Rammer SERVICE

Rammer S 52

Workshop Manual

Note !
This manual contains confidential information and it must not be given to a third party without permission.

Specifications and design presented in this manual are subject to change without notice.

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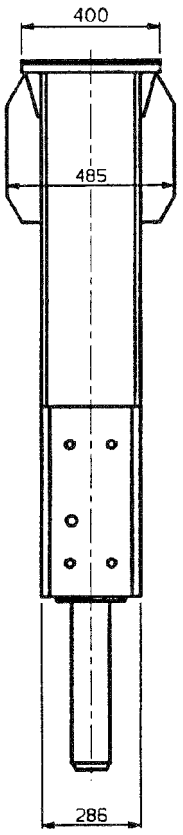
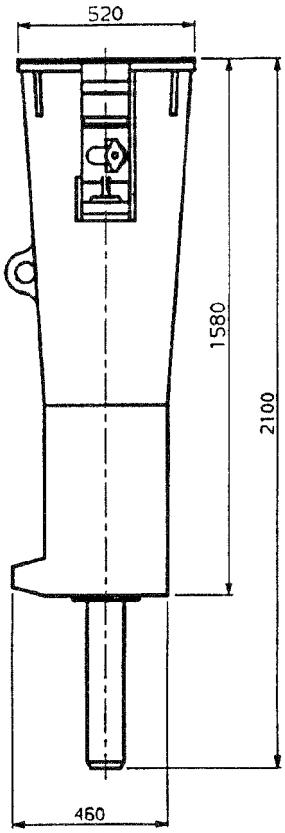
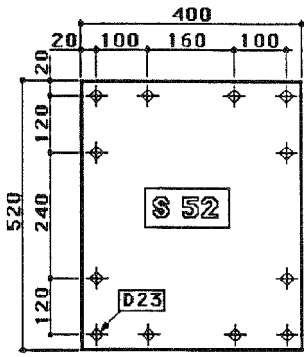
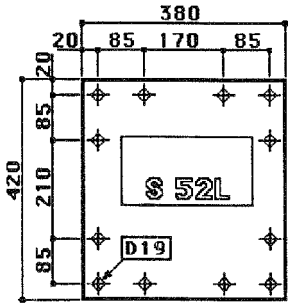
52A01XXX / L01

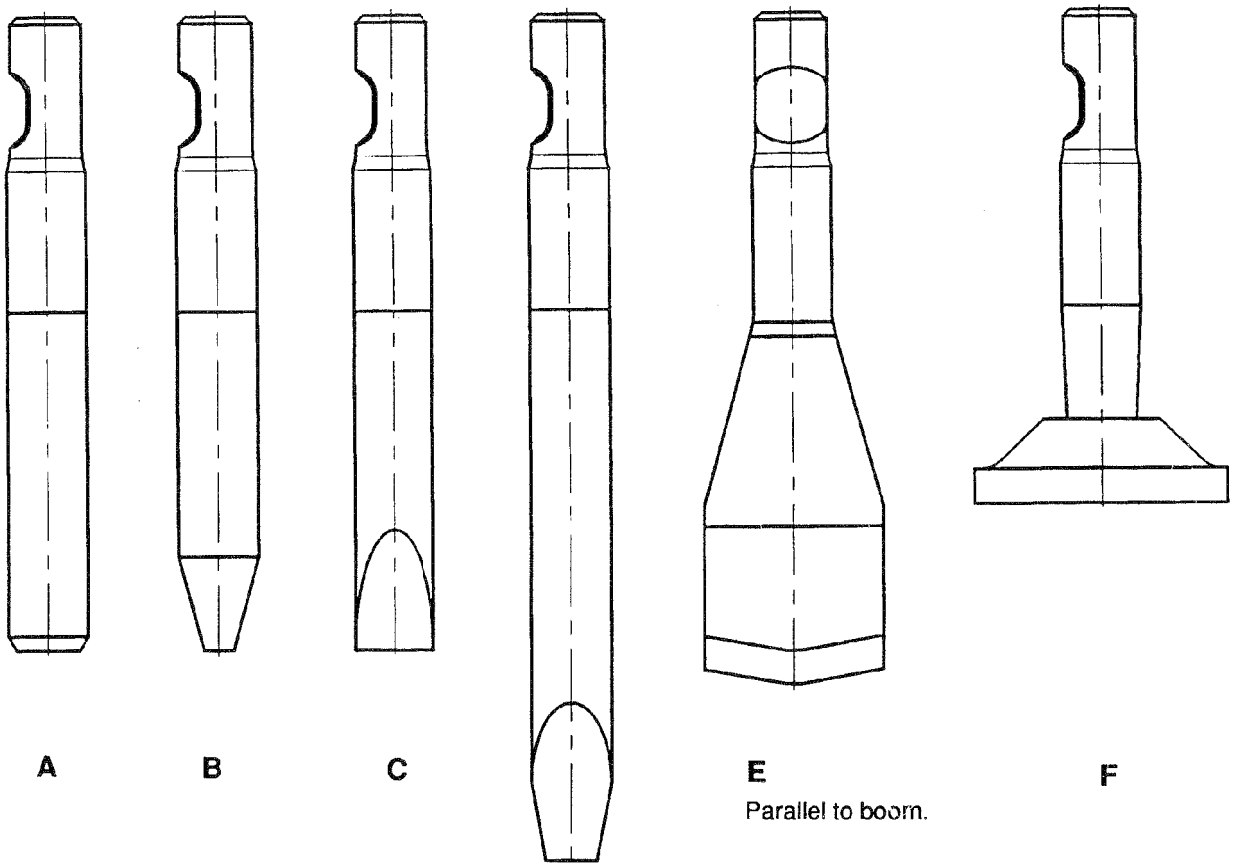








WORKING WEIGHT (with mounting bracket and tool)		**950**	**kg**
IMPACT ENERGY		**1800**	**J**
IMPACT FREQUENCY		**390...560**	**bpm**
OPERATING PRESSURE		**130...140**	**bar**
PRESSURE LIMITS		**185...210**	**bar**
OIL SUPPLY		**70...100**	**L/min**
RETURN LINE COUNTER PRESSURE		**max.6**	**bar**
INPUT POWER		**max. 23**	**kW**
OUTPUT POWER		**max. 17**	**kW**
EFFICIENCY		**0,7**	
TOOL SHANK DIAMETER		**110**	**mm**
CONNECTIONS IN HAMMER			
/PRESSURE LINE		**R 3/4" BSP-ext**	
/RETURN LINE		**R 1" BSP-ext**	
LINE SIZE / INNER DIA /	**PRESSURE LINE**	**19**	**mm**
	RETURN LINE	**25**	**mm**
OIL TEMPERATURE		**-20...+80**	**° C**
HYDRAULIC OIL VISCOSITY		**1000...15**	**cSt**
CARRIER WEIGHT, ALLOWED		**11...18**	**ton**
CARRIER WEIGHT, OPTIMUM		**12...16**	**ton**



A B C D E F

E
Parallel to boom.

Standard tools : lengths mm:s

	Name	Part no.	Total length	Working length	Weight (kg)	Diameter (mm)	Note
A	Blunt tool	20649	900	510	57	110	
B	Moil point	20651	900	510	55	110	
C	Chisel	20650	900	510	55	110	
D	Long chisel	20652	1200	810	75	110	

Special tools:

E	Asphalt cutter	20645	950	560	83	110	Width 250
F	Compacting plate	31298	700	310	107	110	Ø 350

CONTENTS Page

GENERAL

This manual will help you to get the maximum benefit from the Rammer S 52 Hydraulic Hammer as well as in its installation, maintenance and proper use.

The Rammer S 52 is ideally suited to such tasks as

- the demolitions of reinforced concrete and brick structures
- breaking oversized boulders
- removal of road surfaces
- breaking frozen earth
- scaling tunnels and other underground structures
- converter lining removal
- slag removal and the cleaning of casting ladles in foundries and smelting shops
- compacting loose ground

and you will doubtless find more.

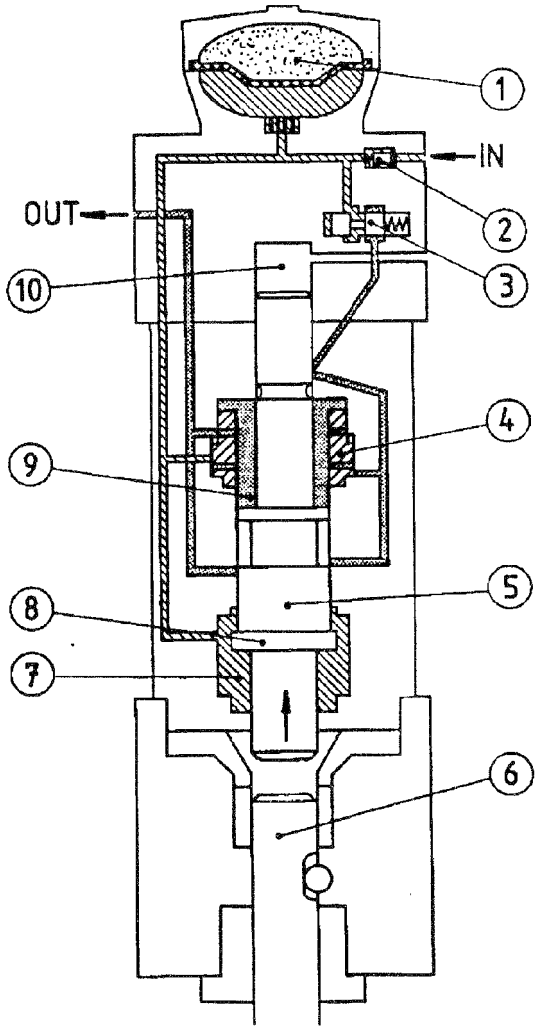
In order to ensure a long, trouble free and profitable working life for the Rammer S 52 Hydraulic Hammer, please observe the instructions contained in this manual.

Correct use and regular maintenance are the two best guarantees of profitable operation.

1. Pressure accumulator
2. Check valve
3. Pressure adjusting valve (pav)
4. Distributor
5. Piston
6. Tool
7. Space below piston
8. Lower shoulder of piston
9. Upper shoulder of piston
10. Space above piston
11. Piston's groove
12. Space below distributor
13. Pilot pressure groove of piston

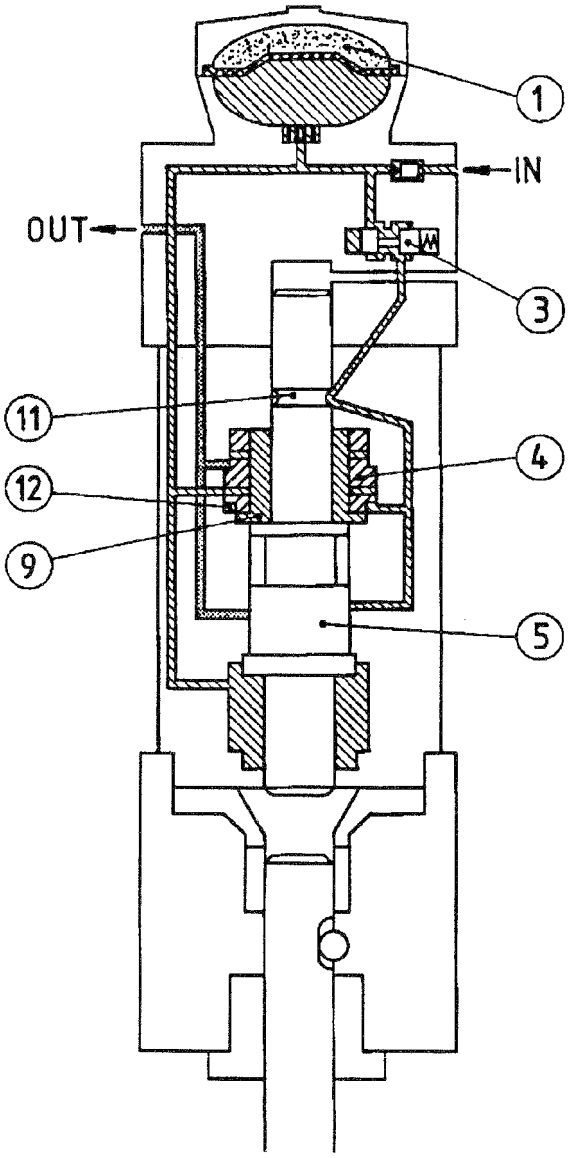
IN Pressure line
OUT Return line

High pressure
Low pressure



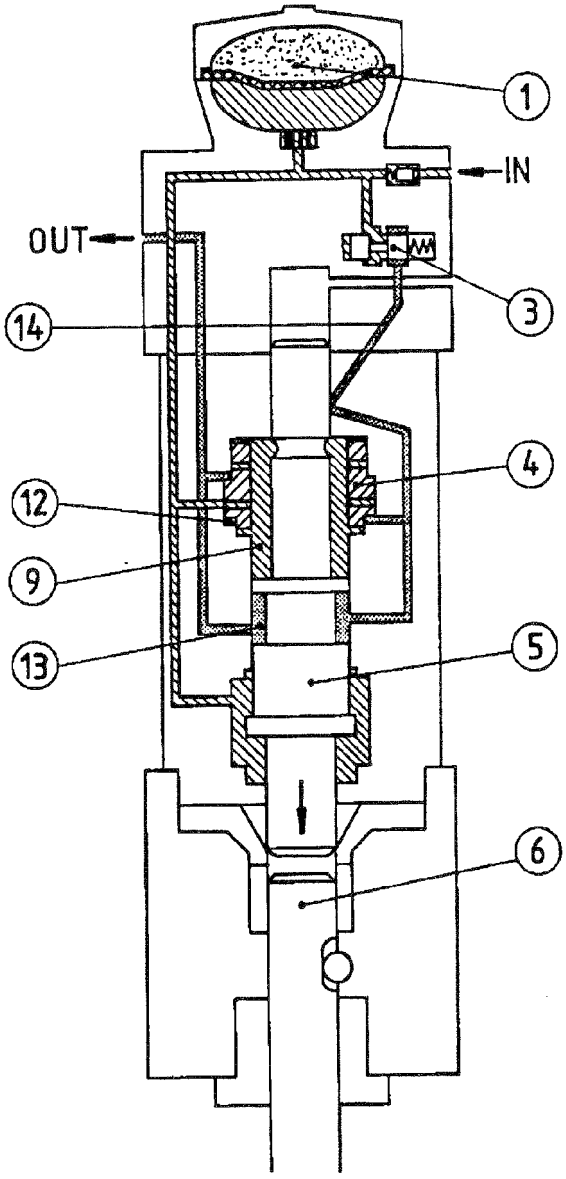
5.1 Start up / raising the piston

Oil flows into the hammer through the pressure fitting (IN) and the check valve (2). It flows into the pressure channel and on to the space below the piston (7). The piston starts to rise because of the difference in the areas of the upper and lower shoulders. Someoil flows to the pressureaccumulator (1) and stores energy thereby pressurizing the nitrogen behind a rubber membrane. The pressure also affects the pav (3) and compresses the valve spool against a spring. The difference in spool area is achieved with the aid of a small auxilliary spool or a needle. The distributor (4) connects the space above the upper shoulder of piston (9) to the return line and oil flows out of the machine through the return line fitting (OUT) at almost zero pressure. The distributor has closed the pressure channel to the space aboce the upper shoulder of piston (9). At this stage, the pressure in the hammer rises continuously. The space above the piston (10) is connected to air breather hole. The control pressure channel is closed.



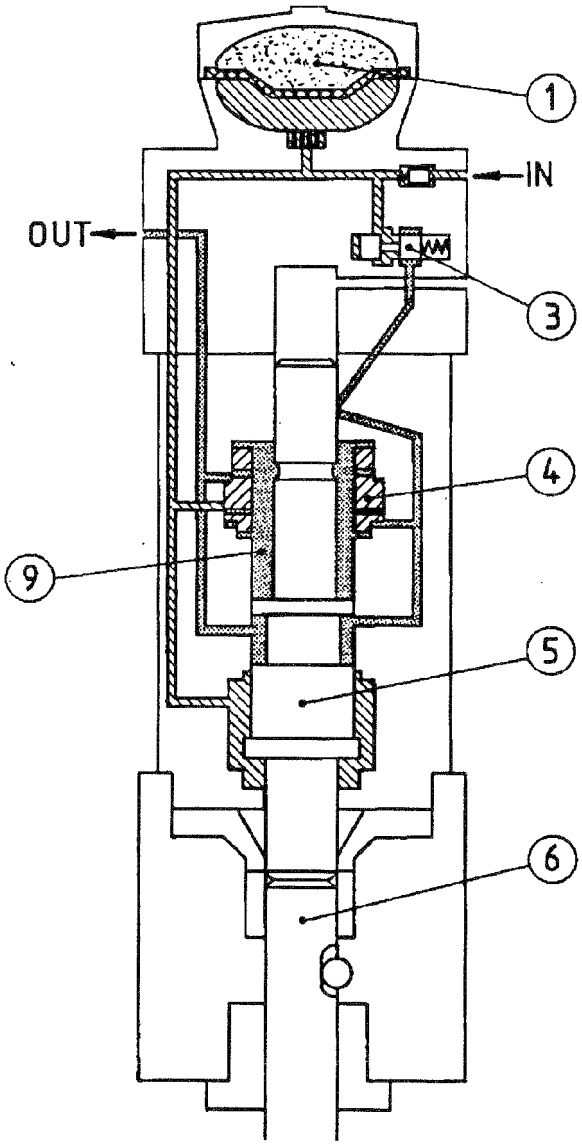
5.2 Raising the piston (end of the raising)

The piston (5) has risen to its upper position. The accumulator (1) is pressurized. The oil pressure has risen to the preset opening value of the pav (3). This value is adjusted by spring loading. The pav oopens and gives pressure impulse to the distributor (4) which rises to its upper position and connects the pressure to the space above the upper shoulder of the piston (9). At the same time, the distributor closes the tank channel. The pressure impulse to the distributor is lead through a groove (11) in the upper part of piston. Thus, the piston is in the right position before the blow. The piston commences its working stroke.



5.3 Piston stroke

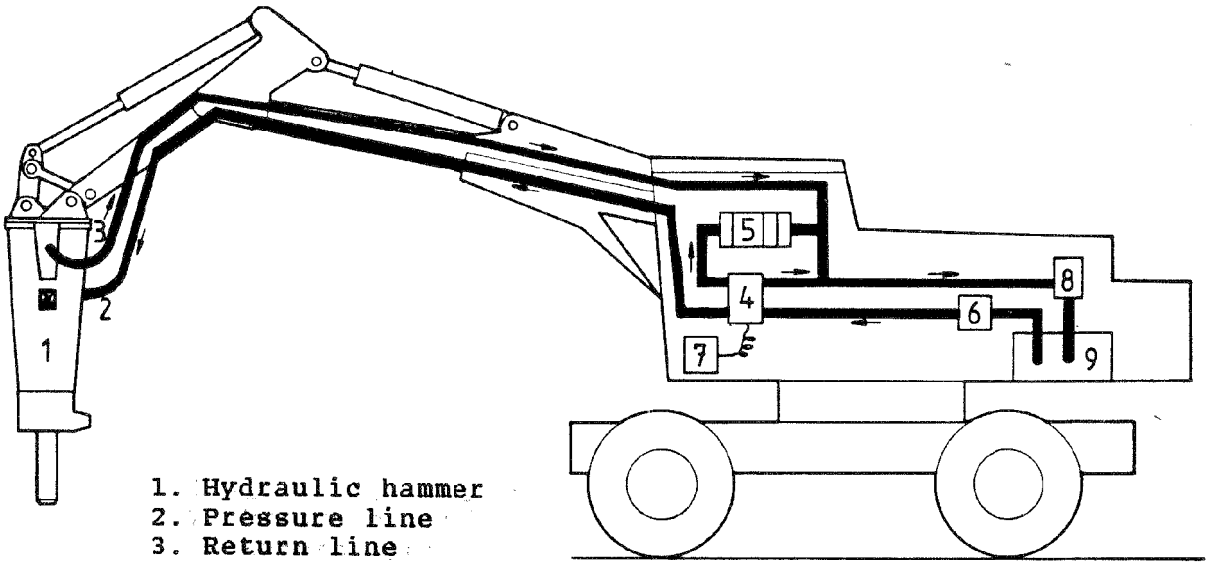
The hydraulic oil pressure has accelerated the piston to a high velocity and its about to strike the tool (6). The pressure falls during the stroke and the pav (3) closes. During the working stroke of the piston the accumulator (1) releases the pressure energy stored in it by discharging oil into the pressure channel and to the space above the piston (9). The distributor (4) is kept in its upper position hydraulically during the working stroke of the piston. The pilot pressure groove (13) in the middle part of the piston connects the space below the distributor (12) to the return line and the distributor begins to move downwards.



5.4 Piston stroke (end of the stroke)

The piston (5) strikes the tool (6). The distributor is in its lower position connecting the space above the upper shoulder of piston (9) to the return line. The pressure in the hammer begins to rise again, the return movement of the piston begins and the cycle is repeated.

3. INSTALLING THE RAMMER S 52 HYDRAULIC HAMMER ON AN EXCAVATOR



1. Hydraulic hammer
2. Pressure line
3. Return line
4. Control valve + pressure limitation
5. Excavator valve block
6. Hydraulic pump
7. Electric switch
8. Hydraulic oil cooler
9. Hydraulic oil tank

3.1 The excavator must have the following specifications:

a) Total weight 11-18 tonnes.

b) The hydraulic pump on the excavator must deliver a max of 70-160 l/min.
The flow rate to the Rammer S 52 hydraulic hammer must be between 70-100 l/min; at a pressure of 13...14 MPa (130...140 bar). A flow regulator valve must be used as necessary.

c) The hydraulic pumps on the excavator must develop minimum pressure of 18,5 MPa (185 bar). In special cases it is also possible to use a lower pressure.

d) The hydraulic oil cooling unit on the excavator must have extra cooling capacity.

e) The electrical system of the excavator must have a voltage of either 12 V or 24 V DC (when BBT602-D6, BBT150-D4 control valve is used).

With special arrangement it is possible to install the Rammer S 52 Hammer on excavators which do not meet all the above requirements. In all special cases the manufacturer must be consulted.

3.2 Hydraulic connection of the Rammer S 52 hammer to the excavator

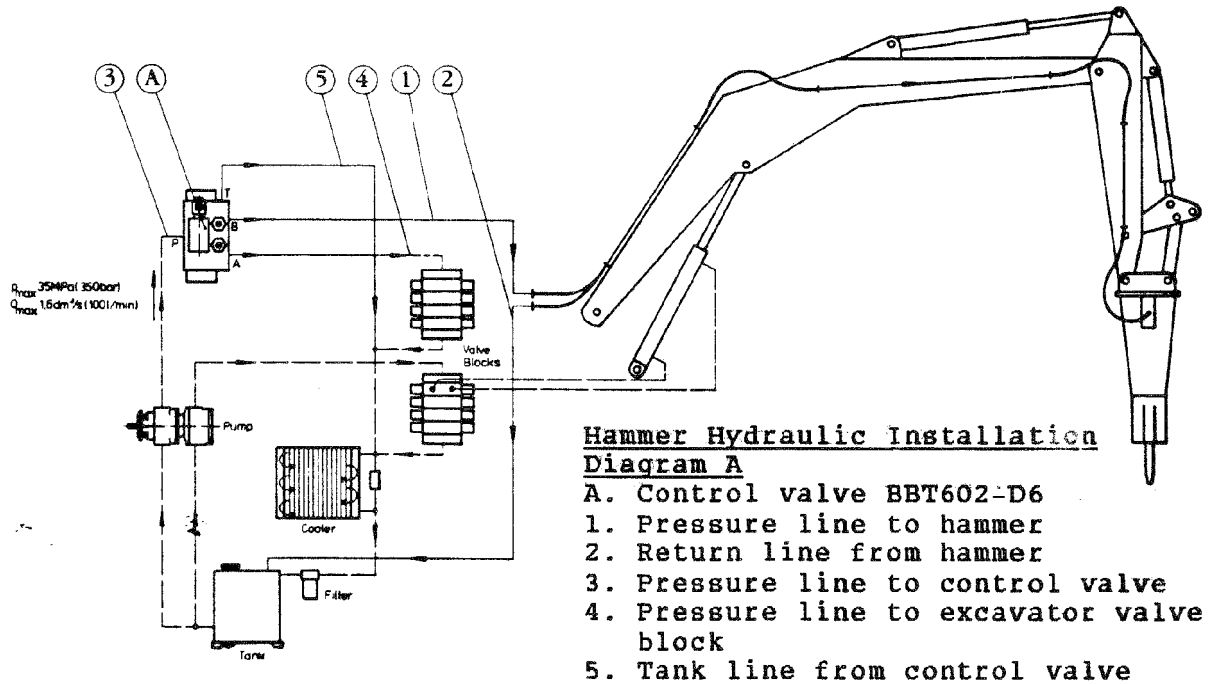
The Rammer S 52 Hydraulic Hammer can be connected to the excavator in accordance with diagram A, B.

The choice of installation depends on the maximum output of the excavator's pumps. Control valve BBT602-D6 is installed in the excavator's pressure line before the control valve block. This valve is a purpose-designed, electrically controlled 3-way valve which contains the necessary pressure limit valves to protect the excavator hydraulic pumps and the Rammer hammer from possible damage from overloading. The valve operates on either 12 V or 24 V DC.

The preset value of the pressure limiting cartridge (P_2) of the hammer line should be between 18,5 and 21,0 MPa (185 - 210 bar). In order to protect the pump, the preset value of pressure limiting cartridge (P_1) should be a little higher than the operating pressure of the circuit in which it functions.

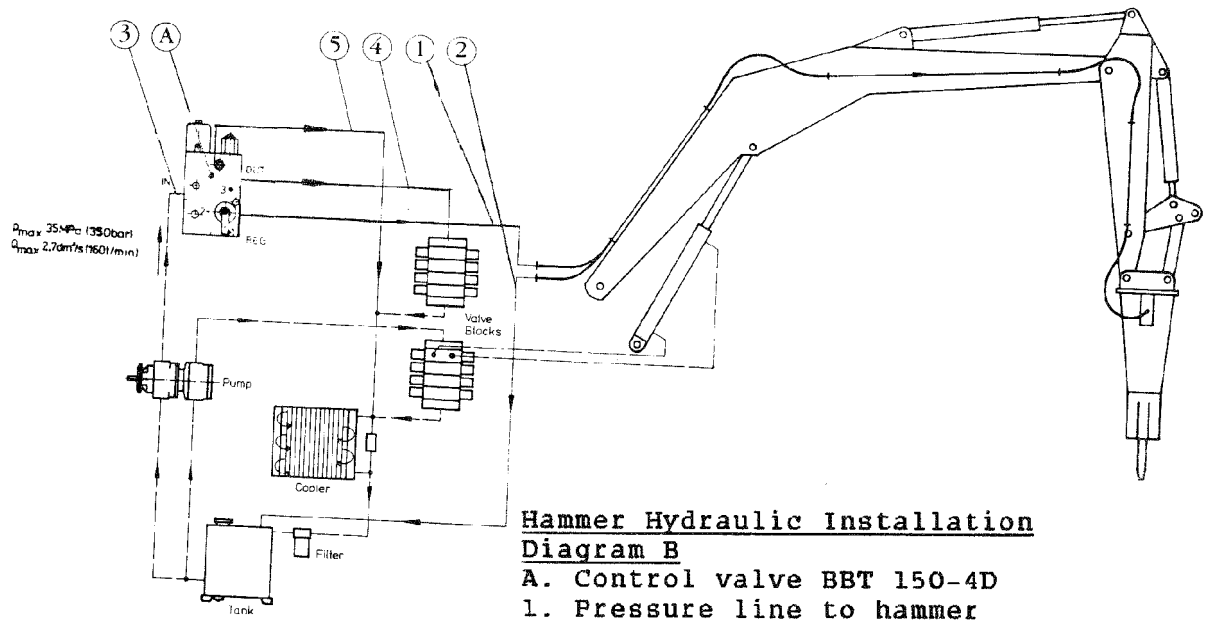
We recommend the hammer control valve to be installed in a pressure line of the excavator in which the maximum flow is less than 100 l/min. In this way, no separate flow regulation valves are required (diagram A). The installation must also take into account the fact that the tool of the hammer is to be pressed against the object to be broken when it is started. This requires at least one of the excavator's pumps to be left free to deliver oil to the excavator valve block. Before the Rammer R700 Hydraulic Hammer is put into use, the hydraulic connection must be inspected by a Rammer specialist.

The Rammer S 52 Hydraulic Hammer can be installed hydraulically on the excavator in other ways. In all special cases, the manufacturer must be consulted. The manufacturer will also supply detailed installation instructions for different excavators.



Hammer Hydraulic Installation
Diagram A

A. Control valve BBT602-D6
1. Pressure line to hammer
2. Return line from hammer
3. Pressure line to control valve
4. Pressure line to excavator valve block
5. Tank line from control valve



Hammer Hydraulic Installation
Diagram B
A. Control valve BBT 150-4D
1. Pressure line to hammer
2. Return line from hammer
3. Pressure line to control valve
4. Pressure line to excavator valve block
5. Tank line from control valv

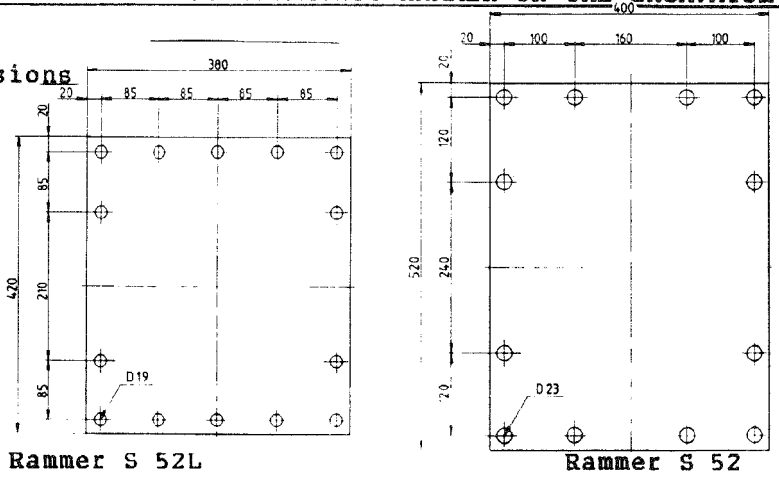
Diagram B

If the max. capacity of the excavator is 100-160 l/min, install the valve BBT 150-D4 according to the same instructions as the valve BBT 602-D6. There is a control arm in the valve by which the flow will be adjusted.
Position 3: 98 l/min is suitable for Rammer S 52. The value in pressure control cartridge of the valve has to be 190 bar. If the max. capacity of the excavator is more than 160 l/min, contact the manufacturer.

The pressure adjustment of the valve BBT 150-D4:
1. Plug the pressure line e.g. on the line to hammer and attach the pressure gauge to the line.
2. Start the motor and adjust 2/3 of the working rate.
3. Operate the valve and adjust the pressure to 190 bar.

3.3 MOUNTING THE RAMMER S 52 HYDRAULIC HAMMER ON THE EXCAVATOR BOOM

Mounting dimensions



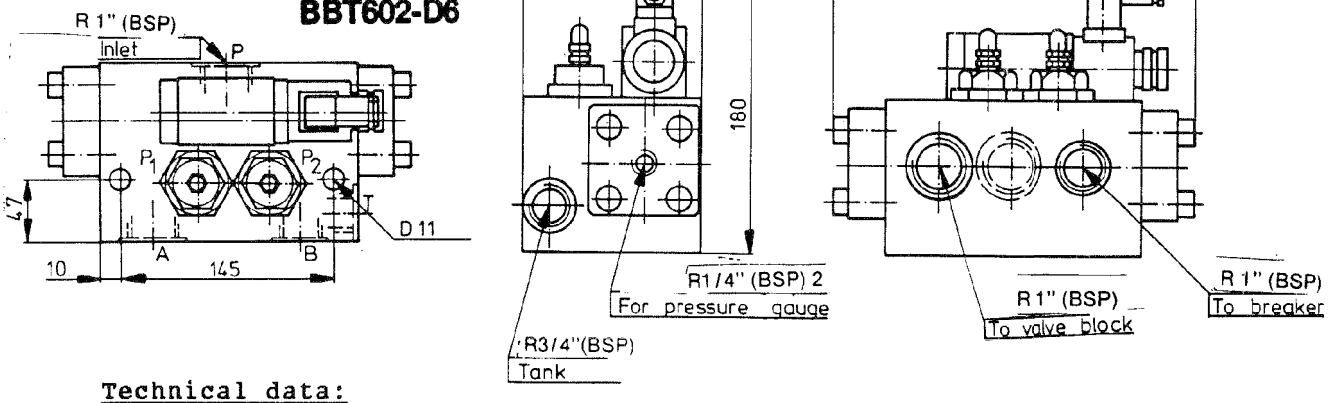
Rammer S 52L Rammer S 52

A special mounting plate is needed to mount the Rammer S 52 hammer on the boom of the excavator. The dimensions of this mounting plate depend upon the dimensions of the boom head.

3.4 Installation parts

3.4.1 Control valve

BBT602-D6



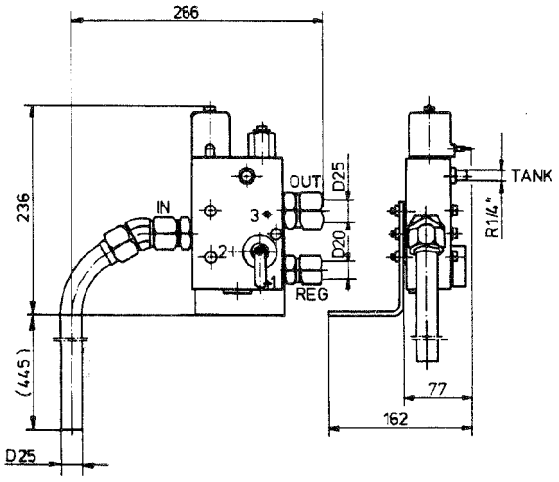
Technical data:

Max operating pressure		35 MPa (350 bar)
Pressure limitation	P_1	15,5-35 MPa (155-350 bar)
	P_2	18,5 MPa (185 bar)
Flow rate		max. 180 l/min (3,0 dm^3/s)
Pressure loss at 70 cSt oil viscosity	p- A	0,35 MPa/150 l/min
	p- A	0,27 MPa/100 l/min
Solenoid		12 or 24 V DC; 29 W
Control valve body		cast iron
Weight		17,0 kg
Order no.		31520

completed with mounting kit BBT 602-D6

(When ordering, the solenoid voltage and the values of the pressure limiting valves must be mentioned.)

B



RAMMER BBT 150-4D valve is used in the installation of **RAMMER** S 24, S 26 and S 52 hammers. The valve comes as a complete package including couplings, inlet pipe, fastening plate and foot pedal.
Valve order number: 95523.

RAMMER BBT 150-4D is installed in the carrier's pump line. The inlet pipe can be rotated 360° to facilitate installation.

The return line from the hammer should be connected to the carrier return line at a sifficient distance (1,5-2,0 m) from the filter and cooler.

Technical data:

Working pressure	IN OUT max. 345 bar
Regulated pressure	REG max. 205 bar
Inlet flow	IN OUT max. 160/1min

Flow regulator: in the valve is a selector switch which has three positions:

Position 1:	64 l/min (RAMMER S 24)
Position 2:	83 l/min (RAMMER S 24)
Position 3:	98 l/min (RAMMER S 26, S 52)
Solenoid	12 V (standard)
	24 V (to order)

Dimensions:

- length	210 mm
- height	100 mm
- width	70 mm
Weight	5,5 kg

3.4.4 Pressure and return lines

Hose	Pipe
Pressure line SAE 100 R2-12	DIN 2391 ø 25 x 3,0
Return line SAE R1T-16	DIN 2391 ø 30 x 3,0

For pressure and return lines, only hose or pipe-hose combinations are used. The pipes and hoses must be of the above mentioned sizes and must also meet the requirements of the above mentioned standards.

The pressure line must be installed on the right hand side of the boom and the return line on the left. The hammer has the words "IN" and "OUT" at the appropriate connections. The pressure line connection is R 3/4"BSP and the return line R 1"BSP. Both connections are externally threaded.

The hoses and pipes must not be bent into steep corners and must not rub against anything. The control valve must be installed in a protected place.

Installation

1. Check that the hammer's control valve BBT 602 is fitted with a control solenoid suitable to the excavator's electrical system. The voltage is stamped on the end of the solenoid.
   Check the values of the pressure limiting cartridges of the control valve.
   Check the type and value of the flow reduction valve, if necessary (diagram B or C).
   Make sure that all necessary parts for each line are on hand and that the connectors for both valve and hammer are correct. Use the connection diagram and parts list as well as a list of connectors for correct identification.

2. Find the pressure line of the excavator into which the control valve is to be placed according to the connection diagram. Mount the control valve near the line in such a way that there is room to install the pipes and hoses.
   Remove the original pressure line and replace it with the new one: pump to valve connection p and valve connection A to excavator valve block.

3. Connect the tank line T of the control valve to the return line of the excavator or to the hydraulic oil tank. Use the proper T-connectors unless the connection is made permanent by welding.

   WARNING!
   The tank connection of the control valve must be connected to the return line or to the tank. Closing the connection or connecting it to the pressure line will damage the valve and/or the hydraulic pump of the excavator.

4. Connect the pressure line of the hammer from connection B of the control valve to the pressure connection of the hammer (diagram A).

5. Connect the return line from the hammer to the point specified in the hydraulic diagram of the excavator.
   When the return line is lead straight to the hydraulic oil tank of the excavator the end of the pipe or hose should be cut at an angle of about 45° and placed so that the end is approximately 100 mm (4") from the bottom of the tank.
   Even though another connection point may be specified for the return line in the hydraulic connection diagram it can, however, also be lead direct to the tank unless the hydraulic system of the excavator makes this impracticable.

6. Attach the hoses to the boom and check that they cannot get damaged in any boom position.

7. Install the electric switch of the control valve in a suitable ergonomic position in the operator's cabin. Connect the electric leads of the control valve. Install the fuse and the terminal block on the dashboard. Bind the leads neatly together using a lead binder or insulation tape.

Trial operation

1. Connect the pressure and the return lines together bypassing the hammer and start the motor. Press the electric switch of the hammer a few times and check the operation of the control valve by observing the hoses. A small movement of the hoses at the moment of switching on and off indicates commencement and cessation of oil flow. Let the oil flow through the line for 5-10 minutes then stop the motor.

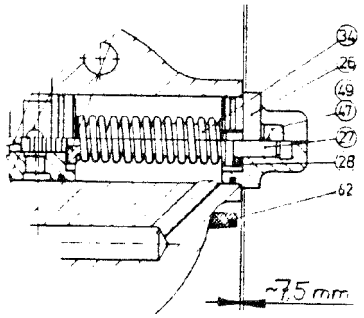
2. Connect the pressure and return lines properly to the Rammer S 52 hydraulic hammer and start the motor. Press the tool of the hammer against a rock or against concrete and start the hammer. Use low motor revolutions at first. The protective oil in the hammer will flow into the return line and mix with the hydraulic oil being used. The hammer should strike strongly and evenly.

3. Adjust the working revolutions of the excavator motor and operate the hammer for about an hour until the normal operating temperature has been reached. Check the start-up and operation of the hammer as well as all hose connections. Put the pressure gauge (41738) into the appropriate connection on the cover of the hammer. Start the hammer and calculate the operating pressure as the average of the highest and the lowest readings. The operating pressure adjustment value is normally 13...14 MPa (130 - 140 bar). Stop the hammer and at the same time observe the gauge. The pressure decreases slowly until a certain point is reached, then it becomes rapid. This is due to the oil draining form the pressure accumulator. It is, thus, a simple matter to check the pressure of the accumulator. The changeover point from slow to rapid must be 4,5-5,0 MPa (45-50 bar); depending on temperature. If it is, then the pressure is correct.
   Remove the gauge and plug the measuring point.

4. Finally, once again tighten all connectors, bolts, screws etc. The Rammer S 52 is now ready for continuous service.

3.5. Measurement and adjustment of hydraulic circuit

The operating pressure of the Rammer S 52 is 13,0...14,0 MPa (130... 140 bar). This is preset at the hammer factory.
The operating pressure of the hammer can be adjusted by adding or removing shims to or from between the cover and the spring of the pressure adjusting valve. Removing shims decreases the operating pressure and adding them increases it.
The pressure is adjusted right when the pre-tightening value of the spring of the pressure adjusting valve is 7,5 mm. The pre-tightening value is measured at the point shown in the picture when measuring it the spring must not be loaded.



NOTE!
The measuring is easier to do when the O-ring of the spring box is not in its place.

The pre-tightening is performed by using shims. The right pre-tightening value (7,5 mm) is usually gained when the total thickness of the shims is 5 mm.

There is a pressure measuring point (R 1/4") on the hammer housing beside the return line connection and the standard maintenance tool set includes a pressure gauge for this purpose. Pressure readings should be taken at a hammer operating temperature of between 40°C and 60°C and at a hydraulic oil volume flow of about 70 l/min. The operating pressure is to be read as an average of the highest and lowest indicated pressures. The pressure limit valve of the hammer circuit must have a value of between 18,5 MPa and 21,0 MPa (185 - 210 bar); at its operating temperature.

The volume flow of the hydraulic oil to the hammer at its normal operating temperature and pressure is a min of 70 and a max of 100 l/min.
The back pressure in the return line of the hammer must not exceed 0,6 MPa (6 bar).
Adjustment of control valve pressure limit cartridge:

Cartridge P_1: BBT602-D6

1. Attach a pressure gauge to the measuring connection which is on the cover on the side of the B-channel (R 1/4"BSP).
2. Fit a stopcock to the A-connection and open it fully.
3. Remove the cover nut from the end of the cartridge and loosen the lock nut on the adjusting screw.
4. Start the motor and adjust the revolution to approximately 2/3 of the operating speed.
5. Close the stopcock. The pressure will now show the pressure of cartridge P_1. Adjust the pressure to 10-20 bar higher than the pressure limit for the same line of the excavator. It must not, however, exceed 350 bar.

Cartridge P_2:
1. Attach the pressure gauge to the measuring connection which is on the cover on the side of the A-channel (R 1/4"BSP).
2. Plug channel B or close it with the stopcock.
3. Adjust the motor to approximately 2/3 of the normal operating speed.
4. Activate the pre-control valve by pressing the button at the end of the magnet. The pressure gauge now shows the pressure of cartridge P_2.
5. Adjust the pressure to 185 bar.

4. HYDRAULIC OIL

Generally speaking, the hydraulic oil originally intended for the excavator can be used in the Rammer S 52 hydraulic hammer. However, since working with the hydraulic hammer will heat the oil much more than is usual in excavation work, the viscosity of the oil must be checked.

When in continuous hammer work the temperatur of the hydraulic oil stabilizes at a certain level, depending on conditions and on the excavator. At this temperature, the viscosity of the hydraulic oil must be 20...40 cSt.

WARNING!
The Rammer S 52 hydraulic hammer must not be started if the viscosity of the hydraulic oil is above 1 000 cSt, or operated when the viscosity of the hydraulic oil is below 15 cSt.

Table 4.1 shows hydraulic oils recommended for hammer use. The most suitable hydraulic oil is selected in such a way that the temperature of the hydraulic oil in continuous use is in the ideal area on the chart and the hydraulic system is used to best advantage.

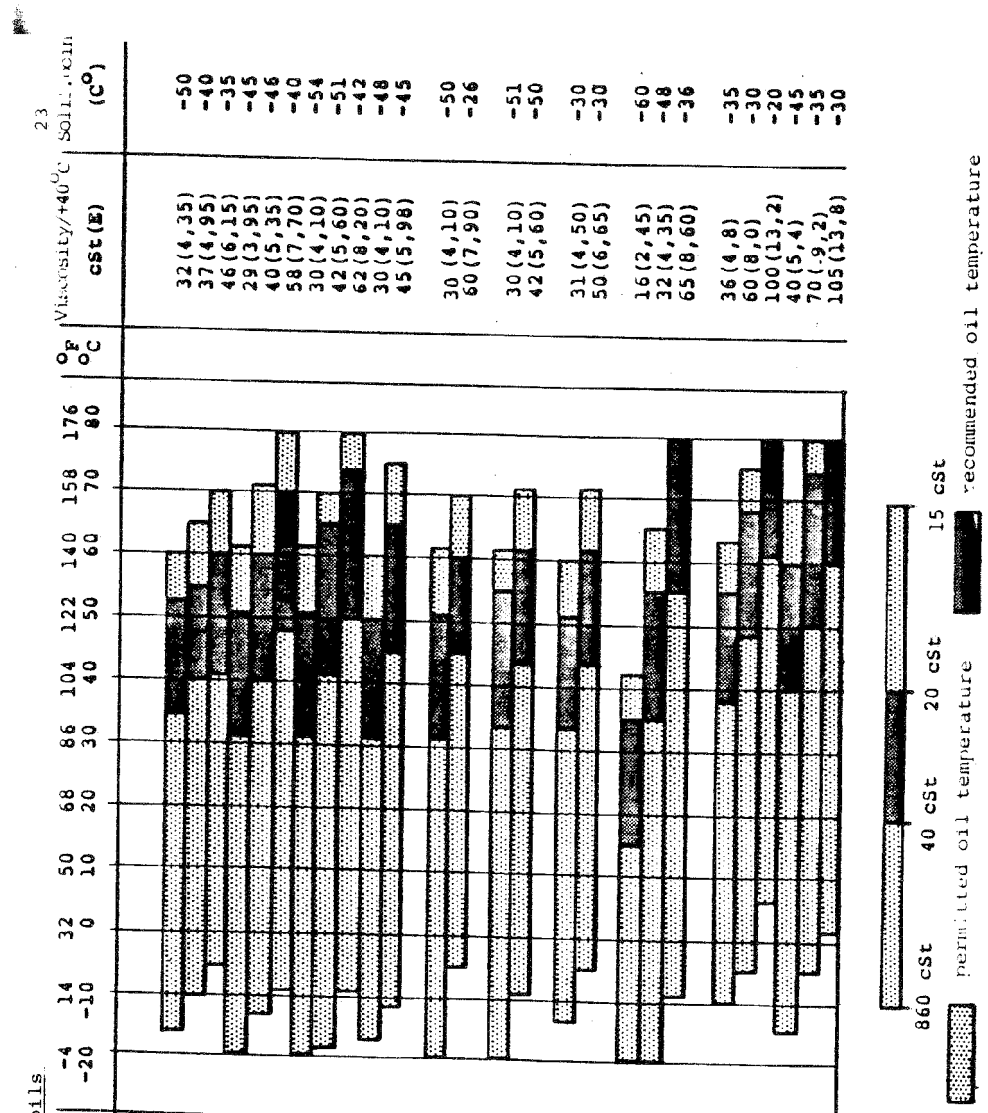
Hydraulic oil in hammer use:

Oil too thick:
- difficult start-up
- stiff operation
- danger of cavitation in the pumps
- accelerated wear of pumps and hammer
- sticky valves
- filter bypassed, impurities in oil not removed

Oil too thin:
- efficiency losses (internal leakage)
- hammer strikes slowly and irregularly
- damage to gaskets and seals, leaks
- accelerated wear of parts because of decreased lubrication efficiency

NOTE! WE STRONGLY RECOMMEND DIFFERENT HYDRAULIC OILS FOR USE IN SUMMER AND IN WINTER IF THERE IS AN AVERAGE TEMPERATURE DIFFENRENCE OF MORE THAN 35°C (95°F). THE CORRECT HYDRAULIC OIL VISCOSITY WOULD THUS BE ENSURED.

4.1 Table of hydraulic oils



4.2 Hydraulic oil purity

No separate filter is required when the Rammer S 52 hydraulic hammer is installed in the hydraulic circuit of an excavator. The hydraulic oil filter of the excavator itself will clean the oil flowing through the hammer.

The purpose of the oil filter is to remove impurities from the hydraulic oil since they cause accelerated component wear, blockages and even seizing up. Impurities also heat and age the hydraulic oil itself. Air and water are also impurities in oil, but not all impurities can be seen with the naked eye.

Impurities enter the hydraulic system:
- during hydraulic oil changes and refilling
- when components are repaired or serviced
- when the hammer is being installed on the excavator
- because of component wear

In hydraulic hammer work the excavator oil filter must fulfill the following specifications:
- It must deliver a maximum particle size of 25 microns (0,025 mm).
- The filter material must be of man-made fibre cloth or very fine gauge metallic mesh to withstand pressure fluctuations.
- It must have a volume flow capacity of at least twice the hammer's maximum volume flow.

In general, oil companies guarantee new oils to have a degree of absolute purity down to 40 microns so that when the hydraulic oil tank is topped up, a filter must be used.

Damage caused by hydraulic oil impurity in hydraulic circuits of excavator and hammer:

1. The working life of pumps is significantly shortened
   - rapid wear of parts
   - cavitation
2. Valves do not function properly
   - spools bind
   - accelerated wear of parts
   - blocking of small holes
3. Rapidly accelerated wear of cylinders and gaskets
4. Reduced hammer efficiency
   - accelerated wear of moving parts and seals
   - piston seizing-up
   - oil leakage
5. Shortened working life and reduced efficiency of hydraulic oil
   - oil overheats
   - oil ages
   - electro-chemical changes in hydraulic oil

PLEASE NOTE!
Component damage is only a symptom. The trouble itself cannot be cured by removing the symptom. After any component damage, the entire hydraulic system must be cleaned.

4.3 Hydraulic oil cooling

The maximum permitted hydraulic oil temperature in continuous hammer use is 50-80°C, depending on the viscosity of the oil in the system. A reliable hydraulic oil thermometer is therefore necessary. If there is no thermometer on the excavator, one must be fitted. The temperature of the hydraulic oil depends upon ambient conditions, the cooling system efficiency of the excavator and on the used capacity of the hammer.

In continuous breaking work with the Rammer S 52 hydraulic hammer, it is necessary to have a cooling system with a rated cooling capacity of 5-8 kW more than is needed in excavation work.

The back pressure caused by the excavator cooler must not exceed 0,2 MPa (2 bar); at full volume flow, if the return line of the hammer is lead through it. The cooler must be able to withstand a dynamic pressure of at least 20 bar.

If the oil cooler of the excavator is too small, either the original cooler must be replaced with a larger one or an auxiliary cooler must be obtained and installed. The auxiliary hydraulic oil cooler can be installed

- In front of the cooler of the motor in which case a separate fan is not needed (max rise in temperature of cooling air 5°C).
- Any other suitable place, using a fan, either hydraulically or electrically driven.

WARNING!

The Rammer S 52 hydraulic hammer must never be used when the viscosity of the hydraulic oil is lower than 15 cSt.

RAMMER S26, S26 L, S52, S52 L

02.12.1986/0101v/PK/PK

Part No. Osa No.	Description Nimitys	Qty Kpl
90689	Torque wrench 70kpm 3/4" Momenttiavain	1
90697	Torque wrench 7kpm 1/2" Momenttiavain	1
90684	Hex. socket screw key 10mm 1/2" Kuusiokoloavain	1
90685	Hex. socket screw key 12mm 1/2" Kuusiokoloavain	1
90686	Hex. socket screw key 14mm 1/2" Kuusiokoloavain	1
90698	Hex. socket screw key 17mm 1/2" Kuusiokoloavain	1
90699	Hex. socket screw key 19mm 3/4" Kuusiokoloavain	1
90700	Hex. socket screw key 22mm 3/4" Kuusiokoloavain	1
90637	Adapter 3/4" - 1/2" Supistin	1

RAMMER S26, S26 L, S52, S52 L

02.12.1986/0101v/PK/PK

Part No. Osa No.	Description Nimitys	Qty Kpl
90661	Hex. socket 11mm, 1/2" Hylsy	1
90654	Oil can 0,5 l Öljykannu	1
90652	Ball-headed hammer Vasara	1
90662	Plastic hammer Muovivasara	1
90679	Punch D7mm Tuurna	1
90703	Open end wrench 46mm Kiintoavain	1
90659	Open end wrench 24mm Kiintoavain	1
90701	Hex. socket 12mm, 1/2" Hylsy	1
90627	Open end wrench 36mm Kiintoavain	1

REQUIREMENT SET 41725 1
TARVIKESARJA

RAMMER S22...S52

02.12.1986/0102v/PK/PK

Part No. Osa No.	Description Nimitys	Qty Kpl
90665	Toolbox Työkalulaatikko	1
	Grease tube 110 g Rasvatuubi	1
	Tin of MoS_2 grease MoS_2 purkki	1
	MoS_2 spray can 450 g MoS_2 spray purkki	1
	Silicone tube 340 g Silikoni tuubi	1
	Silicone spray can 450 g Silikoni spray	1
	Tube of loctite 275 or truloc 397 50 ml Loctite 275 tai truloc 397 tuubi	1
	Tube of loctite 270 or truloc 360 50 ml Loctite 270 tai truloc 360 tuubi	1
	Tube of loctite 242 or truloc 375 50 ml Loctite 242 tai truloc 375 tuubi	1
	Compound press Silikonipuristin	1

RAMMER S52, S52 L

02.12.1986/0098v/PK/PK

Part No. Osa No.	Description Nimitys	Qty Kpl
31074	Extented bushing Pidennetty holkki	1
20654	Special pulling tool Pidennetty holkki	1
31093	Piston dolly Männänlyöntityökalu	1
41735	Plastic dolly Muovituurna	1
31090	Acc.cover opener Akun kannen avaus työk.	1
31092	Acc. filling device Akun täyttölaite	1

Part No. Osa No.	Description Nimitys	Qty Kpl
41736	Acc. mounting plate Akun kiinnitysalusta	1
41734	Lifting ring Nostolenkki	1
41738	Pressure gauge 250 bar Painemittari	1
90605	Lifting ring M24 Nostolenkki	1
41740	Wiper punch D80 Luovuttimen lyöntituurna	1
41739	Wiper punch D95 Luovuttimen lyöntituurna	1

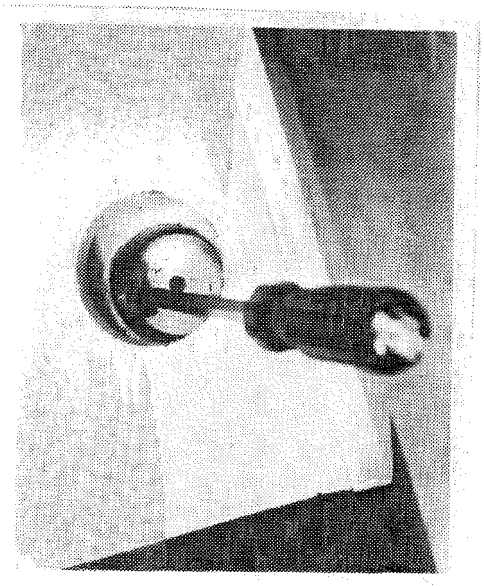
5.1.2 Other necessary tools and materials

General tools:
- torque wrench 550 Nm
- rubber hammer and sledge hammer
- set spanners 16,19,24,36,42 and 46 mm
- hexagonal socket screw 6,8 and 10 mm
- large shifting spanner
- screwdriver, medium size
- grease gun AR 1/8"

Required materials: (order no. 41725 :
- 0,5 kg tin MoS_2 grease (Molykote BR2 Plus)
- 450 g can of Molykote spray (Gleitmo 100S)
- 340 g silicone compound (Permatex Form A Gasket no.6)
- 450 g can silicone spray
- 50 ml tin of Loctite 270
- 50 ml tin of Loctite 275
- 110 g grease tube (Parker O-lube)
- silicone press for 315 ml tube

Additionally required:
- nitrogen (N_2) cylinder
- hoist 1000 kg
- bench vice
- washing sink, compressed air supply
- measuring gauge for hydraulic circuit (e.g. Webster)

5.2 Removal of tool



Turn the hammer to a horizontal position with the stone clutches upwards. Press pin (19) inwards with e.g. a screw driver and at the same time, press retaining pin (17) out from the bottom. Remove the tool from the hammer.

Check the tool and tool bushings for wear. The maximum permitted wearing limits are:

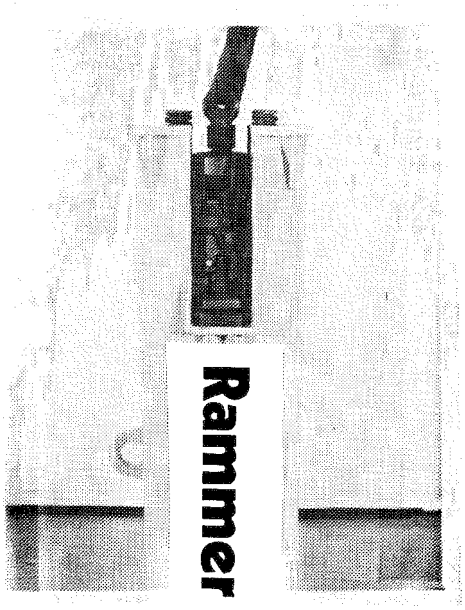
Tool ø 107 mm
ø 97 mm
length 600 mm

Front bushing ø 113 mm
Rear bushing ø 103 mm

The hammer must be dismantled if the tool bushings are to be replaced. See point 5.6, Front head.

Remove any burrs and other irregularities from the retaining pin notch at the upper end of the tool.

5.3 Removal of the hydraulic hammer from its housing



Turn the hammer to a vertical position on a horizontal surface, place protective pieces of suitable wood of approximately 50 mm thick under the edges of the housing in such a way that the front tool bushing is clear of the ground, then stop the excavator motor.

Remove both pressure and return lines from the hammer. Protect all disconnected couplings with clean plugs. The original plugs supplied with the Rammer S 52 hydraulic hammer (60 and 61) can be used as long as they are clean. Remove the mounting plate screws.Remove guide plate (6), springs (3) and washers (10)

Screw lifting ring 41734 onto the cover of the pressure accumulator and lift the machine from the housing. Take care not to damage hydraulic connectors. The hammer must never be lifted by the the connectors. Wash the hammer externally with hot water and detergent.

5.4 Inspection of housing

Check the wear of the buffer (104). The minimum permitted thickness of the buffer is 60 mm; (new 70 mm). Check the wear of the buffer pads (108). The minimum permitted thickness of the pads is 25 mm; (new 30 mm).

Check the wear of the wearing plates (107). The minimum permitted thickness is 8,5 mm. The wearing plates are attached from the inside of the housing with two countersunk screws (116) and secured with Loctite and centre punch.

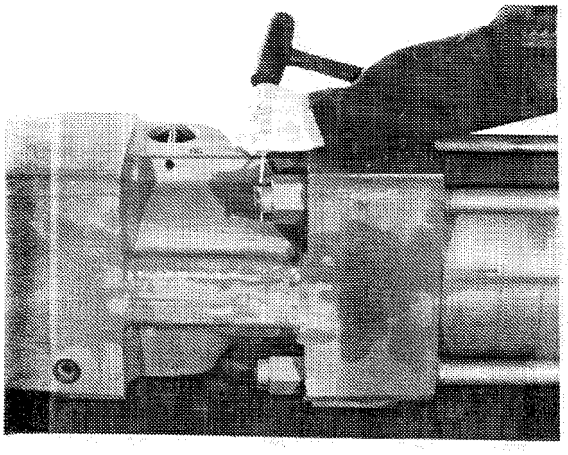
WARNING!

The upper end of the hammer must never come into lateral contact with the inner surface of the housing.
Check the condition of the springs (103)

and

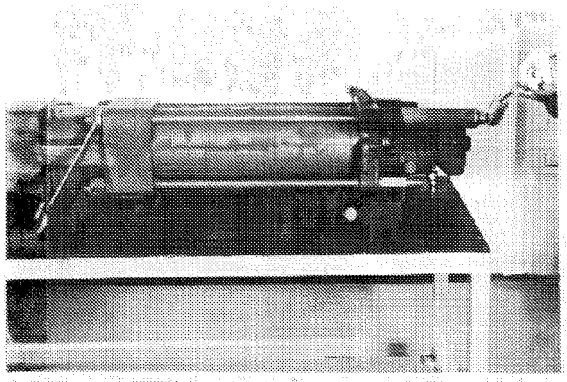
replace if necessary. Repair possible damage to the housing by welding.

5.5 Replacement of piston and bushing gasket



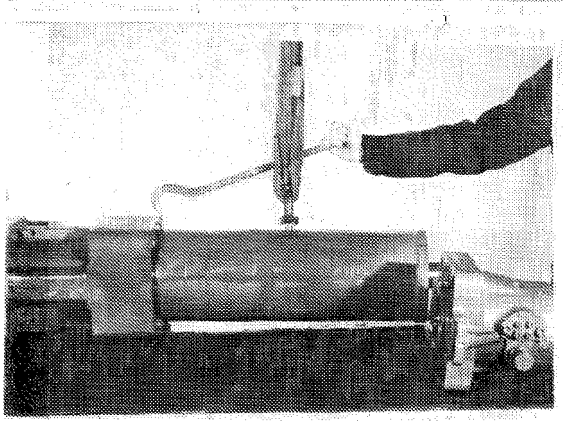
ABSOLUTE CLEANLINESS AND CARE ARE ESSENTIAL IN THE HANDLING OF HYDRAULIC COMPONENTS.

Place suitable supports approx. 20 mm thick under both ends of the hammer cylinder in such a way that the front head cylinder and cover are all evenly supported. Put the machine into a bench vice.

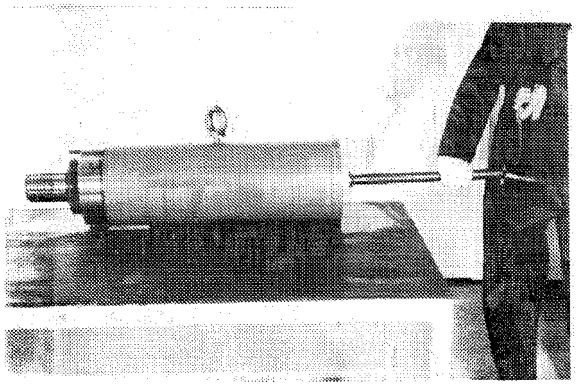


Tie rods

Remove the split pins (40) from the castle nut (15) at the lower end and remove the nuts. Remove the tie rods without loosening the guide nuts (13).

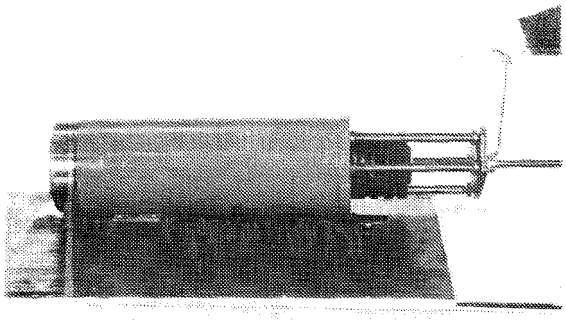


The front head (1) and the cover (3) can now be removed from the cylinder (2). Remove the O-rings (57 and 56) from the upper and lower ends of the cylinder and wipe up any oil that has spilled.

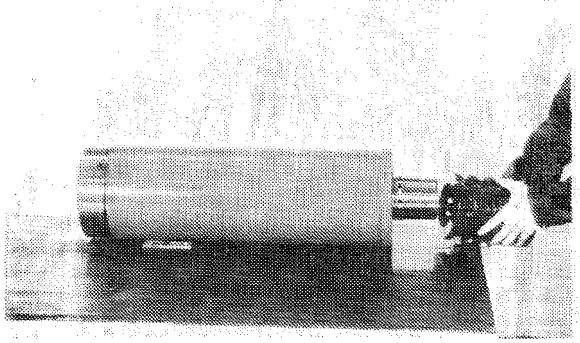


Cylinder

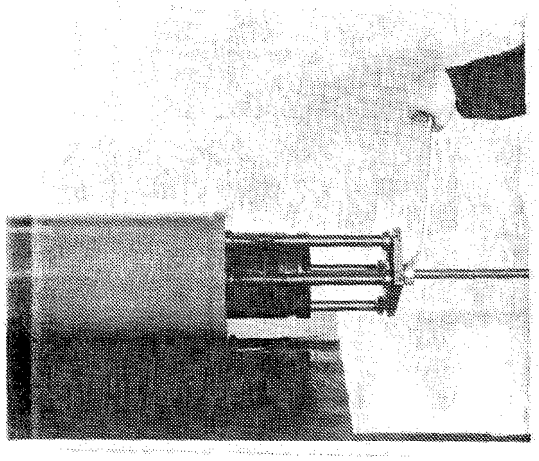
Remove the front bushing (4) and the piston (8) from the cylinder through the front end using the piston dolly 31093. Pull the piston out of the front bushing taking care not to damage it.



Attach the pulling tool (20654) to the upper end of the cylinder and first withdraw the rear bushing (6). Release the pulling tool and remove the rear bushing. Loosen the distributor from the middle bushing (5).

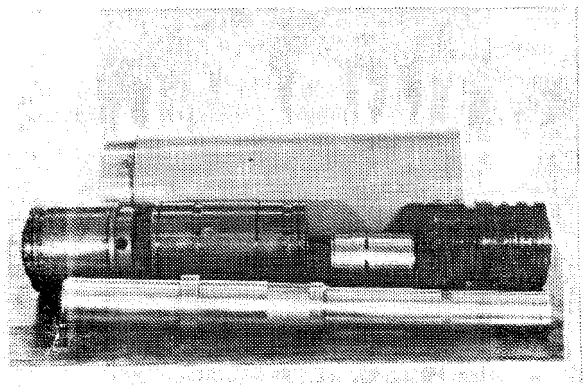


Replace the special pulling tool and remove the middle bushing taking care not to let it fall.

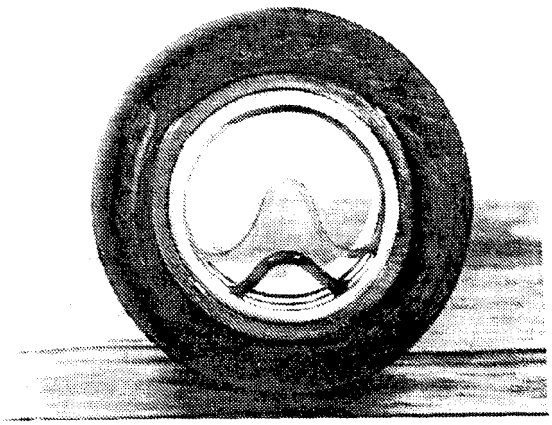


Check the surfaces of the piston, distributor and all bushings for surface damage. Minor scratches may be polished away but badly damaged parts must be replaced. Check the ends of the bushings. If they have been swaged they must be polished perpendicular to the longitudinal axis of the bushing. Check the impact head of the piston. It must be faultless.

Check the plugs in the cylinder channels. They are locked in position with a locking fluid (Loctite 275).



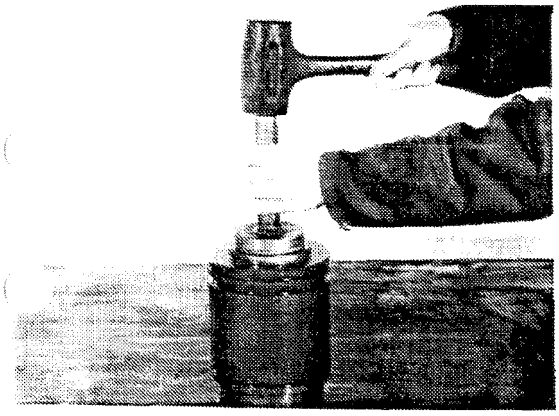
Check the inner surface of the cylinder and polish away any scratches which could otherwise damage the O-rings. Check the six O-rings grooves at the rear end of the cylinder. If the narrow inner wall of the O-ring groove is damaged polish the ridge completely away and replace it with a support ring. Check the front and rear ends of the cylinder. If they are swaged they must be polished perpendicular to the londitudinal axis of the cylinder. In the same way, check the lower surface of the cover (3).



Degrease and wash the cylinder and other parts with a suitable solvent. Dry the parts with compressed air, oil them with pure hydraulic oil before assembly. Also clean the lubrication channel of the cylinder and replace the grease nipple (33), if necessary.

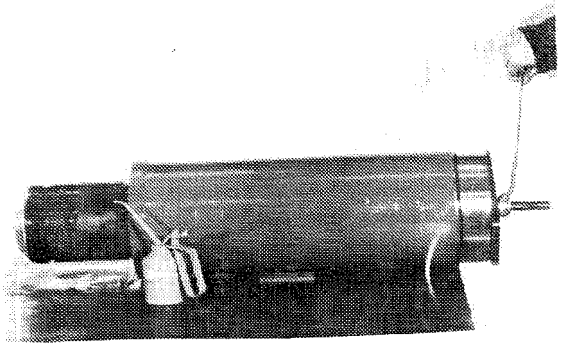
The piston gaskets and the O-rings for the front, middle and rear bushings must always be changed when the hammer is dismantled. The wipers are to be replaced if they are damaged or worn. Other O-rings must be replaced if they have been deformed under pressure. If hydraulic oil leaks from the machine from either the upper or lower end, the piston gaskets are worn.

Lightly oil the O-rings of the piston gaskets (43,44) and place them in their grooves. Bend the gasket to a heart shape using the greatest possible bending radius. Place the gasket in its groove on top of the O-ring. Make sure that the gasket is the right way around (see picture). Press the gaskets into their grooves, first with fingers and finally with a dolly.



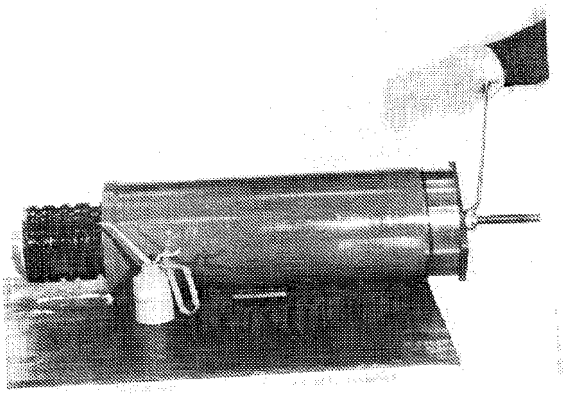
Carefully clean the wiper grooves (41,42). Spread some locking fluid (Loctite 270) in the groove and on the outer circumference of the wiper.

Tap the wiper into place.
NOTE! The locking fluid requires 3 hours time at least temperature of 20°C to harden. Install the large O-rings (53) in their grooves.

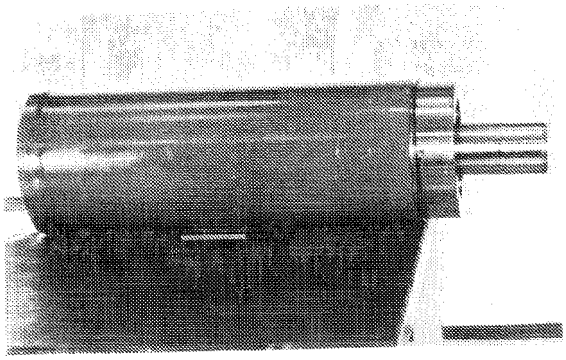


Install the middle bushing (5) through the upper end of the cylinder using the pulling tool (20654). Use a lot of oil when installing the bushings. Make sure that the middle bushing is installed with the four plugs outwards. The middle bushing must be flush with the top end of the cylinder.

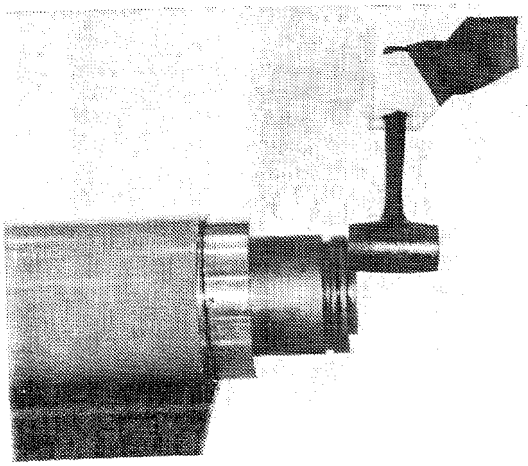
Place the distributor (7) into the middle bushing making certain that it is correctly positioned. The ø 5 mm (1/4") holes should be towards you. The distributor must not be forced or hammered into place. Because of the very tight clearances it can only be inserted when the the londitudinal axes of both components are in exact alignment. Installation is successful only when the distributor revolves freely in the middle bushing.



Install the rear bushing (6) on top of the distributor so that the rear and middle bushings are against each other. Use the pulling tool to draw the bushing in until the flange of the pulling tool is approx. 5 mm (1/4") inside the cylinder. Check by hand or with a suatable tool that the distributor slides and rotates quite freely.

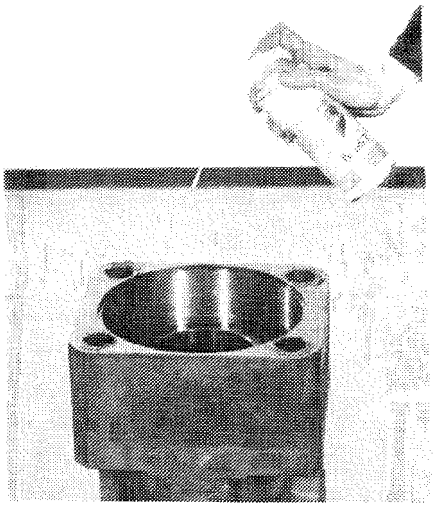


Push the piston (8) into the cylinder through the lower end taking care not to jar the piston or the bushings. It can be tapped into position with a rubber hammer. Care must be taken to ensure that the piston head does not damage the piston seals in the rear bushing when this is being done.

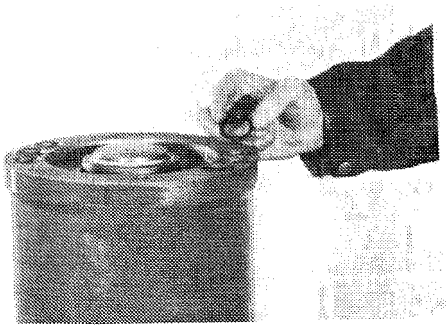


Place the front bushing (4) on top of the piston and tap it into the cylinder. Be careful no to damage the piston seals in the front bushing when doing this. The front bushing must be in contact with the middle bushing.

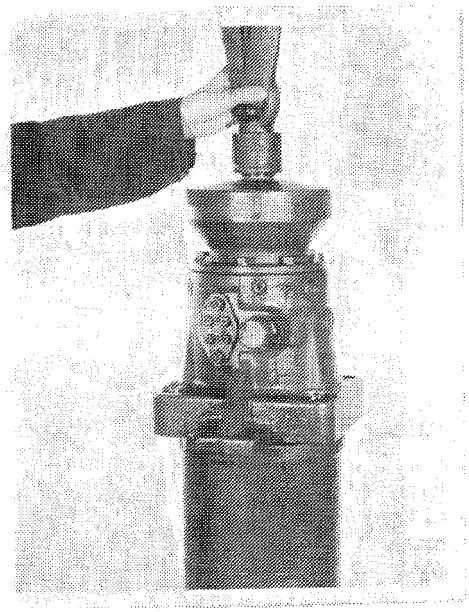
Tap the piston with the rubber hammer to make sure that it moves. If the rear tool bushing (11) or the impact ring (10) are to be changed, they must be changed at this stage (see point 5.6).



Spray the contact surfaces of the cylinder (2), cover (3), rear bushing (6), cylinder, impact ring (10), front head (1) and front bushing (4) with MoS_2 spray.

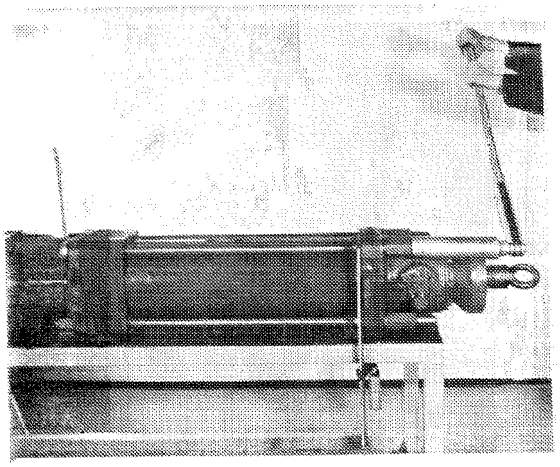


Place the cylinder O-rings (56 and 57) in their grooves and push the front head onto the cylinder and the cover against the cylinder.



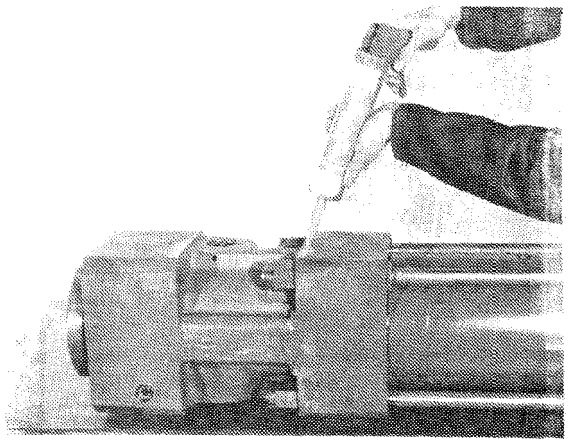
Care must be taken to see that the guide pins (38 and 39) go into their proper holes and that the O-rings remain properly seated.

Make sure that the threads of the tie rods are clean and undamaged and that the nuts can be turned all the way by hand. The guide nut is glued to the tie rod and does not need to be removed.



Put the tie rods (14) into position together with the washers. Grease the threads at the lower end with graphite grease. Screw the nuts (15) into position and tighten them so that both the front head and the cover are against the cylinder. Place the hammer in a bench vice and tighten the tie rods diagonally to 500 Nm (50 kpm); in then tighten all nuts a further 1/6 of a turn (60°).

The split pin (part 40) can be inserted by turning the nut to the nearest suitable position (max $\pm$ 15°).



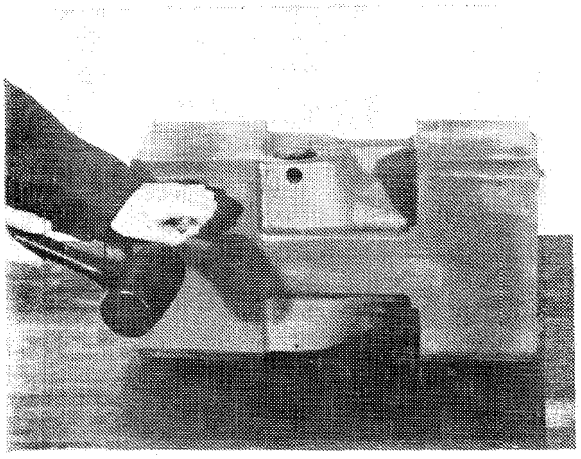
Fill the space between the front head tie rod holes and the tie rods themselves with silicone compound.

5.6 Front head

Replacing the rear tool bushing (11) or the impact ring (10) necessitates the removal of the tie rods (14) (see point 5.5).

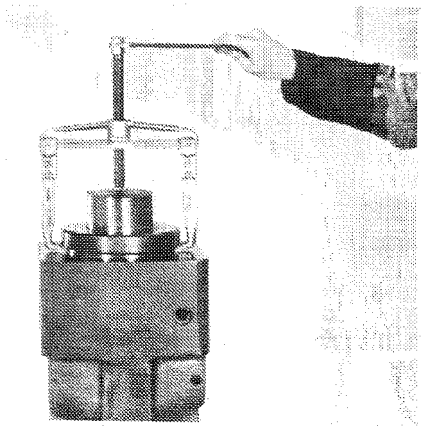
Check the tool bushings for wear. The wear limits are:

Front tool bushing max ø 113 mm
Rear tool bushing max ø 103 mm



The impact ring (10) and the tool bushings (11 and 12) with loose tolerances and the lower tool bushing is locked in position with a pin (18). They are removed and new ones installed with the aid of a hammer and a suitable dolly or by using the special pulling tool. Before installation, the outer surfaces of the tool bushings should be sprayed with MoS_2 spray.

The plugs (48) are locked in position with Loctite and their removal is facilitated by the use of a little heat.



Installation of the tool bushings is facilitated by freezing them or/and warming the front head a little.

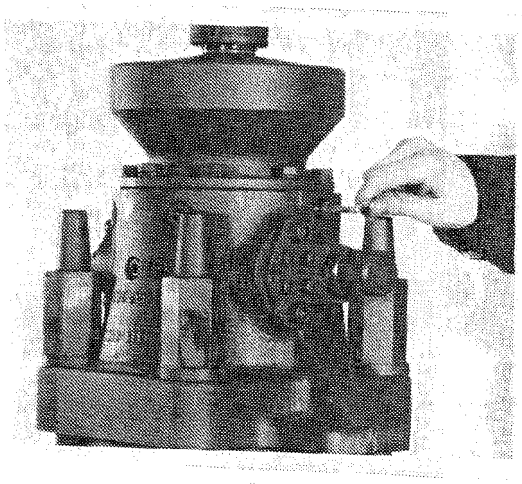
When installing the front tool bushing make sure that the hole for locking pin (18) is the right way.

Pin (19) and spring (35) can be changed by first tapping the split pin (36) into the front head.

Clean the lubrication channels.

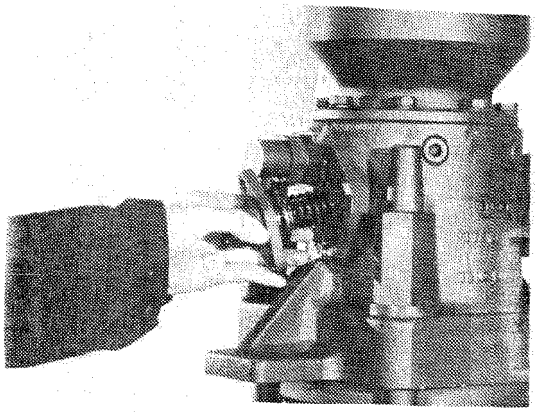
If the tie rods have been opened, they must be retightened in accordance with 5.5 of this manual.

5.7 Pressure reduction valve

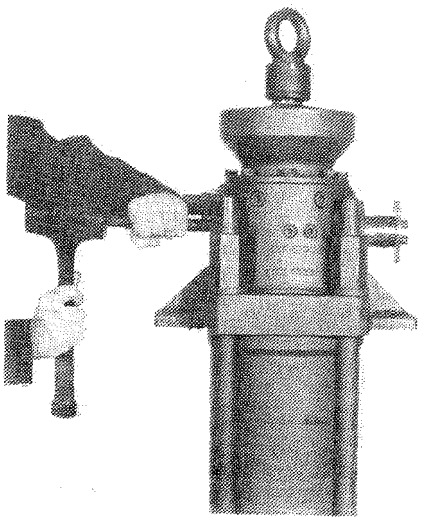


The parts in the cover (3) can be removed without opening the hammer itself or removing it from its housing.

WARNING!
It is possible that the hammer is still under pressure. Before the pressure reduction valve is opened the plugs at the pressure measuring points in the cover (3) must be loosened.

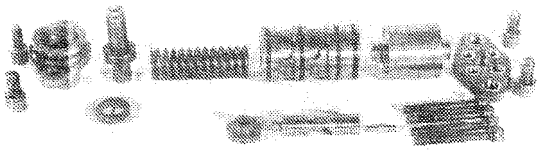


Remove the hexagonal socket screws (47) which lock the cover of the pressure reduction valve in position (10,4 pcs). Remove the reduction valve cover (26). Remove the spring (34) and its guide ring (25).



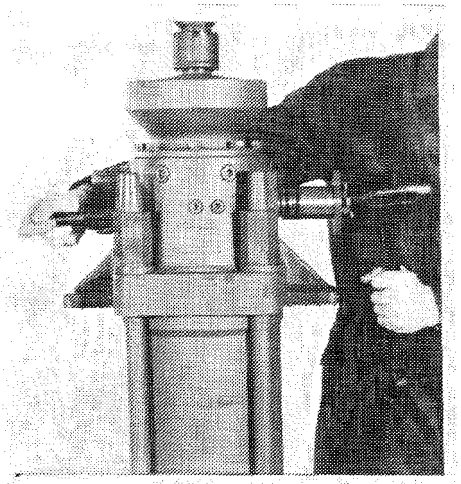
Tap the valve out using the valve dolly (41735). Draw the spool (23) away from its guide. Remove the small spool (22) from inside the larger one. Release the hexagonal screws of the valve (46), (4 pcs) and separate the guide from the flange. Remove all O-rings.

Draw the guide (27) out of the cover (26). Between the guide and the cover there are shims (28) with which the operating pressure of the hydraulic hammer is regulated. One 1 mm shim alters the operating pressure by approx. 1,0 MPa (10 bar).



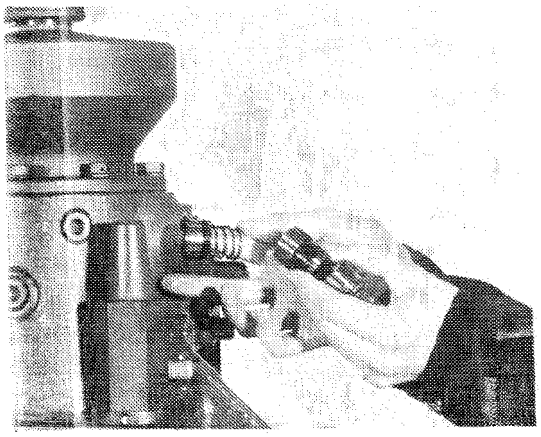
Check the components of the pressure reduction valve. Minor scratches on the spool and its housing may be polished away with diamond polishing paste. The spools must move quite freely. Wash all parts of the valve carefully, dry them with compressed air and finally, oil them with pure hydraulic oil.

Place the O-rings in their grooves. Press the guides (21 and 24) against each other so that the holes for the bolts are aligned. Put the flange (20) in position and screw the bolts and locking washers into their holes. The tightening torque for the bolts is 40 Nm (4,0 kpm). Place the smaller spool inside the larger one (22 and 23). Oil the spool housing and push the spools into the valve. Check that the larger spool is correctly placed and that it moves quite freely.



The pressure reduction valve must be installed in the cover from the side of the hydraulic oil return connection (OUT). Immobilize the spool using the valve dolly (41735) and tap the valve in with the rubber hammer. Tighten the bolt to 85 Nm (8,5 kpm). Place the ring (25) and spring (34) in position. Put the O-ring of the cover (26) into its groove. Place shims (28) on the spring guide (27) on the cover side and install the guide. Press the cover into place. Make sure that the spring is correctly mounted. Insert the bolts with Nord-Locks and tighten them to a torque of 85 Nm (8,5 kpm).

5.3 Check valve (32)

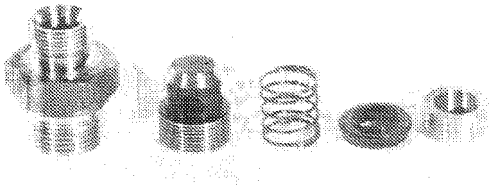


The check valve can be replaced with the hammer in its housing.

WARNING!
It is possible that the hammer is still under pressure. Always remove the plug from the pressure measuring point in the cover before opening the check valve.

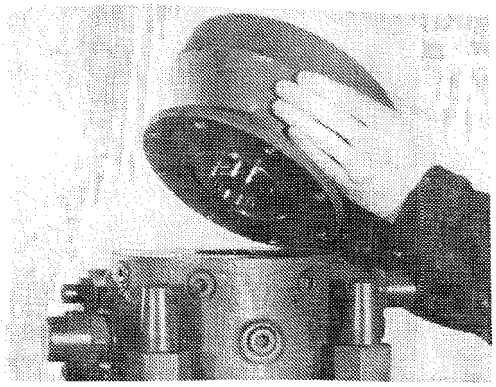
Open the pressure connection (29). Remove the check valve (32) and bushing (31). Inspect the contact surfaces of the valve and connector as well as the condition of the spring. Replace as necessary.

Install the check valve in the cover in the order: bushing (31) (conical surface inwards), spring guide, spring and spool.



Screw the connector (25) into place and tighten it as much as possible. Make sure that the valve spool moves quite freely.

5.9 Pressure accumulator



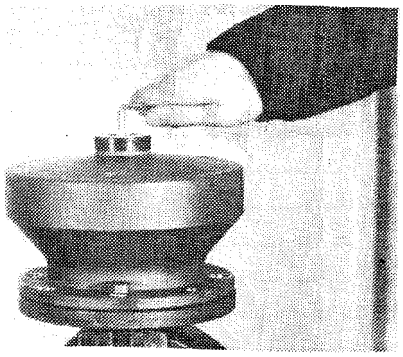
WARNING!
Never release the pressure accumulator cover before you have made sure that the component is not under pressure.

Remove the pressure accumulator from the cover (3) by removing screws (45).

Remove the O-ring (54).

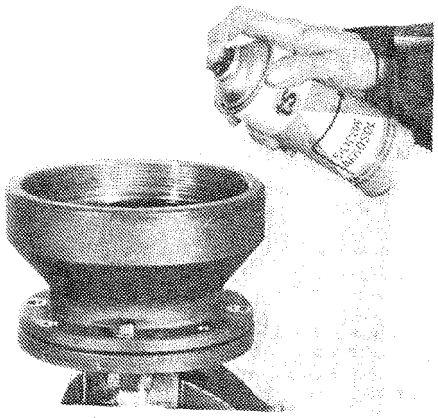
Place the pressure accumulator mounting plate (41736) into a bench vice and lock it in position with two screws.

Open the filling hole plug (69) carefully and release the pressure from the accumulator.



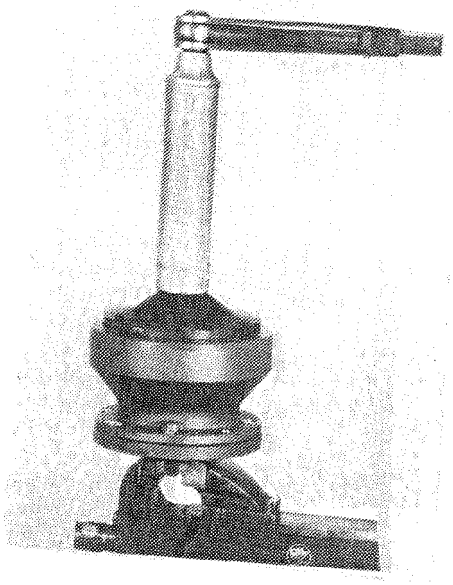
Attach the special opening tool 31090 to the cover of the pressure accumulator and unscrew it.

Remove the membrane and support ring. Stretch the rubber to see if the membrane has been damaged. If there is any sign of damage or if it has knocked badly against the bottom, it must be changed. Wash the accumulator cover and body and check that the threads are quite undamaged. The cover must be screwed on as far as the threads go.



Spray the membrane with silicone spray. Oil the membrane sealing ring groove in the body of the pressure accumulator. Insert a new membrane and support ring. Oil the upper surface of the membrane lightly. Grease the threads of the accumulator.

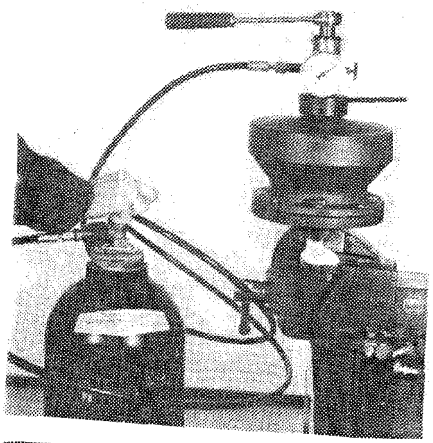
Screw the cover on. Tighten the cover to min. 550 Nm (55 kpm). Install the filling plug together with its seals in the cover.



Pressure Accumulator Refilling Device.

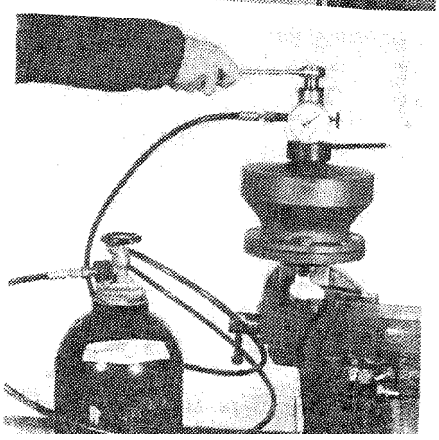
Screw the refilling device (31092) into the cover of the pressure accumulator. Make sure that the O-ring between the refilling device and the cover is in position (see picture).

Attach the hose of the refilling device to the nitrogen cylinder (N_2). Close the discharge valve by turning it clockwise.

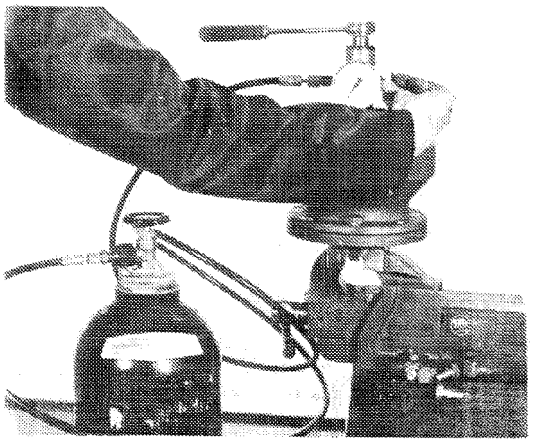


Use a ratchet handle (1) to make sure that the filling plug (69) is open.

Open the nitrogen gas cylinder valve carefully and fill the pressure accumulator to 4.5 MPa (45 bar). Close the nitrogen cylinder valve as soon as the correct pressure has been reached.



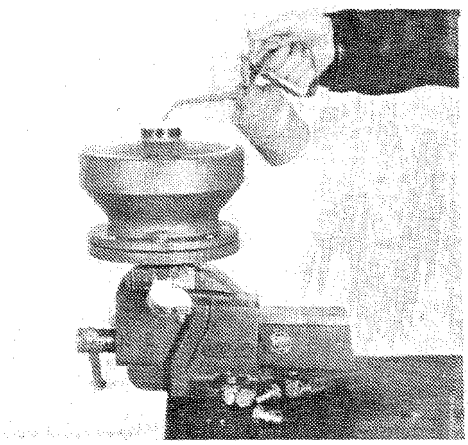
Use the torque wrench (1) to close the filling plug (69) securely. Tightening torque 20 Nm



Release the pressure from the refilling device and the hose by opening the discharge valve (3).

Remove the refilling device from the pressure accumulator.

Make sure that the accumulator does not leak by pouring a little oil into the hole of the filling plug as well as between the threads.



Install the pressure accumulator and a new O-ring (54) onto the cover and tighten the screws (45) to 85 Nm (8,5 kpm).

Pressure accumulator maintenance can also be carried out without removing it from the machine.

WARNING!
The only gas permitted for the filling of the pressure accumulator is nitrogen (N_2). The use of any other gas may cause the accumulator to explode.

5.10 Torques

Ref.no.	Name	Torque
73	Cover	min 550 Nm (55 kpm)
14	Tie rod	500 Nm (50 kpm)+1/6 turn (60°)
45	Hexagonal screw M12	85 Nm (8,5 kpm)
46	Hexagonal socket screw M8	40 Nm (4,0 kpm)
47	Hexagonal socket screw M12	85 Nm (8,5 kpm)

5.11 Application areas for sprays and greases

Molybdenum disulphide grease (MoS_2)
- the threads of the tie rods (14) and nuts (15)
- the threads of the pressure accumulator cover (73)

Molybdenum disulphide spray
- contact surfaces of cylinder (2), cover (3) and rear bushing (6)
- the contact surfaces of the cylinder (2), ring (10), rear bushing (4) and front head (1)
- the surfaces between the tool bushings (11 and 12) and the front head (1)

Silicone compound
- to protect the threads at the lower end of the tie rod, space between the tie bolt and the front head

Silicone spray
- pressure accumulator membrane

Loctite 270
- the threads of the tie rods (14) and guide nut (13)
- breather (62)
- plugs (48,52)
- grease nipple (33)
- the screws of the wear plates (116)
- the screws for the buffers of the cover (113)
- wipers (41, 42)

Loctite 275
- the cone plugs of the cover (3)
- the plugs of the cylinder (2)
- the plugs of the middle bushing (5)

6. TROUBLE SHOOTING CHART

Fault	Cause	Remedy
1. Hammer does not strike.	Improper installation.	Inspect and measure hammer hydraulic circuit - volume flow 70-100 l/min/ 130...140 bar in operating temperature - pressure limit 185-210 bar - back pressure max 6 bar - possible malfunction of control valve.
	Pressure adjusting valve malfunction.	Repair or change.
	Piston stuck.	Press the machine strongly against the object to be broken.
	Internal hammer fault.	Dismantle and repair.
2. Hammer strikes with reduced power.	Improper installation.	Inspect and measure hammer hydraulic circuit.
	Hydraulic hoses jerking strongly.	Check pressure of nitrogen in pressure accumulator (45 bar).
	Internal hammer fault.	Dismantle and repair.
	Overheated hydraulic oil.	Inspect oil cooling system. Max oil temperature 80°C. Check oil viscosity and cleanliness.
	Improper working method.	Press the tool of the hammer straight towards the centre of the object to be broken.
3. Hammer strikes with reduced frequency.	Improper installation.	Inspect and measure hammer hydraulic circuit.
	Overheated hydraulic oil.	Check oil cooling system.
	Internal hammer fault.	Dismantle and repair.
4. Hydraulic oil overheats.	Improper installation.	Inspect and measure hydraulic circuit and oil cooling system.
	Not enough oil in tank.	Add pure hydraulic oil to the tank.
	Internal leakage in hammer.	Dismantle hammer and renew damaged parts and seals.
	Unnecessary use on control valve - unnecessary strikes.	More appropriate use of hammer.
5. Oil leakage.	Loose connectors.	Tighten or renew as necessary.
	Worn seals.	Renew the hammer's piston seals and pressure deformed O-rings.
	Loose plugs.	Open plug, clean and apply Loctite.

Fault	Cause	Remedy
6. Continual damage to hydraulic hoses.	Improper installation.	Inspect and measure hydraulic circuit of hammer and especially hose installation.
	Abnormal pressure in hammer accumulator.	Check nitrogen pressure.
7. Continual damage to or fracture of hammer tools.	Wrong working methods.	Press the tool straight towards the middle of the object to be broken. The tool must not be subjected to bending stress.

7. REGULAR MAINTENANCE AND INSPECTIONS

1. Installation inspection

The manufacturer or his representative will carry out the installation inspection.

BEFORE THE RAMMER S 52 HYDRAULIC IS PUT INTO SERVICE, THE INSTALLATION INSPECTION MUST BE CARRIED OUT.

Check that the installation has been made in complete accordance with the instructions in this manual.
Check that all pipe and hose couplings have been made correctly. Make sure that the hoses move freely, are not caught and do not rub against anything in any boom position. Measure the volume flow of hydraulic oil in the hammer circuit, the pressure limits and the back pressure. The correct values are 70-100 l/min; 185-210 bar and 6 bar max respectively. Carry out a trial operation in accordance with point 3.4.4 of this workshop manual. Measure the operating pressure of the hammer and the pressure of the accumulator. Check the hammer's efficiency, blow rate, evenes of operation. Check the quality of the hydraulic oil being used and its viscosity at the hammer's operating temperature. Instruct the operator of the hammer in correct working methods and advise him regarding daily service of the Rammer S 52.

2. Daily service

The operator of the hammer must carry out these tasks.

Grease the tool once a day with graphite with MoS_2 open gear grease. Check the tightness of all connectors and installation bolts. Tighten as necessary. Once a week remove the retaining pin and tool and check them and the tool bushings for wear. Remove any burrs etc. from the tool.

If the diameters of the tool shank are less than 97 mm and 107 mm at their thinnest points, the tool must be changed. The maximum internal diameters of the tool bushings are ø 113 mm and ø 103 mm.
Check the movement of the Rammer S 52 hydraulic hammer in its housing.
If the pressure accumulator comes into contact with the spring, the wear plates must be changed.

3. Main inspection AFTER 50 OPERATING HOURS
After 50 operating hours the manufacturer or his representative will carry out this inspection.

Check the operating pressure of the hammer and the pressure of the accumulator with a pressure gauge.
Check the temperature of the hydraulic oil in continuous operation.
Check the efficiency of the hammer, its blow rate and evenness of operation.
Check the tightening torques of the tie rods and tighten all other loose bolts.
Check the tightness of all hydraulic connections.
Check that the hydraulic hoses do not rub against anything in any boom position.
Replace the hydraulic oil filters of the excavator.

4. Yearly service
The manufacturer or his representative will carry out this service.

Change all seals in the hammer.
Change the pressure accumulator rubber membrane.
Check all hammer parts and either renew or repair damaged or worn parts.
Measure the hydraulic oil volume flow in the hammer circuit, the pressure limits and the back pressure.
Adjust as necessary.
Renew the hydraulic oil filters for the excavator.
Inspect and tighten all hydraulic connections.
Check all hydraulic hoses and renew as necessary.
Check the hammer's operating pressure, efficiency, blow rate and eveness of operation as well as oil temperature in continuous use.
Instruct the operator of the Rammer S 52 hydraulic hammer in matters concerning hammer maintenance and operation.

8. OPERATING INSTRUCTIONS

1. Press the tool of the hydraulic hammer along its longitudinal axis firmly against the object to be broken before pressing the operating switch.
   Press it along its length during the whole breaking operation.
   Stop the hammer as soon as object is broken. Do not try to break boulders into pieces that are too big at one time.
   Begin with small pieces and increase the size of the objects broken until the best result is achieved.
   Take advantage of natural faults in rocks and boulders, for example, splits, fissures, etc.

2. Work at the right angle.

   Aim and press the tool along the longitudinal axis of the hydraulic hammer straight against the object to be broken. The tool and the hammer must follow the same line as breaking progress. This means that the tool must not be subjected to bending stresses.
   If the sound of the hammer's impacts becomes thinner and the impact less efficient, re-align the tool and the hammer immediately and remember to press the tool firmly against the object you are breaking.

3. Choose the correct tool for the job.

   The moil point and the chisel tool are for breaking hard materials, such as brick and reinforced concrete. The frost wedge is for breaking frozen earth. The blunt tool is recommended for breaking rocks (see point 2.6).

4. The Rammer hammer must not be started if its temperature is below minus 20°C. An immediate result would be the rupture of the pressure accumulator membrane.
   In such cold conditions the accumulator must be heated (for example with exhaust gas) before the hammer is started.

REMEMBER!

- Make every impact count. Do not operate the machine without the tool being against an object to be broken. Each wasted hammer impact is wasted energy and could cause expensive damage.
- Follow the line of the tool with the hammer.
  Do not subject the tool to any bending stresses.
- The Rammer S 52 hydraulic hammer must not be used when the viscosity of its hydraulic oil is more than 1 000 cSt or less than 15 cSt. (See point 4).
- The Rammer S 52 hydraulic hammer must not be used if the tool or tool bushing is worn beyond the prescribed limits.
- The Rammer S 52 hydraulic hammer must not be put into service before the installation inspection has been carried out.
- Do not use the Rammer S 52 hydraulic hammer before you have read and understood its operating and servicing instructions thoroughly.
- The Rammer S 52 hydraulic hammer is a powerful machine. Used without proper care it can cause damage. Use it properly and use it well.