OMPC30006224

# Operation & Maintenance Manual

# PC3000-6

## HYDRAULIC MINING SHOVEL

**SERIAL NUMBERS PC3000-6 6224**



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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 Z23074**

(1) Final drive, hub type travel gear

(2) Crawler carrier

(3) Track roller

(4) Carrier roller

(5) Guide wheel

(6) Travel motors

(7) Center frame

(8) Swing circle guard

(9) Hydraulically operated access ladder, see page 46 for more information

(10) Light switch for access area lighting

(11) Pull chain for emergency lowering of the access ladder, see page 46 for more information

(12) Battery main switches

(13A) Control switch for access ladder at machinery house door

(13B) Control switch for access ladder at operator’s cab

(14) Fuel tank

(15) Cab base, see page 130 for more information

(16) Operator’s cab

(17) Sliding window for emergency exit from operator’s cab, see page 50 for more information

(18) Emergency escape ladder, see page 50 for more information

(19) Exhaust muffler

(20) Engine air cleaners

(21) Machinery house door, see page 128 for more information

(22) Radiator grill door

(23) Counterweight

## Legend for illust. Z 22461

(1) Sliding window, serves for emergency exit

(2) Rigidly mounted emergency escape ladder

(3) Rope ladder. The upper end of the rope ladder is fixed onto the lower rung of the rigid escape ladder (2) by means of the fasteners (4), see detail (X). The lower end of the rope ladder is fixed on brackets (6) and secured with rubber fasteners (5), see section (A-A).

(4) Hooks for fastening the rope ladder onto the rigid ladder (2)

(5) Rubber fasteners for rope ladder in lifted position

(6) Bracket for rope ladder in lifted position. The lower rung of the rope ladder is hooked up into the brackets (6)

**Using the emergency escape ladder**

In case of emergency with normal walkways obstructed use escape ladder (2) and (3) for leaving the machine. Proceed as follows:

1. Unhook fasteners (5) and take out rope ladder rung from brackets (6).
2. Let the rope ladder fall down to the ground. The upper end of the rope ladder is fixed onto the lower rung of the rigid ladder (2).
3. Use the rigid ladder (2) and then the rope ladder (3) for leaving the shovel.

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## Hydraulic Control System

There are two control patterns of levers (1 and 2) available:

- **"EURO"** control pattern and
- **"KMG"** (**K**omatsu **M**ining **G**ermany) control pattern

Your Shovel is equipped with the **EURO** control pattern for levers (1 and 2).

**For more information → See "WORKING WITH THE ATTACHMENT" on page 160.**

**⚠ WARNING**

- **Wrong operation of the controls can cause mechanical break-down, property damage, injury or death.**
- **Observe the Safety Instructions.**
- **Before starting the engine / motor, make sure you know the location and function of each control.**
- **Always sit in the Operator's seat when operating this machine.**

## Safety Circuit for Controls

(Pilot control system cut-out and actuation of hydraulic swing parking brake)

This system is controlled through the safety lock lever at the operator's seat, the hydraulic access ladder and the service arm of the central refilling system. It prevents movements of the Shovel and its attachment as long as the safety lock lever is in the upper locked position and/or the access ladder is in the lowered position or when the service arm of the central refilling system is in its lowered position.

## Control Panel

**Legend for illust. Z 23088**

(1) Hydraulic oil temperature gauge

(2) Hourmeter. The hourmeter indicates the total number of hours of engine operation. A second hourmeter indicating the hours of traveling operation is installed in the X2 switch box, see page 135 for more information.

(3) Fuel level gauge

(4) Ammeter

(5) Voltmeter

(6) Engine oil pressure gauge

(7) Engine coolant temperature gauge

(8) Text display of the Electronic Text Monitoring system ETM, refer to page 86 for operating instructions.

(9) Keyboard with 8 keys, used to switch the screen and for input of data

(10) Service key switch for deletion of ETM memory data

(11) Selector switch for ETM settings

(12) Key operated switch for enabling settings of the ETM system

(13) Acoustic warning signal

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

**⚠ CAUTION**

**In case of too low hydraulic oil level this signal sounds continuously. Shut down the Shovel, 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 138.**

(14) Switch for main working lights

(15) Switch for dashboard illumination

(16) Switch for interior illumination

(17) Switch for warning beacon on cab roof (if so equipped)

(18) Switch for upper and lower windshield wiper
Switch positions:
0 - Off
1 - Interval stage
2 - Slow stage
3 - Fast stage

(19) Switch for windshield washer

## 3.4.2 SYSTEM COMPONENTS

see illust. Z 23090

| | |
|---|---|
| **(A)** Text Display Unit | ● Plaintext messages<br>● Multi-lingual text display<br>● Text store for all available texts<br>● Record memory capacity for max. 1300 messages<br>● Statistics memory for frequency and total time period of the messages |
| **(B)** Key board with 8 keys | ● Function of the keys, refer to page 89 |
| **(G)** Acoustic warning signal | ● Indicates fault messages |
| **(F)** Connector for printer | ● Special equipment |

**Switches for the adjustments of the ETM system**

**(C)** “Service” key switch for deletion of Record - and Statistics memory contents

The erasure function is stored under message no. 30.

**(D)** Pre-selector switch for the following settings:
“0” - Off
“1” - Setting of Date
“2” - Setting of Time of day
“3” - Setting of Operating Hours

**(E)** Key switch, enables the settings selected with switch (D). The adjustments are stored under message nos. 27, 28 and 29.

**NOTICE**
**Settings with key switches (C and E) must only be done by authorized Service Personnel. Refer to page 111 for setting procedure.**

## Print out Contents of Statistics Memory:

| | | |
|---|---|---|
| 15.06.05 | 14: 36: 39 | h: 1351:20<br>1/min: 1800 |


The complete statistics are now being printed out.

**Display:** .

| |
|---|
| *******STATISTICS PRINTOUT****** |
| Printing statistics table, please wait..... |

**NOTICE**
**it is recommended to erase all entries in the statistics memory with key switch (C) after each main service period in order to keep the statistics clear. Prior to delete the statistics, print out or record the contents of the statistics memory in the table on page page 103 to ensure complete service record of the excavator. The date and operating hours should also be recorded.**

## Print out Contents of Record (PROTOCOL) memory:

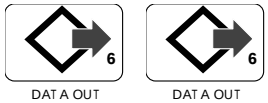
**Print out the complete Contents of Record (PROTOCOL) Memory**


Press until the maximum amount of entries **(39)** is reached

Display:

| | | |
|---|---|---|
| Print from the last | **>** | 1**<** PRO entries |
| page no all * PRO has | | 39 entries ***P*** |

| | | |
|---|---|---|
| Print from the last | **>** | 39**<** PRO entries |
| page no all * PRO has | | 39 entries ***P*** |




The complete PROTOCOL is now being printed out.

## 3.4.6 SETTINGS OF THE TEXT DISPLAY UNIT

**Setting: DATE (Message page 27)**

Set enable key switch “Adjustments” (E) to ON position

Set Selector switch “Adjustments” (D) to position “1”

The cursor flashes in the enter zone.
Use key 4 (PAGE NO) to shift the cursor to the input place. Change the values using key 2 (UP) or 3 (DOWN). Check the new values and then press key 1 (MESSAGE) or key 6 (DATA OUT) to accept the new values and to finish the input function.

**Example:**

| | |
|---|---|
| # F: | date: 03.07.05<br>new date: 17.07.05 |

**Setting: TIME OF DAY (Message page 28)**

With enable key switch (E) in ON position, set selector switch (D) to position “2”. Input procedure is the same as described under DATE.

**Example:**

| | |
|---|---|
| # F: | time: 08:41:30<br>new time: 15:50:15 |

**Setting: HOUR METER (Message page 29)**

With enable key switch in ON position, set selector switch (D) to position “3”. Input procedure is the same as described under DATE.

**Message Pages Number 61 to 64.**

**(Page No.**

| | |
|---|---|
| 61: | Program Identification Number: XXXXXX |

| | |
|---|---|
| 62: | Central Lubrication System "CLS" cycle counter resetting<br>Counter reading:<br>"CLS" cycle counter |

| | |
|---|---|
| 63: | Slew ring gear lubrication System "SLS" cycle counter resetting<br>Counter reading:<br>"SLS" cycle counter |

| | |
|---|---|
| 64: | Truck counter resetting<br>Counter reading:<br>Truck counter |

**NOTICE**
**The Dollar symbol ($) at the beginning of the first text line of fault messages serves as a reference signal for on-line data transfer on machines using the Modular Mining System "MMS".**

**⚠ WARNING**

- **The cab base may contain high voltage electrical appliances.**
  **Access to the cab base for authorized service staff only.**
- **All cables of the 24V board net system are of blue color. All other cable colors indicate a higher voltage. Do not touch these cables, their terminals and connected components. Always contact authorized Electricians having the qualification to work on medium and high voltage systems.**

**Legend for illustration Z 23093**

(1) Cab base door

(2) Light switch

(3) Pilot control frame

(4) Box of the main switch board (X2). See page 135 for more information.

(5) Compressor for signal horn

(6) Signal horn

(7) Controller (E61) for the electronic pump control system CR700

**Coolant Level**

**⚠ WARNING**

**DO NOT remove the radiator pressure cap (6), illust. Z23098 from a hot engine. Wait until the temperature is below 50°C before removing the pressure cap (6). Failure to do so can result in personal injury from heated coolant spray or steam. Turn the radiator cap (6) slowly counterclockwise to the safety stop to allow the pressure to escape, then continue to turn until cap is free to be removed.**

The coolant level should be in the upper field of the sight gauges (4). If necessary add coolant.

**REMARK**

Refer to the Engine Manual for the correct coolant composition.

**Fill Engine Fuel Tank**

**⚠ WARNING**

**Engine fuel is flammable and can cause a fire or an explosion. Do not fill the fuel tank or service the fuel system near an open flame, welding, burning cigar or cigarettes, etc.**

Fill the fuel tank at the end of the of the shift to prevent condensation from forming. See engine operation and maintenance manual for fuel specifications.

Be sure to install and lock the fuel filler caps after re-fuelling. Check the breather filter at the filler neck and clean if necessary.

**Hydraulic oil warm-up**

On machines without hydraulic oil pre-heating system:
DO NOT start the engine if the ambient temperature (oil temperature) is below the starting temperature shown in column “1” of the hydraulic oil viscosity chart on page page 152 in this section.

On machines with hydraulic oil pre-heating system:
Before starting the engine, warm-up the hydraulic oil to the starting temperature shown in column “1” of the hydraulic oil viscosity chart.

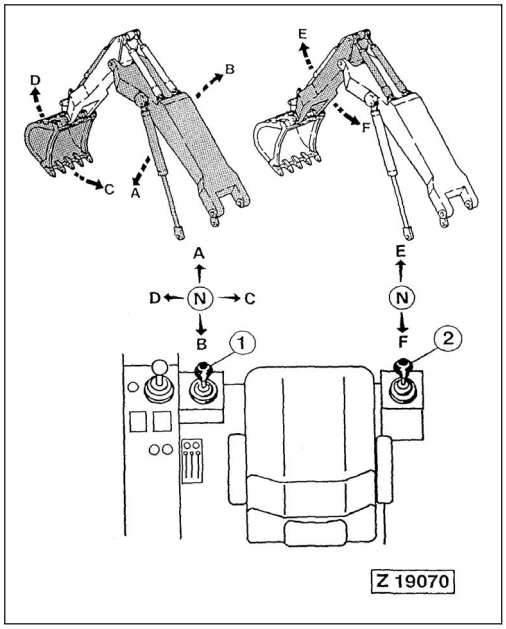
During the warm-up period, complete several operating cycles of all hydraulic movements without load. Avoid operation against limit stops. (high pressure build up).
Work can be started when the minimum operating temperature shown in column”2” of the viscosity chart is obtained.

## 3.12.2 MACHINES EQUIPPED WITH"KMG" CONTROL SYSTEM

**NOTICE**
**The illustrations show a typical construction of control stand and working attachment.**
**However, the shown operation - and working movements apply to this machine.**

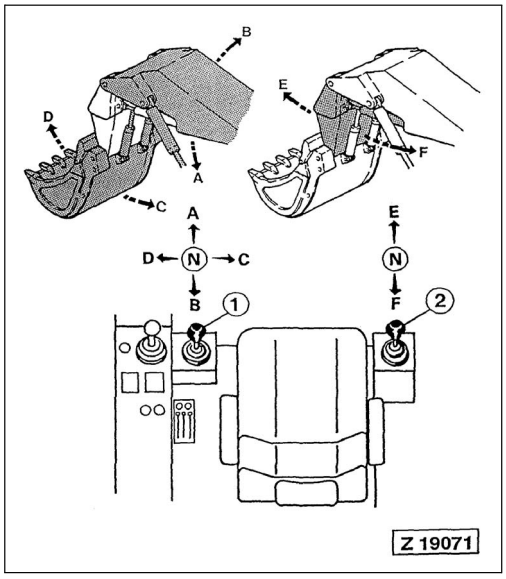
### BACKHOE

| L.H. control lever (1) | | R.H. control lever (2) | |
|---|---|---|---|
| A | Lowering boom | E | Extending stick |
| B | Lifting boom | F | Retracting stick |
| C | Filling bucket (roll back) | | |
| D | Emptying bucket (roll forward) | | |




### FACE SHOVEL

| L.H. control lever (1) | | R.H. control lever (2) | |
|---|---|---|---|
| A | Lowering boom | E | Extending stick |
| B | Lifting boom | F | Retracting stick |
| C | Emptying bucket (roll back) | | |
| D | Filling bucket (roll forward) | | |




**NOTICE**
**The raised working attachment can also be lowered 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 moving control lever (1) to position (A). The necessary oil pressure for shifting the spools of the main control valves is provided by a pressure accumulator in the pilot oil circuit. After stopping the engine, relieve the pressure in the hydraulic system.**

**For more information → See "STOPPING THE ENGINE" on page 172.**

# 3.14 PARKING THE SHOVEL

Park the machine at a safe place on level and solid ground.

- Lower the working attachment onto the ground in a position as shown on the oil level plate at the hydraulic oil reservoir.
- Stop the engine and relieve the pressure in the hydraulic system, see "STOPPING THE ENGINE" on page 172 for more information.
- Move the safety lock lever fully to the rear in locked position.

**⚠ WARNING**

**DO NOT leave the Operator's Cab when the engine is running.**

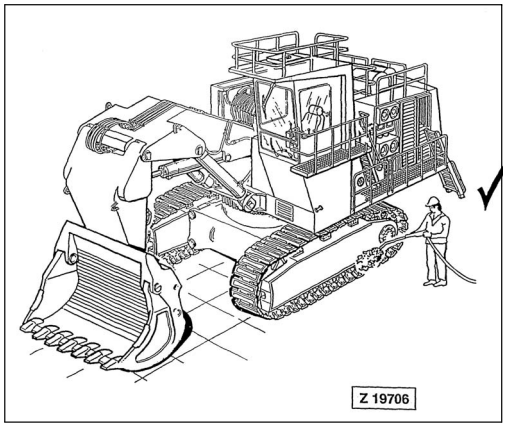
- Be sure to lock the operator's cab door before leaving the Shovel.
- If the Shovel has to be parked on steep terrain, the track groups must be secured with wedges.
- Before leaving the Shovel make sure that the parked machine does not impair local requirements, have consideration for other mining traffic.

## CLEANING THE TRACK GROUPS

Under working conditions with excessive material build up on the crawler components, cleaning of the crawlers is very important to prevent damage.

Material build up on guide wheels, drive sprockets and tracks can lead to over tensioning of the tracks, resulting in severe damage to these components.

If there is danger of frost, the tracks must also be cleaned.




**NOTICE**

**Use a suitable cleaning device for removing dirt, mud and debris from the tracks, rollers, guide wheels and sprockets.**

## FIRE DETECTION AND SUPPRESSION SYSTEM

**⚠ WARNING**

**Before operating the Shovel make sure the Fire Detection, Actuation and Suppression system is operative.**
**Carry out inspection and maintenance according to the separate manuals “Fire Detection and Actuation System” and “Fire Suppression System” in volume 2 binder.**

**⚠ CAUTION**

**This section covers only such information necessary for the operator to understand operation of the fire detection and actuation system.**
**All other information i.e. placing the system in service, daily inspection, functional tests, maintenance and trouble shooting are contained in the separate manuals.**

**Legend for illustration Z 21619**

(A) Control module with manual/automatic actuator in the Operator’s cab

(1) Control module, refer to the separate Manual "CHECKFIRE SC ELECTRIC DETECTION AND ACTUATION SYSTEM" for all information concerning - Operational Modes, Daily Inspection, Maintenance and System Conditions -.

(2) Strike button, manual actuation

(3) Ring pin

(4) Manual / automatic actuator

(5) LT-5-R cartridge

(6) Manual actuator switch at the radiator door

(7) Manual actuator switch at the rear power house door

(8) High level alarm on operator’s cab

(9) Pressure switch - DPST located in the cab base. This switch shuts off the engine immediately when the fire detection system has a fire detected. The reset plunger (10) moves out into its upper position. When the fire suppression system has been recharged, push in the reset plunger.

(10) Reset plunger, be sure to push in this plunger as soon as the fire suppression system has been recharged after actuation of the system.

(11) Fire extinguishing tanks on power house roof

## 3.18.2 OPERATING THE HYDRAULIC SERVICE ARM

**A - Diesel Engine OFF**

The Service Arm can only be lowered.

Proceed as follows:

1. Turn main key switch to ON position.
2. Turn enabling switch (1), illust. (Z24005) to ON position ”1”.
3. For lowering the Service Arm (3) pull down chain (2).
4. Release chain (2) when arm (3) is in fully lowered position.

**REMARK**
To stop lowering movement of the Service Arm in any position release chain (2).

5. Before leaving the Shovel turn enabling switch (1) to OFF position ”0” and remove the main switch key.

**B - Diesel Engine running**

Control the Service Arm as follows:

1. Turn enabling switch (1), illust. (Z24005) to ON position ”1”.
2. To lower the service arm (3) pull chain (2) and hold until the service arm is in fully lowered position. For reversing moving direction of service arm release the chain (2) to stop service arm movement and then pull chain (2) again.
3. To lift the service arm pull chain (2) and hold until the service arm is completely lifted into its home position.

**NOTICE**
**Be sure the Service Arm is completely lifted to its home position otherwise the proximity switch in the guide frame of the service arm will not release the pilot control system.**

**A - Pumping the oil from the Suction Oil Reservoir into the Main Oil Reservoir**

1. Close main valve (8), illustration Z25100.

2. Open cock (2), position (O).

**REMARK**
In order to prevent build-up of a vacuum in the suction system, open the vent plug on the suction pipe of each main hydraulic pump, see page 371 for more information.

3. Switch on pump (1) with switch (4).
   When changing the hydraulic oil, be sure to evacuate the main oil reservoir via the service arm connector simultaneously with the transfusion procedure. Otherwise overfilling of the main oil reservoir. Observe oil level at sight gauge (9).

4. When the suction oil reservoir is empty or after completion of the maintenance job switch off transfer pump (1) with switch (4). Close cock (2), position (C) and open main valve (8).

5. With the main shut-off valve (8) open, the suction oil reservoir will be filled with oil from the main oil reservoir. Let the vent plugs on the main pumps open to allow the air to escape from the suction oil reservoir and hoses.

6. The suction oil reservoir and the suction hoses are filled, when bubble free oil flows out at the vent plugs on each main pump. Close the vent plugs.

7. Check oil level in the main reservoir. Fill up with new hydraulic oil as necessary.

8. Start the engine and run at low idle speed to allow trapped air to be removed from the hydraulic system.

**⚠ CAUTION**

**DO NOT start the engine when the suction oil reservoir is empty.**

**B - Pumping the Oil from the Return Oil Collector Pipe into the Main Reservoir**

1. To empty the return oil collector pipe, open cock (3).

2. Switch on transfer pump with switch (4).

3. Observe oil level at sight gauge (9). As soon as the oil level remains constant the return oil collector pipe is empty. Now switch off the transfer pump (1) and close cock (3).

**NOTICE**
**During normal operation the valves (2 and 3) must be in closed position (C).**

# 4. MAINTENANCE

| Service Intervals | Service Point | Service | See |
|---|---|---|---|
| **Every 250 operating hours or monthly** | Refrigerant compressor | Check drive belt tension | page 275 |
| | Radiator fan belt and automatic belt tensioner | Maintenance check | page 277 |
| | Generator | Check drive belt tension | page 281 |
| | Signal horn compressor | Lubricate | page 283 |
| | Oil cooler fans | Check condition and fastening | page 283 |
| | Automatic lube systems | Clean in-line grease screens and breather filters | page 285 |
| | Cab, air filter | Clean or replace filter element | page 289 |
| | Windshield washer reservoir | Check fluid level | page 291 |
| | Air conditioning for Operator’s cab | Inspection | page 291 |
| | Engine | Maintenance | (1) |
| | Fire suppression system | Inspection | (2) |
| | Eliminator filter | Maintenance check | (4) |
| **Every 500 operating hours or quarterly** | Batteries | Check fluid level | page 293 |
| | Flexible Coupling | Check oil level | page 295 |
| | Fuel tank | Drain condensation | page 297 |
| | Crawler tracks | Inspection | page 299 |
| | Fire detection and actuation system | Maintenance | (2) |

(1) Perform maintenance according to separate Engine Operation an Maintenance Manual filed in volume 2 binder.

(2) Perform inspections according to the separate Manuals ”FIRE DETECTION AND ACTUATION SYSTEM” and ”FIRE SUPPRESSION SYSTEM” filed in volume 2 binder.

(4) Perform maintenance according to separate Service Bulletin "Eliminator Filter" filed in volume 2 binder.

**⚠ CAUTION**

**Carry out initial service according to item 4.6.1.**

## Extended Service Intervals for Engines with Engine Oil Management System

Reserve System Oil Flow Schematic, illust. Z23083

(3) Oil filters for the engine oil reserve system

(4) Suction line from reserve tank

(5) Suction line to pumping unit

(6) Supply line from pumping unit to crankcase

(7) Withdrawal oil line from engine oil pan to pump

(8) Ventilation line for reserve tank

(11) Oil feed-back line to reserve tank

(12) Pumping unit, located on the cross member below the fire wall. The pump unit works automatically as soon as the engine speed is above 300 RPM. The pump unit consists of a pumping element for feeding oil from tank (13) into the engine oil pan. The second pumping element withdraws oil from the engine oil pan and feeds it back into the reserve tank when the oil level in the oil pan exceeds the maximum running oil level. The combined operation of the pumping elements maintains an optimal oil level in the engine oil pan. Oil drawn off by the Centinel burn system is also replaced through the supply system "Reserve".

(13) Reserve oil tank. The reserve oil tank is an integrated part of the main frame cross member.

(14) Drain plug

(15) Cross member below the fire wall

(16) Plug. On shovels with KIM Hot start heating system a thermostat is installed in place of plug (16).

(17) Oil level sight gauge. Be sure to add engine oil via the swing down service arm before the oil level is at the MIN marking on the sight gauge.

(18) Refilling line from swing down service arm

## 4.6.6 MAINTENANCE OF THE ENGINE

All maintenance has to be carried out in accordance with the separate Engine Operation and Maintenance Manual.

**REMARK**

Service the Eliminator Oil Filter according to the separate Service Bulletin **"Eliminator Filter"** filed in volume 2 Binder.

**Service the Grease Filters for Refillable Grease Containers of the Central Lubrication System and Swing circle pinion Lubrication System, illustration Z 20718**

1. Screw off filter case.

2. Remove element assy. (02) and clean. Take care not to contaminate the ”Clean” inside of the element when flushing.

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

3. Inspect O-rings (03 and 05) and back-up ring (04). Replace if necessary.

4. Fill filter case half way up with the specified grease.

5. Installation sequence vice versa. Take care for proper position of filter element (02).

**NOTICE**
**Replace element (02) after three cleanings or after every 5000 operating hours, whichever occurs first.**

## CHECK GREASE INJECTORS

**Legend for illustration Z 19511**

| | |
|---|---|
| (D) | Injectors on slewing connection |
| (1) | Indicator stem for visual indication of injector operation |
| (2) | Output adjusting screw |
| (3) | Protection cap |
| (4) | Grease fitting |

Check operation of all grease injectors (D) 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, proceed according to paragraph CORRECTIVE ACTIONS.

**NOTICE**
**If the failure is caused through a defective central lubrication system, manually lubricate at grease fittings (4) after removal of caps (3).**

## CORRECTIVE ACTIONS

1. Check to make sure grease supply through inlet line is provided.
2. Disconnect the outlet line of the respective injector.
3. Operate the central lubrication system manually.
   - A -
     If now the injector works, i.e. cycle indicator stem (1) moves in and out the disconnected line or the grease passage at the lubrication point is damaged or blocked by foreign matter. Repair as necessary.
   - B -
     If the injector does not work, i.e. cycle indicator stem (1) stationary, replace the respective injector.
4. Operate the central lubrication system and re-check operation of the grease injectors.

**REMARK**
If the failure is caused through a defective central lubrication system, manually lubricate at grease fittings (4) after removal of caps (3).

# 4.9.1 SWING GEAR AND MOTOR ADAPTER HOUSING - CHECK OIL LEVEL

**REMARK**

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

**Swing gear manufactured by "L&S"**

**Legend for illustration Z22913**

Swing gear

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

(1) Oil level gauge

(2) Oil filler plug

(3) Breather filter

(7) Drain coupling or evacuation nozzle for Wiggins system

Motor Adapter Housing

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

(5) Breather filter

(6) Oil drain plug

## CHECK SWING GEAR OIL LEVEL

Remove oil level gauge (1), illustration Z22913 and wipe it clean. Insert the gauge but DO NOT screw in, see detail ”A”. Remove the gauge. The oil level should be at the upper mark of gauge (1). If necessary add the specified gear oil through filler opening (2).
Remove breather filter (3). Blow out with compressed air from inside to outside and reinstall.

## CHECK MOTOR ADAPTER HOUSING OIL LEVEL

Remove oil level gauge (4) and wipe it clean. Insert the gauge but DO NOT screw in, see detail ”A”. Remove the gauge. The oil level should be at the upper mark of gauge (4). If necessary add the specified oil through filler opening (4).
Remove breather filter (5). Blow out with compressed air from inside to outside and reinstall.

## 4.9.4 HYDRAULIC ACCESS LADDER - CHECK SAFETY SENSOR

**Legend for illustration Z23077**

(A) Access ladder in lowered position

(B) Access ladder in upper position (Working position)

(1) Access ladder

(2) Light switch for access area lighting

(3) Pull chain for emergency lowering of the access ladder

**⚠ WARNING**

**Use this chain only in emergency cases, when the Operator does not respond to other communication signals.**

When the chain (E) is being pulled down with the engine running, the pilot control system is made inoperative, preventing further movements of the Shovel.

(4A) Control switch for access ladder at machinery house door

(4B) Control switch for access ladder at operator's cab

(5) Push button for lifting the ladder

(6) Push button for lowering the ladder

(7) Sliding window for emergency exit from operator's cab

(8) Emergency escape ladder

(9) Ladder pivot bracket

(10) Monitor and control sensor (S91). Function of sensor (S91): This sensor monitors the ladder position and controls the moving speed of the ladder. In case the sensor (S22) fails to function properly, the sensor (S91) prevents unintended movement of the ladder.

(11) Safety sensor (S22), located on ladder pivot bracket. Function of sensor (S22): Cut out of the pilot control system and actuation of the hydraulic swing brake with the ladder in lowered position.

(12) Lock nut for ladder pivot ball bearing

**Check Safety Sensor (11)**

With the ladder completely lowered (position A) start the engine.
Move the bucket control lever to ROLL BACK position.
The bucket must NOT start to move.
If the bucket starts to move, the safety sensor and/or its circuit is defective.

**⚠ WARNING**

- **Inform the Service Staff about the malfunction of the ladder sensor.**
- **DO NOT operate the Excavator before the failure has been eliminated and the sensors function properly.**

## 4.10.3 GENERATOR - CHECK BELT TENSION

**REMARK**

For the correct belt tension and belt tension gauge refer to the **Drive Belt Tension Chart** in the Engine Operation and Maintenance Manual, Section V, page 19.

The engine can be equipped with one of the two versions of belt tensioning systems.

**Version A with turn buckle, illust. Z 25103**

**Adjustment:**

1. Remove generator belt guard.
2. Loosen bolts (1 and 2).
3. Loosen lock nuts (3) and adjust belt tension with turn buckle (4).
4. Tighten lock nuts (3) and bolts (2 and 1) in this sequence.
5. Install generator belt guard.

**Version B with slotted bar, illust. Z 25103**

**Adjustment:**

1. Remove generator belt guard.
2. Loosen bolts (1 and 2).
3. Pull the generator until the required belt tension is obtained and tighten bolts (2 and 1) in this sequence.
4. Install generator belt guard.

**NOTICE**

**Check the belt tension after 10 minutes running time and readjust if necessary.**

## 4.10.8 WINDSHIELD WASHER RESERVOIR - CHECK FLUID LEVEL

**Legend for illustration Z24060**

(1) Access door to the water reservoir of the windshield washer system and to the dryer cartridge of the air conditioning

(2) Water reservoir for windshield washer

(3) Cab air filter

(4) Cab blower

(5) Dryer cartridge of the air conditioning

(6) Sight glass for checking refrigerant filling

(7) Shut-off valve for dryer cartridge replacement

(8) Condenser blower

- Fill the water reservoir (2) with clear water, add antifreeze and cleaning agent as necessary. Filling capacity of the reservoir approximately 7 liter. Check washer and wiper system for leakages and carry out a functional test of both systems.

## 4.10.9 AIR CONDITIONING FOR OPERATOR'S CAB - CHECK REFRIGERANT LEVEL

### Checking the refrigerant level, illustration Z24060:

- Switch on air conditioning equipment and run at maximum capacity for approx. 5 minutes.
- Observe inspection glass (6). A refrigerant flow loaded with bubbles or foam indicates a lack of refrigerant. In this case well equipped refrigeration specialists must check the circuit for tightness and must add the missing quantity or refrigerant.
- If more than 200 grams per year are lost, the oil level of the refrigerant compressor must also be checked. This is a special procedure and must be carried out by refrigeration specialists only. Isolated small bubbles in the inspection glass may be neglected. Even with an absolutely tight equipment a certain amount of refrigerant is lost through the walls of the hoses. Therefore a small annual replenishment of the refrigerant quantity is normal.
- The dryer cartridge (5) must be replaced after every 1000 operating hours or once a year by refrigeration specialists.
- Clean the filter mat of condenser blowers (8).

**REMARK**

Servicing of the air conditioning systems is restricted to workshops especially equipped for this purpose. Refer to the separate booklet "AIR CONDITIONING" in Service Literature Binder – Volume 2 for more information.

## CHECK ADJUSTING RANGE FOR GUIDE WHEELS

**Legend for illustration Z 20015**

(1) Guide wheel

(2) Slide block

(3) Stop plate

“X” Adjusting range for track tension

The adjusting range for track tension is the distance “X” between guide wheel slide block (2) and stop plate (3). Depending on lenghtening of the track the slide block (2) may come in contact with stop plate (3). In such a case, it must be ensured that the track does not become too loose, Depending on track condition, the removal of one track pad will restore the adjusting range “X”. If necessary contact our Service Department for more information.

**⚠ WARNING**

**Before working on the track adjusting system, relieve all pressure in the system by opening the pressure relief cock (5), see illust. Z 20371 on previous page.**

**NOTICE**

- **If removal of a track pad becomes necessary, it must be done on both tracks in order to maintain the same length of both tracks.**
- **During operation, the pressure relief cock (5) must always be in CLOSED position. Open cock (5) for pressure relieve prior servicing any part of the system, e.g. removal of a track pad.**

## High-Strength Bolt Connections (continued)

**Check mounting and security of the Diesel engine and pump distributor gear, illustration Z24069**

- Check all flexible bearings (1) for engine and pump distributor gear.
  - ❍ Check the flexible bearings for damage and signs of fatigue. Make sure that there is no contact between the upper and lower metal brackets of the flexible bearings (1). Replace the bearings if necessary.
    After new flexible bearings have been installed, check distance (A) on both torque supports.

**NOTICE**
**All flexible bearings (1) and all rubber-bounded metal bars (4) should be replaced during engine overhaul.**

- Check distance (A) between torque support and stop bolt (8).
  - ❍ With setting of the flexible engine bearings (1) the distance (A) increases and must be adjusted. To do this, loosen lock nut (9) and tighten stop bolt (8) until the correct distance (A) is obtained. Tighten lock nut (9) and recheck distance (A).
    If new flexible engine bearings (1) have been installed, replace also cup springs (7) and adjust distance (A) to 29 mm.
- Check tie bolts (3) on front and rear carrier units for looseness.
  - ❍ Check to make sure that the self locking retainer nuts (5) are tight and that there is no gap between nut and rubber-bounded metal bar (4).
    If necessary retighten retainer nuts (5) snugly.
    Check rubber-bounded metal bars (4) for signs of fatigue and damage.
    Replace as necessary.

**NOTICE**
- **Check all bolt connections for correct tightening torque.**

Check condition of engine carrier and brackets. If any damages, failures or wrong condition are found, corrective action must be taken.

## High-Strength Bolt Connections (continued)

**Swing circle (01), illustration Z20864**

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).

## High-Strength Bolt Connections (continued)

**Procedure for determination of the tightening torque for the crawler carrier mounting bolts after the first 1000 operating hours, see illustration Z24073**

1. Loosen the two measuring bolts (7) at the left crawler carrier and the two measuring bolts at the right crawler carrier.
   Do not lubricate the measuring bolts.
2. Tighten the four measuring bolts (7) with 150 Nm.
3. Attach the measuring device (1 - 6).
4. Set the dial gauge (2) to the zero position.
5. Attach the special hydraulic torque wrench (1), see illustration Z24072 on next page to the measuring bolt (7).
6. Increase the pressure at the hydraulic torque wrench until a torque of 2100 Nm is reached and tighten the measuring bolt.
7. Record the pressure and the change of the bolt length in a table.
8. Increase the pressure further by steps of 10 bar until the required elongation of 0.93 mm of the measuring bolts (7) is reached.
9. Record the corresponding hydraulic pressures in a table.
10. Repeat this procedure on all four measuring bolts (7).
11. Add the 4 determined hydraulic pressures and then divide by 4 to obtain an average value.
12. Now loosen one of the mounting bolts (M48) and tighten up to the determined average pressure.

**⚠ CAUTION**

**DO NOT loosen more than one bolt at the same time.**
**DO NOT lubricate the bolts (M48).**

13. Repeat this procedure at all bolts (M48) step by step.

## FILTER SERVICE

- Replace breather filter element
- Drain water and sediments from hydraulic oil tank

**Legend for illust. Z24075**

(1) Hand wheel of main shut-off valve located between suction oil reservoir and main oil reservoir
- To OPEN the valve, turn hand wheel (1) CCW to the stop
- To CLOSE the valve, turn hand wheel CW to the stop

A proximity switch located on the gearbox of the shut-off valve monitors the valve position. With the valve not fully open, a corresponding message will be displayed on the ETM screen in the Operator's cab.

**REMARK**

Before starting the engine, make sure the shut-off valve is completely open by turning hand wheel (1) fully to the left (CCW).

(2) Breather filter

**Replace Element (C) of Breather Filter (2).**

1. Remove nut (A).
2. Remove cover (B).
3. Remove filter element (C).
4. Insert new filter element and reassemble the breather filter (2).

**Drain Water and Sediments**

Drain water and sediments with machine standing an level ground and when machine was out of operation for some time.

Refer to Operation section page 188 for evacuation procedure.

## 4.12.3 PTO (PUMP DISTRIBUTOR GEAR), SWING GEAR AND TRAVEL GEARS - OIL SAMPLE ANALYSIS

The oil sample analysis gives information about the grade of contamination and aging of the gear oils. Refer to the tables below for limits of contamination.

### Oil drain plugs, illustration Z24078

(1) PTO (Pump distributor gear)

(2) Swing gear

(3) Travel gears, planetary box

(4) Travel gears, spur gear box

### PTO (PUMP DISTRIBUTOR GEAR)

(Oil contamination)

| Element | | Normal | Increased | | Critical |
|---|---|---|---|---|---|
| Iron | < | 100 ppm | 100 - 300 ppm | > | 300 ppm |
| Copper | < | 10 ppm | 10 - 20 ppm | > | 20 ppm |
| Chromium | < | 5 ppm | 5 - 15 ppm | > | 15 ppm |
| Silicon | < | 40 ppm | 40 - 60 ppm | > | 60 ppm |

### SWING GEAR AND TRAVEL GEARS

(Oil contamination)

| Element | | Normal | Increased | | Critical |
|---|---|---|---|---|---|
| Iron | < | 400 ppm | 400 - 700 ppm | > | 700 ppm |
| Copper | < | 25 ppm | 25 - 60 ppm | > | 60 ppm |
| Chromium | < | 5 ppm | 5 - 15 ppm | > | 15 ppm |
| Silicon | < | 40 ppm | 40 - 60 ppm | > | 60 ppm |

**NOTICE**
**If the grade of contamination approaches to the “critical” values in the above tables, change the gear oil. However, the regular oil changes must be carried out every 3000 operating hours or once a year, whichever occurs first.**

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

**Legend for illust. Z25002**

(1) Main hydraulic oil reservoir

(2) Back-pressure valve

(3) Swing gear location

(4) Return oil collector manifold

(5) Drain coupling of the return oil collector manifold

(6) Branch pipe

(7) Strainer of the oil cooler circuit

(8) Intermediate pipe

(9) Differential pressure switch

(10) Pulsation damper

(11) Distributor manifold

(12) Oil flow to cooler

- Drain the oil from manifold (4) by attaching the drain hose (part of tool set) to coupling (5).
- Remove pipe (8) with strainer (7). Insert new strainer and install pipe (8) with new gaskets.
- Remove pulsation damper (10) and install new pulsation damper with new O-ring.

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

### Vent Suction Oil Reservoir and Hydraulic Pumps, illustration Z25014A

1. Loosen vent plugs (A1 and A2) of suction oil reservoir (1). Retighten vent plugs (A1 and A2) when the outflowing oil is free of air bubbles.

2. Vent main pump (2) by opening first vent plug (B) at the suction pipe just below the pump flange. When the outflowing oil is free of air bubbles close vent plug (B). Open vent valve (C) and loosen leakage oil line connector (D). Retighten (C) and (D) when the outflowing oil is free of air bubbles.

3. Vent main pump (3) by opening first vent plug (B) located at the RH side of the suction pipe just below the pump flange. When the outflowing oil is free of air bubbles close vent plug (B). Open vent valve (C) and loosen leakage oil line connector (D). Retighten (C) and (D) when the outflowing oil is free of air bubbles.

4. Vent oil cooler fan drive pump (4) by loosening leakage oil line connector (E). Retighten (E) when the outflowing oil is free of air bubbles.

5. Vent control oil pump (5) by loosening vent plug (F) at the suction line flange. Retighten (F) when the outflowing oil is free of air bubbles.

6. Vent main pump (6) by opening first vent plug (G) at the suction pipe just below the pump flange. When the outflowing oil is free of air bubbles close vent plug (G). Open vent valve (H) and loosen leakage oil line connector (J). Retighten (H) and (J) when the outflowing oil is free of air bubbles.

7. Start the engine and run at low idle for five minutes. Stop the engine.

8. Loosen vent valves (C and H) of main pumps (2, 3 and 6) by one or two turns and close the valves when the outflowing oil is free of air bubbles.

9. Check hydraulic oil level and the whole hydraulic system for leakage.

10. At the first start up after an oil change carry out several operating cycles of all hydraulic movements without load. Operate the cylinders slowly. Do not operate the cylinders to stroke end.

**REMARK**

After changing the oil of the PTO gear vent the PTO lubrication pump (7) by opening vent plug (K) at the suction hose flange. Retighten (K) when the outflowing oil is free of air bubbles.

**Brake Housing - Change Oil (Siebenhaar)**

1. Remove level gauge (8), illustration Z 21694, drain plug (9) and breather filter (7). Drain the oil into a receptacle of approx. 5 liter capacity.

2. Clean breather filter (7) with compressed air from inside to outside and re-install.

3. Install drain plug (9) and fill-up engine or hydraulic oil through filler opening, up to the "MAX" mark on level gauge (8) and install the level gauge.

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

**NOTICE**
**Be sure to fill the brake housing and motor adapter housing with engine oil or hydraulic oil as specified on page 215.**

**Motor Adapter Housing - Change Oil**

1. Remove level gauge (6) and drain plug (5). Drain the oil into a receptacle of approx. 5 liter capacity.

2. Install drain plug (5) and fill-up engine or hydraulic oil through filler opening, up to the "MAX" mark on level gauge (6) and install the level gauge.

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

## PRECAUTIONS

See illustration Z 19360

In order to prevent risks of possible fire break out observe the following items:

1. Keep the excavator clean, especially from inflammable materials.
   Clean the excavator after servicing the hydraulic system, engine and fuel system by means of a steam jet.

2. Clean engine compartment, hydraulic pump compartment and service platform of the superstructure.
   Thereafter check fuel lines, engine oil lines and hydraulic oil lines for leakage, loose fastenings and damage.
   If any leakage, damage or loose fastening is found, corrective action must be taken immediately.

3. Check all electrical cables, terminals and connections for loose fastenings, damage and wear.
   Replace or repair defective or worn parts without delay.

4. Check the turbocharger for correct mounting and tight exhaust, intake and lube oil connections.
   Carry out all necessary repairs without delay.

5. **On machines equipped with a fire detection, actuation and suppression system:**
   Refer to the manufacturers service manuals in volume 2 binder for correct maintenance and inspection of the systems.
   When checking the filling level of the dry chemical tanks, make sure that the extinguishing powder (Ansul FORAY dry chemical agent) is not compacted.
   Stir up the extinguishing powder with a suitable stick until it is in a free flowing condition.

**NOTICE**
**When cleaning the power house take care the heat detection sensors do not come in contact with hot steam or other hot agent. Otherwise the fire suppression system may be triggered.**

6. Make sure fire extinguishers are charged and ready for use.

**NOTICE**
**After cleaning lubricate all lubrication points by means of central lube system or manually.**
**Lubricate swing circle gear after drying by means of the automatic lube system or manually.**