BA RH120E(3 725 082.01)-EN
September 2012

# Operation and Maintenance Manual

## 6030, 6030FS
## Hydraulic Shovel No.

## 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, soundproofing 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 Operation and Maintenance Manual.

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 accopanying 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

## Operation and Maintenance Manual

**Never operate the machine before having read and understood the Operation and Maintenance Manual.**

**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 Operation and Maintenance Manual 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 GmbH mechanic or by attending an CGM HMS GmbH 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 GmbH . Clear-cut data are given in the technical specification.

Never install and commission other equipment and component combinations without CGM HMS GmbH 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 maintain a three point contact with the steps and grab handles.

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.

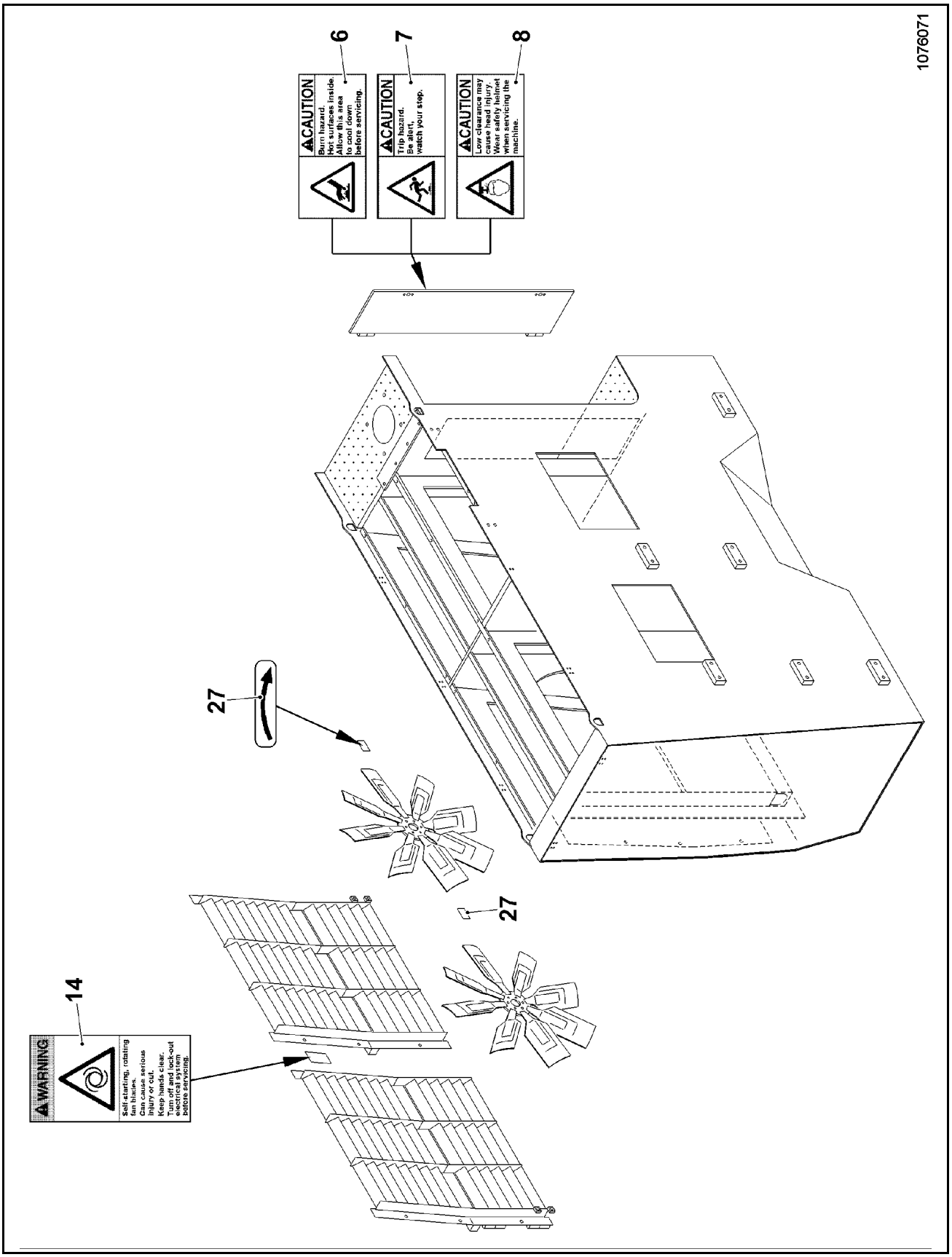
1076071
6
7
8
CAUTION
Burn hazard.
Hot surfaces inside.
Allow this area
to cool down
before servicing.
CAUTION
Trip hazard.
Be alert,
watch your step.
CAUTION
Low clearance may
cause head injury.
Wear safety helmet
when servicing the
machine.
27
27
14
WARNING
Self-starting, rotating
fan blades.
Can cause serious
injury or death.
Keep hands clear.
Turn off and lock-out
electrical system
before servicing.

*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. 2-32:),
- ➲ by pressing the switch (red) on the drive regulators on the right-hand and on the left-hand side (Fig. 2-33:),
- ➲ by pressing the switch (red) on the control cabinet in the engine module (Fig. 2-34:),
- ➲ by pulling the pull-switch below the counterweight on the left (5, Fig. 2-35:).

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.

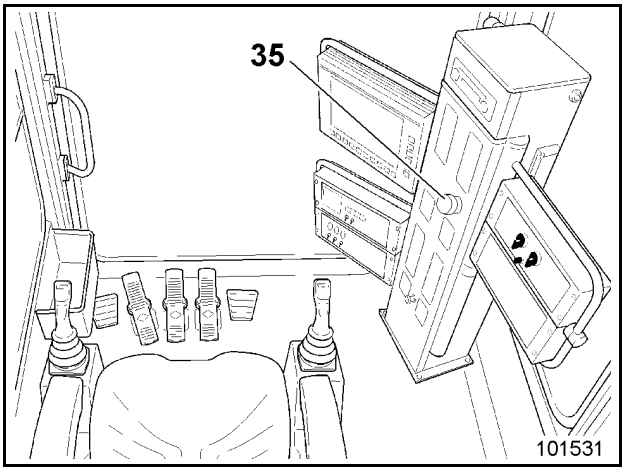


*Fig. 2-32:*

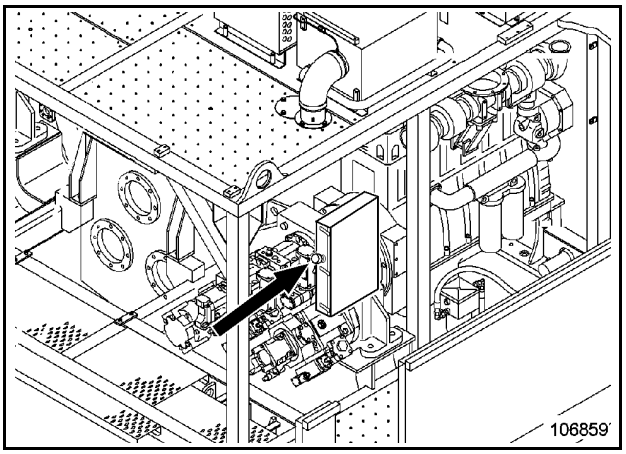


*Fig. 2-33:*

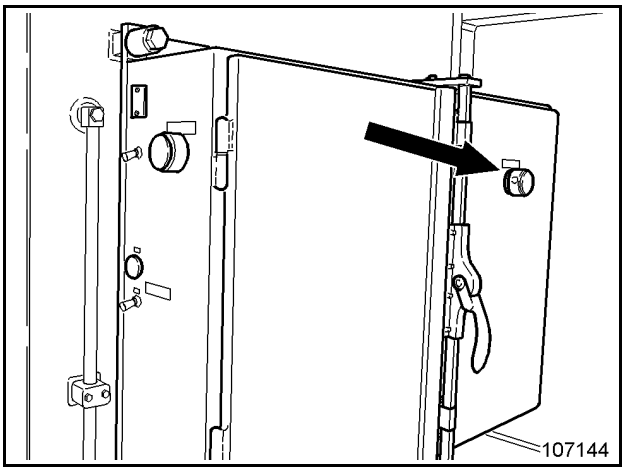


*Fig. 2-34:*

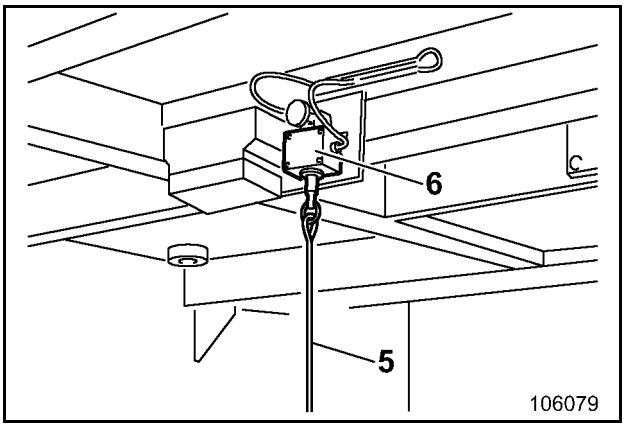


*Fig. 2-35:*

### 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. 2-61:)

## 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:<br>the speed of the engine increases.<br>Press the switch face with the symbol:<br>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 (see section 5 of this Operation and Maintenance Manual: “Engine monitoring, Control lamps”).<br>Check the BCS display for further fault messages and give an information to the responsible service personnel. | |
| **60** | **Warning lamp** | **Engine monitoring** | **STOP!**<br>Lits up when a serious fault occurs on the engine. The diagnosis lamp (59) provides the event code at the same time (flashing). (see section 5 of this Operation and Maintenance Manual: “Engine monitoring, Control lamps”).<br>**Shut off the engine immediately.**<br>Check the BCS display for further fault messages and give an information to the responsible service personnel. | |

(Fig. 2-66:)

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

| No. | Element | | Function | Symbol |
|---|---|---|---|---|
| **121** | **Monitoring device** | **Engine monitoring (engine 1 left)** | Indicates different parameters on the display (E)<br>Use push buttons (C and D) to scroll through parameter list.<br>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.<br>▪ Engine oil pressure too low,<br>▪ Engine temperature too high.<br>  **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.** | |
| **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. |  |

Express couplings are provided for refilling the following consumables (fluids).

**Note:**

Connections used may vary depending on how the machine is equipped.

| Pos. Fig. 2-74: | Fluid | Express coupling for |
|---|---|---|
| 1 | Diesel fuel for lefthand and righthand fuel tank | filling |
| 2 | Cooling fluid for left-hand engine | Filling and/or draining |
| 3 | Cooling fluid for righthand engine | Filling and/or draining |
| 4 | Gearbox oil for left pump transfer gear-box | Filling and/or draining |
| 5 | Gearbox oil for right pump transfer gear-box | Filling and/or draining |
| 6 | Tank for engine oil interval prolongation lefthand engine (op-tional). | Filling and/or draining |
| 7 | Tank for engine oil interval prolongation lefthand engine (op-tional). | Filling and/or draining |
| 8 | Engine oil for lefthand engine | Filling and/or draining |
| 9 | Engine oil for righthand engine | Filling and/or draining |
| 10 | Hydraulic oil tank | Filling and/or draining |
| 11 | Grease container | filling |

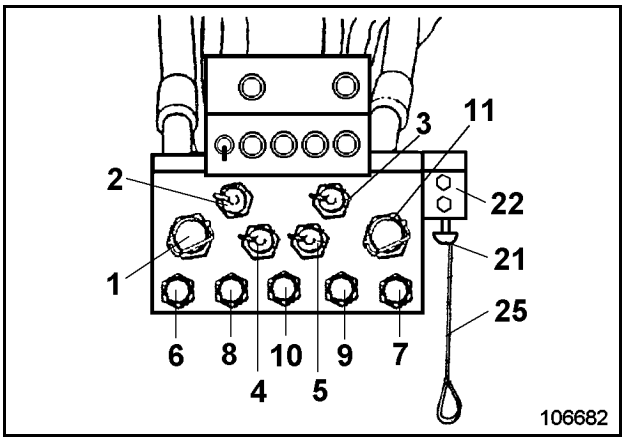



*Fig. 2-74:*

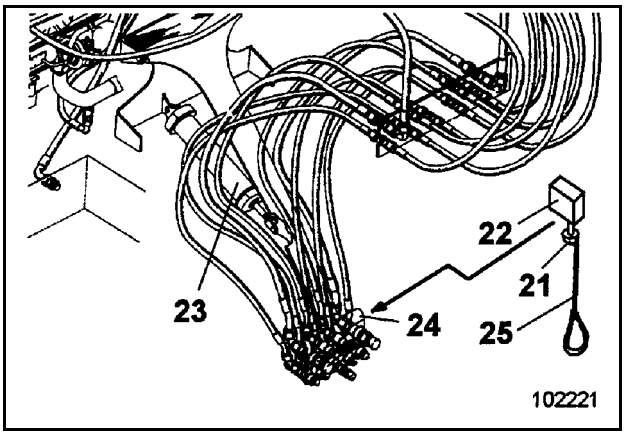



*Fig. 2-75:*

## Lowering the service station

Draw out control knob (21, Fig. 2-75:) of valve (22) with rope (25). The service station is brought down to the lower position. Turn knob (21) by 90° and engage.

## Raising the service station

Disengage control knob (21) of valve (22), turn by 90° and press in. The service station is raised to the top position.

## Refilling and draining

A service vehicle is needed for filling and/or draining of the fluids.

For filling in or for draining fluids, unscrew the cap of the corresponding express coupling (Fig. 2-74:).

Attach express coupling of filling hose from the service vehicle to the corresponding express coupling at the service station. Fill in or drain off fluid.

Take off filling hose and refit cap on the express coupling.

Repeat the starting procedure if one of the engines does not fire. Repeat starting procedure not more often than three to four times. Do not operate the starter for more than 10 seconds.

If warning lamps (44 – 47, Fig. 2-95:) or (54 – 57, Fig. 2-96:) do not go out or when the BCS (Fig. 2-97:) displays a fault message after starting, the engine concerned must be stopped immediately.

Locate the cause of the fault and rectify before restarting the engine.

**Do not run engines at full load unless they have been allowed to run for at least 3 minutes at idling.**

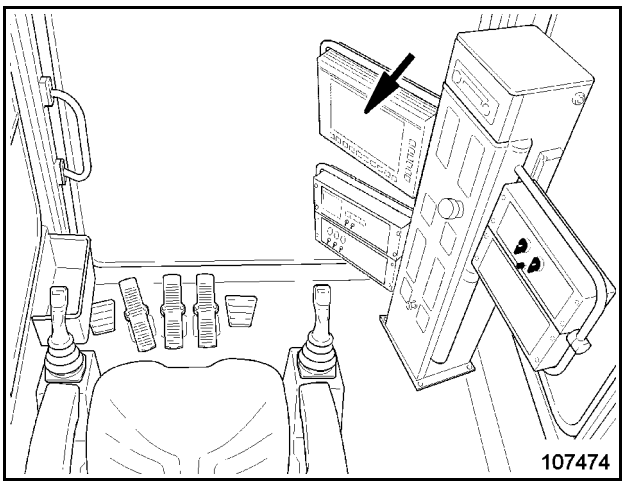



*Fig. 2-97:*

## Engines – adjusting the speed

Adjust the speed of the left-hand engine with switch (48, Fig. 2-95:).

Adjust the speed of the right-hand engine with switch (58, Fig. 2-96:).

- ➲ Press the switch face without symbol - the engine speed is raised up to maximum speed.
- ➲ Press the switch face with the symbol - the engine speed is reduced to idling speed.

## Starting the engines at low temperatures

If the machine is used in low temperatures, the engine may be equipped with a cold-starting device.

The pressure vessel containing the cold-starting fluid (ether) can be installed in or near the engine compartment.

The vessel is screwed into an electro-mechanical metering valve. When the engine is started at temperatures below 0°C (32°F), this valve is activated automatically by the engine electronics and injects a precisely metered amount of cold-starting fluid into the air intake duct of the engine.

Ether is toxic and highly inflammable. Safety instructions and information concerning the handling of pressure vessels for cold-starting fluids (ether) can be found in the following chapters: "Fundamental safety instructions", "Inspection and servicing - Safety instructions", "Cold-starting fluid (ether) - Replacing the pressure vessel".

## Cornering

To take a right-hand corner forwards

➲ depress only pedal(112, Fig. 2-115:) forwards

To take a lefthand corner forwards -

➲ depress only pedal (113) forwards -

## Turning

To turn to the right

➲ depress pedal (112) forwards and pedal (113) backwards

To turn to the left

➲ depress pedal (113) forwards and pedal (112) backwards.

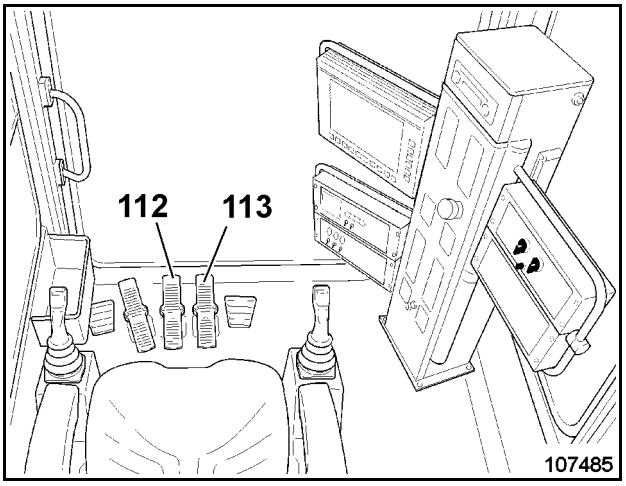



*Fig. 2-115:*

## Note

Change the position of the undercarriage - parallel or perpendicular to the working face - only by cornering forwards/backwards (Fig. 2-116:).

Cornering to the left:

| | |
|---|---|
| forwards | from pos. 1 to pos. 2 |
| backwards | from pos. 2 to pos. 3 |
| forwards | from pos. 3 to pos. 4 |

The same procedure should be adopted if the excavator is to be driven out of depressions (Fig. 2-117:):

| | |
|---|---|
| Cornering to the left | from pos. 1 to pos. 2 |
| Cornering to the right | from pos. 2 to pos. 3 |

**Never use the working equipment to raise one side of the undercarriage and then turn the undercarriage by initiating the swinging and/or the travelling function.**

This way of working is contrary to the excavator's-designated use.

There is a risk of accident. Moreover, the tracks, swing gear, roller bearing swing ring, backhoe or bucket back-wall and the front part of the bucket are subjected to inadmissibly high stresses.

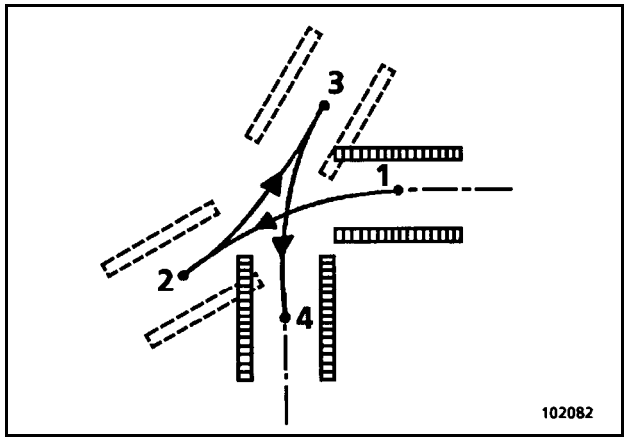



*Fig. 2-116:*

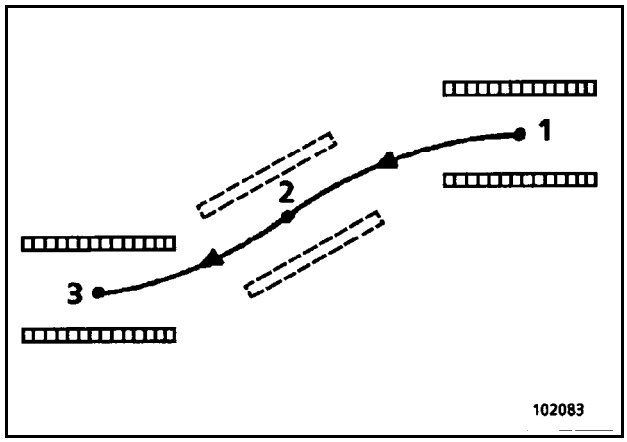



*Fig. 2-117:*

# OPTIONAL EQUIPMENT

## Water spraying system

This excavator is equipped with a water spraying system. This is to humidify dispersible dust while working.The water pump is driven hydraulically, therefore the sprayer system can only be activated with at least one engine running.

Please note, the water tanks must be filled before activating the system. Running the water pump dry may cause damaging the pump.

The water tanks are mounted on the uppercarriage of the excavator.

Activating the water spraying system:

➲ Push key (arrow, Fig. 2-134:) in the left control lever once.
The spraying system sprays water towards the face.

Deactivating the water spraying system:

➲ Push key (arrow, Fig. 2-134:) in the left control lever once again.
The spraying system is deactivated.

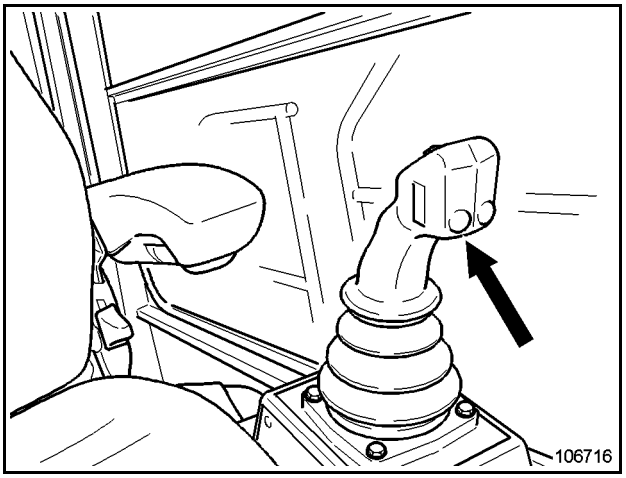



*Fig. 2-134:*

## Additional silencers

This excavator is equipped with additional silencers. The silencers are mounted:

- at the counterweight in front of the outlets of the engine cooling system,
- at the right side of the uppercarriage in front of the outlets of the cooling system for hydraulic liquid.

The silencers and the silencer elements must be checked and maintained in the same intervals like the excavators air intake system. See the „Inspection and maintenance plans“ in the Operation and Maintenance Manual for more information.

Read and observe the safety instructions given in the Operation and Maintenance Manual.

Carry out the following work steps:

Check the perforated plates of the silencer elements, if soiled

- brush the soil off by means of a soft brush,
- blow the soil off by means of pressurized air or water.
  **Please note: blast parallel to the surface (max. angle 15°), pressure maximum 5 bars, distance to the surface minimum 0,5 meters.**

Check fastening bolts of the silencers for tightness.

# 3 INSPECTION AND SERVICING

| | Operation and Maintenance Manual | Target group |
|---|---|---|
| **Part 1** | **INTRODUCTION FUNDAMENTAL SAFETY INSTRUCTIONS** | **Operating personnel** + **Inspection and servicing personnel** + **Repair personnel** |
| **Part 2** | **OPERATION** | **Operating personnel** The operating personnel must have know-how relevant to the operation and the application of this or comparable machines. |
| **Part 3** | **INSPECTION AND SERVICING** | **Inspection and servicing personnel** The inspection and servicing personnel must have know-how relevant to the inspection and servicing of this or comparable machines. |
| **Part 4** | **REPAIR WORK** | **Repair personnel** The repair personnel must have know-how and experience relevant to the repair of this or comparable machines. |
| **Part 5** | **ANNEX** | **Operating personnel** + **Inspection and servicing personnel** + **Repair personnel** |
| **Part 6** | **INDEX** | **Operating personnel** + **Inspection and servicing personnel** + **Repair personnel** |

# Plan V

Plan **V** – Once prior to initial commissioning



| Location | Servicing work | Quantity/ No. |
|---|---|---|
| **Engine** | Check oil level | 2 |
| **Cooling system**<br>Cooling liquid | <br>Check | <br>2 |
| **Electrical system**<br>Battery<br>Lighting | <br>Check liquid level<br>Check operation | <br>6 |
| **Monitoring, warning and control elements**<br><br><br>BCS | Check function of monitoring, warning and control elements<br>Check emergency OFF function<br>Check function | <br><br><br>1 |
| **Hydraulic system**<br><br><br>Hydraulic oil reservoir<br>Hydraulic cylinders | Check function of working and travelling movement<br>Check pressure (see: Technical handbook)<br>Check oil level<br>Vent (see: chapter “Venting hydraulic system“) | <br><br><br>1 |
| **Pump transfer gearbox**<br>- Pre-chambers<br>- Expansion reservoir | Check oil level<br><br>Check oil level | 2<br><br>2 |
| **Swing gearbox (Gearbox P/N 3692960)** | Check oil level | 2 |
| **Swing gearbox (Gearbox P/N 3676892)**<br>- Expansion reservoirs | <br>Check oil level Check oil level | 4 |
| **Travel gearbox (Gearbox P/N 2712182)**<br>- Pre-chamber (spur gear section)<br>- Brake chambers | Check oil level<br>Check oil level<br>Check oil level | 2<br>2 x 1<br>2 x 2 |
| **Travel gearbox (Gearbox P/N 3683493)**<br>- Brake chambers | Check oil level<br>Check oil level | 2<br>2 x 2 |

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** | **Quant. / No.** | **Plan A** | **Plan B** | **Plan C** | **Plan D** | **Plan E** |
|---|---|---|---|---|---|---|---|
| **Pump transfer gearbox** | Carry out oil analysis | 2 | | ● | ● | ● | ● |
| | Change oil | 2 [13] | | | ● | ● | ● |
| - Breather filter | Clean | 2 x 1 | | | ● | ● | ● |
| | Replace | 2 x 1 | | | | | ● |
| - Pre-chamber | Change oil | 2 x 3 | | | ● | ● | ● |
| - Breather filter | Clean | 2 x 1 | | | ● | ● | ● |
| Fastening srews | Check tightness | | ● | ● | ● | ● | ● |
| Oil filter | Check for contamination and damage | 2 x 1 | | | ● | ● | ● |
| | Replace | 2 x 1 | | | | ● | ● |
| **Travel gearbox** | Carry out oil analysis | 2 | | ● | ● | ● | ● |
| **(Gearbox P/N 2712182)** | Check oil level | 2 | | ● | ● | ● | ● |
| | Change oil | 2 [13] | | | | ● | ● |
| - Magnetic rod | Clean | 2 x 6 | | | ● | ● | ● |
| Pre-chamber / spur wheel section | Check oil level | 2 x 1 | | ● | ● | ● | ● |
| | Change oil | 2 x 1 [13] | | | | ● | ● |
| - Magnetic rod | Clean | 2 x 1 | | | ● | ● | ● |
| Brake chambers | Check oil level | 2 x 2 | | ● | ● | ● | ● |
| | Change oil | 2 x 2 [13] | | | | ● | ● |
| Breather filter | Clean | 2 x 3 | | | ● | ● | ● |
| | Replace | 2 x 3 | | | | ● | ● |
| **Travel gearbox** | Carry out oil analysis | 2 | | ● | ● | ● | ● |
| **(Gearbox P/N 3683493)** | Check oil level | 2 | | ● | ● | ● | ● |
| | Change oil | 2 [13] | | | | ● | ● |
| - Magnetic rod | Clean | 2 x 6 | | | ● | ● | ● |
| Brake chambers | Check oil level | 2 x 2 | | ● | ● | ● | ● |
| | Change oil | 2 x 2 [13] | | | | ● | ● |
| Breather filter | Clean | 2 x 3 | | | ● | ● | ● |
| | Replace | 2 x 3 | | | | ● | ● |

[13] see: “Refilling quantities – Oil“ table

## II. Fluid for hydraulic system

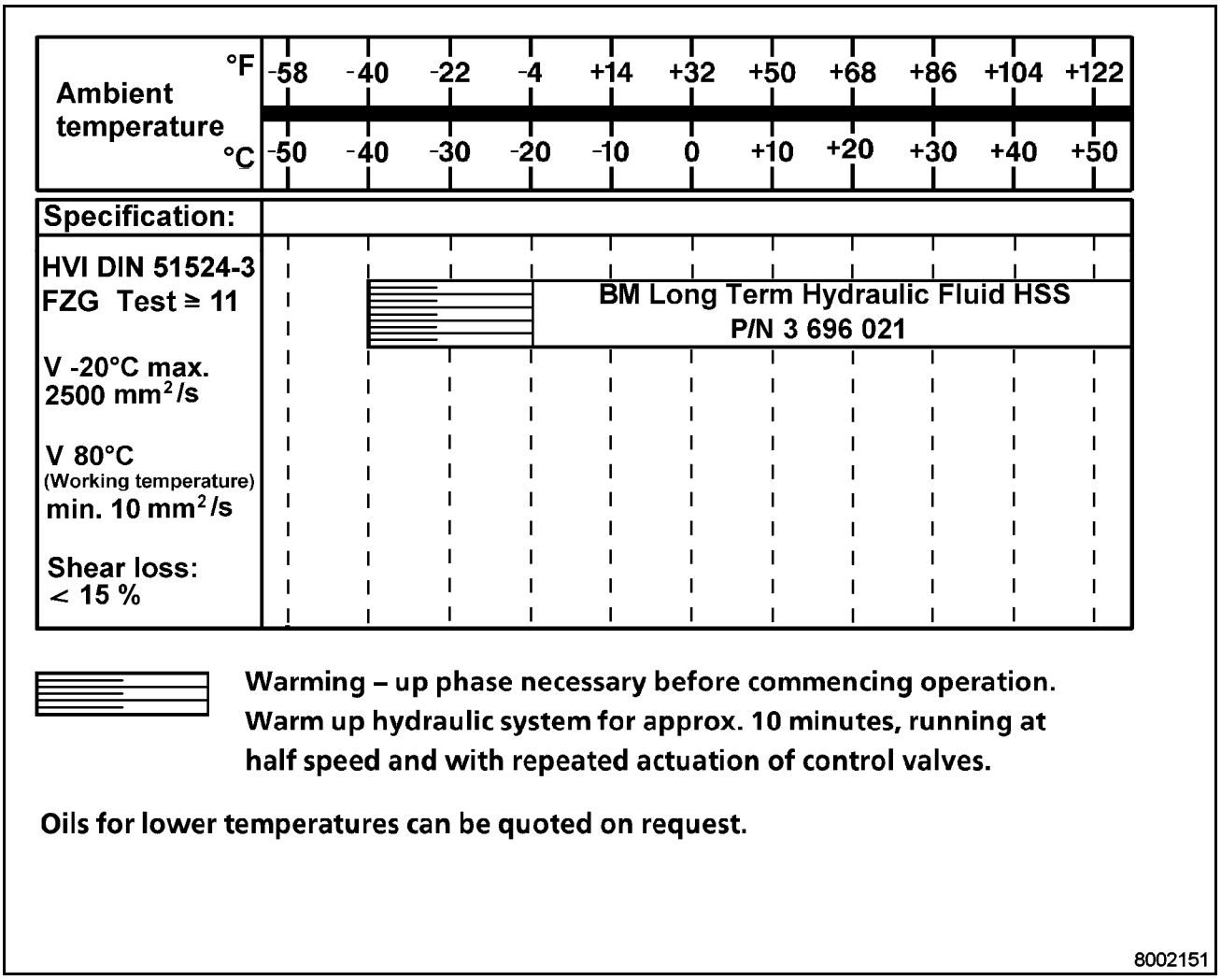



*Fig. 3-4:*

## Filling in engine oil

(oil grade see: “LUBRICANTS” section).

➲ Fill in engine oil through filler tube (1, Fig. 3-17:) until the oil level has reached the "max" mark (Fig. 3-18:) on dipstick (2, Fig. 3-17:).

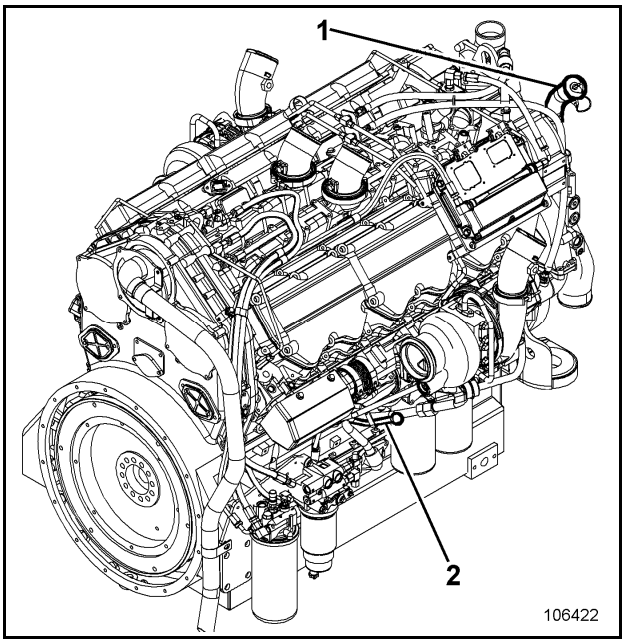



*Fig. 3-17:*

## Filling in engine oil through the service station

(oil grade see: “LUBRICANTS” section).

Fill in engine oil through

- express coupling (8, Fig. 3-19:) for the lefthand engine
- express coupling (9) for the righthand engine

until the oil level has reached the "max." mark (Fig. 3-18:) on dipstick (2, Fig. 3-17:).

➲ Unscrew cap of express coupling and connect filling hose of the service vehicle.

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

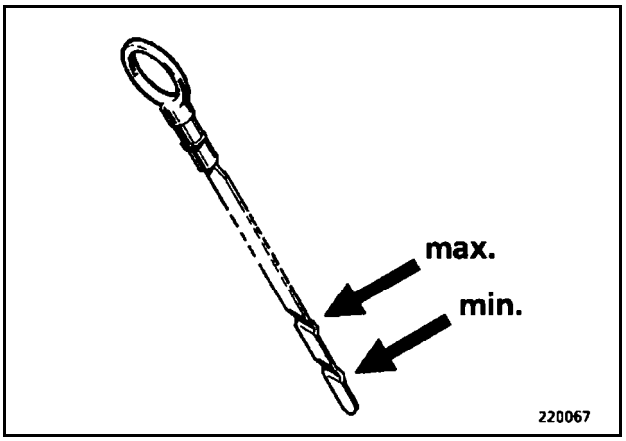



*Fig. 3-18:*

➲ Start the engines and allow to run at idling for abt. 2 minutes.

➲ Check oil level at dipstick (2, Fig. 3-17:) and top up with oil to the "max" mark (Fig. 3-18:) if required.

➲ Remove the filling hose.
The express coupling closes automatically.

➲ Screw on protective cap.

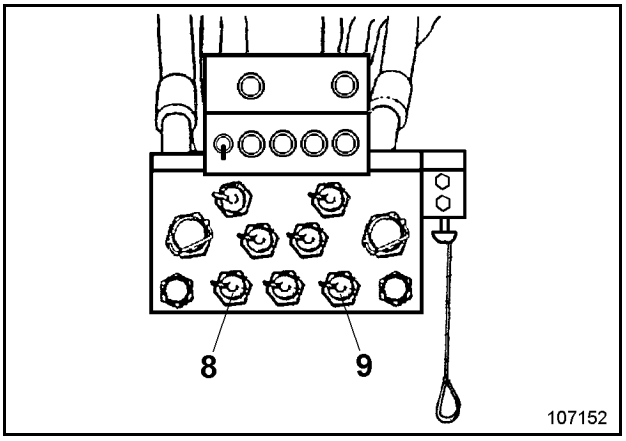



*Fig. 3-19:*

# FUEL SYSTEM

## Fuel system - Safety instructions

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

Before working on the fuel system:

Shut off the engines.

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

Keep away naked flames.

Do not smoke.

Collect escaping fuel and discard without polluting the environment.

Avoid skin contact with diesel fuel.

Diesel fuel may cause skin injury.

Wear firm working clothing.

Wear protective gloves or use a barrier cream.

## Replacing the fuel filter

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

Avoid skin contact with diesel fuel.
Diesel fuel may cause skin injury.
Wear firm working clothing.
Wear protective gloves or use a barrier cream.
Collect escaping fuel and discard without polluting the environment.

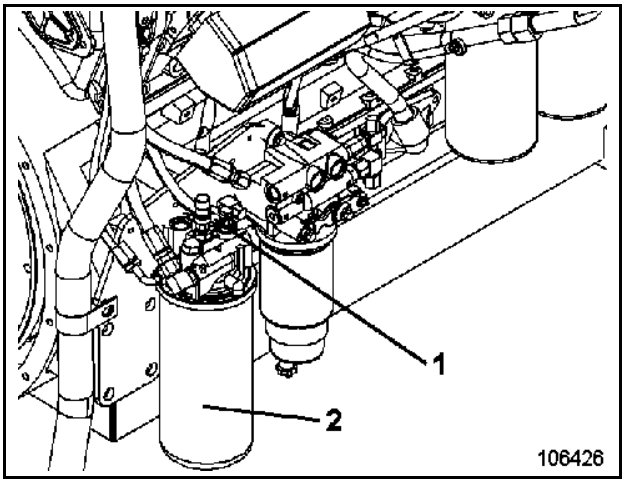



*Fig. 3-34:*

- ➲ Relieve residual fuel pressure from the fuel system by carefully loosen one of the fuel supply connections at the filter head (1, Fig. 3-34:).
- ➲ Unscrew fuel filter (2).
- ➲ Clean gasket sealing surface at the filter head.
- ➲ Do not fill new filter with fuel. This prevents the injection system from beeing contaminated by unfiltered fuel after fuel filter change.
- ➲ Apply clean diesel fuel to the new filter gasket and screw it onto the filter head by hand. Continue to tighten filter by a further ½ to ¾ turn

**Tightening the filter element with a tool may damage or deform the filter head.**

For further information see:“Engine operating and maintenance manual“.

# Switchgear cabinet

## Breather filter

In the switchgear cabinet, the air is drawn in by a ventilator via the filter (Fig. 3-48:).

## Emptying dust trap

➲ Press dust trap (14, Fig. 3-48:) and hold until the dust trap is empty.

## Emptying the dust collector

➲ Loosen clamps (11, Fig. 3-48:).

➲ Remove dust collector (12) and empty.

➲

## Filter element

➲ Remove the dust collector (12, Fig. 3-48:).

➲ Withdraw filter element (13, Fig. 3-159:).

➲ Replace or clean filter element (13).

➲ Refit dust collector (12, Fig. 3-158:).

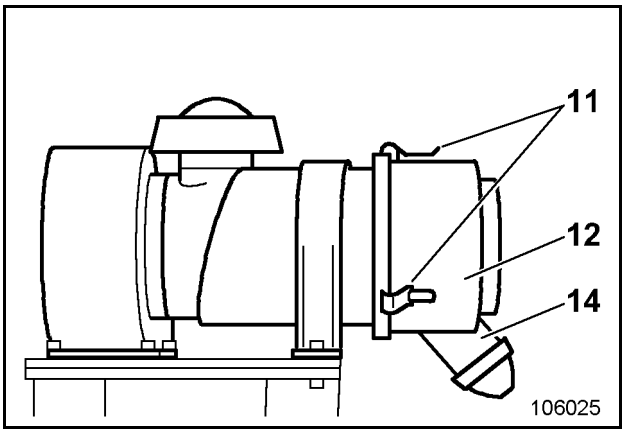



*Fig. 3-48:*

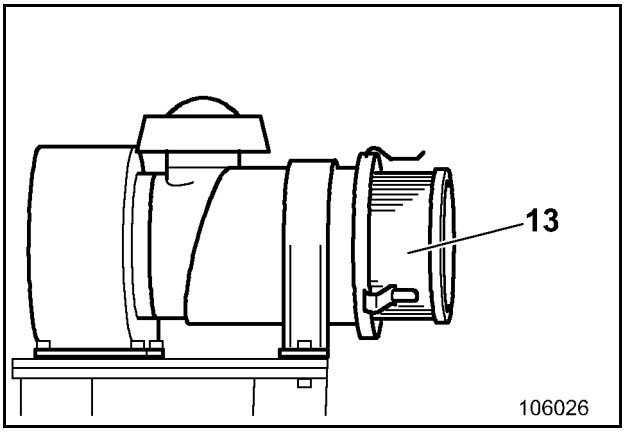



*Fig. 3-49:*

## Hydraulic oil return-flow filters (hydraulic oil reservoir), replace

**Risk of scalding caused by hot hydraulic oil.**

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

Shut off the engines.

The hydraulic oil reservoir itself 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.

The return-flow filters must be replaced:

- when servicing works in accordance with the servicing plan are carried out;
- when the BCS displays a warning on the screen (Fig. 3-74:). In this case, the filter elements (9, Fig. 3-75:) are heavily contaminated;
- after repairs on the hydraulic system;
- in case of damage.

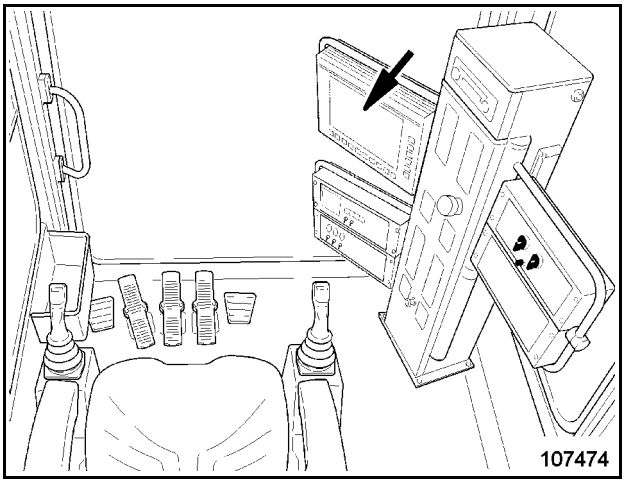



*Fig. 3-74:*

➲ Remove cover (3) together with sealing ring (5) and retaining disk (7).

➲ Remove cap (8) and sealing ring (10).

➲ Withdraw filter element (9) and sealing ring (11) from basket (12).

➲ Insert a new filter element.

If a filter element (9) is damaged, remove basket (12) and check/clean.

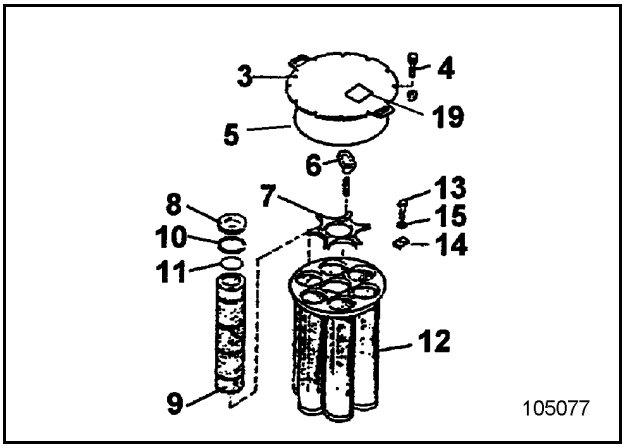



*Fig. 3-75:*

## Changing the hydraulic oil

**Risk of scalding caused by hot hydraulic oil.**

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

Shut off the engines.

The hydraulic oil reservoir itself 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 oil and discard without polluting the environment.

Change the oil when the machine is at operating temperature. Warm oil flows better and carries suspended particles (carbon or abraded matter) better.

**Do not start up the drive engines when the hydraulic oil reservoir is empty. The hydraulic pumps may be destroyed if they are allowed to run dry.**

## Avoid mixing of different hydraulic fluids

The machine has been run in at the factory with BM Long Term Hydraulic Fluid HSS (Part-No. 2482971). CGM HMS GmbH recommends using this high-grade hydraulic fluid also in operation as it has been made especially for use in these machines to which it is also perfectly adapted.

If oil analyses are performed regularly and with positive results, the BM Long Term Hydraulic Fluid can remain in the machine for up to 10 000 operating hours.

If an alternative hydraulic fluid is to be used, it must fulfil the same specifications. Please note that the change interval for alternative fluids is fixed at 5 000 operating hours.

There is an increased risk of damage to hydraulic components, if different hydraulic fluids are mixed during topping up as well as when changing over to a fluid of a different type or from another manufacturer.

For topping up, it is therefore necessary to use only same hydraulic fluid as the one that is already in the hydraulic system.

When changing over to an alternative hydraulic fluid, please observe that there is always a small amount of old fluid remaining in the hydraulic system even after the system has been emptied. The mixing of this residual amount of old fluid with the new alternative fluid reduces the properties of the fluid dramatically and can cause damage to components of the hydraulic system in operation.

To avoid this result, the change-over to the alternative fluid must be performed in strict compliance with the manufacturer's prescriptions. The manufacturer must confirm that his hydraulic fluid is compatible with the BM Long Term Hydraulic Fluid.

The remaining amount of old fluid must not exceed 2% of the total volume. This can only be achieved by repeated flushing with the total fluid volume.

If the remaining amount of fluid exceeds 2% of the total volume, the fluid becomes a detrimental "mixed fluid".

The operation of the system with mixed fluids must by all means be avoided.

CGM HMS GmbH assumes no warranty for damage caused as a result of the machine having been operated with consumables of inappropriate specification or with mixed fluids.

## Pre-chamber

**Draining off oil**

➲ Prepare a collecting recipient for used oil.

Choose the required capacity in accordance with the "Refilling quantities - Oil" table.

➲ Unscrew plug (7, Fig. 3-109) and drain off oil.

➲ Screw plug (7) back in place.

**Filling in oil**

Filling in oil see: “Checking the gearbox oil level / topping up with oil”

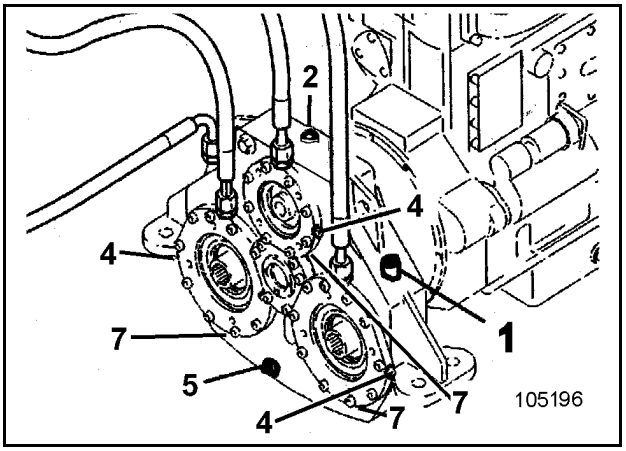



*Fig. 3-109*

## Pump gearbox, venting

The gearbox is vented through breather valve (2, Fig. 3-110:).
Clean breather valve (2) in accordance with the servicing plan.

➲ Unscrew breather filter (2), clean with white spirit or paraffin oil and blow dry with compressed air.

➲ Screw breather filter (2) back in place.

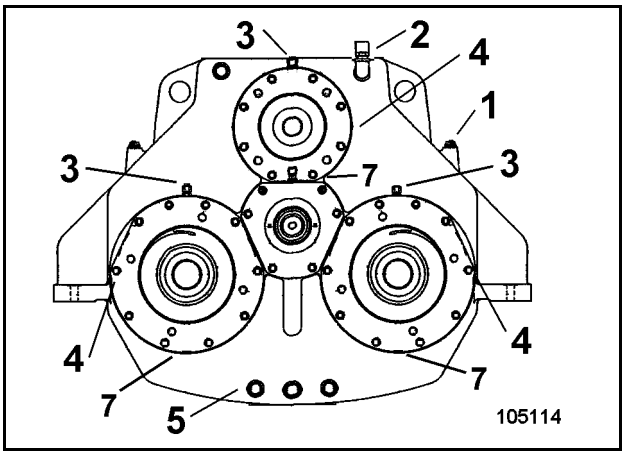



*Fig. 3-110:*

## Pre-chamber venting

The gearbox is vented through breather valve (2, Fig. 3-111:).
Clean breather valve (2) in accordance with the servicing plan.

➲ Unscrew breather filter (2), clean with white spirit or paraffin oil and blow dry with compressed air.

➲ Screw breather filter (2) back in place.

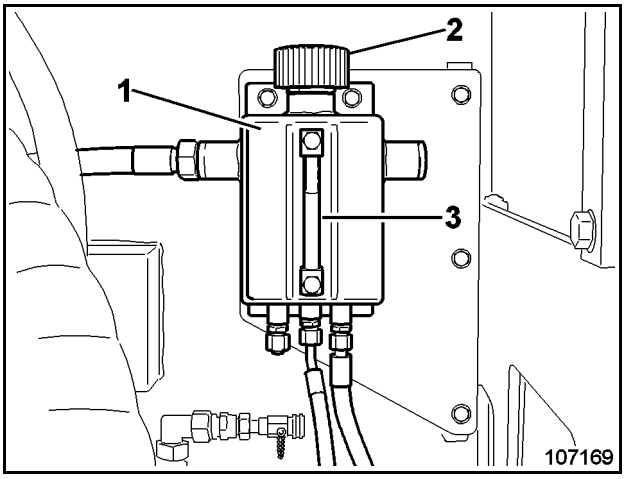



*Fig. 3-111:*

## TRAVEL GEARBOX P/N 3683493

### (For travel gearbox P/N 3683493 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.
- ➲ Screw checking plug (1) back in place.

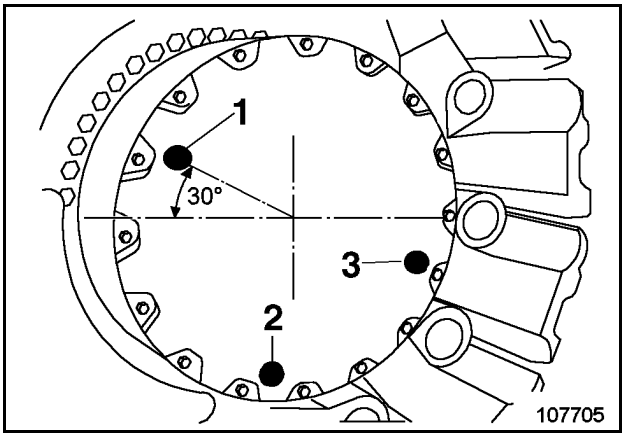



*Fig. 3-132:*

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

- ➲ Unscrew checking screw (6, Fig. 3-133:).

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.

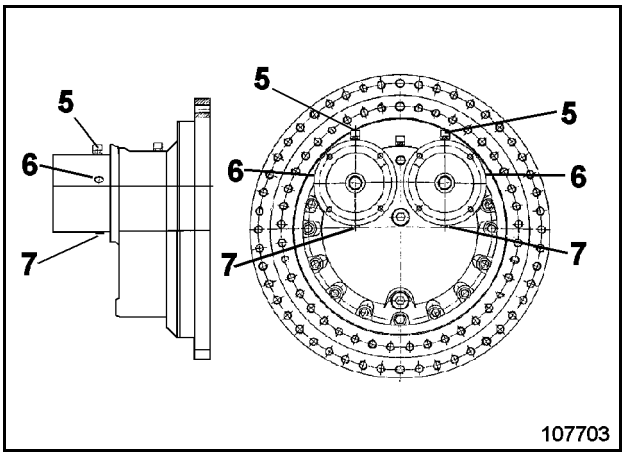



*Fig. 3-133:*

## Function

The grease is pumped by hydraulically driven pumps (2 and 3, Fig. 3-148:) via greasing lines from the grease container to the main distributors on the superstructure and on the undercarriage. Pump (2) supports greasing points on superstructure and working equipment, pump (3) supports the undercarriage (optional).

The control elements of the lubricating system are installed on a control panel (1) attached to the grease container.

As soon as the grease container is empty, the BCS (Fig. 3-149:) gives a warning signal (fault). In the event of a fault, the "dumping" function (shovel or backhoe cylinder) is switched off automatically after 15 min.

Work can be continued when the grease container is filled with grease.

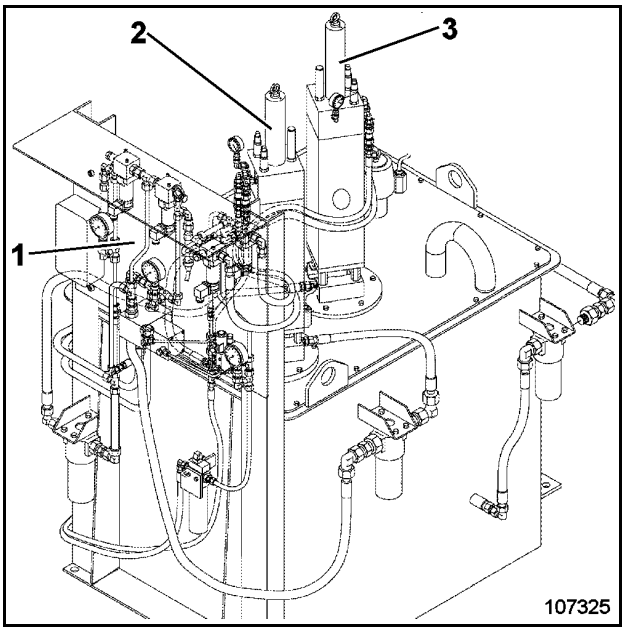



*Fig. 3-148:*

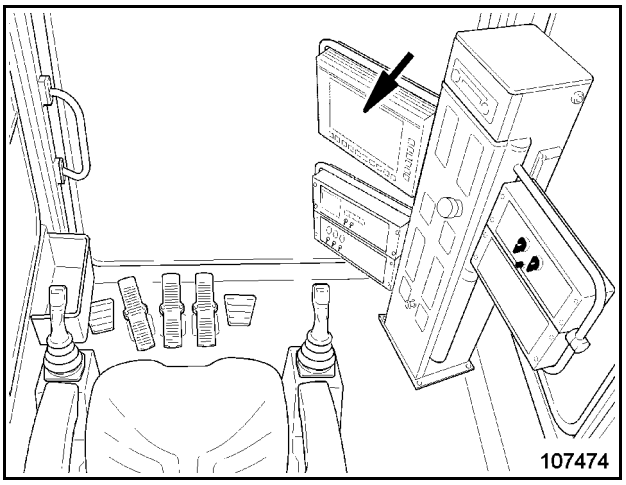



*Fig. 3-149:*

# PUTTING THE EXCAVATOR OUT OF OPERATION AND RECOMMISSIONING

## Putting the excavator out of operation

- ➲ Park the excavator on firm and level ground.
- ➲ Set the working equipment down on the ground, retracting the piston rods of the hydraulic cylinders as far as possible.
- ➲ Set all control element to "**0**".
- ➲ Clean the machine.
- ➲ Carry out a visual inspection of the excavator.
- ➲ Remove coarse dirt, snow and ice from the fins and fan wheel of the hydraulic oil cooler.
- ➲ Carry out engines preservation.
- ➲ Protect all bright metal parts (e.g. piston rods) from rust and dirt.
- ➲ Check anti-freeze concentration of the cooling liquid to avoid freezing during the cold season.
- ➲ Fill up the fuel tanks.
- ➲ Remove the batteries; see: "Battery storage".
- ➲ Secure the machine against unauthorized starting by:
  withdrawing the key from the key-switch,
  locking the cab door,
  securing all lockable hatches.
- ➲ Cover up all openings.

## Battery storage

During prolonged machine downtimes, remove the batteries and store in a dry room at an ambient temperature of ca. 20°C / 68°F. Observe the following points with regard to maintenance:

- ➲ Clean the batteries.
- ➲ Check the acid density and the electrolyte level of the battery every two weeks.
- ➲ Recharge the batteries at the latest, when the acid density has dropped to 1.23 kg/dm³.
- ➲ Keep the batteries clean and dry on the outside.

## Recommissioning

- ➲ Remove the covers.
- ➲ Degrease / clean all protected components.
- ➲ Remove engines preservation in acc. with the engine operationg anstructions.
- ➲ Check the fuel level in tanks.
- ➲ Check track tension (visual inspection).
- ➲ Check level and condition of the cooling liquid in the cooling system.
- ➲ Check grease filling in grease container.
- ➲ Oil level
  - drive engines,
  - swing gearboxes,
  - pump transfer gearboxes,
  - travel gearboxes.
- ➲ Check oil level in hydraulic oil reservoir.
- ➲ Check battery acid density and level.
- ➲ Install batteries and reconnect.
- ➲ Function checks:
  - superstructure holding brake,
  - track brake,
  - lighting system,
  - signalling equipment.
- ➲ Vent the hydraulic system.

# HYDRAULIC SYSTEM

## Repair instructions

Always depressurize the hydraulic system before disconnecting any hydraulic hoses or pipes.

Read and observe also the chapters "Inspection and servicing - Safety instructions" and "Repair - Safety instructions".

Replace damaged and leaking hydraulic hoses and pipes as soon as possible by new ones.

Use original spare parts from CGM HMS GmbH. They are adapted to the respective function.

Do not re-use old hoses.

Never repair damaged hoses.

Discard escaped oil and oily wastes without polluting the environment. These substances must not be allowed to penetrate into the soil.

## Hydraulic hoses – Instructions

Even hoses that have been properly stored or used are subject to natural ageing. Their useful life is therefore limited.

Hydraulic hoses must replaced after a service life of six years (including a storage time of 2 years). Check the date of manufacture on the hose or on the hose fitting regularly.

The recommended interval after which hydraulic hoses - and especially those used in harsh conditions - must be replaced depends on the number of operating hours and on pressure loading.

The use of hoses close to their recommended load limit shortens the replacement interval (e.g. high temperatures, frequent working cycles, extremely high pulse frequencies as well as multi-shift operation and round-the-clock work).

Hydraulic hoses must be replaced, if one of the following defects is detected during a visual inspection:

- Damage to the outer fibre reinforcement layer reaching down to the inner layer (cuts, chafe marks, cracks).
- Embrittlement of the outer fibre reinforcement layer (cracks in the hose material).
- Changes in the ususal shape of the hose under pressure or in pressureless condition in bends or curves such as detachment of fibre layers, formation of bubbles or bulges.
- Leaks.
- Non-observance of fitting requirements.
- Damage to or deformation of hose fittings that may result in a reduction of the strength of the screwed union.
- Detachment of the hose from the fitting.
- Corrosion in fittings reducing the strength of the function of the fitting.

# 5 ANNEX

| | Operation and Maintenance Manual | Target group |
|---|---|---|
| **Part 1** | **INTRODUCTION FUNDAMENTAL SAFETY INSTRUCTIONS** | **Operating personnel + Inspection and servicing personnel + Repair personnel** |
| **Part 2** | **OPERATION** | **Operating personnel** The operating personnel must have know-how relevant to the operation and the application of this or comparable machines. |
| **Part 3** | **INSPECTION AND SERVICING** | **Inspection and servicing personnel** The inspection and servicing personnel must have know-how relevant to the inspection and servicing of this or comparable machines. |
| **Part 4** | **REPAIR WORK** | **Repair personnel** The repair personnel must have know-how and experience relevant to the repair of this or comparable machines. |
| **Part 5** | **ANNEX** | **Operating personnel + Inspection and servicing personnel + Repair personnel** |
| **Part 6** | **INDEX** | **Operating personnel + Inspection and servicing personnel + Repair personnel** |

## Hydraulic data screen

| | |
|---|---|
| **1** | This screen displays data related to the hydraulic system. |
| **2** | All data displayed can be saved to an USB-stick after tapping this button (see: “Saving data to an USB-stick”). |
| **3** | Tapping the button with the door icon “Exit” leaves the current screen and opens the previous screen. |

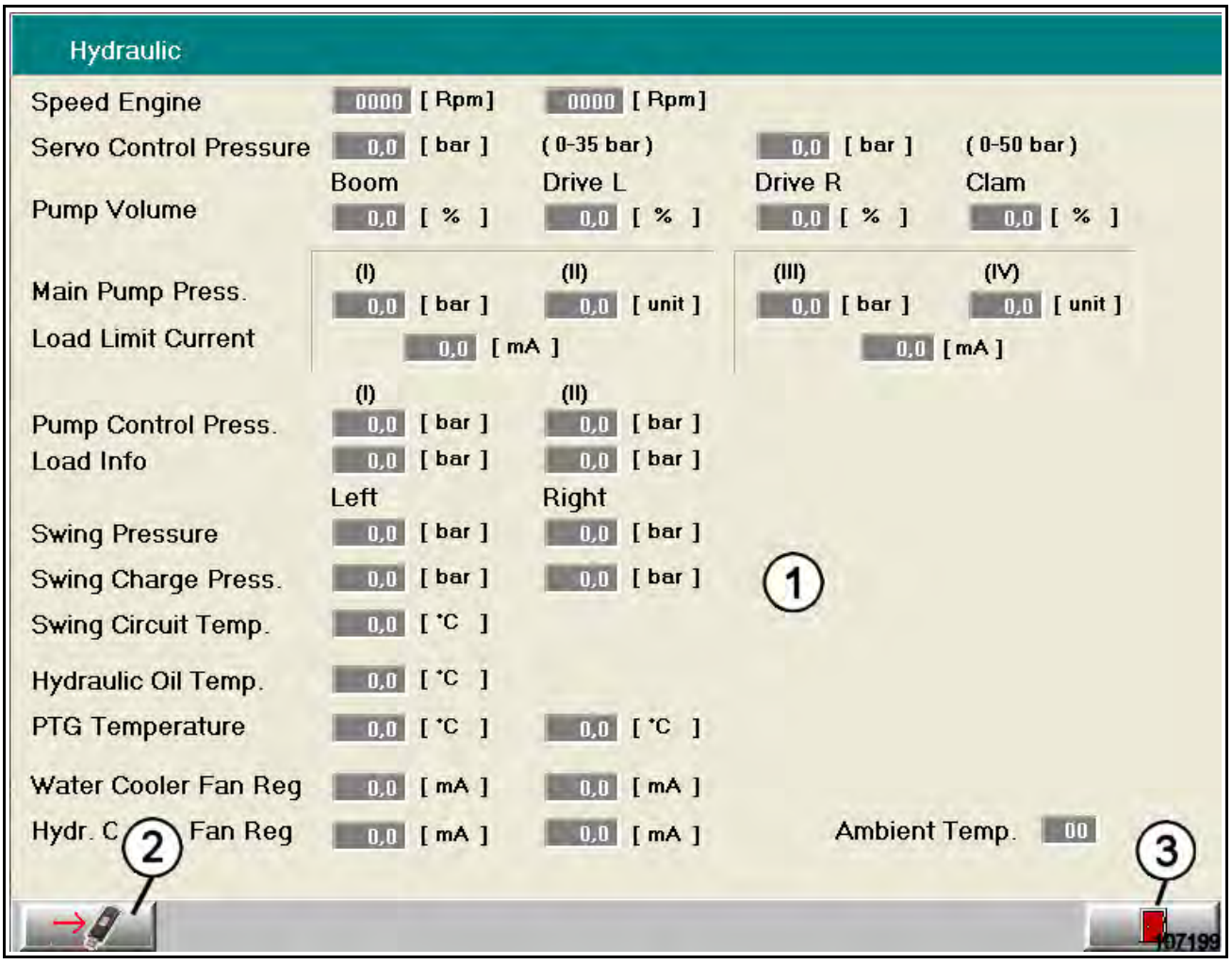



*Fig. 5-9:*

## Saving data to a USB stick

All screens which have the “USB-stick-button” (1, Fig. 5-19:) offer the functionality to store data for external use.

All data related to the current screen will be stored to a USB stick. In this example all data from the “Service, left engine” screen will be saved to a file. Fileformat is RTF (Rich Text Format).

The file name will be automatically created following this pattern:

“Shovel type+serial number+screen name.rtf”.

For example:

“RH120172_Engine_LH.rtf”.

If this file already exists, an extension with increment numbers will be added to the file name:

“RH120172_Engine_LH_(1).rtf”.

“RH120172_Engine_LH_(2).rtf”.

……

Save data:

Plug a USB stick into the USB jack (see: “BCSIII, interfaces”).

To save the data, tap on button (1, Fig. 5-19:).

The BCS system checks the USB interface before saving the data. If no USB stick is detected, a new window appears showing the folder structure on the CF-card as well as the message “Please plug a USB stick”..

If a USB stick is found, a new window appears, see next page (Fig. 5-20:).

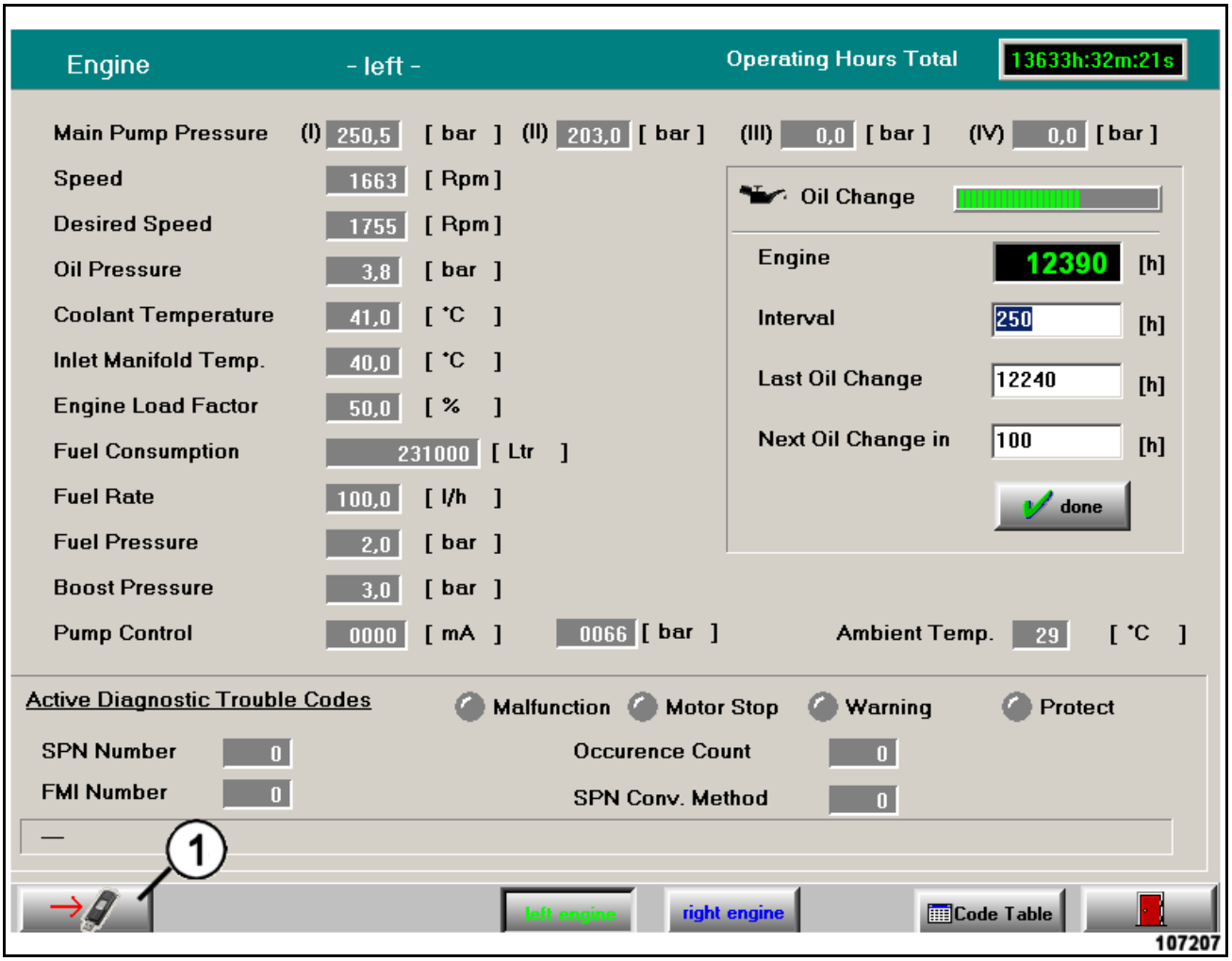



*Fig. 5-19:*

# ENGINE MONITORING, CONTROL LAMPS

The control lamps

- (49 and 50, Fig. 5-22:) for the left engine,
- (59 and 60, Fig. 5-22:) for the right engine,

indicate malfunctions and signal when certain limit values have been exceeded.

An automatic check is performed after switching on the electrical system of the machine; both lamps will light up for approx. 5 seconds and turn off afterwards.

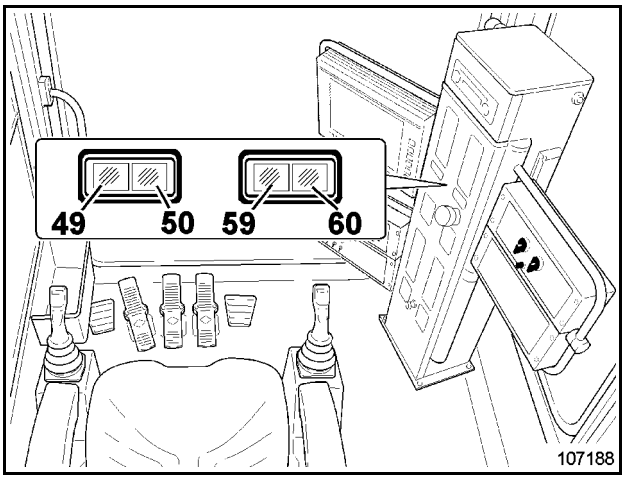



*Fig. 5-22:*

## Diagnosis lamp, yellow (49 and 59):

The diagnosis lamp indicates malfunctions of the electronic control of the engine.

For example: faulty sensors, cable breaks etc.

The indication uses so-called flash codes.

In case of a malfunction, the diagnosis lamp represents two digits, the "diagnosis code" or an "event code“.

This takes place by the flashing of the diagnosis lamp in quick succession.

The first and second digits of the flash code are derived by counting the flash signals.

There is a time interval of approx. 2 seconds between the flashing sequence of the first and second digit.

In case of several diagnosis codes, the time interval between two different diagnosis codes is approx. four seconds.

Refer to the engine's operating and maintenance manual for matching the diagnosis and event codes with the cause of malfunction.

Diagnosis codes are intended to isolate an error and are not suitable for detailed fault diagnostics.

## Warning lamp, red (50 and 60):

**Ignoring the signal lamp may lead to a potential engine breakdown.**

The warning lamp lights up as soon as certain limit values for the following operating parameters of the engine have been exceeded:

(An "Event“ occurred):

- Charge air temperature at engine intake,
- Temperature of coolant,
- Engine oil pressure,
- Engine speed (protection against overspeed),
- Fuel pressure,
- Fuel temperature.

In case of an event (e.g. temperature of coolant is too high), the lamp will light up. The diagnosis lamp provides the event code at the same time (flashing).

In case of a previously specified threshold value, the engine will reduce the output (so-called "engine derate“). This is not indicated by the lamps, e. g.:

- Engine oil pressure approx. 1bar (14.5psi) (rotation speed dependent),
- Temperature of coolant above 111°C (231.8°F),
- Temperature of intake air above 86°C (186.8°F),
- Temperature of fuel above 91°C (195.8°F).

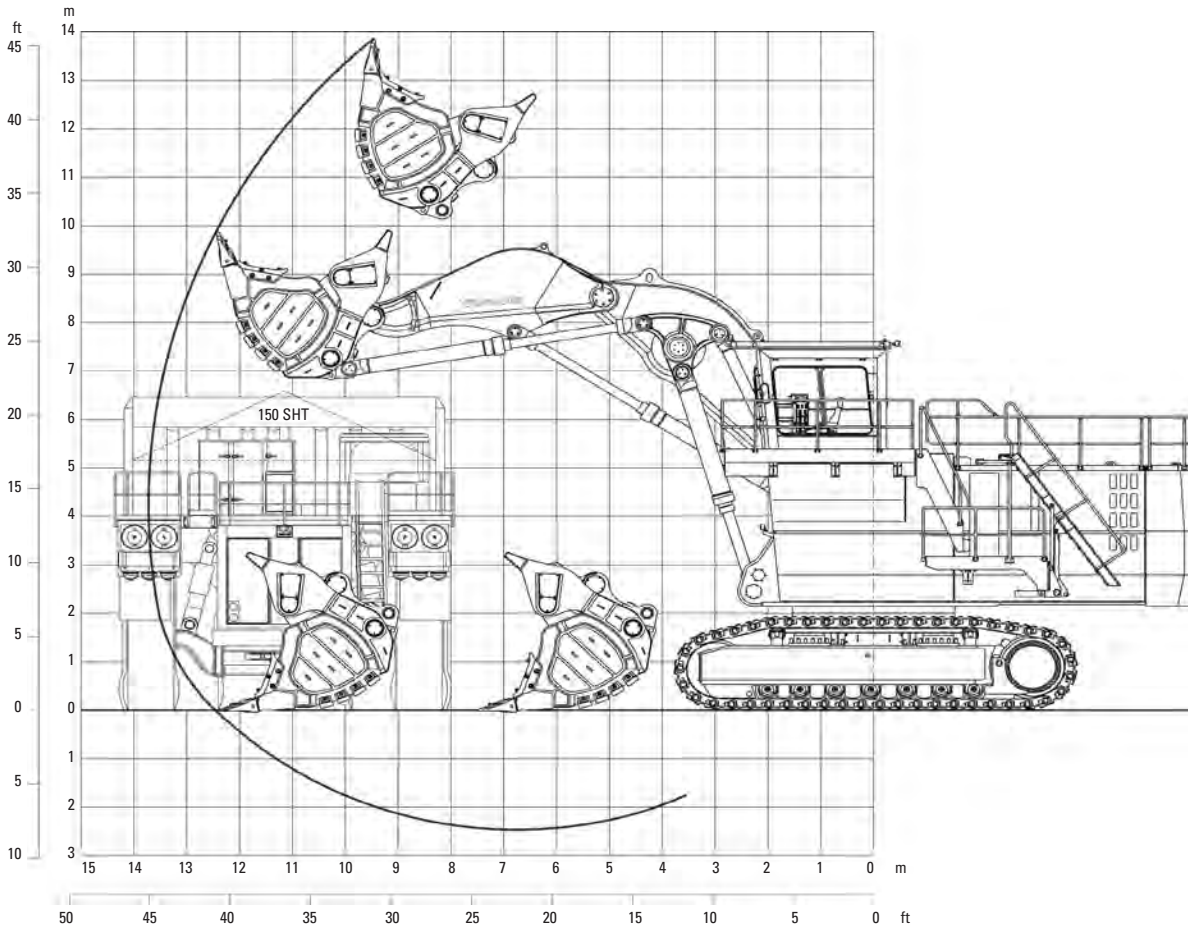
In case of a reduced output, for example by exceeding the maximum working height, none of the lamps will light up or flash.

The limit values and the engine's response when those values are exceeded can be adjusted in the so-called monitoring system within certain limits (service provided by the engine manufacturer).

# Hydraulic Shovel—6030

***TriPower* Face Shovel Attachment (FS)**

**Working Diagram - Boom 6.2 m (20 ft 4 in) - Stick 4.4 m (14 ft 5 in)**




**Working Range**

| | | |
|---|---|---|
| Max. digging height | 13.9 m | 45 ft 7 in |
| Max. digging reach | 13.7 m | 44 ft 11 in |
| Max. digging depth | 2.5 m | 8 ft 2 in |
| Max. dumping height | 10.7 m | 35 ft 1 in |
| Crowd distance on level | 4.9 m | 16 ft 1 in |

**Digging Forces**

| | | |
|---|---|---|
| Max. crowd force | 1 370 kN | 307,880 lb |
| Max. crowd force at ground level | 1 210 kN | 271,920 lb |
| Max. breakout force | 920 kN | 206,750 lb |

**Face Shovels**

| Type | Iron ore shovel | Iron ore shovel | Heavy rock shovel | Heavy rock shovel | **Standard rock shovel** |
|---|---|---|---|---|---|
| Tooth system | ESCO S95 | ESCO S95 | ESCO S95 | ESCO S95 | ESCO S95 |
| Capacity SAE/PCSA 1:1 | 11.6 $m^3$ (15.2 $yd^3$) | 13.9 $m^3$ (18.2 $yd^3$) | 15.4 $m^3$ (20.1 $yd^3$) | 17.0 $m^3$ (22.2 $yd^3$) | 19.0 $m^3$ (24.9 $yd^3$) |
| **Capacity SAE/CECE 2:1** | **10.0 $m^3$ (13.1 $yd^3$)** | **12.0 $m^3$ (15.7 $yd^3$)** | **13.5 $m^3$ (17.7 $yd^3$)** | **15.0 $m^3$ (19.6 $yd^3$)** | **16.5 $m^3$ (21.6 $yd^3$)** |
| Total width | 3 620 mm (11 ft 11 in) | 3 900 mm (12 ft 10 in) | 3 900 mm (12 ft 10 in) | 3 900 mm (12 ft 10 in) | 3 900 mm (12 ft 10 in) |
| Inner width | 3 220 mm (10 ft 7 in) | 3 500 mm (11 ft 6 in) | 3 500 mm (11 ft 6 in) | 3 500 mm (11 ft 6 in) | 3 500 mm (11 ft 6 in) |
| Opening width | 1 680 mm (5 ft 6 in) | 1 790 mm (5 ft 10 in) | 1 790 mm (5 ft 10 in) | 1 790 mm (5 ft 10 in) | 1 790 mm (5 ft 10 in) |
| No. of teeth | 5 | 6 | 6 | 6 | 6 |
| Weight incl. wear kit | 23 400 kg (51,590 lb) | 26 700 kg (58,860 lb) | 27 300 kg (60,190 lb) | 27 500 kg (60,630 lb) | 27 900 kg (61,510 lb) |
| Max. material density (loose) | 3.2 t/$m^3$ (5,390 lb/$yd^3$) | 2.6 t/$m^3$ (4,210 lb/$yd^3$) | 2.2 t/$m^3$ (3,710 lb/$yd^3$) | 2.0 t/$m^3$ (3,370 lb/$yd^3$) | 1.8 t/$m^3$ (3,030 lb/$yd^3$) |