Operation & Maintenance Manual

PC5500-6

HYDRAULIC MINING SHOVEL

SERIAL NUMBER 15016

October 2002

KOMATSU
MINING GERMANY

- 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 Z 22649

(1) Final drive, hub type travel gear

(2) Crawler carrier

(3) Track roller

(4) Carrier roller

(5) Guide wheel

(6) Swing circle guard

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

(8) Battery main switches

(9) Control switch for access ladder

(10) Monitor box for central refilling system, see page 238 for more information

(11) Push button for emergency shut down of both main drive motors.
DO NOT use the emergency shut down button for normal stopping procedure.

(12) Sliding window of operator’s cab, see page 54 for more information

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

(14) Air conditioner unit for high voltage switch cabinet

(15) Hydraulically driven grease pump of the Central Lubrication System (CLS)

(16) Hydraulically driven grease pump of the Swing circle pinion Lubrication System (SLS)

Legend for illust. Z 22461

(1) Sliding window, serves also 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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Switch Board (8)

Legend for illust. Z 22653

(10) Rotary switch - Motor 1 START

(11) Pressure switch - Motor 1 STOP

(12) Rotary switch - Motor 2 START

(13) Pressure switch - Motor 2 STOP

(14) Switch, interior illumination

(15) Switch, dashboard illumination

(16) Switch, warning beacon on cab roof

(17) Switch, main working lights (1)

(19) Switch, cab ventilation blower. Blower runs with low speed, even with switch in ”0” position. (Cab pressurising prevents ingress of dust).

(20) Switch, mirror heating

(21) Not used

(22) Switch, manual actuation of central lubrication system

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

(24) 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 209 for more information.

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

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

(27) Not used.

(28) Key operated main switch

(29) Strike button, emergency shut down of both main drive motors and pilot control system cut out.

⚠ WARNING

In case of emergency push in this button to stop the main drive motors and to cut out the pilot control circuit. DO NOT use for normal stopping procedure.

For releasing the switch, turn and pull-up the strike button.

Legend for illust. Z 22334

(A) Display with basic information

(B) Key board with 8 keys. For the function of the keys refer to page 83.

(C)) Key operated switch for enabling access to the INPUT-OUTPUT levels and input of operational data.

(D) Key section with 4 keys for menu control of Service Functions and for INPUT-OUTPUT functions (On Screen Display).

(9) RETURN Key, this key is used for returning to previous level of INPUT-OUTPUT or Service Functions.

(10) QUI Key, this key is used for access to the next lower level of INPUT-OUTPUT or Service Functions and going back to the Standard Display from a displayed current message.

(11) "0" Key, this key is used for selection of horizontal menu items within a main section of the inputs-outputs or service levels (LH direction).

(12) ”1” Key, same function as key (11) but in RH direction. Refer to page 115 Menu Control, for more information about the key section (D).

(13) Acoustic warning signal (Buzzer)

- This signal is heard for approximately 1 second when a fault message appears on screen (B).
- Continuous sound when the hydraulic oil level is too low.

⚠ 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.

(14) Switch for truck counter on RH control lever. The loaded trucks can be counted by actuating this switch. The total number of trucks loaded will then be displayed on screen (A) for five seconds.

(E) Plug socket for connecting remote printer or other data downloading equipment.
For printing out the contents of the **Statistics** memory, press key (8) and key (6).For printing out the contents of the **Protocol** memory, press keys (7, 6 and 3). Keep key (3) depressed until all messages are selected and then press key (6) two times. Refer also to page 105 for more detailed information.

Automatic Display of Messages

If a fault or an information condition occurs during operation, the basic display is automatically replaced by a message in text. If a further condition occurs, another message is displayed so that the operator is always shown the latest message.
The message text provides the operator with an explanation of the condition in standard texts.

When a fault message is displayed, further ”HELP” information relating to the fault message can be obtained by pressing the ”DOWN” key (3), illust. Z 22334. All fault and information messages are listed in section ”Message Texts”. Each message is related to a page. These MESSAGE PAGES are numbered and can be called up individually. When a fault message is displayed the number of operating hours is displayed and stored at the same time. Fault and information messages are held as long as their cause is existent

Maintenance Schedule

In accordance with the operating hours of the Shovel, the initial and periodic maintenance intervals are automatically displayed.

Example:

After the first 250 operating hours of the Shovel the following message will be displayed:

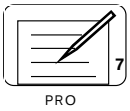
Initial 250 h Maintenance
Perform initial 250 h Maintenance.

Perform maintenance according to the Maintenance section.

Acknowledgement of performed maintenance.

The acknowledgement of performed maintenance is obtained in the main group ”Service” under menu item ”Maintenance” refer to Menu Control Chart -V- on page 129.

Display the Contents of Record (PROTOCOL) Memory, illust. Z 22334



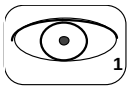
Press to display Protocol memory.

Display:

Last entry of the protocol memory will be displayed first. Higher numbers indicating older entries.

Fault message going

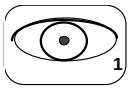
PROTOCOL entry no: 1 status : going
message : 638 date 15.10.02 at 15:27:32



Press to display message 638.

Example for other entries (e.g. Message No. 980)

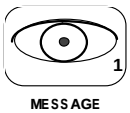
Press until the desired message **no. 980** appears.



Press to display message 980.

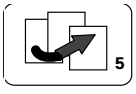
Display: Fault Message No. 980:

$h Swing gear house brake off



or

Press to return to the last message text.



Press to return to the basic display (Standard display) or to the last current message

Return to SYSTEM level:

Display of the Last Message Received or Menu
(Standard Display)

Operation of the keyboard (B) has no influence to the recording of input messages. For example, if the record memory is called up via keyboard (B), the ECS switches back to SYSTEM level after a period of 20 seconds when no further key is actuated within this period. For immediate return to SYSTEM level (message display or menu) press key 5 (SYSTEM).

Setting of Screen Brightness
Increase brightness: Press keys (5 and 2) simultaneously.
Decrease brightness: Press keys (5 and 3) simultaneously.

Ex works the display is adjusted to maximum brightness (basic setting). Any change of the screen brightness via keyboard (B) will be kept until the system is switched off. When the system is switched on again, the maximum brightness of screen (A) will be restored automatically (basic setting).

System Languages

The text of the messages and of the menu control of the ECS-System is available in 2 languages and can be selected in the main group SERVICE with the menu control.
Refer to the section ”SERVICE FUNCTIONS AND MENU CONTROL” for further information.

Message Numbers and Message PAGE Numbers

Each message of the two available system languages is related to a message page. The **message number** and the **message PAGE number** are identical for the **first language,** e.g. English.
The **message PAGE numbers** of the second language have always a higher number (offset), although the **message number** itself remains the same.
If, for example, the **message number. 500**
($h: Start blocked because of main Shut-Off (gate) valve)
is displayed in the English (first) language, the applying **message PAGE number is also 500.** In the second language e.g. German the message page number is 503. The message number displayed on the screen never changes, only the related message page number in the second language changes. If the contents of the protocol memory are printed out in the second language, only the message page numbers of the second language are shown on the print. Depending on the type of the message, the **message PAGE number** of the second language will be **higher** than the **message number** by the following numbers (offsets):

Message number range **500-1309**: message pages with **3** numbers offset
Message number range **1310-1349**: message pages with **1** number offset
Message number range **1350-1439**: message pages with **2** numbers offset
Message number range **1440-1515**: message pages with **5** numbers offset

Menu Control with Key Switch (C) and Key Group (D)

Display of Menu Options

Example: Display of **INPUTS-OUTPUTS**, starting from basic display on level -0-, see Menu Control Charts I and III.

The main group *INPUTS-OUTPUTS* is basically used for Testing procedures through authorized service staff and therefore locked during normal operation. Access to the *INPUTS-OUTPUTS* can be obtained in the main group *SERVICE* as described below.

Proceed as follows:

1. Press the ”QUI” key (10), the menu level -1- *TRUCKS* appears on the display, see Chart I.
2. Press key (12) three times, the main group *SERVICE* appears on display.
3. Press key (10), the menu level -2- with the starting group *Language* appears on the display.
4. Press key (12) four times, the group *INPUTS-OUTPUTS ON/OFF* appears on the display.
5. Press key (10), the menu level -3- with Menu item INPUTS-OUTPUTS Condition: 0 **(OFF)**” is displayed.
6. Press key (12), *OPERATE KEY SWITCH* appears on the display.
7. Operate key switch (C) ”Condition: 0 (OFF)” appears on the display.
8. Press key (12) to change the condition from ”0” to ”1 **(ON)**” Now access to main group *INPUTS-OUTPUTS* is possible.
9. Press the ”RET” key (9) two times for returning to the menu level -1-. The main group *SERVICE* appears on the display.
10. Press key (12), for display of the main group "INPUTS-OUTPUTS*.
    All menu levels and items within the main group INPUTS-OUTPUTS are now accessible by means of key group (D), refer to menu control charts on the following pages.

Data Transfer from Protocol and Statistics Memory to various Downloading Equipment

The illustration (Z 20731) shows typical arrangement of several downloading equipment connected to the text display interface plug socket (X27).

Legend for illust. (Z 20731)

(1)	Text display unit on instrument panel (E35)
(2)	Plug socket (serial interface X27) for connecting data transfer cable to units (4, 5, 6 or 9)
(3)	Plug socket for connecting current supply cable to units (5 or 6)
(4)	MODULAR MINING field computer system ”MMS”
(5)	Printer
(6)	Memory Card System ”MCS”. As a special equipment, this system can also be installed in the instrument panel ex works.
(7)	Memory card
(8)	Protective box for memory card
(9)	Laptop or PC
(10)	Soft- and hardware package for PROSTAT operation program
(11)	Data transfer cable (VL3)
(12)	Adapter for 25 pin interface on PC or laptop
(13)	3,5” disk PROSTAT software
(14)	Instruction manual PROSTAT (Service Bulletin No. 21-538)
(15)	Change-over switch for connecting the internal output channel to plug socket (2) or to the onboard MCS system (6) if so equipped
(E6)	Programmable Logic Controller ”PLC”
(VL4)	Data transfer cable to Memory card system (6)
(VL5)	Current supply cable to Memory Card System (6)
(VL6)	Data transfer cable to printer (5)
(VL7)	Current supply cable to printer (5)
(VL8)	Data transfer cable to field computer system (4)

REMARK

The downloading units shown in illust. (Z 20731) are special equipment.
More information to these units on request.

Level 4: Service / Settings / SWING RING GEAR LUBE SYSTEM (SLS)

- 4 - Settings (minutes) * PAUSE TIME : *
- 4 - Settings (minutes) * MONITORING TIME : *
- 4 - Settings (minutes) * PRESSURE RELIEVE TIME : *
- 4 - Settings * LUBE CYCLE COUNTER : *

Level 5: Service / Settings / SLS / PAUSE TIME

- 5 - Settings OPERATE KEY SWITCH
pause time: new pause time:

Level 5: Service / Settings / SLS / MONITORING TIME

- 5 - Settings OPERATE KEY SWITCH
monitoring time: new monitoring time:

Level 5: Service / Settings / SLS / PRESSURE RELIEVE TIME

- 5 - Settings OPERATE KEY SWITCH
pres. relieve time: new pres. relieve time:

Level 5: Service / Settings / SLS / LUBE CYCLE COUNTER

- 5 - Settings OPERATE KEY SWITCH
cycle counter value: new cycle counter value:

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS
/ Y17A VALVE WARMING-UP TIME 1/2 QMAX

-4- Output signals | OPERATE KEY SWITCH
-4- Valve warming-up time | 0 | 1 | 1/2 Qmax Y17A (A5.8):

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS
/ Y53-1 VALVE GEAR OIL COOLER 1 BACK-PRESSURE

-4- Output signals | OPERATE KEY SWITCH
-4- Valve gear oil cooler 1 back-pressure | 0 | 1 | Y53-1 (A7.1):

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS
/ Y53-2 VALVE GEAR OIL COOLER 2 BACK-PRESSURE

-4- Output signals | OPERATE KEY SWITCH
-4- Valve gear oil cooler 2 back-pressure | 0 | 1 | Y53-2 (A7.2):

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS
/ Y101 VALVE OIL COOLER BACK-PRESSURE

-4- Output signals | OPERATE KEY SWITCH
-4- Valve oil cooler back-pressure | 0 | 1 | Y101 (A7.3):

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS
/ Y124A VALVE SERVICE ARM LIFT

-4- Output signals | OPERATE KEY SWITCH
-4- Valve service arm lift | 0 | 1 | Y124A (A7.4):

Level 4: Inputs - Outputs / DIGITAL-OUTPUTS
/ Y124B VALVE SERVICE ARM LOWER

-4- Output signals | OPERATE KEY SWITCH
-4- Valve service arm lower | 0 | 1 | Y124B (A7.5):

Fault No. 872: (875)

$h: Return oil filter restricted

Help: - Replace filter elements.

Fault No. 878: (881)

$h: Leak oil filter restricted

Help: - Replace filter element.

Fault No. 884: (887)

$h: Warning: Main transformer temperature too high

Help: Main transformer temperature too high.
- Switch off unnecessary consumers.
- Check ventilation system.
- Check trip relay 1A1.

Fault No. 890: (893)

$h: Fan drive oil filter oil cooler 1 restricted

Help: - Replace filter element.

Fault No. 896: (899)

$h: Faulty monitoring channel for motor 1 current

Help: The motor current is beyond the permissible limits.
- Check monitoring channel.

Fault No. 902: (905)

$h: Faulty monitoring channel for motor 2 current

Help: The motor current is beyond the permissible limits.
- Check monitoring channel.

Fault No. 908: (911)

$h: Batteries are not being charged

Help: - Check charging circuit for broken cables.
- Switch off unnecessary consumers.

Fault No. 914: (917)

$h:

Help:

GROUP 4
Information Message Texts of message pages No. 1320 - 1535 will not be stored

Information No. 1320: (1321)	# Hydraulic oil not at operating temp. ! Operate with reduced power !
Information No. 1322: (1323)	# Swing gear house brake ON
Information No. 1324: (1325)	? Motor 2 start h: (This message will be stored).
Information No. 1326: (1327)	? Motor 2 stop h: (This message will be stored).
Information No. 1328: (1329)	# Wait! Start of motor 1 blocked during one minute after start of motor 2
Information No. 1330: (1331)	# Wait! Start of motor 2 blocked during one minute after start of motor 1.
Information No. 1332: (1333)	# Evaluation switched off.
Information No. 1334: (1335)	? Motor 1 start h: (This message will be stored).
Information No. 1336: (1337)	? Motor 1 stop h: (This message will be stored).
Information No. 1338: (1339)	# SERVICE: Central lube system
Information No. 1340: (1341)	#
Information No. 1342: (1343)	# SERVICE: Swing ring gear lube system

3.7.1 COMPONENTS OF THE MEDIUM VOLTAGE SWITCH CABINET

⚠ WARNING

- **Access to the medium voltage area for authorized service staff only.**
- **The local safety regulations must be observed.**

Legend for illustration Z 22656

(1 Switch board "X2". For details refer to page 183.

(2) Monitor and control panel. For details refer to page 189.

(3) Switch board medium tension. For details refer to page 191.

(1U1) Inverted rectifier. The inverted rectifier is protected by one 1.6A fuse at the (+) terminal and one 10A circuit breaker at the terminal no. (11). The controls and monitors of the inverted rectifier are located on the panel (2). See page 189 for details. For more information of the inverted rectifier refer to the separate Manual "Inverter 1500VA 24V/230V 50Hz" filed in volume 2 binder.

(1U2) Battery charger for main batteries. The battery charger is switched ON and OFF with the switch on the front panel of the battery charger. For operating instructions refer to the separate Users Manual "MASTERVOLT" battery charger filed in volume 2 binder.

(1U3) Battery charger for emergency lighting system. The battery charger is switched ON and OFF with the switch on the front panel of the battery charger. For operating instructions refer to the separate Users Manual "MASTERVOLT" battery charger filed in volume 2 binder.

(E32) Electronic control module (ECM) of the pump control system MC7.

(M3) Signal horn compressor with signal horn

(7S2) Light switch

(7H1) Cab base lighting

Electronic Pump Control Module (E32)

The data link adapter for connecting an electronic tool to the control module (5) is located in the Operator’s cab on the Operator’s console.

3.7.4 SWITCH BOARD - MEDIUM VOLTAGE

Legend for illustration Z 22656B

(3)	Switch board - medium voltage
0F7	Power switch for current measuring
1Q2	Power switch for phase sequence monitoring
2Q1	Power switch for air conditioning compressor of the high voltage switch cabinet
2Q2	Power switch for air conditioning compressor of the medium voltage switch cabinet (cab base)
2Q3	Power switch for air conditioning compressor of the operator’s cab
5Q5	Power switch for service crane
5Q6	Power switch for service crane winch
5Q7	Power switch for cable drum drive
1Q1	Power switch for medium voltage feeding
0F4.1	Motor protection relay for main drive motor 1. Refer to the separate instruction manual "Motor Protection Relay SPAM 150C" filed in volume 2 binder for operating and setting instructions.
0F4.2	Motor protection relay for main drive motor 2.
6V1	LED monitoring unit, LED number: 1 - Main transformer temperature too high 2 - Wrong direction of rotation 3 - Overcurrent motor 1 4 - Overcurrent motor 2 5 - Reserve 6 - Reserve 7 - Motor 1 winding temperature too high, trip 8 - Motor 2 winding temperature too high, trip
6V2	LED monitoring unit, LED number: 1 - Restart lock after voltage failure motor 1 (9)* 2 - Restart lock after voltage failure motor 2 (10)* 3 - Temperature in medium voltage switch cabinet too high (11)* 4 - Temperature in high voltage switch cabinet too high (12)* 5 - Motor 1 bearing temperature too high, trip (13)* 6 - Motor 2 bearing temperature too high, trip (14)* 7 - SF6 monitoring (15)* 8 - Reserve

- * Numbering of LED’s in the electrical diagram

NOTICE
Be sure to switch off the power switches prior to work on connected systems.

Automatic Motor Shut-Down System (Safety Chain)

The motor cannot be started or, if running, will be stopped automatically when a serious failure condition occurs. The operator will be informed about the failure by a corresponding message displayed on the ECS screen (A), illust. (Z 22673).

HELP information for displayed Fault Messages can be called up by pressing key (3) of keyboard (B)

Warning Buzzer (30)

The warning buzzer (30) will sound continuously when the hydraulic oil level is too low. In this case, stop the motor, locate and correct the cause immediately. Fill up hydraulic oil to the correct level.

Emergency By-pass switch for the ECS- Shut-down Function.

The unit is equipped with an Emergency By-pass Switch for the ECS-system.

This switch is located on the ”X2” switch board in the cab base compartment and marked with ”S27”. The exact location of the switch is shown on page 183.

If an automatic shut-down of the shovel happens, with a dangerous situation for man or machine, which needs the shovel to be operable to overcome the dangerous situation, actuate this switch to override the shut-down function of the system and to enable a restart of the main drive motors.

⚠ CAUTION

As soon as the immediate situation of danger is over, shut down the unit. Correct the fault that caused the shut down and re-set the Emergency By-pass switch.

Hydraulic oil warm-up

- On machines without hydraulic oil pre-heating system:
  DO NOT start the engines if the ambient temperature (oil temperature) is below the starting temperature shown in column "1" of the hydraulic oil viscosity chart on next.

- 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.

Releasing the Parking Brake

Move up toggle switch (4) to position **"0"**. In this position the switch is automatically pulled down by spring force.

NOTICE
Be sure to release the parking brake before slewing the superstructure.

⚠ CAUTION

If in case of emergency, the parking brake has been used for stopping the turning movement of the superstructure it is necessary to shutdown the Shovel and to have the parking brake inspected, because such use of the brake can damage the internal parts of the brake. Contact your Komatsu dealer for inspection and repair of the parking brake.

Hydraulic Swing Brake actuated by hydraulic access Ladder and Service Arm of Central Refilling System

The hydraulic swing brake will be applied automatically when the access ladder and/or the service arm of the central refilling system is not in its completely lifted position.

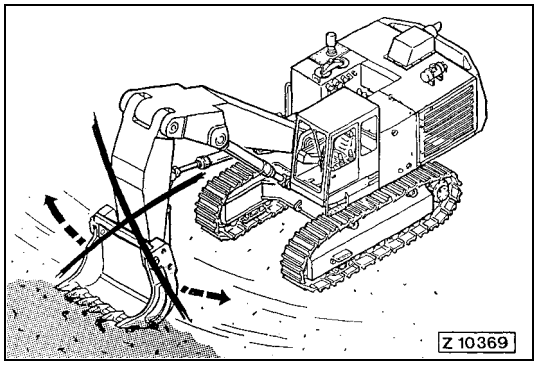
Important Instructions for Slewing the Superstructure

⚠ WARNING

- **DO NOT swing over persons or over the unprotected cab of a truck.**
- **DO NOT level the ground in front of the Shovel by turning superstructure back and forth.**
- **DO NOT jump off the rotating superstructure.**
- **Never swing against the wall of a pit. First raise the attachment out of the pit and then start rotating the superstructure.**
- **Start digging only after finishing the slewing operation.**

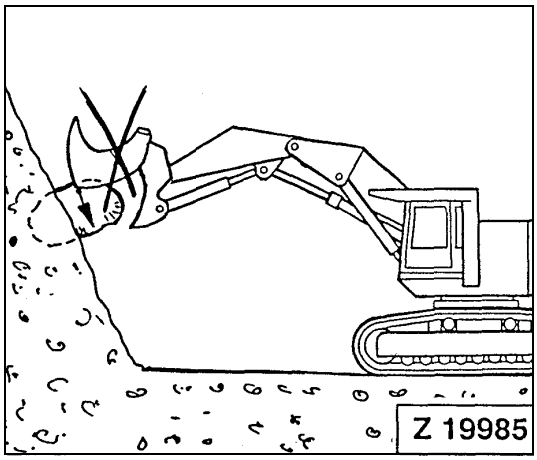
⚠ CAUTION

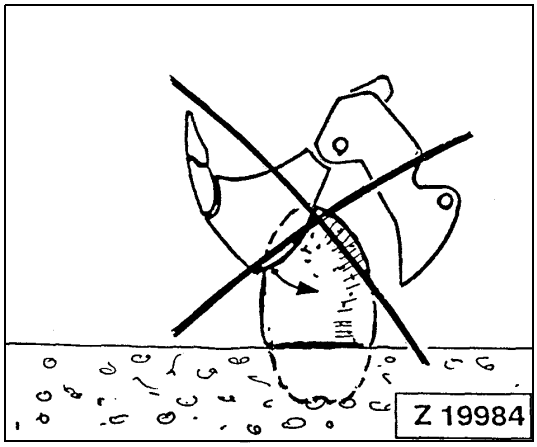
DO NOT "Sweep" with the loader attachment, illust. (Z 10369), as this may result in severe damage on swing gear components.



⚠ CAUTION

DO NOT use the bucket clam for loosening or removing anchored rocks or other solid objects (illust. Z 19984 and Z 19985), since such operations may result in severe damage to the clam pivot bearings.





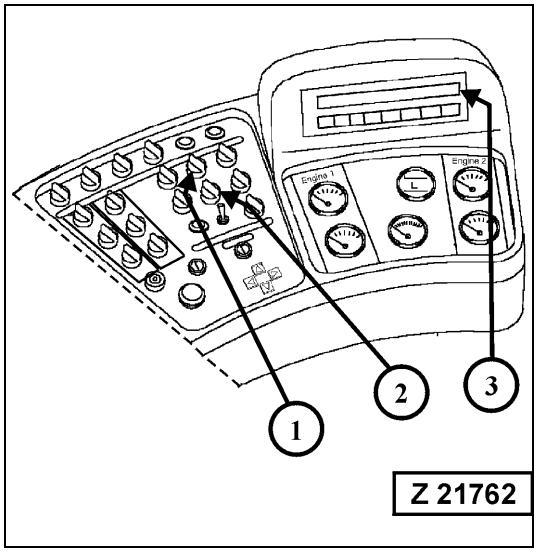
SWING CIRCLE LUBRICATION SYSTEM ”SLS”

Repairs on the swing circle lubrication system with the motor running or with the motor OFF and Main Switch Key in ON position

If repairs under the above conditions have been carried out it is necessary to reset the control circuit of the lubrication system by actuating the rotary switch (2), illust. (Z 21762) for a full lube cycle.

If this manually actuated lube cycle is not being carried out, the fault message ”LUBE SYSTEM FAILURE” will remain on the ECS display (3).

Resetting of the lube system control circuit can also be done by shutting down the motor and switching OFF the main switch key.



NOTICE
For more information regarding inspection, trouble shooting and maintenance of the lubrication system, refer to the separate manual LUBRICATION SYSTEMS in volume 2 binder.

ADJUSTMENTS OF THE SWING CIRCLE-LUBRICATION SYSTEM

The following adjustments can be made in the service menu of the ECS system:

Level 4: Service Menu / Settings

- *PAUSE TIME
- *MONITORING TIME
- *PRESSURE RELIEF TIME
- *LUBE CYCLE COUNTER

Refer to section "ELECTRONIC MONITORING AND CONTROL SYSTEM ECS" for description of adjustment procedure.

Refilling Procedure:

Water tank in the Operator's cab

NOTICE
If freezing temperatures are expected, drain the water from the water tank filling line by opening the drain cock(5), illust. (Z 22662). If so equipped, switch on the motor-independent auxiliary cab heater during standstill periods to prevent freezing of the water in the cab water tank.

⚠ WARNING

- **DO NOT drink the water from the water-tap in the Operator's cab.**
- **Use for hand washing only.**

REMARK

The overflow line of the hand wash sink and water tank must not be obstructed. The overflow line is routed inside the cab base through a hole in the base floor to the outside. Excess water will flow through this line to the outside just below the cab base.

Refer to Maintenance section 4, for the correct lubricant specifications and filling capacities.
For motor Lubricants refer to the separate motor Operation & Maintenance Manual filed in Volume 2 Binder.

- Connect supply lines to the respective adapters.
- Monitor the respective fluid/lubricant level at the indicator lights (7, 8 and 9).
- After finishing the refilling operation, cover the adapters with the protection caps provided.

⚠ CAUTION

Recheck fluid levels before operating the machine.

3.21.1 OPERATING THE SERVICE CRANE

⚠ WARNING

- **Before operating the crane, check condition and fastening of the crane structure and base.**
- **Read the separate Instruction Manual "CRANE TYPE HMK 60 Ta1" before operating the Crane. The Crane Instruction Manual is filed in volume 2 Binder.**

⚠ CAUTION

DO NOT exceed maximum payload of 1000 kg.
DO NOT lift the hook block to the stop.
Carry out inspection and maintenance according to the separate Manuals.
Check security and tightening torque of all mounting bolts after the first 100 operating hours and thereafter every 1000 operating hours. Refer to the maintenance section 4 for the tightening torque specifications.

Roof mounted Service Crane, illustration Z 22661

1	Control panel
2	Electric – hydraulic power unit
3	Rotating boom
4	Lift boom
5	Hydraulic rope winch
6	Lift boom extensions
7	Load hook
8	Support for lift boom (4) in rest position
9	Securing eye for load hook (7) in rest position
10	Emergency stop switch for all hydraulic operations of the crane
11	Warning light, if this light comes on the crane has reached 90% of its maximum permissible lifting capacity. This light is used as a pre-warning to indicate a possible overload condition.
12	Push button with indicator light. This button is used to override an automatic cut-off of the hydraulic winch. If a minimum of three windings of rope are left on the winch drum, the winch rope cut-off device automatically stops the winch. To reactivate the winch push in the light button while simultaneously rewinding the winch rope.
13	Control lever for lift boom extensions EXTEND - RETRACT
14	Control lever for lift boom RAISE - LOWER
15	Control lever for rotating boom SLEW LEFT - SLEW RIGHT
16	Control lever for winch rope UP - DOWN

3.26.3 FINAL DRIVES AND SWING GEAR

Noisy operation	● Incorrect lubricant or oil level too low ● Bearings scored or damaged. ● Sun gear teeth excessively worn or damaged ● Bearings of planetary pinions worn

3.26.4 CRAWLER TRACKS

Excessive track wear	● Wrong track tension due to improper pressure adjustment of the hydraulic track tensioning system ● Track roller loose or out of alignment ● Track links stuck ● Worn drive sprocket
Excessive wear on drive sprocket	● Wrong track tension ● Track links (pins/bores) Excessively worn ● Sprocket, rollers and guide wheel out of aligment

4.5 STANDARD TORQUE LIST

Bolt dia.	Wrench size [mm]	Tightening torque		
		Nm		
		lbs.ft.		
		Quality grades		
		8.8	10.9	12.9
M 10	17	43	63	73
		32	47	54
M 12	19	74	108	127
		54.6	80	94
M 14	22	118	173	202
		87	128	149
M 16	24	179	265	310
		132	196	229
M 18	27	255	360	425
		188	265	313
M20	30	360	510	600
		265	376	443
M 22	32	485	690	810
		358	509	597
M 24	36	620	880	1030
		457	649	760
M 27	41	920	1310	1530
		679	966	1128
M 30	46	1250	1770	2080
		922	1305	1534
M 33	50	1690	2400	2800
		1246	1770	2065
M 36	55	2170	3100	3600
		1600	2286	2655
M 39	60	2800	4000	4700
		2065	2950	3466

Insert all bolts lubricated with MPG, KP2K

4.7.1 SWING CIRCLE TOOTHING LUBRICATION

See illustration Z 20850

All teeth of the ring gear (3) must be completely covered with grease.

If teeth are not completely covered with grease, they have to be lubricated immediately with special adhesive spray grease, illust. (Z 0148) or spread type adhesive grease as specified in the Parts Catalog. The spread type grease can be applied, for example, with a brush.

Observe the instructions on the grease container for correct use of the lubricant.

NOTICE

- **If the machine is equipped with gear ring guard (6), remove covers (7) for swing circle teeth inspection.**
- **If the automatic lubrication system of the swing circle-teeth, is out of function for more than one shift, lubricate manually (using spray grease) and remove the lube pinion (5), to prevent serious damages.**
- **In order to ensure proper adherence of the lubricant, clean and dry the ring gear prior lubrication.**
  In most cases it is sufficient to rotate the superstructure several times for removing moisture from the gear teeth.
- **Make sure that the multi-purpose grease of the swing circle bearing does not come in contact with the teeth of the swing circle because this will diminish lubrication capability of the swing circle teeth lubricant.**
  If necessary remove excessive multi-purpose grease from the swing circle above the dust seal ring.

WORKING ATTACHMENT - CHECK GREASE INJECTORS FOR PROPER OPERATION

NOTICE
There are two types of grease injectors installed “SL1” and “SL11” injectors, see illust. (Z 19721).

Legend for illustration Z 19721

A	Injectors on 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)	Distributor ledge, stick
(6)	Boom
(7)	Distributor ledge, boom

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 paragraph "CORRECTIVE ACTIONS" in this section and to the separate manual "Lubrication Systems" in part 3 of this binder for corrective action.

Carry out same checks on the injectors for slewing connection.

4.9.2 TRAVEL GEARS, BRAKE HOUSINGS AND MOTOR ADAPTER HOUSINGS - CHECK OIL LEVELS

- Planetary Gear Box
- Support Bearing Box
- Spur Gear Box
- Brake Housings (two on each gear)
- Motor Adapter Housings (two on each gear)

Legend for illustration Z 20316

Planetary gear box, View -A-:

(1) Oil level marking on crawler carrier

(2) Oil levelplug

(3) Oil filler plug

(4) Drain plug

Support bearing box, View -A-:

(5) Oil level plug

(6) Oil filler plug

(7) Oil drain plug

Spur gear box, View -B- and -C-:

(8) Oil level plug

(9) Oil filler plug

(10) Oil drain plug

(11) Connector for breather filter line, the breather filter is located inside the center frame, see illustration Z21771 on page 305.

Brake housing, View -C-:

(12) Oil level plug

(13) Oil filler plug

(14) Oil drain plug

Motor adapter housing, View -C-:

(15) Oil level plug

(16) Connector for breather filter line, the breather filter is located inside the center frame, see illustration Z21771 on page 305. The port of connector (16) is also used as oil filler opening.

(17) Oil drain plug

4.9.4 HYDRAULIC ACCESS LADDER - CHECK SAFETY SENSOR

Legend for illustration Z 21532

(A) Access ladder in lowered position

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

(C) Stop bar

(D) Manual actuator for fire suppression system

(S84) Ladder control switch at the radiator door
Switch positions:
0 - OFF
1 - Lifting the Ladder
2 - Lowering the Ladder

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

(S91) Monitor and control sensor
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.

(S33a) Emergency shutdown switch for main drive motors

Check Safety Sensor (S22) as follows:

With the ladder completely lowered (position A) start the motor.
Hold an iron part (screw driver) in front of sensor (S22).
The ladder must not start to move.
If the ladder starts to move, immediately remove the iron part from the sensor.

⚠ WARNING

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

4.10.7 AIR CONDITIONING FOR OPERATOR'S CAB AND SWITCH CABINETS

Air conditioning for Operator's Cab

Legend for illustration Z 22669

(1) Refrigerant compressor Type 4FC-5.2Y. Carry out maintenance according to the separate Operating Instructions "KB-100-1" filed in volume 2 binder.

(2) Air conditioner unit

(3) Sight glass for checking refrigerant filling

(4) Shut-off valve on dryer cartridge

(5) Dryer cartridge

(6) Refrigerant collector reservoir

(7) Condenser

(8) Condenser blower

(9) Low pressure switch

(10) High pressure switch

(11) Expansion valves

(12) Evaporator blower

(13) Evaporator

(14) Cool air outlets

- Checking the refrigerant level:

Switch on air conditioning equipment and run at maximum capacity for approx. 5 minutes. Observe inspection glass (3). 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 mats of condenser (7) and evaporator (13).

⚠ CAUTION

Servicing of the air conditioning systems is restricted to workshops especially equipped for this purpose. Refer to the separate manual "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 of Operator's cab, illust. Z 22663

- Check tightening torque of mounting bolts as indicated in the illustration.
- Check condition and fastening of chains (1).
- Check the silicone oil filled viscous mounts (2) for leakage and signs of fatigue.

High-Strength Bolt Connections (continued)

Check fastening and condition of the eight power house posts (75) and transverse carrier (82), illust. Z 20706

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(85)	M30	10.9	46	1770	48
(86)	M24	10.9	36	880	12

* SW = Wrench size

High-Strength Bolt Connections (continued)

Check fastening and condition of control valve carrier, main control valves (I, II and III) and swing control valve (5), illust. Z 21777

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
(1)	M24	10.9	36	880	4
(2)	M20	10.9	30	510	3
(3)	M20	10.9	30	510	9
(4)	M16	10.9	24	265	3
(5) Swing control valve					

* SW = Wrench size

High-Strength Bolt Connections (continued)

Shovels with Electric Prime Mover

Check condition and fastening of slip ring unit (01), illust. Z 20616

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty.
((04)	M16	10.9	24	265	4
(05)	M16	8.8	24	180	4
(07)	M16	8.8	24	180	4

High-Strength Bolt Connections (continued)

Roof mounted service crane (special equipment) Check condition and fastening of crane base and crane

Legend for illustration Z 22635

(1) Crane base

(2) Slew crane

(3) Outrigger

(4) Electric chain hoist or hydraulic rope winch

(5) Safety hook

(6) Electric - hydraulic power unit

Check the following mounting bolts for correct tightening torque

Reference No.:	Bolt size mm	Grade	SW * mm	Tightening torque Nm	Qty. both power units
(7)	M24	10.9	36	880	8
(8)	M20	10.9	30	510	10
(9)	M20	10.9	30	510	2
(10)	M12	8.8	19	74	4

* SW = Wrench size

- Re-tighten loose mounting bolts and replace missing bolts.
- Replace self locking nuts which have lost their clamping torque.

REMARK

For more information concerning crane maintenance refer to the separate Instruction Manual "MKG Crane HMK 60 Ta1" filed in volume 2 binder.

FILTER SERVICE

High Pressure Filters "HPF", illustration Z 21780

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

5. Remove element (10) and clean. Take care not to contaminate the "Clean" inside of the element when flushing.

6. Inspect O-rings (12 and 14) and back-up ring (13). Replace if necessary.

7. Install drain plug (7) with new packing ring (11). Fill filter case (8) half way up with clean hydraulic oil and re-assemble the filter. Make sure element (10) is properly seated in the filter head.

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

⚠ CAUTION

In case filter element (10) is soiled by metal chips, examine hydraulic pump for damages. Install new element (10).

NOTICE
If after cleaning of the filter element, the message "High pressure filter restricted" is displayed again, replace the filter element.
Replace elements (10) after three cleanings or after every 5000 operating hours, whichever occurs first.
After pump repairs all high pressure filter elements must be replaced.

4.12.5 HYDRAULIC TRACK TENSIONING SYSTEM - CHECK PRESSURE ACCUMULATORS

⚠ WARNING

Before working on any part of the hydraulic track tensioning system relieve all pressure in the system by opening pressure relief cock (5), illustration Z 20371.

NOTICE
For checking the charging pressure a special testing and filling device must be used. This device can be ordered from your Komatsu Dealer.
The testing and filling procedure of the pressure accumulators has to be carried out in accordance with Service Bulletin No. 21-426.

Legend for illust. Z 20371:

(1)	Rotary distributor
(2)	Supply line, pilot pressure from travel brake release circuit
(3)	Return oil line (leakage oil)
(4)	Valve block
(5)	Pressure relief cock for hydraulic track tensioning system.
	“C” - Closed (Normal working position)
	“O” - Open
(6)	Shut-off cock in supply line
	“O” - Open (Normal working position)
	“C” - Closed
(7)	Two stage pilot pressure operated relief valve
(8A)	Pressure accumulator, high pressure (150 bar)
(8B)	Pressure accumulator, low pressure (31 bar)
(9)	Shutoff cocks, RH & LH
	“O” - Open (Normal working position)
	“C” - Closed
(10)	Track adjusting cylinders, inner
(11)	Track adjusting cylinders, outer
(12)	Test connectors and vent valves

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

Legend for illust. Z 21787

(6) Hand wheel of main shut off valve between main oil reservoir and suction oil reservoir

- To open the valve, turn hand wheel (6) CCW to the stop
- To close the valve, turn hand wheel (6) CW to the stop

NOTICE
Before starting the motors, make sure the shut off valve is completely open by turning the hand wheel (6) fully to the left (CCW).

(11) Compensator

(12) Intermediate pipe

(13) Gaskets

(14) Suction oil strainer

(15) Suction oil reservoir

(16) Drain coupling

Attach drain hose (part of tool set) to coupling (16) and drain oil from suction oil reservoir. Remove intermediate pipe (12) and strainer (14). Install new strainer (14) with new gaskets (13).

REMARK
There are six further strainers installed in the suction oil reservoir (15). Refer to page 413 for replacement instructions.

4.14.1 SWING GEARS AND MOTOR ADAPTER HOUSING - CHANGE OIL

Legend for illustration Z 22510

Swing gears

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

(1) Oil level gauge

(2) Oil filler plug

(3) Breather filter

(10) Drain plugs or evacuation nozzles 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

Swing Gears, change oil:

1. Use adequate working platform for draining the oil. Place receptacles of sufficient capacity (approx. 150 liter) below drain couplings (10). Attach drain hose (part of tool set) to drain coupling (10). Remove parts (1, 2 and 3) to speed up draining. On swing gears with evacuation nozzle (10), use the Wiggins system for changing the oil.

2. Clean breather filter (3) with compressed air from inside to outside and re-install.

3. After the oil is completely drained, flush the gear with the regular gear oil.

4. Remove drain hose from coupling (10) and attach the protection cap onto the drain coupling.

5. Fill gear housing through filler opening (2) up to the "MAX" mark on level gauge (1) with fresh oil and re-install plug (2).

NOTICE
For checking the oil level insert the level gauge (1) but DO NOT screw in, see detail (A).

6. After short operating period check oil level and housings for leaks.

4.14.3 PTO (PUMP DISTRIBUTOR GEAR) - CHANGE OIL

Legend for illustration Z 20696

(1) Oil level gauge

(2) Oil filler plug

(3) Breather filter

(4) Oil drain plug

(7) Oil collector reservoir for adapter housings of hydraulic pumps for fan drives of radiator and hydraulic oil coolers

(8) Breather filter with oil level gauge

(9) Adapter housings for main hydraulic pumps

(10) Oil level plug

(11) Oil filler plug with breather pipe

(12) Oil drain plug

Gear Oil Viscosity

Select gear oil viscosity grade according to ambient temperatures.
If the new gear oil has a different viscosity grade compared with the drained oil it is necessary to enter the new viscosity grade into the appropriate **"Shovel Components"** group.

Refer to page 76 for the INPUT procedure of the oil viscosity.

NOTICE
Before opening the access covers from below the pump distributor gears provide an adequate working platform with sufficient space for the oil collecting container (approx. 200 liters for both gears).