

# **Operating Instructions**

**Hydraulic Excavator**

**6030, 6030FS      No.**

**CGM HMSGmbH**



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## **Selection and qualification of personnel; basic responsibilities**

Any work on and with the machine must be executed by reliable personnel only. Statutory minimum age limits must be observed.

Employ only trained or instructed staff and set out clearly the individual responsibilities of the personnel for operation, set-up, maintenance and repair.

Make sure that only authorized personnel works on or with the machine.

Define the machine operator's responsibilities giving the operator the authority to refuse instructions by third parties that are contrary to safety.

Do not allow persons to be trained or instructed or persons taking part in a general training course to work on or with the machine without being permanently supervised by an experienced person.

Work on the electrical system and equipment of the machine must be carried out only by a skilled electrician or by instructed persons under the supervision and guidance of a skilled electrician and in accordance with electrical engineering rules and regulations.

Work on chassis and brake systems must be performed by skilled personnel only, which has been specially trained for such work.

Work on hydraulic systems must be carried out only by personnel with special knowledge and experience of hydraulic equipment.

## **Safety instructions governing specific operational phases**

### **Standard operation**

Avoid any operational mode that might be prejudicial to safety.

Before beginning work, familiarize yourself with the surroundings and circumstances of the site, such as obstacles in the working area and the bearing capacity of the soil.

Take the necessary precautions to ensure that the machine is in a safe and reliable state.

Operate the machine only if all protective and safety-oriented devices, such as removable safety devices, emergency shut-off equipment, sound-proofing elements and exhausters, are in place and fully functional.

Check the machine at least once per working shift for obvious damage and defects. Report any changes (incl. changes in the machine's working behaviour) to the competent organization/person immediately. If necessary, stop the machine immediately and lock it.

In the event of malfunction, stop the machine immediately and lock it. Have any defects rectified immediately.

Start the machine from the driver's seat only.

During start-up and shut-down procedures always watch the indicators in accordance with the operating instructions.

Before setting the machine in motion, make sure that nobody is at risk.

Before starting work or travelling with the machine, check that braking, signalling and lighting systems are fully functional.

Before setting the machine in motion always check that the accessories have been safely stowed away.

In conditions of poor visibility and after dark always switch on the lighting system.

Persons accompanying the driver must be seated on the passenger seat provided for this purpose.

When crossing underpasses and bridges or when passing under overhead lines always make sure that there is sufficient clearance.

Always keep a distance from the working face and from slopes.

Avoid any operation that might be a risk to machine stability.

Never travel across slopes; always keep the working equipment and the load close to the ground, especially when travelling downhill.

On sloping terrain always adapt your travelling speed to the prevailing ground conditions.

Before leaving the driver's seat always secure the machine against inadvertent movement and unauthorized use. Shut off the engines.

## OPERATION - SAFETY INSTRUCTIONS

### Operating instructions



**Never operate the machine before having read and understood the operating instructions.**

#### Pay special attention to:

the "Fundamental Safety Instructions" and to all warning and instruction signs attached to the machine.

Familiarize yourself with the layout, the functioning and the sense of actuation of the control elements prior to starting up the machine.

Activate the control elements from the driver's seat only.

Keep the operating instructions with the machine at all times.

### Operating personnel

The operating personnel must be fully informed of the operation and application of this or comparable machines.

The necessary know-how can be acquired in several days' instruction, e.g. by an CGM HMS mechanic or by attending an CGM HMS operator's training course.

### Personal protective gear and working clothing

Wear a safety helmet and working footwear with non-slip soles. Smooth soles may slip from steps and pedals resulting in injury or incorrect operation.

Wear closely fitting working clothing when operating the machine. Loose, wide garments may result in control levers being inadvertently activated.

Wear ear protectors when leaving the driver's cab with the engines on and running.

### Safety belt

For machines with a safety belt for operating personnel:

Check the safety belt attached to the driver's seat. In the event of damage or after an accident, have it replaced immediately.

Apply the safety belt before starting work.

### State of the machine

Operate the machine only in a safe state and only in accordance with its designated use. Always observe the safety instructions.

Always have inspection and maintenance work carried out on schedule.

Operate the machine only with the equipment and component combinations approved by CGM HMS. Clear-cut data are given in the technical specification.

Never install and commission other equipment and component combinations without CGM HMS having first inspected and approved the project.

Before starting work or travelling with the machine, check that the braking, signalling and lighting systems are fully functional.

Poor visibility may result in accidents. Always clean the windows and the glass covers of all lamps before starting the machine.

Check that all warning and instruction signs attached to the machine are present and legible.

### Entering and leaving the machine

Always face the machine when entering or leaving it.

Use only the ladders, steps, platforms and grab handles provided when entering and leaving the machine.

Always keep ladders, steps and platforms in a non-slip, safe state and remove any oil, grease, soil, snow, ice and other foreign matter immediately.

### Hazard range

The hazard range is that zone around the machine in which persons are within reach of loads or attachments falling as a result of operational movements by the machine, of its equipment and attachments or of swinging loads.

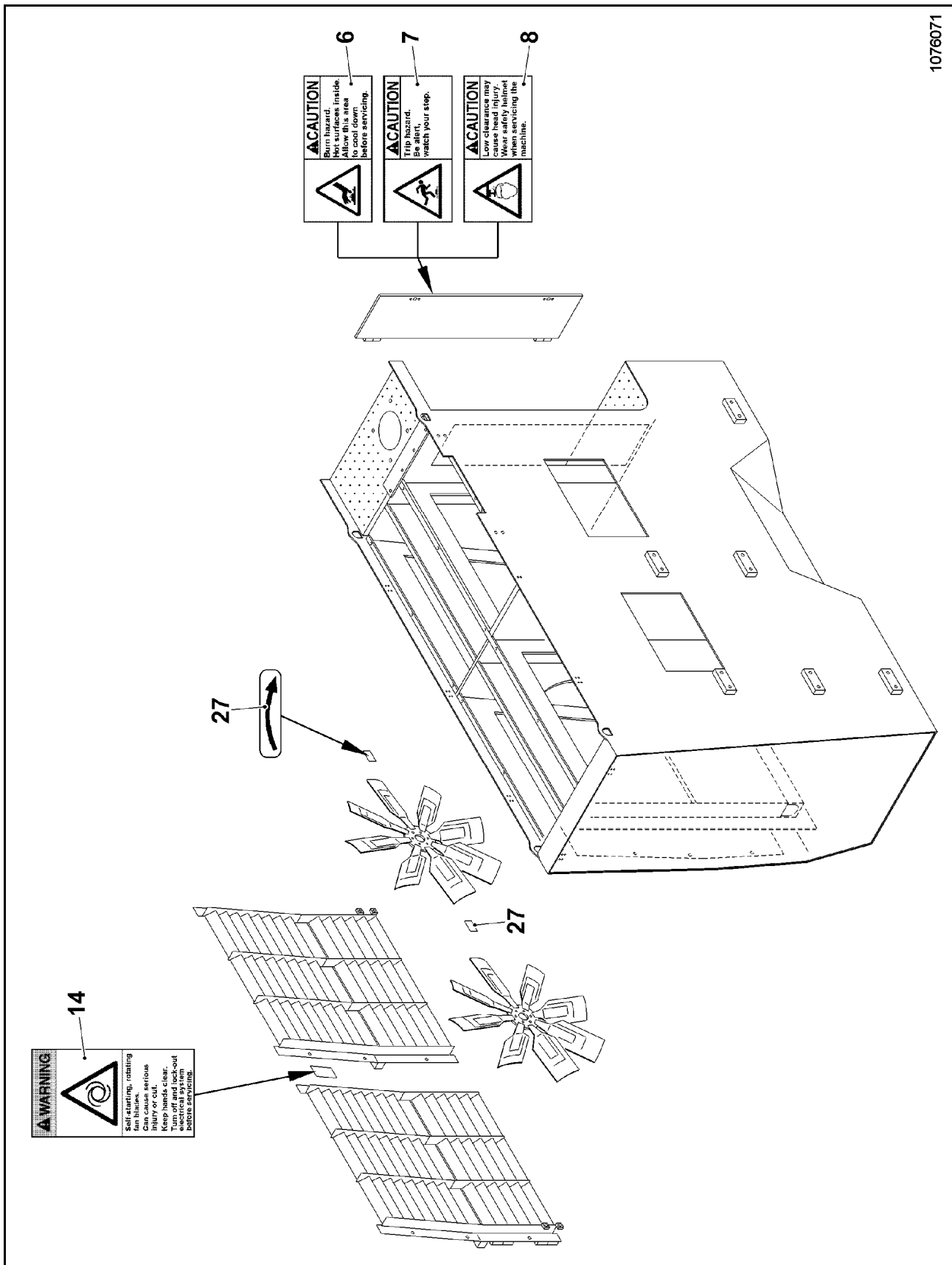


Fig. 2-5:

## Emergency shut-off function

The emergency shut-off function can be triggered from five different places on the machine:

- by pressing the switch (red) on the front panel of the control column (35, Fig. 2-30:),
- by pressing the switch (red) on the drive regulators on the right-hand and on the left-hand side (Fig. 2-31:),
- by pressing the switch (red) on the control cabinet in the engine module (Fig. 2-32:),
- by pulling the pull-switch below the counterweight on the left (5, Fig. 2-33:).

The emergency shut-off function disconnects all power outputs of the electronic control units. In this case, all engines are shut off and all valves are de-energized so that no working movements can be performed anymore.

The power supply of the electronic control units of the engines (ECM) and of the machine (BCS, SPS) is, however, not interrupted. For this reason, the monitoring functions continue to remain active.

Other auxiliary functions such as:

- the fire extinguishing system,
- the service station (tank-lift) and,
- the radio, the cab interior lighting and the access ladder lighting

remain functional as well.

The emergency shut-off function can also be triggered before maintenance operations are performed on the machine. For this purpose, one of the switches is depressed and secured with a padlock. Any inadvertent starting of the engine is thus prevented.

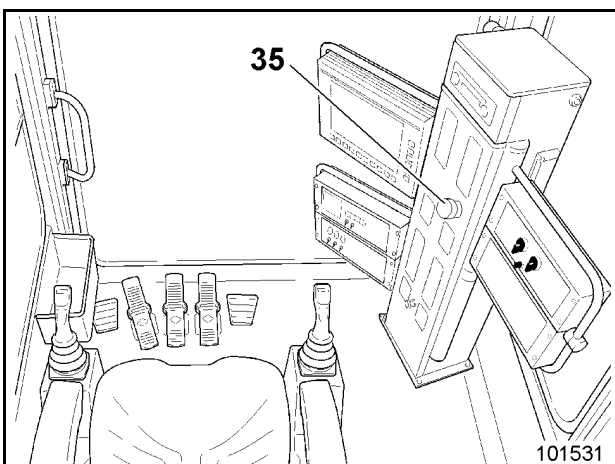


Fig. 2-30:

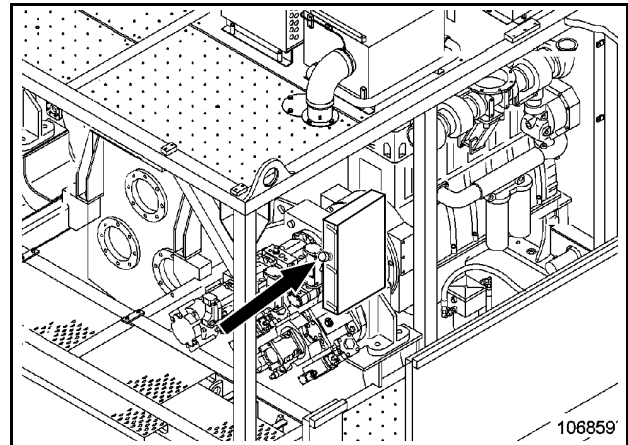


Fig. 2-31:

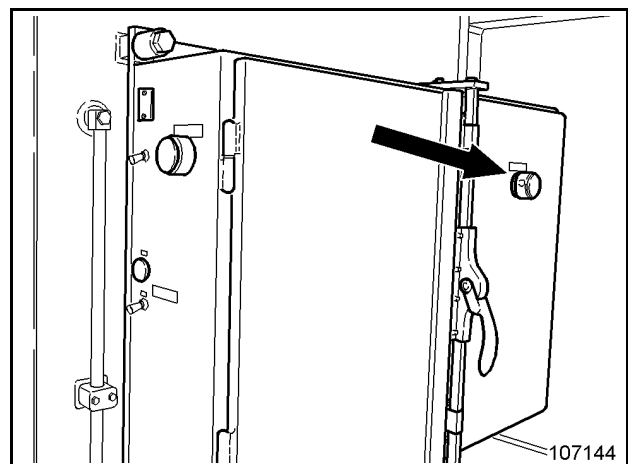


Fig. 2-32:

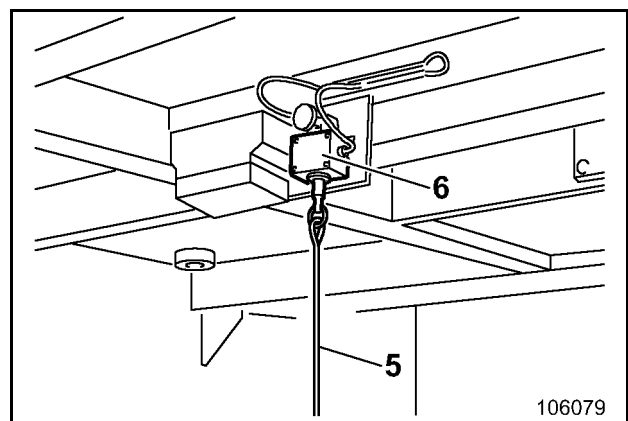


Fig. 2-33:

## Putting the machine back into operation

The machine can only be put back into operation when all switches listed above are again in their basic position (i.e. not actuated).









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(Fig. 2-58:)

## Engine 2 (RH), control and monitoring







All switches and pushbuttons have an illuminated symbol face.

The opposite side is equipped with an LED. The LED lights up when the switch / pushbutton is actuated.

No.	Element	Function	Symbol
51	Push-button Start	Starting of the engine. For starting, press the push-button face with the symbol opposite	
52	Push-button Stop	Stopping of the engine. For stopping, press the push-button face with the symbol opposite	
53	Push-button Idle	Stopping of the engine with an after-run delay of 5 min. For delayed stopping, press the push-button face with the symbol opposite .	
54	Warning lamp Engine oil pressure	Lit up when the engine oil pressure is too low.	
55	Warning lamp Alternator	Lit up when the batteries are not being charged or in the event of an alternator defect.	
56	Warning lamp Engine oil temperature	Lit up when the engine oil temperature is too high.	
57	Warning lamp Cooling liquid temperature	Lit up when the engine cooling liquid temperature is too high.	
58	Switch Engine speed	Press switch face without symbol: the speed of the engine increases.  Press the switch face with the symbol: the speed of the engine reduces.	
59	Diagnosis lamp Engine monitoring	Lits up when malfunctions occur on the engine. The indication uses so-called flash-codes.  <b>Check the BCS display for further fault messages and give an information to the responsible service personnel.</b>	
60	Warning lamp Engine monitoring	<b>STOP!</b> Lits up when a serious fault occurs on the engine. The diagnosis lamp (59) provides the event code at the same time (flashing). <b>Shut off the engine immediately.</b> <b>Check the BCS display for further fault messages and give an information to the responsible service personnel.</b>	

(Fig. 2-63:)

**(Engine 1 (left) monitoring)**

No.	Element	Function	Symbol
121	Monitoring device Engine monitoring (engine 1 left)	Indicates different parameters on the display (E) Use push buttons (C and D) to scroll through parameter list. Indicator lamps (A and B) lit when an active fault occurs.	
122	Thermometer Engine temperature (engine 1 left)	Indicates the cooling-water temperature.	
123	Pressure gauge Engine oil pressure (engine 1 left)	Indicates the oil pressure in the diesel engine lubricating system.	
124	Warning device Engine monitoring (engine 1 left)	Gives an acoustic warning signal if a fault is reported, e.g. <ul style="list-style-type: none"> <li>Engine oil pressure too low,</li> <li>Engine temperature too high.</li> </ul>  <b>Lower the equipment to the ground and shut off engine immediately if the warning device (124) sounds. The warning device (124) continues to sound until the fault has been rectified.</b>	
125	Indicator lamp Idle (engine 1 left)	Lits up when engine is in idle phase.	
126	Warning lamp Cooling water level (engine 1 left)	Lits up when the cooling-water level is too low.	
127	Warning lamp Alternator (engine 1 left)	Lits up when the batteries are not recharged.	

Assemblies resp. reservoirs	Measuring device	Remarks
Fuel tank	BCS fuel indicator (Fig. 2-73:)	<p>Switch on the monitoring system by using toggle switch (23, Fig. 2-74:). The indicator light (22) comes on.</p> <p>Fill in fuel using express coupling (1).</p> <p>The indicator light (32) comes on when the LH fuel tank is full.</p> <p>Stop filling when the fuel tank is full.</p> <p>The indicator light (33) comes on when the RH fuel tank is full.</p> <p>Stop filling when the fuel tank is full.</p> <p>Switch off the monitoring system by using toggle switch (23), indicator light (22) is off.</p>

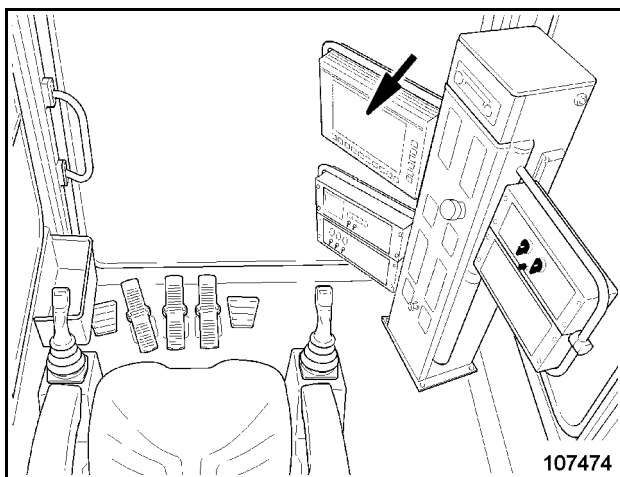


Fig. 2-73:

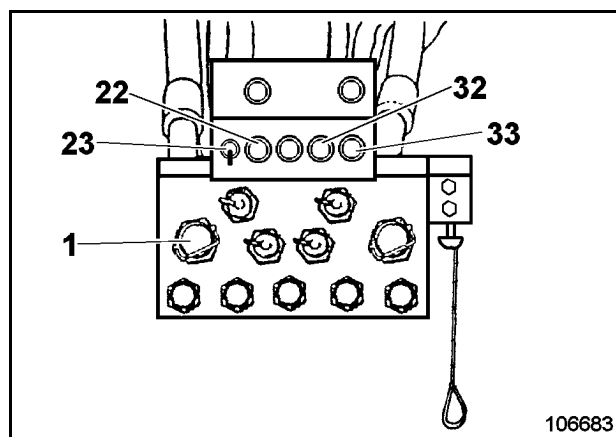


Fig. 2-74:

## AIR CONDITIONER (OPTION)

### Control unit (Sigma)

The illustration (Fig. 2-97:) shows a control unit for a dual air conditioner. The control unit of a single air conditioning system contains the control elements only once.

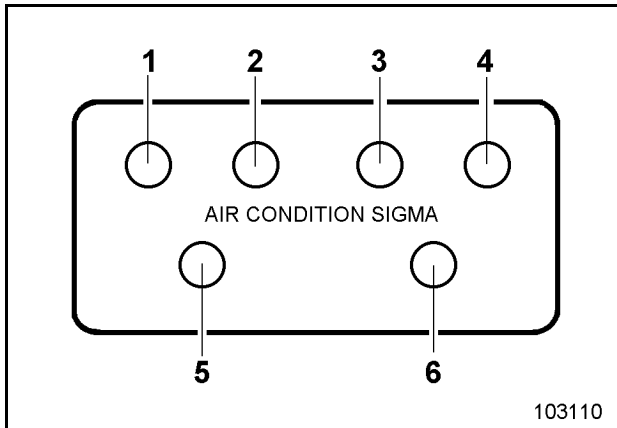


Fig. 2-97:

1	Rotary switch	selects the intensity level of the blower (3 levels)
2	Rotary switch	selects the desired control function (heating, cooling, ventilation, defrosting)
3	Rotary switch	selects the intensity level of the blower (3 levels)
4	Rotary switch	selects the desired control function (heating, cooling, ventilation, defrosting)
5	Thermostat	sets the desired temperature inside the cab
6	Thermostat	sets the desired temperature inside the cab

### Back-up heating driver's cab (option)

The back-up heating for the driver's cab is located in the module below the driver's cab (Fig. 2-98:). The heating consists of one or two heating units (1) and the fuel reservoir (2).

- Switch on the back-up heating using switch (142, Fig. 2-99:). The pilot lamp above switch (142) lights up.

The heating system has an automatic regulation.



**Do not switch on the back-up heating when the air conditioner is set to "cooling".**

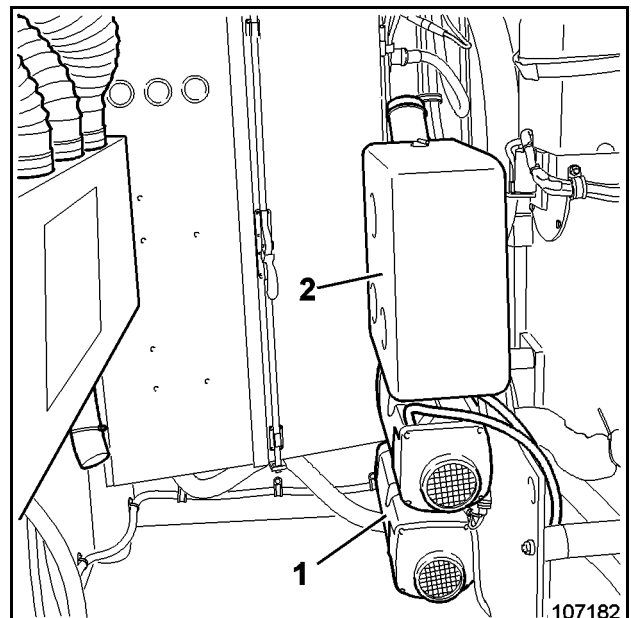


Fig. 2-98:

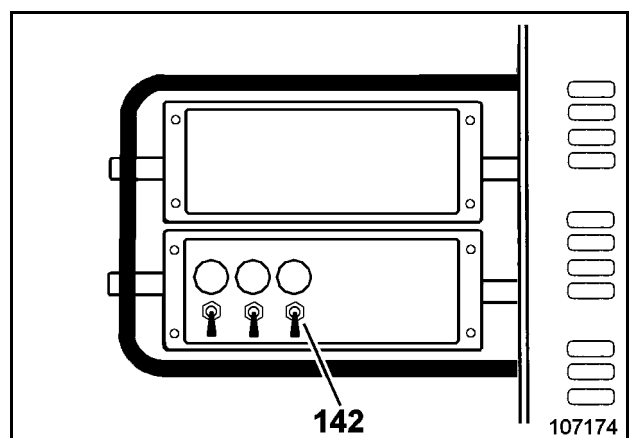


Fig. 2-99:

## WORKING OPERATION - SAFETY INSTRUCTIONS



Read the sections "Fundamental safety instructions" and "Operation, safety instructions" carefully and observe the instructions given in them.

Inspect the site for underground gas, power and water lines before starting work. Any damage to such lines is a risk to life!

Clean off any earth, mud, snow, ice, grease and oil adhering to your working footwear before operating the machine. There is otherwise a risk of slipping off the pedals and initiating inadvertent movements.

Sound the horn to warn persons in the immediate vicinity before starting work.

Stop work if anyone is in the hazard range of the machine. Make sure they have left the hazard range before resuming work.

Never operate the machine unless it is standing on a reasonably horizontal, flat surface. The stability of the machine is otherwise at risk.

Ensure that the attachment has adequate clearance below overhead power lines and structures.

Trenches and working faces may give way. Keep well clear of them.

Do not operate the machine,

- when several track rollers or support rollers have been removed;
- when one or several slewing gearboxes have failed or been removed;
- when one or several teeth on the backhoe or on the shovel are worn or missing;
- when parts of the hardfacing layer on the backhoe or on the shovel are worn or missing.

Working under these circumstances results in heavy wear and possibly in severe damage and thus in high repair costs.

Such circumstances are considered by CGM HMS as "abusive utilization".

**CGM HMS refuses to assume the guarantee for damage and consequential damage caused by an abusive utilization of the machine.**

### Running-in instructions for hydraulic cylinders

Compression of an oil/air compound in a hydraulic cylinder may result in detonations which might damage pistons and sealing rings.

Prior to initial commissioning and/or after repairs, run in the hydraulic cylinders as follows:

- Start up the engines and run at low speed. The pressure-limiting valve in the hydraulic system must not respond
- In the first two working cycles, retract and extend the pistons of the hydraulic cylinders to max.  $\frac{1}{2}$  to  $\frac{3}{4}$  (not to the limit stop). Never change direction suddenly. The waiting time between changes of direction must be at least 4 seconds.
- In the next eight working cycles, retract and extend the pistons of the hydraulic cylinders to the limit stop. The waiting time between changes of direction must be at least 4 seconds.
- When all hydraulic cylinders have been run in, the excavator can operate at a higher engine speed.

### Warming up the hydraulic system

At low temperatures, bring the engines down to moderate speed, then activate all hydraulic functions for about 10 minutes (bring to service temperature). For further instructions, see section "Lubricants".

If the BCS indicates problems with the cooling liquid temperature, engine oil pressure, coolant level, alternator or hydraulic oil filter control (with hydraulic oil at service temperature) light up:

Lower the working equipment and shut off engines.

## ON-BOARD CRANE (OPTIONAL)



The on-board crane is designed for lifting heavy parts only.

Do not lift persons.

Observe all national directives as well as specific regulations relevant to crane operation.

### Personel

Crane work may be carried out only by operators who have the necessary know-how and the permission to operate cranes.

If such know-how or such permission is lacking, meticulous instruction must be given by experienced personnel, e.g. from CGM HMS GmbH.

Incorrect operation of the crane may give rise to life-threatening situations.

## Monitoring, warning and control elements

(Fig. 2-130:)

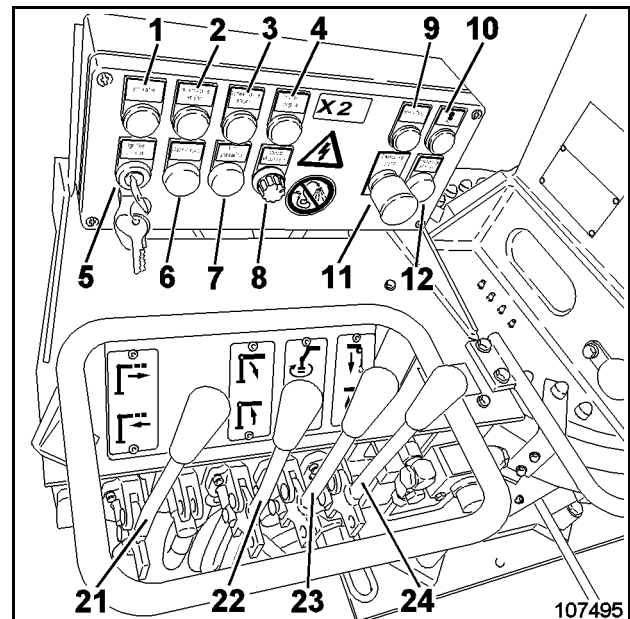


Fig. 2-130:

Pos.	Element	Function
1	Monitoring lamp	Alternator
2	Warning lamp	Engine oil pressure
3	Warning lamp	Engine temperature
4	Monitoring lamp	Air filter
5	Key-switch	Electrical system ON/OFF
6	Button	Start engine of drive unit
7	Monitoring lamp	Preheating system (option)
8	Knob	Engine speed variation
9	Monitoring lamp	Crane in operation
10	Warning lamp	Malfunction
11	Button	EMERGENCY STOP
12	Button	Emergency lowering of winch
21	Control lever	Extending and retracting of boom extension
22	Control lever	Folding the boom
23	Control lever	Swinging the boom
24	Control lever	Winch up / down

### **Relieving residual pressure in the hydraulic system**

Only unpressurized hydraulic systems may be opened. Even when a machine is parked on a horizontal surface with its attachments supported on the ground and its driving motors switched off, there may still be substantial residual pressure in parts of the hydraulic system, e.g. primary pressure from the last hydraulic movements prior to stopping the machine.

Residual pressure is reduced only gradually. If an intervention into the hydraulic system is to be undertaken immediately after stopping, the system must be depressurized:

(do not leave the driver's seat)

- Stand working equipment on the ground,
- Shut off the engines,
- Move all control levers and pedals repeatedly into all directions.

### **Screwed connections, piping, hydraulic hoses**

Repair any leakage in the piping and hose system immediately.

A fine, highly pressurized jet of hydraulic oil can penetrate the skin.

Never search for leakages with the fingers, but use a piece of cardboard and always wear goggles.

If oil has penetrated into the skin, consult a doctor immediately.

Never repair damaged piping; always replace them.

Replace hydraulic hoses immediately on detecting any damage or moist areas.

Tighten leaking screw plugs only when the system is depressurized.

Escaping oil is an environmental hazard.

## Plan N

Plan N – After initial commissioning and during the running-in period (after approx. 100 OH)

Page 1 of 2

Location	Servicing work	Quantity/ No.
<b>Engine</b> - Bearing, Fastening bolts	Check for tightness	
<b>Cooling system</b> Water filter Radiator - Bearing - Fastening bolts	Replace  Check for tightness	2 x 1
<b>Hydraulic system</b> Oil cooler - Bearing - Fastening bolts Return-flow filter Magnetic rod Filter housing (cooling system) - Return-flow filter - Magnetic rod Pressure accumulator – emergency lowering Pressure accumulator - ramp-type ladder (optional)	Check for tightness Replace Clean Replace Clean Check function Check function	   7 1  2 2 1 1
<b>Pump transfer gearbox</b> - Pre-chambers - Fastening bolts	Change oil Change oil Check for tightness	2 <sup>4</sup> 2 x 3 <sup>4</sup>
<b>Swing gearbox (Gearbox P/N 3692960)</b> - Fastening bolts	Change oil Check for tightness	2 <sup>4</sup>
<b>Swing gearbox (Gearbox P/N 3676892)</b> - Brake chamber - Fastening bolts	Change oil Change oil Check for tightness	2 <sup>4</sup> 2 <sup>4</sup>
<b>Travel gearbox (Gearbox P/N 2712182)</b> - Pre-chamber (spur gear section) - Brake chambers Fastening bolts	Change oil Change oil Change oil Check for tightness	2 <sup>4</sup> 2 x 1 <sup>4</sup> 2 x 2 <sup>4</sup>
<b>Travel gearbox (Gearbox P/N 3683493)</b> - Brake chambers	Check oil level Check oil level	2 2 x 2

<sup>4</sup> see: "Refilling quantities – Oil" table

Plan **A** - after every 250 OH  
(at 250, 750, 1250 ... OH)

Plan **B** - after every 500 OH  
(at 500, 1500, 2500 ... OH)

Plan **C** - after every 1000 OH  
(at 1000, 2000, 3000, 4000 ... OH)

Plan **D** - after every 5000 OH  
(at 5000, 15000, 25000 ... OH)

Plan **E** - after every 10000 OH  
(at 10000, 20000, 30000, ... OH)

Location	Servicing work	Menge / No.	Plan A	Plan B	Plan C	Plan D	Plan E
<b>On-board crane (Option)<sup>14</sup></b>			●	●	●	●	●
- Bearing	Lubricate	4					
- Joint (column / boom)	Lubricate	2					
- Cylinder bearing	Lubricate	5					
- Swing ring	Grease	1					
Hydraulic system	Change oil	1 <sup>15</sup>					
- Return-flow filter	Replace	1					
- Breather filter	Replace	1					
	see: "On-Board Crane" operating instructions		●	●	●	●	●
Crane drive engine	Clean	1					
	Change oil	1 <sup>15</sup>					
- Oil filter	Replace	1					
- Fastening bolts	Check for tightness	1					
- Fuel filter	Replace	1					
- Air filter	Replace	1					
- Battery cable connection	Check for tightness	2					
	see: "Crane Drive Engine" operating instructions						
<b>Steel components</b>	Visual inspection acc. to "Structural Inspection Report every 500 OH" <sup>16</sup>			●	●	●	●
	Inspection with dye penetrant test acc. to "Structural Inspection Report every 5000 OH" <sup>16</sup>					●	●
<b>Modules</b>							
- Fastening bolts	Check for tightness (see: „Technical Handbook“)				●	●	●
<b>All articulated joints and hinges</b>	Grease				●	●	●

<sup>14</sup> Do all servicing jobs at least once a year and when necessary

<sup>15</sup> see: "Refilling quantities – Oil" table

<sup>16</sup> "Structural Inspection Reports" for inspections every 500 OH and every 5000 OH can be downloaded from the CGM HMS website, section "Support, Warranty".

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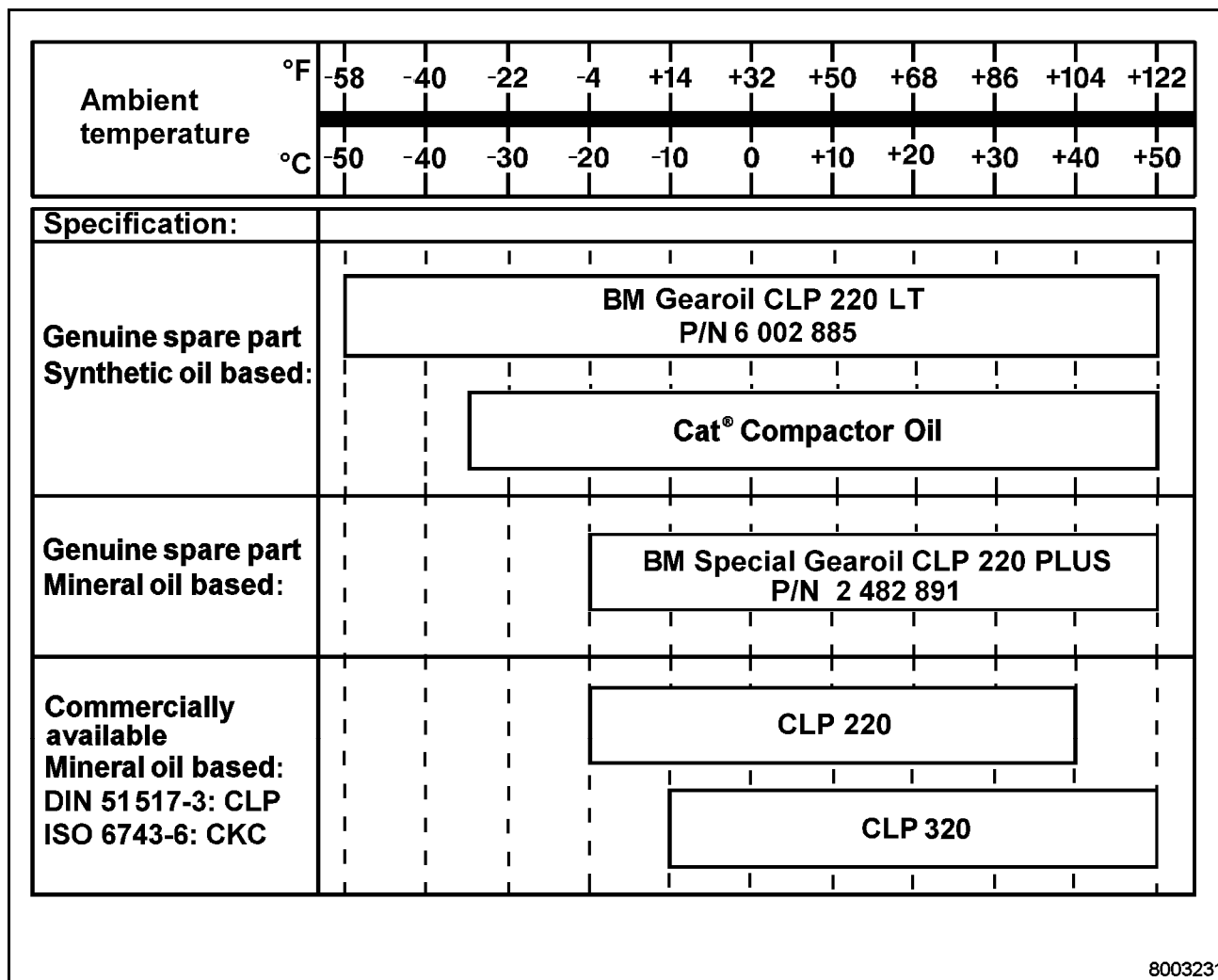
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### III.b Oils for swing gearboxes



8003231

Fig. 3-6:

## Draining the oil off the engine oil reservoir (optional)



Risk of scalding from hot engine oil.

The engines oil reservoirs may also be hot.

Wear protective gloves and firm working clothing.

Collect escaping oil and discard without polluting the environment

### Drawing the oil off the engine oil reservoir (optional)

- Bring engine oil to operating temperature.
- Park the machine on a horizontal surface and secure engine oil reservoir
- Shut off the engines.

Draw off engine oil with the service station (Fig. 3-22:) through

- express coupling (6) for the lefthand engine oil reservoir
- express coupling (7) for the righthand engine oil reservoir
- Unscrew cap of epress coupling and connect hose line of the service vehicle

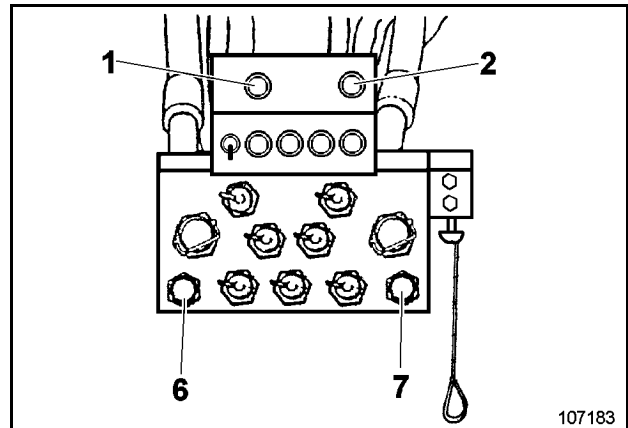


Fig. 3-22:

The hose line and its use are described in the "hose line for oil and cooling liquid change" section.

- Remove the hose line.  
The express coupling closes automatically.
- Screw on protective cap.
- After the engine oil has been drawn off:  
Replace the oil filters.

### Removal and installation

- Unscrew nut (1, Fig. 3-36:) and remove cover (2).
- Unscrew nut (4) and withdraw main filter element (5). Do not loose the washer under nut (4).
- Replace or clean main filter element.

New or cleaned main filter elements should always be at hand to shorten excavator downtimes.

Before installing the filter element, clean contact faces at cover (2) and at filter housing.

- Put on cover (2) and tighten nut (1).

During the removal of the main filter element, the safety element (7, Fig. 3-37:) must remain in the filter housing.

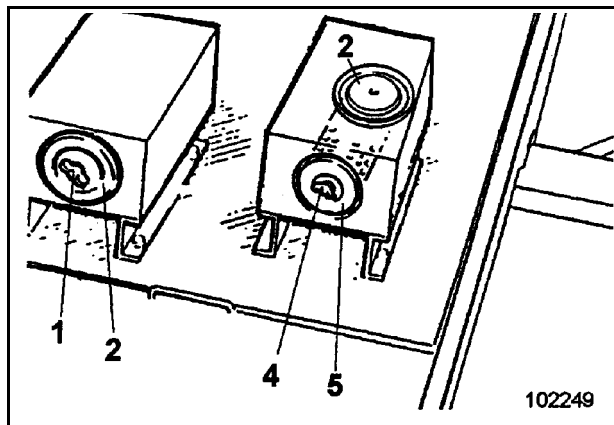


Fig. 3-36:

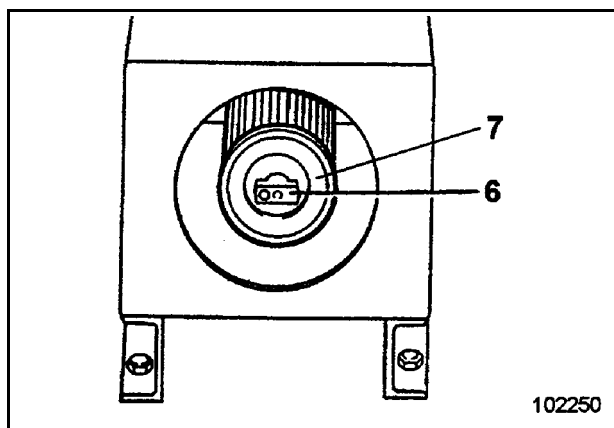


Fig. 3-37:

## Charging batteries inside the machine, safety instructions



**Explosion hazard.**

**Battery gases are highly flammable.**

**Keep any potential ignition sources, such as unshielded lights or burning cigarettes, away from the batteries.**

**Risk of injury from acid splashes and battery gases.**

**Wear safety goggles or a face protection shield and acid proof protective gloves.**

**Do not lean over the batteries while charging.**

The batteries of the machine can also be charged while installed in the machine.

For this purpose, the arm of the service station (Fig. 3-52:) is equipped with a socket outlet for a charging cable.



**Risk of fire**

**Do not use the socket outlet (Fig. 3-52:) for jump-starting of the engines.**

**The connectors and the cables are not designed for the high currents flowing during the starting phase.**

Check before charging why the batteries are discharged and replace the batteries if they are defective.

Check the connecting cables of the battery set for damage, corrosion and tight fit.

Never charge the batteries while they are frozen. Warm them up beforehand and check for proper functioning.

Do not charge the batteries when they are warmer than "warm to the touch" (45 °C / 113 °F).

Use only approved chargers for 24 volts DC. Read and observe the instructions for the charger.

The charging cable must have a conductor cross-section of at least 70 mm<sup>2</sup>.

## Charging the batteries

- Cut out the battery main switch.
- For battery ventilation unscrew the cover of the battery cabinet.
- Connect the charging cable to the socket outlet (Fig. 3-52:).
- Switch on the charger and watch the charging process.

Stop the charging process:

- if the batteries are getting hot,
- if acid escapes from the batteries,
- if the charge current is still insignificantly low even after 15 minutes of charging.

Before starting a new charging cycle, check the batteries and the connecting cable thoroughly and replace any damaged components. It may be necessary to remove the batteries and to charge them one by one.

When the batteries are full:

- Shut off the charger first before withdrawing the charging cable from the socket outlet.

Read the instructions of the charger in order to know when the charging cycle has ended.

The batteries are fully charged, if

- the charging current and voltage remain constant (for voltage-controlled chargers);
- the charging current does not any rise longer for two hours (current-controlled chargers);
- the charger shuts off or switches over to trickle charge (automatic chargers).

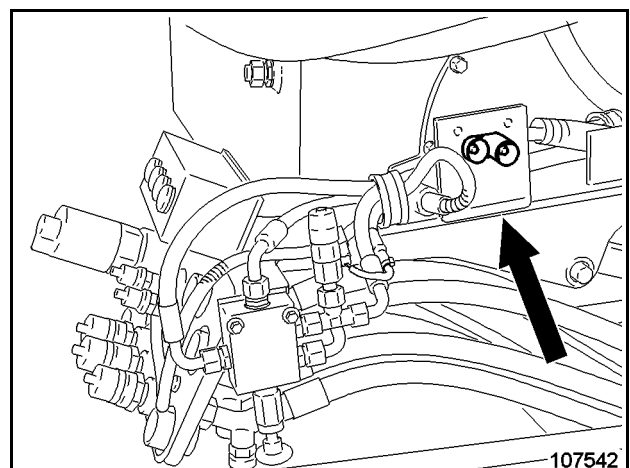


Fig. 3-52:

## HYDRAULIC SYSTEM

### Hydraulic system - Safety instructions



Read and observe the "Inspection and servicing – Safety instructions" chapter.

Before working on the hydraulic system, make sure that the system is without pressure and that the residual pressures have also been eliminated.

Shut off the engines.

Risk of burning caused by hot hydraulic components (e.g. hydraulic oil reservoir, cylinder, valves).

Secure the machine as described in the "Securing the machine" section.

Avoid skin contact with hydraulic oil.

Contact with hydraulic oil can cause skin injury. Wear protective gloves and firm working clothing.

### Depressurizing the hydraulic system

Hydraulic systems may only be opened if they are completely depressurized. Even when an excavator is parked on a horizontal surface with the working equipment resting on the ground (Fig. 3-72: and Fig. 3-73:) and with its drive engines stationary, there may still be a considerable amount of residual pressure in parts of the hydraulic system, as e.g. the primary pressure resulting from the last hydraulic movements before the immobilization. Residual pressures disappear only gradually. If work is to be carried out on the hydraulic system immediately after the immobilization, the system must be freed from pressure, i.e. depressurized:

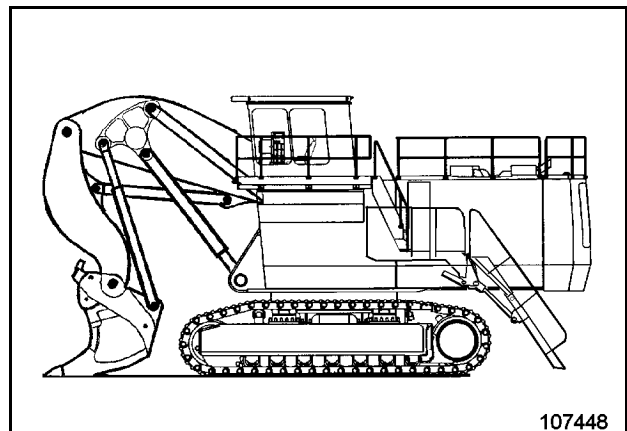


Fig. 3-72:

- Locate the system section to be opened.
- Depressurize the section to be opened. If required, the necessary measures described must be combined.
- Open the depressurized system section with caution.

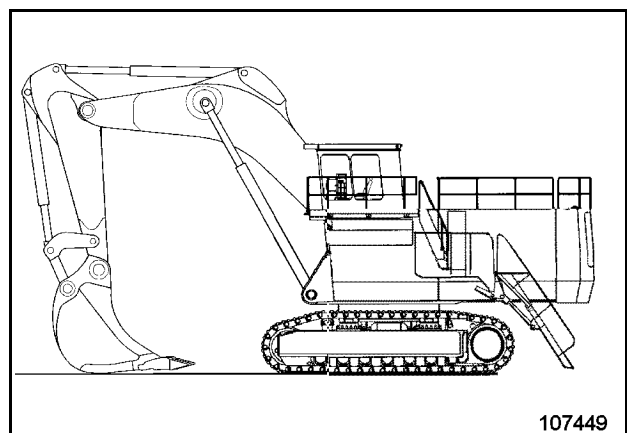


Fig. 3-73:

## High-pressure filter for working hydraulics, replace

To filter the hydraulic oil on the high-pressure side of the working hydraulic system, the machine is equipped with four high-pressure filters (Fig. 3-92:). The filters are located in the pump compartment.

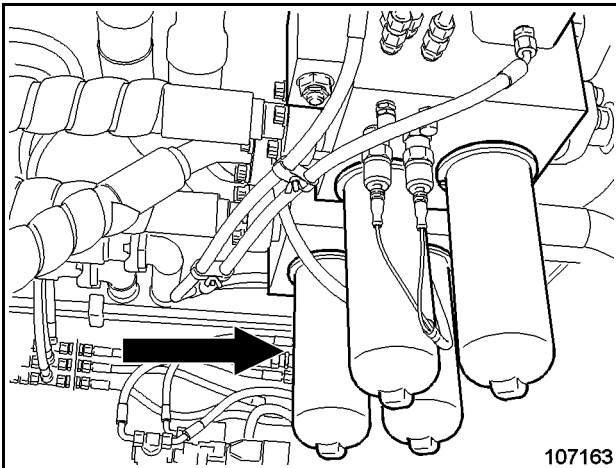


Fig. 3-92:



Shut off the engines.

Risk of scalding caused by hot hydraulic oil.

The filter housings themselves may also be hot.

Avoid skin contact.

Skin contact with hydraulic oil may cause skin injury.

Wear protective gloves and firm working clothing.

Collect escaping hydraulic oil and discard without polluting the environment.

## Checking/cleaning the filter elements

- Unscrew drain plug (11, Fig. 3-93:) and drain the hydraulic oil from the filter housing (9). (Place a suitable resilient under the filter housing).
- Unscrew filter housing (9).
- Disengage filter element (15) with a slight turn from its retaining catch and withdraw from filter housing (9).
- Clean filter element (15) in white spirit or paraffin oil.
- Replace filter element (15) if it is damaged.
- Check seals (10 and 14) and replace, if required.
- Re-assemble the filter element in reverse order.
- Check for leaks after putting the filter into operation.

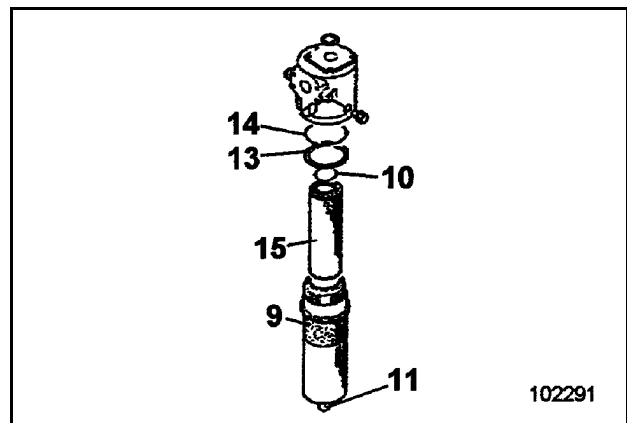


Fig. 3-93:

## Replacing the filter elements

- Detach the filter element as described under "Checking / cleaning the filter elements".
- Clean filter housing (9, Fig. 3-93:) and the sealing faces at the filter head with white spirit or paraffin oil.
- Insert new filter element into filter housing (9) and refit to the filter head with new, lightly oiled sealing rings (10 and 14) and a new retaining ring (13).

Check high-pressure filter for leaks after putting it into operation.

### Pressure accumulators - Emergency lowering and servo circuit

To permit the working equipment to be lowered in an emergency, the machine is equipped with pressure accumulators (arrows, Fig. 3-111:).

The pressure accumulators are located outside the module below the driver's cab.

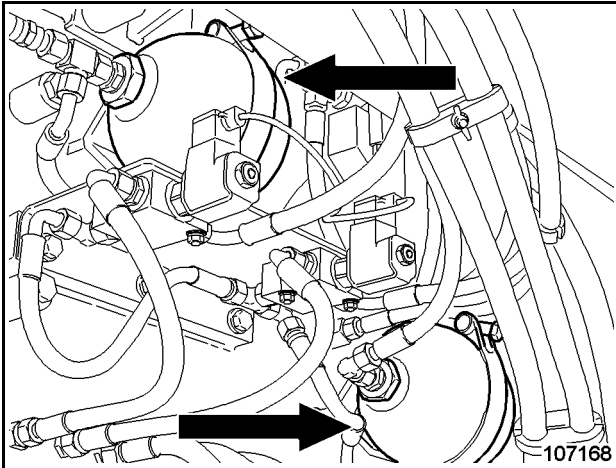


Fig. 3-111:

### Pressure-accumulator inspection regulations

**The following regulations are applicable only in Germany. Please observe the relevant regulations in force in your own country.**

### Extract from the German regulations

The accumulator vessel must not be subjected to welding, soldering or any other mechanical work. Work on systems containing accumulators (repairs, connection of pressure gauges or similar work) may be carried out only when the fluid pressure has been released

### Extract from the German acceptance regulations


Hydraulic accumulators are pressure vessels and are therefore subject to the "Druckbehälterverordnung (DruckbehV)" [Pressure Vessel Regulations]. Their installation, equipment and operation are governed by the "Technische Regeln Druckbehälter (TRB)" [Technical Rules for Pressure Vessels]. The pressure vessels of hydraulic accumulators are classified by the admissible operating pressure  $p$  in bars, the capacity  $l$  in liters and the product of pressure and capacity  $p \times l$ . Depending on the class to which the accumulator belongs, the following inspections are mandatory:

Checking the gas charging pressure in the pressure accumulator

After commissioning (new installation or repair), the gas charging pressure in the pressure vessel must be checked at least once during the first week. If no pressure loss is detected, the second pressure test must be performed after ca. 3 months. If no pressure loss is detected in this test either, the testing interval can be fixed at once pressure test each year.

Group	Inspections prior to commissioning		Regular inspections
	at the factory	at the place of use	
II $p \geq 1$ bar and $p \times l \leq 200$	Pressure testing Prototype and pressure test certified by the manufacturer	Inspection certificate (Check of correctness and correct installation) issued by an expert	Inspection schedule to be drawn up by end user, based on experience with type of operation and fluid.

**TRAVEL GEARBOX P/N 2712182**  
 (For travel gearbox P/N 2712182 only)

 **Risk of scalding caused by hot gearbox oil.**  
 The gearbox housings may be hot, too.

**Shut off the engines and let cool down.**

**Skin contact with cooling liquid is a potential health hazard. Protect the skin from contact with gearbox oil.**  
**Wear protective gloves and firm working clothing.**

Secure the machine as described in the "Securing the machine" section.

Read and observe: "Inspection and servicing - Safety instructions".

**Travel gearbox, checking the oil level / Topping up with oil**

- Move the excavator into such a position that the screw plugs (1, 2 and 3, Fig. 3-132: are in the displayed position.
- Unscrew checking screw (1). The oil level should reach up to the lower edge of the opening. Top up with oil, if required. (Oil grade see "LUBRICANTS" section).
- Screw checking plug (1) back in place.

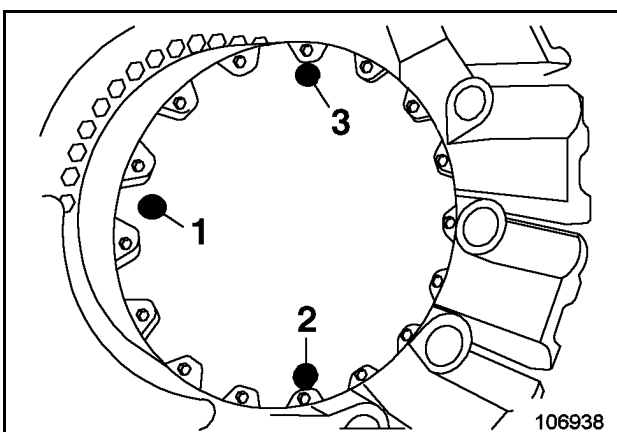


Fig. 3-132:

**Pre-chamber / spur gear section - Checking the oil level / Topping up with oil**

- Check oil level at the inspection glass (2, Fig. 3-133:). The oil level should be the center of the inspection glass.
- If required screw out plug (4) and top up with oil through the opening. (Oil grade see "LUBRICANTS" section).
- Screw in plug (4) back in place.

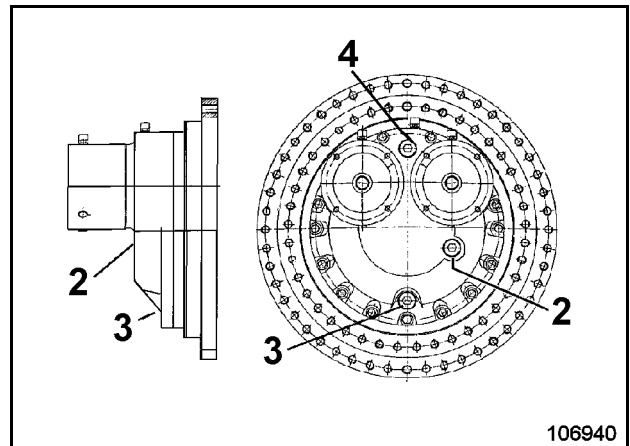


Fig. 3-133:

**Brake chamber - Checking the oil level / Topping up with oil**

- Unscrew checking screw (6, Fig. 3-134:). The oil level should reach up to the lower edge of the opening. Top up with oil, if required (see: "Brake chamber, changing oil").
- Screw checking plug (6) back in place.

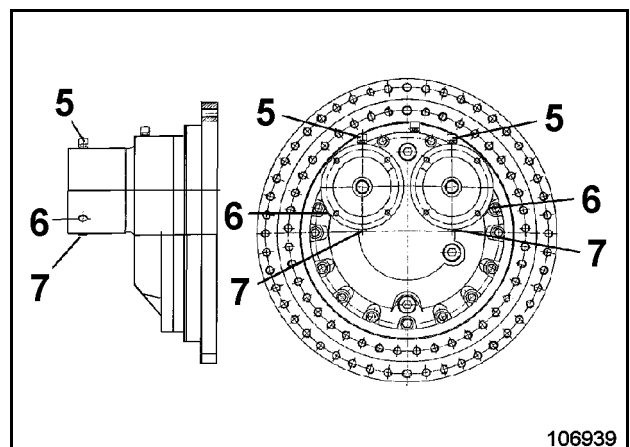


Fig. 3-134:

## SWING RING



**Read and observe: "Inspection and servicing - Safety instructions."**

Shut off the engines.  
Wear protective gloves and firm protective clothing.

## Swing ring - Instructions

The grease filling must be replaced:

- when repairs have been carried out on the swing ring, the swing ring seals or the swing ring housing.

Remove old grease completely before filling in new grease.

If greater losses are detected, locate cause immediately to prevent damage to the swing ring. Greases and greasy cleaning rags must not be allowed to pollute the environment. Discard grease and greasy cleaning rags separately from other waste without polluting the environment.

## Bearing races

The central lubricating system supplies grease continuously to the two roller bearing races and the internal gearing .

The grease is pumped to the greasing points of the bearing races by a distributor (Fig. 3-149:).

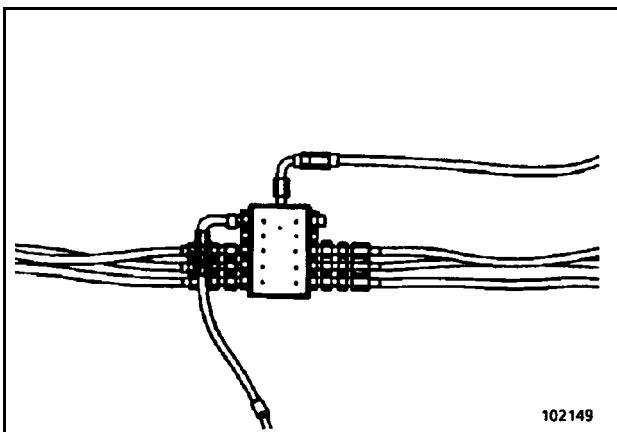


Fig. 3-149:

## Internal gearing

The internal gearing (1, Fig. 3-150:) and the pinion (2) are enclosed in a housing (3, Fig. 3-151:). The housing forms a grease-filled trough in which the pinion of the swing mechanism moves.

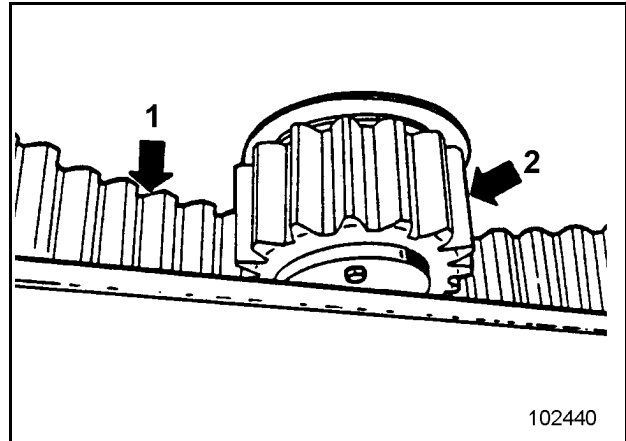


Fig. 3-150:

The grease is pumped to the greasing port of the grease trough by the distributor (Fig. 3-149:). The amount of grease used up during operation is replenished by the central lubricating system.

The housings have a check opening which is closed with a cover (2, Fig. 3-151:). For checking, the cover must be removed.

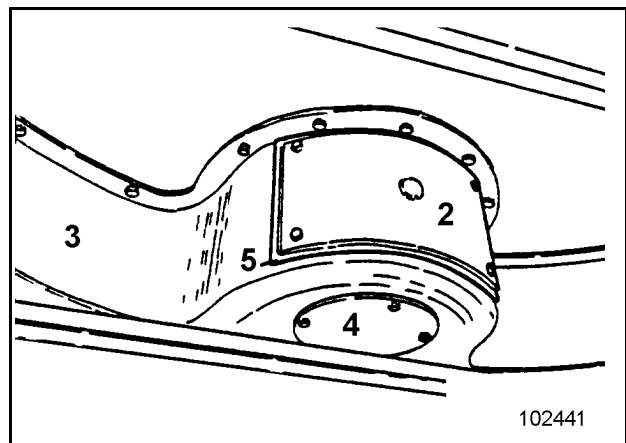


Fig. 3-151:

## Pressure-accumulator inspection regulations



**The following regulations are applicable only in Germany. Please observe the relevant regulations in force in your own country.**

### Extract from the German regulations

The accumulator vessel must not be subjected to welding, soldering or any other mechanical work. Work on systems containing accumulators (repairs, connection of pressure gauges or similar work) may be carried out only when the fluid pressure has been relieved.

### Extract from the German acceptance regulations

Hydraulic accumulators are pressure vessels and are therefore subject to the "Druckbehälterverordnung (DruckbehV)" [Pressure Vessel Regulations]. Their installation, equipment and operation are governed by the "Technische Regeln Druckbehälter (TRB)" [Technical Rules for Pressure Vessels]. The pressure vessels of hydraulic accumulators are classified by the admissible operating pressure  $p$  in bars, the capacity  $l$  in liters and the product of pressure and capacity  $p \times l$ . Depending on the class to which the accumulator belongs, the following inspections are mandatory:

## Checking the gas charging pressure in the pressure accumulator

After commissioning (new installation or repair), the gas charging pressure in the pressure vessel must be checked at least once during the first week. If no pressure loss is detected, the second pressure test must be performed after ca. 3 months. If no pressure loss is detected in this test either, the testing interval can be fixed at once pressure test **each year**.

Group	Inspections prior to commissioning		Regular inspections
	at the factory	at the place of use	
III $p \geq 1$ bar and $p \cdot x \cdot l \geq 200$ bars $p \cdot x \cdot l \leq 1000$ bars	Preliminary inspection by an expert  Prototype and pressure test certified by the manufacturer (type approval) or the expert	Acceptance inspection by an expert	Inspection schedule to be drawn up by end user, based on experience with type of operation and operating fluids.

## REPAIR WORK, FIRE AND EXPLOSION HAZARD



### Safety instructions

**Prior to commencing work, obtain information on the national and corporate rules for the prevention of accidents and avoiding fires.**

**Pay particular attention to hazards caused by combustible and easily flammable substances.**

**Obtain information on the safe handling of the fire extinguishers to be used.**

Avoid smoking and open fire on, next to and below the excavator.

Even battery gases can ignite in open flames or fire.

Combustible and easily or highly inflammable substances or liquids increase the risk of fire and explosion. This is also valid for pressure vessels containing flammable substances as, for instance, spray oil or cold-starting fluid (ether). They are heat-sensitive and can explode even if exposed only to intensive sunlight.

These substance can also ignite themselves if they come close to hot units or objects as, for instance, a turbocharger.

Do not store these substances on the excavator. If combustible, easily or highly flammable substances or liquids were used during maintenance operations, they must be completely removed from the excavator at the end of the work.

Avoid parking the excavator in places where

- combustible substances such as coal dust or tar are present.
- open or smouldering fire may occur.

Remove the excavator from such an area where combustible or easily flammable liquids have spilled from the excavator onto the ground.

Flying sparks (caused by welding, flame cutting, grinding, electrical short-circuit) may cause fire on the ground that can spread to the excavator.

Place suitable fire guardings (fire barriers) if open fire or flying sparks cannot be avoided during repair work.

If necessary, also cover the ground with fire-protective blankets.

Apply special protection to cables, cable ducts as well as to hose and pipe lines.

Have all your welding, flame cutting and grinding work approved before starting work.

The engine compartment can be equipped with pressure vessels containing cold-starting fluid (ether). Ether is toxic and highly flammable; the vessels are under pressure. These pressure vessels can explode if exposed to high temperatures (above 49°C / 120°F) or in the event of damage. Protect the pressure vessels against damage before beginning to work in or close to the engine compartment.

Ensure sufficient ventilation.

Do not keep any fire extinguishers that are not suitable or have not been tested.

Do not extinguish flammable liquids with water. Use:

- dry-powder, carbon-dioxide or foam extinguishing compounds.

When getting into contact with burning substances, the fire-fighting water would abruptly evaporate and distribute the substance such as oil over a wide area. Water causes short-circuits in the electrical system thus possibly entailing new hazards.

Call the fire brigade.

Clean the excavator carefully after the maintenance, if oil, grease, fuel, detergents or cold-starting fluid have been spilt over the machine. If possible, use a steam-jet cleaner for cleaning.



### Information given on the “Service” screen

1	Tapping on the photo of the engine opens a screen displaying current engine data (see “Engine data screen”). Same result when tapping on button “Engine” or pressing key “1” on the housing.	4	Tapping on the photo of the control lever (joystick) opens a screen displaying control elements adjusting data (see “Controls adjustment data screen”). Same result when tapping on button “Servo-system” or pressing key “7” on the housing.
2	Tapping on the photo of the hydraulic pumps opens a screen displaying current hydraulic data (see “Hydraulic data screen”). Same result when tapping on button “Hydraulic” or pressing key “3” on the housing.	5	Tapping on this button opens the “View documents” screen (see: “View documents screen”).
3	Tapping on the photo of the lubrication control opens a screen displaying current lubrication data (see “Lubrication data screen”). Same result when tapping on button “Lubrication” or pressing key “5” on the housing.	6	Adjusting screen brightness. Sliding the green button sets screen brighter / darker. Tapping on button “Autom.” sets brightness to automatic mode.
		7	Tapping on this button opens the “Signal Table” screen (see: “Signal Table screen”).
		8	Tapping the button with the door icon “Exit” leaves the current screen and opens the previous screen.

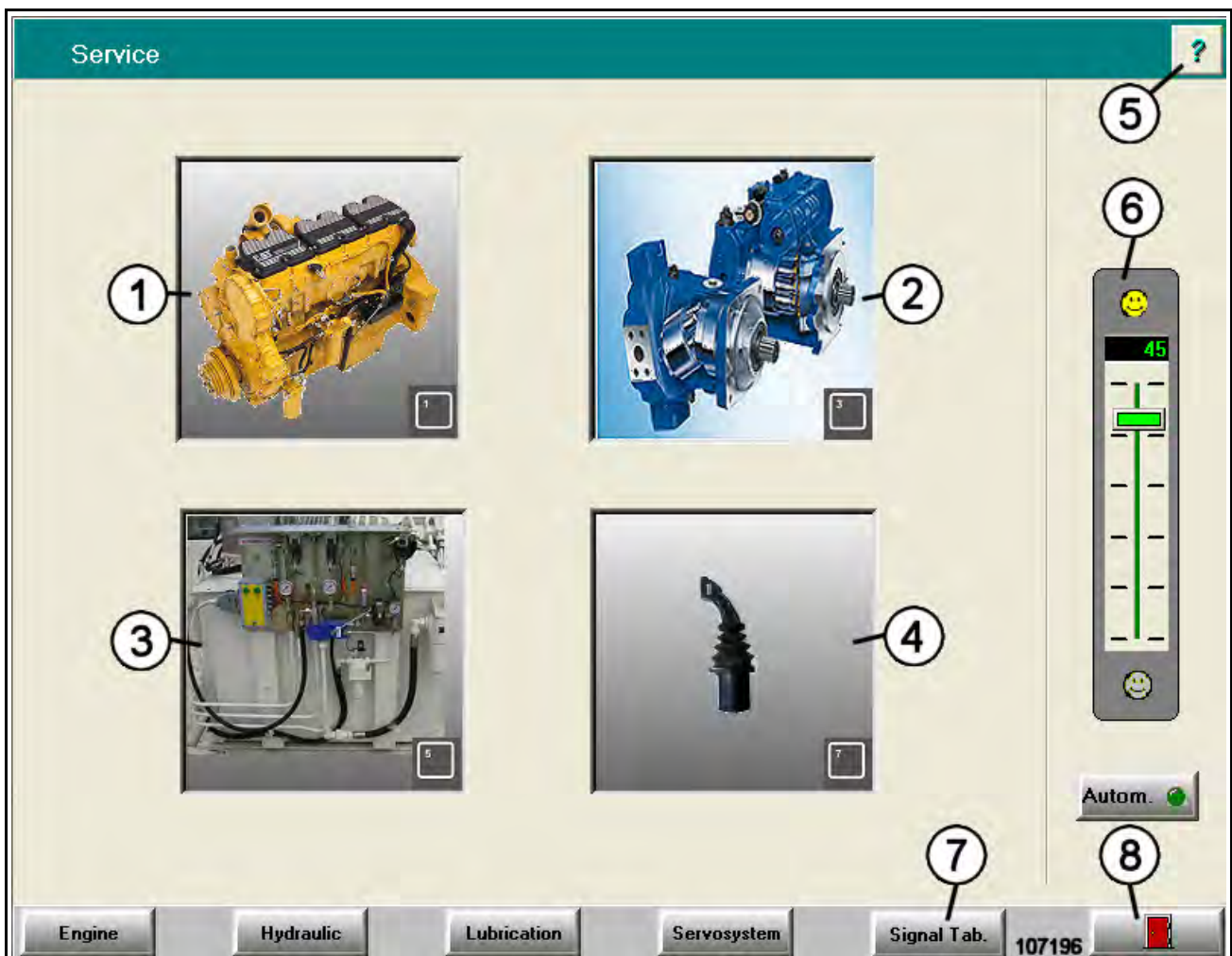


Fig. 5-7:

### Code table screen

Coming from the “Engine data screen” (Fig. 5-8:) after tapping the “Code Table” button.

This screen displays a listing of all available trouble codes according to the SAE J1939 standard.

Active faults or malfunctions are displayed on the “Engine data screen” with their “SPN Number” and their “FMI Number”. To get the description for the fault or malfunction, key in both numbers at (1) and tap on the button left aside.

The appropriate description will be displayed (2).

- |   |   |
|---|---|
| 1 | SPN = Suspect Parameter Number, according to SAE J1939 standard,<br>For example: 94                   |
| 2 | FMI = Failure Mode Identifier, according to SAE J1939 standard,<br>For example: 18                    |
| 3 | Tapping these buttons will scroll the listing: forward, reverse, to beginning, to end.                |
| 4 | Tapping the button with the door icon “Exit” leaves the current screen and opens the previous screen. |

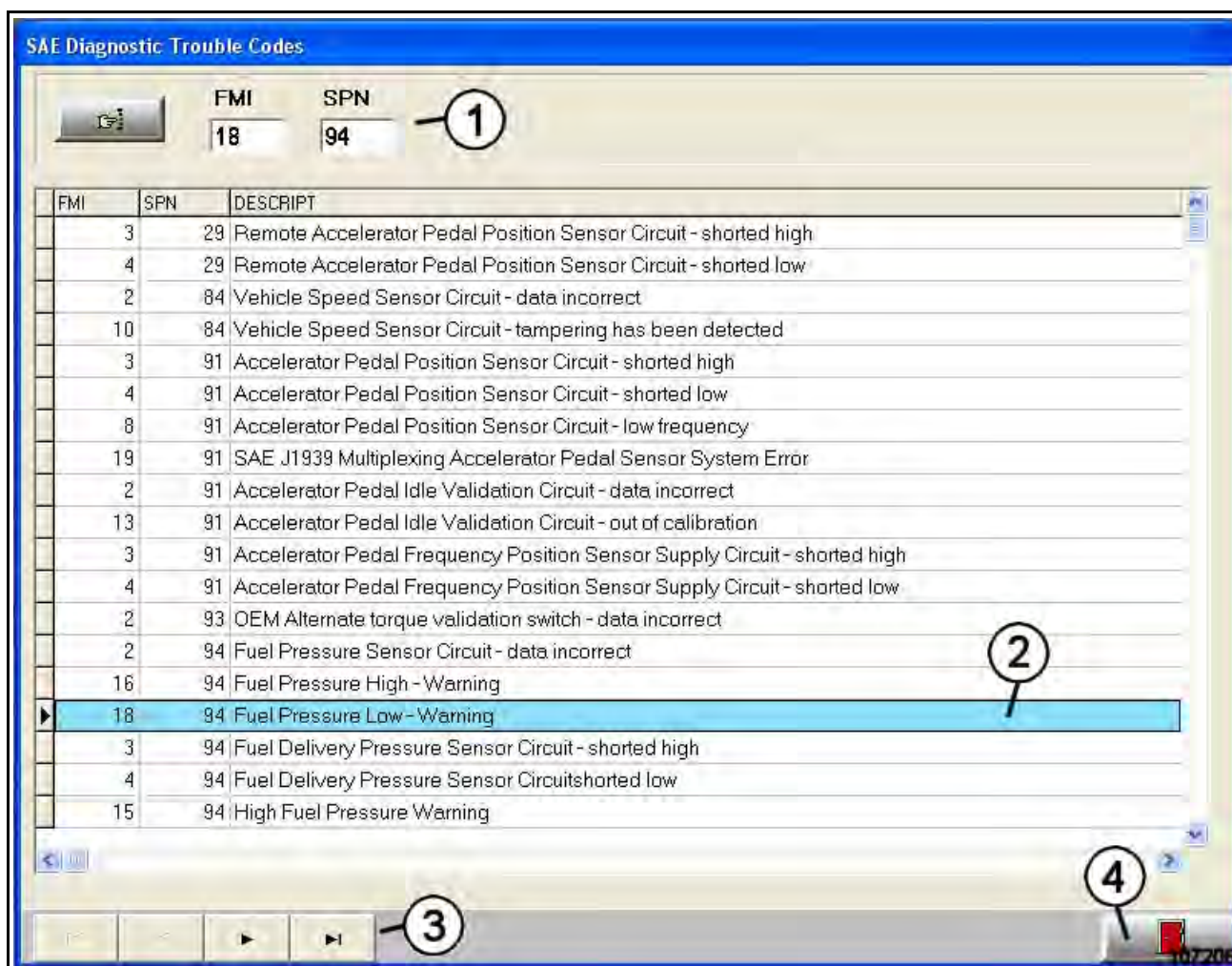


Fig. 5-17:

### Swing mechanism – Fault table

Fault				Remedial action	
No swing possible				Check	<b>P</b>
No righthand or lefthand swinging				Adjust	<b>E</b>
Slewing performance insufficient				Replace	<b>W</b>
Uncontrolled swinging movement				Top up	<b>A</b>
				Reduce	<b>S</b>
				Clean	<b>R</b>
				1) Contact the CGM HMS Service	
<b>Cause</b>				<b>Chapter ref.</b>	
•			Electronic excavator control not activated / defective	Working	<b>P</b>
•			Limiting switch optional, ramp-type ladder not complete retracted	Operation	<b>P</b>
•			Superstructure holding brake applied		<b>P</b>
•	•		Pressure-relief valve adjusted too low level / defective		<b>1)</b>
•			Servo system pump defective		<b>1)</b>
•	•		Malfunction in feed-pressure circuit of swing pump		<b>1)</b>
	•		Malfunction in high-pressure circuit of swing system		<b>1)</b>
	•	•	Malfunction of moment-regulating valve		<b>1)</b>
	•	•	Malfunction in swing pump displacement cylinder		<b>1)</b>
	•		Excessive leakage in swing motor		<b>1)</b>

# Hydraulic Shovel—6030

## Diesel Engines (continued)

### Version 1 - Cat® C27 Tier 2

Make and model	2 x Cat C27
Total rated net power ISO 3046/1	1 140 kW (1,530 HP) 1,800 min <sup>-1</sup>
Total rated net power SAE J1349	1 140 kW (1,530 HP) 1,800 min <sup>-1</sup>
Total rated gross power SAE J1995	1 140 kW (1,530 HP) 1,800 min <sup>-1</sup>
No. of cylinders (each engine)	12
Bore	137.7 mm (5.42 in)
Stroke	152.4 mm (6.0 in)
Displacement	27.0 I (1,648 in <sup>3</sup> )
Aspiration	Turbocharged and charge air-cooled
Max. altitude without deration at 15°C	1,750 m (5,750 ft) a.s.l.
Emission certification	US EPA Tier 2; Europe NRMM Tier 2
Alternators	2 x 150 A
Emission certification	US EPA Tier 4i

### Version 2 - Cummins® QSK19 Tier 2

Make and model	2 x Cummins QSK19
Total rated net power ISO 3046/1	1 008 kW (1,350 HP) 1,800 min <sup>-1</sup>
Total rated net power SAE J1349	1 008 kW (1,350 HP) 1,800 min <sup>-1</sup>
Total rated gross power SAE J1995	1 008 kW (1,350 HP) 1,800 min <sup>-1</sup>
No. of cylinders (each engine)	6
Bore	159 mm (6.25 in)
Stroke	159 mm (6.25 in)
Displacement	19 I (1,159 in <sup>3</sup> )
Aspiration	Turbocharged and charge air cooled
Max. altitude without deration	1 500 m (4,900 ft) a.s.l.
Alternators	2 x 175 A

## Hydraulic System with Pump Managing System

Main pumps (Diesel and electric version)	
	4 x variable swash plate pumps
Max. oil flow	
Diesel version	4 x 552 I/min (4 x 146 US gal/min)
Electric version	4 x 543 I/min (4 x 143 US gal/min)
Max. pressure, attachment	31 MPa = 310 bar (4,495 psi)
Max. pressure, travel	36 MPa = 360 bar (5,220 psi)
Swing pumps	
Diesel version	2 x revers. swash plate double pumps
Electric version	2 x revers. swash plate double pumps
Max. oil flow	
Diesel version	2 x 394 I/min (2 x 104 US gal/min)
Electric version	2 x 426 I/min (2 x 113 US gal/min)

## Hydraulic System with PMS (continued)

Max. pressure, swing system	31 MPa = 310 bar (4,495 psi)
Total volume of hydraulic oil	Approx. 3 500 I (925 US gal)
Hydraulic tank capacity	Approx. 2 500 I (660 US gal)

- Pump Managing System contains:
  - Electronic load limit control
  - Flow on demand from main pumps depending on joystick position
  - Automatic regulation of main pumps to zero flow without demand
  - Automatic rpm reduction of engine speed during working breaks
  - Reduced oil flow of main pumps at high hydraulic oil temperature or at high engine temperature
- Pressure cut-off for main pumps
- Cooling of pump transmission gear oil
- Filters:
  - Full-flow high-pressure filters (100 µm) for the main pumps, installed directly behind each pump
  - High pressure filters (100 µm) for the closed swing circuit
  - Full-flow filters (10 µm) for the complete return circuit
  - Full-flow filters (10 µm) for the cooling return circuit
  - Pressure filters (40 µm and 6 µm) for servo circuit
  - Transmission oil filters (40 µm)

## Undercarriage

Travel speed (2 stages)	
1st stage	Max. 1.4 km/h (0.87 mph)
2nd stage	Max. 2.7 km/h (1.68 mph)
Max. tractive force	1 637 kN (167 t = 367,880 lb)
Gradability of travel drives	Approx 64 %
Track pads (each side)	47
Bottom rollers (each side)	7
Support rollers (each side)	2 plus a skid plate in between
Travel drives (each side)	1 planetary transmission with 2 two-stage axial piston motors
Parking brakes	Wet multiple disc brake, spring loaded / hydraulically released

- Cast double-grouser combined pad-links with bushings connected by hardened full floating pins
- All running surfaces of sprockets, idlers, rollers and pad links, as well as teeth contact areas of sprocket and pad links, are hardened
- Fully hydraulic self-adjusting track tensioning system with membrane accumulator
- Automatic hydraulic retarder valve to prevent over-speed on downhill travel
- Acoustic travel alarm

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