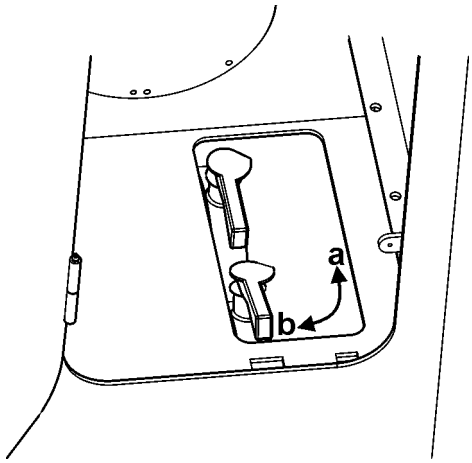

Fig. 5-51 Shut off valves

The shut off valves on the hydraulic tank to the intake hose has two positions:

– **a** open
– **b** closed

- ▶ If the intake hose **10** has to be unscrewed at the pump or at the hydraulic tank, close the shut off valves (position **b**) on the hydraulic tank.
- ▶ Unscrew the intake hoses **10** or one of the intake hoses **10**.
- ▶ Drain the hydraulic oil out of the pump and intake hose **10**.
- ▶ Once the repair work is completed, turn the shut off valves back to its starting position **a** and engage.

5.9.10 High pressure filters in working circuit

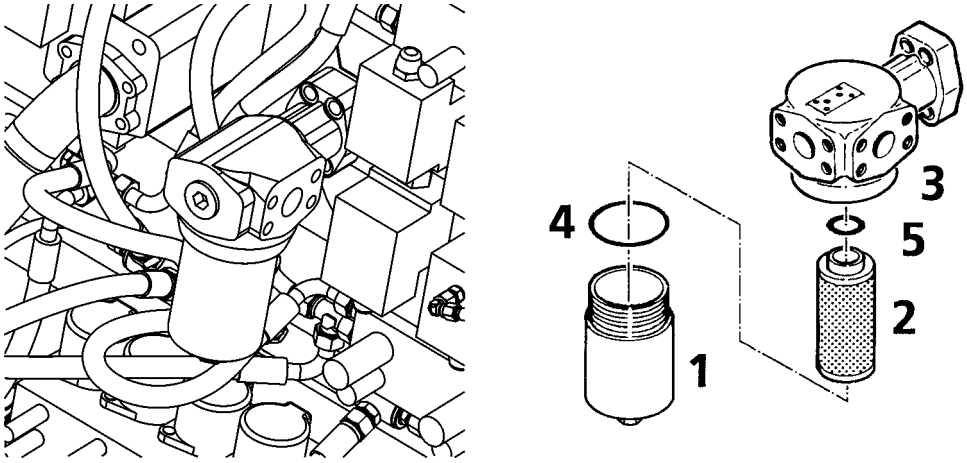

Fig. 5-52 *High pressure filter*

These filter are installed on the inlet port of the control valves.

To clean the filter element :

- ▶ Remove the filter housing **1**.
- ▶ Remove the filter element **2** and clean it with non flammable cleaning fluid, or replace it with a new element,
- ▶ Clean the filter housing **1** and the filter head and reinstall, making sure the o-rings **4** and **5** are seated properly.

Note!
Any time the filter element is cleaned or replaced, check for leaks.

- ▶ To check for leaks, start the engine, operate the machine for a short period, and check for leaks between the filter housing **1** and the filter head **3**.

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5.10 Servicing the hydraulic cylinder

5.10.0.1 Checking the condition of the piston rod mount

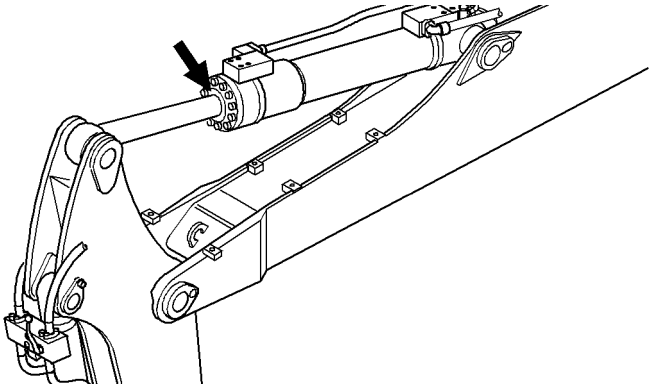

Fig. 5-53 *Piston rod mount*

Note
When a leak appears on the piston rod mount of a hydraulic cylinder (boom), the sealing kit must be replaced by a LIEBHERR dealer.

5.10.0.2 Protecting the piston rods

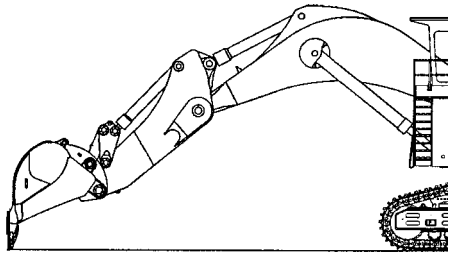

Fig. 5-54 *Machine with piston rods drawn in*

When the machine is out of service for more than 4 weeks and particularly for transportation by sea, the following measures must be taken:

- ▶ Position or transport the machine in such a way that the piston rods are fully drawn into the cylinders.
- ▶ Cover any loose piston rods with a thick layer of non-corrosive anti-corrosion fluid to all exposed sections of the piston rods.

Grease quality: see “Lubricating and operating materials”

- ▶ For sea transportation (salt water), or in winter (road salt), recheck the condition of the piston rods once more after loading the machine, since the anti-corrosive grease may have been removed by the wiper ring.

- Additionally, cover piston rods with anti-corrosion fluid if a cylinder only has a low stroke for certain work, meaning that the piston rod is not regularly moistened with hydraulic oil (eg. cylinder on slewing arm when working over ground).
- Check the condition of hydraulic cylinders which are not moved a great deal regularly.

5.10.1 Replacing hydraulic hoses

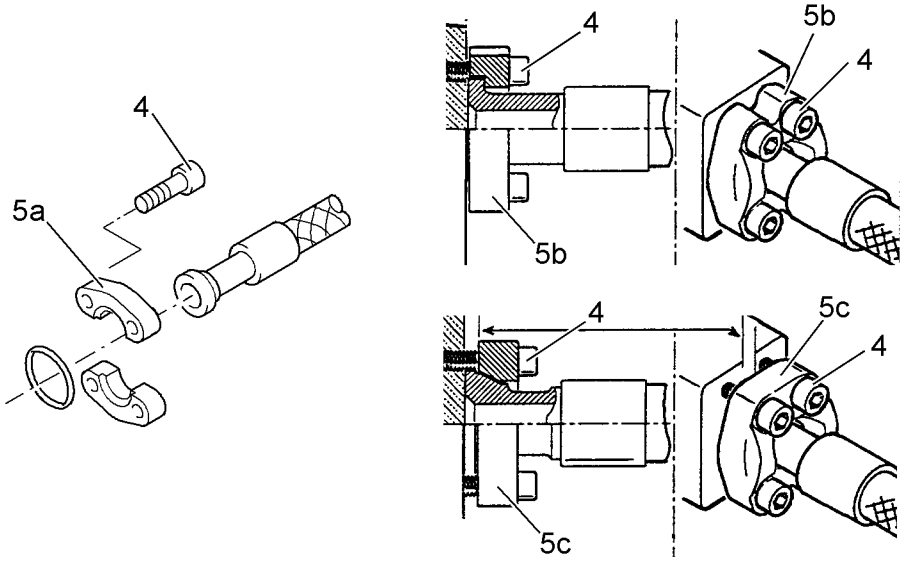

Fig. 5-55 *High pressure hose with SAE fitting*

Danger!
A defective hydraulic hose can cause accidents and injuries.

- Replace defective hydraulic hoses (bubbles, moisture, damaged top edge etc.) immediately.
- Install new hoses in such a way that torsion loading is avoided.
- Ensure that the hydraulic hose is not twisted when mounting.

Installed high pressure hoses with SAE connections have a nominal diameter of 16, 20 or 25.

You must tighten the mounting screws of the SAE fittings with the following tightening torques.:

Size of screw 4	Torque value in Nm - Quality 10.9		
	Half flanges 5a	Flat flange 5b	Conical flange 5c
M8	31	/	/
M10	62	45	65
M12	108	70	110
M14	172	120	180
M16	264	170	250
M20	350	250	450

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Tab. 5-7 *Tightening torques for SAE fittings - Quality 10.9*

Size of screw 4	Torque value in Nm - Quality 8.8
	Half flanges 5a
M8	22
M10	44
M12	76
M14	122
M16	187

Tab. 5-8 *Tightening torques for SAE fittings - Quality 8.8*

5.10.2 Oil changes on components

5.10.3 General information

- ❑ The machine must be standing level.
- ▶ Switch off the engine.
- ▶ Wait briefly until the oil has collected in the oil sump.
- ▶ Drain off the oil (preferably when oil is at operating temperature)
- ▶ Add the oil.
- ▶ Check the oil level.

Oil quality and quantity: see lubricant chart.

Change intervals: see lubrication and maintenance chart.

5.10.4 Swing gear transmission – oil change

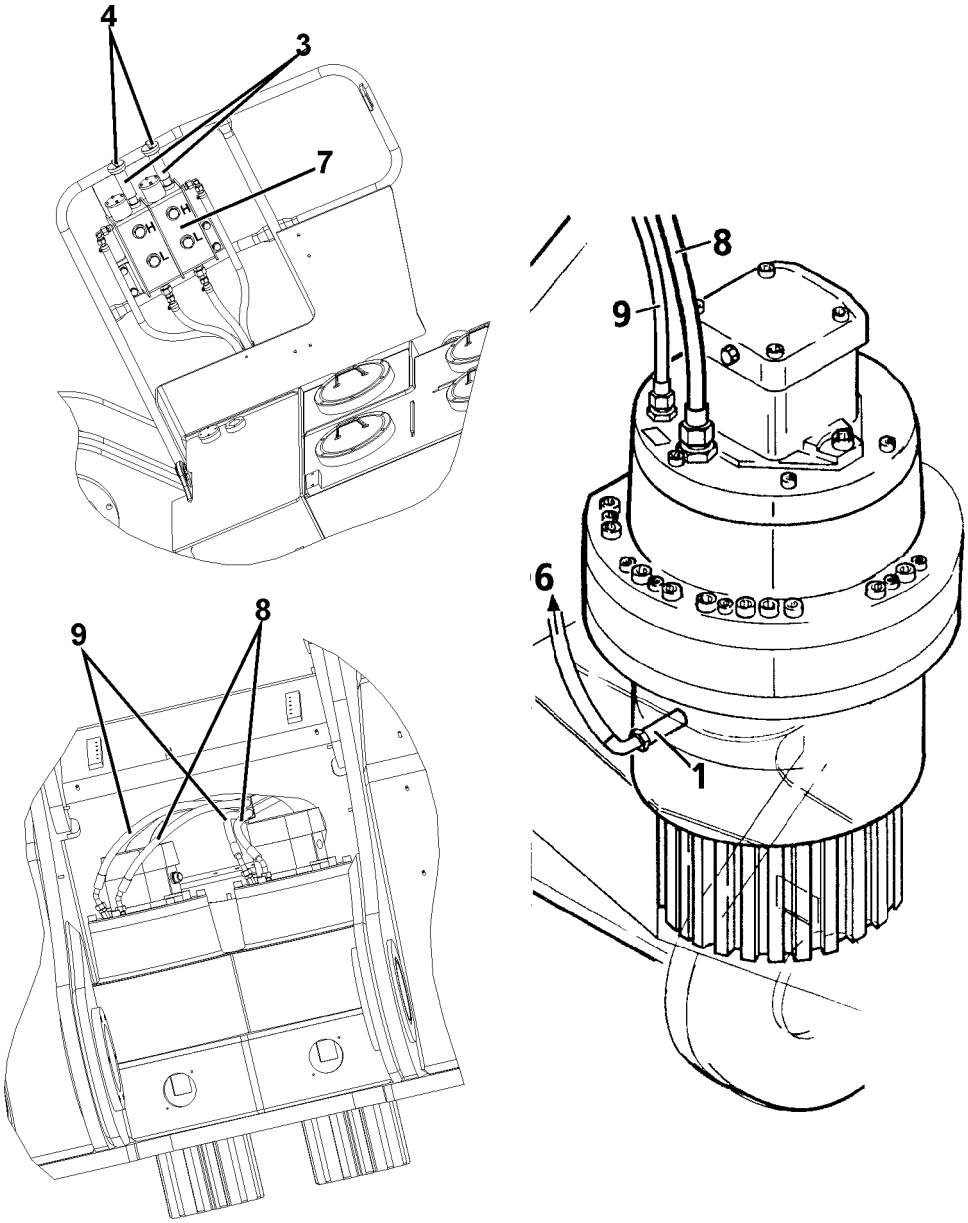

Fig. 5-56 *Changing the oil on the slewing gear transmission*

1 Drain valve
3 Filler tube
4 Sealing cap
6 Drain hose
7 Expansion reservoir
8 Hose
9 Hose

Note!
The oil in the swing gears must be changed at operating temperature.

Note!
For oil specification and oil quantity, refer to the lubrication chart.
For oil change intervals, refer to the Maintenance Schedule.

To drain the oil :

- ▶ Remove the sealing cap **4**.
- ▶ Unscrew the cover of the drain valve **1**.
- ▶ Screw the drain hose provided **6** to the drain valve and let the oil flow out into a suitable container.
- ▶ Remove the hose **6**.
- ▶ Screw the cover of the drain valve **1** back on.
- ▶ Put the sealing cap **4** on the expansion reservoir **7**.

To add the oil :

For small quantities :

- ▶ Remove the caps **4**.
- ▶ The oil refilling may be done via the filler tubes **3**.
- ▶ Each expansion reservoir is connected to the upper section of a swing gear via two hoses **8** and **9**.

When there is more oil to add :

- ▶ Unscrew the hoses **8** and **9** of the swing gear.
- ▶ Add oil in the swing gear via the two holes who were screwed the hoses **8** and **9**.
- ▶ When the oil level is sufficient, screw the hoses **8** and **9** on the swing gear.

The oil level :

The oil level must reach the middle of the lower sight glass "**L**" of the expansion reservoir **7** when the oil is cold, and must not overpass the sight gauge "**H**" when the oil is hot.

Note!
If at operating temperature the oil level is lower than the sight glass "**L**", oil must be refilled.

5.10.5 Travel gear - changing the oil

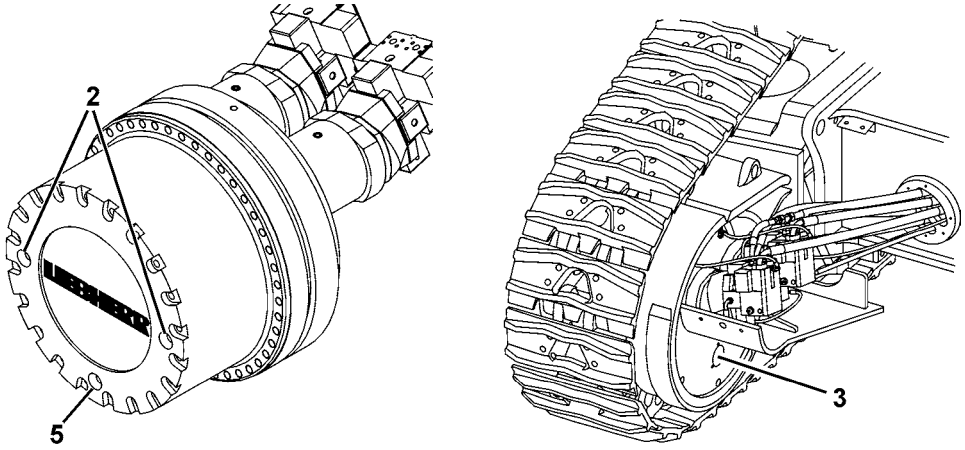

Fig. 5-57 *Travel gear - adding and draining oil*

If possible, drain the oil when the oil is at operating temperature.

Each travel gear is equipped with two plugs to check the oil level and to add oil (pos. 2), and with two oil drain plugs. One drain plug (pos. 3) is mounted to the lower inner section, the second drain plug (pos. 5) to outer ring which rotates with the sprocket.

To drain the oil:

- ❑ Ensure that you have a suitable oil drainage container to hand.
- ▶ Move the travel gear, until the plug 5 is straight below the center axle of the gear.
- ▶ Remove one plug **2**.
- ▶ Remove then both plugs **3** and **5**.
  ↳ .Drain the oil into a suitable container.

Danger!
When the oil is hot, the travel gear may be under pressure. Before draining the oil, carefully loosen the oil filter plug **2** to allow the internal pressure to escape.

To add the oil:

- ▶ With the drain plugs **3** and **5** installed,
  ↳ Slowly add oil via bore **2** until oil runs out.
- ▶ Reinstall plug **2**.

For oil specification and oil quantity, refer to the lubrication chart. For oil change intervals, refer to the Maintenance Schedule

5.11 Track components

The track components are maintenance-free until the regeneration of the treads or the cylinder or until all running gear parts are completely worn.

The lifetime design of the support rollers, track rollers and leading wheels increases the track components lifetime and metal sealing make it insensitive to dirt.

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5.11.1 Checking the track components mountings

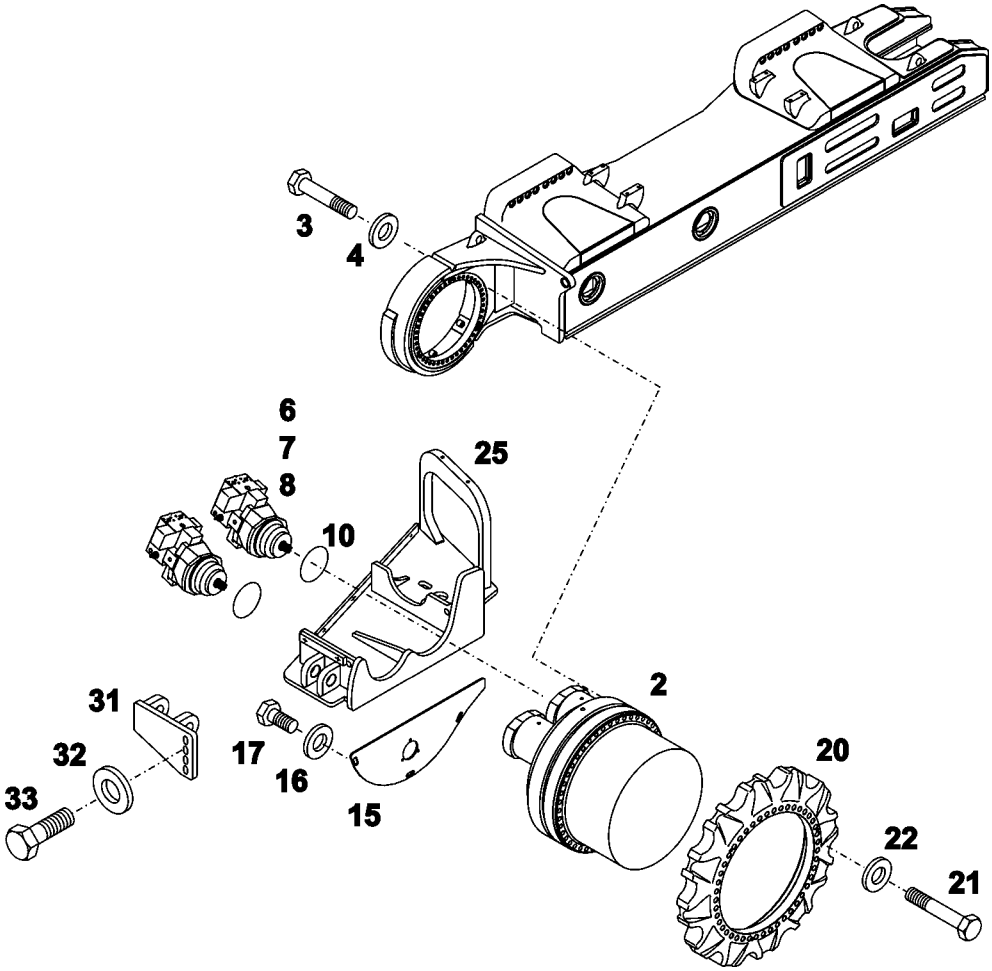

Fig. 5-58 *Running gear component mountings*

2	Travel gear		**17**	Screw M 24	960 Nm
3	Screw M 30x2	2120 Nm	**20**	Sprocket	
4	Washer		**21**	Screw M 30x2	2120 Nm
6	Travel motor		**22**	Washer	
7	Screw M 20	560 Nm	**25**	Travel motor protection	
8	Washer		**31**	Bracket	
10	O-ring		**32**	Washer	
15	Cover		**33**	Screw M 30	1900 Nm
16	Washer				

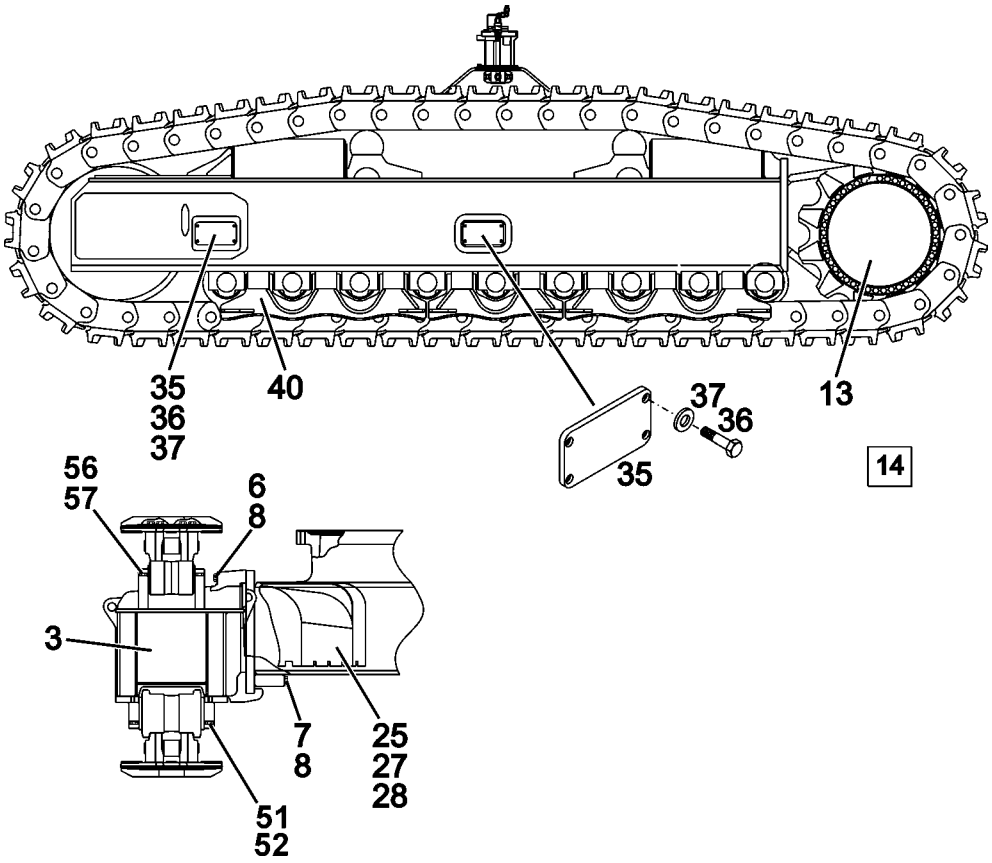

Fig. 5-59 *Track components*

3	Side frame		**28**	Screw M 20	390 Nm
6	Screw M 42	4810 Nm	**35**	Cover	
7	Screw M 42	4810 Nm	**36**	Screw M 10	68 Nm
8	Washer		**37**	Washer	
13	Travel drive		**51**	Screw M 30	1900 Nm
14	Hyd. instal. motor-rot.		**52**	Washer	
25	Travel motor cover		**56**	Screw M 24	960 Nm
27	Washer		**57**	Washer	

▶ Carry out regular checks for loose mounting screws on the base plates and travelling mechanisms.

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5.11.2 Monitoring the track tension

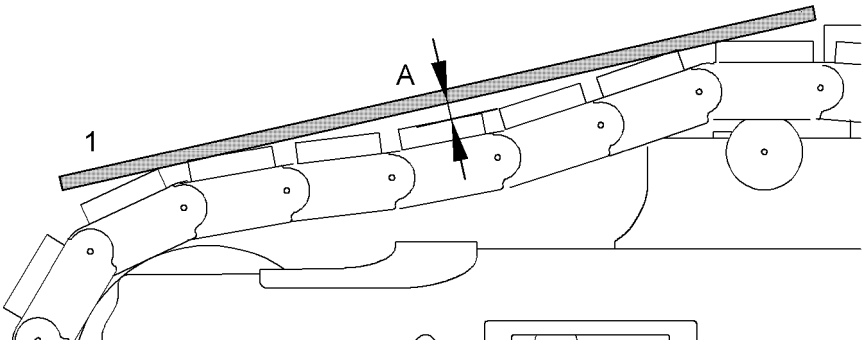

Fig. 5-60 *Monitoring the track tension*

- ▶ Relieve the tracks by driving the machine forwards and backwards.
- ▶ Place the measuring rod **1** in the area between the leading wheel and the carrier roller
- ▶ Measure distance **A** between the measuring rod lower edge.
  - ↳ The track should, under operating conditions, sag **25 to 30 mm** between the carrier roller and the sprocket.
  - ↳ Retension the tracks if necessary.

5.11.3 Retensioning the track

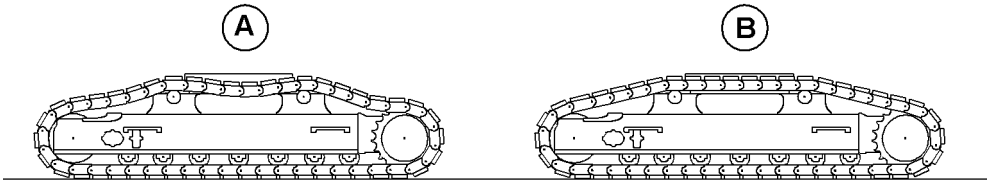

Fig. 5-61 *track when insufficiently (**A**) and correctly (**B**) tensioned.*

With normal wear on the sprocket, it is necessary to check the track tension regularly and retension the track if necessary.

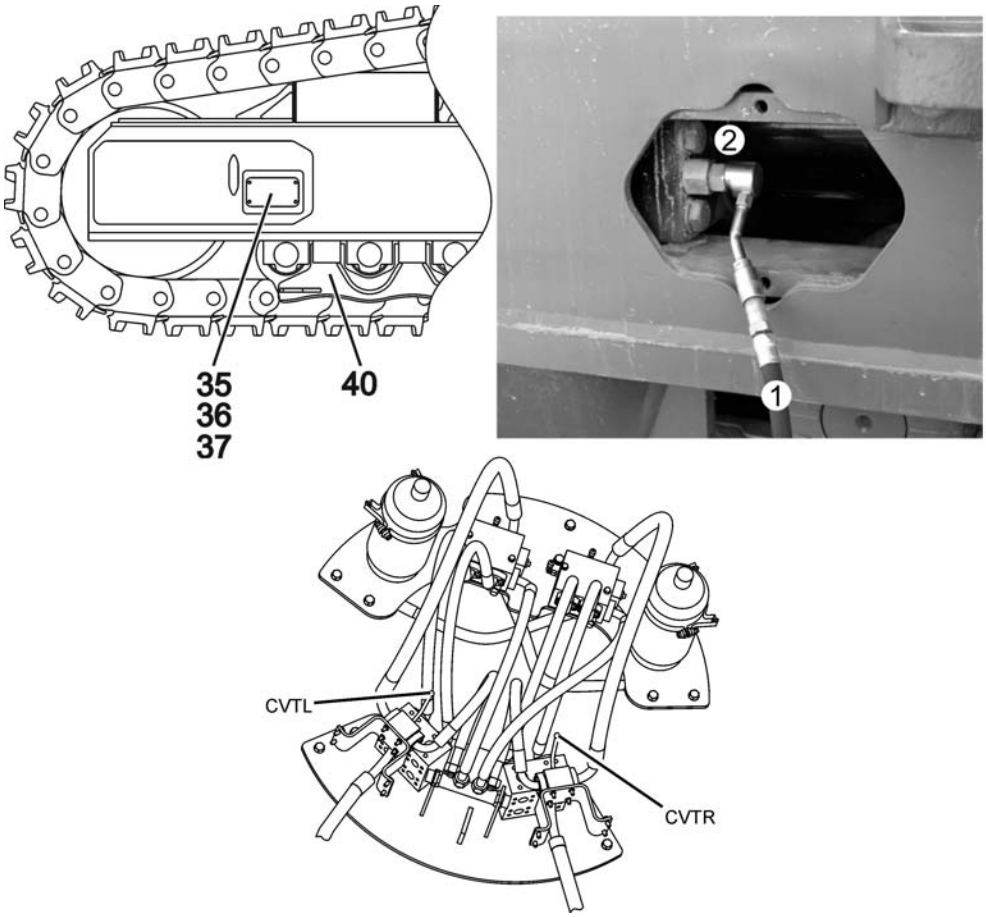

Fig. 5-62 *Retensioning the track*

- ▶ Remove the cover **35** on the side frame of the undercarriage.
- ▶ Screw high pressure hose **1** onto the manual grease gun.
- ▶ Through the opening, connect the high pressure hose **1** with the special fitting **2** of the grease tension jack.
- ▶ Inject grease until the track is sufficiently tensioned.
- ▶ Monitoring the track tension.

Danger!
When adjusting the chain tension, keep your head clear of the access hole. The grease cylinder is under high pressure and the chain will sag.
Grease is under high pressure and might squirt out. Also make sure that the track tension cylinder is out!

To move the levers CVTL (left) and CVTR (right) () allows to release the track tension pressure for the side you are working on. To tighten the track, replace the lever CVTL or CVTR.

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5.11.4 Releasing the track tension

Danger!
Risk of injury due to sudden dropping of the track and spraying grease.

- ▶ When releasing the tension on the track, keep your head away from the track roller frame.

- ▶ Carefully unscrew lubricating nipple **2** (see Fig. 5-62) by several thread pitches until the grease oozes out of the nipple's annular groove.
- ▶ Tighten lubricating nipple **2** as soon as the desired track tension is attained.
- ▶ After the adjustment procedure, drive the machine forwards and backwards and monitor the track tension once again.

5.11.5 Cleaning the travel gear

Do not operate the machine if larger stones, pieces of wood or metal, wires or cables are trapped in the running gear.

Dried or frozen mud and stones or other foreign bodies in the travel gear parts could result in considerable damage to the machine if the machine is operated or an attempt is made to free the machine using engine power.

5.12 Electrical system

5.12.1 Notes on the electrical system

Danger!
Risk of injury due to formation of sparks.

- ▶ Avoid sparks and naked flame when charging batteries or working on the batteries.
- ▶ Always wear protective goggles and gloves.

- ▶ Check that the machine's electrical system is functioning correctly at regular intervals.
- ▶ Burnt-out fuses and bulbs should be replaced immediately once the cause of the defect has been rectified.
- ▶ Rectify defects such as loose connections, abraded cables or badly fastened clamps immediately.
- ▶ Disconnect the batteries when working on the electrical system or when carrying out electric arc welding on the machine.

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Danger!
Risk of injury due to formation of sparks.

▶ Disconnect the negative terminal (-) first and connect it last.

5.12.2 Main battery switch

Caution!
Take particular care with machines with built-in independent heating.

▶ Only switch off the main battery switch when the independent heating's run-on is over.

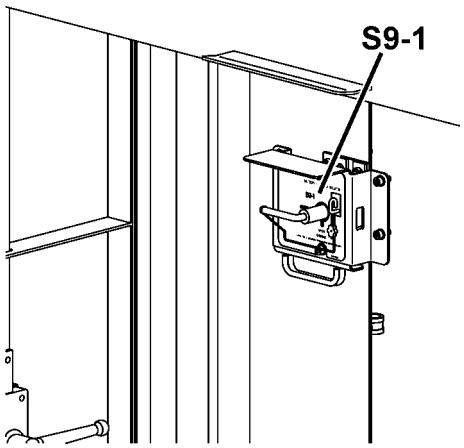

Fig. 5-63 *Main battery switch*

▶ Before starting any work on the electrical system, including welding work on the machine, switch the main battery switch to position **0**.

▶ When washing the machine, cover the electrical units (particularly the alternator, generator, cabling, electronic components and measured value sensor) to prevent water penetrating.

▶ When cleaning the engine with a water / steam jet, do not subject electrical measured value sensors such as oil pressure switches to any direct jets.
  - If this happens, moisture could penetrate and lead to contact corrosion and the failure of the measuring function.
  - Oil pressure switches are not watertight due to the necessary presence of membrane ventilation.

Note!
Batteries can become flat if the machine is out of service for longer periods.

▶ Before laying up the machine for longer periods, switch the main battery switch to position **0** (off).

5.12.3 Battery care

The battery must always be kept clean to ensure that it is able to function perfectly.

▶ Particular care should be taken to clean the pole ends and cable terminals **A** regularly and to then cover them with a thick layer of acidproof grease (see Fig. 5-64).

Danger!
Bent rubber hoses on the central gas outlet increase the risk of explosion!
The hydrogen contained in the batteries should not be allowed to build up in the accumulator box and must be able to escape via the rubber hoses. The central gas outlet hoses must be routed without kinks.

▶ Check the condition of the hoses regularly, particularly after installing a battery (see Fig. 5-64).

The fluid level in the cells should be 10 to 15 mm above the top of the plate. Only distilled water is to be used for any refilling.

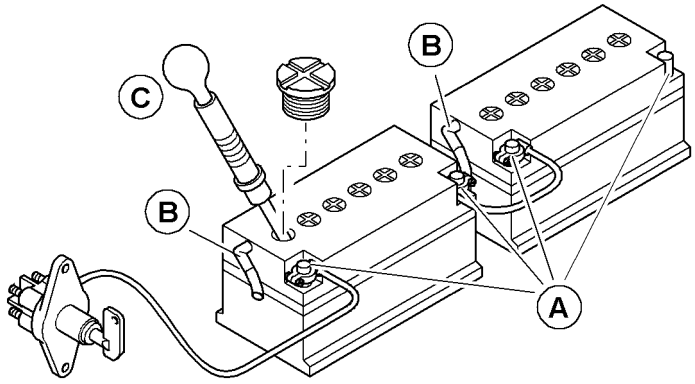

Fig. 5-64 *Battery care*

▶ From time to time, measure the acid concentration **C** using an acid tester.

When the battery is fully charged, the **unit weight is 1.28 kg/l (31.5° Bé)**.

▶ If the acid tester displays a lower value, the batteries is virtually flat and should be charged if necessary.

5.12.4 Electrical components location

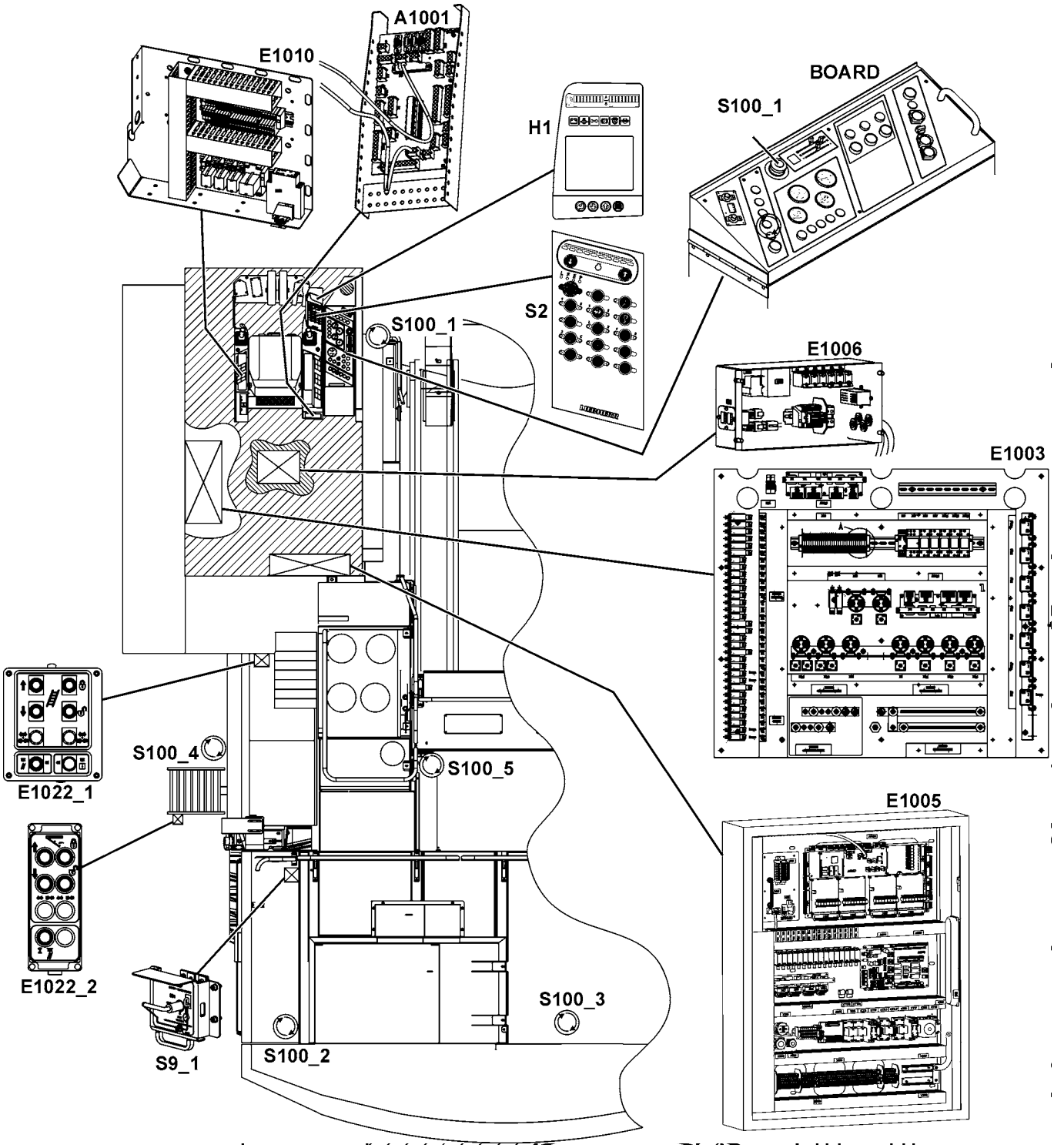

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Fig. 5-65 *Electrical components location*

E1003 Power connection box
E1005 Cabin connection box
E1006 Cabin connection box / air conditioner
E1010 Cabin connection box / greasing
E1022_1 Connection box / ladder control
E1022_2 Connection box / trap control
H1 Monitoring display
S2 Control unit
S9_1 Engine battery switch
S100_1, 2, 3, 4 and 5 Emergency stop

5.12.5 Electrical boxes and cab pressurization

The air filters for electrical boxes and cab pressurization must be cleaned regularly.

▶ To clean the air filters, press to open the dust discharge valve 5.

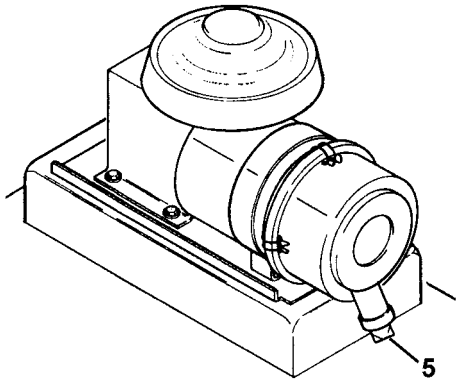

Fig. 5-66 *Air filter*

5.13 Heating/air-conditioning system

The machine has a heating and an air-conditioning system as standard.

The heater is installed on the cab floor. The evaporator for the air conditioning system is integrated in the roof of the cab, and the condenser is installed on the engine cooling radiator.

5.13.1 Cab ventilation

The heater as well as the air conditioner can both be used, at the same time and independently of each other to ventilate the cab.

5.13.1.1 Heating system

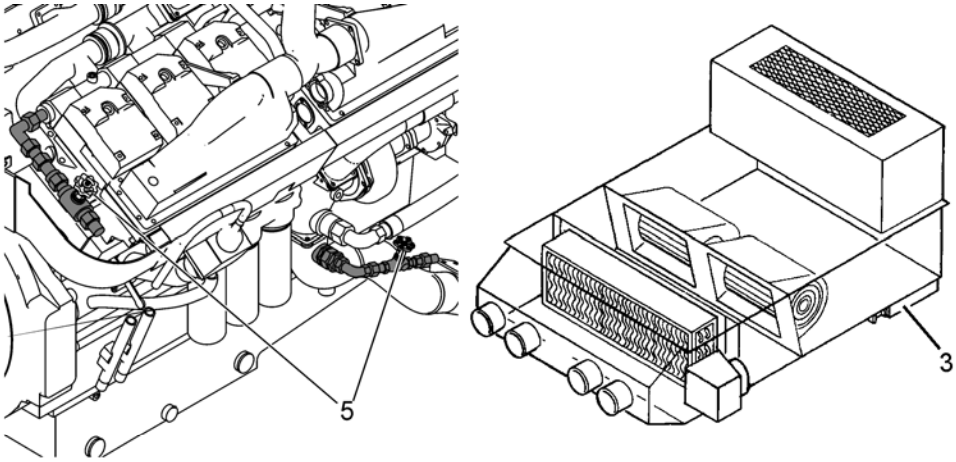

Fig. 5-67 *Heating system*

The air flow in the heating system is reduced when the filters are dirty and this frequently results in the system icing up or shutting down.

– Remove and clean the heat exchanger **2** and the fresh air filter **3** at intervals specified in the maintenance schedule.
– Do not operate the machine, even briefly, without these filters, since the heat exchanger **2** will otherwise quickly become blocked (see Fig. 5-67).

To clean and change the recirculated and fresh air filters:

▶ Remove the fresh air filter **3**.

Note!

▶ Never wash the filter elements with hot water or a steam jet.

▶ If damaged or in a bad condition, replace the filter elements.

▶ Blow out the filter elements using compressed air or clean in cold or luke-warm water.

To check the heat exchanger:

▶ Check the heat exchanger plates annually for damage.

5.13.2 Air-conditioning system

Switch on the air-conditioning system for approx. 10 minutes every 2 or 3 weeks, regardless of the season.

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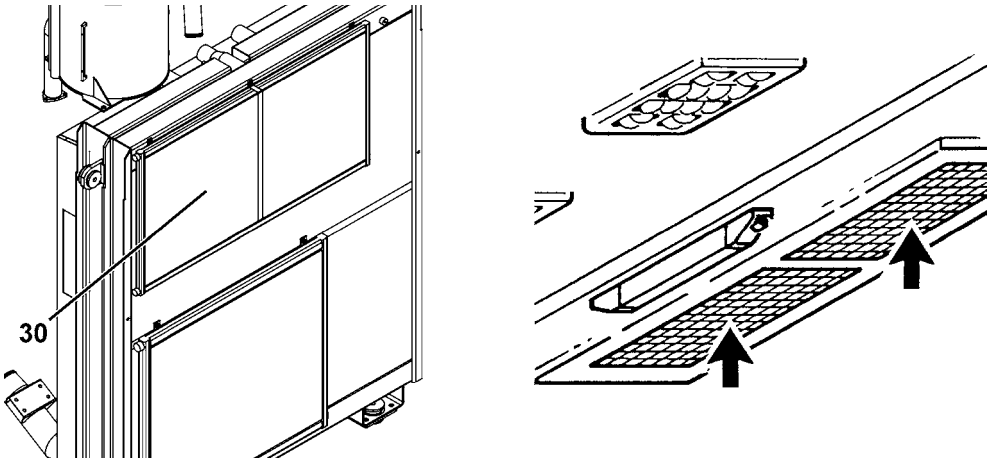

Fig. 5-68 *Air conditioner elements*

During the warm season, perform following checks or maintenance works :

- ▶ Check the heat exchanger of the condenser located on the engine radiator (pos. 30) and if necessar blow it out with pressurised air or steam, from the inner (fan side) to outside.
- ▶ Clean the recirculating air filter on the evaporator in the cab.

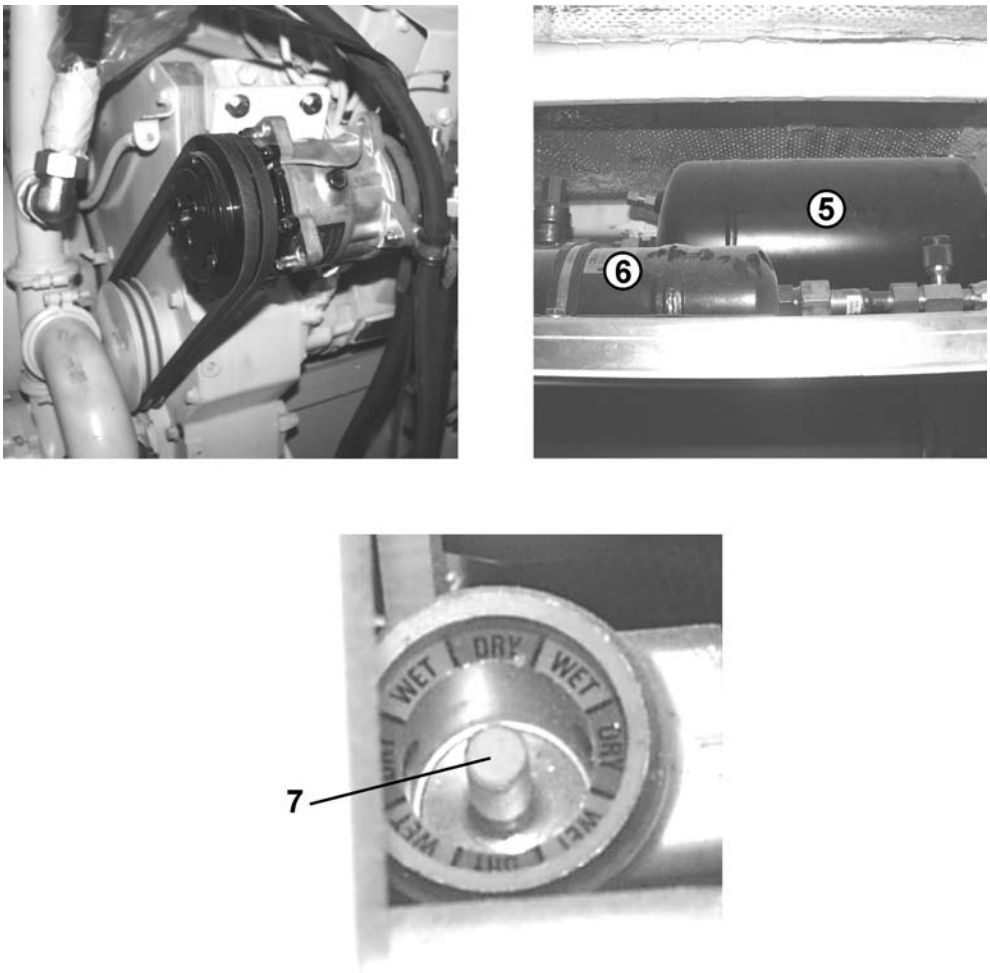

Fig. 5-69 *Air conditioner elements*

- ▶ Check the V-belts of the compressor for correct tension and good condition.

In addition, the refrigerant charge of the system must be checked at regular intervals (see maintenance schedule), by observing the sight glass of the receiver drier while the air conditioner is operated.

Bubbles or foam in the sight glass indicate an insufficient refrigerant charge.

▶ In this case, the system should be checked and refilled by a trained specialist.

The condition of the refrigerant receiver 5 must be checked visually for corrosion and mechanival damage.

▶ Should rust formation be observed on the receiver (on mounting consoles, connecting parts, ...), so it must be replaced immediatly.

▶ The filter / drier 6 must be exchanged at regular intervals, since it may be obturated due to excessive absorption of humidity.

▶ If the indicator becomes yellow, it means that there is too much humidity in the circuit. The filter / drier 6 must be exchanged immediatly by a trained specialist.

▶ For maintenance intervals, see maintenance schedule.

5.14 Drive unit brakes and swing gear brakes

Both the drive unit brakes and the swing gear brakes are spring-applied, pressure-released multi-plate brakes. They are ventilated hydraulically and are fully sealed and integrated in the travel gear or swing gear transmission.

Their usage purely as parking brakes makes them wear-free and therefore maintenance free.

5.15 General maintenance points

5.15.1 Replacing working parts

In addition to the normal maintenance and repair work that is to be carried out at the given intervals, the machine operator and maintenance personnel can also carry out the repairs referred to below:

– Replacing worn teeth on the bucket.
– Replacing defective sealing material on the pipe and hose system and on the hydraulic unit connections (not, however, on pressure relief valves which are lead sealed at the works).
– In addition, high pressure hoses, hydraulic lines and bolt connections on the hydraulic system can be replaced.

It should be noted that only original LIEBHERR replacement parts are to be used.

This is particularly relevant for hoses and hydraulic lines, which must be preassembled at the works. For all other repairs, particularly when dismounting the counterweight, works and dealership fitters are to be consulted.

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5.15.2 Welding work on the machine

Welding work on all main components serving the power transmission (such as the chassis frame, rotating platform, equipment parts etc.) may only be carried out by the manufacturer or by an authorized workshop.

- ▶ Disconnect the batteries before starting any electric arc welding work on the machine.
- ▶ Always disconnect the negative terminal (-) first and reconnect it last.
- ▶ Switch off the main battery switch!

Nevertheless if welding repair should be done on components which may contain inflammable gases (welded counterweight, hydraulic tank, fuel tank, ...) these components must be previously and sufficiently ventilated with pressurized air to avoid all fire or explosion hazard.

Caution!
If high currents flow through the bearings or sealing elements, these could be burnt.

- ▶ Move the earthing cable of the welding tool as close as possible to the welding surface so that the welding current cannot flow over parts like the slewing ring, hinges, bearings, sockets, rubber elements or seals.

5.16 Check mounting bolts for tightness

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

Notice : when installing bolts of size bigger than M40 the thread of the screw must be slightly coated with a MoS2 based grease. Also grease the bolt head supporting surface, unless hereafter otherwise specified.

Danger!
Due to their size, most of the below listed mounting bolts require, to be tensioned to the prescribed torque, the use of a special, hydraulic or electric actuated tensioning device.
These high torque tensioning devices are power tools, which must be operated by trained mechanics, knowing the safety precautions edicted by the tool manufacturer and that must be observed to avoid accidents or personal injury.
In particular, pay attention to chose a solid and secure reaction point for the tool and position the reaction arm during operation. Keep clear of the reaction arm during operation; if it must be held or steaded during operation, use alternative means of securing the tool during operation.

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5.16.1 Mounting bolts of the counterweight

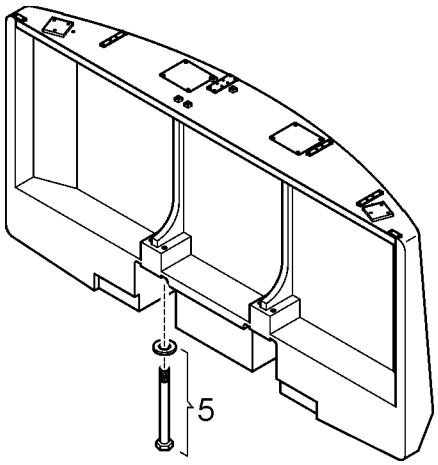

Fig. 5-70 *Counterweight bolts*

The eight mounting bolts **5** (M42) must be torqued to 5400 Nm (3982 ft.lbs).

5.16.2 Mounting bolts of the swing ring

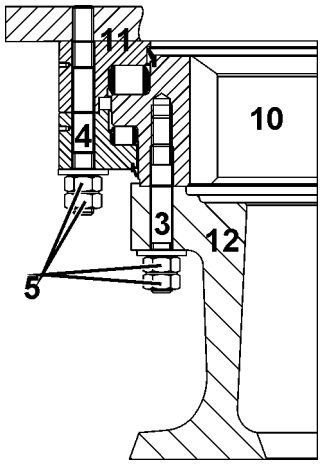

Fig. 5-71 *Swing ring bolts*

The stud bolts **4** (M36) for the mounting of the swing ring **10** to the uppercarriage **11** must be tensioned to 570 kN.

The stud bolts **3** (M36) for the mounting of the swing ring **10** to the undercarriage **12** must be tensioned to 1060 kN.

Tighten the protection nuts **5** on the bolts **3** and **4** between 500 and 1000 Nm.

The use of special tensioning procedure and tool is necessary to obtain the correct bolt tension (LIEBHERR recommends the employ of the special bolt tensioning cylinder ident. Nb. 5617448, at the required hydraulic pressure of 1350 bar).

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Danger!
The special tool may only be operated by qualified personnel, especially trained for the use of this high pressure tensioning device and aware of the operating instructions as well of the recommendations for accident and damage prevention concerning this tool.
Use appropriate working platforms and lifting devices to install and hold in position the special tool while tensioning the bolts.

5.16.3 Mounting bolts of fuel tank

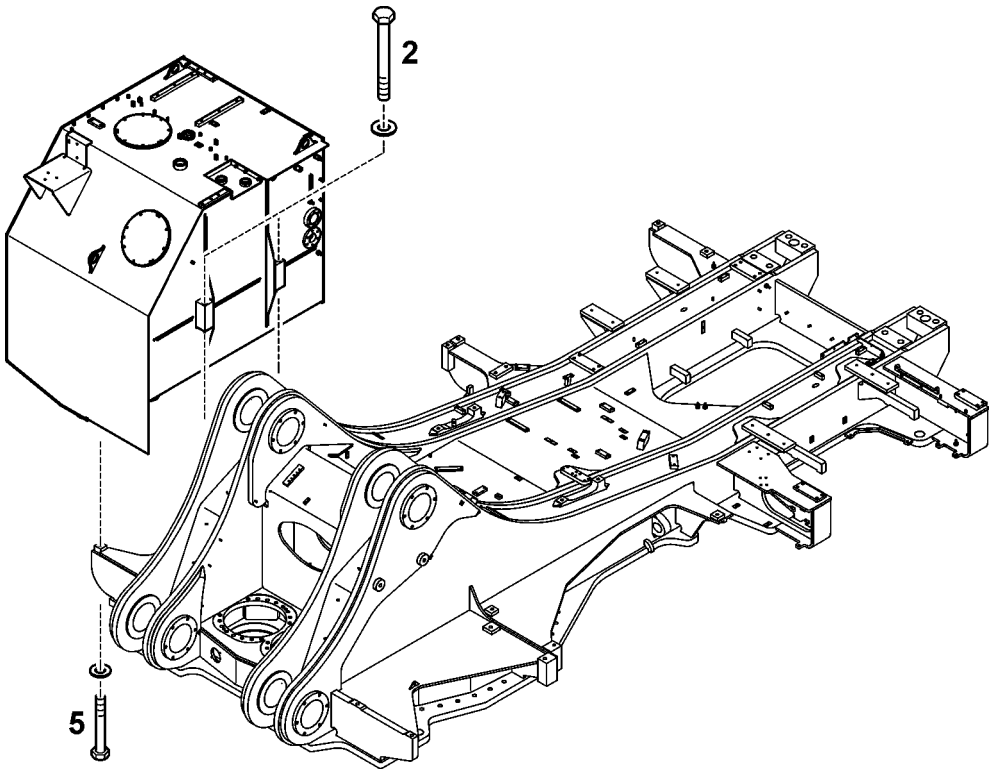

Fig. 5-72 *Fuel tank bolts*

The two mounting bolts **2** (M30) of the fuel tank must be torqued to 1900 Nm (1400 ft.lbs). And the two bolts **5** (M24) must be torqued to 960 Nm (708 ft.lbs).

5.16.4 Mouting bolts of hydraulic tank

The three mounting bolts M24 of the hydraulic tank must be torqued to 960 Nm (708 ft.lbs).

5.16.5 Mounting bolts of powerpack

The mounting bolts M20 of the powerpack must be torqued to 560 Nm (413 ft.lbs).

5.16.6 Mounting bolts of the swing gear and motor

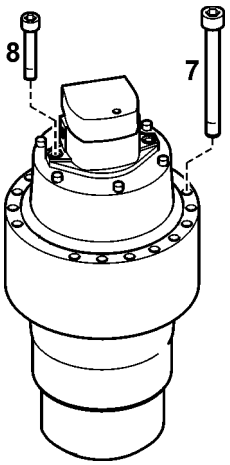

Fig. 5-73 *Swing gear and motor bolts*

The mounting bolts **7** (M30) of the swing gear must be torqued to 1900 Nm (1400 ft.lbs)

The mounting bolts **8** (M24) of the swing motor must be torqued to 960 Nm (708 ft.lbs).

5.16.7 Mounting bolts of hydraulic pumps

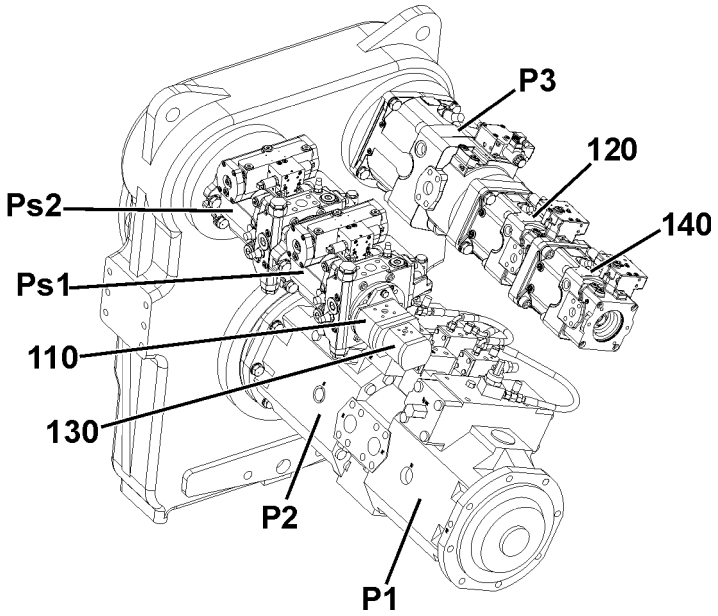

Fig. 5-74 *Hydraulic pumps bolts*

The mounting bolts M20 of the main working pumps (**P1** and **P2**) must be torqued to 560 Nm (413 ft.lbs).

The mounting bolts M20 of the main working pump (**P3**) must be torqued to 560 Nm (413 ft.lbs).

The mounting bolts M20 of the water cooler fan pump (**120**) and the oil cooler fan pump (**140**) must be torqued to 560 Nm (413 ft.lbs).

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The mounting bolts M12 of the control oil pump (**110**) and the splitterbox lube oil pump (**130**) must be torqued to 117 Nm (86 ft.lbs).

5.16.8 Connection of central piece and side frames

The bolts must be checked regularly, and if necessary retightened.

The lower bolts M42 must be torqued to 4810 Nm (3550 ft.lbs).

The upper bolts M42 must be torqued to 4810 Nm (3550 ft.lbs).

5.16.9 Mounting bolts if the driver's cab

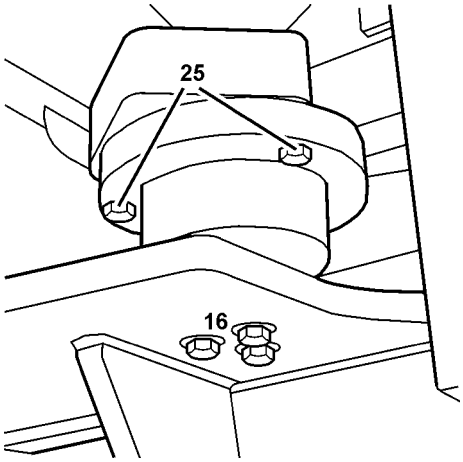

Fig. 5-75 *Driver's cab bolts*

These bolts must be checked regularly, and if necessary retightened.

These screws (**16** and **25**) are of size M16 and must be torqued to 280 Nm (206 ft.lbs).

5.17 Control and maintenance chart

Caution!
Careful maintenance can only be carried out when the machine is clean. In particular, visual checks such as crack testing are only possible on a clean machine.

▶ Clean the machine before you start maintenance work (see also the chapter "Safe maintenance of the machine", subheading "Cleaning and crack testing").

Note
The daily maintenance work that the device operator has to carry out comprises a function check of the brakes (slewing gear, service and parking brake), steering and the electrical and hydraulic systems.
Additionally, a visual check must be made for leaks on the engine, hydraulic system, transmission and axles.

			WORK TO BE PERFORMED R 9250	
Daily	Weekly		❑ First and only interval ❍ Repeat interval	**Note**
			DIESEL ENGINE & SPLITTERBOX	
❍	❍		Check oil level	
❍	❍		Check coolant level	
❍	❍		Check speed on RPM gauge	
❍	❍		Check running noises	
❍	❍		Check exhaust gas colour	
❍	❍		Check engine and external pipework for leaks	
❍	❍		Check exhaust connections for leaks. Check oil supply / return pipework for leaks	
❍	❍		Check for air filters clogging at the restriction indicators	
❍	❍		Check oil pressure and coolant temperature during operation	
	❍		Check oil level in splitterbox	
	❍		Check condition of the cyclone tubes of the precleaner, clean if necessary	
	❍		Check air intake hose for condition and leaks	
	❍		Check and clean radiator core and fan	
	❍		Check radiator cap for leaks, replace if necessary	
	❍		Drain fuel tank	
❍	❍		**Daily :** perform the complete "Daily" Maintenance Echelon, as started in CUMMINS Operating and Maintenance Manual	
	❍		Check fastening of thermic protection on exhaust manifold	
			HYDRAULIC SYSTEM	
❍	❍		Check oil level in hydraulic tank	
❍	❍		Check hydraulic system for leaks	
❍	❍		Inspect the fastening and the good condition of pipes and hoses for damage and leakage	
❑	❍		Clean magnetic rods in one of the return filters (each week another one) (daily during the first 300 hrs.)	
❑	❍		Clean magnetic rods in leak oil filter (daily during the first 300 hrs.)	
❍	❍		Check hydraulic cylinder rods for leaks and good condition	
	❍		Inspect, and if necessary clean oil coolers	

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Daily	Weekly		WORK TO BE PERFORMED R 9250 ❑ First and only interval ❍ Repeat interval	Note
	❍		Check hydraulic tank air filter, clean if necessary	
			ELECTRICAL SYSTEM	
❍	❍		Clean and check LCD screen of the display for proper function when starting	
❍	❍		Check indicator lights and gauges on control panel when starting	
❍	❍		Press to open dust discharge valve on air cleaner for cab and electrical boxes	
	❍		Check head and floodlights, clean if necessary	
	❍		Visual inspection of wiring system damage	
			AIR PRESSURE SYSTEM	
❍	❍		Check cut in and cut out pressure of air pressure regulator	6,2 - 7,25 bar
	❍		Drain air tanks	
			SWING RING	
❍	❍		Check function of swing ring bearing lubrication system during operation	
❍	❍		Check function of swing ring teeth lubrication system during operation	
❍	❍		Check visually the grease delivery (outlet of new grease around the swing ring)	
			SWING GEAR	
❍	❍		Check function and operation of swing brake	
❍	❍		Visually check mounting bolts of gear and oil motor	
❍	❍		Check for leaks on swing gears, check oil level in expansion tanks	
			TRAVEL GEARS	
❍	❍		Check for leaks, if gear is leaking, check oil level	
❍	❍		Check function and operation of travel brakes	
			TRACKS	
❍	❍		Clean track chain (after working)	
❍	❍		Visually check and tighten if necessary mounting screws of side frames	

Daily	Weekly		WORK TO BE PERFORMED R 9250 ❑ First and only interval ❍ Repeat interval	Note
❍	❍		Check tensioning cylinders, idler, carrier and track rollers for leaks	
❍	❍		Visually check and if necessary tighten screws of sprocket, rollers, idlers, chain guides and track pad bolts.	
❍	❍		Check track chain tension visually	
			CAB, HEATER AIR CONDITIONER	
	❍		Operate air conditioner every week for 10 minutes (during winter)	
	❍		Visual check condenser unit and evaporator filter	
	❍		Check refrigerant level, if necessary refill circuit	
	❍		Check tension of V-belt for air conditioner (on the engine)	
			UNDER / UPPERCARRIAGE & ATTACHMENTS	
❍	❍		Check function of working attachment lubrication system during operation	
❍	❍		Check visually the grease delivery at each lube point	
❍	❍		Check bucket teeth visually for wear	
❍	❍		The daily maintenance work must include the check of the proper function of hydraulic, electric, pneumatic and brakes systems before starting operation	
	❍		Visually check and if necessary tighten mounting screws of counterweight, tanks, power-pack, control valve console, cab, catwalks, grease box, ladder	
	❍		Check fastening of pin covers	
	❍		Check fastening of hoses and pipe clips	
	❍		Check level in reservoir for winshield washer, refill if necessary	
			CENTRALIZED LUBRICATION SYSTEM	
❍	❍		**Daily :** perform a complete daily maintenance as stated on page 9250_1001a.4a	
❍	❍		**Weekly :** perform a complete weekly maintenance as stated on page 9250_1001a.4a	

Tab. 5-9 *Daily / weekly maintenance schedule R 9250*

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At delivery	At 250, 750, ...hrs	At 500, 1500, ...hrs	At 1000, 3000, ...hrs	At 2000, 4000, ...hrs	At 7500, 15000, ...hrs	WORK TO BE PERFORMED R 9250 ❑ First and only interval ❍ Repeat interval	Note
❍	❍	❍	❍	❍	❍	Perform all checks and works in the daily / weekly maintenance schedule	
						DIESEL ENGINE & SPLITTERBOX	
			❍	❍		Check the tightness of all screws and bolts on splitterbox	
	❑		❍	❍		Check the oil quality in splitterbox, change if necessary	
				❍		Check mounting screws of engine and splitterbox for tightness	
			❑	❍		Check the engine rubber buffers (replace if necessary and at least every 10000 hours)	
						Replace primary element of air cleaner (if necessary or once a year)	
						Replace safety element of air cleaner (if necessary or once a year)	
						Every 250 hours or 6 months, perform a complete "250 hrs" Maintenance Echelon, as stated in CUMMINS Operation and Maintenance Manual to extend the oil change interval, it is advised to use the chart method (see CUMMINS Manual page 19 (QSK 45 with 75 US Gallon sump)). This method allows to extend the oil change interval.	
						Every 10000 hours or 2 years, perform a complete "10000 hrs" Maintenance Echelon, as stated in CUMMINS Operation and Maintenance Manual	
						See CUMMINS Operation and Maintenance Manual for other maintenance (Eliminator, Centinel, Fleetguard, valves and injectors adjustment)	
						Every 10000 hours, perform a complete "10000 hrs" Maintenance Echelon, as stated in Geislinger (coupling manufacturer) Manual	
						HYDRAULIC SYSTEM	
		❑	❍	❍		Change servo filter elements (first after 500 hrs)	
		❑	❍	❍		Change swing pumps replenishing oil filter elements (first after 500 hrs)	
		❑	❍	❍		Change filter element of leakage oil filters (first after 500 hrs)	
		❑	❍	❍		Change filter element of return filters (first after 500 hrs)	
		❑	❍	❍		Check mounting of components (pumps, motors, clamps, ...)	
❍			❍	❍		Check and adjust primary and secondary pressure relief valves	
				❍		Replace hydraulic oil	

At delivery	At 250, 750, ...hrs	At 500, 1500, ...hrs	At 1000, 3000, ...hrs	At 2000, 4000, ...hrs	At 7500, 15000, ...hrs	WORK TO BE PERFORMED R 9250 ❑ First and only interval ❍ Repeat interval	Note
						Bleed servo system and hydraulic pumps (as necessary)	
						Clean high pressure filters (as necessary)	
						CENTRALIZED LUBRICATION SYSTEM	
			❍	❍		**Every 1000 hours,** perform a complete 1000 hrs Maintenance Echelon as stated on page 9250_1001a.4a	
			❍	❍		**Every 7500 hours,** perform a complete 7500 hrs Maintenance Echelon as stated on page 9250_1001a.4a	
						ELECTRICAL SYSTEM	
		❍	❍	❍		Check level and specific gravity of the electrolyte in the batteries	
			❍	❍		Check and clean battery terminals	
						ENGINE AIR SYSTEM	
				❍		Replace filter cartridge of air dryers	
						SWING RING	
			❑	❍		Check and if necessary tighten mounting screws	
			❑	❍		Check pinion gear mesh	
			❑	❍		Check axial play of swing ring	
						SWING GEAR	
		❑	❍	❍		Replace gear oil (first at 500 hrs)	2x37 l (9,8 US Gal.)
				❍		Check mounting screws of gear and oil motor	
						TRAVEL GEAR	
			❑	❍		Check mounting screws of gear, sprocket wheels and oil motors	
			❑	❍		Replace gear oil (first at 1000 hrs)	2x52 l (13,8 US Gal.)

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At delivery	At 250, 750, ...hrs	At 500, 1500, ...hrs	At 1000, 3000, ...hrs	At 2000, 4000, ...hrs	At 7500, 15000, ...hrs	WORK TO BE PERFORMED R 9250 ❑ First and only interval ❍ Repeat interval	Note
						TRACKS	
			❑	❍		Check tightening torque of screws of the locking keys of the idler axis	
			❑	❍		Check tightening torque of screws of rollers, pin locking screws and chain guides	
			❑	❍		Check tightening torque of side frames screws	
						CAB, HEATER AND AIR CONDITIONER	
			❍	❍		Check locks and hinges on doors and windows (lubricate if necessary)	
				❍		Check heater for leaks, heat exchanger and heater filter	
					❍	Replace the filter / drier (at least every two years)	
						Yearly check condition of the refrigerant receiver, if necessary replace it	
						Replace main element on air cleaners (at least once a year)	
						Replace safety element on air cleaners after 3 services of main element	
						Lubricate all doors seals with silicone or talc (before cold season)	
						UNDER / UPPERCARRIAGE & ATTACHMENTS	
	❍	❍	❍	❍		Check all parts for cracks	
			❍	❍		Check and lubricate cover hinges and locks	
				❍		Check tightening of mounting screws for counterweight, tank, powerpack, control valve console, cab, catwalks, grease box, ladder	
❍						Explain proper use and maintenance to the operator	

Tab. 5-10 *Hours maintenance schedule R 9250*

5.18 Centralized lubrication system

1 Function of the lubrication system

1.1 Description of the entire system: see the diagram under item 1.3

The lubrication points of the hydraulic excavator are supplied by two mutually independent centralized lubrication systems:

System 1 – Equipment lubrication- Slewing rim lubrication

Single-line system

Main components: Hydraulic pump "P1" 609-29333-1
Injectors LM-5, SL-1
Progressive metering devices SSV

System 2 – Gear rim lubrication

Main components: Hydraulic pump "P2" 644-46265-1-L
Progressive metering devices SSV

1.2 Sequence of a lubrication cycle

1.2.1 Systems 1

Upon expiration of the pause time the pump begins operating and supplies the lubricant to the injectors 9 (LM-5, SL-1) via the main line. The pistons in the injectors are actuated by the lubricant under pressure and discharge a pre-dosed quantity of lubricant to the connected lubrication points.
The pressure continues to rise in the main line until the value (220 bar) set at the pressure switch (B69) is reached. The control unit stops the pump and, at the same time, the main line is discharged via the solenoid valve (Y79). The relieved lubricant reaches the pump reservoir via a bypass.
The pistons in the injectors 9 (LM-5, SL-1) return to their initial position by spring force.
The pause time begins. The system is ready to carry out a new lubrication cycle.

1.2.2 System 2

After the pause time has elapsed, the pump supplies the lubricant to the connected progressive metering devices.
A progressive metering device 8 (SSV) is equipped with a proximity switch for control and monitoring.
A lubrication cycle is completed after the SSV has supplied twice, and the pump is switched off again.

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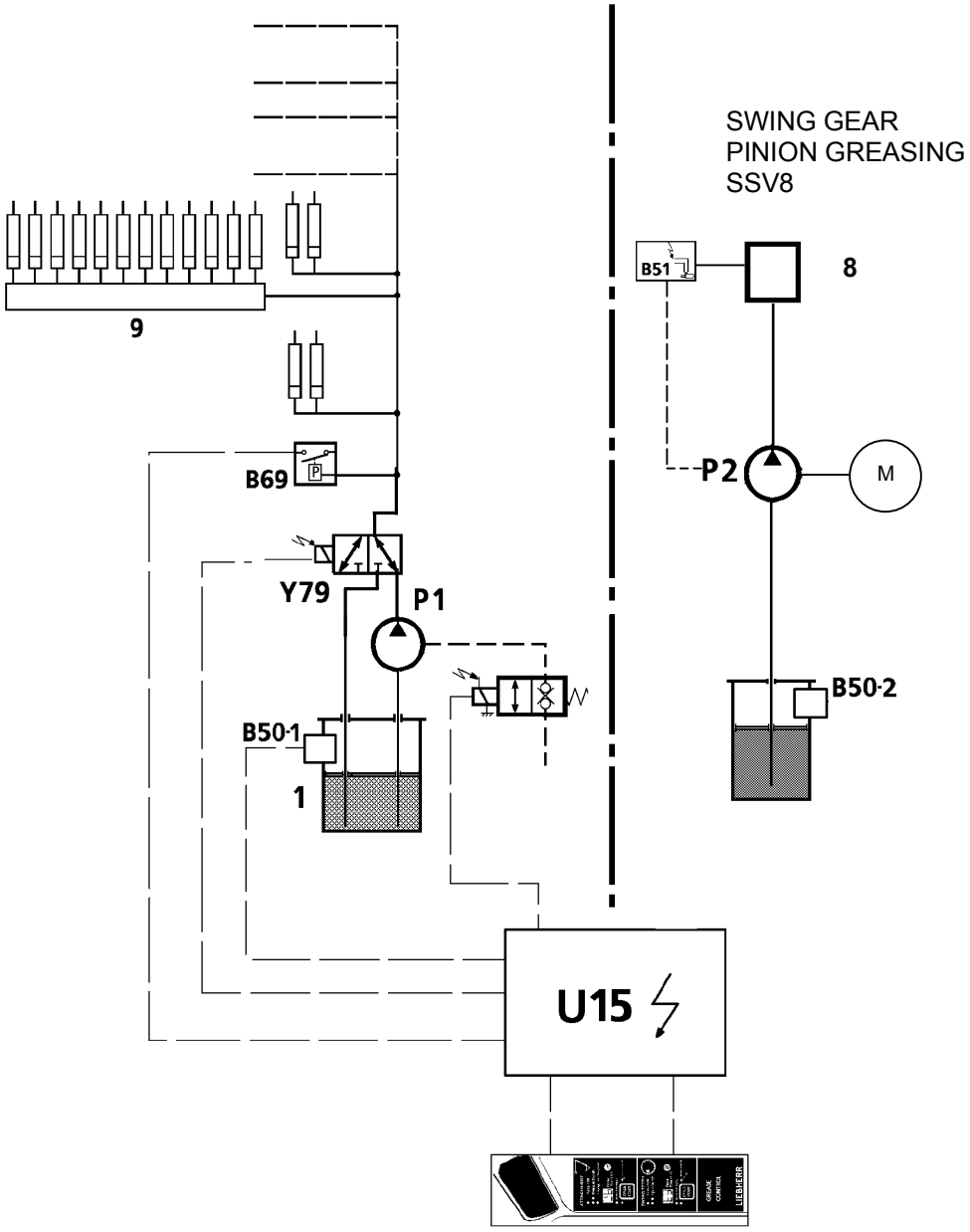
1.3 Schema



P1	Lubrication pump -attachment	B69	Pressure switch / end of lube cycle for P1
P2	Lubrication pump -swing ring teeth	B51	Limit switch on progressive distributor for P2
Y79	Solenoid valve / pressure release (attachment)	8	Progressive distributor SSV
U15	Lubricating system monitor	9	Grease injector banks LM-5, SL1
1	Grease tank (80L)	B50-1	“High level“ and “Low level“ sensor for P1
		B50-2	“High level“ and “Low level“ sensor for P2

2 Operation

CAUTION

- **Only allow operation by properly instructed personnel**
- **Do not exceed permissible system pressures**
- **Top up lubricant or change drum in good time**

When the machine is started all centralized lubrication systems are automatically pressurized.
Each pump triggers one lubrication cycle, stops only for the preadjusted pause time, ... etc.
When the excavator is delivered from the factory the time period between two lubrication cycles is 6 minutes for pump P1 and 8 minutes for pump P2. This corresponds to a grease consumption of approx. 600 g/h for P1, 20 g/h for P2.

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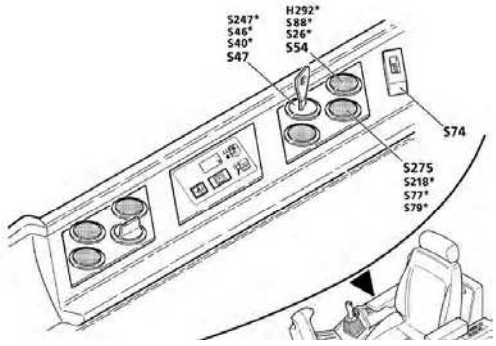
3 The lubrication system monitor

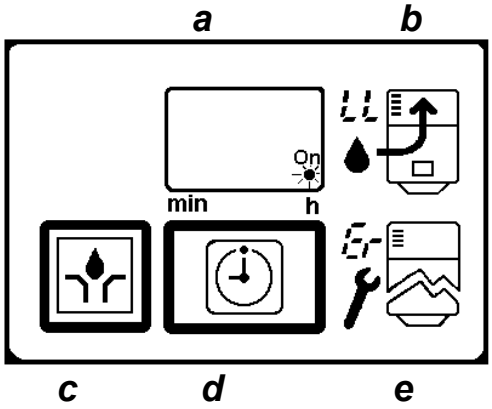


CAUTION

- **Only allow operation by properly instructed personnel**
- **Do not exceed permissible system pressures**
- **Top up lubricant or change drum in good time**

When the excavator is started the lubrication system is automatically alive.
The lubrication pump then carries out a complete lubrication cycle, is stopped only for the duration of the set pause time, etc....
The pause time is factory set at 2 hours.

During lubrication the diesel engine must be in operation because the lubrication pump is driven via the compressed air of the excavator.
During a lubrication cycle, the pump function is represented by a rotating girder on the field indicator.
The delivery of grease can be checked by ensuring that the control pin of each injector moves back and forth.

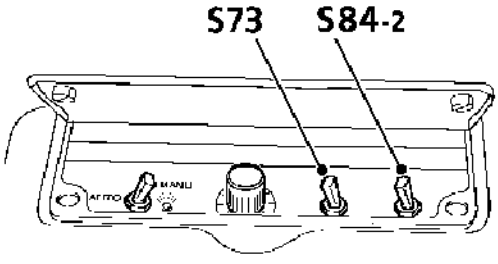


The flashing of the pushbutton ***C*** indicates a malfunction in the automatic lubrication system (lubrication cycle still not completed after about one hour).

The fault is also indicated by means of an intermittent whistling sound at the control unit. Possible causes of malfunction are:

- Blockage or breakage of the main line
- Fault at the pressure switch
- Lack of lubricant in the grease reservoir
- Fault in the power supply of the lubrication system
- Fault in the compressed air system

An additional lubrication cycle can be triggered at any time by pressing the key ***c*** on the control unit U15 (at least 2 sec).



On malfunction of the command unit U15, an additional lubrication cycle can be triggered by key S84-2 of the emergency unit command E52.

4 Inspection and maintenance

- **Do not perform any repairs while system is pressurized.**
- **To relieve pressure open a threaded connection carefully**
- **Caution: Lubricant may escape while pressurized**

Regular inspection and maintenance are the prerequisites for proper operation of the centralized lubrication system over a prolonged period of time. The warranty on our product can only be valid if the prescribed maintenance intervals are adhered to. The regular inspections and maintenance procedures are described below:

1. System as a whole

Daily: Visual check of the lubrication points for escaping lubricant
Visual check of the hose connections for leaks or wearing

Weekly: Visual check of the screwed pipe connections for leakage
Determining the time for one operating cycle. If the time determined differs from the usual operating time, the individual components (pump station, injectors, pipes) must be checked.
Functional check of the pressure switch

2. Pump station

Weekly: Check that threaded connections and hoses are firm and tight.
Visual check of pump tube gland seal
Check function of the solenoid valve
Check electrical cable connections
Clean outside of pump station

1000 hours: Clean filter element of grease filter

3. Injectors

Daily: Check movement of control pins: During the work cycle the pins must be retracted depending on the metering quantity; in the resting phase all the pins must be extended.

Weekly: Visual check for leaks

4. Progressive Plunger Metering Device

Weekly: Visual check for leaks

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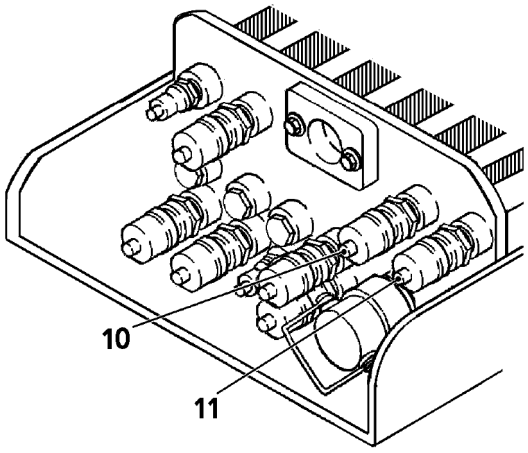
5 Exchanging / topping up grease reservoirs

CAUTION

- **Lines are pressurized. Be careful when decoupling.**
- **Observe extreme cleanliness when exchanging or topping up the grease reservoirs.**
- **Contaminated lubricant causes malfunctions and premature wear of the grease pump and other components of the system.**
- **Clean surroundings before exchanging or topping up**
- **Switch off centralized lubrication system (turn off engine)**

5.1 P1 and P2: Filling of the container



Filling of the container through service-plate

* Remove dust protective cap at the filling coupling and the dust protective cap at the filling nipple
* Couple the filling hose at item 10 (P1) resp. 11 (P2) and switch on the filling pump
- When the reservoir is full, the ultrsonic sensor transmits an electric signal to the control unit. Visual control is possible by screwing off a lid
- the filling pump is switched off
* Disconnect the filling coupling and reinstall the dust protective caps

6 Malfunctions and their remedy

In the following, only malfunctions of the system as a whole are described. You will find detailed remedies for malfunctions of the individual units in the respective User's Information.

• **Malfunction: No pressure build-up in the system**	
• **Cause:**	• **Remedy:**
• Malfunctions of the pump	• See Troubleshooting: Pump
• Leakage in the main line	• Check main lines, eliminate leaks, tighten threaded connections, replace defective hoses
• Air trapped in the main line	• De-aerate the line
• Two-line metering devices leaky or worn	• Replace u-cup sealing at control pin if necessary Change complete metering device if pistons are worn
• Injectors leaky or worn	• See Troubleshooting: Injectors
• **Malfunction: No pressure relief or too slow pressure relief in the main line**	
• **Cause:**	• **Remedy:**
• Pressure control device faulty	• Replace pressure control device, check electric cable
• Solenoid valve faulty	• Replace solenoid valve, check voltage supply
• Grease too hard or not suitable for low temperatures	• Change lubricant

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