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04 / 2013

Operation and Maintenance Manual

6020B
Hydraulic Shovel No.

DNR00101 - DNR00104

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Special work in conjunction with utilization of the machine and maintenance and repairs as well as troubleshooting during work; disposal of parts and consumables

Observe the adjusting, maintenance and inspection activities and intervals set out in the operating instructions, including information on the replacement of parts and equipment. These activities may be executed by skilled personnel only.

Brief operating personnel before beginning special operations and maintenance work, and appoint a person to supervise the activities.

In any work concerning the operation, conversion or adjustment of the machine and its safety-oriented devices or any work related to maintenance, inspection and repair, always observe the start-up and shut-down procedures set out in the Operation and Maintenance Manual and the information on maintenance work.

Ensure that the maintenance area is adequately secured.

If the machine is completely shut down for maintenance and repair work, it must be secured against inadvertent starting by:

- ➲ removing the ignition key and
- ➲ attaching a warning sign.

Carry out maintenance and repair work only if the machine is positioned on stable and level ground and has been secured against inadvertent movements.

To avoid the risk of accidents, individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting tackle and secured. Use only suitable and technically perfect lifting gear and suspension systems with adequate lifting capacity. Never work or stand under suspended loads.

The fastening of loads and the instructing of crane operators should be entrusted to experienced persons only. The marshaller giving the instructions must be within sight or sound of the operator.

For carrying out overhead assembly work always use specially designed or otherwise safety-oriented ladders and working platforms. Never use machine parts as a climbing aid

Wear a safety harness when carrying out maintenance work at heights above 1 m.

Wear an approved harness equipped with fall arresters and safety lines.

Keep all handles, steps, handrails, platforms, landings and ladders free from dirt, snow and ice.

Clean the machine, especially connections and threaded unions, of any traces of oil, fuel or preservatives before carrying out maintenance/repair. Never use aggressive detergents. Use lint-free cleaning rags.

Before cleaning the machine with water, steam jet (high-pressure cleaning) or detergents, cover or tape up all openings which - for safety and functional reasons - must be protected against water, steam or detergent penetration. Special care must be taken with electric motors and switch-gear cabinets.

Ensure during cleaning of the machine that the temperature sensors of the fire-warning and fire-fighting systems do not come into contact with hot cleaning agents as this might activate the fire-fighting system.

Exhaust pipes and turbo chargers in the engine compartments are covered with special heat-insulating material. This material must not be spray-washed with steam-jet cleaners or high-pressure cleaners. It will be damaged. Therefore cover all the insulating material with plastic foils before using steam-jet cleaners or high-pressure cleaners inside the engine compartments.

After cleaning remove all covers and tapes applied for that purpose.

After cleaning, examine all fuel, lubricant, brake and hydraulic fluid lines for leaks, loose connections, chafe marks and damage. Any defect found must be rectified without delay.

Always tighten any screwed connections that have been loosened during maintenance and repair.

Any safety devices removed for set-up, maintenance or repair purposes must be refitted and checked immediately upon completion of maintenance and repair work.

Ensure that all consumables and replaced parts are disposed of safely and with minimum environmental impact.

FIRE AND EXPLOSION HAZARD

⚠ WARNING

Safety instructions:

Prior to commencing work, obtain informatio-non 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 hydraulic shovel.

Combustible and easily or highly inflammable substances or liquids increase the risk of fire and explosion

Do not store or transport flammable substances on the hydraulic shovel during the work. 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.

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

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

Clean rubber or electrical with compressed air only.

Ensure sufficient ventilation.

Even battery gases can ignite in open flames or fire.

Avoid parking the hydraulic shovel in places where

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

Remove the hydraulic shovel from such an area where combustible or easily flammable liquids have spilled from the hydraulic shovel 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 hydraulic shovel.

Clean the hydraulic shovel before starting work.

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.

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.

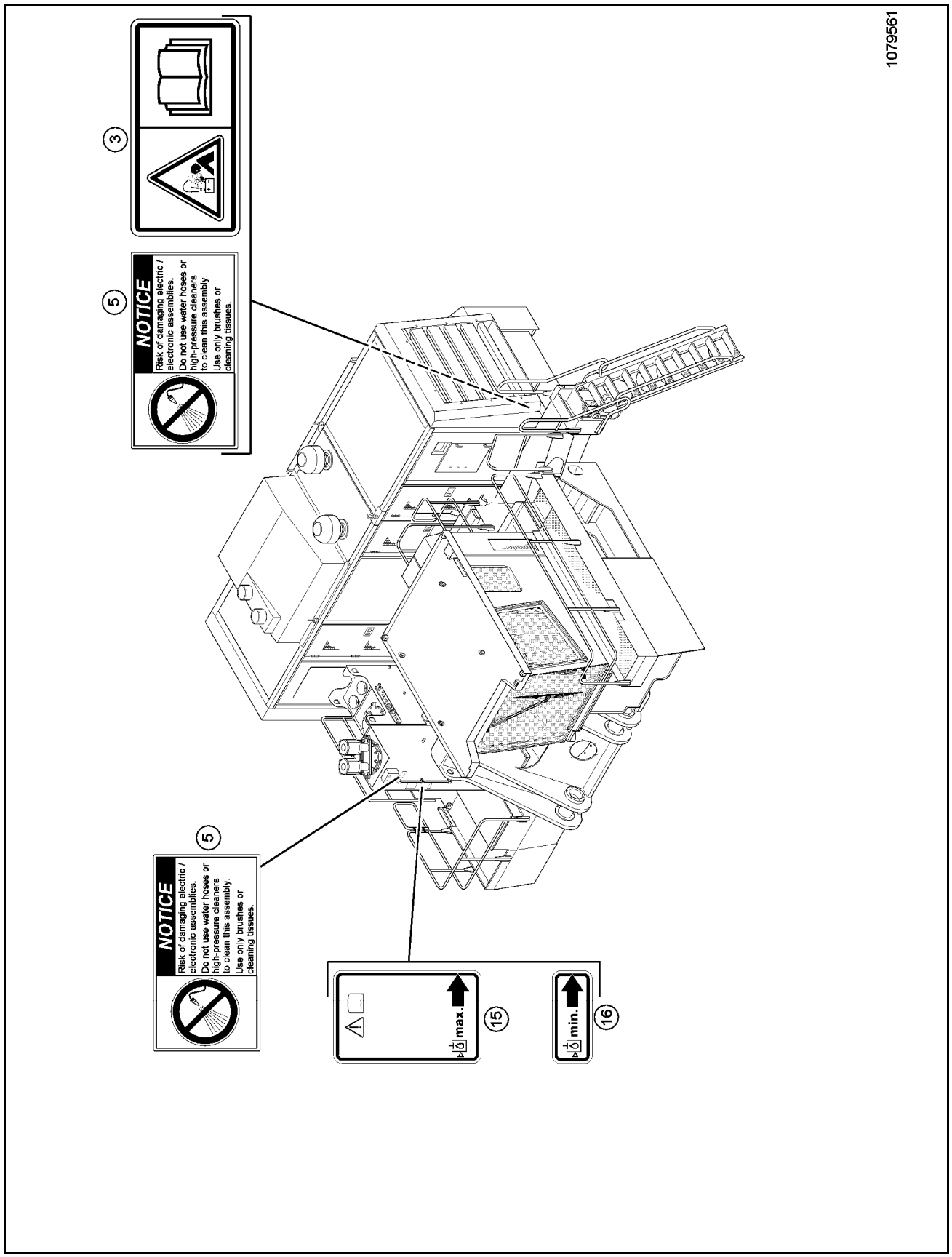
Do not extinguish flammable liquids with water. Use:

- 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.

Have all your welding, flame cutting and grinding work approved before starting work.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3
5
NOTICE
Risk of damaging electric / electronic assemblies.
Do not use water hoses or high-pressure cleaners to clean this assembly.
Use only brushes or cleaning tissues.
5
NOTICE
Risk of damaging electric / electronic assemblies.
Do not use water hoses or high-pressure cleaners to clean this assembly.
Use only brushes or cleaning tissues.
max.
15
min.
16

Fig. 2-7:

Machine number plate – location

The identification plate with the machine number (Fig. 2-32:) is attached to the front side of the A-frame (arrow, Fig. 2-33:).

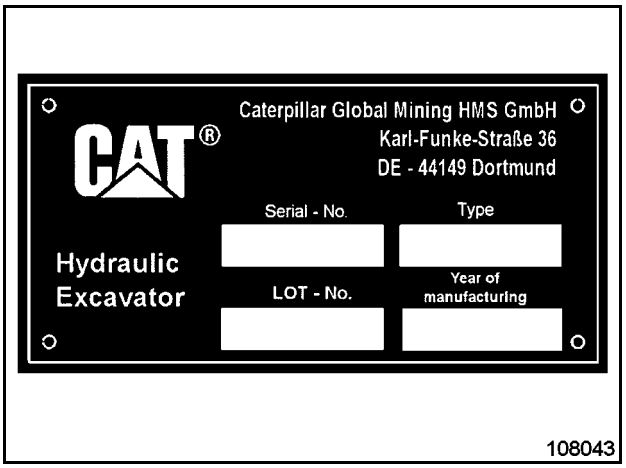

Fig. 2-32:

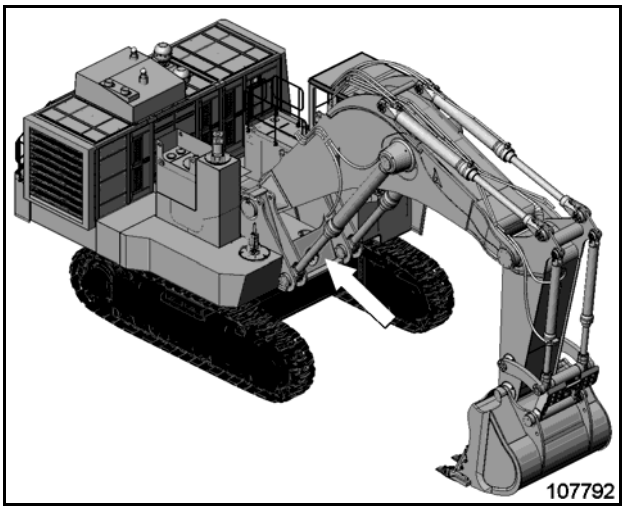

Fig. 2-33:

Component numbers – location

Other larger units also have identification plates indicating, among other things, their serial number.

On steel components, the CGM HMS part number or the serial number may be stamped into the metal at a clearly visible place.

Engine number plate – location

The serial number plate (1, Fig. 2-34:) for the diesel engine is located on the left side of the diesel engine.

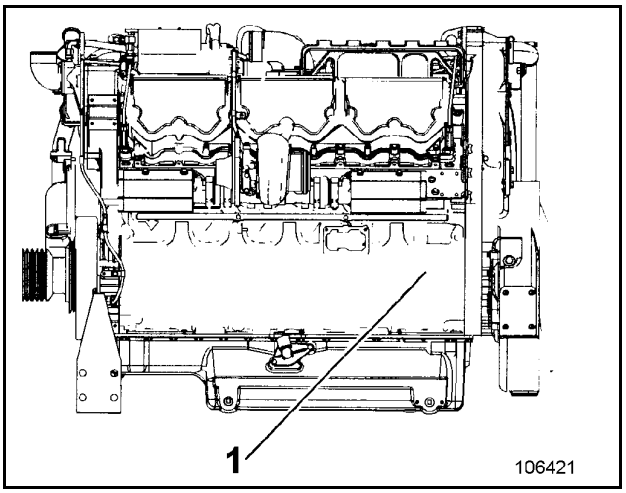

Fig. 2-34:

Engine information plate – location

The engine information plate (2, Fig. 2-35:) is located on the right side of the engine. The plate gives information about the engine like horsepower, high idle, full load engine speed and others.

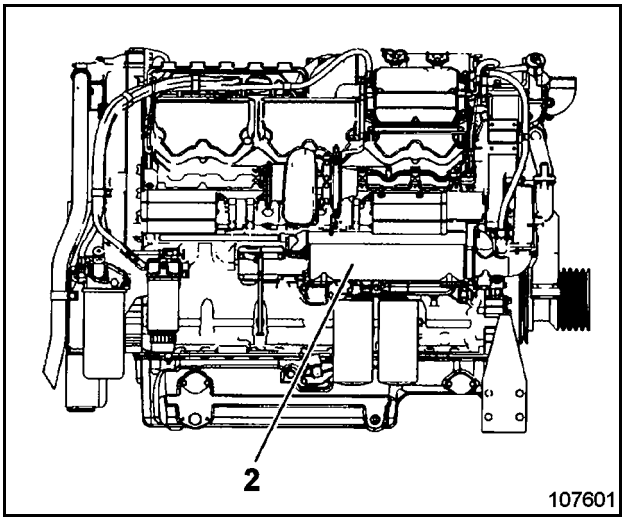

Fig. 2-35:

Emergency shut-off switches, continued

Emergency shut-off switch inside the power module, pump compartment

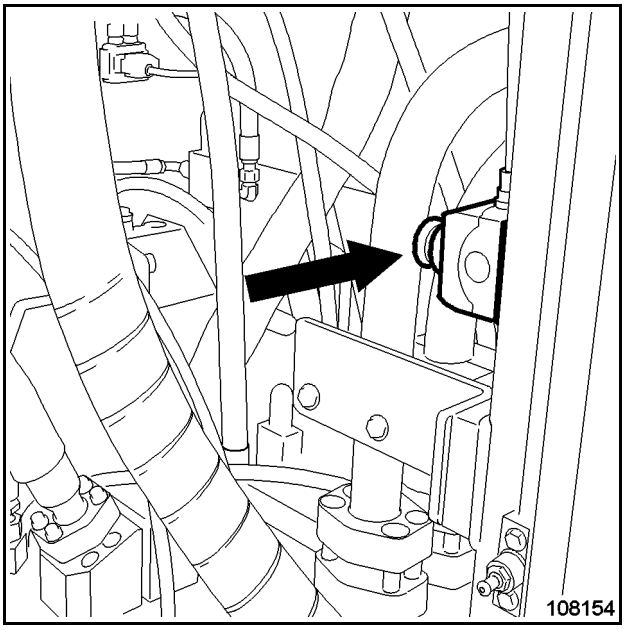

Fig. 2-60:

Emergency shut-off switch inside the power module, engine compartment

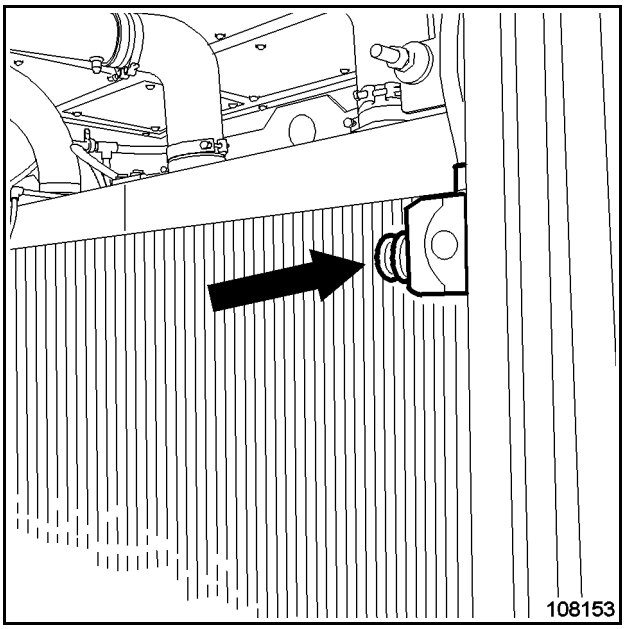

Fig. 2-61:

Emergency shut-off pull switch between power module and counterweight

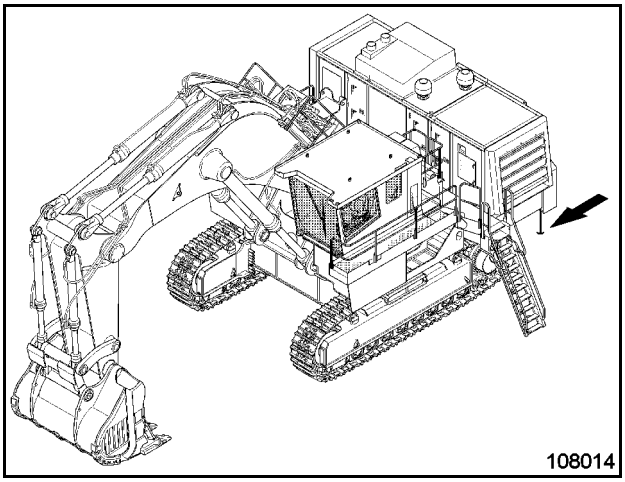

Fig. 2-62:

Putting the machine back into operation – reset of emergency shut-off function

The machine can only be put back into operation when all emergency shut-off switches listed above are again in their basic position (i.e. not actuated / resetted). To reset pull out the red knob. The emergency shut-off switch on the rear side of the power-module is resetted after pulling out the blue knob.

Additionally the Reset button switch (1, Fig. 2-63:) has to be pushed. The Reset button switch is located in the front door of the battery main switch cabinet (37) at the power module.

After pushing the Reset button switch (1) a green LED located inside the switch comes on.

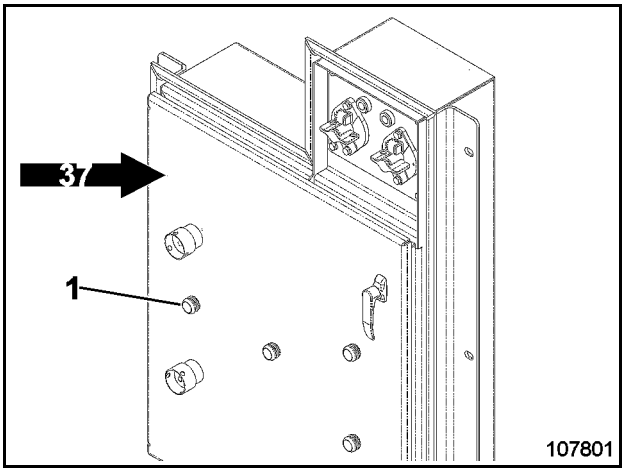

Fig. 2-63:

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(Fig. 2-87:)

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
81	**Switch**	**Travelling speed**	Not actuated: 1st travelling stage travelling forwards / backwards is possible. Press the switch face with the symbol: 2nd travelling stage, only parallel forward travel is possible. In case of backward travel and cornering, the machine switches back automatically into the 1st travelling stage.	
82	**Push-button**	**Central lubricating system reset**	Reset function of the central greasing system control (Press for at least 3 sec.). Press switch face to the left: Resets the control of the upper structure. Press the switch face to the right: **To be decribed.**	
83	**Push-button**	**Emergency lowering**	Lowering of the working equipment, for instance, if the engine has failed. Press and hold the switch face with the symbol using at the same time the control lever to lower the working equipment.	
84			Not connected.	
85	**Switch**	**Working light (optional)**	Press the switch face with the symbol: Workinglights on the boom / arm are ON.	
86	**Switch**	**When the machine has to be manoeuvered out of dangerous situations**	Press the switch face with the symbol: The machine can be driven and the upper structure be slewed although these functions are automatically deactivated. **Use this function only in dangerous situations to manouever yourself or the machine out of hazard zones.** **Risk of damaging parts of the machine, e.g. the hydraulic ladder.**	
87			Not connected.	
88			Not connected.	

Assemblies resp. reservoirs	Level measuring device	Remarks
Fuel tank	BCS fuel indicator (Fig. 2-93:)	Remove protective cap from express coupling at the Service-Station (arrow, Fig. 2-94:). Attach filling hose from the service vehicle to express coupling. Fill in fuel. Stop filling when the fuel tank is full. Detach filling hose. Push protective cap back on to express coupling.

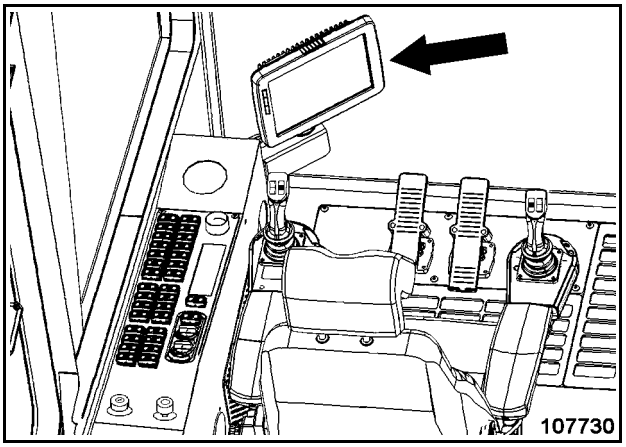

Fig. 2-93:

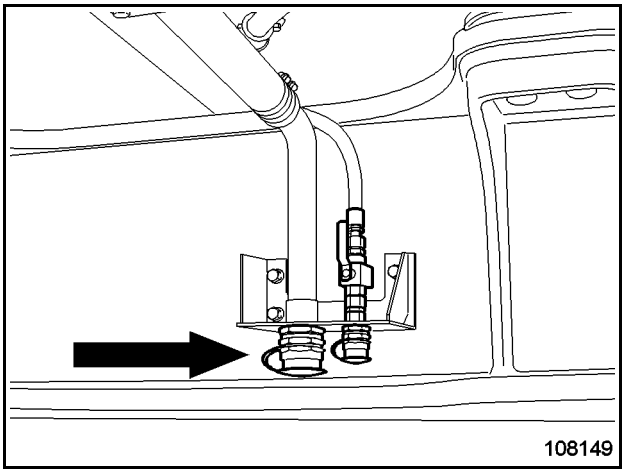

Fig. 2-94:

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TRANSPORTING THE MACHINE

Transport - Safety instructions

The machine must be loaded and transported only after all safety regulations have been observed and complied with.

Entrust loading and transporting of the machine to a company experienced in the transport of heavy equipment.

The responsability for loading and transporting lies with the transport company or their representative.

Remove oil, grease, soil, mud, snow, ice and other materials from the hydraulic shovel's transport modules and from ramps and loading platforms of the transport vehicle to minimize slipping.

Secure the transport vehicle against rolling away.

Use only tying equipment of sufficient strength (the weights and dimensions of the hydraulic shovel are set out in the "Product Specification Sheet").

Transport

The dimensions and the service weight of the fully assembled hydraulic shovel do not allow the hydraulic shovel to be transported in an undismantled state on a low-bed trailer over public roads.

Therefore, the machine must be disassembled into the transportable field assembly modules beforehand.

Lifting and lashing points as well as the center of gravity are marked on the modules (see example, Fig. 2-130:).

Dimensions and weights of the machines modules can be found in the annex, chapter “Product Specification Sheet” as well as in the “Service Manual”.

In chapter 3 of the Service Manual you can find a detailled description about disassembly and assembly procedures.

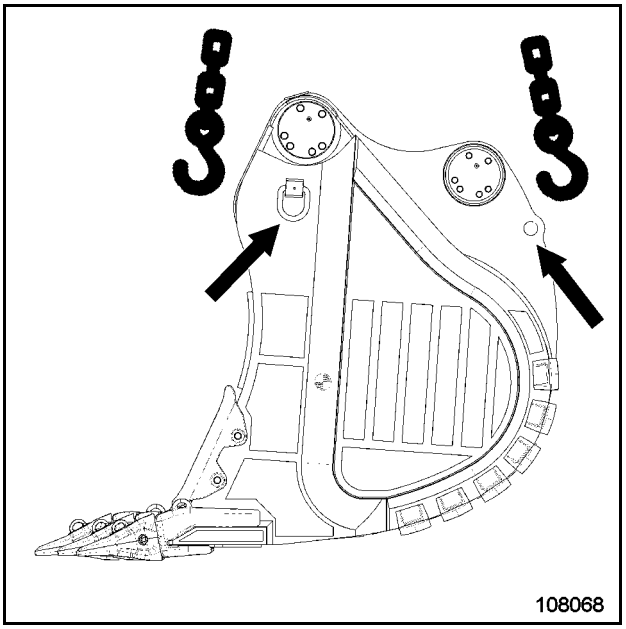

Fig. 2-130:

Emergency lowering of the working equipment

With the engine not functional, the working equipment can be lowered to the ground as follows:

- ➲ Switch on electrical system (24V) with key-operated switch (11, Fig. 2-144:).
- ➲ Actuate switch (83) and hold.
- ➲ Push control lever (116) forwards. The working equipment comes to the ground.

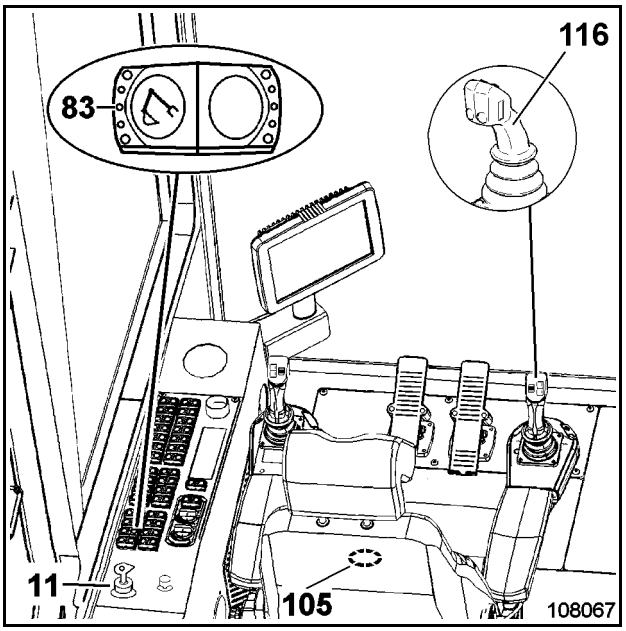

Fig. 2-144:

After daily operation

Parking the machine

- ➲ Park the machine on level and stable ground. This is particularly important in winter to avoid freezing of the tracks.
- ➲ Stand the working equipment on the ground.
- ➲ Shut off the engine.
- ➲ Shift both control levers into all directions to depressurize the hydraulic cylinders.
- ➲ Clean the machine of coarse dirt as well as of combustible and easily flammable substances, if possible with a stream jet (rubber parts and electric components with compressed air - refer to information label). Otherwise, the fire and explosion hazard will exist.
- ➲ Clean off gross dirt, ice and snow from the fins and the fan wheel of the hydraulic oil cooler.
- ➲ Fill up the fuel tank.
- ➲ Inspect the engine, the hydraulic system, the track rollers, support rollers, sprockets, idlers and gearboxes visually for leaks.
  Escaping oil pollutes the environment.
  Repair leaks immediately (or have them repaired).
  Report oil accidents to the responsible person.
- ➲ Check the upper structure, undercarriage and the working equipment for damage and all steel components for cracks or fractures.
  Report detected damage immediately to the responsible person.
- ➲ Withdraw the key from the electrical system key-switch.
- ➲ Lock the cab door and all lockable doors, hatches and covers on the machine.

INSPECTION AND SERVICING - SAFETY INSTRUCTIONS

Operating manual

No inspection and servicing work must be carried out until the operating manual has been read and understood.

Pay special attention to:

„Fundamental safety instructions" and all warnings and safety instructions attached to the machine.

The operating manual lists all jobs to be done. The descriptions of job sequences, however, provide only

Experienced personnel with the necessary instructions.

The operating manual must be kept with the machine at all times.

Inspection and servicing personnel

Inspection and servicing personnel must have the necessary know-how on the inspection and servicing of this or comparable machines.

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

Personal protective equipment and working clothes

Wear closely fitting working clothing when working on the machine. Loose, wide garments may catch on machine parts and result in injury.

Wear your personal protective equipment: a safety helmet, safety goggles, safety footwear and gloves.

When carrying out work on the working equipment, f.ex. on the boom, use a fall arrester. Falling down from great hight may cause severe injuries. Connect the fall arrester to the safety line on the boom.

Securing the working equipment

Stand working equipment on the ground in such a way that no movements can be made if mechanical or hydraulical connections become detached.

Secure any equipment or component which is to be mounted or dismantled, or whose position is to be changed, with hoists or appropriate slinging / supporting devices to prevent them from moving, slipping or falling inadvertently.

Securing the machine

Carry out servicing work only if the machine is secured as described in the section "Securing the machine".

Climbing onto and off the machine

Use only the ladders, steps, platforms and handrails provided when climbing onto or off the machine.

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

Always face the machine when climbing on and off.

Always maintain a three point contact with the steps and grab handles.

Checking the state of tools

Use only fully functional, reliable tools.

Select the right tool for the job.

Wrenches of the wrong size, for example, may slip and cause injury.

Cleaning jobs

Prior to commencing work, clean your working area, if necessary and possible, with a stream jet (rubber parts and electric components with compressed air - refer to information label).

Exhaust pipes and turbo chargers in the engine compartments are covered with special heat-insulating material. This material must not be spray-washed with steam-jet cleaners or high-pressure cleaners. It will be damaged. Therefore cover all the insulating material with plastic foils before using steam-jet cleaners or high-pressure cleaners inside the engine compartments.

Use only lint-free cleaning rags when working on the hydraulic system or the engine.

Cleaning agents and solvents may give off harmful, readily flammable vapours. Never work with such agents except on well ventilated premises; never inhale the vapours and never smoke.

Prevent solvents and cleaning agents from coming into contact with your skin.

Wear gloves.

Observe the instructions on the packaging.

Plan N

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

Location	Servicing work	Quantity	Checked
Undercarriage:			
LH / RH crawler structure	Inspect visually for cracks / damage		
Carbody	Inspect visually for cracks / damage		
- Fastening bolts	Check for tightness (see: „Service Manual“)		
- Hoses	Check for leaks, tightness of flange bolts		
Track chain assembly			
- Bolts	Check for tightness (see: „Service Manual“)		
- Chain links	Check for cracks / broken pins		
- Shoes	Check for cracks		
Track tensioning system			
- Cylinder	Check for leaks		
- Pressure accumulator	Check pressure (see: „Service Manual“)		
- Hoses	Check for leaks / damage		
- Idler assembly	Check axle for leaks		
Travel gearbox (PN 3857025)			
- Pre-stage (spur gear section)	Change oil	2 x 1 [3]	
- Main stage	Change oil	2 x 1 [3]	
- Motor coupling housing	Change oil	2 x 2 [3]	
- Fastening bolts at gearbox, sprocket, motors and guards	Check for tightness (see: „Service Manual“)		
All lines, hoses, fittings and connections	Inspect visually for leaks, wearing marks, tightness of flange bolts		
Upper structure:			
Engine (After 20 – 40 OH, cf. Engine Operation and Maintenance Manual)			
- V-belts, Poly-V-belts	Check tension, check condition		
- Bearing, fastening bolts	Check for tightness		
Cooling system			
- Cooling liquid	Carry out cooling liquid analysis after 250 OH (see: “Engine Operation and Maintenance Manual”)		
- Radiator bearings, fastening bolts	Check for tightness (see: „Service Manual“)		
- Coolant lines	Check for leaks, check tightness of clamps		

[3] 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**	**Quantity**	**Plan A**	**Plan B**	**Plan C**	**Plan D**	**Plan E**
Steel components	Visual inspection acc. to "Structural Inspection Report every 500 OH" [18]			●	●	●	●
	If any suspect areas have been found additional testing is required: For detailed crack analysis prepare the surface of the relevant area to be inspected and carry out the dye penetrant, magnetic powder or ultrasonic test.			●	●	●	●
Modules							
– Fastening bolts	Check for tightness (see: “Service Manual”)				●	●	●
All articulated joints and hinges	Lubricate				●	●	●

[18] "Structural Inspection Reports" for inspections every 500 OH can be downloaded from the CGM HMS website www.bucyrus-HEX.de, section "Support, Warranty".

II. Fluid for hydraulic system

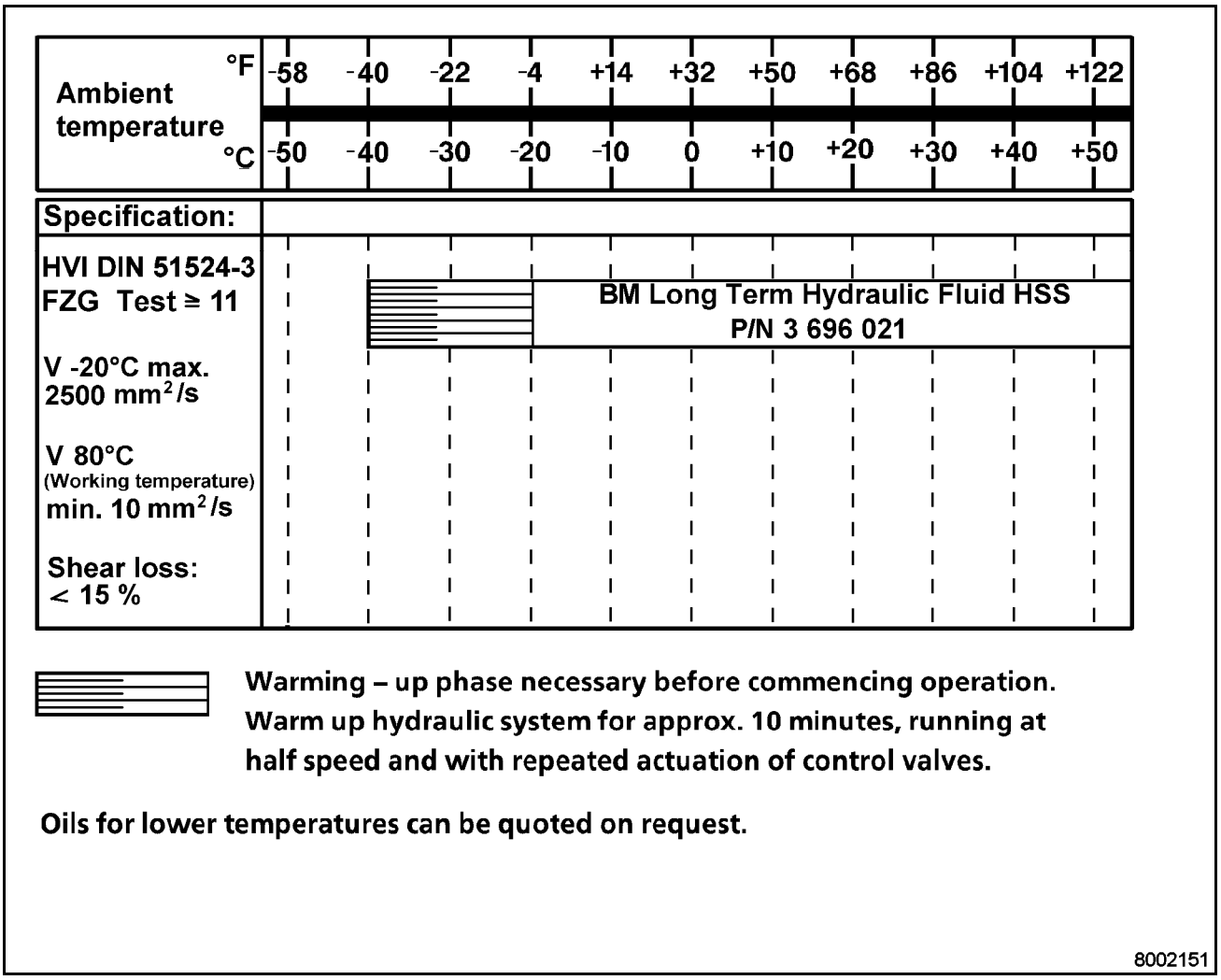

Fig. 3-5:

Engine oil filters – Replace

⚠ CAUTION

Risk of scalding from hot engine oil.

The engine may also be hot.

Wear protective gloves and firm working clothing.

Collect escaping oil and discard without polluting the environment.

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

- ➲ Carry out servicing of the oil filters (Fig. 3-22:) in accordance with the engine operating instructions.
- ➲ Shut off the engine.
- ➲ Unscrew the four filters (arrow, (Fig. 3-22:).
- ➲ Install new filters together with slightly oiled sealing ring and tighten by hand.
- ➲ Run engine at idling speed for a short time and check filters for leaks. Shut off engine.
- ➲ After 10 minutes check oil level, top up if necessary.
  (Oil grade see: “LUBRICANTS / CONSUMABLES” section).

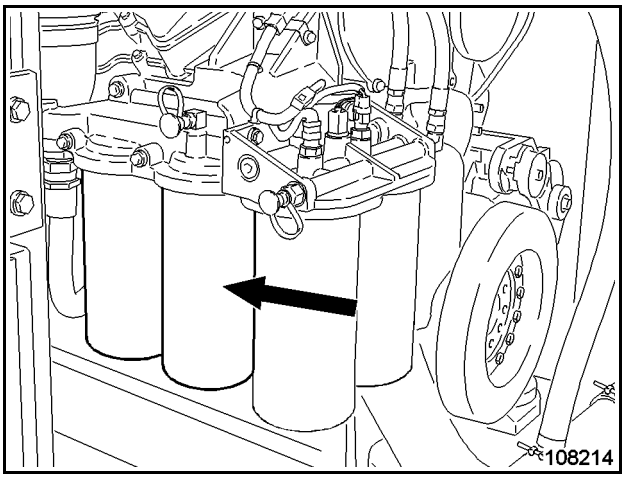

Fig. 3-22:

AIR-INTAKE SYSTEM - INFORMATION

⚠ WARNING

Risk of injury caused by hot parts of the engine exhaust system.

Let exhaust cool down.

NOTICE

Do not start the engine when parts of the air-intake system have been detached.

Engine damage may occur if the engine is allowed to draw in unfiltered air.

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

Read and observe the "Engine - Safety instructions" chapter.

The engine is equipped with two dry-air filters consisting of Cyclone pre-cleaner, dust trap, main filter element and secondary filter element (Fig. 3-40:).

The Cyclone pre-cleaners are located on the deck of the power module. They work automatically, no cleaning work is necessary.

The two air filters are mounted inside the power module (Fig. 3-39:). One is accessible from the machine's center and one is accessible from the counterweight-side after opening an access door.

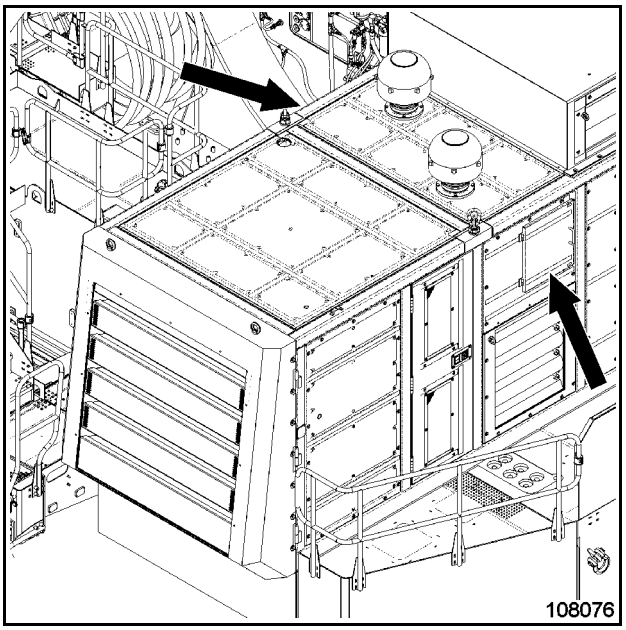

Fig. 3-39:

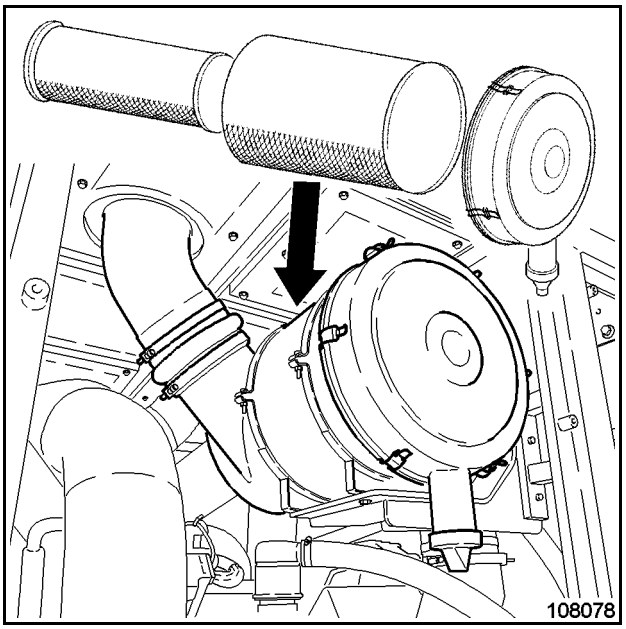

Fig. 3-40:

Dust trap - Cleaning

The dust trap (arrow, Fig. 3-41:) collects dust and dirt that infiltrates the air filter housing.

➲ Open access doors of the power module.

➲ To remove dust and dirt, squeeze the flexible part of the dust trap several times.
Dust and dirt will be detached and come off.

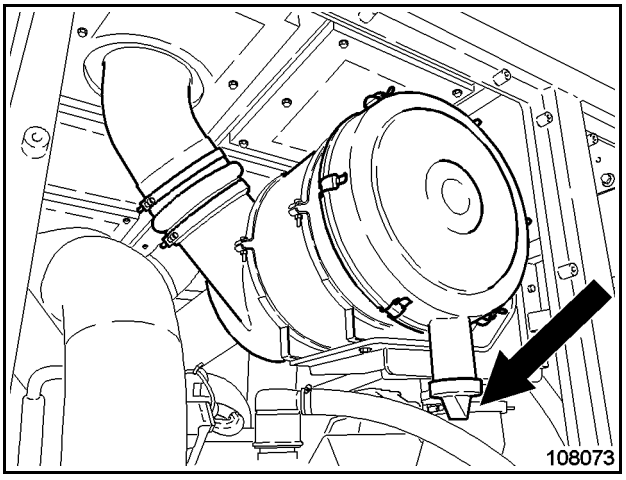

Fig. 3-41:

Fuel tank – drain water and sediment

⚠ WARNING

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. Therefore, before working on the fuel tank:

Shut off the engine.

Keep away naked flames.

Do not smoke.

Collect escaping fuel and discard without polluting the environment.

Diesel fuel may cause skin injury.

Avoid skin contact with diesel fuel.

Wear firm working clothing.

Wear protective gloves or use a barrier cream.

- ➲ Shut off the fuel tank supply valve to the engine. To do so, shift lever of the ball valve to position "**0**" (Fig. 3-57:).
- ➲ Collect escaping liquid in a recipient suitable for diesel fuel and discard without polluting the environment.
- ➲ Loosen drain plug (arrow, Fig. 3-57:) and drain off water and sediment.
- ➲ Screw drain plug back in place.
- ➲ Open fuel tank supply valve. To do so, shift lever of the ball valve to position "**I**"

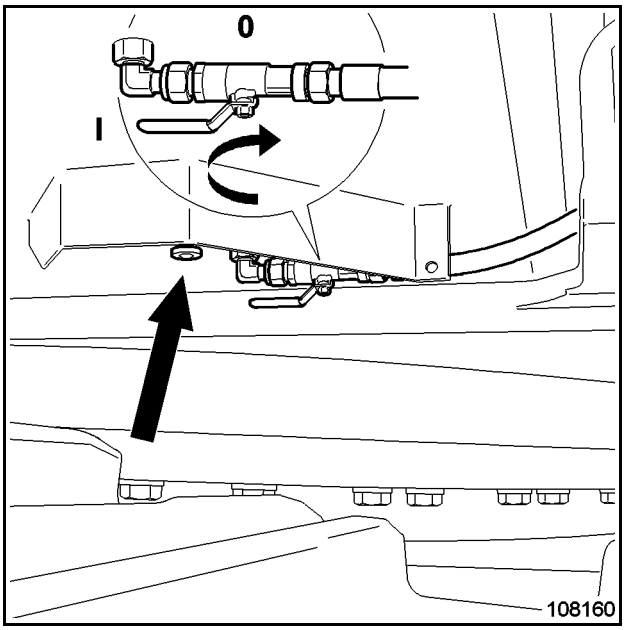

Fig. 3-58:

HYDRAULIC SYSTEM

Hydraulic system - Safety instructions

⚠ WARNING

Hydraulic oil under pressure!

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 engine.

⚠ CAUTION

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

Contact with hydraulic oil can cause skin injury.

Avoid skin contact with hydraulic oil.

Wear protective gloves and firm working clothing.

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

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

Hydraulic system - depressurize

Hydraulic systems may only be opened if they are completely depressurized. Even when an hydraulic shovel is parked on a horizontal surface with the working equipment resting on the ground (Fig. 3-74:) and with its engine 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:

➲ 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.

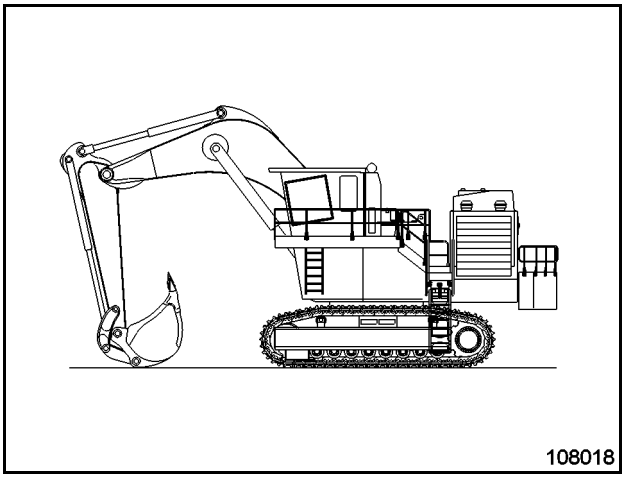

Fig. 3-74:

Hydraulic oil - change

⚠ CAUTION

Risk of scalding caused by hot hydraulic oil.

The hydraulic oil tank itself may also be hot.

Shut off the engine and let the system cool down before starting work.

Skin contact with hydraulic oil may cause skin injury. Avoid skin contact.

Wear protective gloves and firm working clothing.

Collect escaping hydraulic oil and discard without polluting the environment.

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

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

NOTICE

Do not start up the drive engine when the hydraulic oil tank 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 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 assumes no warranty for damage caused as a result of the machine having been operated with consumables of inappropriate specification or with mixed fluids.

PUMP DRIVE GEARBOX P/N 3855121

⚠ CAUTION

Risk of scalding caused by hot gearbox oil.

The gearbox housings may be hot, too.

Shut off the engine and let cool down.

Skin contact with gearbox oil 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.

To identify the gearbox partnumber (P/N) check the name plate attached to the gearbox.

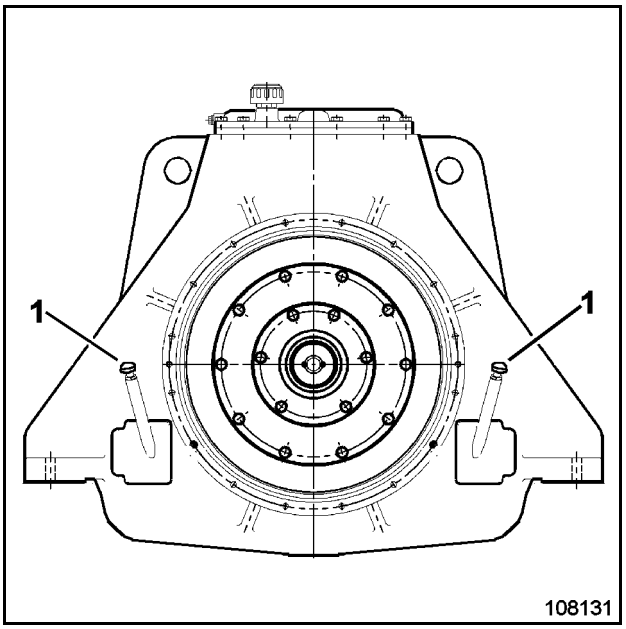

Fig. 3-113:

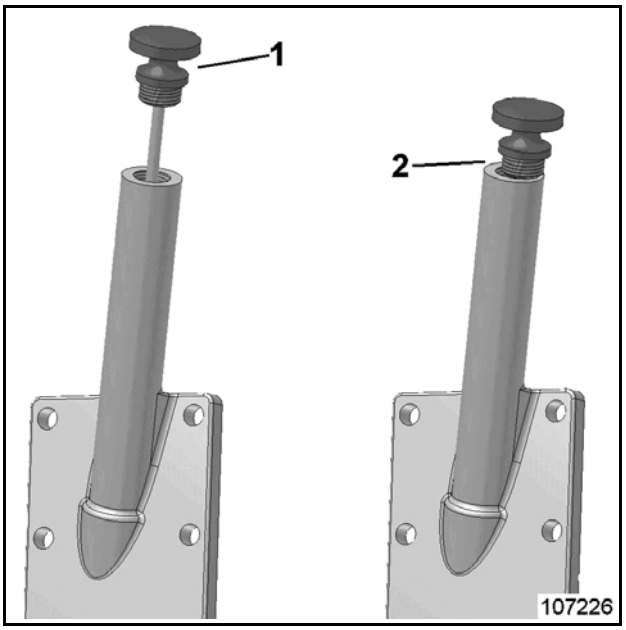

Fig. 3-114:

Pump drive gearbox - checking the oil level / Topping up with oil

- ➲ Park the machine as described under "Securing the machine".
- ➲ Unscrew dipstick (1, Fig. 3-113: and Fig. 3-114:) and wipe.
- ➲ Insert dipstick until the thread reaches the top of dipstick's tube, do not screw in (2, Fig. 3-114:).
- ➲ Withdraw a second time.
  Oil level should be between the two dipstick markers "min" and "max".
  Top up with gearbox oil if required. Fill in gearbox oil through dipsticks bore.
  (Oil grade see: „LUBRICANTS / CONSUMABLES" section).
- ➲ Screw in dipstick (1) back in place.

Travel gearbox pre-stage - Changing oil

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

Draining off oil

- ➲ Open cover of the travel motors.
- ➲ Place a collecting recipient for used oil under the gearbox pre-stage.
  Choose the required capacity in accordance with the "Refilling quantities - Oil" table.
- ➲ Unscrew drain plug (2, Fig. 3-132:) and drain off the oil completely.
  Slackening plug (1) allows the oil to run out more readily.
- ➲ Clean screw plugs (1 and 2)
- ➲ Screw screw plug (2) back in place.

Filling in oil

- ➲ Fill in oil through opening of plug (1) until it reaches the center of inspection glas (3).
  (Oil grade see “LUBRICANTS / CONSUMABLES” section).
- ➲ Screw plug (1) back in place.

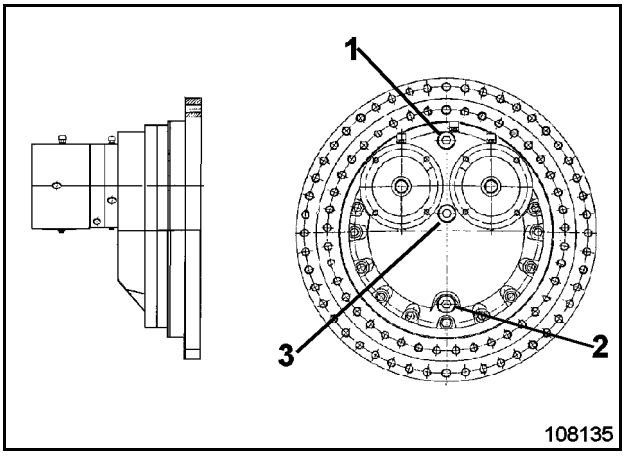

Fig. 3-132:

Travel motor coupling housing - Changing oil

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

Draining off oil

- ➲ Open cover of the travel motors.
- ➲ Place a collecting recipient for used oil under the brake housing.
  Choose the required capacity in accordance with the "Refilling quantities - Oil" table.
- ➲ Unscrew drain plugs (3, Fig. 3-134:) and drain off the oil completely.
  Slackening breather (1) allows the oil to run out more readily.
- ➲ Clean screw plugs (3).
- ➲ Screw plugs (3) back in place.

Filling in oil

- ➲ Unscrew screw plug (2).
- ➲ Fill in oil through opening of breather (1) until it flows out of opening of plug (2).
  (Oil grade see “LUBRICANTS” section).
- ➲ Screw plugs (2) and breathers (1) back in place.

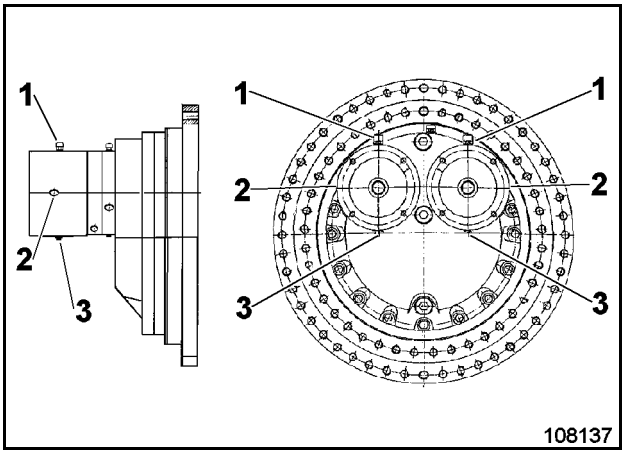

Fig. 3-133:

Grease drum - replace

Always replace the grease drum in time to avoid air from penetrating into the greasing system. Air in the greasing may cause malfunctions.

- ➲ Stand working equipment to the ground.
- ➲ Shut off the engine.
- ➲ Switch off the electrical system of the machine.
- ➲ Depressurize hydraulic system.
- ➲ Detach plate (2, Fig. 3-148:). The grease drum is accessible then (Fig. 3-150:).
- ➲ Clean the lid of the grease drum and all components carefully to prevent the grease system from being contaminated.
- ➲ Depressurize grease lines by pressing down lever (arrow, Fig. 3-150:).
- ➲ Detach hydraulic lines (1 and 2, Fig. 3-151:) and grease line (3) from the express couplings.
- ➲ Detach all electrical connections to sensors and valves.

Continued next page

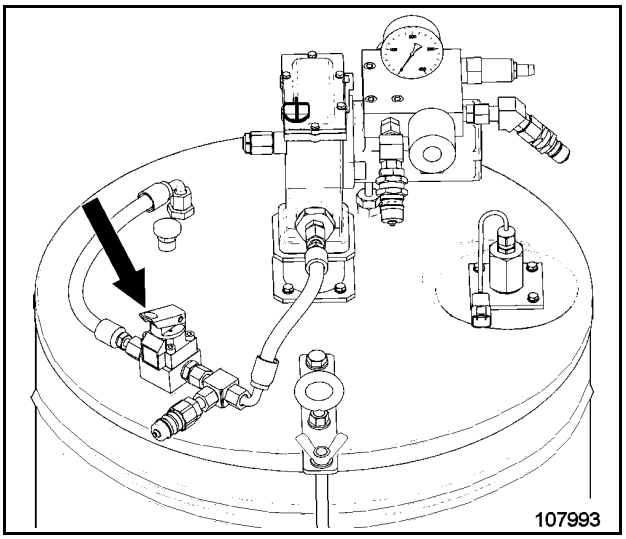

Fig. 3-150:

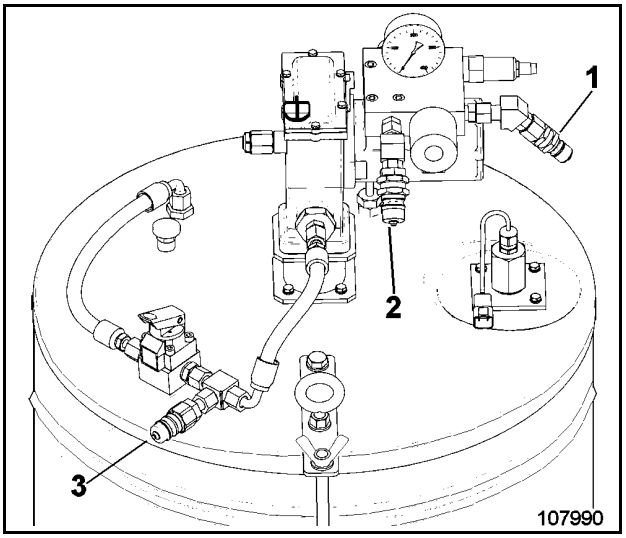

Fig. 3-151:

Window panes - cleaning

- Clean the outside of the cab windows from the walkways (see Fig. 3-168:).
- Use a clean sponge or a soft cloth.
- Wash the windows with a mild soap or with a mild detergent. Also use plenty of lukewarm water.
- Rinse the windows thoroughly.
- Dry the windows with a moist chamois or with a moist cellulose sponge.

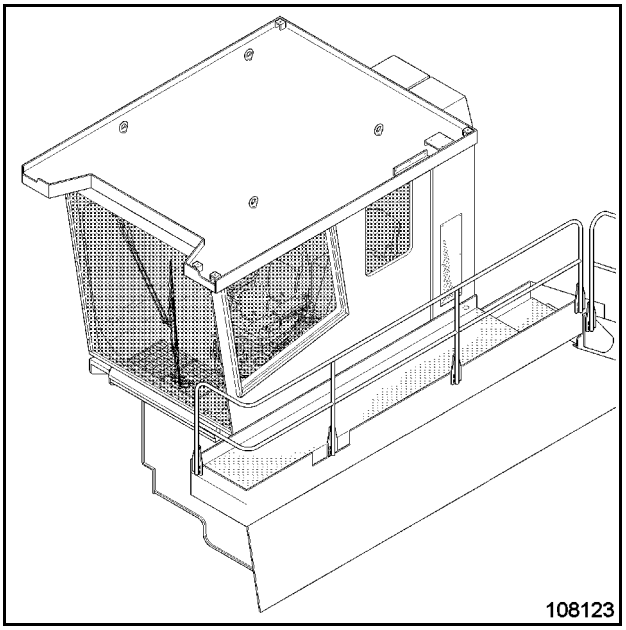

Fig. 3-168:

Floor window pane - cleaning

- Clean the floor window in front of the operator's seat from inside the cab (see Fig. 3-169:).
- Unscrew grids, mounted above the window (arrow, Fig. 3-169:).
- Use a vacuum cleaner to remove coarse dirt laying on the pane..
- Use a clean sponge or a soft cloth.
- Wash the windows with a mild soap or with a mild detergent. Also use plenty of lukewarm water.
- Rinse the windows thoroughly.
- Dry the windows with a moist chamois or with a moist cellulose sponge.
- Attach the grids back in space.

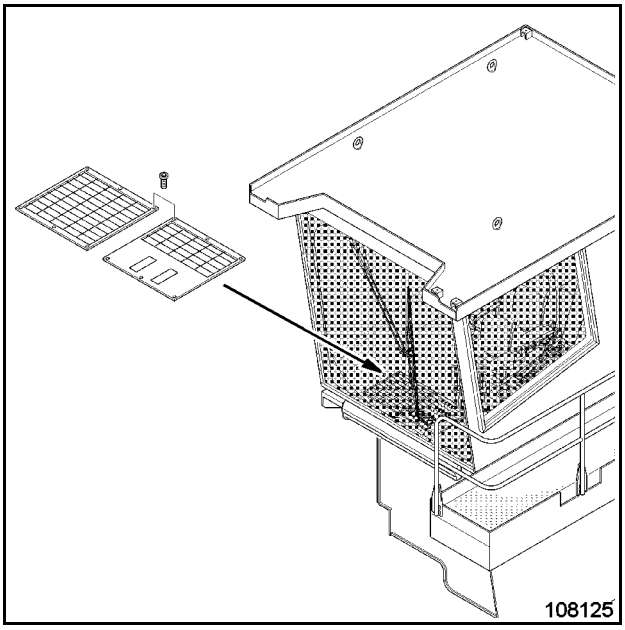

Fig. 3-169:

REPAIR WORK - FIRE AND EXPLOSION HAZARD

⚠ WARNING

Prior to commencing work, obtain informationon 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 hydraulic shovel.

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 hydraulic shovel. If combustible, easily or highly flammable substances or liquids were used during maintenance operations, they must be completely removed from the hydraulic shovel at the end of the work.

Avoid parking the hydraulic shovel in places where

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

Remove the hydraulic shovel from such an area where combustible or easily flammable liquids have spilled from the hydraulic shovel 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 hydraulic shovel.

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 hydraulic shovel 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.

DISPOSAL AT THE END OF THE SERVICE LIFE

Dismantling and removal instructions

Before beginning work, think about the risks involved, e.g.:

- Most of the machine components have considerable mass. Therefore use only lifting gear and slings of sufficient bearing capacity.
- Risk of residual pressures still in the hydraulic system. Be very careful when opening hydraulic lines.

Read the following text attentively and observe the instructions given. Respecting the instructions will help you to protect yourself against health hazards and injuries and to prevent avoidable environment pollution.

Risk of deflagrations

In the course of time, flammable gases may have formed or accumulated in the hollow spaces of welded constructions, e.g. the counterweight. To remove these flammable gases, the hollow spaces must be purged carefully with compressed air before work with hand grinders, flame cutters or other sparking tools is being undertaken.

Risk of fire

Remainders of fuel or oils may lead to the formation of flammable gases in tanks or other hollow spaces. When these tanks or hollow bodies are cut into pieces, the gases may ignite or even explode.

For this reason, remove all fuel or oil remainders from these components and purge them carefully with compressed air in order to eliminate flammable gases (other efficient methods of removing flammable gases can also be applied) before work with hand grinders, flame cutters or other sparking tools is being undertaken.

Disposing of the machine without polluting the environment

Before stripping down the machine at the end of its service life observe the following instructions:

The assemblies of the machine contain various operating fluids or lubricants. These substances may pollute the environment (so-called hazardous substances) and must therefore be disposed of properly.

Observe the national laws and regulations governing the non-polluting disposal of these substances.

Remove all operating fluids from the systems, remove all lubricants and dispose of these substances properly.

- Fuel system:
  fuel tanks, fuel filters, fuel lines, filling station. Auxiliary attachment and units, such as an onboard crane or an auxiliary heater have their own fuel tanks with the corresponding line systems.
- Hydraulic oil:
  hydraulic oil tank, hydraulic cylinders, hydraulic motors, hosepipes, piping, hydraulic pumps, hydraulic valves, hydraulic oil filter, filling station.
- Engine coolant:
  engine, radiator, expansion reservoir, piping and hosepipes, filling station.
- Gearbox oil in swing gearboxes, travel gearboxes and pump drive gearbox systems, expansion tanks, piping and hospipes, filling station; idlers, support and track rollers.
- Have the refrigerant (R134A) sucked out of the air conditioner system.
- Grease from the central lubricating system, grease drum, piping and hosepipes, distributors, filling station; grease accumulations in bearings of the working equipment, grease filling in the slewing ring, grease filling in track and support rollers as well as in idlers.

BCSIII, the first screen after startup

This screen (Fig. 5-6:) is displayed once after starting up the machine.

The screen may contain important messages given from the service personnel to the operator.

In the lower part of the screen a fault log may appear.

The operator should follow the massages given.

After tapping the button, the BCS start screen will appear.

With tapping this button the operator confirms that he read the messages given on this screen.

The BCS screen is designed as a touch-screen. By slightly touching the active areas, the user can perform activities such as changing to another screen page.

Active areas are shown on the screen as three-dimensional graphics. In the basic configuration – not activated - they seem to project out of the user interface. When touched, they appear to be lowered.

NOTICE

Never use pointed objects such as a ball pen, screwdriver, nail or similar.

This could damage the active surface of the touch-screen.

Do not press on the sensitive areas, just slightly touch them with your fingertip!

Fig. 5-5:

System status – Hydraulics, Attachment screen

This screen (Fig. 5-14:) displays graphically and numerically the current hydraulic pressures in the cylinders of backhoe attachment.

The pointers should be in the green coloured sections of the dial gauges. If the pointer is in the red section an event / fault occurs.

Check the “Event list” for details. Call the responsible service personnel.

HE = Piston side of the hydraulic cylinder;

RE = Rod side of the hydraulic cylinder.

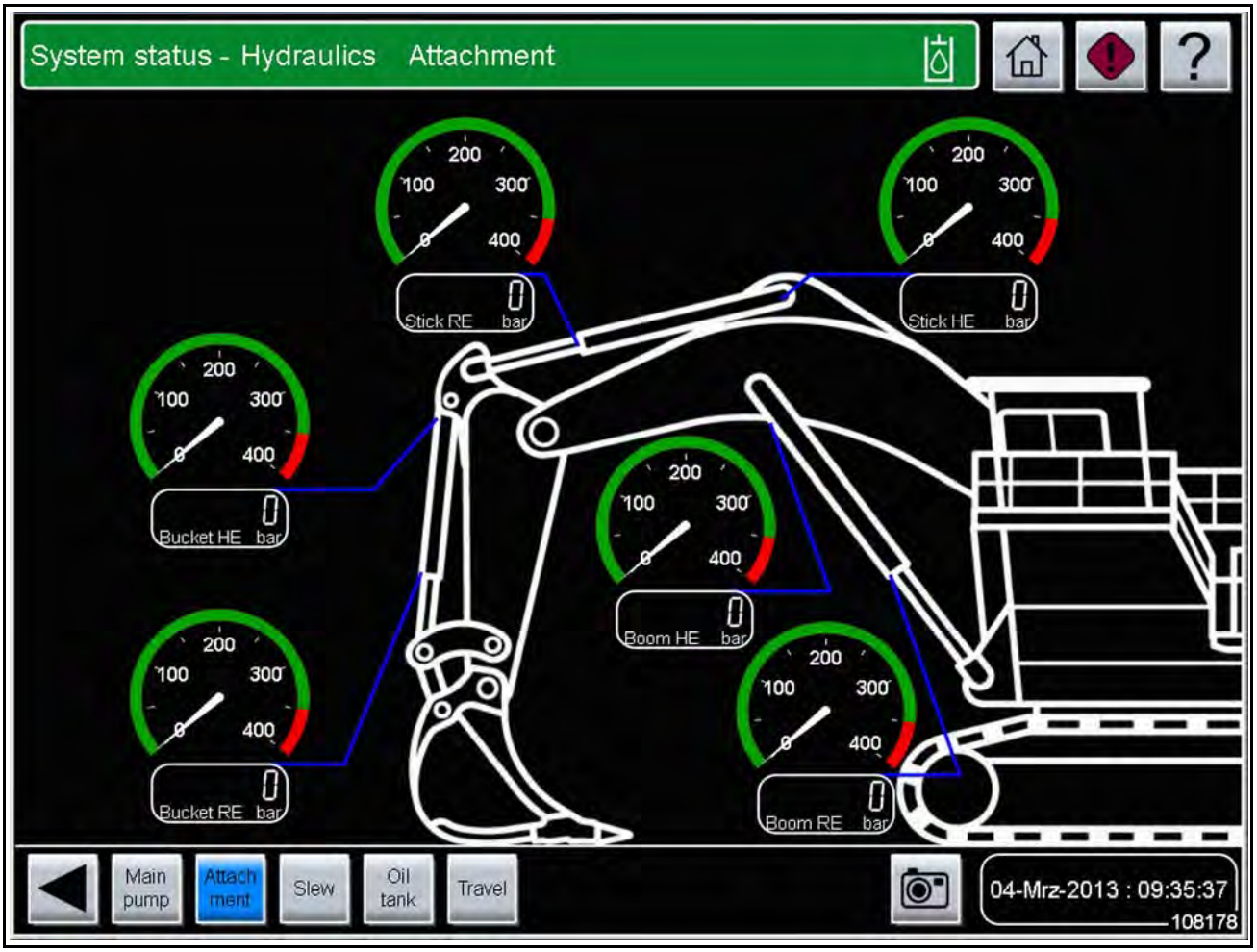

Fig. 5-14:

PDF™ reader - settings screen

In this screen some settings can be made that influence the appearance of the PDF™ file viewer.

- Arrangement of the menu bar, left or right side of the window.
- Possibility to invert swipe.
- Background color black or white.

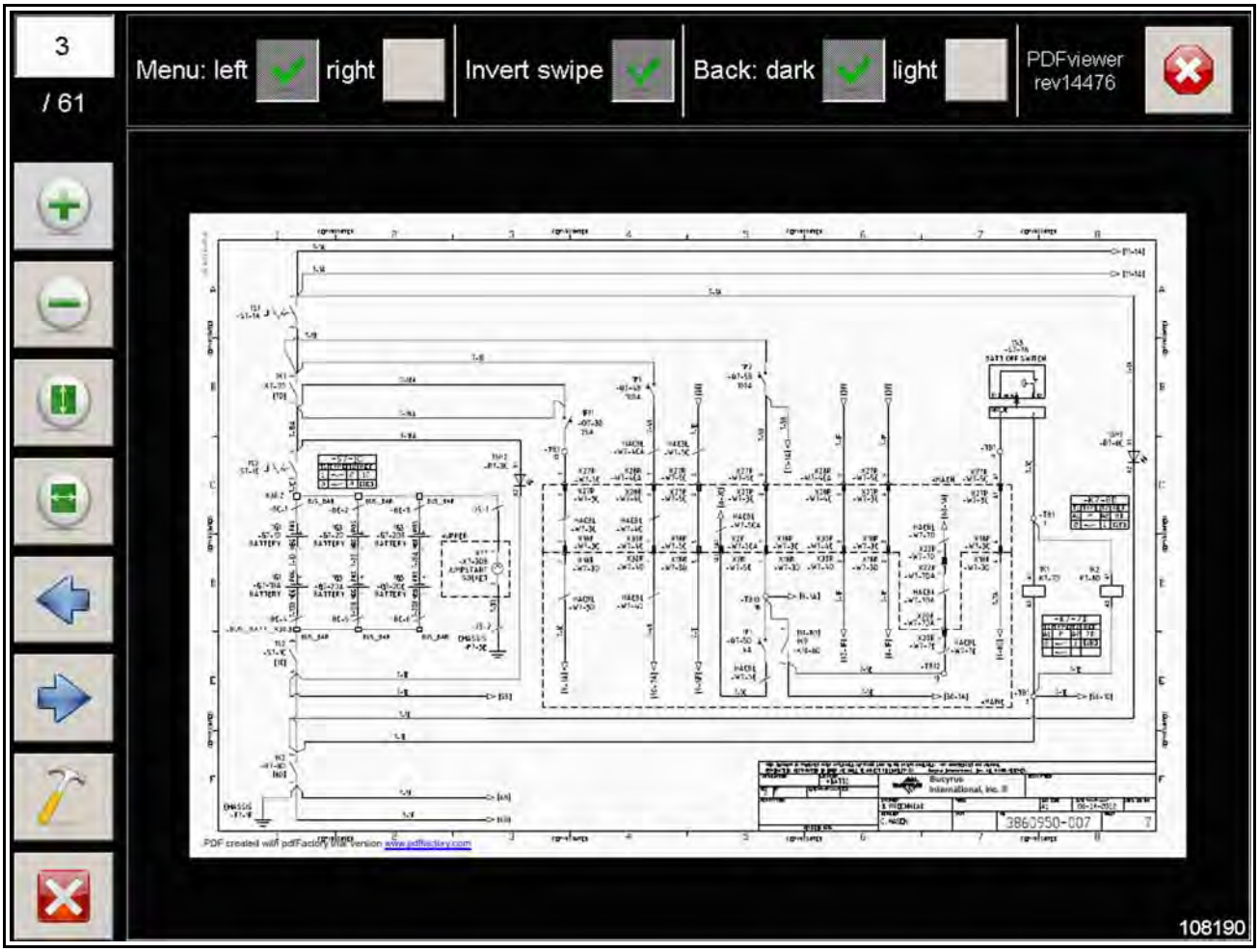

Fig. 5-24:

FAULT TABLES

Combustion engine - Fault table

Engine fails to start or starts only with difficulty	Engine does not turn	Engine starts, but runs enevenly or intermittently	Engine gets too hot, temperature warning activated	Engine not working at full power	Engine not working on full cylinder papacity	Engine without oil pressure or oil pressure too low	Engine oil comsumption too high	Engine emits blue smoke	Engine emits white smoke	Engine emits black smoke	Engine cannot be stopped	Engine throttled down strongly	Cause	Chapter ref.	
			•		•								Oil level too low	Engine oil level	**A**
			•	•		•	•						Oil level too high	Engine oil level	**S**
					•	•	•						Engine inclination too big	Engine Op. Instr.	**P**
•													Engine oil of wrong SAE-class	Lubricants	**W**
•		•		•				•					Fuel quality not corresponding to specification	Engine Op. Instr.	**W**
•		•		•			•		•				Air filter contaminated / turbo-charger defective	Air intake syst.	**P**
				•									Fuel filter contaminated	Fuel filter	**P/W**
			•	•					•				Charge-air line leaking		**P**
			•										Radiator / cooling fins contaminated	Cooler cleaning	**R**
			•										Cooling fan or water pump defective or loose	Engine Op. Instr.	**P/W**
			•										Cooling air gets too hot / heat buid-up		**P**
•													Battery defective or discharged	Battery	**P**
•													Cable connections in starter circuit loose or corroded		**P**
•													Starter defective or pinion not in mesh		**P**
•											•		Shut-off relay jamming		**1)**
•		•	•	•	•				•				Incorrect valve setting	Engine Op. Instr.	**E**
•		•		•	•								Injection line leaking		**P**
•		•	•	•	•			•	•				Injection valve defective	Engine Op. Instr.	**P/W**
	•												Combustion engine blocked on output side		**1)**
											•		PMS malfunction		**1)**
		•		•				•	•		•		Celect coding lamp flashing/lit		**1)**
		•											Celect defective (software error)		**1)**

Remedial action

Check **P**
Adjust **E**
Replace **W**
Top up **A**
Reduce **S**
Clean **R**

1) Contact your Cat dealer Service

PRODUCT SPECIFICATION SHEET