OMPC40008152

Operation & Maintenance Manual

PC4000-6

HYDRAULIC MINING SHOVEL

SERIAL NUMBERS PC4000-6 8152

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- Always keep at a distance from the edges of building pits and 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. Never change to a lower gear on a slope but always before reaching it.
- Before leaving the driver's seat always secure the machine against inadvertent movement and unauthorized use.

SPECIAL WORK IN CONJUNCTION WITH UTILIZATION OF THE MACHINE AND MAINTENANCE AND REPAIRS DURING OPERATION; DISPOSAL OF PARTS AND CONSUMABLES

- Observe the adjusting, maintenance and inspection activities and intervals set out in the Operation,- Lubrication and Maintenance Manual, 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,- Lubrication 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:
  - locking the principal control elements and removing the ignition key and/or
  - attaching a warning sign to the main switch
- Carry out maintenance and repair work only if the machine is positioned on stable and level ground and has been secured against inadvertent movement and buckling.
- 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.

INSTRUCTIONS FOR USE

Open the lock, lift the harness by the catch hook (C), the blue straps (leg straps J) are below. The harness is being put on just like a jacket. Pull the belly strap (E) through the lock, as shown on the illustration, and secure it.

By closing the breast strap, you avoid the shoulder straps to side-slip. Bring the leg straps (J) around the legs to the front, pull them in, as shown in the illustration, and tighten them. Adapt the harness to body form, seeing to perfect fit, in particular that the catching hook (C) be in the center of the back.

The safety harness should belong to its wearer personally.

The safety harness should only be used together with connectors acc. to EN 354, and fall arrest acc. to EN 355, or fall protection devices acc. to EN 360.

The attachment point for the safety harness should be above the wearer, and the carrying capacity of the attachment point should be sufficient to correspond with the minimum carrying capacity acc. to EN 795.

Legend for illustration Z21464

(1) Operator's cab with integrated Falling Object Protective Structure (FOPS)

(2) Battery main switches

NOTICE
After switching OFF the main key switch in the Operator's cab, wait at least 3 minutes before switching OFF the battery main switches. The Vehicle Health Monitoring System (VHMS) needs this period for saving data. If batteries are switched OFF before this time period is over, data will be lost.

(3) Air cleaners for engine

(4) Cab support, contains the electronic components of the VHMS system and the electrical switch boards.

(5) Swing circle

(6) Fuel tank

(7) Hydraulically operated access ladder

(8) Counter weight

(9) Hydraulic oil cooler

(10) Hydraulic oil reservoir

(11) Power Take Off (PTO) with hydraulic pumps

(12) Flexible coupling, oil filled

(13) Diesel engine

(14) Batteries

(15) Radiator

(16) Control valves with high pressure in-line filters

(17) Swing machinery

(18) Central Lubrication System (CLS)

(19) Swing circle pinion Lubrication System (SLS)

Operating the hydraulic Access Ladder, illust. (Z 21131)

Raise the ladder

Enter the Excavator with ladder in fully lowered position (A).

Start the engine.

For starting procedure → See "STARTING THE ENGINE" on page 136.

Go back to the ladder control switch (S84) at the radiator door.

Raise the ladder by holding the switch in raise position (1) until the ladder contacts the stop bar (C) in position (B).

Lowering the ladder

Stop the engine.

For stopping procedure → See "STOPPING THE ENGINE" on page 166.

Hold switch (S84) in lowering position (2). If necessary, slightly push theladder until it starts moving down by its own weight.

⚠ WARNING

- **Make sure the moving range of the ladder is clear of all persons before lowering the ladder.**
- **Enter the ladder only after the ladder is in fully lowered position (A).**

NOTICE
Check safety sensor of access ladder for correct function after every 50 operating hours or once a week. Refer to Maintenance Section 4, for checking procedure.

Operator's Seat Adjustment

Before operating the Excavator adjust the seat and mirrors for Operators maximum comfort, visibility, and complete control of the Excavator.

Legend for illust. (Z 21420):

(1) Seat suspension adjustment (firm to soft ride)

(2) Height adjustment

(3) Seat depth adjustment

(4) Seat cushion tilt adjustment

(5) Fore/aft adjustment

(6) Not used on this model

(7) Control lever carrier

(8) Headrest (optional)

(9) Seat heater switch (optional)

(10) Lumbar support adjustment

(11) Armrest, foldable

(12) Armrest adjustment

(13) Backrest adjustment

(14) Fore/aft isolator

Seat belt (not shown)

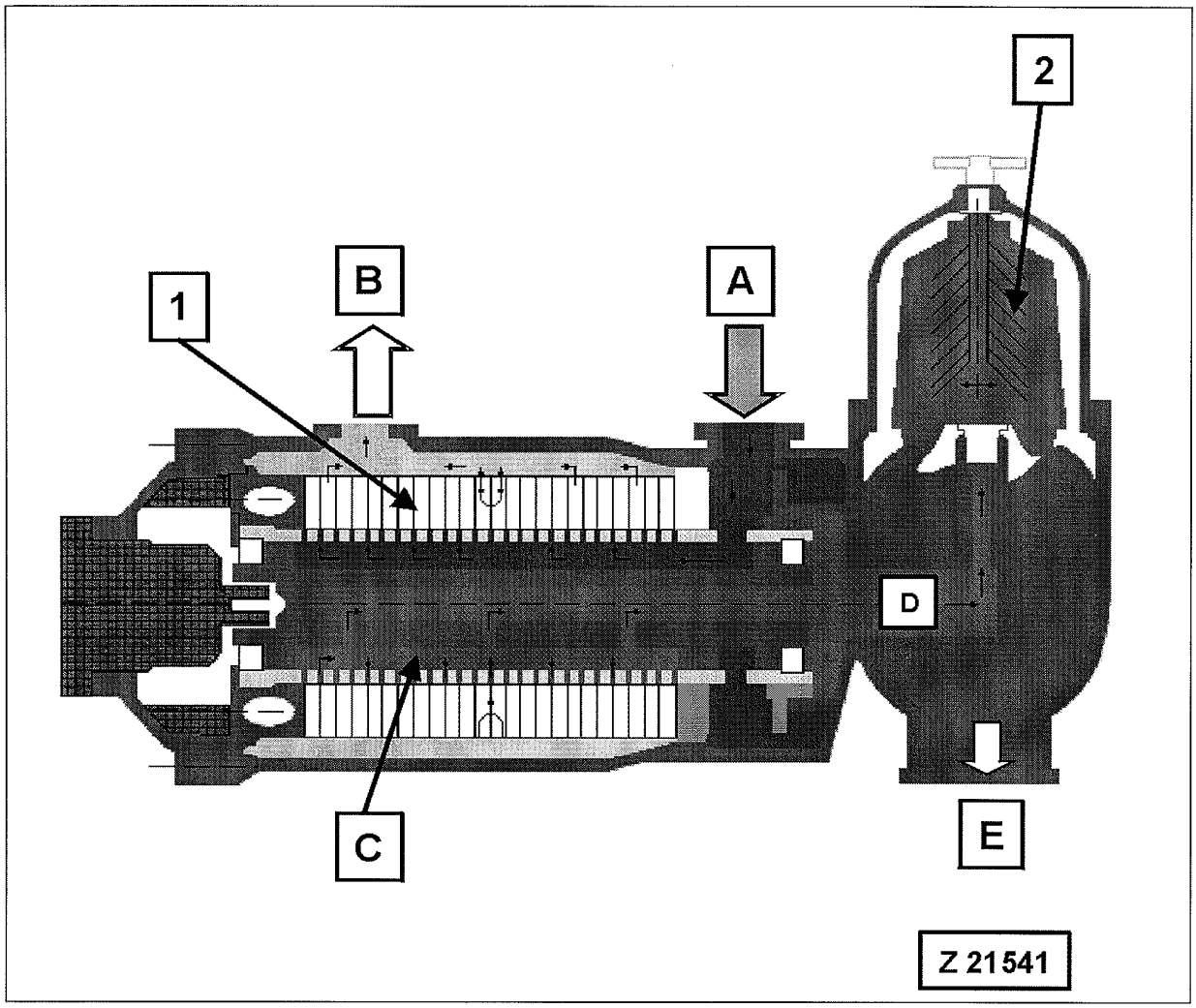
⚠ CAUTION

Use seat belt in accordance with the local safety regulations and laws.

REMARK

For more Information, refer to the separate Operating Instruction Manual "AIR SUSPENSION SEAT" in part 3 of this binder.

Eliminator Engine Oil Filtration System



Legend for illust. Z 21541 (schematic illustration)

(A) Oil inlet from engine (100%)

(B) Oil outlet to engine (95%)

(C) Backflush oil (5%) for cleaning the filter

(D) Oil flow to centrifuge (5%)

(E) Oil flow to engine oil pan (5%)

(1) Stainless steel filter removes particles as small as 20 µm

(2) Centrifugal separator removes particles up to a size of 2 µm

Switch Board (continued)

Legend for illust. (Z 21567)

(34) Switch, manual actuation of central lubrication system

(35) Switch, manual actuation of swing ring gear pinion lubrication system

(36) Toggle switch, swing parking brake

- "0" Parking brake released - UP
- "1" Parking brake applied - DOWN.

⚠ CAUTION

The parking brake must only be applied with superstructure at complete standstill. Refer to page 149 for more information.

(37) Switch, windshield washer (main windshield and head light glasses)

(38) Switch, main windshield wiper (slow - fast) and wipers of head light glasses

(39) Enable switch for hydraulic service arm operation. Set this switch to ON position "1" before lowering the service arm. With this switch in ON position, the pilot control system is made inoperative and the hydraulic swing brake is applied. After completion of replenishment procedure, swing back the service arm to its home position and set switch (39) to OFF position "0".

(40) Acoustic warning signal

This signal sounds for approximately 1 second when a fault message appears on the VHMS screen.

⚠ CAUTION

In case of too low hydraulic oil level this signal sounds continuously. Shut down the Excavator, locate and correct the cause immediately. Fill up hydraulic oil to the correct level. For the correct checking procedure → See "CHECKS BEFORE STARTING THE ENGINE" on page 130.

(41) Key operated main switch

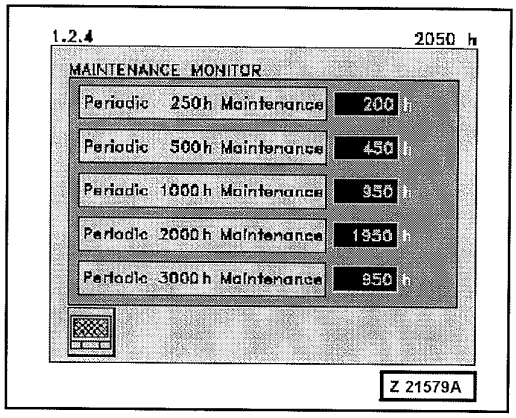
⚠ CAUTION

After switching OFF main switch (41), wait at least 3 minutes before switching OFF the battery main switches. VHMS needs this period for saving data. If batteries are switched OFF before this time period is over, data will be lost.

Maintenance Monitor 1.2.4

The Maintenance Monitor can be selected from the Standard monitor 1 and from the expansion monitors 2 and 3 by pressing the Maintenance button (4). The color of this button changes to yellow when maintenance is due. The color will change to red when maintenance is overdue.

The maintenance monitor is shown at six different operating hour readings, see pictures (Z 21579A to F).

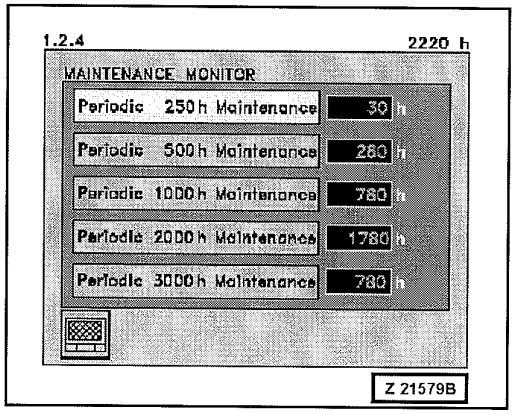


Color definition of Periodic Maintenance text:

The five periodic maintenance intervals are listed in text form with a colored background. The colors have the following significance:

Grey - Maintenance still not due the displayed hours at the right side of the text are greater than 48 h before the next maintenance is due.

Yellow - Maintenance is due the displayed hours are equal or smaller than 48 h before the next maintenance or, numbers smaller or equal to 48 h with a minus sign indicating that the maintenance is already overrun. The total number of hours in the yellow range is 96, divided in 48 hours with a positive value and 48 hours with a negative value.



Red - Maintenance is overdue hour numbers with a negative value go further into the minus range indicating that the limit for the periodic maintenance is exceeded.

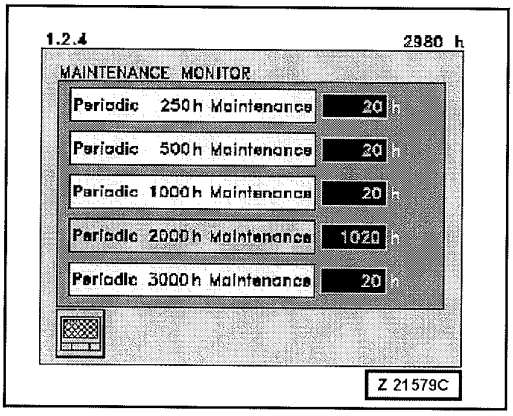
Examples of Maintenance Monitor displays:

Illust. Z 21579A: 2050 Operating hours

All five periodic maintenance intervals on the screen are gray. No maintenance required.

Illust. Z 21579B: 2220 Operating hours

The Periodic 250 h Maintenance field is yellow indicating that this maintenance has to be carried out. The number of hours displayed is less than 48. All other maintenance fields having hour numbers greater than 48 h and are still gray.



Illust. Z 21579C: 2980 Operating hours

The 250 h, 500 h, 1000 h and 3000 h maintenance is due. The 2000 h maintenance has been carried out at 2000 operating hours and there are 1020 h left until the next 2000 h maintenance becomes necessary.

ErrorCode (Message number) G = Excavator C = Engine 1	Color of TOP Message: 0 = RED 1 = YELLOW 2 = GREEN	Instruction Message Number. Refer to separate Table	TOP Message with colored background
G00152	1	17	Trouble monitoring oil filter pump lubric
G00153	1	17	Trouble monitoring oil filter pump contr
G00154	1	17	Trouble monitoring return oil filter
G00155	1	17	Trouble monitoring leak oil filter
G00157	1	17	Trouble monitoring oil filter radiator
G00158	1	17	Trouble monitoring oil filter fan drive oil cooler
G00159	1	17	Trouble monitoring breather filter
G00160	1	17	Trouble monitoring engine air cleaner
G00161	1	17	Trouble monitoring battery voltage
G00162	1	17	Trouble monitoring charging-/discharging current
G00163	1	17	Trouble monitoring pilot control
G00164	1	17	Trouble air cleaner
G00165	1	17	Trouble breather filter hydraulic oil tank
G00166	1	17	Trouble oil filter gear (PTO)
G00167	1	17	Trouble oil filter pump lubrication
G00168	1	17	Trouble oil filter pump control
G00169	1	17	Trouble return oil filter hydraulic oil tank
G00170	1	17	Trouble leak oil filter hydraulic oil tank
G00171	1	17	Trouble oil filter fan drive oil cooler
G00172	1	17	Trouble oil filter fan drive radiator
G00173	1	18	Trouble monitoring swing gear house brake
G00174	1	19	Trouble monitoring travel gear house brake
G00175	1	19	Trouble travel gear house brake
G00176	1	17	Trouble battery voltage
G00177	1	17	Trouble battery charging circuit
G00178	1	17	Trouble battery charging current to high
G00179	1	17	Trouble control pressure X1
G00180	1	17	Trouble pilot pressure X2 too low
G00181	1	17	Trouble pilot pressure X2 too high
G00183	1	17	Trouble pump support pressure X4
G00184	1	20	Central lubrication system empty

3.4.5 TABLE OF AVAILABLE INSTRUCTION MESSAGES

NOTICE
TOP Messages and applying Instruction Messages are always displayed together.

Message No.	Instruction Message
0	
1	Engine stopped because of main Shut-Off (gate) valve. - Open the Shut-Off (gate) valve. - If failure exist further, inform service.
2	Inform service.
3	Stop the engine. - Inform service.
4	Start blocked because of main Shut-Off (gate) valve - Open the Shut-Off (gate) valve. - If failure exist further, inform service.
5	Start blocked - Inform service.
6	The fire suppression system has been actuated. - Inform the fire brigade. - Evacuate endangered persons. - Fight the fire. - Inform service.
7	Bucket motion switched off. - Inform service.
8	Circuit breaker F13 switch on. - If failure exist further, inform service.
9	Ladder end switch or seat contact open. - If failure exist further, inform service.
10	Emergency shut-down switch at ladder was actuated. - Unlock before restarting. - If failure exist further, inform service.
11	Emergency shut-down switch at valve block was actuated. - Unlock before restarting. - If failure exist further, inform service.
12	Emergency shut-down switch at hydraulic control panel was actuated. - Unlock before restarting. - If failure exist further, inform service.

⚠ WARNING

The cab base contains batteries which are located in a compartment below the floor plate.
Batteries emit highly explosive gas!
Sparks or flame can cause the gas to explode.

- **DO NOT smoke or use open flame when entering the cab base.**
- **DO NOT weld or grind near the batteries.**
- **DO NOT short across or ground any terminals of the batteries.**
- **On removal always disconnect the ground (-) cables first. when reinstalling the batteries connect the positive (+) cables first.**

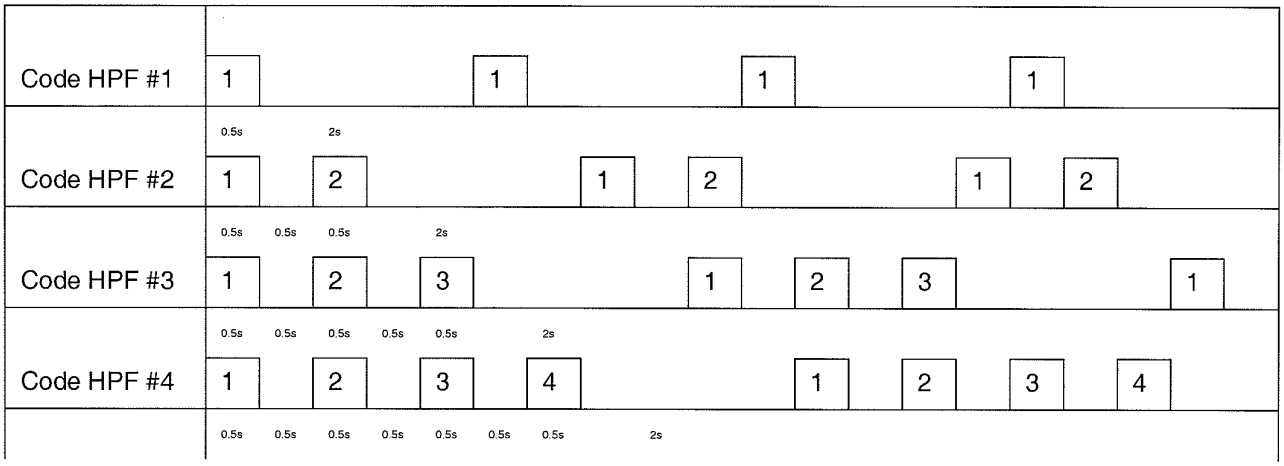
Legend for illustration Z 21593

(1)	Cab base door
(2)	Door handles
(3)	Lock rod for locking the cab base door in open position
(4)	Door seal
(5)	Controller of VHMS system
(6)	Main switch board (X2), refer to page 121 for switch board components.
(7)	Battery box compartment below floor plate
(8)	Battery box contains the back-up batteries for the programmable logic controller (PLC)

High Pressure Filter "HPF" and Chip Indicator Identification Codes of LED H31

The LED "H31", illust. (Z 21612), monitors all four high pressure filters and the chip indicators of the four main pumps. If a failure condition of a high pressure filter or chip indicator occurs, the LED "H31" will begin flashing out a diagnostic code for identification of the concerned filter or chip indicator. If more than one filter or chip indicator send a failure signal at the same time, the LED will always show the diagnostic code of that filter/chip indicator with the lowest number.

High Pressure Filter "HPF" No. respectively main pump No. of the concerned chip indicator:



Example:
Identification Code for High Pressure Filter #4 or chip indicator of main pump #4:

When the differential pressure switch of high pressure filter #4 sends the signal "Filter restricted" or when the chip indicator of main pump #4 sends the signal "chips in pump sump", the LED H31 will flash four times at regular intervals of 0.5 seconds and then after two seconds pause time will start again flashing four times at regular intervals of 0.5 seconds and so on.

The number of the four 0.5 seconds interval flashing groups corresponds to the number of the high pressure filters respectively to the number of the main pumps.

3.9.1 STARTING PROCEDURE

1. Insert battery main switch keys and turn to operating position, refer to section 3.6 for the location of the battery main switches.

2. Insert key into main switch (1) illust. Z21614 and turn to operating position.

NOTICE
The warning buzzer (2) must give an acoustic test signal. If the buzzer fails to function, corrective action must be taken.

3. Observe health monitor (3). Normally the initialization screen is displayed on the monitor.

   For more information → See "VEHICLE HEALTH MONITORING SYSTEM VHMS – HEALTH MONITOR" on page 82.

4. Set toggle switch (4) to low idle speed position.

5. Sound the signal horn (5).

6. Start the engine by turning starter switch (6).

REMARK
The engine is equipped with a prelubrication system which is activated by the starter switch (6). Turning and holding the switch in the start position sends current to the prelubrication starter solenoid which then pre lubricates the engine. This solenoid timer prevents current from flowing to the conventional starting motor until adequate oil pressure has been achieved in the cam oil rifle. After a subsequent 3 second delay, current is then directed to the conventional starting motors for cranking the engine.

Cold Weather Starting Aid

Controlled Ether Injection

The electronic control module (ECM) of the engine controls ether injection into the intake manifold while cranking if the engine is below a calibrated minimum coolant temperature or intake manifold temperature value. It will continue to inject ether until a calibrated maximum engine speed has been reached.

For more information refer to Engine Manual page 1-16.

NOTICE
Never operate the starter longer than 30 seconds at a time in order to avoid damage. If the engine does not start within the first 30 seconds, wait 2 minutes before cranking again.

7. As soon as the engine is running, check health monitor display (3), for information.

3.11 SLEWING AND BRAKING THE SUPERSTRUCTURE

3.11.1 SLEWING THE SUPERSTRUCTURE

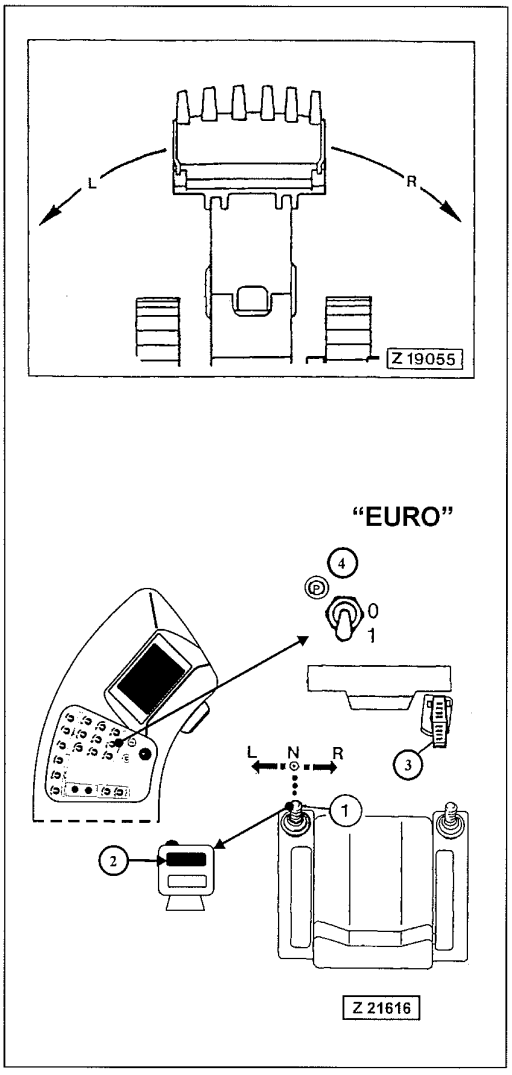
MACHINES WITH "EURO" CONTROL

Legend for illustration Z 21616

"L"	CCW- Lever (1) to the left "L"
"N"	Neutral position
"R"	CW- Lever (1) to the right "R"

REMARK

The slew speed can be increased by activating the slew speed switch (2) on the control lever (1). For smooth and efficient slewing operation, use the higher slew speed only for slewing angles greater than 90°.

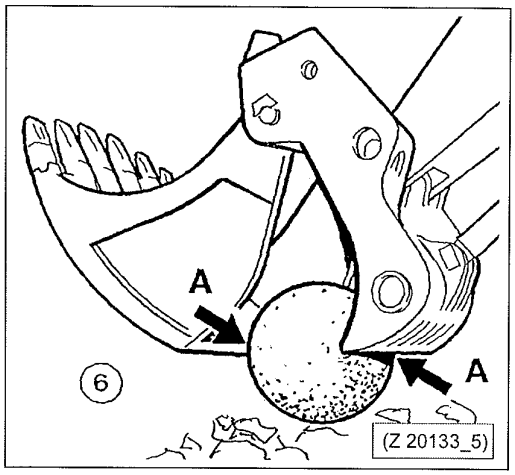


⚠ WARNING

- **Be sure everyone is in the clear before slewing the superstructure.**
- **Never swing or position the attachment or load over persons or vehicle cabs.**
- **Never allow anyone to walk or work under the excavator or load while the excavator is operating.**

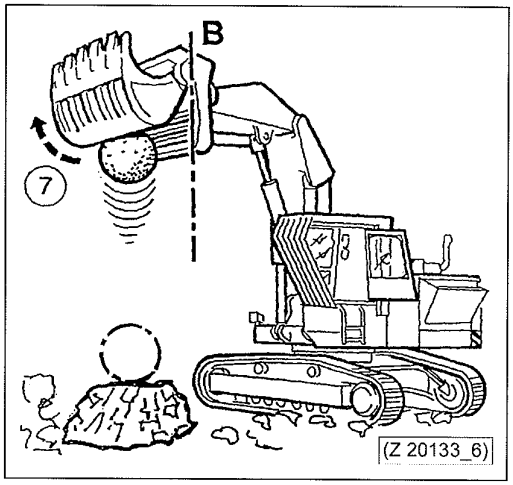
Legend for illustration Z 20133_5

(6) Pick-up position of the drop ball
A - Greatest circumference of the drop ball



Legend for illustration Z 20133_6

(7) Drop height, level with cab roof
B - Back wall of the bucket in vertical position



WORKING HINTS

Place the rock to be crushed on a solid and level ground with the impact surface in a horizontal position.

If so equipped lift up the cab front guard (1). The roof mounted beacon will then automatically switched on for warning other persons.

Change the impact surface of the rock by 90°, if after two to three drops the rock is not being crushed.

NOTICE
The pressure accumulator in the pilot oil circuit serves also for lowering a raised working attachment to the ground with the engine at standstill. If, for example, the engine stalls with the working attachment in a raised position, lowering of the working attachment is possible by operating the respective control lever.

5. Set main switch key (1) to "0" position and remove.

NOTICE
After switching OFF the main key switch in the Operator's cab, wait at least 3 minutes before switching OFF the battery main switches. The Vehicle Health Monitoring System (VHMS) needs this period for saving data. If batteries are switched OFF before this time period is over, data will be lost.

6. Switch off the battery main switches and remove keys.

3.17.4 INDICATION OF OPERATIONAL MODES AT CONTROL MODULE, AFTER AUTOMATIC ACTUATION OF THE FIRE SUPPRESSION SYSTEM

Alarm to Shutdown Period - The RED alarm LED and the audio alarm will pulse at a rate of 2 times per second.

Shutdown to Discharge Period - The RED alarm LED and the audio alarm pulses "on" four times per second.

Timer Setting (factory adjustment)

- Alarm to Shutdown: 5 seconds
- Shutdown to Discharge: 10 seconds

⚠ WARNING

In Case of Fire

- **Act according to the circumstances and the applying safety regulations.**
- **Evacuate area to lessen risk of injury from flames, heat, hazardous vapours, explosions, or other hazards that may be created.**
- **Evacuate endangered Persons.**
- **Inform the fire brigade.**
- **Fight the fire.**

⚠ CAUTION

For continued protection, the Detection and Actuation System and the Fire Suppression System must be recharged through authorized Service Personnel immediately after operation.

Legend for illustration Z 21623

12	Adapter for evacuation and filling of the main hydraulic oil reservoir. After the oil is completely evacuated, drain the oil from suction oil reservoir, collector pipe and back-pressure valve pipe. Refer to maintenance section, item hydraulic oil change for draining procedure. Open the shut-off valve between main oil reservoir and suction oil reservoir. Fill the hydraulic reservoir and observe indicator lamp (13).
13	Indicator lamp lights up when the hydraulic oil level in the reservoir is correct. Recheck hydraulic oil level at the sight gauge before operating the machine.
14	Adapter for filling the grease barrel of the Central Lubrication System (CLS). Before filling the grease barrel make sure the grease filter in the filling line is not obstructed.
15	Indicator light, grease barrel of Central lubrication System FULL.
16	Adapter for filling the grease barrel of the Swing circle pinion Lubrication System (SLS). Before filling the grease barrel make sure the grease filter in the filling line is not obstructed.
17	Indicator light, grease barrel of Swing circle pinion Lubrication System FULL.

3.22 EXCAVATOR STORAGE

GENERAL

Storage periods up to 30 days require no special preservation when the unit is stored in a protected place. When the excavator is placed in storage for 30 days or more follow the procedure below.

NOTICE
The description below includes special equipment which may not be installed in your machine.

3.22.1 PREPARING FOR STORAGE

1. Clean the excavator thoroughly, lubricate all points according to the lubrication chart. Move the machine to a protected place or cover the excavator with a tarpaulin. Retract all hydraulic cylinders as far as possible. Cover the protruding piston rods with grease.
2. Refer to Engine Operation and Maintenance Manual for Engine storage procedure.
3. Fill up cooling system with anti-freeze and coolant. Observe instructions in the Engine Manual.
4. Service the engine air cleaner.
5. Drain condensation from fuel tank and fill the fuel tank with a mixture of 90% Diesel fuel and 10% protection oil, e.g. Shell Ensis 20.
6. Seal the engine air intake, exhaust outlet, electrical components, fuel tank ventilation and breather on the hydraulic oil reservoir to prevent dirt and moisture from entering.
7. Remove the batteries and store them in a cool, dry place (0 to 10° C) to minimize self discharge. Be sure the batteries are fully charged. Never allow batteries to run down below ¾ full charge.
8. Loosen all drive belts.
9. Repaint areas that have paint damage with a good quality paint. Grease all machined unpainted surfaces with good quality grease to prevent rust.
10. Drain condensation from hydraulic oil reservoir. If necessary, add hydraulic oil.
11. Attach a tag to the instrument panel to indicate what work has been done.

4.3 FUEL AND LUBRICANTS

Lubrication Point	Lubricant	Ambient Temperature °C	Viscosity Grades		Quality Grades DIN/API
Engine Oil Coolant Fuel	Refer to "Engine Operation and Maintenance Manual" for Specifications.				
Hydraulic System	Hydraulic oil "HLP or "HLPD" with ZINC anti-wear additives *1)	- 25 to + 15	22	-	DIN-51524 T.2 - HLP
		-15 to + 25	32	or 32 - 68	
		-10 to + 30	46		
		- 5 to + 35	68		
		+ 5 to + 50	100	-	
Travel gears, Final drives and Swing machinery	Hydraulic oil "HLP"	- 40 to + 10	HLP T32		DIN 51524. T.2 - HLP
	Gear oil "CLP" *2)	-15 to + 50	CLP 220		DIN 51517 3 - CLP
Brake housings and Motor adapter housings of Swing machinery and Travel Gears	Engine oil	all	SAE 10		
	or Hydraulic oil		HLP 22 or HLP 32		DIN 51524T.2 - HLP
PTO (Pump distributor gear)	Hydraulic oil "HLP"	- 40 to + 10	HLP T32		DIN 51524. T.2 - HLP
	Gear oil "CLP" *2)	-15 to + 50	CLP 150		DIN 51517 3 - CLP
Fan bearing housings of Radiator and Hydraulic oil cooler	Gear oil "CLP"		CLP 150		DIN 51517 3 - CLP

NOTICE

- ***1) DO NOT mix up ZINC-FREE Hydraulic oils with Hydraulic oils containing Zinc.**
  DO NOT mix up Mineral Hydraulic oils with Synthetic Hydraulic oils.
  Mixing of the above oils, will result in diminishing of anti wear properties and oxidation stability of the oil. Quick plugging of the oil filters in the hydraulic system is to be expected.
- ***2) Refer to the chart "Gear Oils" in part 3 of this binder for the released gear oil qualities and viscosity grades.**
- **The lubricating instructions in this book refer to the recommended grade specifications. Damages caused by using lubricants other than specified are not covered by the manufacturer's guarantee.**

REPLACEMENT OF HYDRAULIC HOSE LINES

Hydraulic Hose lines are subjected to natural aging. Hence, their usable lifetime is limited to maximum 6 years.

⚠ CAUTION

The maximum permissible storage time of hydraulic hose lines is 2 years. This storage period is part of the usable lifetime and must be considered when a new hose line is being installed. If, for example, a hose line with a one year storage time shall be installed, the remaining service life of the hose line is 5 years. The production year and the ordering number of the hydraulic hose lines is stamped on the hose fittings.

All hydraulic hose lines of the Excavator have to be replaced after every 6 years at the latest, even if there are no visible damages.

⚠ WARNING

Repairs on hydraulic hoses and hose lines are not allowed. Use ONLY GENUINE KMG Replacement Hydraulic Hose Lines.

INSPECTION OF HYDRAULIC HOSE LINES

Inspect all hoses, hose lines and fittings periodically. Check for leaks and damages. Replace damaged parts without delay. Hydraulic fluid escaping under pressure can cause serious injuries and fire break out.

Some examples of faults on hydraulic hoses requiring replacement of the concerned part:

- Damages on the outer layer (e.g. chafed spots, cuts or scratches).
- Brittle top layers. Flaws on the hose material
- Distortion of the hose line (strong deviation from the original shape) under pressurized and pressureless conditions or when bended, e.g. disintegration of hose layers or blisterings.
- Leaks
- Detachment of hose and fitting. Damaged hose fitting.

4.7.3 AUTOMATIC LUBRICATION SYSTEMS FILL GREASE BARRELS

Fill the grease barrels of the Central Lubrication System and Swing circle pinion Lubrication System when the corresponding message "grease barrel empty" is displayed on the health monitor. Make sure the grease filters in the filling line are not obstructed. If necessary service the Grease Filters.

Legend for illustration Z 21625

(A) Grease supply line to the injectors for lubrication of the loader attachment, swing circle bearing and swing machinery pinion bearing

(B) Grease supply line to the injectors for lubrication of the swing circle toothing

(P) Pressure oil supply from pilot oil circuit to hydraulically driven grease pumps (5 and 12)

(R) Return oil to main hydraulic oil reservoir

(1) Grease refilling line from service arm adapter to grease filter (2) of the central lubrication system

(2) Grease filter for central lubrication system.

(3) Grease refilling line from grease filter (2) to grease container (4) of the central lubrication system

(4) Grease container of the central lubrication system

(5) Hydraulically driven grease pump

(6) Grease pressure gauge

(7) Grease supply line to the injectors of the central lubrication system, see (A).

(8) Grease refilling line from service arm adapter to grease filter (9) of the swing circle pinion lubrication system

(9) Grease filter for swing circle pinion lubrication system.

(10) Grease refilling line from grease filter (9) to grease container (11) of the swing circle pinion lubrication system

(11) Grease container of the swing circle pinion lubrication system

(12) Hydraulically driven grease pump

(13) Grease pressure gauge

(14) Grease supply line to the injectors of the swing circle pinion lubrication system, see (B).

CHECK GREASE INJECTORS FOR PROPER OPERATION

NOTICE
There are two types of grease injectors installed "SL1" and "SL11" injectors, see illust. (Z 20840).

Legend for illustration Z 20840

A	Injectors on bottom dump bucket
B	Injectors on stick
C	Injectors on boom
(1)	Indicator stem for visual indication of injector operation
(2)	Output adjusting screw
(3)	Protection cap
(4)	Grease fitting
(5)	Grease fittings on backhoe bucket linkage **REMARK** Backhoe bucket linkage must be lubricated manually, if not connected to the central lubrication system.

Check operation of all grease injectors (A, B and C) by visually watching the cycle indicator stem (1) while operating the central lubrication system manually. Stem (1) must move in and out once a complete lubrication cycle.

If a cycle indicator (1) does not move during a lubrication cycle, grease supply to the lubrication point of the concerned injector is interrupted.

Refer to next page for corrective action.

Carry out same checks on the injectors for swing circle, see next page.

4.9.1 SWING MACHINERY, BRAKE HOUSINGS AND MOTOR ADAPTER HOUSINGS - CHECK OIL LEVELS

REMARK

The machine can be equipped either with a swing machinery of manufacturer "L&S" or of manufacturer "Siebenhaar". Refer to the data plate on each swing machinery housing to find out the manufacturer of the swing machinery.

Swing Machinery manufactured by "L&S"

I Swing machinery RH

II Swing machinery LH

Legend for illustration Z 21655

Swing machinery "G"

(A) Position of oil level gauge for checking the oil levels

(G1) Oil level gauge

(G2) Oil filler plug

(G3) Breather filter

(10) Drain plug or evacuation nozzle for Wiggins system

Brake Housing "B"

(B4) Oil level gauge and filler opening

(B5) Breather filter

(B6) Evacuation nozzle for Wiggins system

Motor Adapter Housing "M"

(M7) Oil level gauge and filler opening. This opening can also be used for connecting a suction pump when changing the oil.

(M8) Breather filter

(M9) Oil drain plug

4.9.4 PTO (PUMP DISTRIBUTOR GEAR) AND OIL RESERVOIR - CHECK OIL LEVEL

Legend for illustration Z 21657

(1) Oil level gauge

(2) Oil filler plug

(3) Breather filter

(4) Oil collector reservoir for secondary oil pump drive shaft housings

(5) Breather filter with oil level gauge

(6) Main pump drive shaft housings

(7) Oil level plug of main pump drive shaft housing

(8) Oil filler plug with breather pipe of main pump drive shaft housing

(9) Oil drain plug of main pump drive shaft housing

(10) Oil drain plug of PTO gear

CHECK OIL LEVEL OF PTO GEAR

1. Unscrew level gauge (1) and wipe it clean.
2. Insert gauge (1), but DO NOT screw in, see detail (A).
3. Remove level gauge and read the oil level. The oil level should be between the "MIN" and "MAX" mark. If necessary, add oil through filler opening (2) up to the "MAX" mark on gauge (1).

NOTICE
If the oil level is above the "MAX" mark, drain the oil down until the oil level is at the "MAX" mark. Too much oil in the pump distributor gear will cause aeration of the oil.

4. Insert gauge (1) and tighten securely. Remove breather filter (3). Blow out with compressed air from inside to outside and reinstall.

CHECK OIL LEVEL OF OIL COLLECTOR RESERVOIR (4)

Remove breather filter with oil level gauge (5). The oil level should be between the "MIN" and "MAX" mark. If necessary, add oil through the level gauge opening. Clean the breather filter and install.

NOTICE
If oil starts dropping out at breather (5), check oil seals of secondary pump drive shafts for damage.

4.10.6 AUTOMATIC LUBRICATION SYSTEMS - CLEAN IN-LINE GREASE FILTER

Legend for illustration Z 21465

(1) Grease pump drive (Hydraulic cylinder)

(2) Solenoid valve (Oil pressure supply)

(3) Flow control valve

(4) Pressure reducing valve

(5) Hydraulic oil supply line (Pilot pressure)

(6) Hydraulic oil return line

(7) Vent valve (Solenoid valve, de-energized open to barrel)

(8) Grease supply line to injectors

(9) Lubricant level indication, (Sonar sending and receiver principal)

(10) Grease barrel

(11) Pump mechanism

(12) Grease filter element

(13) Hydraulic pressure test plug (Operating pressure)

(14) Grease pressure gauge (Operating pressure)

(15) Vent line to barrel

(16) Breather

(17) Electrical terminal box

Components of In-Line-Grease-Filter:

(12) Filter element

(18) Plug screw

(19) Packing ring

(20) Filter housing

(21) Spring

(22) Spring guide

⚠ WARNING

Before servicing stop the engine/motor and remove ignition key in order to prevent operation of the system. Be sure to vent system pressure before removing plug (18).

A blocked filter can disintegrate under pressure and damage the automatic lube system.

4.11.3 PTO (PUMP DISTRIBUTOR GEAR) MAIN PUMP DRIVE SHAFT HOUSINGS - CHECK OIL LEVEL

Legend for illustration Z 21657

(1) Oil level gauge

(2) Oil filler plug

(3) Breather filter

(4) Oil collector reservoir for secondary oil pump drive shaft housings

(5) Breather filter with oil level gauge

(6) Main pump drive shaft housings

(7) Oil level plug of main pump drive shaft housing

(8) Oil filler plug with breather pipe of main pump drive shaft housing

(9) Oil drain plug of main pump drive shaft housing

(10) Oil drain plug of PTO gear

CHECK OIL LEVEL OF ALL MAIN PUMP DRIVE SHAFT HOUSINGS

The Oil level should be at the lower edge of level plug opening (7). If necessary remove filler plug with breather pipe (8) and add Gear Oil through the filler opening up to the level opening (7).

Re-install plugs (7 and 8) and tighten securely.

If pump removal becomes necessary, drain the drive shaft housing oil by removing drain plug (9). Be sure to fill the drive shaft housing up to the filler opening (7) after mounting of the pump.

NOTICE
If oil starts dropping out at one of the breather pipes (8), the oil seal ring of the respective pump drive shaft must be checked and replaced if necessary.

4.12.1 HIGH STRENGTH BOLT CONNECTIONS

Check high-strength bolt connections and securing elements for damage and looseness. If any damages, failures or wrong condition are found, corrective action must be taken.

NOTICE

- **If the torque load is not stated otherwise refer to standard torque chart I for torque data.**
- **Bolts inserted with Multi-Purpose Grease MPG, KP2K on thread and head.**

⚠ CAUTION

When selecting the tightening torque observe quality grade and bolt size

Hydraulic Access Ladder, illust. Z 21136

(01) Hinged ladder

(03) Ladder lifting cylinder

(06) Self locking nut

(17) Ladder bearing assembly

Check condition and fastening of hinged ladder (01), bearing assembly (17) and hydraulic cylinder (03).
Make sure the self locking nuts (06) are correctly tightened and have not lost their clamping torque.

Tightening Torque of Self Locking Nuts (06):

- New nut: 440 Nm
- Used nut: 350 Nm

Clamping Torque of Self Locking Nuts (06):

- New nut: 106 Nm
- Used nut: 12 Nm minimum

Lubricate both eyes of hydraulic cylinder (03). Make sure both pivot pins (12 and 13) are properly secured with cotter pins (15). Check hydraulic lines (23 and 24) for leakage and damage. Replace as necessary.

High-Strength Bolt Connections (continued)

Check fastening and condition of hydraulic oil cooler, illust. Z 21673

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(1)	M30	10.9	46	1770	4
(2)	M30	10.9	46	1770	4

* SW = Wrench size

High-Strength Bolt Connections (continued)

Check mounting and security of Diesel engine and pump distributor gear, illust. Z 21601

Legend for illustration (Z 21601):

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(1) Flexible bearing					14
(2) Bolt w/self locking nut	M10	8.8	17	43	112
(3) Tie bolt	M24	10.9	36	snugly	4
(4) Rubber bounded metal bar					4
(5) Self locking nut	M24	8.0	36	snugly	4
(6) Bolt w/self locking nut	M16	10.9	24	265	20
(7) Cup springs					14
(8) Stop bolt	M36	10.9	55	to distance "B"	2
(9) Lock nut	M36	10.0	55		2
(10) Bolt	M24	10.9	36	880	10
(11) Bolt	M20	10.9	30	510	16
(12) Resilient sleeve					16
(13) Bolt	M30	10.9	46	1770	4
(14) Resilient sleeve					4

* SW = Wrench size

High-Strength Bolt Connections (continued)

Swing circle, illust. Z 20864

Check tightening torque of inner and outer mounting bolts (02 and 04) according to PARTS & SERVICE NEWS, No. AH00511.

NOTICE
Checking/retightening of swing circle mounting bolts is only necessary after the first 1000 operating hours.

Check condition and fastening of swing circle guard (10) and bolts (15).

Bolt Torque Chart

Torque Data for Standard Application

Bolt dia.	Wrench size [mm]	Tightening torque Nm		
		Quality grades		
		8.8	10.9	12.9
M 10	17	43	63	73
M 12	19	74	108	127
M 14	22	118	173	202
M 16	24	179	265	310
M 18	27	255	360	425
M20	30	360	510	600
M 22	32	485	690	810
M 24	36	620	880	1030
M 27	41	920	1310	1530
M 30	46	1250	1770	2080
M 33	50	1690	2400	2800
M 36	55	2170	3100	3600
M 39	60	2800	4000	4700
M 42	65	3500	4950	5800
M 48	75	5200	7500	8700

Insert all bolts lubricated with MPG, KP2K

When selecting tightening torques, observe size and quality

FILTER SERVICE

High Pressure Filters "HPF", illustration Z 21684

NOTICE
Carefully inspect elements for damage. Always install new elements if ruptures or other damages are found.

6. Inspect O-rings (7 and 9) and back-up ring (10). Replace if necessary.

7. Install drain plug (2) with new packing ring (6). Fill filter case (3) half way up with clean hydraulic oil and re-assemble the filter. Make sure element (5) is properly seated in the filter head.

8. After short operating period check filter units for leakage.

⚠ CAUTION

In case filter element (5) is soiled by metal chips, examine hydraulic pump for damages. Install new element (5).

NOTICE
If after cleaning of the filter element, the message "Trouble HPF ...." is displayed again, replace the filter element.
Replace elements (5) after three cleanings or after every 5000 operating hours, whichever occurs first.
After pump repairs all high pressure filter elements must be replaced.

4.12.6 WATER FILTER - REPLACE FILTER CARTRIDGE

Legend for illust. Z 21688

(1) Access cover for water filter compartment

(2) Water filter

(3) Water pump

(4) Pressure compensation tank

(5) Water tank

(6) Water tap

Replace filter cartridge of water filter (2) as follows:

1. Open water tap (6) and drain all water from tank (5).
2. Remove access cover (1).
3. Depress red pressure relief button (if so equipped) to relieve pressure.
4. Unscrew bottom of housing. Remove large O-ring, wipe clean of lubricant and set aside.
5. Remove used cartridge and discard. Rinse out bottom of housing and fill about 1/3 full with water. Add about 2 tablespoons of bleach and scrub cap and bottom of housing with nonabrasive sponge or cloth. Rinse thoroughly.
6. Lubricate O-ring with clean petroleum jelly (Vaseline). Place O-ring back into groove and smooth into place with finger.
7. Insert new cartridge over stand pipe in bottom of housing. Cartridges with tapered ends need to be specifically installed with the tapered end toward the threads of the housing.
8. Screw bottom of housing onto cap and hand tighten. DO NOT over-tighten. Make sure cap standpipe slips into cartridge.
9. Fill water tank (5) with 50 liters of clear water.
10. Depress pressure relief button (if so equipped) to release trapped air.
11. Open water tap (6) and flush the new filter cartridge for a minimum of 5 minutes. The water must be completely clear before closing the tap.

⚠ WARNING

DO NOT drink the water of the cab water system.
The cab water system is not constructed as a drinking water system.

HYDRAULIC SYSTEM - CHANGE OIL, REPLACE SUCTION STRAINERS AND PULSATION DAMPER

FILLING THE HYDRAULIC SYSTEM

1. Make sure main shut-off valve is in open position and all connections are securely tightened.

REMARK

Select hydraulic oil viscosity grade according to ambient temperatures.
If the new hydraulic oil has a different viscosity grade compared with the drained oil it is necessary to enter the new viscosity grade into the appropriate "**Service SETTINGS**" group of the VHMS Menu Control.

2. On machines equipped with Central Refilling System fill main hydraulic oil reservoir according to section
"Central Refilling System" on page 182.
On machine without central refilling system fill main oil reservoir through opening (4), illustration Z 21585. Depending on type of attachment and the present oil temperature, select the applying oil level range on plate (3). Be sure to use the correct marking on oil level plate (3).

Legend for illustration Z 21585

(1) Main hydraulic oil reservoir

(2) Hydraulic oil level sight gauge

(3) Oil level plate

(4) Oil filler plug

Motor Adapter Housing - Change Oil "M" (L&S)

1. Remove level gauge (M7) and breather filter (M8). Insert the suction hose of the pump into the gauge pipe (M7) until the hose end just touched the bottom of the pipe T-union (M9). Place the oil outlet hose of the suction pump into a receptacle of approx. 5 liter capacity (for both housings). Switch on the pump and completely suck off the oil from the motor housing. If the suction pump is not available, place a receptacle below drain plug (M9). Remove plug (M9) and drain the oil completely.

2. Clean breather filter (M8) with compressed air from inside to outside and re-install.

3. If removed, install drain plug (M9) and fill-up engine or hydraulic oil through filler opening (M7), up to the "MAX" mark on level gauge (M7) and install the level gauge.

4. After short operating period check oil level and housing for leaks.

4.14.3 FINAL DRIVE HOUSINGS - CHANGE OIL

See illustration Z 19117

1. Remove drain plug (4), filler plug (2) and oil level gauge (1) and drain the lubricating oil.
2. Check breather filter (3), mounted inside center frame, and clean as necessary.
3. After the oil is completely drained, install the cleaned drain plug (4) and tighten securely.
4. Fill in new oil up to the "MAX" marking on oil level gauge (1).
5. Clean filler plug (2) and reinstall.
6. After short operating period check oil level and gear for leaks.