Shop Manual

HYDRAULIC
MINING
SHOVEL

PC4000E-6

SERIAL NUMBER 08165- up

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine. This manual should be kept near the machine for reference and must be periodically reviewed by all personnel who will come into contact with it.

Komatsu has Operation and Maintenance Manuals written in other languages. If a foreign language manual is required, contact your local distributor for availability.

KOMATSU

2.4.3.6 PROVIDE FIRE EXTINGUISHER AND FIRST AID KIT

Always follow the precautions below to prepare for action if any injury or fire should occur.

– Be sure that fire extinguishers have been provided and read the labels to ensure that you know how to use them in emergencies.
– Carry out periodic inspection and maintenance to ensure that the fire extinguisher can always be used.
– Provide a first aid kit. Carry out periodic checks and add to the contents if necessary (Fig. 3-4).

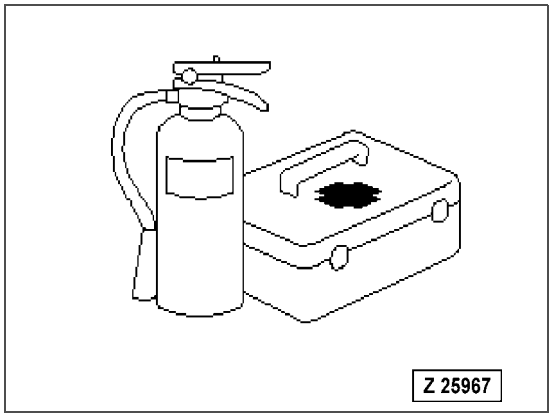


Fig. 3-4

2.4.3.7 IF A PROBLEM IS FOUND

If you find any problems in the machine during operation and maintenance (noise, vibration, smell, incorrect gauges, smoke, oil, leakage, etc., or any abnormal display on the warning devices or monitor), report to the person in charge and have the necessary action taken. Do not operate the machine until the problem has been corrected.

2.4.4 FIRE PREVENTION

2.4.4.1 PRECAUTIONS TO PREVENT FIRE

Fire caused by fuel, oil, antifreeze, or window washer fluid.

Do not bring any flame or fire close to flammable substances such as fuel, oil, antifreeze, or window washer fluid. There is a danger they may catch fire. To prevent fire, always observe the following:

– Do not smoke or use any flame near fuel or other flammable substances. (Fig. 3-5)
– Stop the engines before adding fuel.
– Do not leave the machine while adding fuel or oil.
– Tighten all fuel and oil caps securely.
– Be careful not to spill fuel on overheated surfaces or on parts of the electrical system.
– After adding fuel or oil, wipe up any spillage.
– Put greasy rags and other flammable materials into a safe container to maintain safety in the workplace.
– When washing parts with oil, use a non-flammable oil. Do not use diesel oil or gasoline. There is a danger that they may catch fire.
– Do not weld or use a cutting torch to cut any pipe or tubes that contain flammable liquids.
– Determine well ventilated areas for storing oil and fuel. Keep the oil and fuel in the determined place and do not allow unauthorised persons to enter.

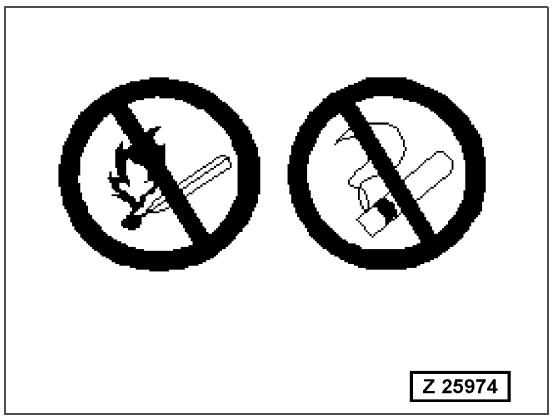
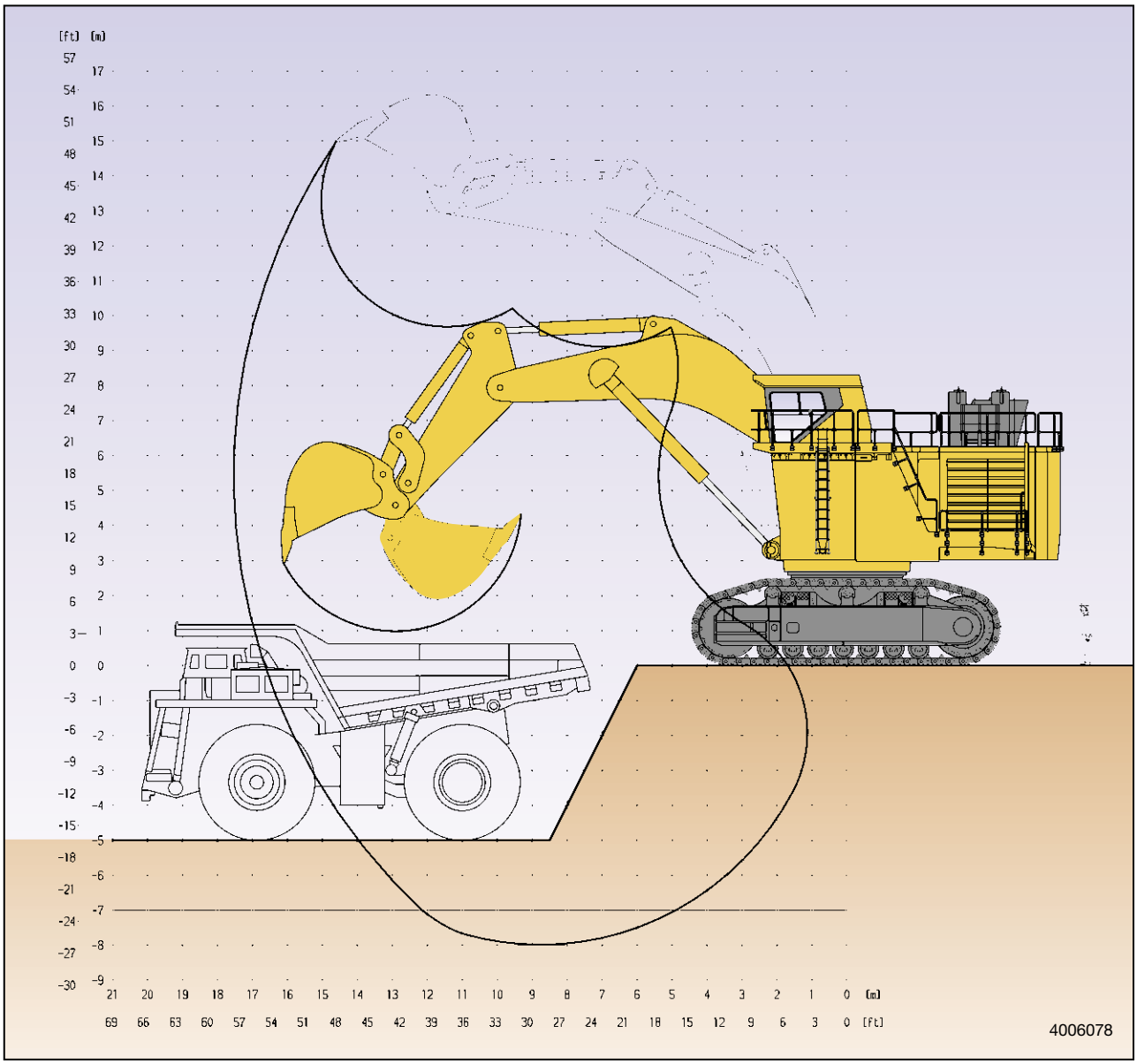


Fig. 3-5

REMARKS: Before carrying out grinding or welding work on the machine, remove any flammable materials.

PRODUCTIVITY-FEATURES



DIGGING FORCES

Break-out force	1155 kN 260,000 lb
Tear-out force	1050 kN 236,000 lb

Maximum reach at ground level	16.650 mm 54'8"
Maximum digging depth	8000 mm 26'3"

BACKHOE BUCKET, STICK AND BOOM COMBINATION

Bucket Capacity	Width	Weight	Teeth	Boom Length 9750 mm 32'0"
SAE Heaped 1 : 1		including Wear package-2		Stick Length 4500 mm 14'9"
22 m³ 29 yd³	3790 mm 12'5"	23.4 t 51,590 lb	6	○ Material weight to 1.8 t/m³ 3000 lb/yd³

Alternative buckets/wear packages are available

Basic Values in Ohm according to DIN 43 76

For Measuring Resistor PT100

° C	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-50	80,31	79,91	79,51	79,11	78,72	78,32	77,92	77,52	77,13	76,73
-40	84,27	83,88	83,48	83,08	82,69	82,29	81,89	81,50	81,10	80,70
-30	88,22	87,83	87,43	87,04	86,64	86,25	85,85	85,46	85,06	84,67
-20	92,16	91,77	91,37	90,98	90,59	90,19	89,80	89,40	89,01	88,62
-10	96,09	95,69	95,30	94,91	94,52	94,12	93,73	93,34	92,95	92,55
0	100,00	99,61	99,22	98,83	98,44	98,04	97,65	97,26	96,87	96,48

° C	0	1	2	3	4	5	6	7	8	9
0	100,00	100,39	100,78	101,17	101,56	101,95	102,34	102,73	103,12	103,51
10	103,90	104,29	104,68	105,07	105,46	105,85	106,24	106,63	107,02	107,40
20	107,79	108,18	108,57	108,96	109,35	109,73	110,12	110,51	110,90	111,28
30	111,67	112,06	112,45	112,83	113,22	113,61	113,99	114,38	114,77	115,15
40	115,54	115,93	116,31	116,70	117,08	117,47	117,85	118,24	118,62	119,01
50	119,40	119,78	120,16	120,55	120,93	121,32	121,70	122,09	122,47	122,86
60	123,24	123,62	124,01,	124,39	124,77	125,16	125,54	125,92	126,31	126,69
70	127,07	127,45	127,84	128,22	128,60	128,98	129,37	129,75	130,13	130,51
80	130,89	131,27	131,66	132,04	132,42	132,80	133,18	133,56	133,94	134,32
90	134,70	135,08	135,46	135,84	136,22	136,60	136,98	137,36	137,47	138,12
100	138,50	138,88	139,26	139,64	140,02	140,39	140,77	141,15	141,53	141,91
110	142,29	142,66	143,04	143,42	143,80	144,17	144,55	144,93	145,31	145,68
120	146,06	146,44	146,81	147,19	147,57	147,94	148,32	148,70	149,07	149,45
130	149,82	150,20	150,57	150,95	151,33	151,70	152,08	152,45	152,83	153,20
140	153,58	153,95	154,32	154,70	155,07	155,45	155,82	156,19	156,57	156,94
150	157,31	157,69	158,06	158,43	158,81	159,18	159,55	159,93	160,30	16067

1.1 Superstructure

1.1.6 Cab support

Legend for illustration (Z 21475):

(1) Cab support (Location of electrical switch board “X2”)

(2) Mounting bolts

Quantity	Bolt size (mm)	Grade	SW* (mm)	Tightening torque (Nm)
4	M 36 x 240	10.9	55	3100

*SW = Wrench size

(3) Mounting bolts

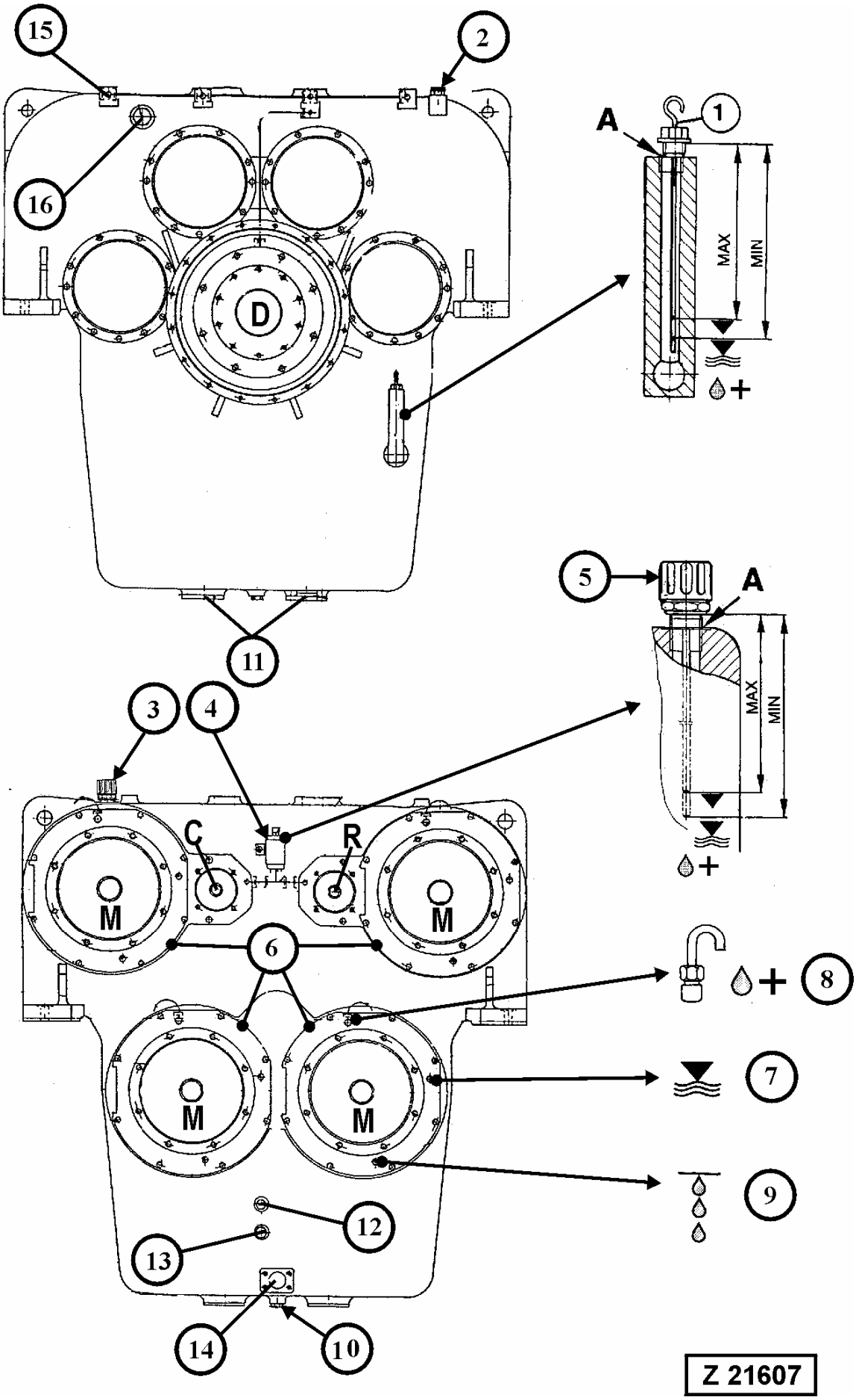
Quantity	Bolt size (mm)	Grade	SW* (mm)	Tightening torque (Nm)
4	M 36 x 240	10.9	55	3100

*SW = Wrench size

(4) Door

(5) Gasket

(6) Door handle (adjustable)


15
2
16
A
1
MAX
MIN
D
11
5
A
MAX
MIN
3
4
C
R
M
M
6
8
M
M
7
9
12
13
14
10
Z 21607

3.3 Return oil collector tube with strainer

Legend for illustration (Z 21497):

(1) Return oil collector tube - Part 1 -

(2) Return oil collector tube - Part 2 -

(3) Return oil collector tube - Part 3 -

(4) Strainer

(5) Bolt

Quantity	Bolt size (mm)	Grade	SW* (mm)	Tightening torque (Nm)
8	M 20 x 80	10.9	30	510

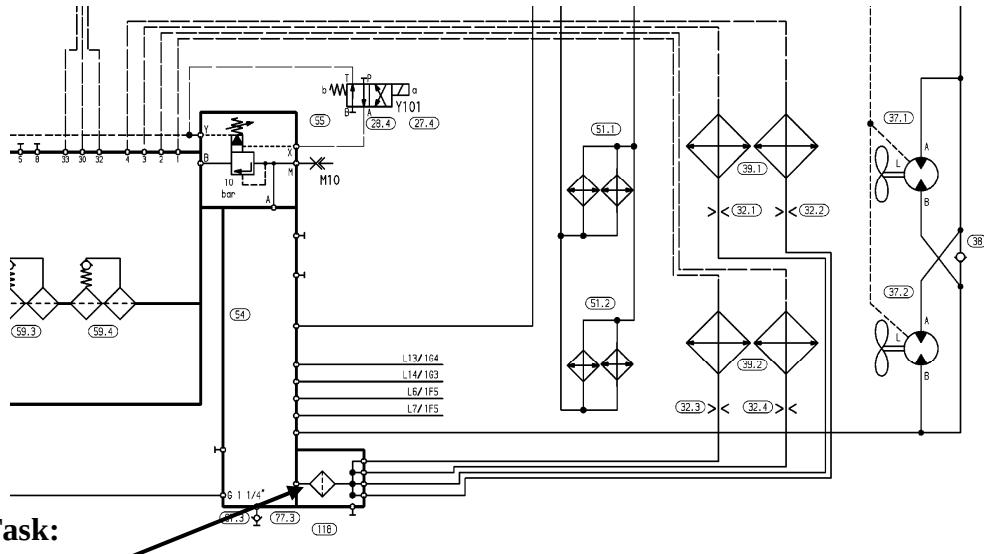
(6) Bolt

Quantity	Bolt size (mm)	Grade	SW* (mm)	Tightening torque (Nm)
8	M 20 x 70	10.9	30	510

(7) Self locking nut

(8) Gasket

* SW = Wrench size



Task:

The strainer is installed to prevent the hydraulic oil coolers from getting clogged up in case of contamination in the main return circuit oil.

Excessive increase of the hydraulic oil temperature can be an indication for a restricted strainer, i.e. bad cooling performance due to insufficient oil flow through the coolers.

In case that main components such as cylinders or motors are internal fragmentary damaged, the strainer should be inspected for metal chips.

4.7 Adjustment of the cooler fan drive speed

Cont'd

Basic Adjustment – Maximum Speed, illustration (Z 21932b)

6. Check the fan speed with a non-contact rev counter
   Required fan speed: 1250 min-1

- **Be careful not to get caught in the fan or other rotating parts**

7. Increase the output flow of pump (5.1), by adjusting the swivel angle, until the fan speed will be 20 min^{-1} higher than required:
   To do this, loosen both lock nuts (6.1 + 7.1) and turn **in** bolt **(6)** and turn **out** bolt **(7)** the **same length**.
   This is necessary to avoid a loose positioning pin (10), resulting in oscillating of the cylinder barrel.
   Tighten the lock nuts (6.1 + 7.1).

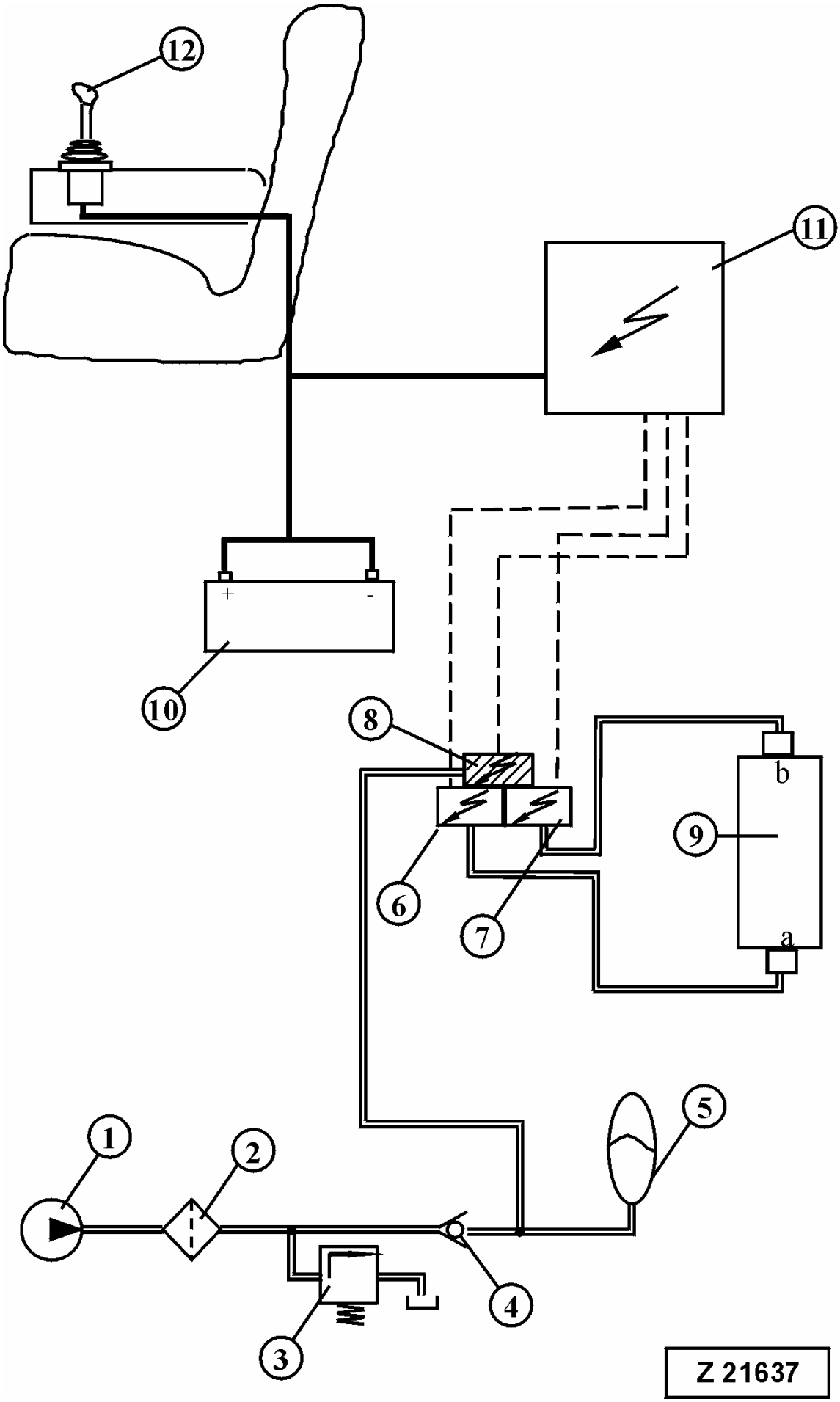
- **Do not exceed the maximum permissible operating pressure of 230bar.**

- **Note down the lengths ”L1” and ”L2” as reference measurements.**

8. Loosen lock nut (b) of the relief valve (31.1), and decrease the pressure with set screw (c) until the correct fan speed is obtained.
9. Tighten lock nut (b) and fix protection cap (a).

- **Both fans have to be checked. A difference of approx. 50 rpm is normal due to the higher resistance for the air stream for the lower fan. If the speed difference between both fans is higher than 50 rpm, a possible cause could be a worn hydraulic motor or defective bearings.**

continued


12
11
10
8
b
9
6
7
a
1
2
5
4
3
Z 21637

5.11 Adjusting the Amplifiers Type B, illustration (Z 21642)

Cont'd:

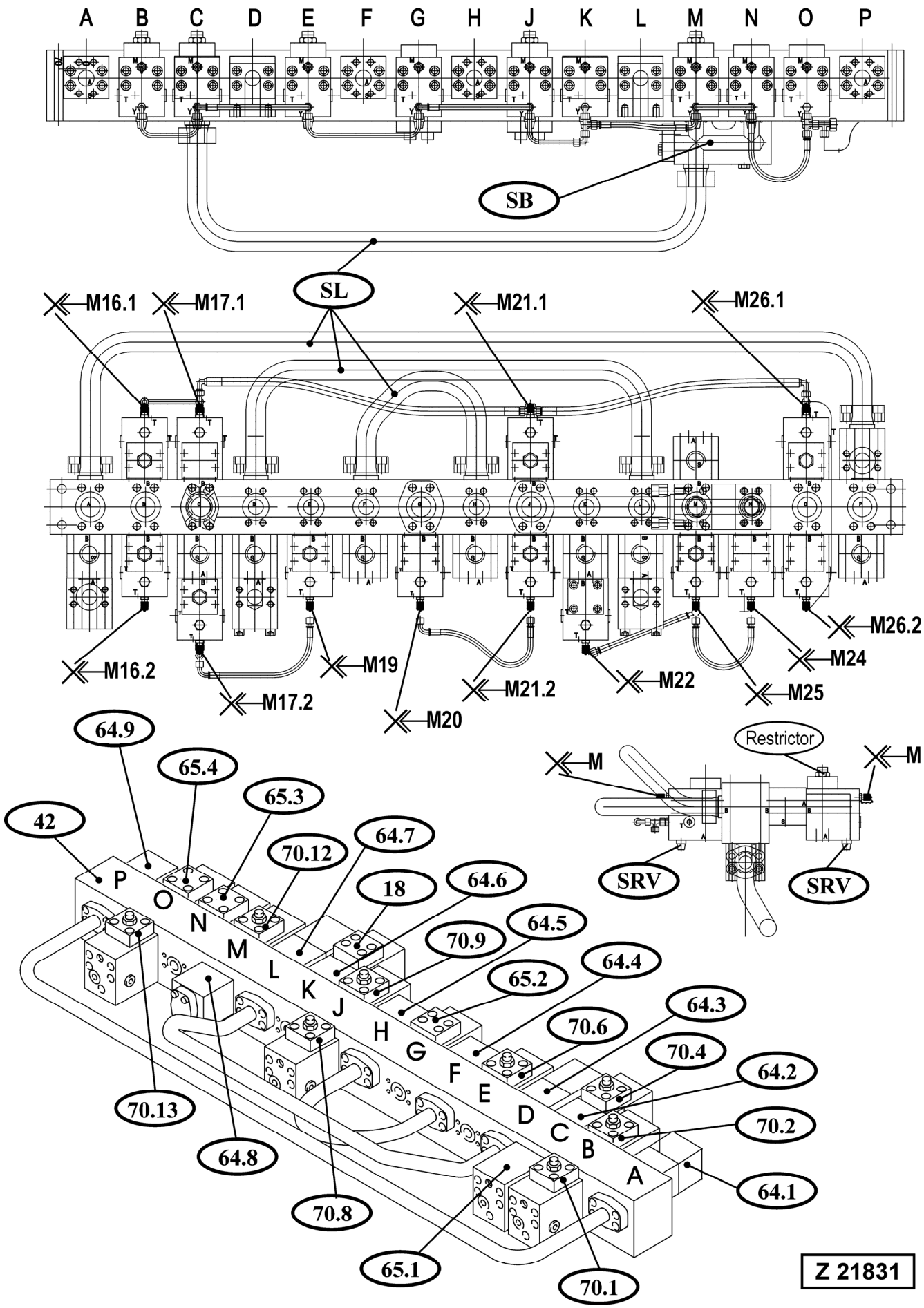
11. If the setting with either positive or negative potential was successful, turn the potentiometer (P) of the **service module** into the opposite direction and check the settings with the other polarity i.e. if the first setting was done with positive potential then turn the pot into negative direction; **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.

Adjusting the Ramp Time

1. Turn potentiometer (Rt) 30 revolutions counter clockwise, to guarantee the correct start position at the complete left side.
2. Turn potentiometer (Rt) so many revolutions clockwise as shown in the table below (part of the electrical circuit diagram).

Einstellung Rampenzeit / adjustment ramp time	Umdrehungen vom linken Ende / revolutions from left end
Ausleger / boom	0
Stiel / stick	0
Schaufel / bucket	10
Klappe / clam	10
Drehen / slew	0
Fahren / travel	0

* 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.


A
B
C
D
E
F
G
H
J
K
L
M
N
O
P
SB
SL
M16.1
M17.1
M21.1
M26.1
M26.2
M16.2
M19
M17.2
M20
M21.2
M22
M24
M25
64.9
65.4
65.3
42
70.12
64.7
18
64.6
64.5
70.9
65.2
64.4
64.3
70.6
70.4
64.2
70.2
64.1
70.13
64.8
70.8
65.1
70.1
Restrictor
M
M
SRV
SRV
Z 21831

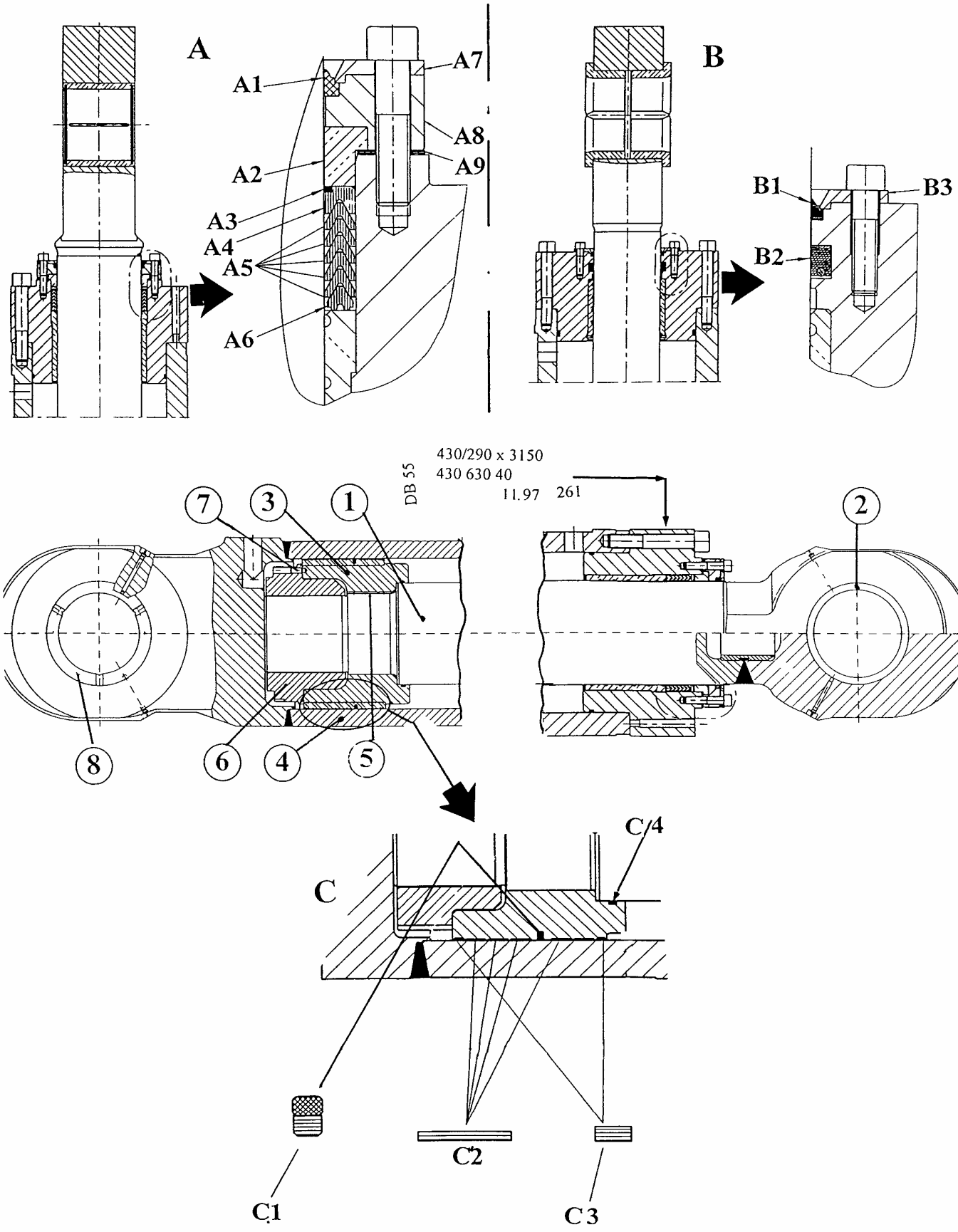
6.1.12 Control Blocks and Valves

- **This is a principle drawing, showing valve block II and IV.**

Legend for illustration (Z 21702):

(1) Control block housing
(2) Main relief valve (MRV)
(3) Boom lifting / lowering, Spool (special)
(4) Long cap ("B" side)
(5) "B" side service line ports
(6) Centering springs
(7) Solid spool
(8) Short cap ("A" side)
(9) "A" side service line ports
(10) Load check valves
(11) Pilot oil warm up and flushing grooves
(12) Fine controlling grooves
(13) Type plate

Control blocks with "**Open Center and Closed Ports**".
Control blocks I and III are 3 spool blocks II and IV are 4 spool blocks.
See hydraulic circuit diagram for spool details.
Each spool is provided with "Fine Controlling Grooves", ring grooves for hydraulically centering of the spool and “Pilot oil warm up and flushing“ grooves.
Between 8 and 19 bar pilot pressure the spools are moved in their fine control range.
Spool (3) is special designed, to keep the pressure channel connected to the center channel during the function “Boom lowering“ is selected, so that pump flow is available for other functions.
The **Load Holding Valves** are installed beneath a plug from the service port side of the control block.
The **MRV** is a pilot operated pressure relief valve.


A
A1
A2
A3
A4
A5
A6
A7
A8
A9
B
B1
B2
B3
DB 55
430/290 x 3150
430 630 40
11.97 261
1
2
3
4
5
6
7
8
C
C/4
C1
C2
C3

Z 22735

7.1 Main Pumps

7.1.3 Operating Principles

Cont'd:

Symbol of main hydraulic pump **A4VSLO 750 LR3DN / 30L**

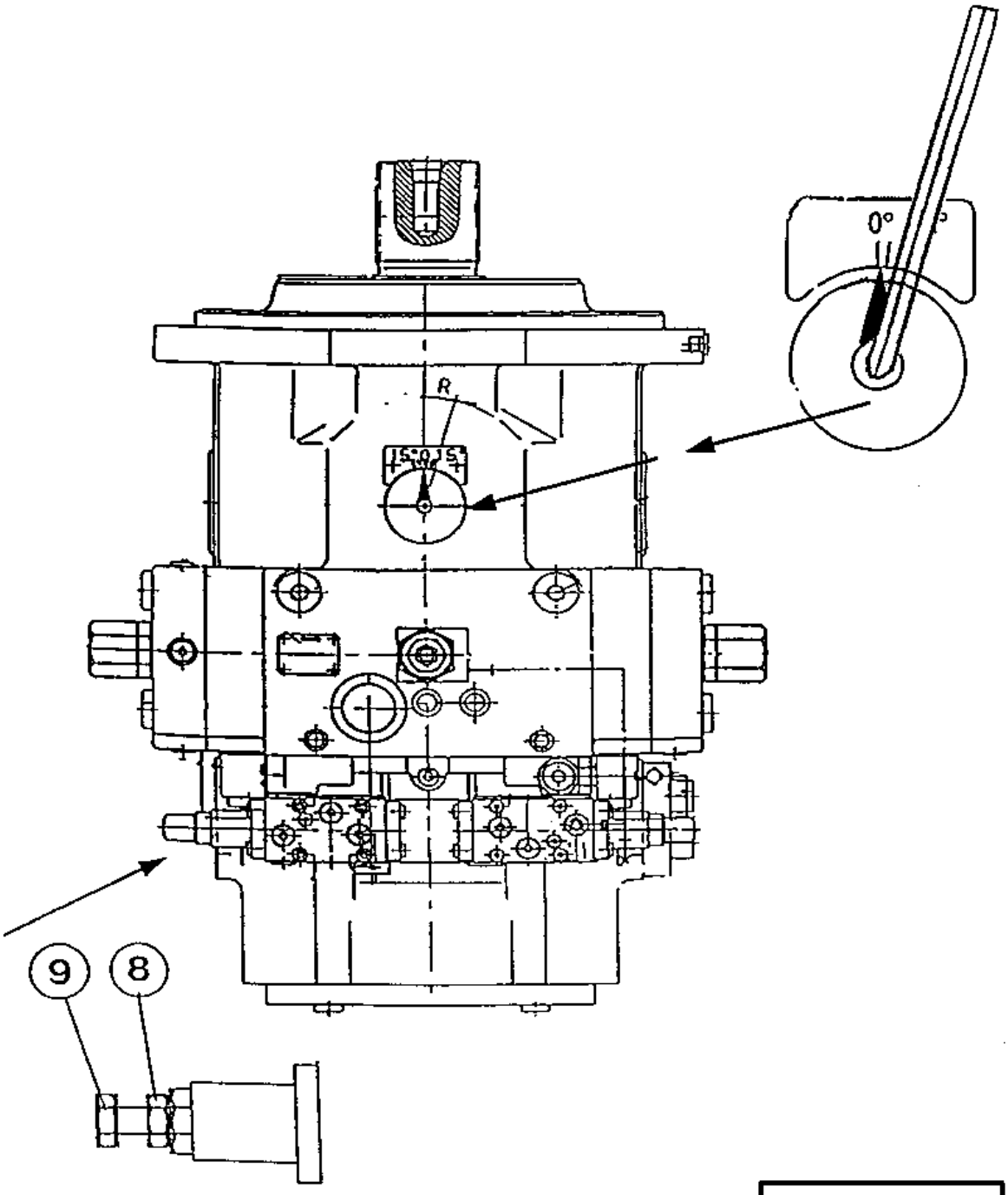
Legend for illustration (Z 21550):

(1) Main pump (swash plate pump, variable displacement)
(2) Charging pump (impeller type pump)
(3) Pump bearing group
(4) Drive shaft
(5) Non return valves
(6) Remote control valve
(6.1) Mechanical stroke limitation*
(6.2) Remote pressure (P_{ST}) operated piston for item 6
(6.3) Mechanical stroke limitation*
(7) Spool valve (pressure balance valve)
(8) Nozzle
(9) Power control valve
(10) Nozzle
(11) Pressure cut-off valve
(12) Auxiliary pump (Gear pump, fixed displacement
(13) Positioning piston
(14) Slipper pad piston
(15) Lever
(16) Cam
(17) Through drive shaft

- *** Factory side adjusted, no field adjustment required**

B/B1 Pressure port
S Oil intake (suction port)
MB Operating pressure check point
ML Charging pressure check point
MST Control pressure check point
R Filler and bleeder port
T Connection port for chip indicator
P Pump support pressure (”X4”-pressure)
PST Remote control pressure port (”X3”-pressure)
U Bearing flushing port
XLR Regulating pressure port (”X1”-pressure)

continued



Z 21560

7.2 Electronic Pump Regulation System

7.2.3 Checks and adjustments Microcontroller MC7, illustration (Z 22629c)
Cont'd:

Method A - Demanded power adjustment

Pre-conditions: Normal operating temperature, correct pilot pressure setting and the system must be free of air.

1. Connect pressure gauges to check points M11, M12, M13 and M14 at the high pressure filters.
2. Connect pressure a gauge to the X1 pressure check point M5.1.
3. Unplug solenoid valves Y6a and Y6b to ensure that the hydraulic oil cooler fans are running with maximum speed.
4. Start the motor.
5. Set the MRV individually to approx. 120 bar *, to prevent the motor from overloading during the adjustment.
6. Shift the three way cock valves (253.1) to position “Hydraulic (constant) Regulation Mode”.
7. Set the X1-pressure at pressure reducing valves (253.2) > 34 bar **, to ensure that the pumps remain in Q-max. flow position during the adjustment.
8. Apply max. load to all pumps (e.g. extend the bucket cylinders to the stop position until the hydraulic system stalls), and increase the pressure at all 4 MRV’s * equally until the motor draw ≅ 128 Ampere. (reading of text display)
   Expected system pressure at 128 Ampere = 4 times 172 bar (peak point).
   Record this pressure for other tests.

- **If the operating pressure is higher respectively the motor current is lower than required there is probably not the full volume available.**

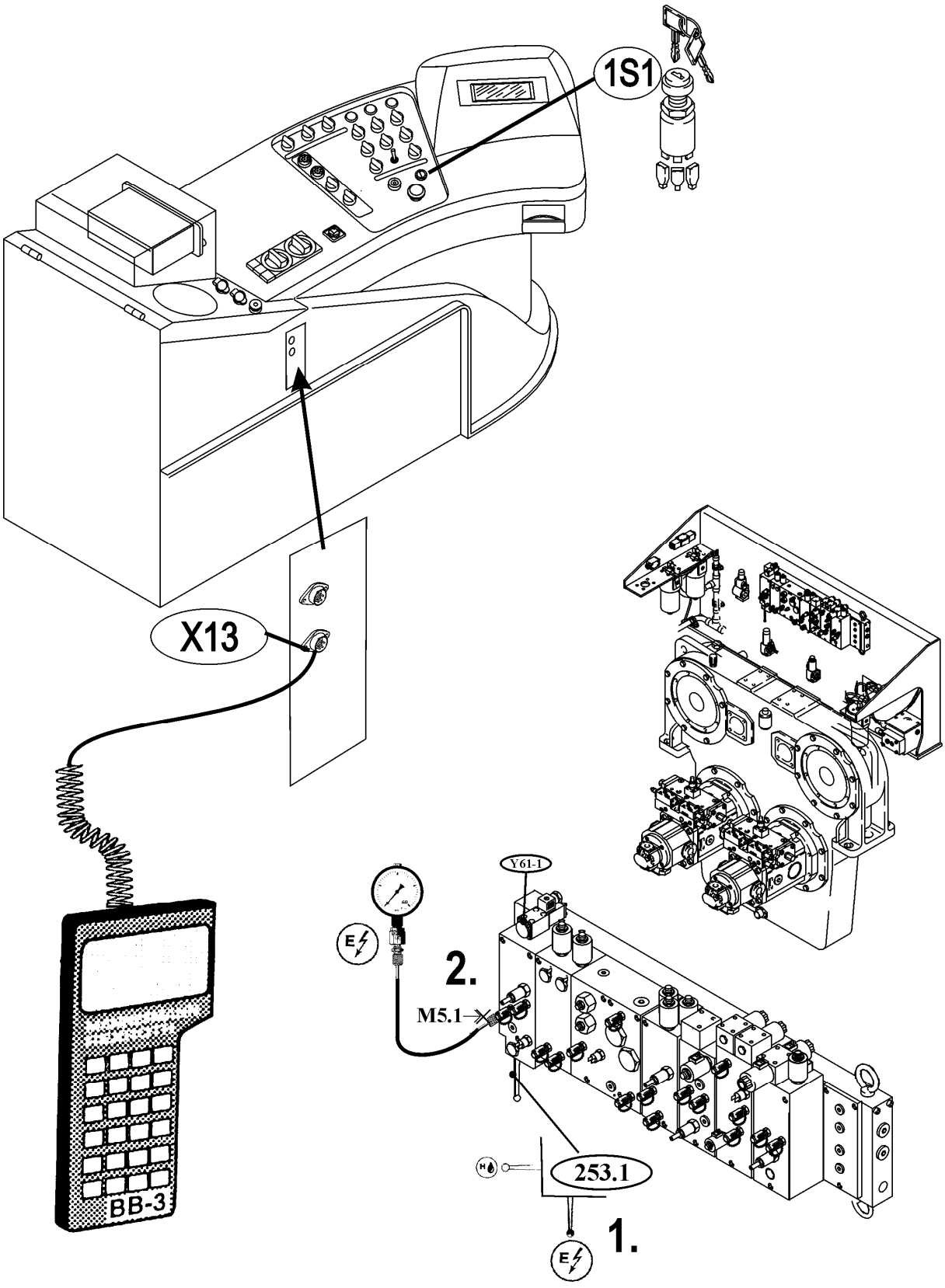
***Altering the MRV-Setting:**

- Remove dust cap (a).
- Loosen lock nut (b).
- Turning the set screw (c) **cw** the pressure will increase.
- Turning the set screw **ccw** the pressure will decrease.

****Altering the X1-Setting:**

- Loosen the lock nut (e).
- Turning the set screw (f) **cw** the pressure will increase.
- Turning the set screw **ccw** the pressure will decrease.

continued



Z 22357f

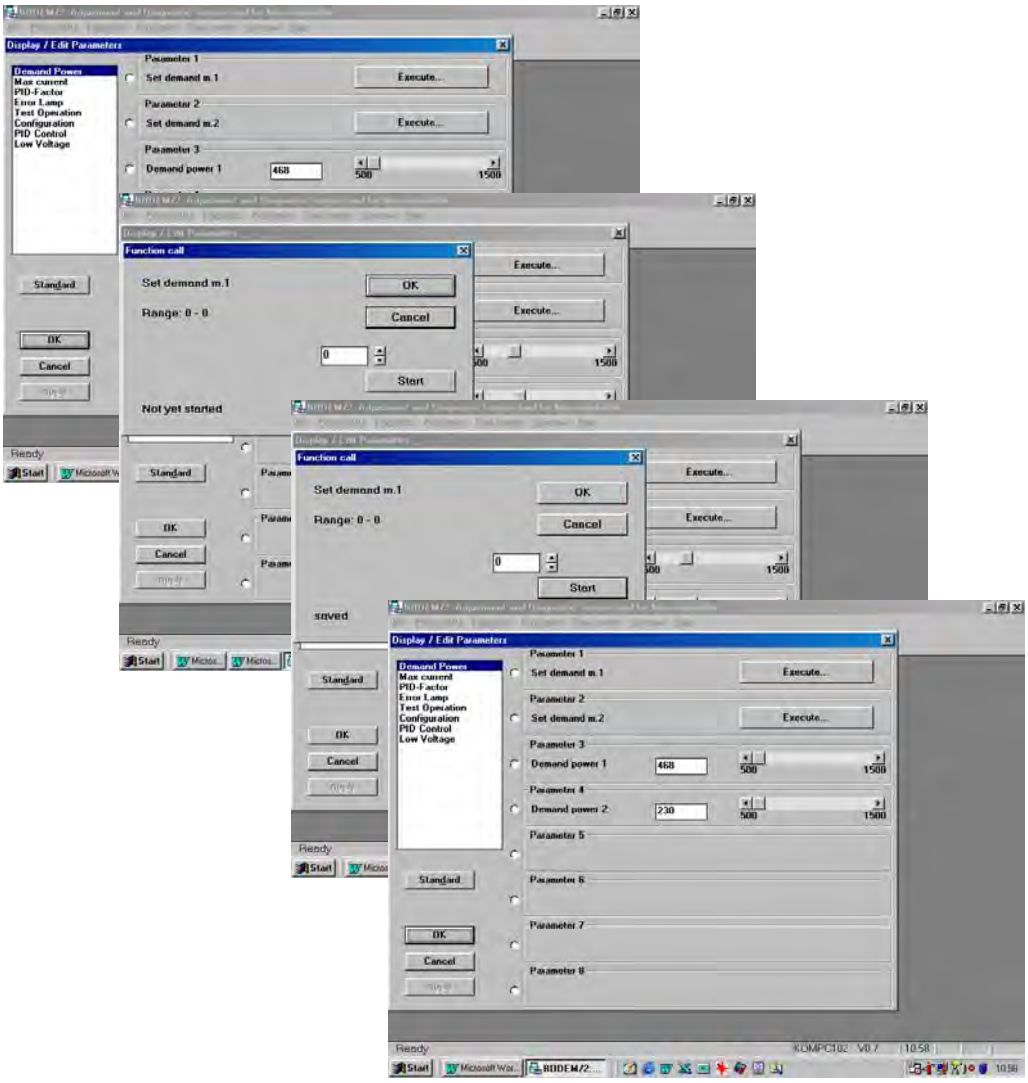
7.2 Electronic Pump Regulation System

7.2.3 Checks and adjustments Microcontroller MC7, illustration (Z 22639f) Method C

Cont'd:

Demand power adjustment:

9. Select **Execute** of menu point **Set demand m. 1** for motor 1 .
   Select **Start** to set the actual power as demand power. Confirm with **OK.** The new actual demand power will be only shown after a new upload of the MC7 settings. Exit the BODEM software and start again.
10. Stop the motor.



8.1.5 Electric / Hydraulic flowchart " Bucket filling " FSA

Legend for illustration (Z 21965):

(E19)	Control lever (Joy stick)
(D32)	Time relay – Pilot control: Neutral position monitoring
(XB)	Direction (axis) of joy stick
(-10V)	Signal voltage (Maximum)
(ws / gn)	Colour code of signal voltage cable (Joy stick)
(X2...)	Terminal rail with number
(A9)	Amplifier module – Bucket
(A9a)	Amplifier module – Bucket
(A9b)	Amplifier module – Bucket
(A10b)	Amplifier module – Boom up or Bucket when not raising the boom.
(K50)	Relay – pilot control: Bucket cut-off Contacts 6 / 10 only closed if the hydraulic oil is overheated.
(K58)	Relay – pilot control: Contacts 6 / 10 and 5 / 9 only closed while lifting the boom.
(K71)	Relay – pilot control: Contacts 6 / 10 and 5 / 9 only closed while filling the bucket.
(K74)	Relay – pilot control: Contacts 5 / 9 only closed while extending the stick.
(K76)	Relay – pilot control: Contacts 6 / 10 only closed while traveling the left crawler.
(K78)	Relay – pilot control: Contacts 7 / 11 only closed while traveling the right crawler.
(14.1 – 14.3)	Remote control valves
(15)	Remote control valves
(Y63 + Y64)	Proportional solenoid valve
(Y71 + Y75)	Proportional solenoid valve
(Y22 + Y32)	Directional solenoid valve
(Y36 + Y44)	Directional solenoid valve
(I – IV)	Main control blocks I – IV
(42)	Distributor manifold

Electrical signal flow.

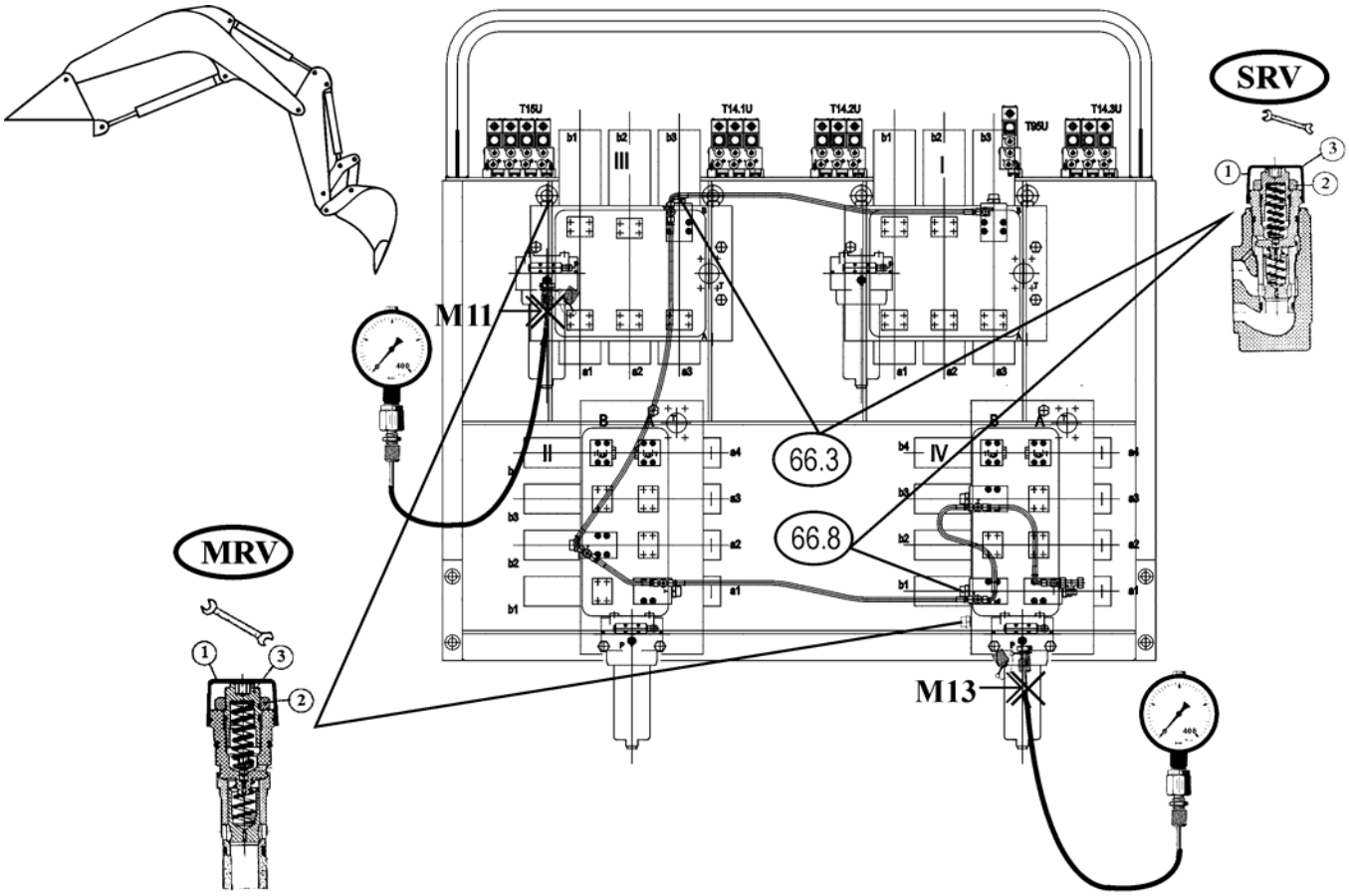
Signal voltage of joy stick (E19) arrives via relay contacts at terminal 5 of the amplifier modules (A9, A9a, A9b and A10b) and further to the proportional and directional solenoid valves of the remote control blocks (14.1, 14.2, 14.3, and 15).

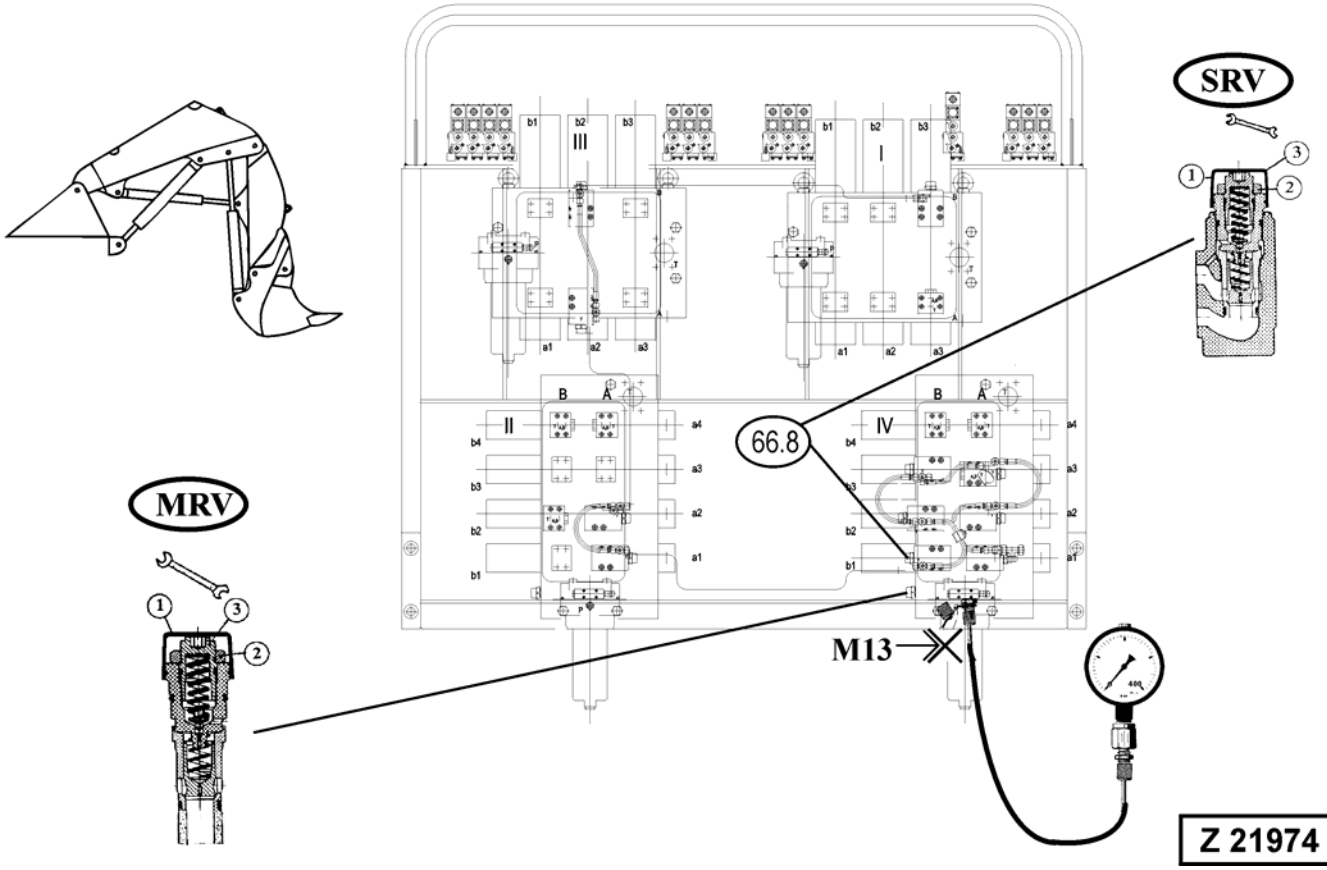
Hydraulic signal flow. (pilot pressure)

When the proportional and directional solenoid valves are energized pilot pressure oil flows to the pilot pressure ports of the main control blocks.

Hydraulic oil flow

Now the oil of the main pumps flows through the main control blocks (I to IV) and arrives via distributor manifold (42) at the hydraulic cylinders.





Z 21974

8.1.10 Checks and adjustments of the Service Line Relief Valves (SRV), illustration (Z 21980a):

Cont'd:

Stick cylinder "Piston rod side" BHA

9. Adjust all SRV's equally, until all gauges show a pressure of 360 bar.
   Adjust in steps of ¼ turn of set screw (3) in the following sequence:
   70.8 ⇨ 70.9⇨ 70.10
   Remove protective cap (1) of SRV's.
   Loosen lock nut (2).
   Turn set screw (3) -**clockwise** to **increase** pressure, **Counter-clock wise** to **decrease** pressure.
   Tighten lock nut (2) and install cap (1).
10. Reduce the pressure, at SRV- 70.8 to a value below the required value, and then increase up to the required pressure (350 bar), while observing all gauges.

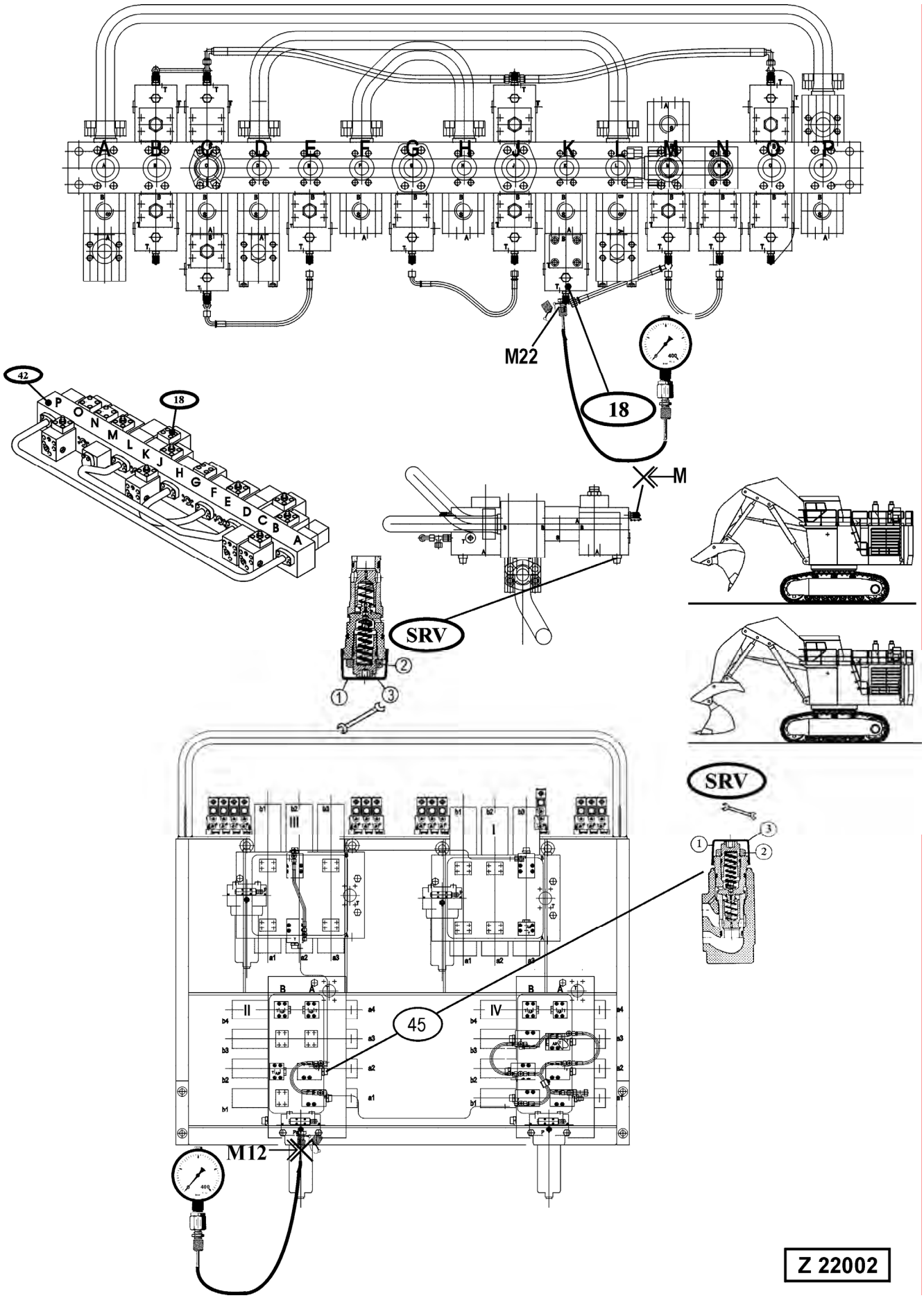
☞
- **Now all gauges will show the same value of 350 bar, but only SRV-70.8 has the correct setting.**

11. Proceed with the other valves in the same manner in the following sequence:
    70.9 ⇨ 70.10

⚠
- **Strong pulsation of the return line hoses, indicates deviation in opening pressure of SRV's and must be avoided.**
  Repeat the adjusting procedure until the oil returns well-balanced via all service line relief valves.

12. Reset the MRV's to 310 bar $^{+ 5 \text{ bar}}$ after the check / adjustment is finished, as follows:
    Remove protective cap (1).
    Loosen lock nut (2).
    Turn set screw (3) -**clockwise** to **increase** pressure, **Counter-clock wise** to **decrease** pressure.
    Tighten lock nut (2) and install cap (1).

☞
- **It is important that the valve body of MRV-valve and the SRV-valve are firmly tightened (with 300 Nm).**
  Otherwise, the internal sealing is not properly which results in loud flow noises and wrong adjustments.


A
B
C
D
E
F
G
H
I
K
L
M
N
O
P
M22
18
42
18
M
SRV
SRV
45
M12
Z 22002

8.1.11 Checks and adjustments of the lowering speed, illustration (Z 22031):

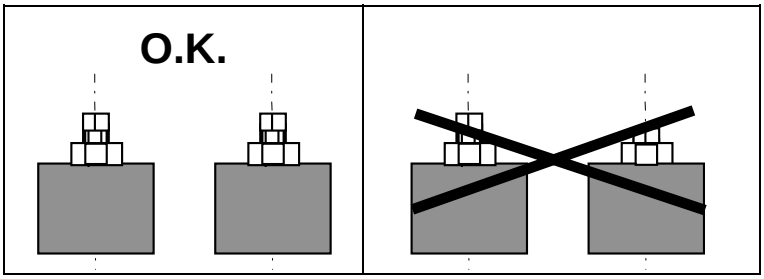
Bucket cylinder BHA

Maximum permissible lowering speed:

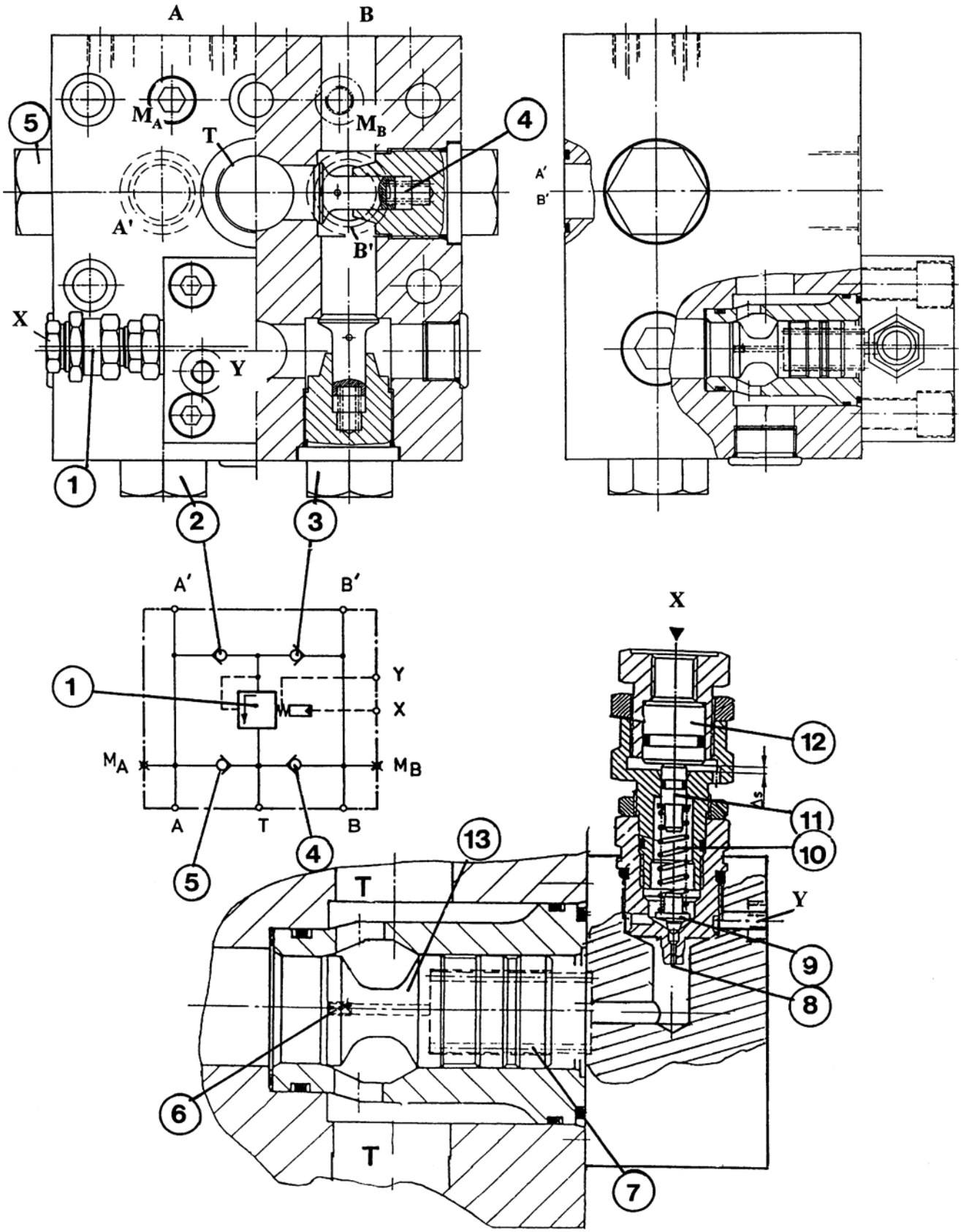
	Cylinder retracting time/meter (s /m)	**Total time (s)**
Bucket BHA	2,4	**5,2**

Adjustments / Checks:

1. Use a stop watch to measure the cylinder running time.
2. Raise the fully extended attachment with **empty** bucket to the maximum height position (A).
3. Shift the engine to high idle speed.
4. Rapidly move the control lever (E19) to the r.h. end position (start the stop watch) and hold it until the final position (B) is reached.(stop the stop watch).
5. If the lowering speed is too high, i.e. the measured time is less than the permissible time, the speed must be reduced by **altering the throttle valves 70.3, 70.4 and 70.12 at the distributor manifold (42).**
   Adjust as follows:
   To decrease the lowering speed loosen the lock nut (1) and turn the bolt (2) cw.
   To increase the lowering speed loosen the lock nut (1) and turn the bolt (2) ccw.
   Since there are several valves throttling the return oil flow of the bucket cylinder the valves must be set synchronously. The adjusting screws have to be turned in by the same amount of revolutions.



6. Check lowering speed again and repeat the adjustment if necessary.
7. If the adjustment is finished tighten lock nut (1).



Z 21935

8.3.1 Travel Circuit

Legend for illustration (Z 22506a):

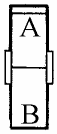
(2 + 4)	Main pumps
(II)	Control block
(IV)	Control block
(14.2)	Remote control valve block
(15)	Remote control valve block
(19)	Rotary distributor
(21.1+ 21.2)	Travel motors
(41)	Main oil reservoir
(55)	Back pressure valve
(56.1+ 56.2)	Travel brake valves
(57.1+ 57.2)	Travel parking (house) brakes
(B48)	Pressure switch, parking brake release pressure
(M4)	Pressure check point for parking brake release pressure
(Y16)	Solenoid valve for travel parking brake
(L9)	Case drain (leak oil) line
(ST)	Pilot pressure line to the travel parking brake

Brief description (Control circuits)
(Study together with the hydraulic and electric circuit diagram).
When the pedals E21a and E21b are moved out of there neutral position, proportional solenoid valves Y67 and Y70 and simultaneously the directional solenoid valves Y28 or Y29 (L.H.-crawler) and Y34 or Y35 (R.H.- crawler) are energized.

(E21a) Control pedal A – forward => Y70 +Y35

Left track

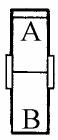
B – reverse => Y70 +Y34

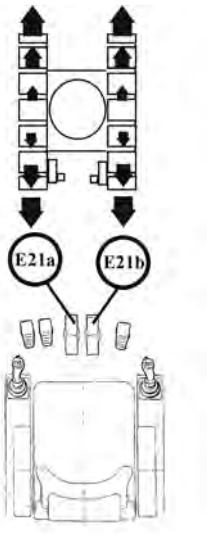


(E21b) Control pedal A – forward => Y67 +Y28

Right track

B – reverse => Y67 +Y29





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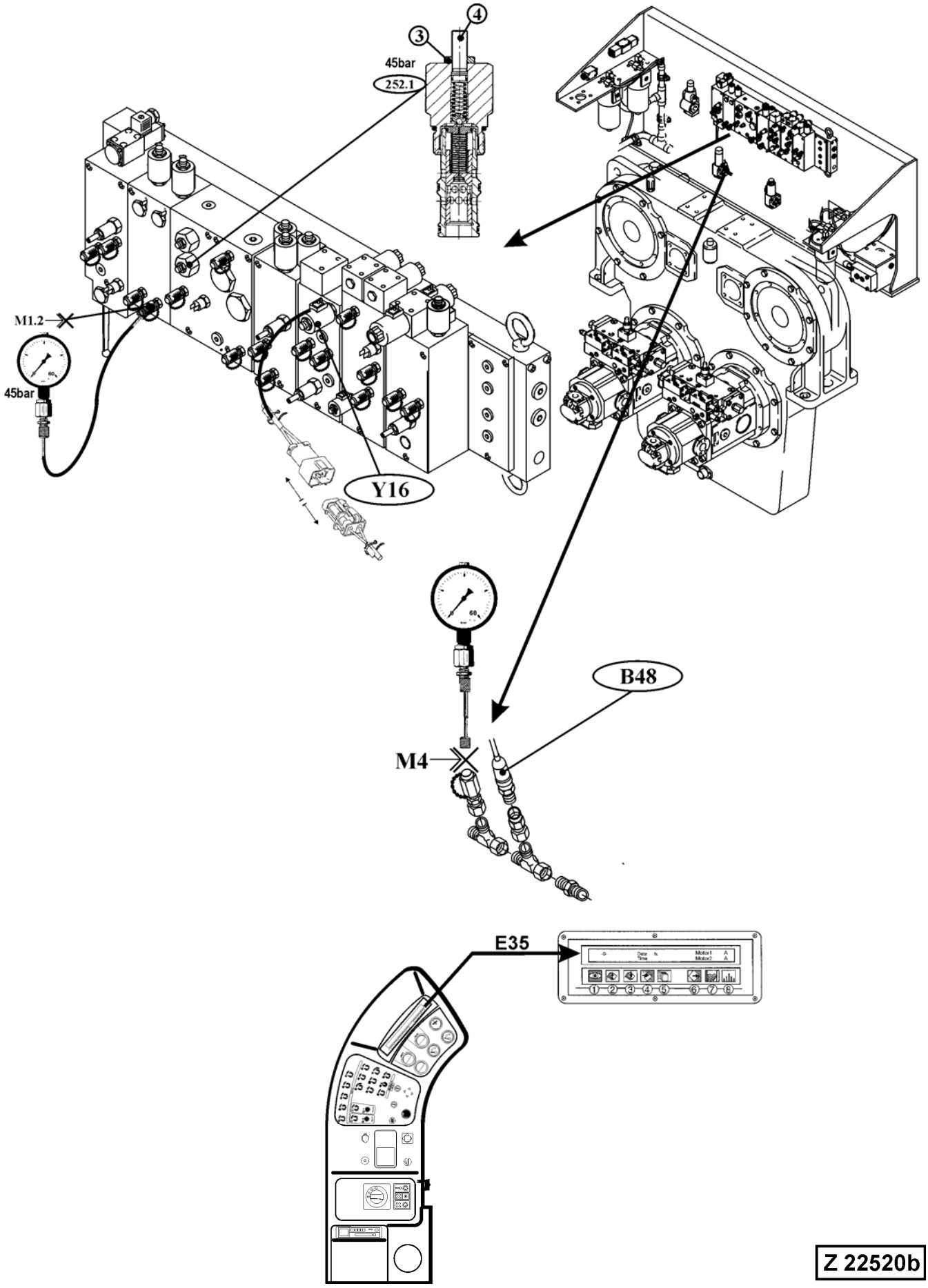

4
3
45bar
252.1
M1.2
45bar
Y16
B48
M4
E35
Z 22520b

9.4 Adjustments / Checks **Cont'd.:**

5. Move the pressure gauge from M11.5 to M29.4
6. Connect pressure check point M11.5 with pressure check point M29.2, using a long pressure gauge hose. (required for the oil supply)
7. Disconnect the pilot pressure line at port X of the pressure increasing valve (141) and close the hose with a plug (P).
8. Loosen lock nut (4) of the pressure increasing valve and screw in set sleeve (5) until piston (1) comes to stop. (substitution of 35bar pilot pressure)
9. Start the motors
10. Stall the hydraulic with the clam opening function (clam cylinders completely retracted) and observe pressure at check point M29.4.
    A pressure of 310 $\pm$ 5 bar must reached within a time period of 10 – 15 minutes and must remain at this value.

△ **The maximum pressure will be shown only after the accumulators are completely filled with oil.**
When the pressure reaches the pre-charge gas pressure (31 bar and 150 bar) the gauge pointer moves slower depending on the gas compression.

If the gauge shows a lower or higher value the pressure increasing valve must be adjusted.

Setting procedure, high pressure stage (Valve 141)

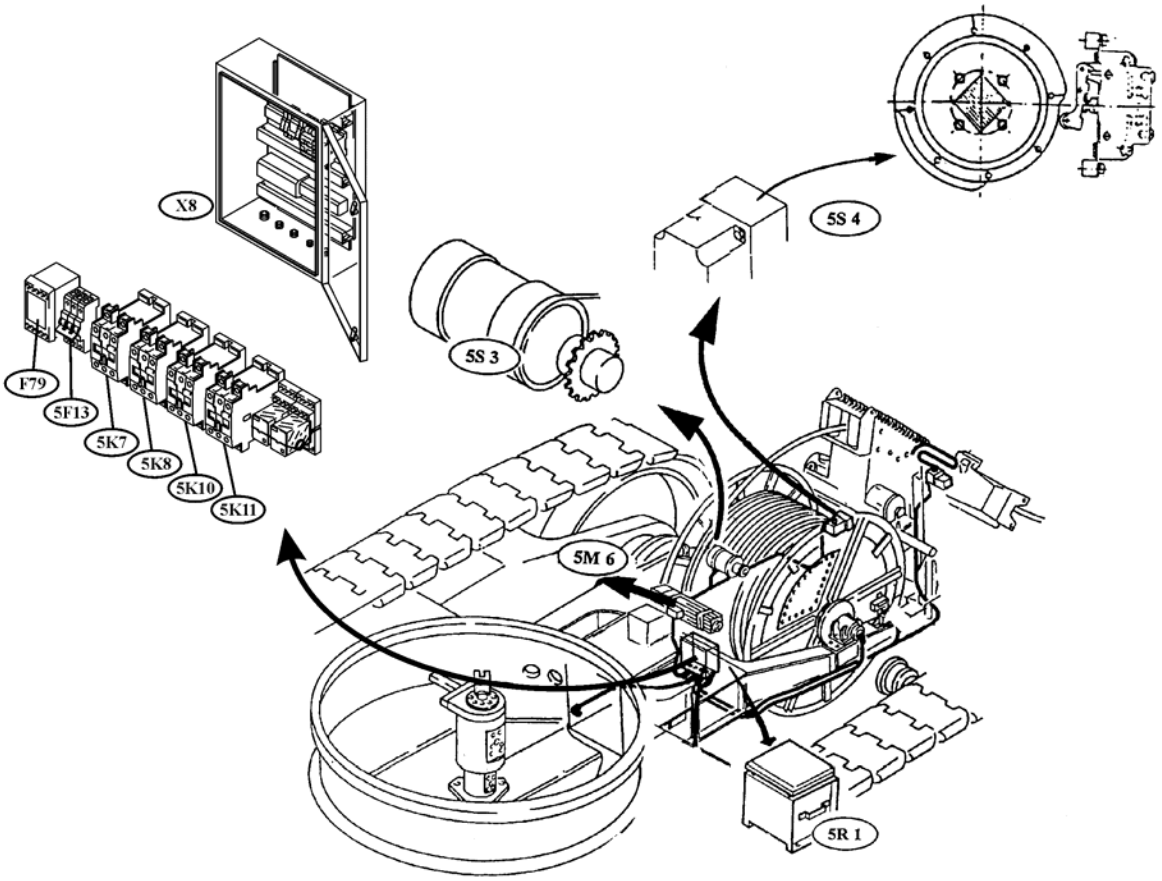
a) Loosen lock nut (2).
b) Adjust pressure with set screw (3).
c) Secure adjustment by tightening lock nut (2).
d) Re-check pressure setting.

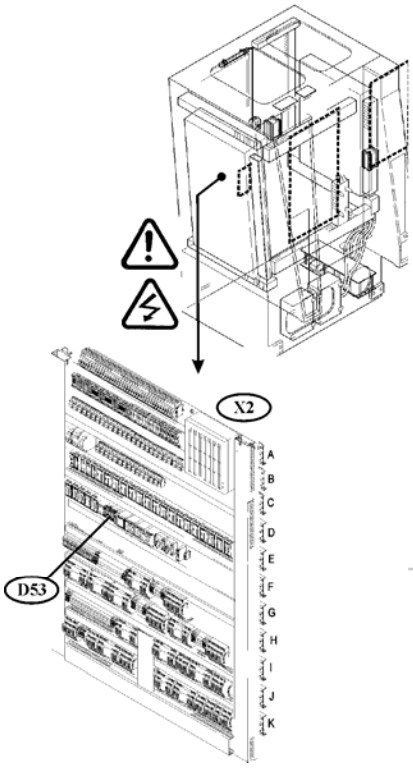
11. The low pressure setting of the pressure increasing valve must now be reset (with the pilot pressure line at port X still disconnected):

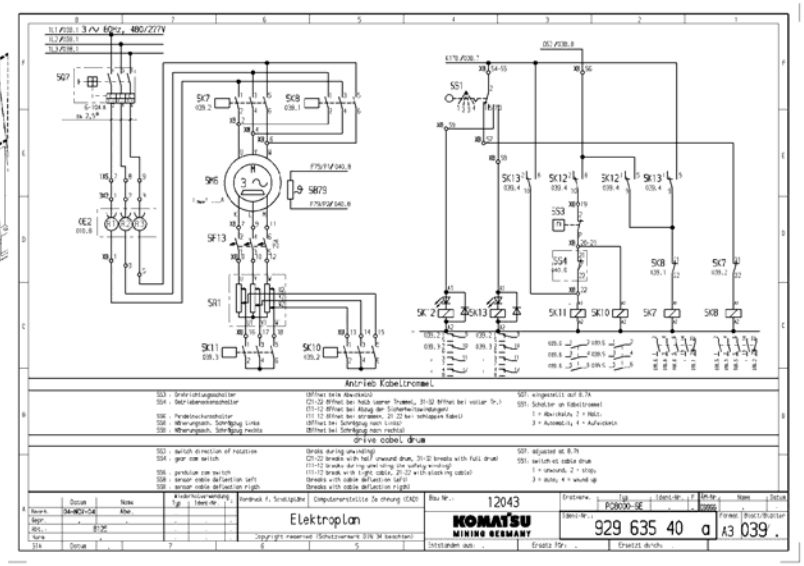
Setting procedure, low pressure stage (Valve 141)

a) Stall the hydraulic with the clam opening function (clam cylinders completely retracted) and observe pressure at check point M29.4.
b) loosen lock nut (4) and turn set screw (5) ccw until gauge at check-point M29.8 shows 35 bar.
c) Tighten lock nut (4).
d) Re-check pressure setting.

continued

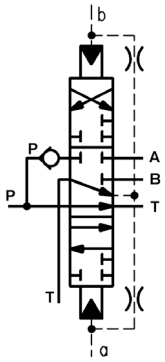
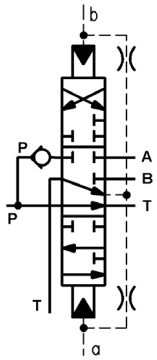
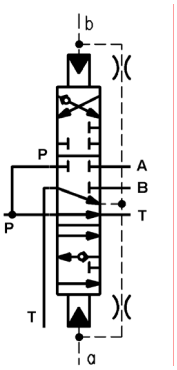
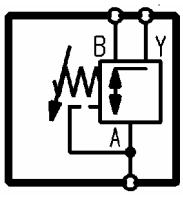

X8
5S 4
5S 3
F79
5F13
5K7
5K8
5K10
5K11
5M 6
5R 1

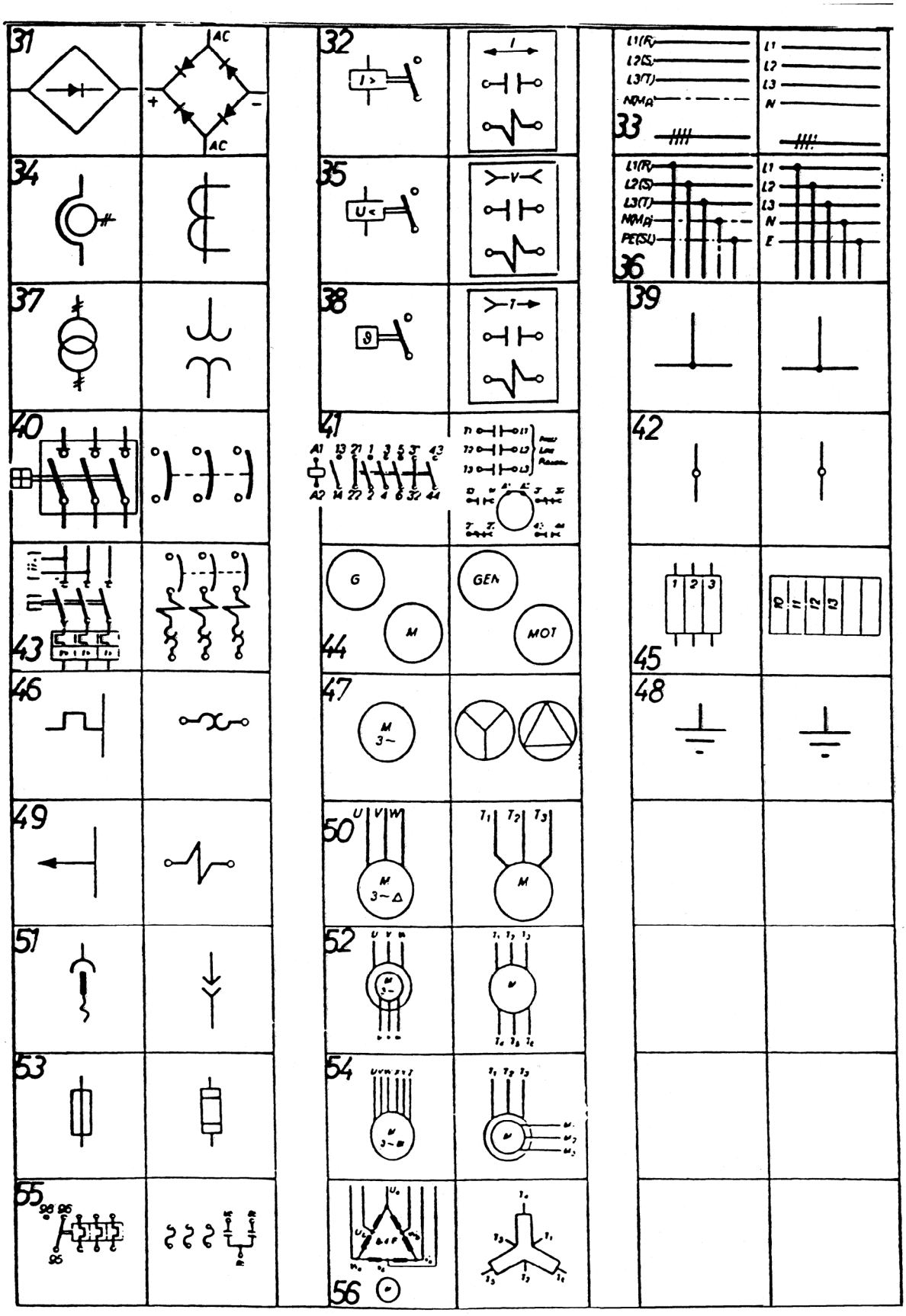

X2
D53


Antrieb Kabeltrommel
drive cabel drum
Elektroplan
12043
929 635 40 a
A3 039.

Z 22834a

12.1 Symbols

12.1.4 Valves and valve components		
Symbol	**Description**	**Used as / at / on**
41 	**Main control valve "standard function"** In neutral position: open pump flow (P-PU) and control port flushing (T – a, T – b), in position a or b closed circulation port (P- PU)	Standard control valve for two directions of cylinder or motor.
42 	**Main control valve "pressure less lowering"** **Neutral position:** open pump flow (P-PU), control port flushing (T– a, T– b) **Position b:** closed circulation port (P-PU), normal function P – B and B - T, **Position a:** open circulation port P – PU, only port B – T connected	Control valve for pressure less lowering. Used to assist the floating function of boom and stick,
43 	**Main control valve "floating function"** **Neutral position:** open pump flow (P-PU), control port flushing (T– a, T– b), **Position b:** closed circulation port (P-PU), normal function P – B and B - T, **Position a:** open circulation port (P – PU) = A, B, T, P connected together via tank	Control valve with floating function in position a, e.g. floating valve for boom or stick, .
44 	**Pressure reducing valve, assembly** Variable inlet pressure at port B and constant lower output pressure at port A, output pressure is adjustable.	Emergency mode pressure (X3-pressure), pilot oil pressure


31
AC
AC
+
-
32
I>
I
33
L1(R)
L2(S)
L3(T)
NPA
L1
L2
L3
N
34
35
U<
V
36
L1(R)
L2(S)
L3(T)
NPA
PE(SU)
L1
L2
L3
N
E
37
38
I
39
40
41
A1
A2
42
43
44
G
M
GEN
MOT
45
1
2
3
46
47
M
3~
48
49
50
U
V
W
M
3~Δ
T1
T2
T3
M
51
52
53
54
55
56

Z 21817

14.1.4 Definitions; Symbols and Abbreviations

≡	Sign used for “corresponds to”
≠	Sign used for “not equal to”
Bit	A bit is the smallest unit for information. It can assume only two conditions: logical 0 or logical 1 (also referred to as logical L-Level and logical H-Level).
Boolean algebra	Mathematical rules for binary variables and conditions. For Boolean equations the following signs are used: Logical AND operation (AND or &) ∧ Logical OR operation (OR or >=1) ∨ Logical Negation (NOT or 0) ¬
Byte	Unit for Information unit comprised of 8 bits. A byte can assume a value between 0 and 255.
Word	Memory unit comprised of 2 byte or 16 bit. A word covers the numeric range from –32767 to +32767.
Clock	Signal pulse
VWP	**V**er**W**altung**P**rogramm: (management program) A control program created by the user.
AWP	**A**n**W**ender **P**rogram: (Application program, user program) A control program created by the user.
AWL	**A**n**W**eisungs**L**iste: (instruction sequence) Representation of a program using alphanumeric signs and symbols as defined in DIN 19239. Programming in AWL (selection logic) is the at present widely applied method of programming.
CMOS	**C**omplementary **M**etal-**O**xide **S**emiconductor: Complementary metal-oxide semiconductor technology with very low-level closed circuit current. These semiconductors are used above all for accumulator and battery buffering.
RAM	**R**andom **A**ccess **M**emory: Read-write memory in which each memory cell can be addressed in order to read, write or delete at any time. RAM losses all of its information when the computer is turned off which is why it is often buffered by accumulators or batteries.
EPROM	**E**rasable **P**rogrammable **R**ead **O**nly **M**emory***:*** Read-only memory erasable by ultraviolet light and electrically programmable. With this memory type, the contents remain intact in the event of a power failure. In the case of **DIGSY plus ®** this memory contains the management program (firmware).

continued

14.5 Function explanations with electrical diagram

14.5.2 Pressure Measuring (Hydraulic System), Illustration Z 22805

(study with the respective circuit diagram)

(**Program run see Flowchart)**

Analogous Inputs:

„EW 14.1“ for pressure sensor B87A (0 up to 500 bar)

Measuring channel: 0.....10 V

Function:

- Voltage supply for the pressure sensor: 24 V
- Output voltages **Ua** (OUT+, pin 2) of the pressure sensors:

Sensor **0 – 0,4 bar** ⇨ K= 25 V / bar

Sensor **0 – 60 bar** ⇨ K= 0,1667 V / bar

Sensor **0 – 500 bar** ⇨ K= 0,02 V / bar

(Pressure sensors with +1 V Offset)

Possible voltage checks:

24 V Supply between supply line 15 (start at circuit breaker) and GND.

Output voltage OUT (pin 2) of the sensor

between GND. Use respective circuit diagram for terminal numbers.

* How to calculate the Output voltage Ua:

Ua = output voltage proportional to the pressure input.

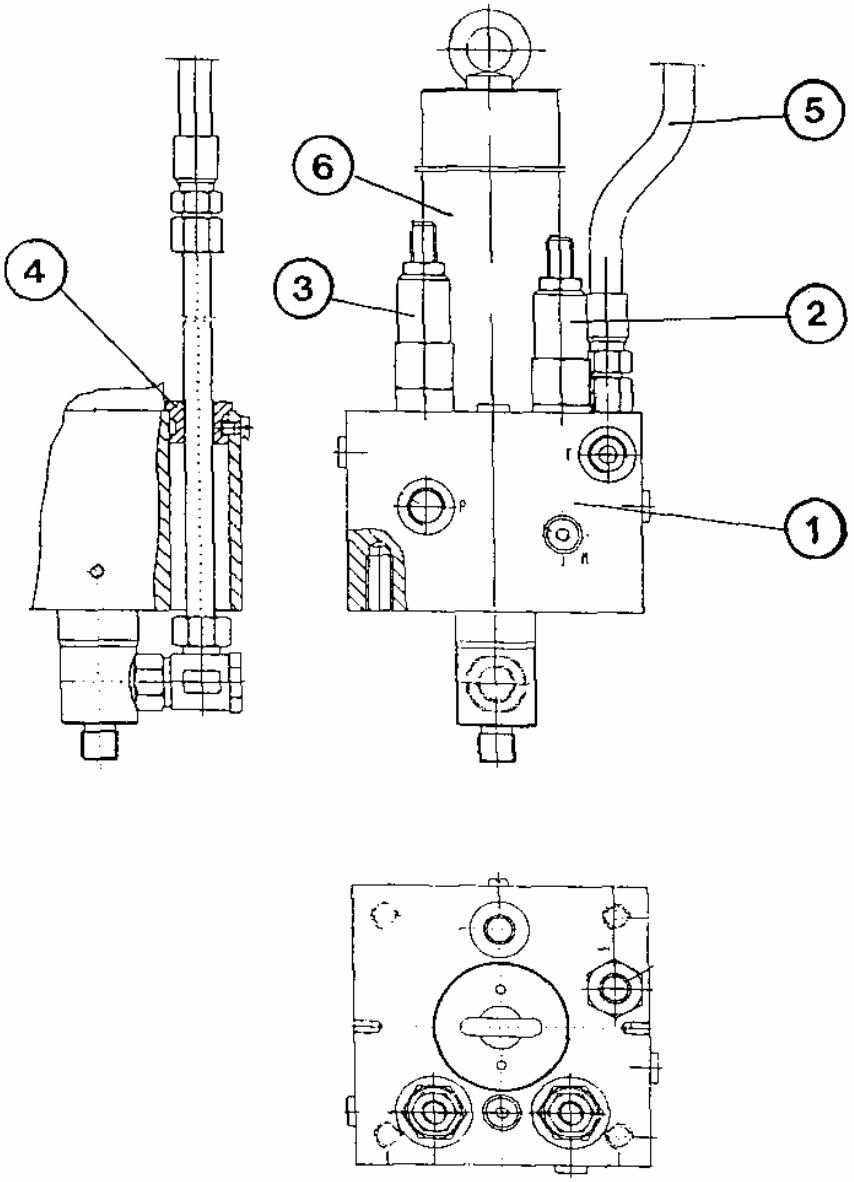
P = input pressure

K = calculation factor for the respective pressure sensor.

Ua = (P x K) + 1 V

Example for 200 bar and a 0 – 500 bar sensor:

Ua = (200 x 0,02) + 1 V = 5 V


6
5
4
3
2
1
Z 21174

Function Pinion type (dummy wheel) system.

Legend: Z 21183a

(1) Lubricant pump drive (Hydraulic cylinder)
(2) Solenoid valve Y9 (Oil pressure supply)
(3) Flow control valve
(4) Pressure reducing valve
(5) Hydraulic oil supply line (Pilot pressure)
(6) Hydraulic oil return line
(7) Vent valve Y9A (Solenoid valve, de-energized open)
(8) Grease supply line to injectors
(9) Lubricant level indication
(10) Lubricant barrel
(11) Pump mechanism
(12) Lubricant filter
(13) Hydraulic pressure test plug (Operating pressure)
(14) Lubricant pressure gauge (Operating pressure)
(15) Vent line to barrel
(16) Breather
(17) Electrical terminal box

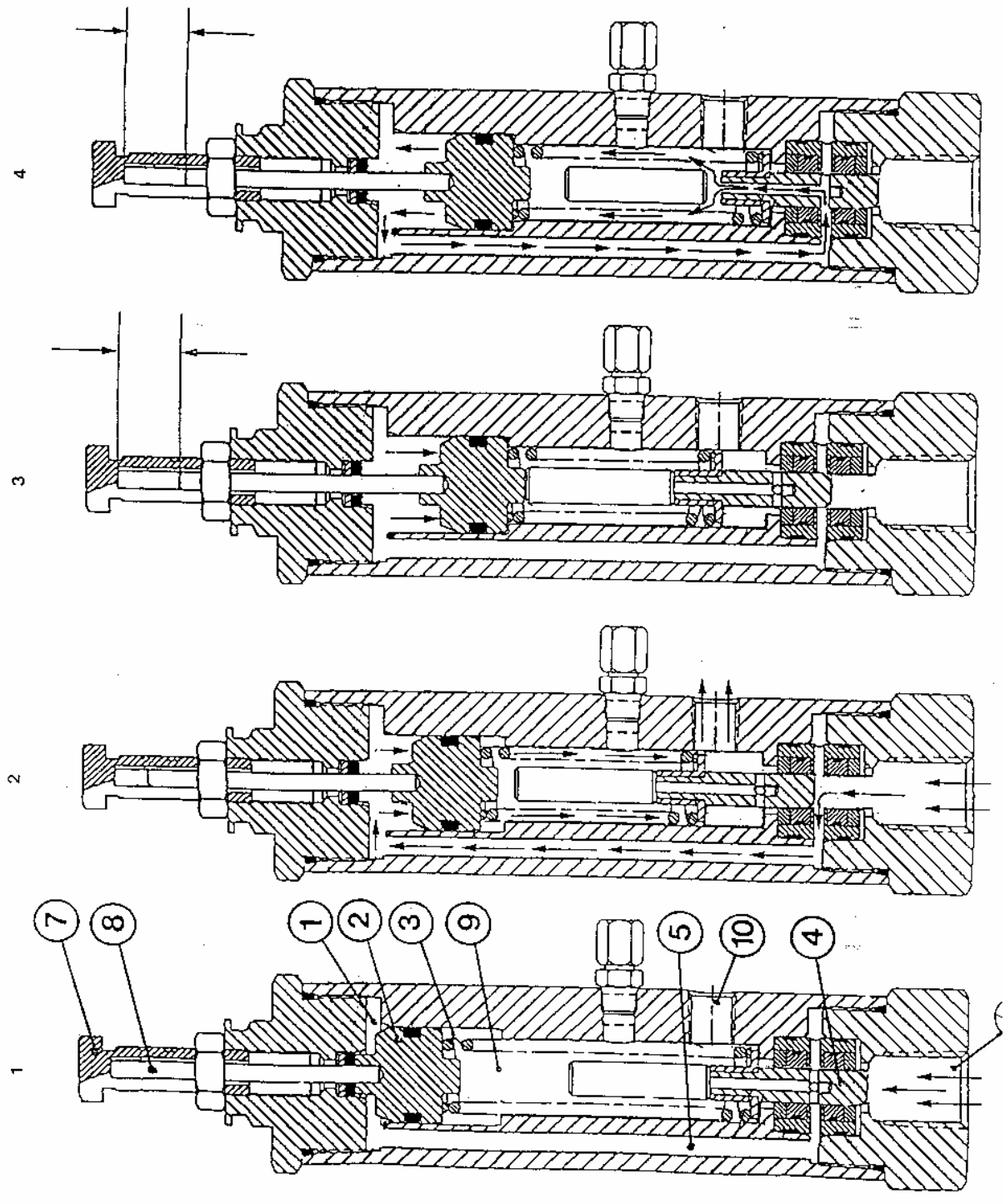
Principle of operation:
By the lubricant pump, the lubricant is supplied to the centered bore hole (B) of the lubrication type pinion (R). Bore hole (B) must be perfectly aligned to the center of the lubrication type pinion (A) to be greased, so that lubricant leaves the tooth flank always when the gear tooth is in contact. The grease outlet (D) of the lubricating type pinion is arranged at a different angle for each tooth, so that the lubricant is distributed in a uniform and perfect manners on the tooth flank of the drive pinion to be lubricated.

Function:
As soon as the adjusted "Pause-Time" elapse the solenoid valves (2 + 7). energized and the lubricant pump (1) start to pump lubricant.
By the function of the solenoid valve (8) the port to the vent line (15) (return line to the lubricant container) closed, thus a pressure built up is possible.
The high-pressure lubricant pump (1) supplies lubricant into the supply line (8). It continuos through the lubricant filter (12) to the injectors (metering valves) (18).

The picture shows an example with one pinion only. There are also machines which have more lubrication type pinion (dummy wheel).

By the injectors the lubricant is forced with full pump pressure via the feed line (19) to the centered bore hole (B) of the lubricating type pinion (R).

continued



Z 21188

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15.3.1 GENERAL INFORMATION ON CLS

A hydraulic driven lubricant pump (Fig. 15-3, Pos. 1 & 11) pumps grease from a barrel (Fig. 15-3, Pos. 10) through pipes (Fig. 15-3, Pos. 8) or hoses to the injectors (Fig. 15-3, Pos. 18). These injectors pump a defined quantity of grease to the lubrication points. After all injectors delivered their grease quantity to the lube points, the grease pump stops and the next lubrication cycle will start after an adjusted time period (pause time). The central lubrication system is only active if the engine is running at high idle.

- After the pilot pressure has been reduced it passes to the hydraulic cylinder (Fig. 15-3, Pos. 1) which operates the grease pump (Fig. 15-3, Pos. 11).
- The hydraulic cylinder (Fig. 15-3, Pos. 1) operates the grease cylinder with 19 – 21 double strokes per minute. In that way 612 - 680 cm^3 (approx. 550 - 612 g) of lubricant are delivered per minute.
- With the vent valve (Fig. 15-3, Pos. 7) closed, the pump continues to cycle until the maximum pressure is achieved and the injectors (Fig. 15-3, Pos. 18) have metered grease to the lubrication points. The pressure in the lubrication system is 180 bar.
- When the maximum system pressure is reached, the end-line switch (Fig. 15-3, Pos. 20) will open.
- The open end-line switch (Fig. 15-3, Pos. 20) signals the controller that the pumping cycle has to be stopped.
- The solenoid valve (Fig. 15-3, Pos. 2) is de-energized and the hydraulic oil stops flowing to the pump (Fig. 15-3, Pos. 1).
- The MTC starts to count down a fixed time (pressure holding time) and an adjustable pause time (rest time between the automatic lubrication cycles).
- The vent valve (Fig. 15-3, Pos. 7) is still closed (solenoid active) and the lubricant pressure will be kept on the pressure (a slow pressure decrease is normal).
- If the countdown for the pressure holding time (5 min) is finished the controller terminates the signal to the solenoid valve (Fig. 15-3, Pos. 7).
- If the vent valve (Fig. 15-3, Pos. 7) is de-energized, it opens and allows the grease pressure to drop to zero.
- All injectors move into their initial position by spring force and recharge themselves for the next lubricant cycle.
- The system is at rest now and ready for another lube cycle.

Manual lube activation
A manual activation of the lubrication systems is possible by operating switch 20S124 (CLS) or 20S126 (SLS) at the dashboard. The MTC counts the number of switch activations and operates the lube system successively, as often as the switch was activated. The system rests between the lube cycles according to an adjustable pause time (pressure relief time).

After the previous loop is completely finished and after the pause time is experied the next lubrication cycle can start if the engine is running at high idle (CLS/SLS) and if a slew movement was activated (SLS).

Component Code Table (according to Wiring Diagram)

System	Solenoid Valve (2)	Vent Valve (7)	End-Line Switch (20)
CLS	62Q507	62Q507a	80B043
SLS	62Q509	62Q509a	62B046

Legend for Fig. 15-11

A	Normal position (rest position) pressure-free
B	Inlet pressure increasing and lubricant application
C	Maximum inlet pressure application completed
D	Inlet pressure relieved and internally reloading
(1)	Set screw
(2)	Indicator stem
(3)	Lock nut
(4)	Injector piston
(5)	Spring
(6)	Slide valve
(7)	Service port
(8)	Discharge chamber
(9)	Passage
(10)	Lubricant supply inlet
(11)	Lubricant outlet
(12)	Measuring chamber

15.13 COMMISSIONING

15.13.1 COMMISSIONING OF THE CLS LUBRICATION SYSTEM

Commissioning procedures for the automatic Central Lubrication System. These procedures must be performed after the first assembly of the excavator, or after repair and exchange of components.

⚠ WARNING

- **Some checks and adjustments can only be done with the engine running. For such jobs two persons are necessary.**
- **Thereby, the controls must not be left unattended, while the other man carries out checks and adjustments.**
- **The service technican on the operator's seat must be skilled in the operation of the excavator.**
- **He must keep constant visual contact with the other service technician and both must agree on suitable communication signals before they start their work.**

1. Visual check of all hose and pipe connections from the lubrication pump station to the lubrication points via the injectors.
2. Check the correct mounting of the lubrication system.
3. Check the correct connection of the hydraulic oil supply line and the tank line.
4. Check the correct electrical connection.
5. Check the correct kind and quality of the respective grease according to the OPERATION AND MAINTENANCE MANUAL. In addition refer to the relevant PARTS & SERVICE NEWS.
6. Check the injector adjustment of each injector. It should be on max. volume, if not, adjust to max. volume, refer to section 15.7.3 on page 15-25.
7. Check if the grease supply line (from the pump station to the injectors) is pre-charged with grease. If not, open (unplug) the supply line close to the end-line switch. Start the engine and activate the lubrication station so often until grease comes out of the open end of the supply line. Stop the engine and close the open supply line.
8. Manually pre-lubricate all bearings with a grease gun of the lube track. To do this, unscrew the dust cap at the second port of each injector and connect the grease gun to the grease nipple. Apply sufficient grease into the bearing until a small amount of fresh grease appears at the bearing seals or open bearings.
9. Adjust the end-line switch if necessary, refer to section 15.9 on page 15-32.
10. Check the lubrication pump speed. If required adjust it, refer to section 15.6.1 on page 15-22.
11. Check the time settings of the pause time at the VHMS *Real Time Monitor*. Adjust the suggested settings which are given in the PM-CLINIC forms. This is the basic setting and also a guaranty for sufficient lubrication.

NOTE: A fine adjustment is possible to adapt the lubricant apply to the working and environmental conditions by minimized lubricant consumption.

12. Start the engine and activate several cycles of the CLS lubrication.
13. Set the lubrication cycle counter to zero and note the actual working hours from the hour meter.
14. The excavator is now ready for operation.

Legend for Fig. 15-10**:**

(1)	Plug screw
(2)	Plug screw gasket
(3)	Filter element
(4)	Filter housing
(5)	Spring guide
(6)	Spring

Task

The in line filter prevent the lubrication injectors against contamination.

⚠ CAUTION

Before servicing stop the motor and remove ignition key in order to prevent operation of the system!

NOTE: A clogged filter element will be moved against the spring force by the lubricant pressure and unfiltered lubricant reaches the system!

For Maintenance proceed as follows:

1. Remove plug screw (Fig. 15-10, Pos. 1) using 36 mm width wrench.
2. Remove plug screw gasket (Fig. 15-10, Pos. 2).
3. Take out spring (Fig. 15-10, Pos. 6), spring guide (Fig. 15-10, Pos. 5) and filter element (Fig. 15-10, Pos. 3).
4. Clean all parts and inspect for damage.

Replace as necessary.

5. Insert filter element, spring guide (Fig. 15-10, Pos. 5) and spring.
6. Install plug screw (Fig. 15-10, Pos. 1) with gasket (Fig. 15-10, Pos. 2) and tighten with a wrench.

NOTE: For service intervals refer to MAINTENANCE MANUAL

15.5.2 INJECTORS

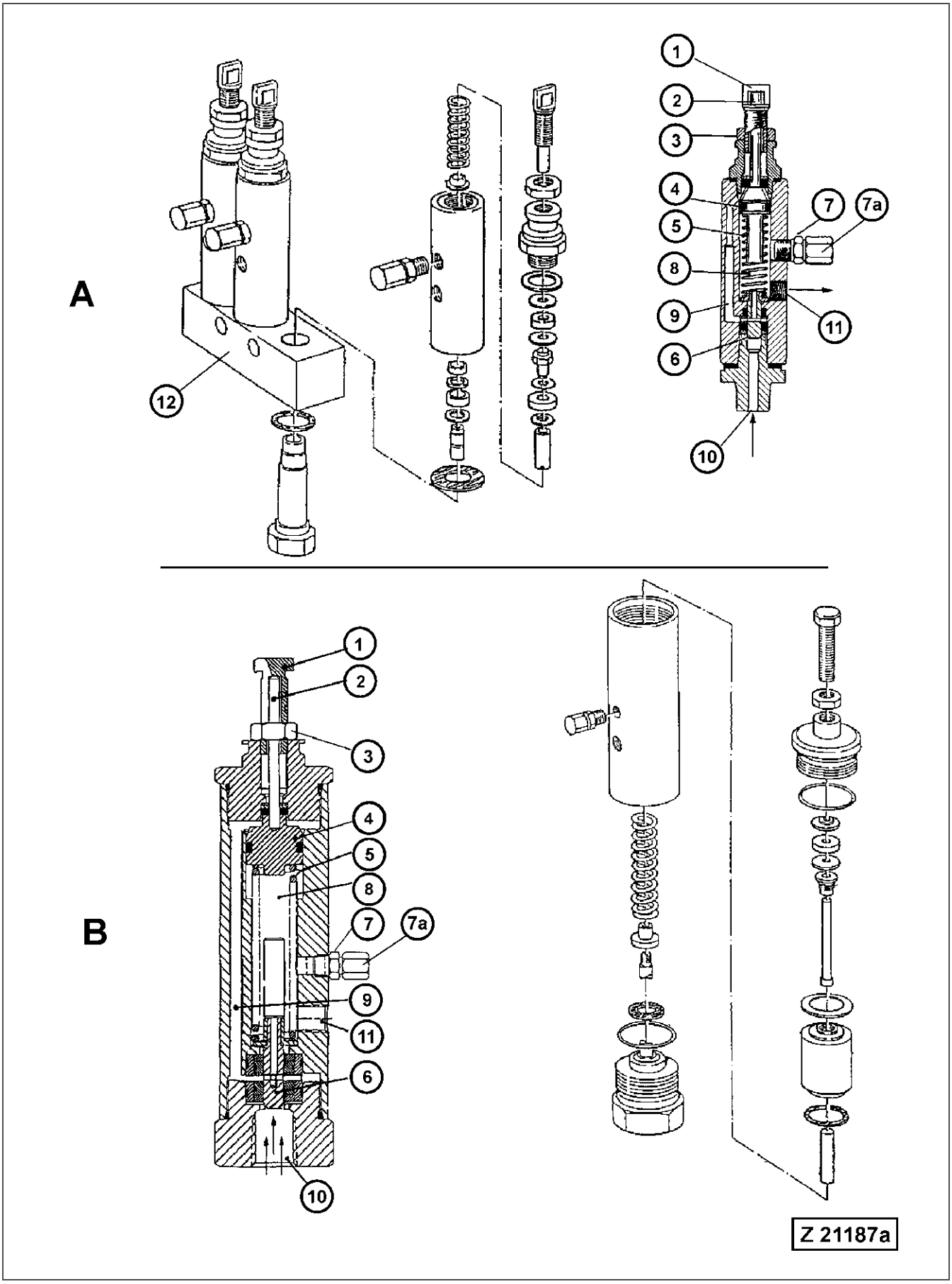


Fig. 15-21 Injectors

COPYRIGHT

2.3 SOUND PRESSURE LEVEL IN THE OPERATOR'S CAB.

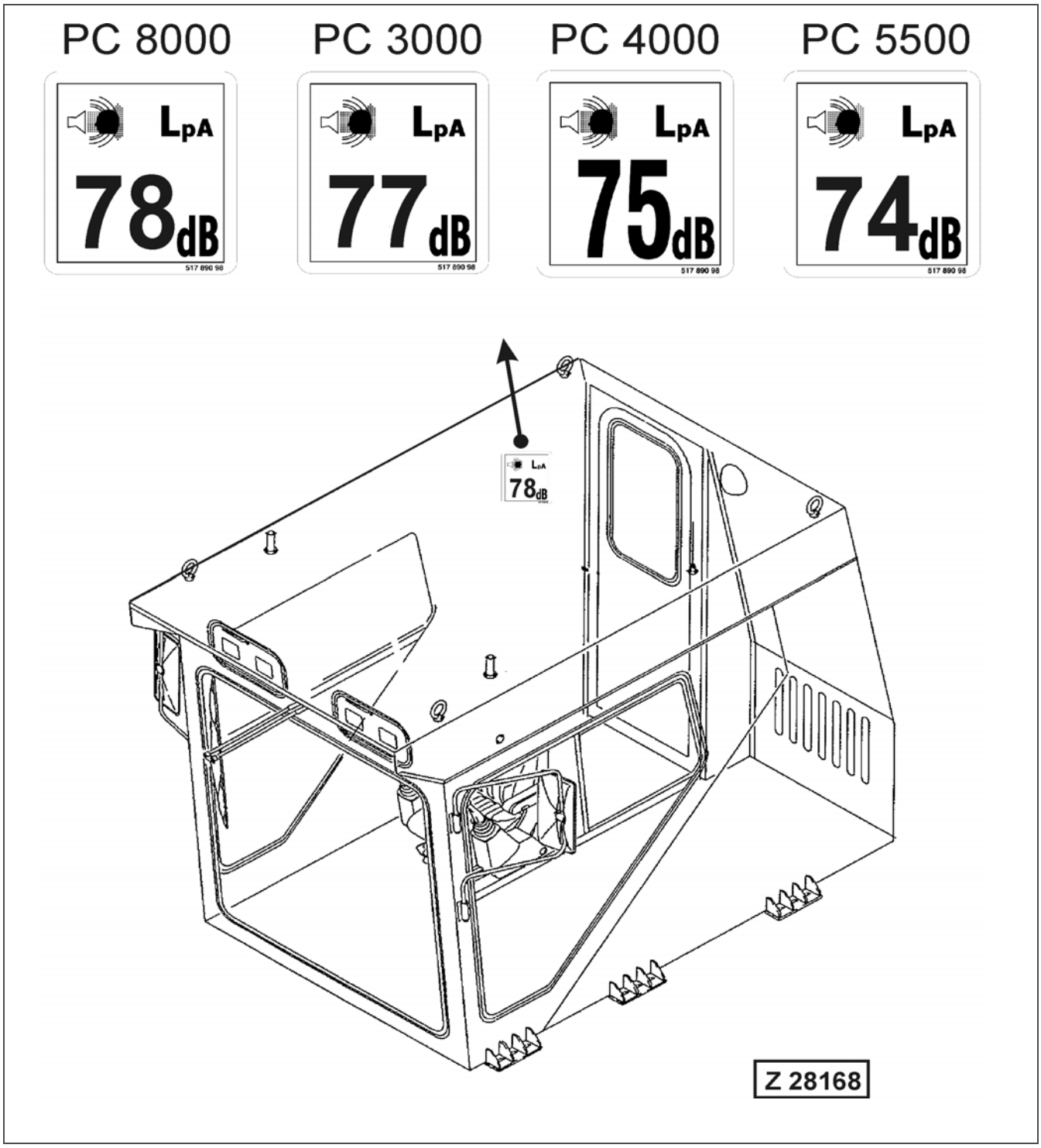


Fig. 2-1

The sound pressure level in the operator's cab is measured according to ISO 6396 (Dynamic test method).

The sound pressure value is also shown on the decal attached to the wall inside the operator's cab, see Fig. 2-1.

2.4.11.5 OPERATIONS ON SLOPES

– When working on slopes, there is a hazard that the machine may lose its balance and turn over when the swing or work equipment are operated. This may lead to serious injury or property damage, so always provide a stable place when carrying out these operations, and operate carefully.

– Do not swing the work equipment from the uphill side to the downhill side when the bucket is loaded. This operation is dangerous, and may cause the machine to tip over.

– If the machine has to be used on a slope, pile the soil to make a platform (A on Fig. 2-29) that will keep the machine as horizontal as possible.

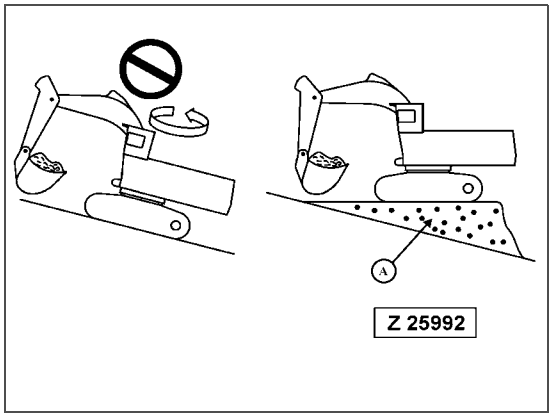


Fig. 2-29

2.4.11.6 PROHIBITED OPERATIONS

– Never dig the work face under an overhang. There is a hazard that rocks may fall or that the overhang may collapse and fall on top of the machine (Fig. 2-30).

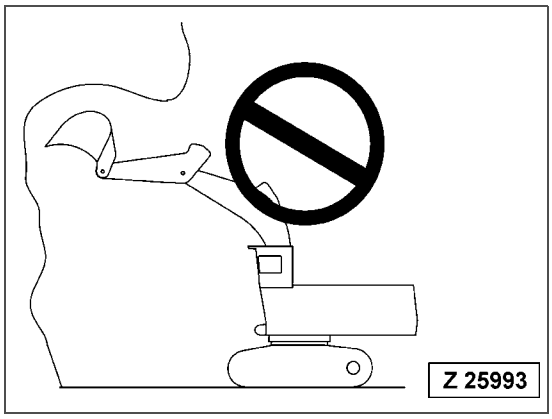


Fig. 2-30

– Do not excavate too deeply under the front of the machine. The ground under the machine may collapse and cause the machine to fall (Fig. 2-31).

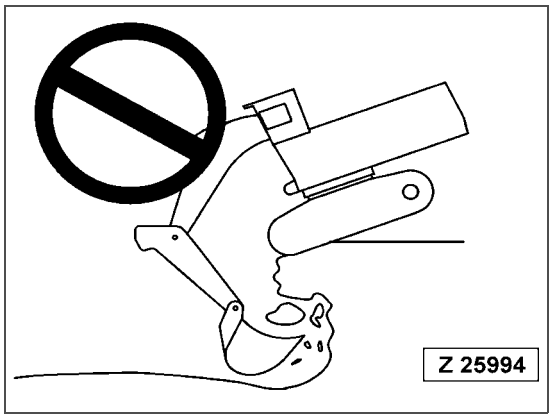


Fig. 2-31

Legend for Fig. 2-51:

(1) Safety Harness according to EN 361

(2) Strap-Type Fall Absorber according to DIN EN 355

(3) Railings (attachment points)

(4) Walkway on the boom

(A) Shoulder Strap

(B) Back Plate

(C) Catching Hook

(D) Shoulder-Strap Fixing

(E) Belly Strap

(F) Holding Hook

(G) Hold-Back Hook

(H) Pelvis Strap

(J) Leg Strap

2.7.5.2 INSTRUCTIONS FOR USE

Open the lock, lift the harness by the catch hook (C), ensuring the leg straps hang below (J). Pull the harness over the shoulders as you would a jacket. Insert the end of the belly strap (E) through the buckle and tighten securely, as shown in the illustration (Fig. 2-50).

Prevent the shoulder straps from slipping by fastening the breast strap. Pull the leg straps (J) between the legs and securely buckle them at the front as illustrated. Adjust the harness so that it snugly fits the body ensuring that the catching hook (C) is in the center of the back.

The safety harness is a personal accessory and should only belong to its owner.

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.

3.3.3 FINAL ALIGNMENT OF THE ELECTRIC MOTOR

Special tools:	Laser measuring equipment, PN 232 813 40
Additional equipment:	Shim set, PN 961 786 40
★	If there is nothing mentioned explicitly, tighten all bolts according to KOMATSU company standard, refer to section 6.8 on page 6-13.

The electric motor must be aligned in order to assure the optimal straight-line power transmission from the motor via the coupling halves to the PTO.

Three kinds of misalignment in the power transmission must be compensated:

– Parallel misalignment
– Angular misalignment
– Axial misalignment

For the complete description of the alignment procedure (including laser device and shim set) refer to the PARTS & SERVICE NEWS No. "AH11517" latest release.

3.5.2.4 REMOVAL OF MAIN PUMP 2

Special tools:	n/a
Additional equipment:	Safety harness in conformity with DIN EN 361 Crane Mobile elevator working platform (articulated boom) Oil drain pans
	Main pump 2 assembly: 526 kg Walkway frame with all gratings: 90 kg
	Dogman/rigger
★	For further information about the needed blind plugs, refer to section 6.9 on page 6-17.

REMARKS: For information about the main pump's location, refer to section 3.5.1 on page 3-26.

1. Carry out the preparatory work, refer to section 3.5.2.1 on page 3-28.
2. Mark all pipes and hoses at main pump 2 assembly and the pilot oil pump.

⚠ DANGER

HYDRAULIC PRESSURE!

The hydraulic system may be pressurized. Opening any hydraulic lines under pressure will result in blindness, serious injury or permanent disfigurement.

Make sure that the pressure is relieved before any hydraulic lines will be removed.

3. Remove all hoses from the hydraulic pilot oil pump (Fig. 3-32, Pos. 1), refer to section 3.5.4.1 on page 3-41.
4. Disconnect the high pressure hose (Fig. 3-32, Pos. 2) and the the suction hose (Fig. 3-32, Pos. 3) from the main pump assembly.
5. Disconnect the load sensing hose (Fig. 3-32, Pos. 4) and two control hoses from the control block (Fig. 3-32, Pos. 5).
6. Disconnect the bearing flushing/lubrication hose from the right side of pump mounting flange (Fig. 3-32, Pos. 6).

REMARKS: When the pump hoses are disconnected, the oil inside the piping will flow out. Catch it in an oil pan.

Cap the openings with blind plugs to avoid contamination.

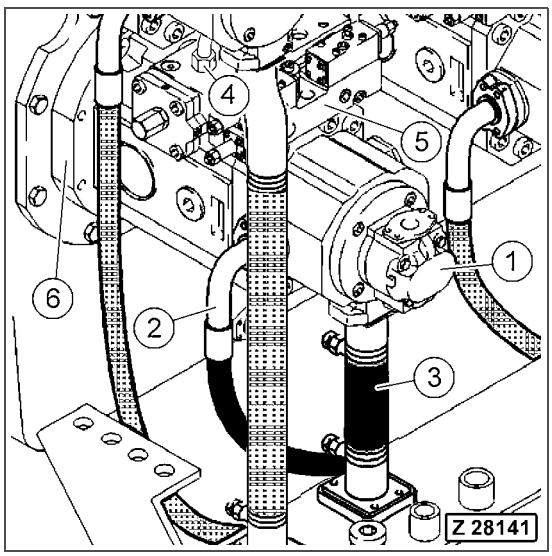


Fig. 3-32

7. Dismantle the hose mounting plate between main pump 2 and main pump 3.

3.6.1.1 REMOVAL OF HYDRAULIC COOLER FAN

Special tools:	n/a
Additional equipment:	Mobile elevator working platform (articulated boom)
	Hydraulic cooler fan: 19,6 kg
	Second person to handle the fan

1. Prepare an area of flat ground large enough to accommodate the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.).
2. Park the machine on the prepared flat ground area.

REMARKS: If the ground condition is too poor to guarantee safe and stable stand of the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.), make sure that the machine is moved to any location with appropriate ground condition.

3. Isolate the machine according to local regulations.
4. Open the swing out cooler (Fig. 3-51, Pos. 1). to gain access to the hydraulic cooler fans (Fig. 3-51, Pos. 2).

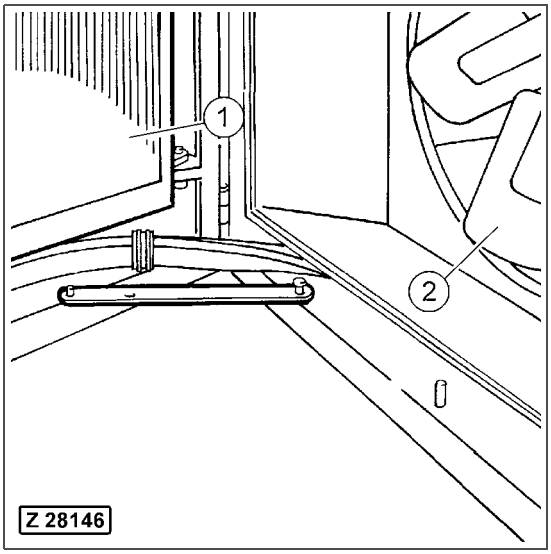


Fig. 3-51

⚠ CAUTION

SHARP BLADE EDGES!

Fan blades could have sharp edges. May result in injury to the hands due to cuts.

Use protective gloves.

5. Remove the attaching bolts (Fig. 3-52, Pos. 1) with the locking plates (Fig. 3-52, Pos. 2). Discard the locking plates.
6. Remove the cooler fan (Fig. 3-52, Pos. 3) from the drive shaft (Fig. 3-52, Pos. 4).

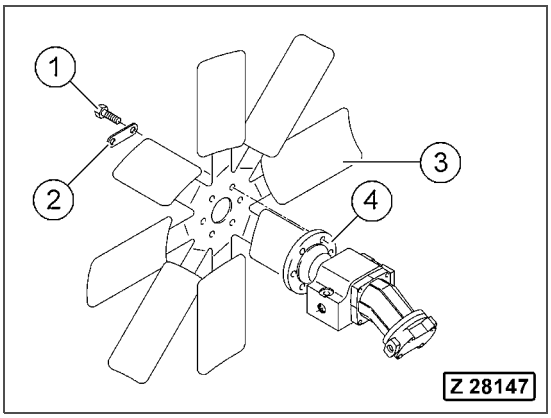


Fig. 3-52

5. Disconnect the hydraulic hoses (Fig. 3-79, Pos. 1), leading to the hydraulic coolers, from the hydraulic oil reservoir.

REMARKS: When the hydraulic hoses are disconnected, the oil inside the piping will flow out. Catch it in an oil pan. Cap the openings with blind plugs to avoid contamination.

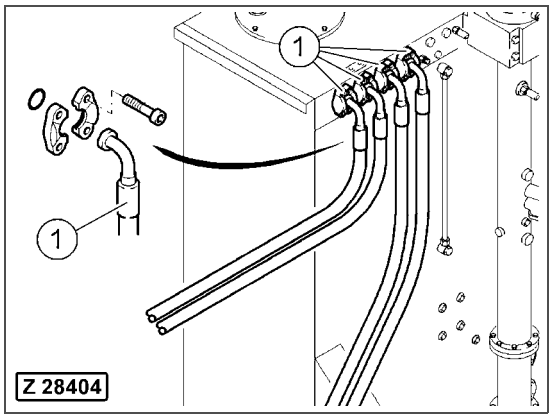


Fig. 3-79

6. Loosen all clamps (Fig. 3-80, Pos. 2) mounted at the hydraulic oil reservoir to clear all hydraulic lines from the hydraulic oil reservoir (Fig. 3-80, Pos. 3).

7. Mark and disconnect all hydraulic lines (Fig. 3-80, Pos. 1) from the hydraulic oil reservoir.

REMARKS: When the hydraulic hoses/pipes are disconnected, the oil inside the piping will flow out. Catch it in an oil pan.
Cap the openings with blind plugs to avoid contamination.

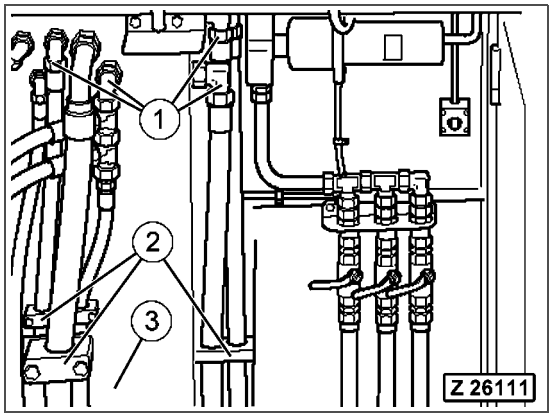


Fig. 3-80

8. Disconnect all hydraulic lines from the return oil collector tube (Fig. 3-81, Pos. 7).

REMARKS: When the hydraulic hoses/pipes are disconnected, the oil inside the piping will flow out. Catch it in an oil pan.
Cap the openings with blind plugs to avoid contamination.

9. Shut the cock valves at the hoses (Fig. 3-81, Pos. 2 - 4) and disconnect the hoses behind the transfer pump (Fig. 3-85, Pos. 1) but directly in front of the cock valves.

10. Loosen the clamps (Fig. 3-81, Pos. 5) to clear hoses from the hydraulic oil reservoir.

11. Remove the grating (Fig. 3-81, Pos. 6).

12. Disconnect and clear the harness of the transfer pump.

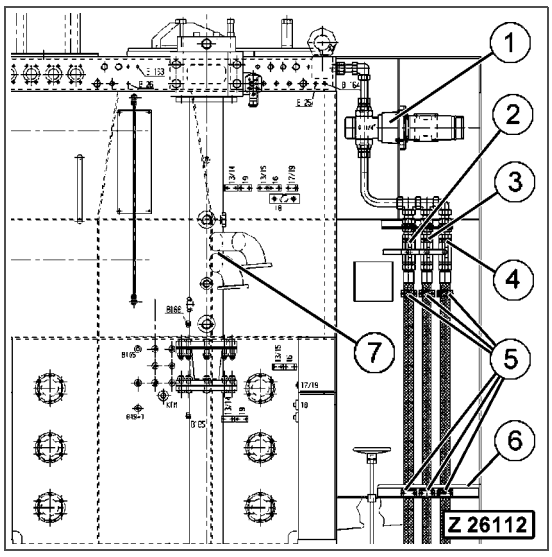


Fig. 3-81

12. At main control valve block II / IV insert a swivel hoist ring into a thread of the SAE flange instead of one bolt when installing the blind plug.
    At main control valve block I / III insert a swivel hoist ring into the thread of a pressure filter mounting bolt.

REMARKS: If rigid lifting eyes are installed at the main control valve blocks, replace them by swivel hoist rings.

13. Sling main control valve block at the hoist rings.

⚠ DANGER

FLOATING LOADS!

Death or serious injury will result due to swinging or downfall of heavy machine parts.

When moving machine parts using a crane, make sure that nobody steps below or in close range to the lifted machine part.

14. Remove the mounting bolts and dismantle the main control valve block from the control valve carrier using a crane.

3.6.7.6 REPLACEMENT OF ACV ON MAIN CONTROL VALVE BLOCKS

Special tools:	n/a
Additional equipment:	n/a
★	If there is nothing mentioned explicitly, tighten all bolts according to KOMATSU company standard, refer to section 6.8 on page 6-13.

REMARKS: Ensure that the mating surfaces are clean and free of paint before assembly.
Fit new O-rings to the ACV.

1. Fit new O-rings (Fig. 3-120, Pos. 1) and support rings (Fig. 3-120, Pos. 2) to the valve body (Fig. 3-120, Pos. 4).

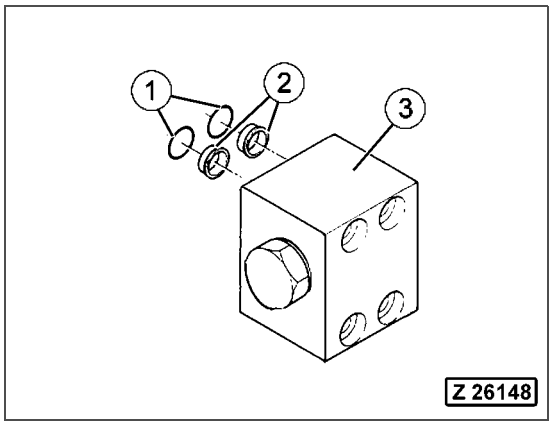


Fig. 3-120

2. Carry out installation in reverse order to removal.
3. Bleed air from the hydraulic system, refer to Operation & Maintenance Manual, chapter 4, section "HYDRAULIC SYSTEM - CHANGE OIL, REPLACE SUCTION STRAINERS AND PULSATION DAMPER" and to the PARTS & SERVICE NEWS No. "AH01513".
4. Add hydraulic oil up to the specified level.

10. Remove swing motor (Fig. 3-136, Pos. 2) from the slew gear box, refer to section 3.7.2.1 on page 3-133.

REMARKS: Leave the hydraulic hoses and the slew service brake valve (Fig. 3-136, Pos. 1) attached to the swing motor.

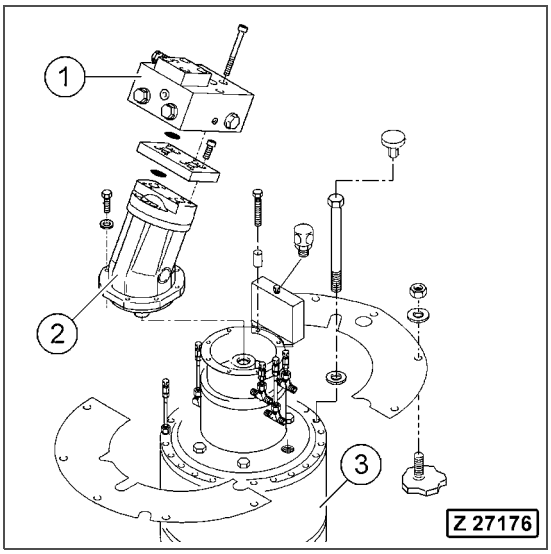


Fig. 3-136

⚠ DANGER

HYDRAULIC PRESSURE!

The hydraulic system may be pressurized. Opening any hydraulic lines under pressure will result in blindness, serious injury or permanent disfigurement.

Make sure that the pressure is relieved before any hydraulic lines will be removed.

11. Disconnect the oil pressure line from the slew parking brake.

REMARKS: When the oil pressure line is removed, hydraulic oil from inside the line and the brake will flow out. Catch it in an oil pan.
Cap the openings with blind plugs to avoid contamination.

12. Remove the cover plates (Fig. 3-137, Pos. 3).

13. Remove the protection caps (Fig. 3-137, Pos. 1) from the bolt heads and remove the slew gear mounting bolts (Fig. 3-137, Pos. 2). Discard the bolts.

14. Insert swivel hoist rings (M16) displaced by 90° into the threads of the swing motor mounting bolts and attach a crane.

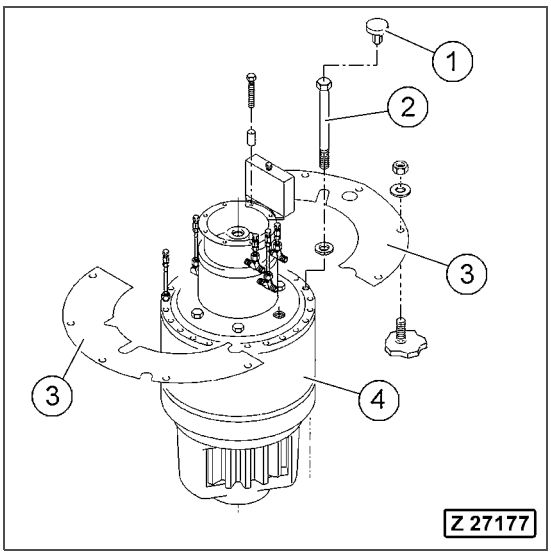


Fig. 3-137

⚠ DANGER

FLOATING LOADS!

Death or serious injury will result due to swinging or downfall of heavy machine parts.

When moving machine parts using a crane, make sure that nobody steps below or in close range to the lifted machine part.

15. Remove the slew gear box (Fig. 3-137, Pos. 4) using a crane.

9. Carry out further installation in reverse order to removal.

NOTICE

BRAKE NOT BLED!
The slew parking brake can not be released completely due to air in the hydraulic system. This may cause severe damage to the brake lamellas.

Before initial operation or after repairs on the hydraulic circuit, all slew parking brakes have to be vented at the oil pressure port.

10. Bleed the slew parking brake at the pressure oil port.

NOTE! Make sure to use the specified bolts and torques for the swing motor mounting bolts, refer to section 3.7.2.2 on page 3-135.

Fill specified oil into the motor adapter housing, up to level gauge marking.
Fill specified oil into the brake housing, approx. 0.2 liters.
Refer to the Operation & Maintenance Manual, chapter 4, section "SWING GEARS AND MOTOR ADAPTER HOUSING - CHANGE OIL".
For the proper lubricants, refer to the Operation & Maintenance Manual, chapter 4, section "FLUIDS AND LUBRICANTS".

11. Add specified hydraulic oil up to the specified level.

12. Check the slew parking brake for proper function. Refer to the Service Manual.

3.7.6.2 REPLACEMENT OF THE LUBRICATION PINION ASSEMBLY

Special tools:	n/a
Additional equipment:	Safety harness in conformity with DIN EN 361 Mobile elevator working platform
	Pinion cover: 2.5 kg Lubrication pinion assembly: 14 kg
	If there is nothing mentioned explicitly, tighten all bolts according to KOMATSU company standard, refer to section 6.8 on page 6-13.

NOTE! Always wear a safety harness when working at the lubrication pinion on the elevator working platform.

1. Carry out installation in reverse order to removal.

REMARKS: A second person is required for this work.

2. After installation is complete, the swing circle lubrication system has to be activated manually.
   Activate the switch S26 at the dash board until the correct pressure is reached.

REMARKS: There may be a time gap up to 11 minutes until the next manually started cycle is carried out. Refer to the time table in the flow chart.

3. Reset the lubrication cycle counter of the slew ring lubrication system. Refer to the Operation & Maintenance Manual, chapter 3, section "SWING CIRCLE PINION LUBRICATION SYSTEM SLS".

3.9.5 OPERATOR’S SEAT

3.9.5.1 REMOVAL OF THE OPERATOR’S SEAT

Special tools:	n/a
Additional equipment:	Crane
	Operator’s seat: 62 kg
	Dogman/rigger

1. Prepare an area of flat ground large enough to accommodate the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.).
2. Park the machine on the prepared flat ground area.

REMARKS: If the ground condition is too poor to guarantee safe and stable stand of the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.), make sure that the machine is moved to any location with appropriate ground condition.

3. Isolate the machine according to local regulations.
4. Disconnect the wire harness connector (Fig. 3-184, Pos. 1) of the air suspension.
5. Remove both control lever carriers (Fig. 3-184, Pos. 2 and 3).
6. Remove all mounting bolts (Fig. 3-184, Pos. 4) from the cover plate (Fig. 3-184, Pos. 5).
7. Remove the cover plate (Fig. 3-184, Pos. 5) by removing all seat mounting bolts (Fig. 3-184, Pos. 6) and nuts (Fig. 3-184, Pos. 7) from the operator’s seat (Fig. 3-184, Pos. 8).

REMARKS: A second person is required to carry the operator’s seat out of the operator’s cab.

8. Sling the operator’s seat and lift it off the machine using a crane.

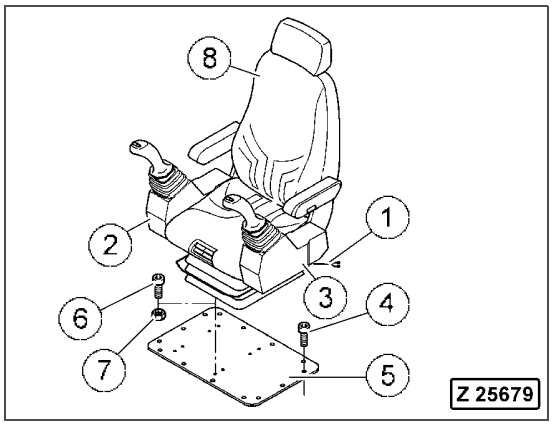


Fig. 3-184

⚠ DANGER

RISK OF EXPLOSION!

Blindness, serious injury, permanent disfigurement and scarring, or death will result.

Do not weld, flame-cut, grind, or drill at the counterweight!
Follow the instructions given in PARTS & SERVICE NEWS No. "AH04518" for expelling the gases from the counterweight chambers!

The chambers of the counterweight are filled with a mixture of concrete, granulated ore and steel pellets. This mixture can create explosive gases which will accumulate in the chambers of the counterweight.
Before any welding, flame-cutting, grinding, or drilling procedures are carried out on the counterweight, it is vital to expel these gases from the counterweight chambers. Failure to properly expel the gases from the counterweight chambers can result in an explosion with serious personal injury or death.
Follow the instructions given in PARTS & SERVICE NEWS No. "AH04518" for expelling the gases from the counterweight chambers.

3.12.1 REMOVAL OF THE COUNTERWEIGHT

Special tools:	Hydraulic torque wrench, PN 232 615 40 Electro-hydraulic pump set, PN 793 375 73 65 mm hexagon impact socket wrench, PN 232 521 40
Additional equipment:	Safety harness in conformity with DIN EN 361 Mobile elevator working platform Crane
	Counterweight: 37,000 kg
	Dogman/rigger

NOTE! Always wear a safety harness when working at the counterweight and on the elevator working platform.

1. Prepare an area of flat ground large enough to accommodate the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.).

2. Park the machine on the prepared flat area and position the bucket on the ground.

REMARKS: If the ground condition is too poor to guarantee safe and stable stand of the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.), make sure that the machine is moved to any location with appropriate ground condition.

3. Isolate the machine according to local regulations.

8. Open the slip ring unit (Fig. 3-217, Pos. 1) and disconnect the high voltage power supply cables and wiring leading into the slip ring unit.
9. If equipped, disconnect the extinguishing agent hose (Fig. 3-217, Pos. 2) of the fire suppression system from the slip ring unit.
10. Sling the slip ring unit at the installed hoist rings to a crane.

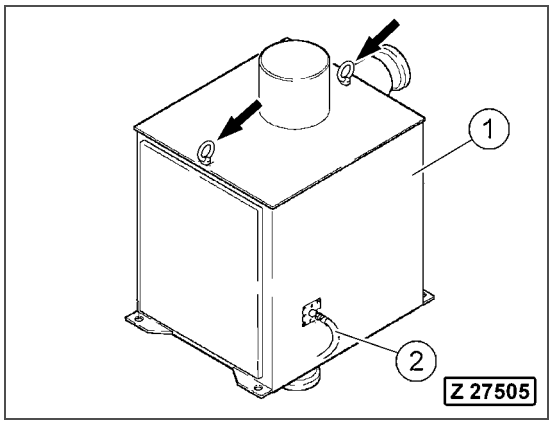


Fig. 3-217

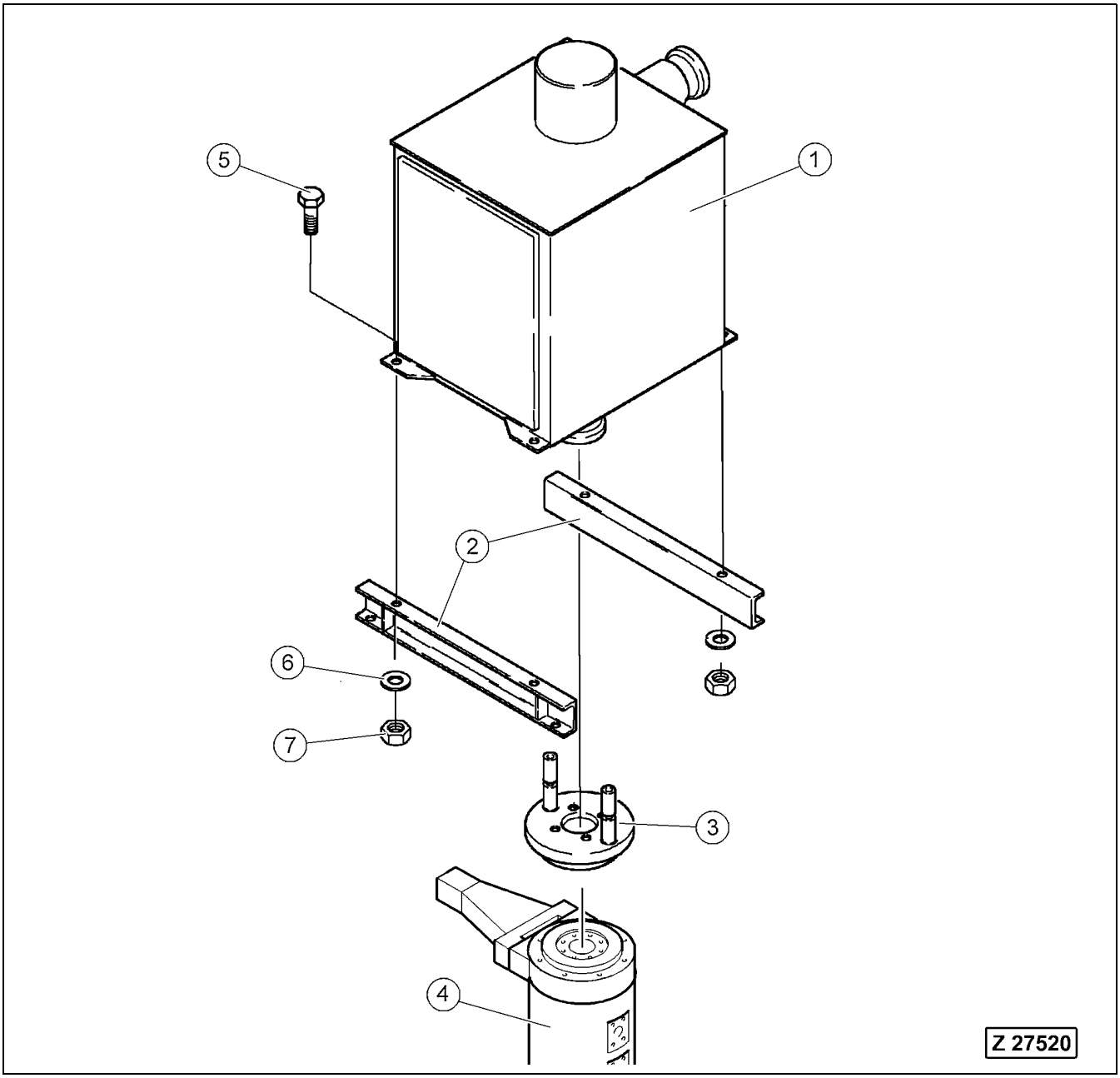


Fig. 3-218

⚠ DANGER

FLOATING LOADS!

Death or serious injury will result due to swinging or downfall of heavy machine parts.

When moving machine parts using a crane, make sure that nobody steps below or in close range to the lifted machine part.

⚠ WARNING

HAZARD OF SQUEEZING AND SHEARING!

May result in serious injury to hands and fingers from squeezing and sharing due to violent pressure from sliding parts.

Ensure to keep hands away for the component sliding surfaces during removal.

8. Sling guide wheel assembly (Fig. 4-23) and pull the guide wheel assembly out of the crawler carrier.

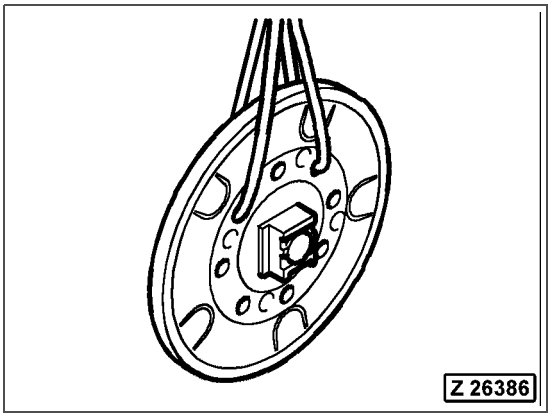


Fig. 4-23

Please continue reading on the next page.

1. Carry out assembly in reverse order to disassembly.

REMARKS: Replace all O-rings, back-up rings and quad-rings.

Apply oil at the outer discs (Fig. 4-54, Pos. 2) and at the inner discs (Fig. 4-54, Pos. 3).

Before fixing the retainer (Fig. 4-54, Pos. 5) with the snap ring (Fig. 4-54, Pos. 4) the Brake must be released.

Refill oil in the motor adapter housing, approx. 0.6 liters.
Refill oil in the brake housing, approx. 0.5 liters.

Refer to Operation & Maintenance Manual, chapter 4, section "TRAVEL GEARS, BRAKE AND MOTOR ADAPTER HOUSINGS - CHANGE OIL".
For the proper lubricant, refer to the Operation & Maintenance Manual, chapter 4, section "FLUIDS AND LUBRICANTS".

2. If the hydraulic hoses at the motors had been removed add hydraulic oil up to the specified level.

REMARKS: Filling of the brake housing has to be done with the motor stopped and the brakes applied to prevent overfilling.

NOTICE

BRAKE NOT BLED!

The travel parking brake can not be released completely due to air in the hydraulic system. This may cause severe damage to the brake lamellas.

Before initial operation or after repairs on the hydraulic circuit, the travel parking brakes have to be bled to prevent the brake lamellas from welding when travelling.
If not installed, a vent plug can be connected to the pressure port to bleed the brake.

3. Bleed the travel parking brake.

4. Perform a function check of the travel parking brake. Refer to the Service Manual for further information.

4.3 CAR BODY

4.3.1 REMOVAL OF THE CAR BODY AND THE CRAWLER CARRIERS (TYPE WITH MOUNTING PINS)

Special tools:	n/a
Additional equipment:	2 x Crane
	Car body: 29,000 kg Crawler carrier: 56,300 kg each (with track width 1200 mm) Crawler carrier: 58,000 kg each (with track width 1500 mm)
	Dogman/rigger Crane operators trained in dual crane lift
	For further information about the needed blind plugs, refer to section 6.9 on page 6-17.

1. Prepare an area of flat ground large enough to accommodate the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.).

2. Park the machine on the prepared flat ground area.

REMARKS: If the ground condition is too poor to guarantee safe and stable stand of the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.), make sure that the machine is moved to any location with appropriate ground condition.

3. At first the wear of the bushes in the car body should be checked, refer to the PARTS & SERVICE NEWS No. "AH08508".

4. Relieve the pressure in the hydraulic system. Refer to the Operation & Maintenance Manual, chapter 3, section "RELIEVE PRESSURE IN THE HYDRAULIC SYSTEM".

5. Isolate the machine according to local regulations.

6. Relieve the pressure in the track tensioning system by opening the ball cock (Fig. 4-72, Pos. 1) at the track tensioning valve block (Fig. 4-72, Pos. 2) inside the car body.

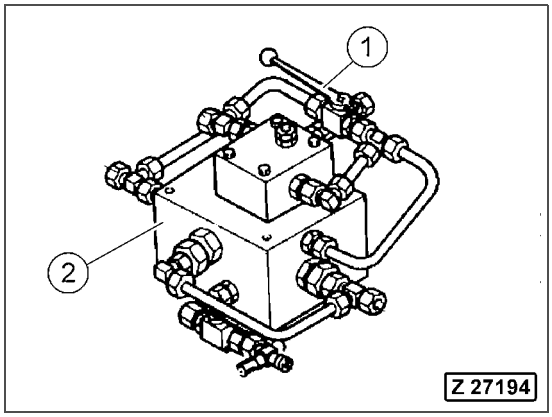


Fig. 4-72

7. Remove the superstructure from the car body, refer to section 3.13.1 on page 3-208.

8. Remove the cable drum / cable support from the car body, refer to section 4.4.2 on page 4-102 resp. refer to section 4.5.2 on page 4-108

9. Disconnect all hydraulic lines from both travel motors, refer to section 4.2.9.1 on page 4-42.

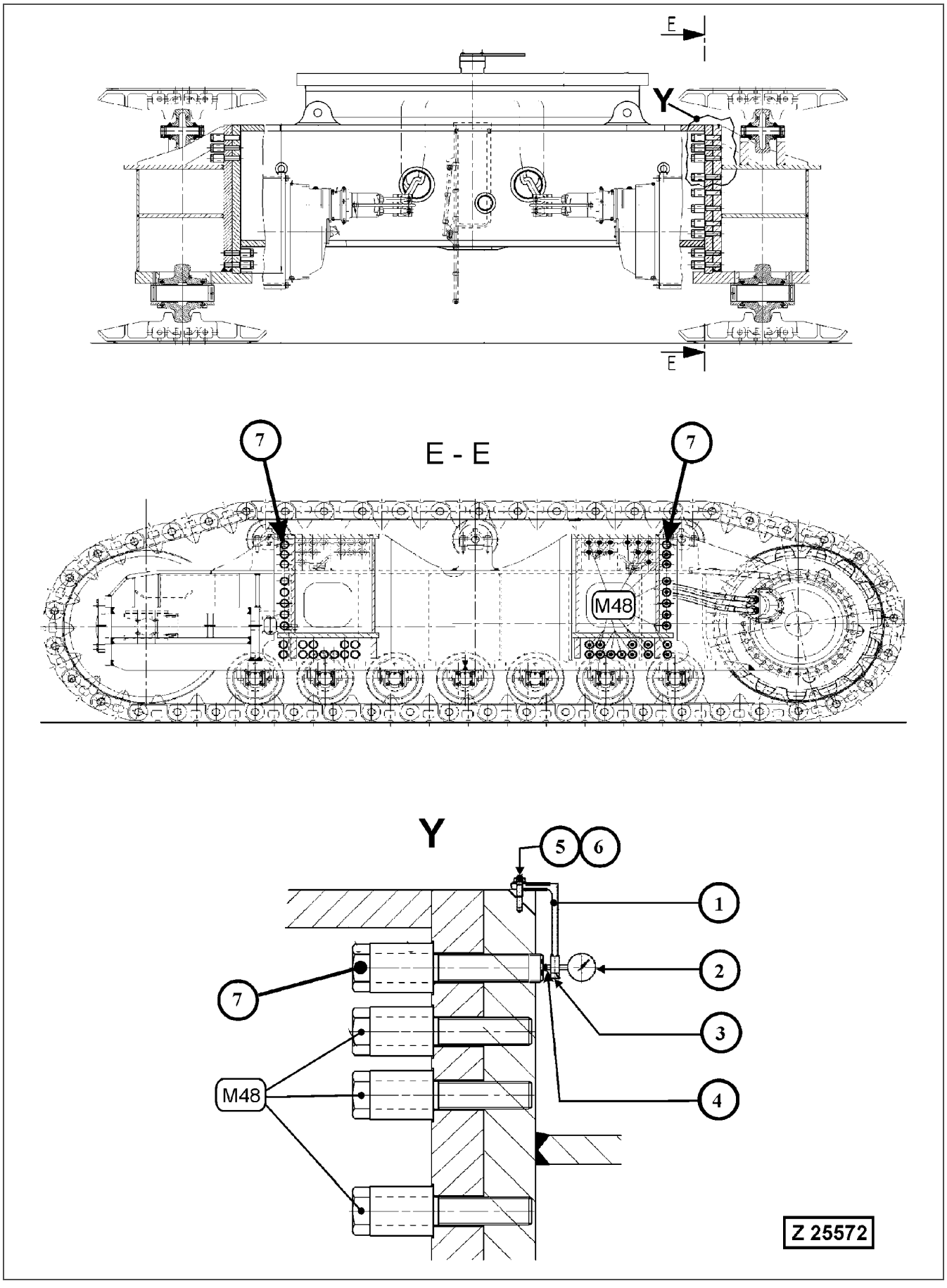


Fig. 4-90 Crawler carrier mounting bolts

Please continue reading on the next page.

Special tools:	Thread Protector, PN 409 329 40
Additional equipment:	Safety harness in conformity with DIN EN 361 3 x crane 2 x chain hoist Mobile elevator working platform
	Stick: 21,139 kg Stick incl. steering and bucket cylinders: 25,200 kg Pin stick/boom: 1100 kg Nut-cap: 35 kg
	Dogman/rigger Crane operators trained in dual crane lift
★	For further information about the needed blind plugs, refer to section 6.9 on page 6-17.

NOTE! Always wear a safety harness when working at the attachment.
Most of the following operations require the use of men safety cages on elevator working platforms.

1. Prepare an area of flat ground large enough to accommodate the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.).
2. Park the machine on the prepared flat ground area and position the bucket with its flat side (underside) on the ground.
3. If the ground condition is too poor to guarantee safe and stable stand of the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.), make sure that the machine is moved to any location with appropriate ground condition.

NOTE! Use blocks and safeguard the bucket against toppling.

4. Remove the bucket, refer to section 5.1.3.1 on page 5-34.
5. Fully retract the bucket cylinders and secure the cylinder piston rods using wire ropes. Use chain hoists to fix the bucket cylinders to the stick.
6. Disconnect all electric wires attached to the stick.
7. Disconnect the grease feeding hose leading to the stick.
8. Disconnect the bucket cylinder hoses from the bucket cylinders, refer to section 5.1.6.4 on page 5-70.
9. Remove the pins connecting the stick cylinders to the stick, refer to section 5.1.2.3 on page 5-24.

REMARKS: Support the stick cylinders (Fig. 5-20, Pos. 1) with blocks (Fig. 5-20, Pos. 2) between stick cylinders and boom (Fig. 5-20, Pos. 3).

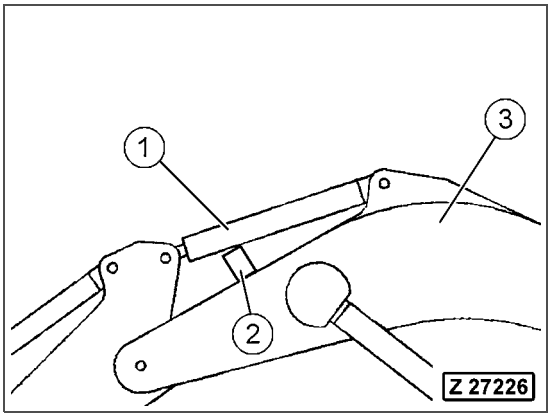


Fig. 5-20

5.1.3.3 REMOVAL OF THE BUCKET CYLINDERS

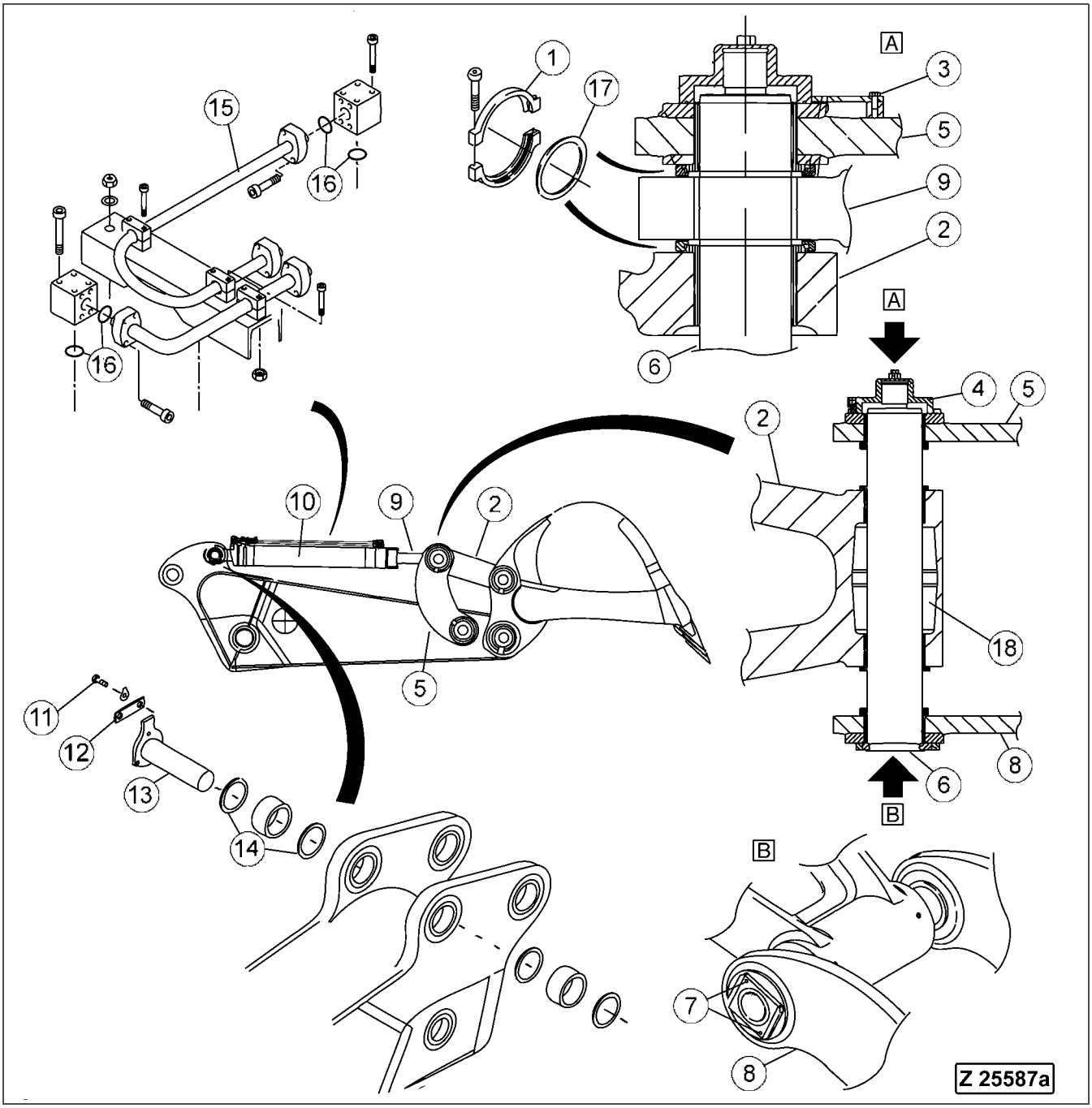


Fig. 5-43 Bucket cylinder, removal and installation

Legend for Fig. 5-67:

(1)	Hose clamp	(5)	Hydraulic tube on boom
(2)	Clamp line	(6)	Hydraulic hose (arc hose)
(3)	Clamp line	(7)	Bolt
(4)	Manifold	(8)	O-ring

REMARKS: At machines with SN 08173 and up a hose retainer at the manifold is standard configuration. The retainer is not shown in Fig. 5-67.

Special tools:	n/a
Additional equipment:	Safety harness in conformity with DIN EN 361 Crane Oil drain pan
	Boom arc hose 26 kg...40 kg (depending on diameter)
	Dogman/rigger
	If there is nothing mentioned explicitly, tighten all bolts according to KOMATSU company standard, refer to section 6.8 on page 6-13. For further information about the needed blind plugs, refer to section 6.9 on page 6-17.

NOTE! Always wear a safety harness when working at the attachment.

1. Prepare an area of flat ground large enough to accommodate the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.).

2. Park the machine on the prepared flat area and position the bucket on the ground with the bucket cylinders in fully extended and the stick cylinders in fully retracted position (Fig. 5-68).

REMARKS: If the ground condition is too poor to guarantee safe and stable stand of the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.), make sure that the machine is moved to any location with appropriate ground condition.

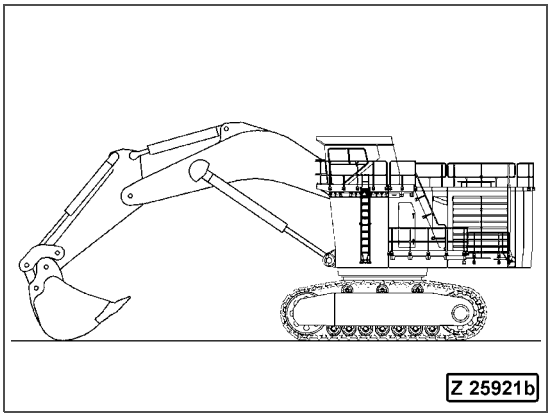


Fig. 5-68

3. Relieve the pressure in the hydraulic system, refer to the Operation & Maintenance Manual, chapter 3, section "RELIEVE PRESSURE IN THE HYDRAULIC SYSTEM".

4. Isolate the machine according to local regulations.

5.2.2 BOOM

5.2.2.1 REMOVAL OF THE BOOM

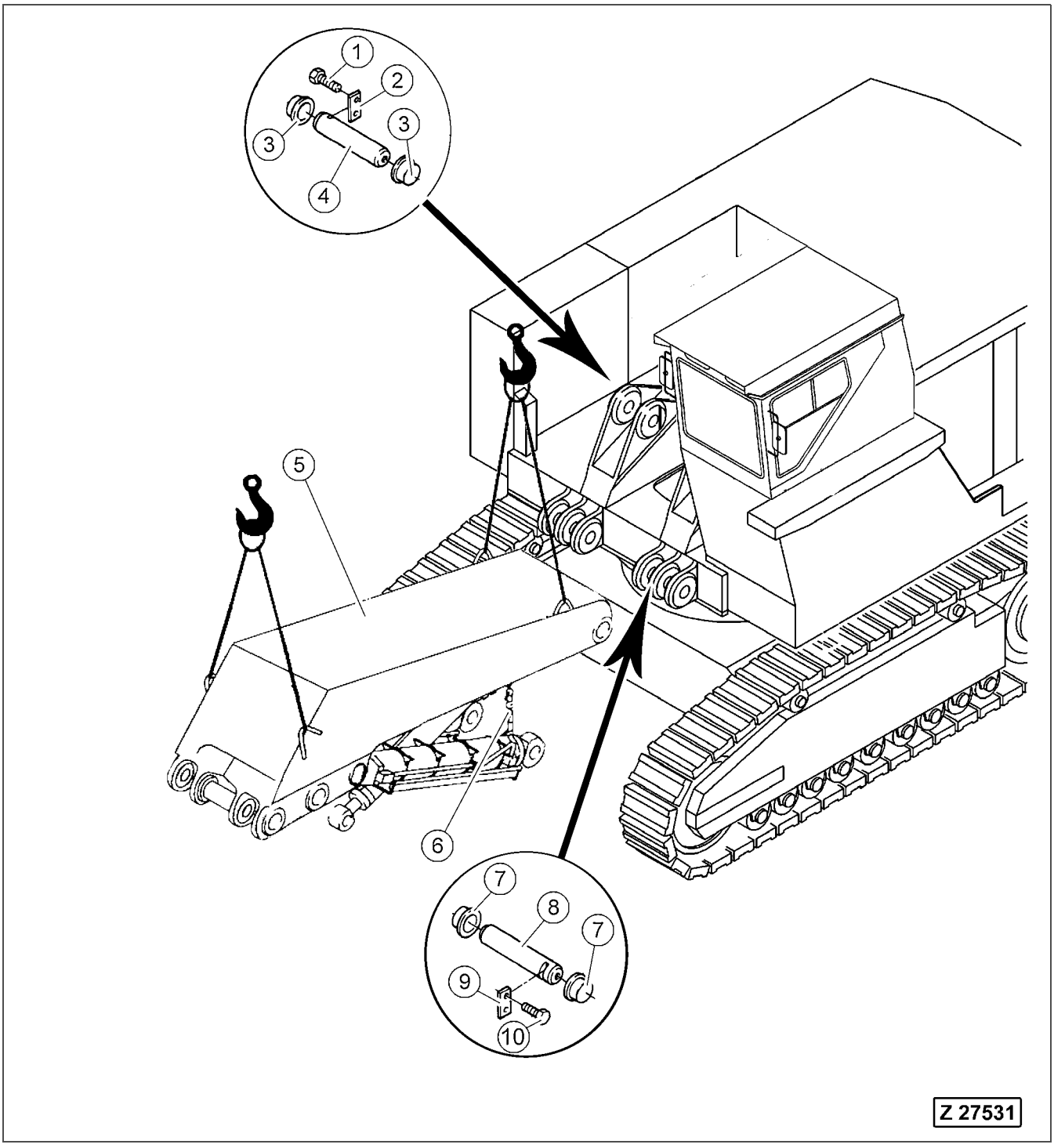


Fig. 5-83 FSA Boom removal

Please continue reading on the next page.

Special tools:	n/a
Additional equipment:	Oil drain pan
kg	Bucket (22 m³): 35,000 kg Pin bucket cylinder/bucket: 125 kg Pin bucket/stick: 180 kg
★	For further information about the needed blind plugs, refer to section 6.9 on page 6-17.

1. Prepare an area of flat ground large enough to accommodate the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.).
2. Park the machine on the prepared flat area and position the bucket on the ground with the stick and the bucket cylinders in vertical position (Fig. 5-111).

REMARKS: If the ground condition is too poor to guarantee safe and stable stand of the machine and the additional working equipment (crane, mobile working platforms, forklift, etc.), make sure that the machine is moved to any location with appropriate ground condition.

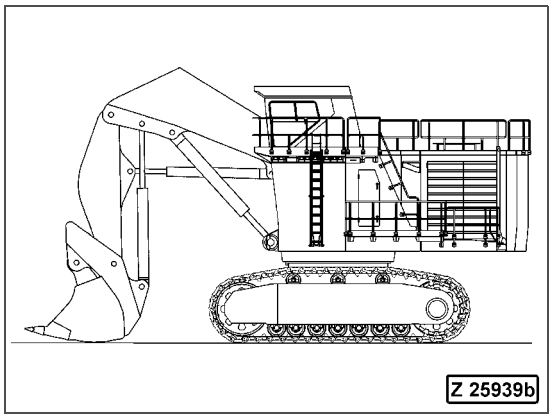


Fig. 5-111

3. Relieve the pressure in the hydraulic system, refer to the Operation & Maintenance Manual, chapter 3, section "RELIEVE PRESSURE IN THE HYDRAULIC SYSTEM".
4. Isolate the machine according to local regulations.
5. Disconnect the grease feeding lines leading to the bucket.
6. Remove the cover (Fig. 5-112, Pos. 2) from the bucket (Fig. 5-112, Pos. 1) to access the pin.

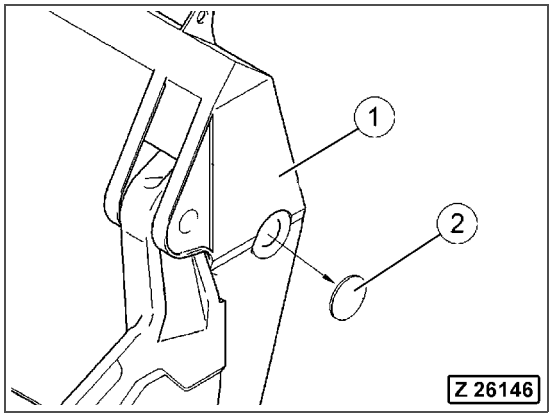


Fig. 5-112

NOTICE

SHARP-EDGED GROOVE!

Damages to the seals in the clam cylinder may result.
There is a tolerance gap between bush and seal, so that the seal can move freely within the groove. When installing the pins, the seals can get sheared between pin and the sharp groove edge.

In order to avoid damage to the seals make sure that the seals are centered in their mounting position within the bushes.

4. Insert the pin (Fig. 5-133, Pos. 3).
5. Fix the pin with the plate (Fig. 5-133, Pos. 2).
6. Secure the plate with the bolt (Fig. 5-133, Pos. 1).

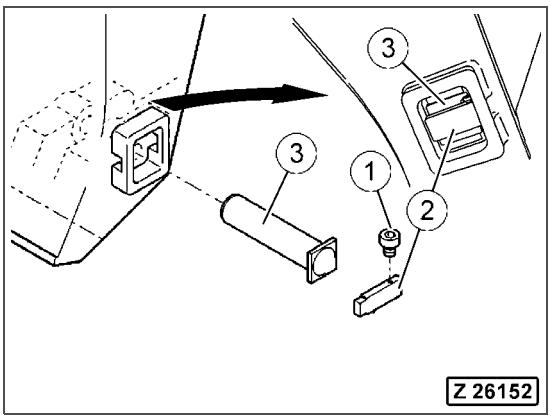


Fig. 5-133

7. Connect the hydraulic hoses (Fig. 5-134, Pos. 1) to the clam cylinder.

REMARKS: Use new O-rings (Fig. 5-134, Pos. 2) at the SAE-flange connections.

8. De-isolate the machine according to local regulations.
9. Switch S155 to Q_{min}.

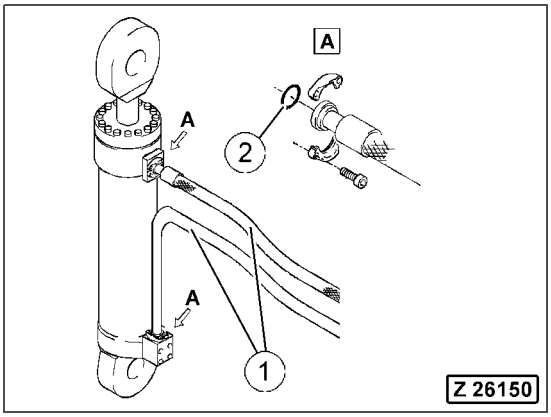


Fig. 5-134

⚠ WARNING

AIR IN THE HYDRAULIC CYLINDER!

May result in personal injury due to slightly jerky movements of the cylinder when it is operated. The jerky movements are caused by the air in the cylinder which is compressible.

Make sure that nobody is in close range to the cylinder when it is operated with only one end connected to the attachment.

10. Extend and retract the clam cylinder slowly at Q_{min} 2…3 times as far as possible to partly bleed the cylinder.

NOTE! Both clam cylinders are connected to the same hydraulic line, so when the cleared cylinder is fully retracted, the clam will start to open. Do not open the clam.

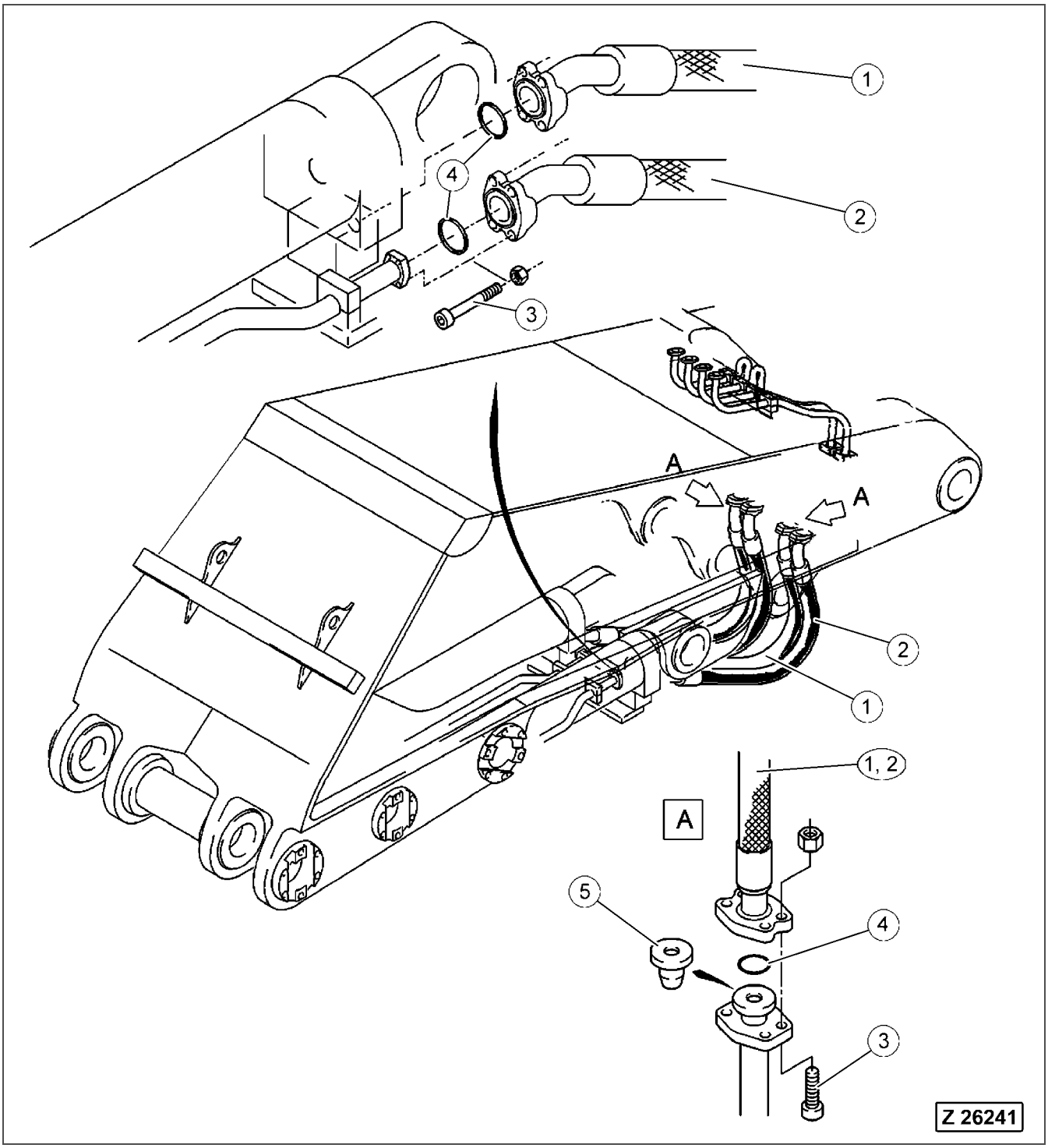


Fig. 5-149 Stick cylinder hoses, removal and installation

5.4 CYLINDER BYPASS TEST

Special tools:	n/a
Additional equipment:	Safety harness in conformity with EN 361 Mobile elevator working platform Infrared thermometer

The cylinder bypass test can be performed to check if a hydraulic cylinder has an internal leakage. A cylinder with an internal leakage also has a higher temperature (at working temperature of the machine) than a hydraulic cylinder which has no internal leakage.

1. Relieve the pressure in the hydraulic system, refer to the Operation & Maintenance Manual, chapter 3, section "RELIEVE PRESSURE IN THE HYDRAULIC SYSTEM".

2. Isolate the machine according to the local regulations.

3. Check hydraulic cylinder temperature using an infrared thermometer at the cylinder where the internal leakage is assumed.

4. Check the other (same function) hydraulic cylinder temperature using the infrared thermometer and compare the readings.

If the temperature is not higher than the temperature of the other cylinders, another reason e.g. leakage of a valve may be the reason for loosing pressure.
If the temperature is higher than the temperature of the other cylinders, the resp. cylinder has an internal leakage and should be replaced.

Up to 6000 PSI			
SAE size	**Form / type according to Fig. Fig. 6-3**	**PN**	**DN (hose / pipe)**
3/4"	A	506 580 98	20
1"	A	506 519 98	25
1 1/4"	A	506 520 98	32
1 1/2"	A	506 581 98	40
2"	A	506 582 98	50
1"	B	506 524 98	25
1 1/4"	B	506 525 98	32
1 1/2"	B	506 526 98	40
2"	B	506 527 98	50
1 1/4"	C	516 499 98	32
1 1/2"	C	509 375 98	40
2"	C	509 376 98	50

Inhalt / Contents

Seite / Page No.

232 124 40	**Flachschaber, 250 mm lang**	**Flat scraper, 250 mm long**	
	Verstellbares Wendeisen für Gewindebohrer	**Adjustable tap wrench for taps**	
232 164 40	M 1 - 10	M 1 - 10	
232 165 40	M 10 - 27	M 10 - 27	
232 235 40	M 20 - 42	M 20 - 42	
	Gewindefeile	**Thread restorer**	
232 162 40	Whitworth	Whitworth	
232 163 40	Metrisch	Metric	
	Gewindebohrer	**Tap**	
232 166 40	M 3	M 3	
232 167 40	M 4	M 4	
232 168 40	M 5	M 5	
232 169 40	M 6	M 6	
232 170 40	M 8	M 8	
232 171 40	M 10	M 10	
232 172 40	M 12	M 12	
232 173 40	M 14	M 14	
232 174 40	M 16	M 16	
232 357 40	M 18	M 18	
232 175 40	M 20	M 20	
232 240 40	M 24	M 24	
232 241 40	M 30	M 30	
232 242 40	M 36	M 36	
232 243 40	M 42	M 42	
	Gewindebohrer	**Tap**	
232 244 40	M 8 x 1	M 8 x 1	
232 245 40	M 10 x 1	M 10 x 1	
232 246 40	M 14 x 1,5	M 14 x 1.5	
232 247 40	M 20 x 1,5	M 20 x 1.5	
232 248 40	M 24 x 1,5	M 24 x 1.5	
232 236 40	R 1/8"	R 1/8"	
232 237 40	R 3/8"	R 3/8"	
232 238 40	R 1/4"	R 1/4"	
232 239 40	R 1/2"	R 1/2"	
	Schneideisenhalter für Schneideisen	**Holder for threading dies**	
232 176 40	M 3 / M 4 — 20 x 5 mm	M 3 / M 4 — 20 x 5 mm	
232 177 40	M 5 / M 6 — 20 x 7 mm	M 5 / M 6 — 20 x 7 mm	
232 178 40	M 8 / M 8 x 1 — 25 x 9 mm	M 8 / M 8 x 1 — 25 x 9 mm	
232 179 40	M 10 / M 10 x 1 — 30 x 11 mm	M 10 / M 10 x 1 — 30 x 11 mm	
232 180 40	M 12 / M 14 — 38 x 14 mm	M 12 / M 14 — 38 x 14 mm	
232 359 40	M 16 / M 18 / M 20 — 45 x 18 mm	M 16 / M 18 / M 20 — 45 x 18 mm	
232 249 40	M 24 — 55 x 22 mm	M 24 — 55 x 22 mm	
232 250 40	M 30 / M 36 — 65 x 25 mm	M 30 / M 36 — 65 x 25 mm	
232 364 40	M 14 x 1,5 — 38 x 10 mm	M 14 x 1.5 — 38 x 10 mm	
232 364 40	R 1/8" / R 1/4" — 38 x 10 mm	R 1/8" / R 1/4" — 38 x 10 mm	
232 365 40	M 24 x M 1,5 — 55 x 16 mm	M 24 x M 1.5 — 55 x 16 mm	
232 358 40	R 3/8" / R 1/2" — 45 x 14 mm	R 3/8" / R 1/2" — 45 x 14 mm	

Ausgabe: 11. November 2011
Release: November 11, 2011

947 173 40 947 178 40	**Hilfswerkzeug für Gewindestifte** M12 M16 Für die Reparatur von Hydraulikzylindern **Weiterführende Informationen in der PARTS & SERVICE NEWS AH08501 (aktueller Stand)**	**Auxiliary tool for threaded pins** M12 M16 Used for the repair of hydraulic cylinders **For detailed information refer to the PARTS & SERVICE NEWS AH08501 (latest edition)**	

1. Safety Instructions

- Assign trained or well-instructed personnel only and clearly define the respective spheres of responsibility for the repair work.
- Inform the operating personnel prior to the commencing special and regular maintenance work.
- Secure the maintenance area amply enough, as far as required.
- Carry out repair and maintenance work only with the machine standing on firm and level ground and secured against rolling away and sinking in.
- During exchange action, fix and secure individual parts and assemblies carefully to the lifting devices so that they cannot become dangerous in any way. Use exclusively suitable lifting devices consistent with sound engineering and load-lifting elements with sufficient load-bearing capacity! Never stay or work beneath suspended loads!
- Entrust experienced personnel only with fastening and securing of loads and guiding crane operators! The guide has to be within the operator's visual range or have voice contact with him.
- In case of assembly work exceeding body height, use suitable and otherwise secure means of access and working platforms. Never step on machine parts as an access! For maintenance work at higher levels, use the appropriate safety devices! Keep all handles, steps, handrails, landings, working platforms, ladders, etc. free from dirt, snow and ice!
- Retighten immediately all bolted connections loosened during repair and maintenance work!
- If disassembly of safety devices is required for rigging, maintenance, and repair, reassembly and checking of such safety devices has to be carried out immediately after having finished the respective work.
- Strictly observe all safety instructions and warnings in the country of destination.

7.2. Outer toothing

Adhesive lubricants may be applied by means of an automatic swing circle gear lubrication system or manually by a spatula, a brush or a spray tin.

Lubrication with automatic lubrication system

- Spray lube system
- Drop lube system
- Swing circle gear lubrication system

The most important requirement of a swing circle gear lubricant, besides the extreme pressure resistance, is its optimum adhesion to the tooth flanks, which can only be obtained by using the recommended lubricants in the prescribed temperature ranges. The Parts & Service News AH00519 (latest version) includes several adhesive lubricants providing excellent results on several machines under different working conditions.
The use of other lubricants is not recommended before consultation of the Service Dept. 8151.

Lubrication: Manual

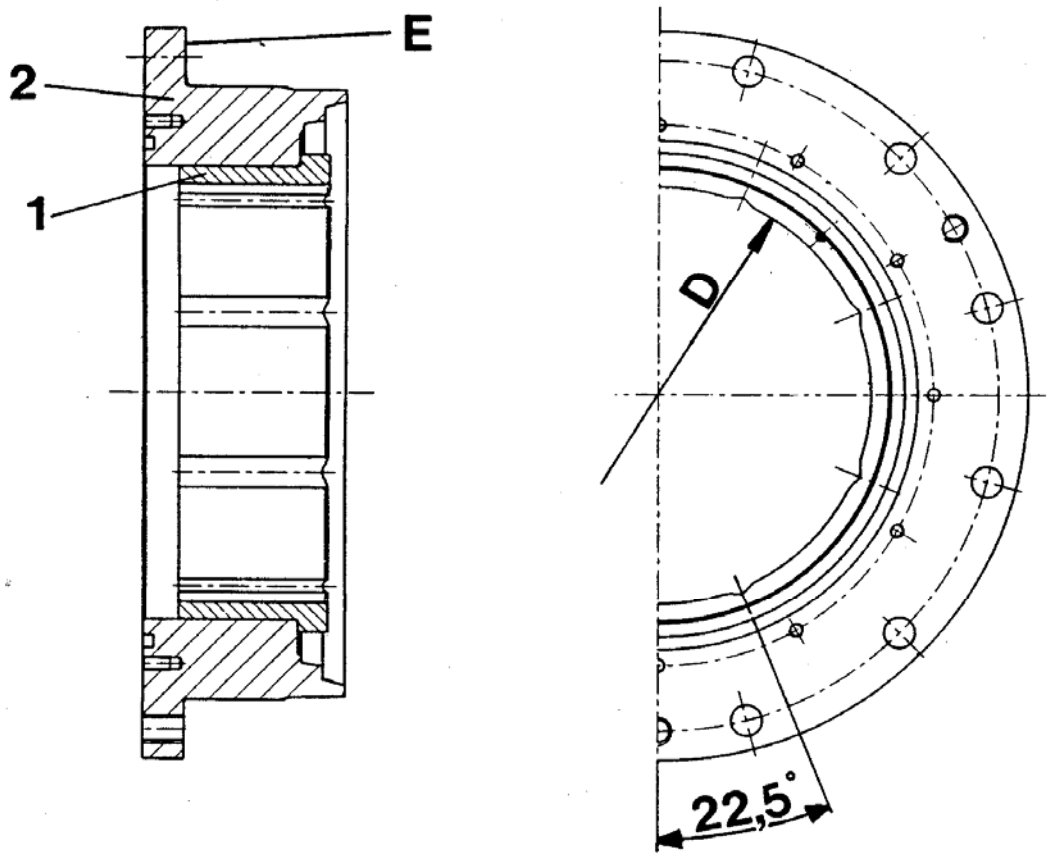
The manually lubrication has to be carried out with the following adhesive lubricants.
Those lubricants are suitable for <u>all</u> temperature ranges.

Company	Product	T1 -5°C ⇒ +60°C +23°F ⇒ +140°F	T2 -20°C ⇒ +10°C -4°F ⇒ +10°F	T3 -40°C ⇒ -10°C -40°F ⇒ +14°F
KOMATSU	Voler Compound 2000 E Spray (0,625kg)	**P/N 500 893 98**		
Special grease	Voler Compound 2000 E Adhesive lub (indicate quantity in kg)	**P/N 006 057 98**		

b) Reducing the axial play by remachining

When the axial play comes up to the maximum value according to the table on page 4, flange (2) can be remachined in area (E) , to bring the axial play to the new machine condition.

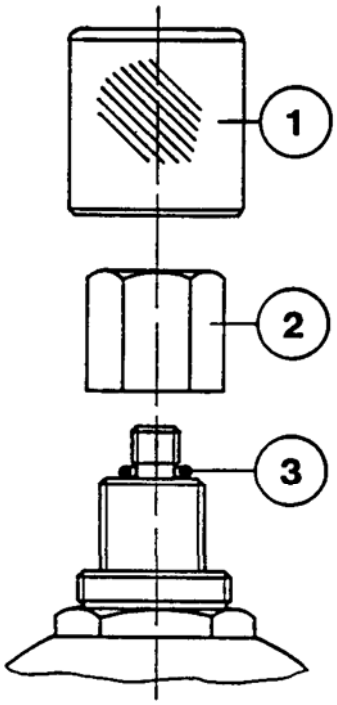
- Underpin sprocket, suspend to a crane.
- Remove bolts (S) (see page 06), remove flange (2) by means of puller bolts.
- Remachine flange (2) in area (E), until the axial play (new value) is reached.
- For the mounting , proceed in inverse sequence of the removal.



3. Testing of existing gas pressure bladder accumulators

The testing- and refilling device includes pressure gauges:

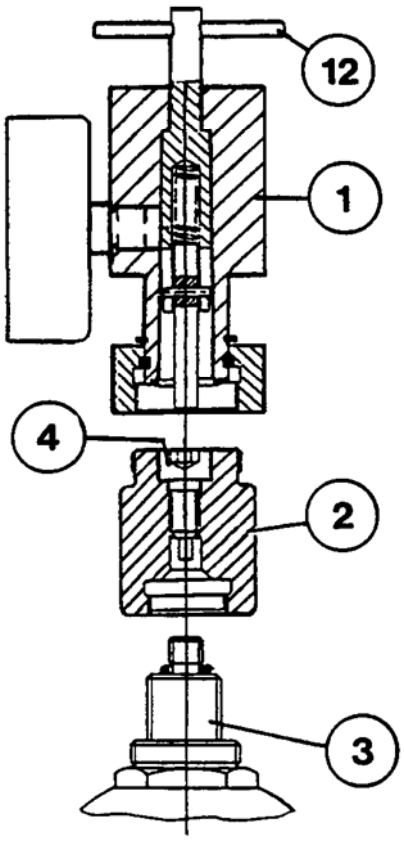
0 to 25 bar
0 to 100 bar
0 to 250 bar.



- Screw the pressure gauge with the correct pressure range in the testing- and refilling device.
- Shut down the engine.
- Allow pressure relief of the system to be checked.
- Unscrew the feeding line in order to allow the hydraulic oil to pour out.
- Remove cap (1) and nut (2).
  Do not remove O - ring (3).

☞

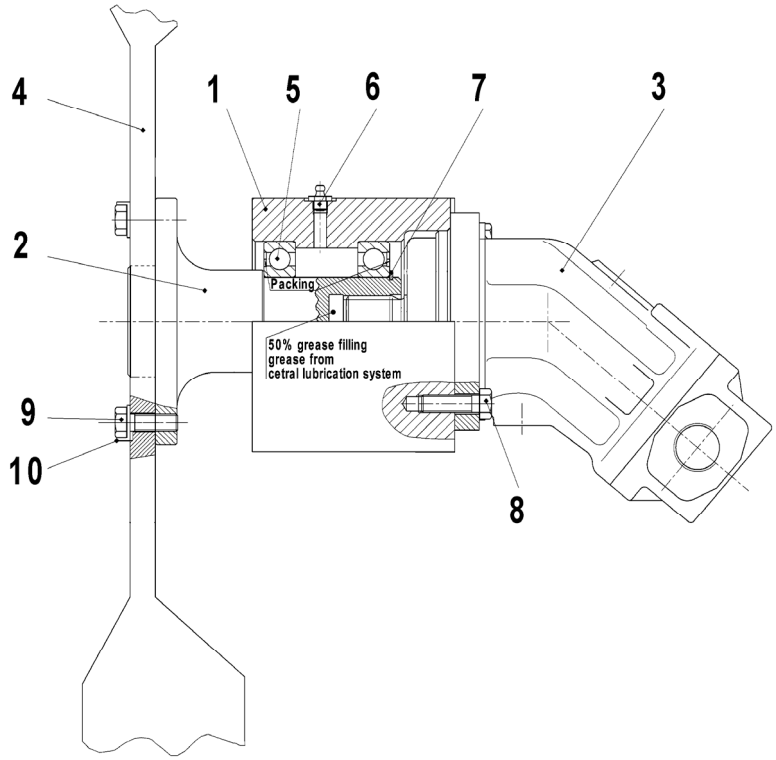
- **Check valve in hose connection is operative only when hose is not connected.**



- Turn the socket head screw (4) installed in the adapter (2) a little bit.
- Mount testing- and refilling device to adapter (2).
- Install adapter (2) to testing connection (3).
- Turn in completely outlet screw of the filling device.
- Turn T – handle (12) several times in both directions until it is engaged in the screw (4) of the adapter (2).
- By means of the T – handle (12) turn in the screw so far that the existing gas pressure is indicated by the pressure gauge.
- Do not turn in the screw any further; the gas valve may be destroyed.

Hints for replacement:

1. Grease lubricated bearings

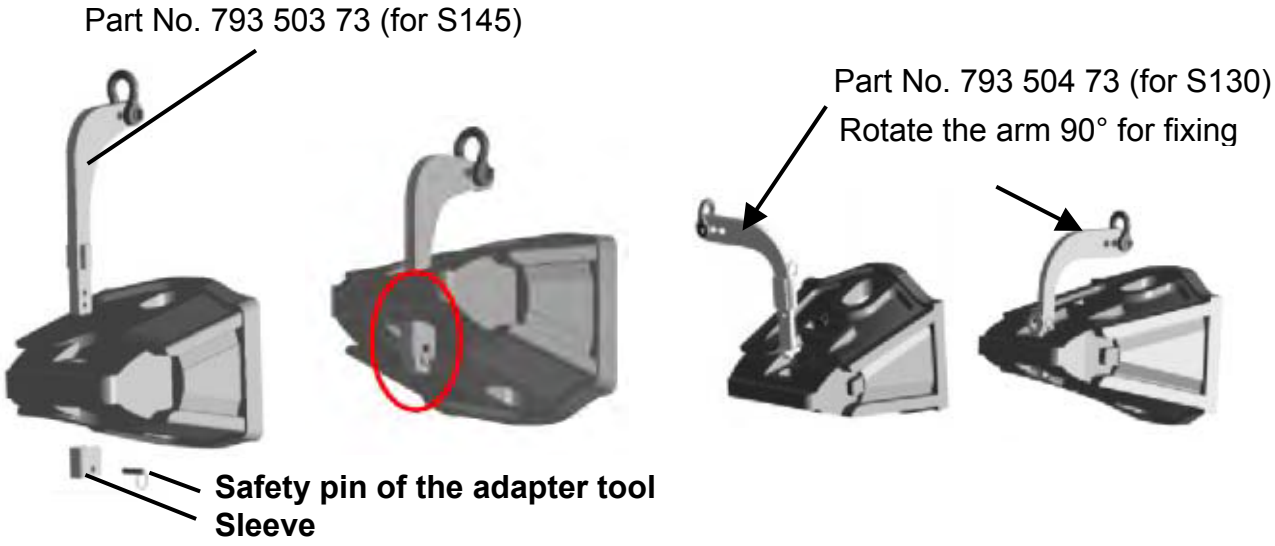


1 Bearing retainer
2 Shaft
3 Hydraulic motor
4 Fan
5 Bearing
6 Grease nippel
7 Circlip
8 Bolt
9 Bolt
10 Locking plate

1. Remove the hydraulic and the grease lines; the fan; and then the motor.
2. Remove the bearings and the fan shaft.
3. Clean all parts carefully.
4. Install the first bearing (5) and fill the chamber between the bearings to 50% with grease.
5. Install the shaft with the first bearing (5) and the grease into the bearing retainer.
6. Install the second bearing and fix it with the circlip (7).
   (Install also the sleeve between the bearings if applicable.)
7. Grease the hydraulic motor drive shaft with “Optimol paste white T” and fill the chamber in the fan shaft to 50% with normal grease according to the drawing above.
8. Reinstall the bearing hub, the fan and the motor.
9. Reconnect all lines.

- **Grease the bearings every 500 working hours with maximal 2 strokes with the hand greasing pump.**

5. Install the new discs. At first an outer disc (grease it with oil), then an inner disc and then a sinus ring ... and so on.

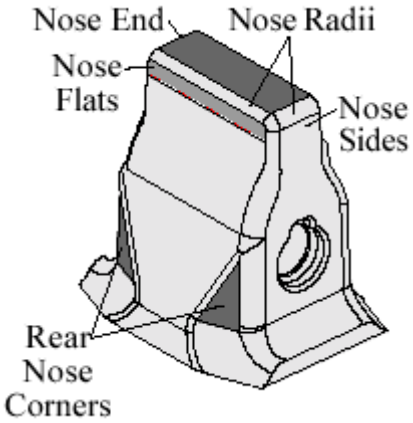


- Using a boom rated at 270 kg (600 lb) or greater (PC5500 and PC8000) or a boom rated at 230 kg (500 lb) or greater (PC4000), hook into the shackle at the top of the arm and remove the adapter.

3.2 Nose rebuild

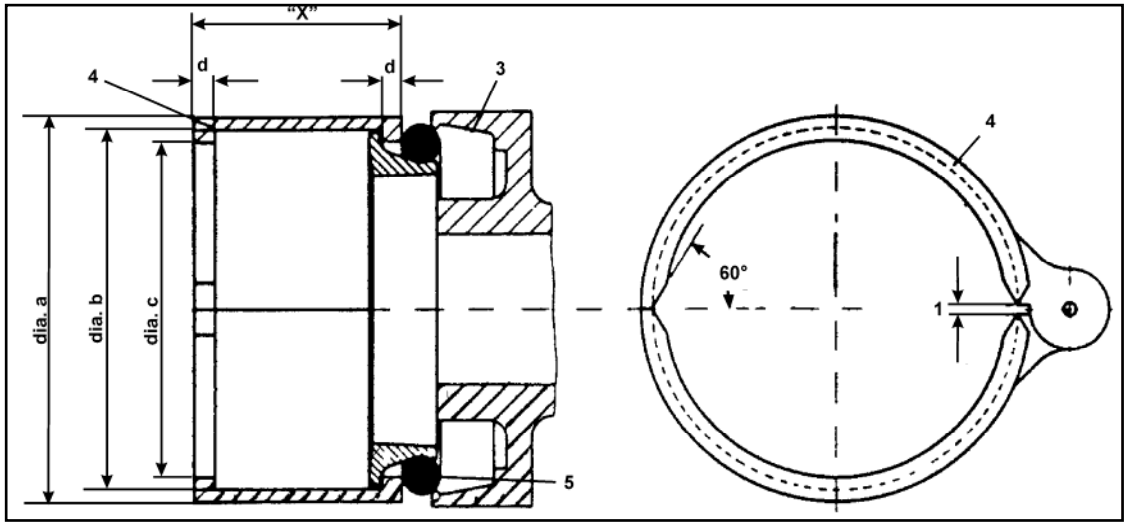
Nose fit: This tooth system is designed to operate with movement of the adapter on the nose. However, movement may become excessive over long term service because of nose wear. In this event, the nose can be rebuilt in the indicated areas with welding and grinding.

3.2.1 Nose end and sides rebuild



Assembly tool (locally made)

The assembly tool consists of two half-shells that are closed around the seal ring. The two halves are joined by a hinge.
Step (d) grips between the O-ring (5) and the land of the seal ring. The pressure required to insert the seal is then applied directly via the O-ring (5).
Measure dimension "b" at the dual cone seal.
Determine the machining dimensions "a", "b", "c" and "d" according to this measured dimension in the chart.
The dimension "X" can be chosen freely.



Ø b mm	Ø a mm	Ø c mm	d mm	Ø b mm	Ø a mm	Ø c mm	d mm
95	100	89,5	1,8	**191**	198	185	4
99	107	92,5	3,5	**200**	208	192	4
104	118	98	3	**202**	209	196	4
110	115	104	2,5	**213**	220	201	4
111	118	105	4	**217**	225	210	4
112	120	107	3	**231**	238	220	4
121	128	115	4	**229,5**	236,5	220,5	4
127	131	121	3,5	**242**	249	232	4
126	134	120	3	**254**	261	242,5	4
139	148	133	3	**270,5**	279	258,5	4
142	150	135	4	**282,8**	292	269	4
141,5	149	133	3	**295,5**	302,5	282	4
143	150	137	4	**326**	334	321	4
146	153	137,7	4	**343,5**	350,5	335	4
157	163	150,5	4	**348**	357	342	7
162	169	155	3	**377,5**	384,5	369	4
175	182	169	4,5	**397**	407	385	4
159	166	153,5	3	**418**	426	410	5
174,5	181,5	162	4	**458**	468	446	4
177	185	168	4	**503**	518	495	7
169	176	161	2,8	**536,5**	545	528,4	5
172,5	180	166,5	3,5	**563**	578	555	7
169	175	165	2	**593**	608	585	7
171	177	168	2,5	**611**	620	603	5
170	176	165	4	**703**	710	694	5
176	183	167,5	3,5	**626**	642	618	7
182	190	177	3	**753**	768	745	7
194	201	182,5	4	**890**	898	878	10

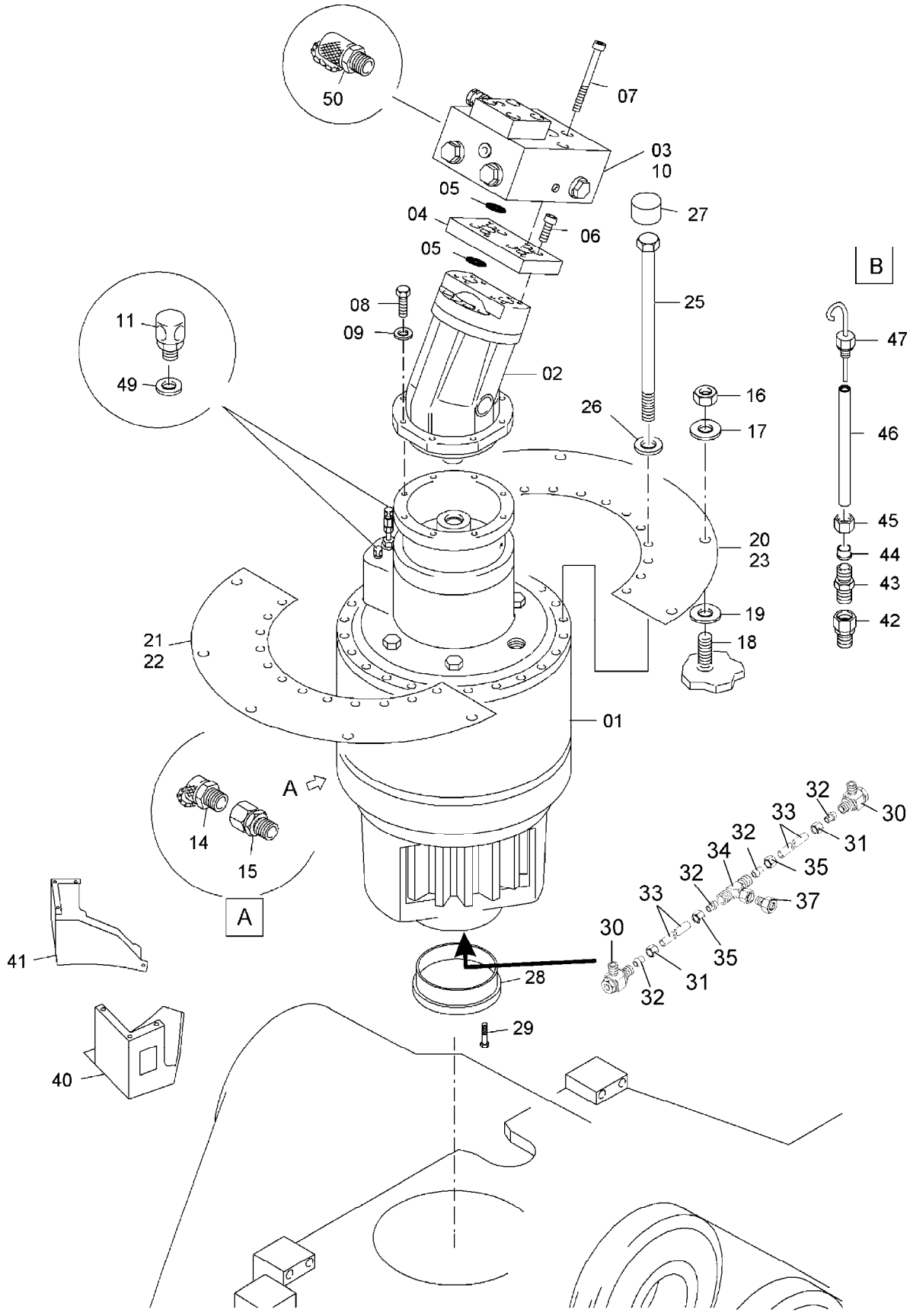
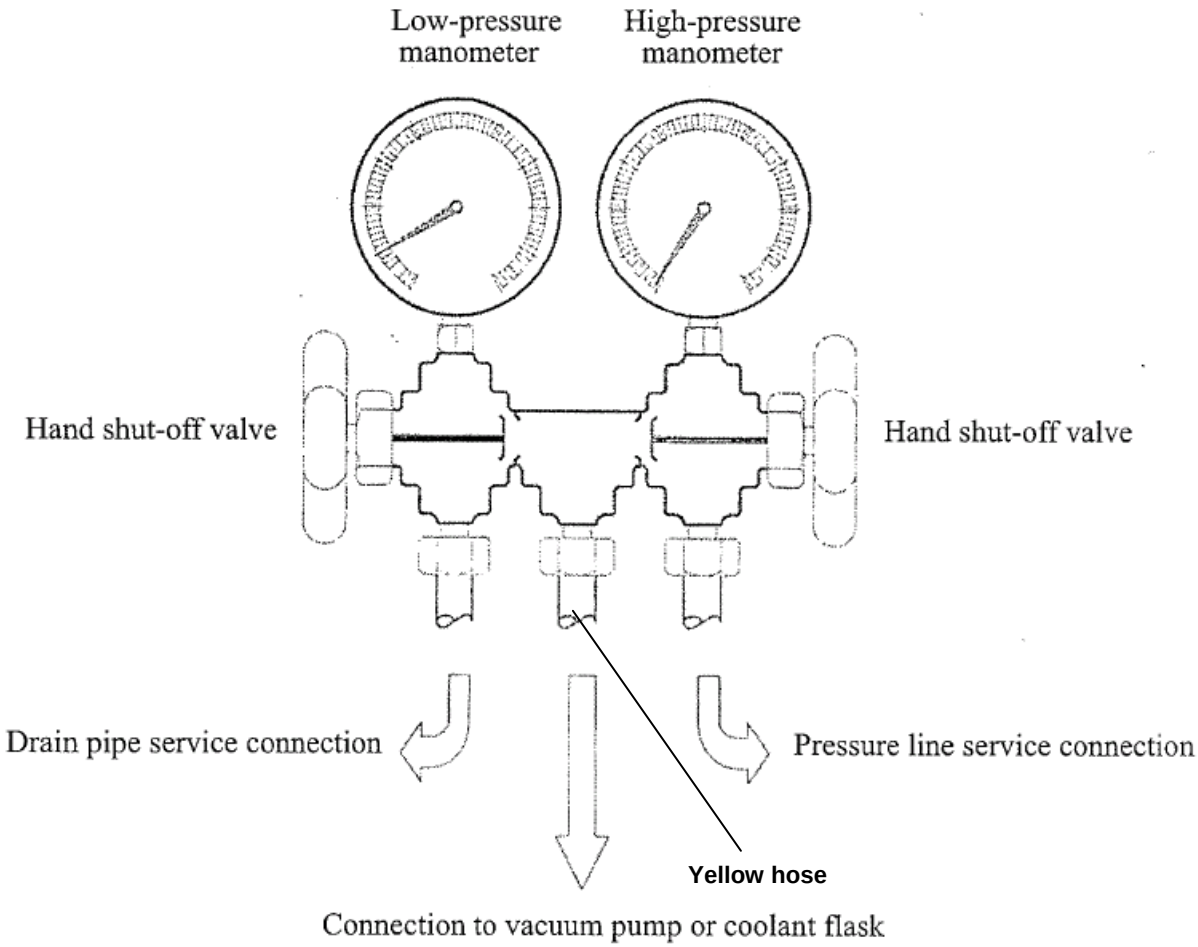
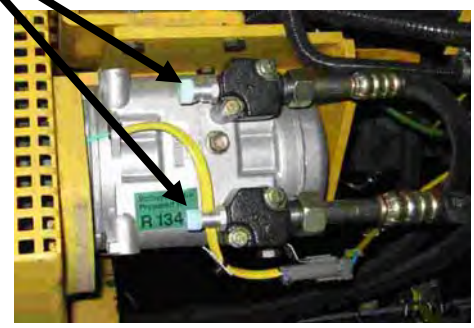


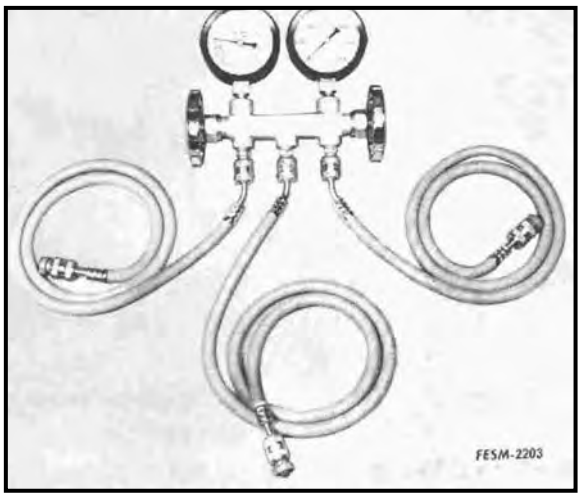
Illustration 6

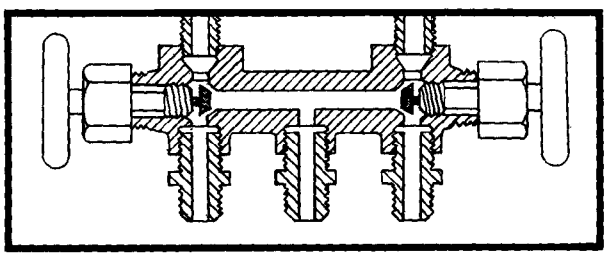
Gauge Manifold



Connection points for the Gauge Manifold

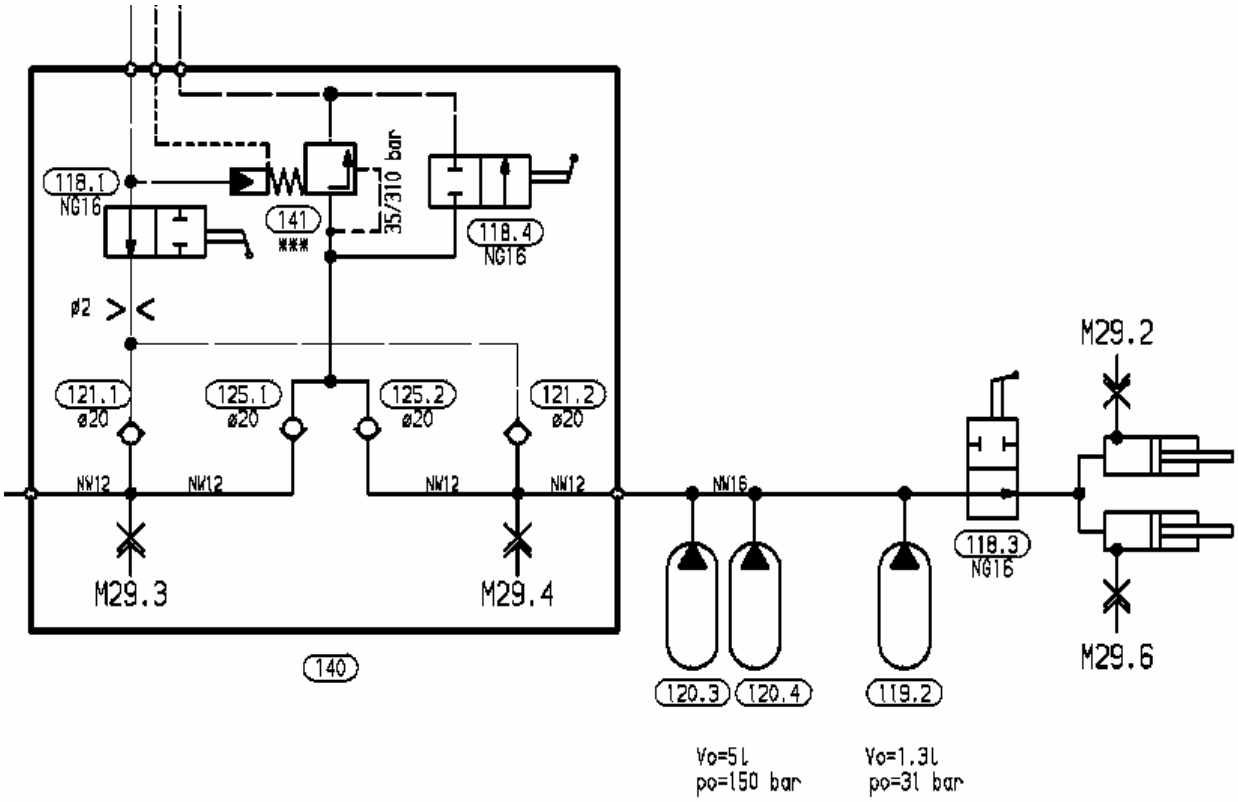






BOTH MANIFOLD VALVES OPEN

Hydraulic circuit diagram (partly) for the right hand track tensioning system



PARTS & SERVICE NEWS	REF NO.	AH08508
	DATE	June 13, 2008

SUBJECT: Bushings of the attachment and at the undercarriage

PURPOSE: Wear checking procedure

APPLICATION: PC3000-1; PC3000-6; PC4000-6; PC5500-1; PC5500-6; PC8000-1; PC8000-6

FAILURE CODE: 7100CA

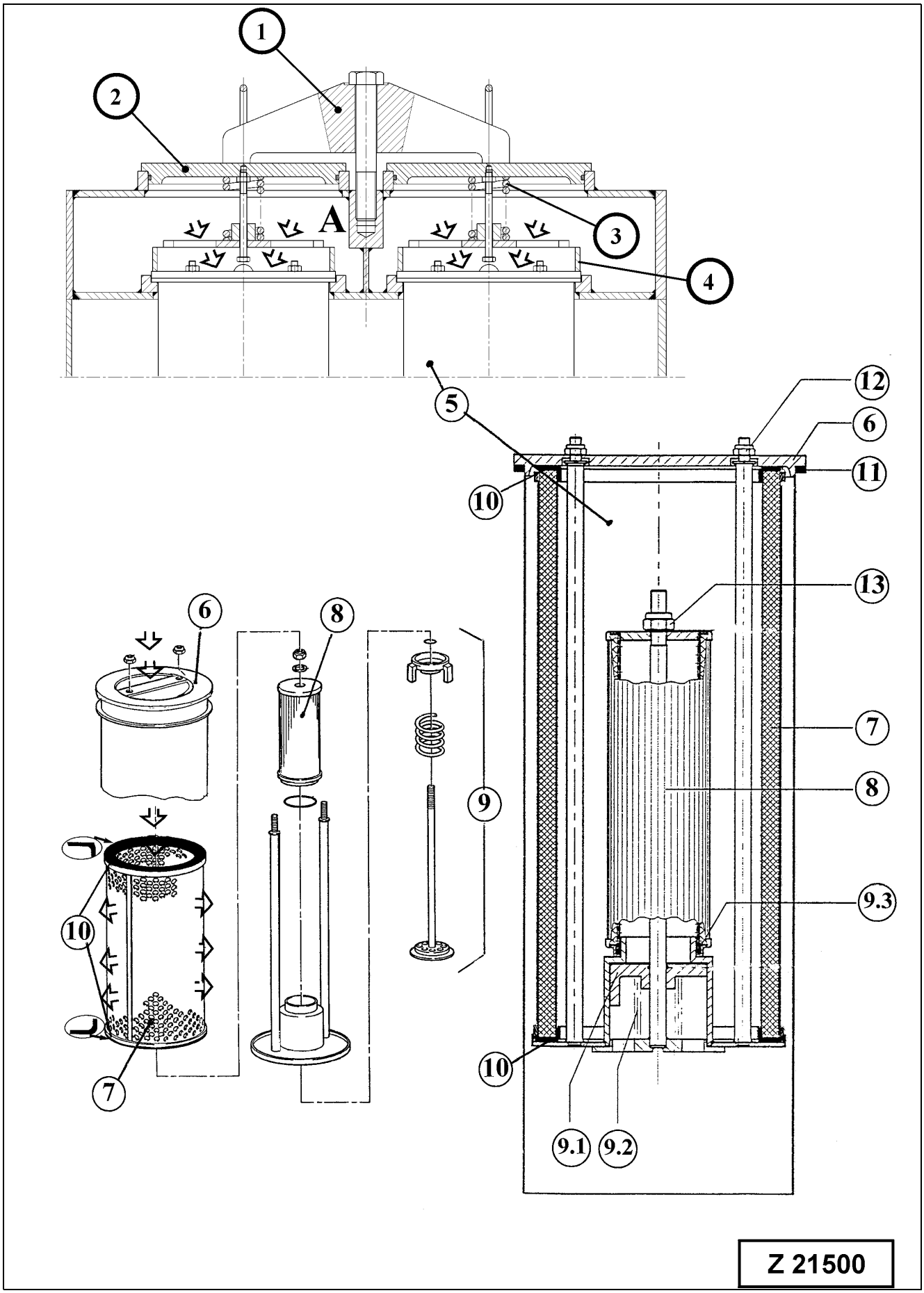
DESCRIPTION:

- **Before carrying out any repairs, read all the safety instructions of the Operation and Maintenance manual of your shovel.**
- **The local safety rules must also be observed.**

- **For installation of bushes please refer also to Parts & Service news AH06545.**

1. **Bushings of the attachment**
2. **Bushings between bolted track frame and undercarriage** (depends on the execution)

2.2 Return and leak oil filter



Legend for illustration (Z 24013):

A	View from machine center
B	View from pump compartment
C	Top view

1	Main hydraulic oil reservoir
2	Location temperature sensors
3	Location level sensors
4	Oil level sight gauge
5	Breather filter
6	Return oil filter (three)
7	Auxiliary return oil connections
8	Back pressure valve
9	Leakage oil line connections
10	Leakage oil filter (one)
11	Mounting brackets
12	Oil reservoir outlet (suction pipe)
13	Main gate valve
14	Compensator
15	Access cover
16	Level switch for service arm indicator light
17	Refill plug

General

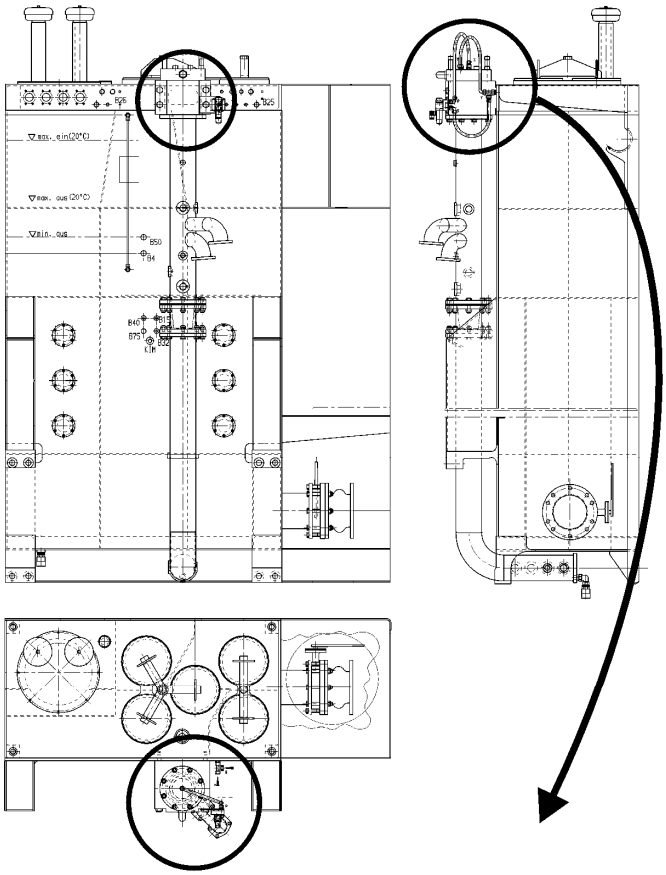
The suction lines of all hydraulic pumps are connected via suction tank and screen filters, compensator (14) and main valve (13) to the main hydraulic oil reservoir (1). The hydraulic oil reservoir is a welded sheet-metal construction with integrated swash reduction.

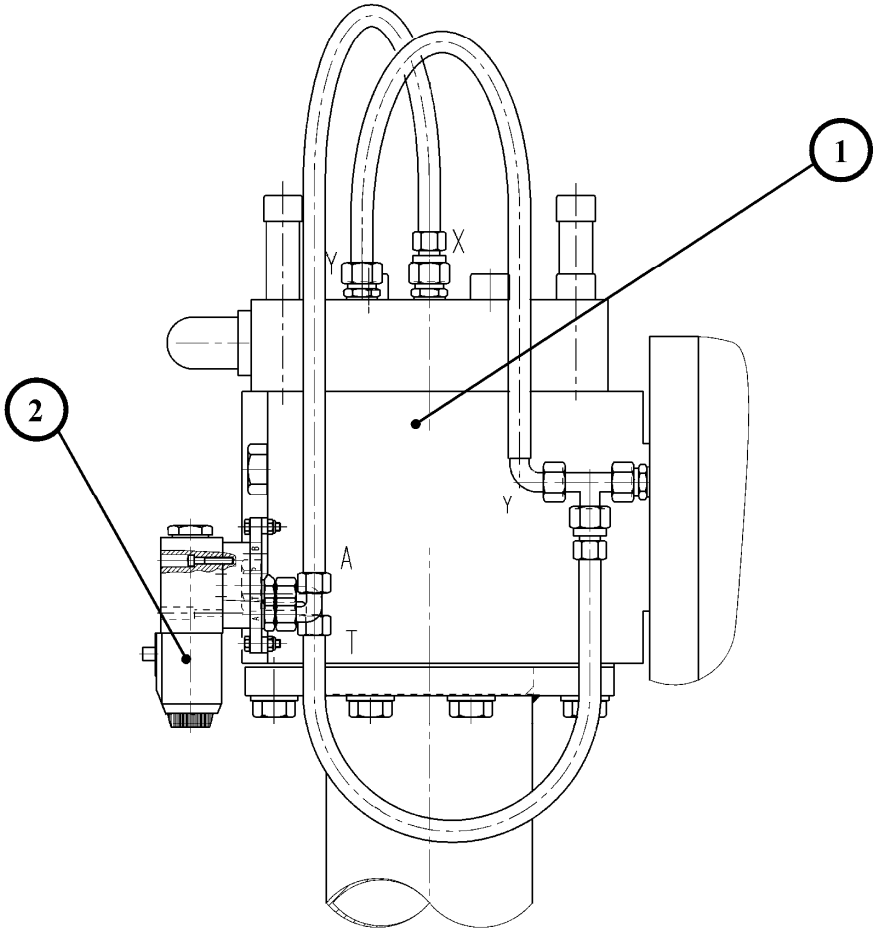
The filling capacity is 2700 liters. The reservoir contains four oil filters divided in three return oil filter (6) and one drain oil filter (10).

The hydraulic system is a open and pressure-less circuit, means there is a direct connection to the ambient air pressure. To protect the hydraulic oil from dust and dirt is a breather filter (5) on top of the reservoir mounted. A vacuum switch monitors the condition of the breather filter (5).

The back pressure valve and the pressure check point M4 are located at the back pressure valve block (8).

3. PC4000/6D

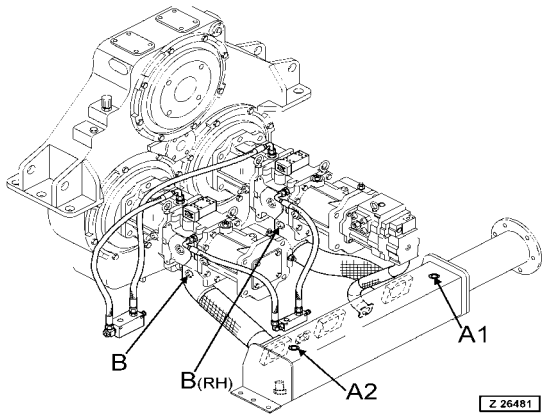




Z 21498

Table of contents section 3.0

14 Lower park attachment to the ground in a position as shown on the oil level plate. Stop motor / engine and check oil level. If required correct oil level.



INTRODUCTION

HYTORC tools are uniquely multi-purpose. They can be used as accurate bolting equipment on conventional nuts in open or confined spaces. They also can be used as reaction arm free tensioning equipments, when used with HYTORC LoaDISC washer or HYTORC-Clamp, Hydraulically Actuated Mechanical Tensioner.

SECTION I
IMPORTANT SAFETY INSTRUCTIONS

HYTORC tools are designed for the safety of operators. However, they are powerful tools and certain safety precautions should be observed to avoid accidents or personal injury. The following tips will assist you.

READ ALL INSTRUCTIONS

KEEP WORK AREA CLEAN AND WELL LIT

CONSIDER WORK AREA ENVIRONMENT — **Electric pumps should never be used in any atmosphere which can be considered potentially volatile. If there is any doubt, use an air pump.**

Also note: Metal to metal contact can cause sparks. Precautions must be taken.

AVOID PREMATURE TOOL STARTING — **The pump remote control should be operated by a designated operator and ensure "ALL CLEAR" prior to starting and to avoid premature tool starting.**

STAY CLEAR DURING OPERATION — **In most cases, the tool will allow "hands free" operation. If the tool must be reset on bolt during operation, make sure the remote control operator is aware of turning the pump off.**

IMPORTANT NOTE: NEVER HOLD THE TOOL DURING OPERATION!

GUARD AGAINST ELECTRIC SHOCK — **Ensure the pump is properly grounded and the proper voltage is used.**

STORE EQUIPMENT PROPERLY — **When not in use, tools and accessories should be properly stored to avoid deterioration.**

USE THE RIGHT TOOL — **Do use tools or attachments suitable for the applications.**
***refer to our recommended torque/load chart**

PROPER SAFETY ATTIRE — **When handling/operating hydraulic equipment, wear work gloves, hard hats, safety shoes, safety glasses and other applicable clothing.**

MOVING EQUIPMENT — **Do not use hydraulic hoses, uniswivels, pump power or remote cords as means of moving the equipment.**