With this **SERVICE MANUAL** KOMATSU provides you with the description of the construction and the function of the major systems of the Hydraulic Excavator **PC8000**.

We describe for you all functions and how to carry out the inspections and adjustments.

How do you find "your" desired information?

In the table of CONTENT all the functions and components are shown in their sequence of the description.

If after reading this **SERVICE MANUAL** you can give us suggestions and comments for improvements - please do not hesitate to contact us.

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The editorial staff will be pleased about your co-operation.

- FROM THE PRACTICE - FOR THE PRACTICE -

- **This service manual corresponds to the state of development of the machine at the time the manual was produced.**
  Variations based on special customers request and special equipment are not included in this manual

In this part we describe all functions; testing and adjustment procedures.
Of course for better understanding of the systems the hydraulic and electric circuit diagram is very helpful and a must for fault finding.
Whenever it is possible for the description the circuit diagram numbers / codes are used.
One who is not able to understand the circuit diagram or is not so familiar with the used symbols should study the hints for the circuit diagrams chapter 10 and 11.

Following abbreviations are used:

PDG	=	**P**ump-**D**istributor-**G**ear
LBA	=	**L**oader-**B**ucket-**A**ttachment
BHA	=	**B**ack-**H**oe-**A**ttachment
MRV	=	**M**ain-**R**elief **V**alve (Primary valve)
SRV	=	**S**ervice-line-**R**elief **V**alve (Secondary valve)
ACV	=	**A**nti-**C**avitation **V**alve
EPM	=	**E**lectronic-**P**ower **M**odule
ESR	=	**E**lectronic-**S**ignal **R**ectifier
ELL	=	**E**lectronic-**L**oad **L**imiter
EFM	=	**E**lectronic-**F**uel **M**easurement
DRE	=	**D**ruck-**R**eduzierventil-**E**lektrisch (Pressure Reducing Valve Electrical)
EGR	=	**E**lektronische-**G**renzlast-**R**egelung (Electronic Load Limit Regulation)
EBL	=	**E**lectronic **B**ucket **L**evelling
ETM	=	**E**lectronic **T**ext and **M**onitoring System
CLS	=	**C**entral **L**ubrication **S**ystem
CLS	=	**C**entral **L**ubrication **S**ystem
STC	=	**S**lew ring **T**eeth **C**entr. Lubrication System

- **All adjustments and pressure settings for the hydraulic circuits must be carried out at normal operating temperature!**

- **For service intervals, oil levels and filling capacities see the "Service Literature", because this literature is always made for the specific machine !**

Control Blocks, Slew Gears

Legend for illust. Z 21264

(1) Main control blocks
(2) High pressure filter
(3) Distributor manifold
(4) Slew gears

Electric Motor Mounting

Legend for illust. Z 21268

(1) Cooling air intake
(2) Cooling air exhaust
(3) Electric motor
(4) Alignment shims
(5) Alignment supports
(6) Motor frame
(7) Coupling
(8) PTO

The motor is solid bolted to the motor frame (6).
The alignment shims (4) thickness must be determined due the alignment procedure. The alignment must be done in accordance with the Service Bulletin 21-282, last edition.

- **The alignment shims thickness must be also determined when replacing the electric motor.! Never use the existing shims without determination.**

Cont'd:

Illust. Z 21272

Measuring / setting the pressure relief valve
(Same procedure for both drive motors).

1. Connect pressure gauge to check point (M8.1 / M8.2).
2. Start engine and run with max. RPM.
3. Read pressure, required 7.5± 0.5 bar, **below normal operating temperature.**

- **If the pressure of 7.5 bar cannot be adj. 100 %, adj. to the lowest possible pressure.**
  At normal operating temperature the pressure will be less than 7.5 bar, approx. between 5 and 7 bar

How to alter the setting:

a. Remove dust cap (1a).
b. Loosen lock nut (1b).
c. Alter the pressure setting with set screw (1c).
d. Secure adjustment with the lock nut and re-fit dust cap.

4. Stop the drive motor and remove gauge.

Legend:

(1) Pilot operated relief valve
(2) Plug screw
(3) Valve piston
(4) Port for pressure switch B89
(-) --------
(6) Port for pressure check stud
(7) Jet bore 1.8 mm
(8) Valve spring
(9) Seal rings
(A) Pressure port
(T) Return from valve

Location of Sensors and Switches, illustr. Z 21276

Function resp. designation	Circuit diagram code	Remarks
Safety switch for transfer pump oil level switch	8B68	
Safety switch for preheating(oil level switch)	2B3	Min. contact
Min. allowable hydr. oil level	8B4	Shut down system
Max. allowable hydr. oil temp	8B15	
Restricted breather filter on hydraulic tank	8B24	
Restricted case drain filter	8B25	
Restricted return oil filter	8B26	
Max. oil level for central refilling unit (WIGGINGS)	8B42	Max. contact part of 2B3
Temperature transmitter for hydr. oil temperature	8B75	Dashboard gauge
Thermo switch for heating element of main oil tank	2B4	
Heating elements main oil tank	2R1 - R6	
and their thermo switches	2B5 - B10	Heater elem. part
Safety switch at the shut-off valve of main oil tank	8S31	Shut down system
Heating elements, suction tank	2R7 - 2R9	
Thermo switch for heating elements of suction tank	2B11	

- **The items with the prefix 2 are options**

General

Task:

The hydraulic oil cooling system maintains the hydraulic oil at a normal operating temperature.

Legend for illust. Z 21281

(1) Fan motor (Axial piston motor)
(2) Fan
(3) Cooler (Radiator)
(4) Noise shield
(5) Bearing group
(6) Fan drive assy.
(7) Bearings
(8) Drive shaft
(9) Grease nippel or grease line connector
(10) Bearing group carrier

Design:

There are four* hydraulic oil coolers in front of the hydraulic tank on the L.H. side of the platform.

They are in pairs mounted in one frame, one above the other. The for the cooling needed air stream is produced by hydraulic driven fans. The air flows from **inside** to **outside** through the coolers.

For a better cleaning, the noise shield and the coolers can be moved to the side. ("Swing out cooler")

The bearing groups are manually lubricated via the grease lines

- **On request are MESABI cooler available**
- **Maintenance see section 6.3 of Maintenance Manual**

continued

Cont'd:

Legend for illust.. Z 21285 for the valve combination:

(1)	Valve housing	(9)	"X" port
(2)	Valve cartridge	(10)	Spring chamber
(3)	Main piston	(11)	Control line
(4)	Jet bore	(12)	Solenoid valve spool
(5)	Jet bore	(13)	Port PS
(6)	Pilot poppet	(14)	Port B
(7)	Spring	(A)	Pressure port
(8)	Solenoid valve	(B)	Return oil port

Function:

Pressure in line A effects the main piston (3). At the same time there is pressure via the jet bore (4) on the spring-loaded side of the main piston and via jet bore (5) at the pilot poppet (6) of the relief valve cartridge (2).

If system pressure in line A exceeds the value set at the spring (7), pilot poppet (6) opens. The signal for this comes from line A via the jet bores (4) and (5). The oil on the spring-loaded side of the main piston (3) now flows via the jet bore (5) and poppet (6) into the spring chamber (10). From here it is fed internally by means of the control line (11) to tank (port B).

Due to the state of equilibrium at the main piston (3), oil flows from line A to line B, while the set operating pressure is maintained.

The pressure relief valve can be unloaded by means of the port "X" and the function of the solenoid valve (8).

With de-energised solenoid, the spool (12) keeps the "X" connection (9/14) to port P (13) closed. The pressure relief valve operates normal.

With energised solenoid, by the spool (12) a connection is made between "X" (9/14) and port P (13).

Each system pressure opens now the main piston (3) because via the "X"-port the oil from the back side of piston (3) flows to tank. The normal valve function is eliminated.

Front Control Panel, illust. Z 21288

Solenoid valves

(8Y6.1)	Cooler fan RPM control
(8Y17.1)	„Idle time" control for pumps 1 - 4
(8Y17a.1)	½ Q-max (reduced oil flow at too cold oil)
(8Y44)	Slew foot brake pressure
(8Y61.1)	„X1.1" pressure, pumps 1 - 4
(8Y102.1)	„X4.2" pressure, pumps 1 - 4 (cancel pump support pressure during start) Eliminate pumps swing to Q -max. during start procedure
(8Y120)	Actuate hydrostatic swing brake

Pressure switches:

(8B22)	Filter element (68.1) monitoring
(8B27.1)	Filter element (69.1) monitoring
(8B28.1)	Filter element (68.2) monitoring
(8B23.1)	Filter element (68.4) monitoring
(8B85a)	X1.1 pressure monitoring
(8B86)	X 2, Pressure monitoring
(8B97.1)	„X4.1" pressure, pumps 1 - 4 (pump support pressure)
(8B17.1)	PTO gear lubrication (lowest permissible pressure)

Pressure check points:

(M1.a)	„X2" pilot pressure (50 bar)
(M1.1)	„X2" pilot pressure (35 bar)
(M2.1)	„X1.1" pressure for ½ Q-max (reduced oil flow at too cold oil)
(M3)	„X1.1" pressure with „Hydraulic Regulation" (≈ 12bar constant)
(M5.1)	„X1.1" pressure with „Electronic Regulation"
(M6.1)	Cooler fan drive operating pressure
(M8.1)	PTO gear oil lubrication
(M27.1)	Pump bearing lubrication
(M30.1)	„X4.1" pressure (pump support pressure)

Filter:

(68.1)	Pilot pressure and pump regulation
(68.2)	Cooler fan drive
(69.1)	PTO gear lubrication
(68.4)	Pump bearing lubrication

Miscellaneous:

(64.1)	„X1.1" pressure for ½ Q-max (reduced oil flow at too cold oil)
(70.1	Lube pump supply pressure, 50 bar pressure relief valve
(70.2)	„X2" pilot pressure relief valve
(71.1)	Manifold
(72.1)	Cooler fan drive relief valve with solenoid valve
(74.1)	Pres. relief valve, PTO gear lubrication
(74.2)	Pres. relief valve, pump bearing lubrication
(79.1)	Change over valve, „Electronic Regulation" / „Stop Gap Operation"
(81)	Pressure reducing valve, „X1" for „Stop Gap Operation)
(84.1+84.2)	Check valves in pilot pressure pump lines

More in detail see individual circuits

Control Block Proportional Solenoid Valves, LBA

Legend for illust. Z 21293

Control Block I resp. 14

(8Y20)	L.H. crawler forward
(8Y21)	L.H. crawler backward
(8Y22)	Stick retracting
(8Y23)	Stick extending
(8Y24)	Bucket emptying
(8Y25)	Bucket filling
(8Y26)	Boom lowering
(8Y27)	Boom lifting

Control Block III resp. 16

(8Y36)	R.H. crawler backward
(8Y37)	R.H. crawler forward
(8Y38)	Boom lowering
(8Y39)	Boom lifting
(8Y40)	Bucket emptying
(8Y41)	Bucket filling
(8Y42)	Stick retracting
(8Y43)	Stick extending

Control Block II resp. 15

(8Y28)	L.H. slewing
(8Y29)	R.H. slewing
(8Y30)	Bucket emptying
(8Y31)	Bucket filling
(8Y32)	Boom lowering
(8Y33)	Boom lifting
(8Y34)	Stick retracting
(8Y35)	Stick extending

Control Block IV resp. 17

(8Y98)	Clam closing
(8Y99)	Clam opening
(8Y100)	Boom lowering
(8Y101)	Boom lifting
(8Y102)	Stick retracting
(8Y103)	Stick extending
(8Y104)	Bucket emptying
(8Y105)	Bucket filling

Proportional Amplifier Module

Legend for illust. Z 21516 Type A
(for Slew brake only)
(LED) LED for Solenoid A or B
(P) Set Potentiometer
R1 for the lowest current value

R2 for the highest current value

The amplifier module contains the necessary electronics for the control of two proportional solenoids. Depending on the input polarity, either solenoid A or solenoid B is operated.
The solenoid current (solenoid A - solenoid B) is measured and compared with the external input value. Differences between feed-back and input values, for example caused by changes in solenoid temperature or supply voltage, are compensated.
The module also generates a direction-dependent voltage signal (solenoid A - solenoid B) as soon as the solenoid current reaches the lowest set value.
The lowest and highest values are set externally via the potentiometer R1 + R2.
The brightness of the LED's changes with the current.
This function should not be used for setting.

Cont'd:

Illust. Z 21520

11. If the setting with either positive or negative potential was successful, turn the potentiometer (P) of the **service module** into the opposite direction and check the settings with the other polarity i.e. if the first setting was done with positive potential then turn the pot into negative direction; **otherwise vice versa**.
12. Repeat the setting as described under item 7 to 10.
13. Remove multimeter, test wire, close* the terminals and reconnect the wire to terminal 5 of the amplifier module.

* How to open and close the terminal:
Push the yellow stud (1) down with a screw driver and turn it 90° to the left to open or to the right to close the terminal. A spring pushes then the stud outwards and the contacts are either open or closed.

continued

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Restrictor Block

Task:

The restrictor block is used for limiting cylinder speeds.

Legend for illust. Z 21315

(Type 132.1 - 132.4 of the hydr. circuit diagram:)

(1)	Adjustment spindle	(18)	Jet bore, 1.2 mm
(2 + 3)	O-ring with back-up ring	(19)	Flange
(4)	Flange	(20)	Allen bolt
(5 + 6)	O-ring with back-up ring	(21	Correction shim(s)
(7)	Spring	(22)	Valve housing
(8)	Spring cup	(23)	Valve spring
(9)	Valve poppet	24 + 25)	O-ring with back-up ring
(10)	Lock nut	(26)	O-ring
(11)	Housing	A + B	Line ports
(12	Snap ring)	T	Return line port
(13)	Allen bolt	M	Pressure check point
(14)	Jet bore, 1 mm	Y	Control oil drain port
(15 + 16)	O-ring with back-up ring		
(17 + 17.1)	Pressure relief valve, pilot operated		

Function:

Pre-setting of the cylinder speed (flow B to A) is achieved by means of the spindle (1). Depending on the spindle setting, the radial holes (9.1) in the valve poppet (9) will be partially opened to produce the required throttling of the oil flow.
The extra holes (fixed throttle 9.2) prevents the valve from becoming completely blocked.
For the lifting operation (flow A to B), the valve poppet (9), which is guided by the spindle (1), is pressed against the spring (7) to allow the valve to fully open.

Cont'd.:

Illust. Z 21319

The valve stem (2) gets moved regarding the present current, and simultaneously the hollow piston (3) inside the bush (6) is moved.
The return oil chamber (L) gets closed by the piston edge and a connection is made to the pilot pressure chamber (P_{ST}).
Thus the pilot pressure oil passes the feed borings (4) and flows through the piston (3) into the oil passage (11 or 15) and further into the pilot pressure oil chamber (12 or 16).
By the force of the pilot pressure onto the spring cup (13) the spool (14) gets moved.
The spring (8) moves the piston (3) into its final position and opens the return to chamber (L) whenever the solenoid is de-energized to make sure that the spool can be moved into its neutral position by means of the centering springs (17).
The solenoid bearing must be bleeded by means of the bleeder plug (18).
Turn out the plug and select a spool operation and turn the plug in after the oil comes bubble free out of the thread bore.

Directional Control Valve (Common Name„Solenoid Valve“)

Task:

Directional control vales are solenoid operated directional spool valve. They control the start, stop and direction of an oil flow.

Legend for illust. Z 21323

(1) Housing
(2) Solenoid
(3) Control spool
(4) Return spring
(5) Plunger
(6) Dust cap with stem for manual operation

Function:

When there is no flow through the valve, control spool (3) is held in neutral or output position by means of the return springs (4). The control spool (3) is operated by means of oil immersed solenoid (2).
The force of the solenoid (2) effects control spool (3) by means of the plunger (5) and pushes it from its resting position to the required end position.
This gives free flow from or P to B and A to T.
When solenoid (2) is de-energised, control spool (3) is returned to its resting position by means of return springs (4).
An optional hand emergency (6) allows movement of the control spool (3) without energising the solenoid.

Gear Pump

(External gear pumps are used for the pilot pressure circuit, pump bearing lubrication and the PTO gear box lubrication)
Either as single pumps or double pumps

Legend for illust. Z 21327

(1) Drive shaft
(2) Housing parts
(3) Dowel pins
(4) Needle bearings
(5) Gear on the drive shaft (shaft and gear is one solid part)
(6) Seal plates with seals
(7) O-ring
(8) 2nd. gear
(9) Radial seal rings

Cont'd.:

Illust. Z 21330

The cylinder is held in position by the centrepin. In pressureless condition the cylinder is pressed on to the control surface of the control lens by means of a spring.
As pressure increases hydraulic forces act additionally on the cylinder, the necessary lubricating film on the control surface and the circular plane is maintained, the leakage oil volume, however, remains small. The ball heads of the piston rods and centrepin and, via bores in the drive shaft, also the bearings are simultaneously lubricated by the leakage oil. Via the boring (12) the bearing group is additionally lubricated with hydraulic oil.

The axis of the cylinder is designed at an angle to the drive shaft axis (bent axis design). When a piston moves due to the rotation of the drive shaft from the lower to the upper dead point, a piston stroke corresponding to the swivel angle is carried out in the cylinder bore.
This causes oil to be sucked in through the suction bore and the control inlet.

On further rotation of the cylinder, the piston moves from the upper to the lower dead point and the oil drawn in is supplied through the second control inlet to the pressure side.
The flow of each pump size is depending on the drive speed and the swivel angle of the cylinder.

continued

Pump Bearing Lubrication.

The pump bearing lubrication system ensures, under any circumstances, sufficient lubrication of the main pump bearings.

Legend for illust. Z 21334

(9.1 + 9.2)	Pump
(68.4 + 68.7)	Filter
(8B23.1 + 8B23.2)	Safety switch
(74.2 + 74.4)	Pressure relief valve
(M27.1 + M27.2)	Pressure check point
(94.1-94.4 + 94.5-94.8)	Orifice, 8 mm

Function:

The pumps (9.1+9.2) deliver the oil through the filters (68.4+68.7) to port "U" of each main pump.
The 8 mm orifices (94.1-94.8) are installed to ensure that each pump gets approx. the same amount of oil. Also, the orifice acts as a damper.
The pressure relief valve maintains the adjusted pressure of 7 + 1 bar.
The filter element condition is monitored by the safety switches (8B23.1+8B23.2). At too much restricted element the fault message **„Oil filter pump lubrication 1 restricted "** (front drive motor) or message **„Oil filter pump lubrication 2 restricted "** (rear drive motor) is displayed at the operator's dash board.

Checking with Test Bolt

Illust. Z 21341

- **Before starting this work, do some arrangement to prevent loss of oil.**

1. Measure and note down the outer length "**X**" of the **Qmax. stop bolt** of the resp. pump.
2. Loosen lock nut of Qmax. stop bolt and turn out the bolt.
3. Now measure and note down the length "**Y**" of the Qmax. stop bolt.
4. Turn the bolt (1) of the test-bolt "M" that way that with fully depressed spring (2) you get length "Y".
5. Turn the test bolt "M" into the pump, and tighten slightly the lock nut (3).
6. Connect pres. gauge to check point for X1-pressure.
7. Connect the gauge to the **pres. check point,** for the pump being checked, **at the pressure transducer box**.
7. Start drive motor.
9. Adjust the pump pressure for the respective circuit to 150 bar.
10. Decrease the X1-pressure to 15 $\pm$ 0.5 bar and watch while doing it the outer pin (4) of the test bolt. The pin must move in as soon as the X1-pressure reaches 15 $\pm$ 0.5 bar.

That means: The destroking starts.

If the pin does not move at the required pressure resetting, the following is required:

11 Loosen lock nut (5) and adjust start of destroking by turning the bolt (6) either in or out.

12. After check or adjustment, replace test-bolt by Qmax. stop bolt.
Pay attention to the length "X" and "Y".
Refer to SERVICE BULLETIN 21-197 last edition, if necessary
13. Adjust MRV to the required pressure.
14. Adjust the X1-pressure as described in the corresponding chapter.

- **If an adjusting is not possible it may be caused by an not correct set damper bolt. See the page "Adjusting the damper bolt".**

Cont'd:

Illust. Z 21350

Testing the ESR input/output voltage

For a transformer function test the **AC**-Input Voltage and the **DC**-Output Voltage must be tested.

△

- **The potentiometer settings are under no circumstances allowed to be altered, because the setting is possible only with a HF-Generator and an Oscilloscope.**
- **If the potentiometer set-positions have been altered, a new Module, with sealed potentiometers, must be ordered.**

Procedure: Same procedure for both Modules

1. Disconnect the wire from terminal 23 of the ESR Module.
2. Start the motor and let it run without an extra load on it.
3. Measure the AC-Voltage between the terminals 21 and 41 and record it.
4. Measure the DC-Voltage between the terminals 23 and 11 and record it.
5. The measured DC-Voltage must be 1/2 of the AC-Voltage.

Example: $\frac{5\ V_{DC}}{10\ V_{AC}} = 0{,}5$ (1 % plus/minus is ok)

Small variations are based on amplitude variations of the AC-Input voltage while measuring the DC-Output voltage.
Greater variations denotes a faulty ESR Module.

continued

Cont'd:

Illust. Z 21355

9. Move the change over (79.2 and 79.2) "Hydraulic / Electronic" regulation into position for „Hydraulic regulation“ ⚠

10. Adjust with each **MRV** 290 bar (Procedure see chapter 8)

☞ • **Pay attention that the pressure cut-of valve setting is correct.**

11. Stall the hydraulic by extending the stick and bucket cylinder and read the motor current.

☞ • **With above load the motor current must not exceed the max. permissible current**

If the current value is too high or far below alter the pressure of the pressure reducing valve (81.2) See chapter 6 page 14.

12. Re-set **MRV,** re-plug solenoid valve Y8Y6.1 + Y8Y6.2 connection, remove gauges and put change over (79.1 and 79.2) into position „Electronic regulation“ ,⚠.

continued

Testing the Ell-Module, 8a34.1 + 8a34.2, illust. Z 21360

- **The potentiometer settings for the I-Part and the D-Part are under no circumstances allowed to be altered, because a setting is possible only by computer assistance.**
- **If the potentiometer settings for the I and D-Part have been altered, a new module with sealed potentiometers must be installed**

- **Switch OFF the power before disconnecting and/or connecting cables**

A rough function check is done to determine, if the following pre-calibration can be carried out without any problems.
Disconnect the cables at terminal (35, 42, 43) and shift the switches for the **I** and **D**-Part into **OFF** position.
Then check the Supply Voltage at the terminals (31 /+15 $_{VDC}$, 32/-15 V_{DC} and 33/+5 V_{DC}) to terminal 34 GND.
If the required voltages not present check the EPM Module. see page 24
If the required voltages present carry out following test:

Nominal value adjustment test. (**S-Potentiometer**)
Measure the **Nominal Value** at terminal (44 to 34) and try, by turning the **S-Potentiometer**, if a voltage from 2.5 up to 7.5 V_{DC} (±0.25 V_{DC}) is adjustable.
Then set with the S-potentiometer the NOMINAL value to 3.69 V_{DC}

continued

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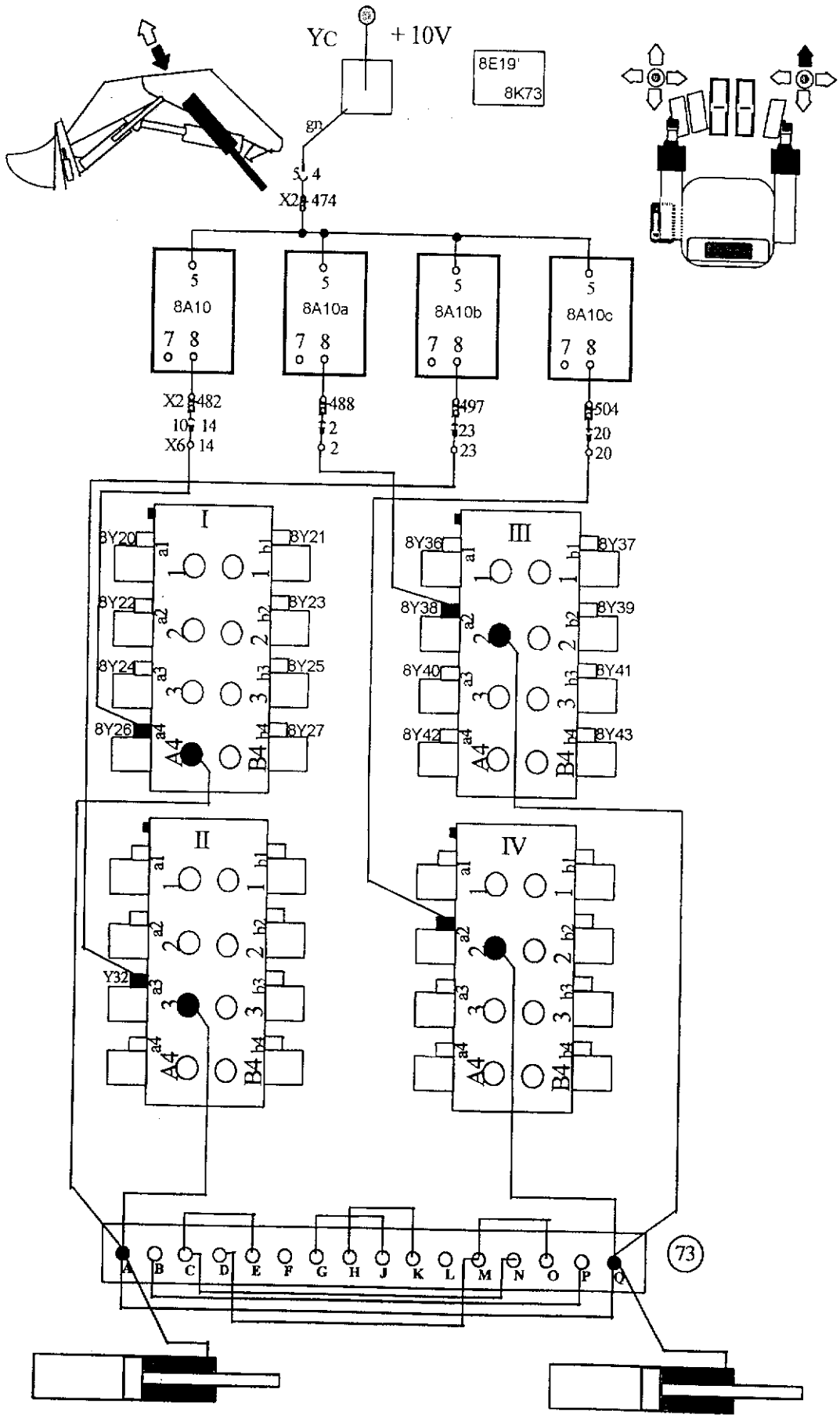
- **Never raise the Service Line Relief Valve (SRV) pressure essential or bottom out the valve. It causes components and/or structural damage.**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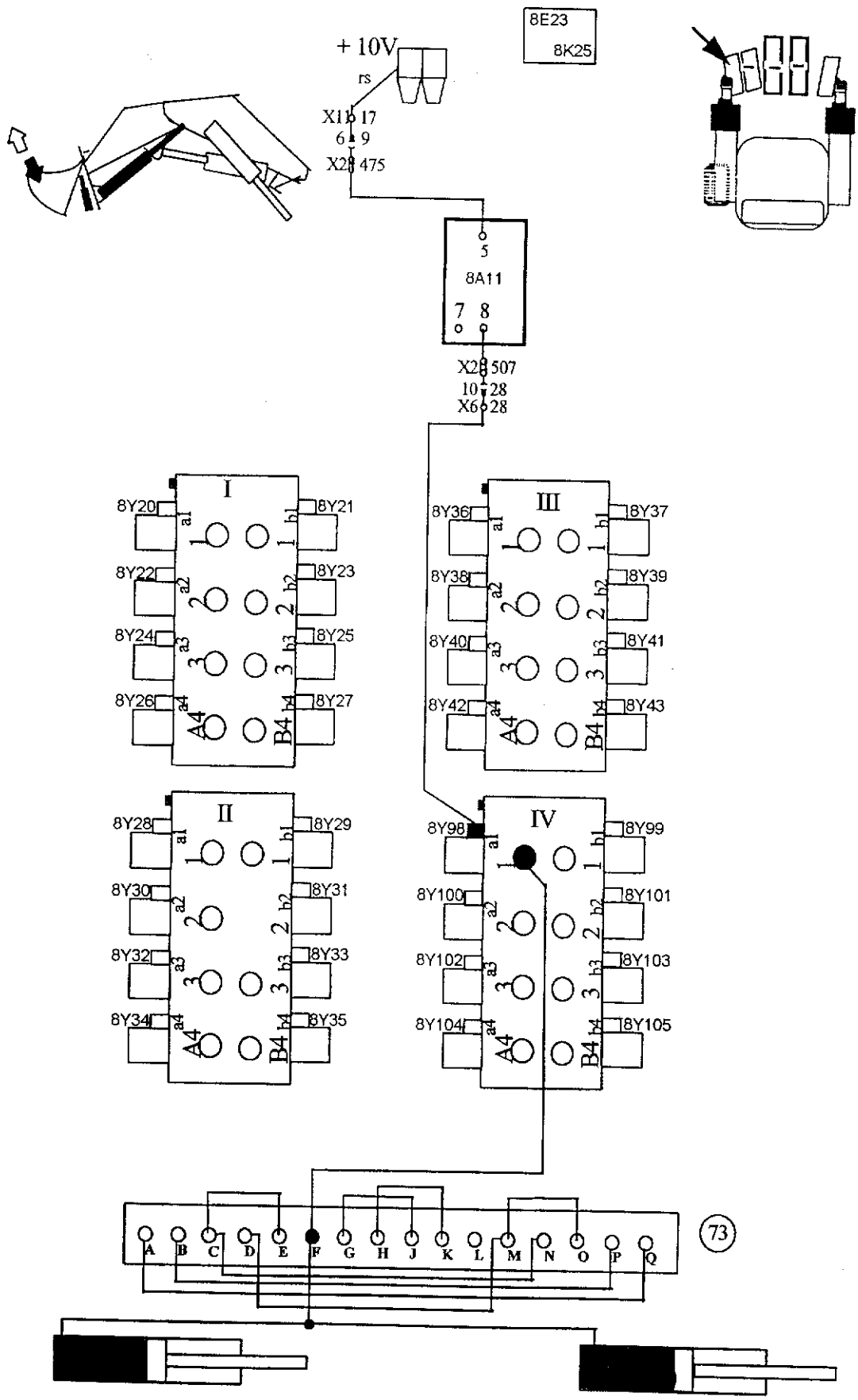
8E23
8K25
+ 10V
rs
X1 17
6 9
X2 475
5
8A11
7 8
X2 507
10 28
X6 28
I
II
III
IV
8Y20
8Y21
8Y22
8Y23
8Y24
8Y25
8Y26
8Y27
8Y28
8Y29
8Y30
8Y31
8Y32
8Y33
8Y34
8Y35
8Y36
8Y37
8Y38
8Y39
8Y40
8Y41
8Y42
8Y43
8Y98
8Y99
8Y100
8Y101
8Y102
8Y103
8Y104
8Y105
A4
B4
A B C D E F G H J K L M N O P Q
73

Cont'd.

Service Line Relief Valves, Bucket Cylinder LBA., illust. Z 21368

Bucket "Filling":

Valve	Pres. check point	Location
131.1	M17	Manifold (73) section C
131.2	M18	Manifold (73) section E
131.8	M22.2	Manifold (73) section N
131.9	M22.1	Manifold (73) section N
MRV	High pressure filter	One in each control block

Bucket "Emptying"

Valve	Pres. check point	Location
33.2	M11.14	Control block I / 14
33.3	M11.12	Control block II / 15
33.7	M11.13	Control block IV / 17
MRV	High pressure filter	One in each control block

1. Connect the gauge to the required check point
2. Start drive motor.
3. Extend cylinder to full or retract to minimum for the valve being tested until the hydraulic system stalls.
4. Increase slowly the MRV-pressure while observing the pressure gauge. Gauge value must remain at 350 bar $\pm$ 5 bar.

If the gauge shows a smaller or greater value the SRV must be adjusted.

How to alter a valve adjustment:

a. Remove protective cap (1).
b. Loosen lock nut (2).
c. Turn set screw (3) -**clockwise** to increase pressure, **counter-clockwise** to decrease pressure.
d. Tighten lock nut (2) and replace cap (1).

5. Re-set MRV to 310 bar $^{+}$ 5 bar after the check / adjustment is finished.

- **Because the piston and the rod side of the bucket cylinders are protected by more than one valve, the pressure gauge shows the pressure of the valve with the lowest setting.**
  Even when the gauge shows the required pressure it is possible that one valve has a higher setting.
  Therefore lower the pressure on one valve below the required pressure and then increase up to required pressure.
  Proceed with next valve in the same manner.
- **If the pressure for bucket "Filling" can not be obtained it may be due to the faulty anticavitation valve 32.7 contr. bl. I / 14, 32.8 contr. bl. II / 15, 32.14 contr. bl. IV / 17**
- **If the pressure for bucket "Emptying" can not be obtained it may be due to the faulty anticavitation valve 109.4, at the manifold section M and 32.10 at control block III / 16.**

continued

Cont'd.

Function: Illust. Z 21374

The pressure oil inlet (A or B) and consequent oil outlet (B or A) determine the output drive direction of the drive flange (1).

Direction of rotation:

"Clockwise" = Direction of flow A to B

"Counterclockwise" = Direction of flow B to A

with view onto drive shaft!

Via the control lens (9) the oil is directed to the cylinder bores.

The piston (6) is moved from the lower (7b) to the up- per dead point (7a) by means of the force acting on it and causes the drive flange to rotate. On further rotation of the drive flange (additional pistons are pressurized) this piston is moved towards the lower dead point again and oil of the cylinder chamber is forced out through the kidney formed openings of the control lens. This oil is fed back to the tank via the return line.

If the supply and return line gets changed it changes the output drive direction of the drive flange.

By means of the angled arrangement of the cylinder (8) (bent axis design), a certain piston stroke is produced which results in a fixed displacement per revolution of the drive flange. According to the size of the applied flow this therefore produces a specific output speed.

The output torque at the drive flange is dependent on the size of the motor and the required operating pressure.

The port (3) is provided for an external bearing lubrication at extreme operating conditions.

Electric / Hydraulic Flow Charts

On the following pages are shown the electric / hydraulic flow charts for the slew circuit. Exc. : **EURO Control**

It is shown: **Illust. Z 21378**
The **electrical signal** from the joystick (8E 20) to the amplifier module (8A7) and further to the proportional solenoid valves of the control block (II / 15)
The **hydraulic signal** (pilot pressure) from the main control block gallery is passed via the proportional solenoid valves 8Y28 and 8Y29 directly to the selected spool cap proportional to the joystick movement.
The **hydraulic oil flow** from the main control block via the brake valve blocks (49.1 + 49.2) to the hydraulic motors (20.1 + 20.2).

Cont'd.

Illust. Z 21381

Low pressure check / adjustment (Slewing down path (drifting)
(with still disconnected pilot pressure line **L**)

8. Actuate either l.h. or r.h. rotation until the hydraulic system stalls.
   a) loosen lock nut (3) and turn out set screw (4) until 170 $^{+5}$ bar is reached.
   b) Tighten lock nut (3).
   c) Recheck pressure setting.
9. Re-connect the pilot pressure line **L**.

- **For laterone pressure checks the steps 2 + 3 must not be done.**
- **The slewing down path may be extended, means the low pressure may be decreased, a little; e.g. for greater operating radius such as at strip mining. But a little only otherwise disturbance due slewing will occur.**
- **The slewing down path may be shortened, means the low pressure may be increased appr. 20 bar; but not more because that means greater shocks in the systems which will shorten the life time of the components.**

1. Connect the gauge to the check point M4.
2. Start engine and let it run with max. speed.
3. Depress fully the foot brake pedal and read the pressure.

The pressure must be 19 $\pm$1 bar.

If adjustment is required:

Alter the position of the potentiometer R2 of the amplifier A17 as long as the pressure is 19 $\pm$1 bar.

Basic adjustment for A17 see section 5

Cont'd.

Function: Illust. Z 21384

The pressure oil inlet (A or B) and consequent oil outlet (B or A) determine the output drive direction of the drive flange (1).

Direction of rotation:

"Clockwise" = Direction of flow A to B

"Counterclockwise" = Direction of flow B to A

with view onto drive shaft!

Via the control lens (9) the oil is directed to the cylinder bores.

The piston (6) is moved from the lower (7b) to the up- per dead point (7a) by means of the force acting on it and causes the drive flange to rotate. On further rotation of the drive flange (additional pistons are pressurized) this piston is moved towards the lower dead point again and oil of the cylinder chamber is forced out through the kidney formed openings of the control lens. This oil is fed back to the tank via the return line.

If the supply and return line gets changed it changes the output drive direction of the drive flange.

By means of the angled arrangement of the cylinder (8) (bent axis design), a certain piston stroke is produced which results in a fixed displacement per revolution of the drive flange. According to the size of the applied flow this therefore produces a specific output speed.

The output torque at the drive flange is dependent on the size of the motor and the required operating pressure.

The port (3) is provided for an external bearing lubrication at extreme operating conditions.

Cont'd.

Travel gear house brake with drive shaft housing

Legend for illust. Z 21389

(1)	Drive shaft	(90)	Springs
(18)	Disk carrier	(91)	Piston
(27)	Intermediate ring	(92)	Quad-Rings
(29)	Inspection cover	(93)	Oil pressure port
(39)	Ball bearing	(94)	Oil level plug
(43)	Radial seal ring	(95)	Oil drain plug
(44, 47,+58)	O-Ring	(96)	Housing
(50)	Cover bolts	(97)	Oil filler plug *
(57)	Brake fitting bolts	(98)	Thrust washer
(53+74)	Seeger clip ring	(99)	Inner and outer disks
(83 + 82)	Bolt and lock washer	(100)	Retainer

* **The brake must be released for oil change!**

Function:

Brake applied:

The outer disks (99) engaged to the housing (96) by serration and the inner disks (99) in serration connection with the drive shaft (11) are pressed together by the springs (90). This results in a fixed connection between housing (96) and shaft (11).

Brake released:

Oil pressure via port (93) reaches the bottom of the piston (91) and forces the piston against the retainer (100).

This function eliminates the spring force onto the disks thus the brake is released.

The releasing pressure is 21 - 23 bar, the maximum permissible pressure 50 bar.

This is a so named "Wet Brake" because the brake housing is filled with gear oil. The oil must be filled in after removing the filler plug (97) up to the edge of the level control plug (94) thread.

Detailed Explanation for "Travelling Forward"

Illust. Z 21393
(Study together with the for the machine valid hydraulic and electric circuit diagram).

Electrical signal flow
From each one of the pedal units 8E21.1 and 8E21.2 (pink cable) a positive signal voltage is sent to the amplifiers 8A12 and 8A13 terminal 5. By the function of the neutral contact switch the relay 8K74 is energized and allows operating voltage to the amplifiers, terminal 1.
Because of the positive input signal there is now a current output signal at terminal 8 of each amplifier. This in turn energizes the proportional solenoids 8Y20 (L.H. forward) and 8Y37 (R.H. forward) *.

Pilot pressure oil flow "Travelling Forward"
The energized 8Y20 and 8Y37 connects the P_{ST} line of the control blocks with the pilot pressure line (a1/14) and (b1/16) for the spools.
The control block spool gets displaced and the connection between the pump line (P) and the service line ports A1/14 + B1/16 is made

High pressure oil flow "Travelling Forward"
The oil flows from port A1/14 and B1/16 to the rotary distributor (21), ports C + D and further to the travel brake valves (39.1 + 39.2, ports B.
From there to the l.h. travel motors (20.3 + 20.4), ports A and to the r.h. travel motors (20.5 + 20.6), ports B.
From the opposite ports of the travel motors the oil returns via the travel brake valves to the rotary distributor, ports A + B and further to the control block 14/B and 16/A1.

Travelling "Reverse", illust. Z 21394
(Follow up hydraulic and electric circuit diagram which are valid for the specific machine).

continued

Legend for illust. Z 21398

(21)	Rotary distributor
(ST)	Supply line, pilot pres. from travel parking brake circuit
(123.1 - 123.4)	Pressure accumulator, 5 liter. **Pre-charge pressure 150 bar**
(125.1 + 125.2)	Pressure accumulator, 1.3 liter **Pre-charge pressure 31 bar**
(124.1 - 124.4)	Track adjusting cylinders. **230 mm dia. x 350 mm stroke**
(118.1)	Supply line shut-off cock
(118.4)	Main shut-off cock
(118.2 + 118.3)	Service Shut-off cocks
(117)	Pressure increasing valve
M26.1 - M26.6	Bleeder and pressure check points
(126.1 + 126.2)	Check valves (prevents a cross-over flow)
(121.1 + 121.2)	Check valves (prevents feedback pressure to pilot pressure)

O = open
C = closed

General:

The hydraulic track tensioning system maintains automatically the correct track tension.

The pilot pressure oil for the travel gear parking brake circuit is used to pressurize the four adjusting cylinders (124.1 - 124.4). The resulting force moves the guide wheels toward the front, until the correct track tension is obtained. External forces acting upon the guide wheels are absorbed through the pressure accumulators (125.1 + 125.2, first stage) + (123.1 - 123.4, second stage).

Functioning description see next page.

Details for the track tensioning see section 6.6 of the **Service Literature**

Tensioning Cylinder

Legend for illust. Z 21402

(1) Cylinder tube
(2) Piston
(3) Rod guide ring
(4) PU-Stepseal
(5) O-ring
(6) TURCON Stepseal
(7) Scraper ring
M Pressure check point (Bleeder port)
P Oil supply

- **Maximum permissible piston stroke 360 mm!**
  During bench test an external stroke limiter must be used!