Rammer SERVICE

Rammer S 20

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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Date 1989-12-27 Valid from serial number 20A01XXX / A01

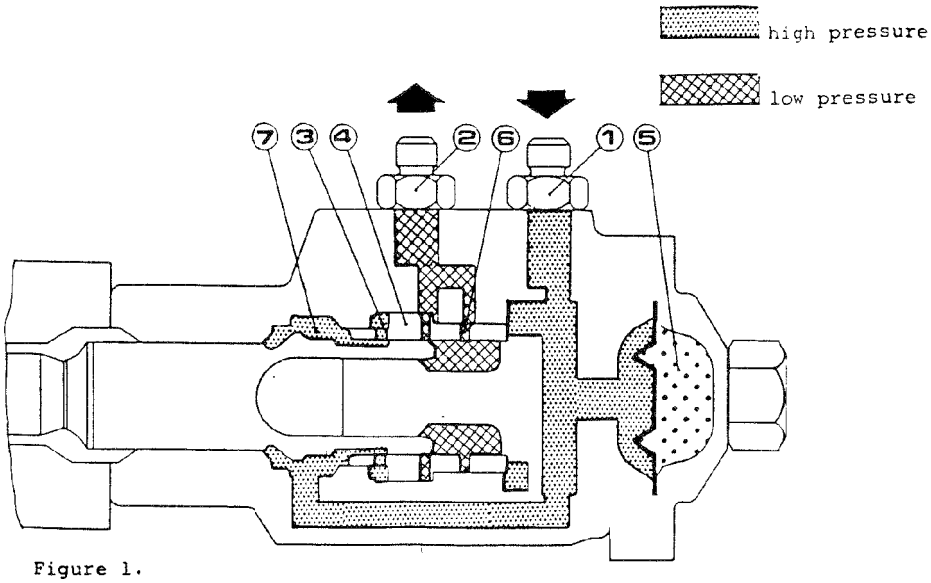


Figure 1.

The piston is shown at the front end of its stroke. The hydraulic oil enters the breaker through the high pressure port (1) and flows into the front part of the cylinder (7) forcing the piston backwards and at the same time entering the distributor chamber (3) pushing the distributor (4) to the rear position closing the oil supply to the rear part of the cylinder. Part of the delivery enters the H.P. accumulator (5) compressing its nitrogen and thus accumulating energy. In this position, the oil in the rear end of the piston escapes through port (6) to the return port (2).

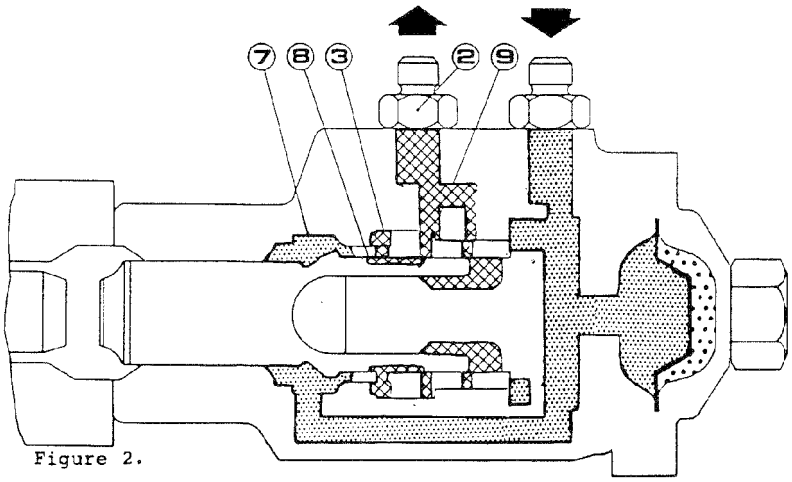


Figure 2.

The piston has moved far enough that the edge (8) prevents pressurized oil from flowing to the distributor chamber (3). The oil from the distributor chamber escapes through port (9) to the return port (2).

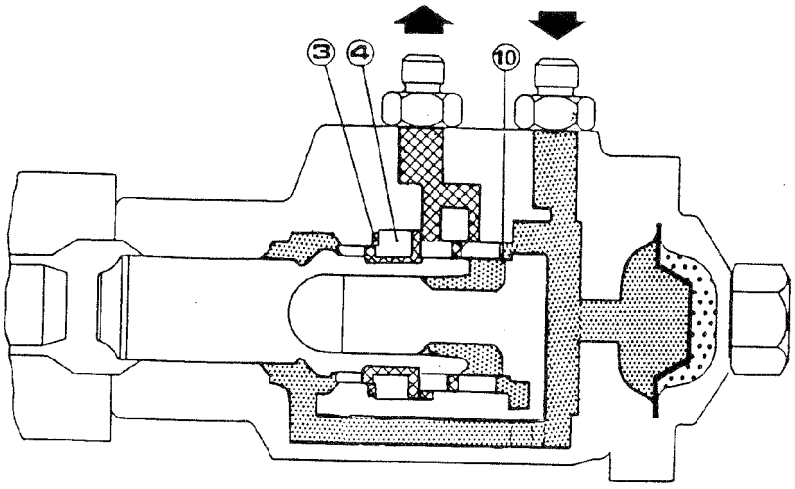


Figure 3.

As the pressure in the distributor chamber (3) is relieved, the high pressure prevailing against the rear face of the distributor (4) forces it forwards. In this position, the oil starts to flow to the rear part of the cylinder through the pressure port (10) behind the piston.

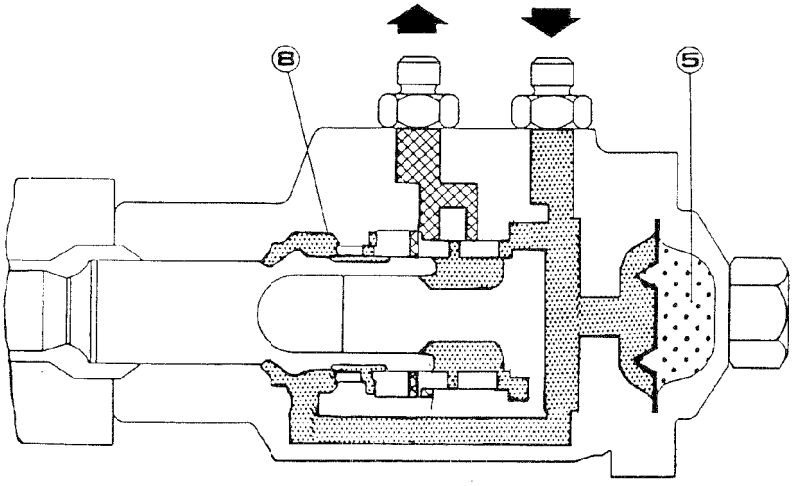
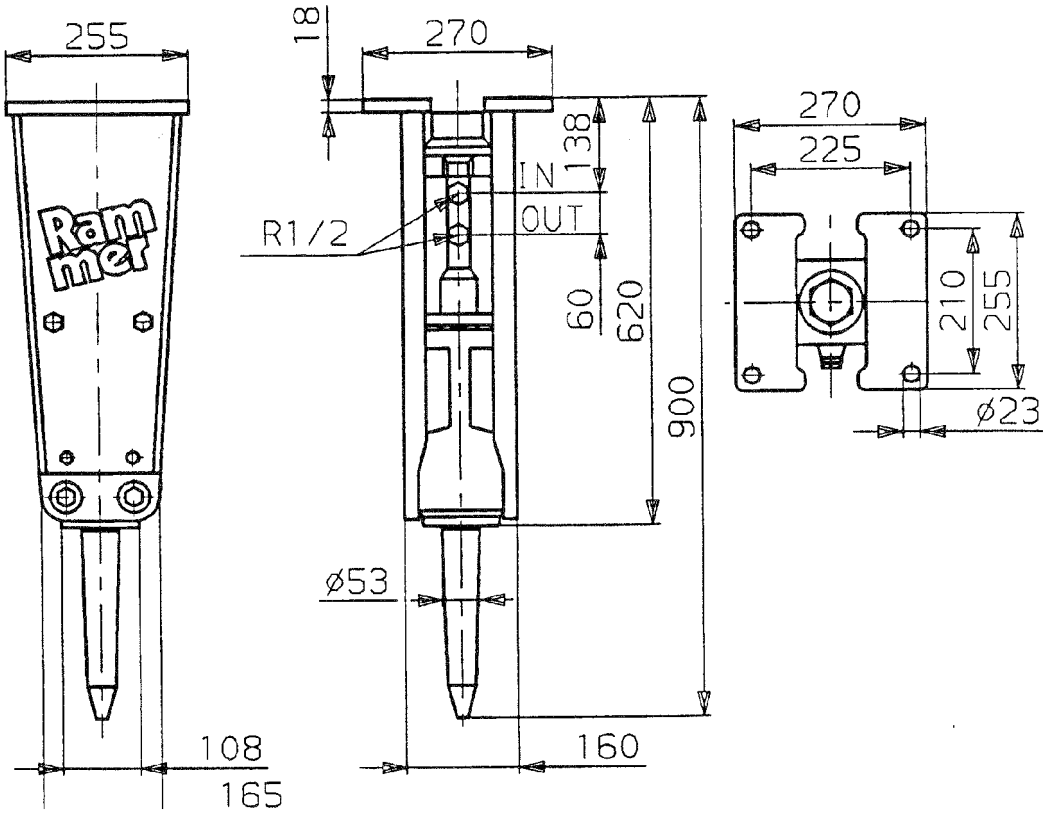


Figure 4.

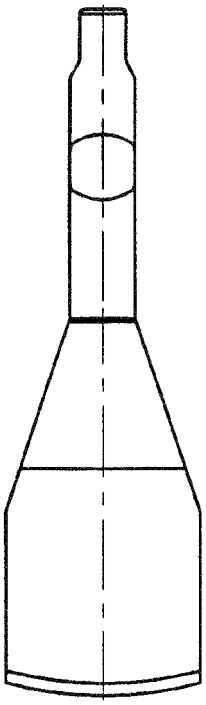
The piston has moved forwards due to imbalance of forces prevailing in the rear and front parts of the cylinder. At the same time the H.P. accumulator (5) has discharged oil to the H.P. line thus increasing oil flow to the cylinder. Shortly before the percussion point of the piston the edge (8) allows the oil to flow to the distributor chamber. Imbalance of forces between distributor faces moves the distributor to the rear position closing the oil supply to the rear part of the cylinder as in section 1. After this, the return movement of the piston starts as described in section 1.



WORKING WEIGHT (with mounting bracket and tool)	90	kg
IMPACT ENERGY	140	J
IMPACT FREQUENCY	1400...1600	bpm
OPERATING PRESSURE	120...140	bar
PRESSURE LIMITS	140...160	bar
OIL SUPPLY	25...30	L/min
RETURN LINE COUNTER PRESSURE	max.11	bar
INPUT POWER	max. 7,0	kW
OUTPUT POWER	max. 3,7	kW
EFFICIENCY	0,7...0,5	
TOOL SHANK DIAMETER	53	mm
CONNECTIONS IN HAMMER		
/PRESSURE LINE,HAMMER (INT)	(BSP) R 1/2"	
/RETURN LINE,HAMMER (INT)	(BSP) R 1/2"	
LINE SIZE / INNER DIA / PRESSURE LINE	12	mm
RETURN LINE	12	mm
OIL TEMPERATURE	-20...+80	° C
HYDRAULIC OIL VISCOSITY	1000...15	cSt
CARRIER WEIGHT, ALLOWED	0,8...1,8	ton
CARRIER WEIGHT, OPTIMUM	1,1...1,5	ton

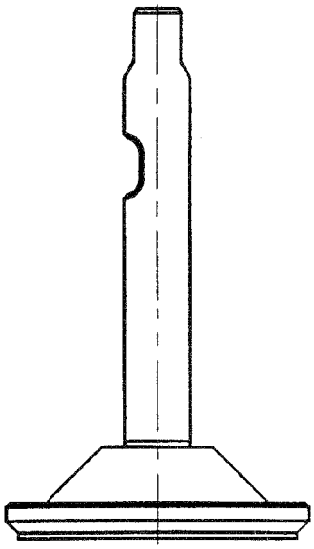
A

B



D

Parallel to boom.



E

Standard tools : lengths mm:s

	Name	Part no.	Total length	Working length	Weight (kg)	Diameter (mm)	Note
A	Moil point	20669	530	280	7	53	
B	Chisel	20671	530	280	7	53	
C							

Special tools:

D	Asphalt cutter	10776	585	335	14	53	Width 160
E	Compacting plate	20665	450	200	23	53	Ø 250
F							

4.1 Spare part orders

Address orders to:

Your Rammer representative:

If Rammer representative not available:

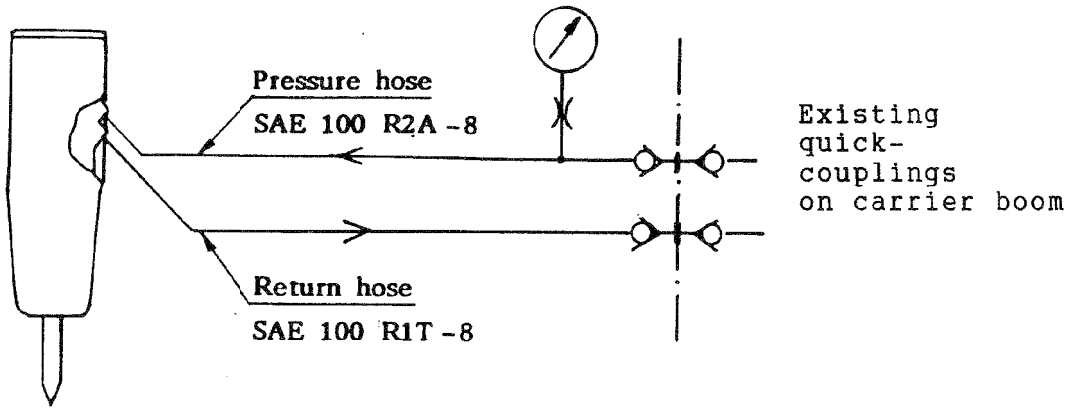
Rammer Oy Taivalkatu 8, P.O.Box 20, 15171 LAHTI Tel: Int. + 358 - 18 - 86111 Telex 16265 ram sf Telefax Int. + 358 - 18 - 520325

Quick deliveries are secured by exact orders.

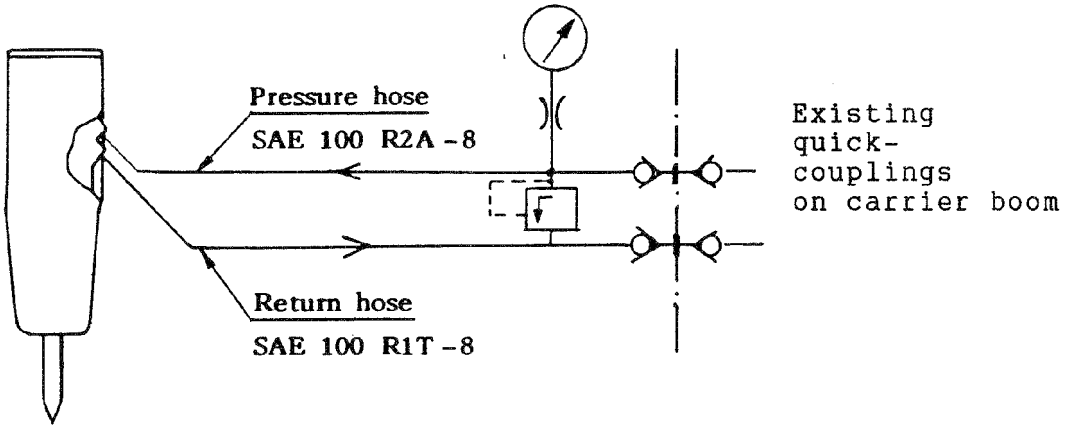
Required information:

1. Name of customer,contact person
2. Order number
3. Delivery address
4. Mode of delivery
5. Required delivery date
6. Invoicing address
7. Model and serial number of hammer
8. Name and number of spare part

In the carrier main control valve block there is a pressure relief valve. If the relief value is 140...160 bar, the installation diagram is as follows:



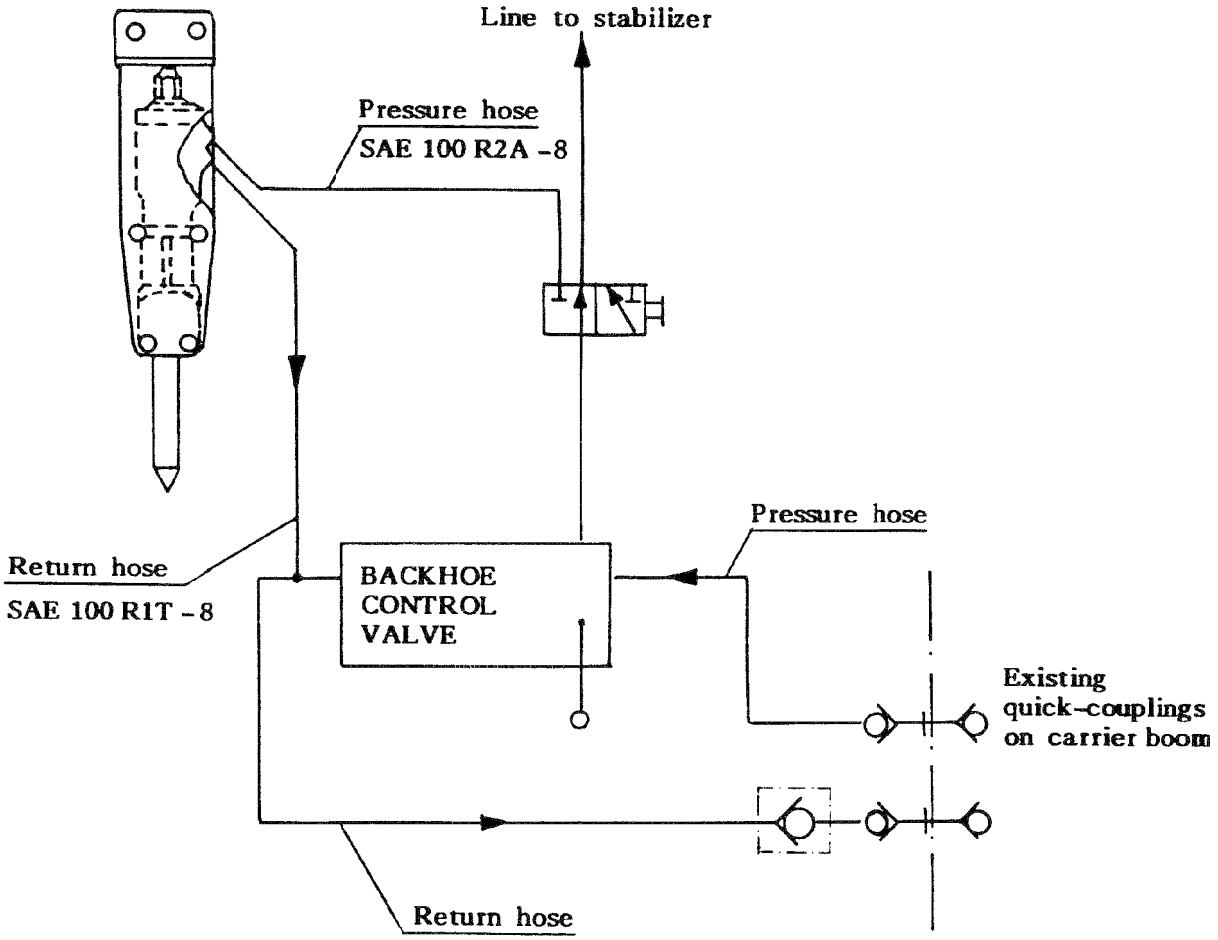
If the relief level is bigger than 160 bar, an additional pressure relief valve (150 bar) is needed in the hammer pressure line.
Installation diagram as follows:



In the case when a skid steer loader is equipped with a removable backhoe and you wish to install the S20 hammer to the backhoe boom. The pressure oil can be taken to the hammer from one of the stabilizer lines which drive the stabilizer's piston rod outwards.

When the installation is done according to the diagram (fig.) the hammer is controlled as follows:

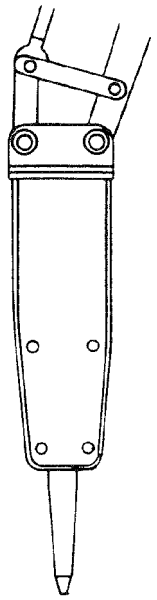
- At first settle the stabilizers on the right level, then turn the 3-way valve to the other position and you are able to control the hammer by stabilizer control lever.

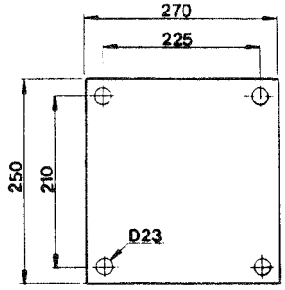


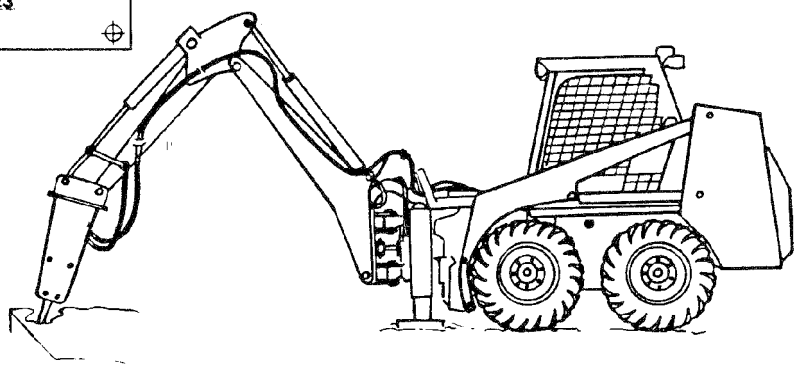
3.3
Mounting the hammer on the carrier boom

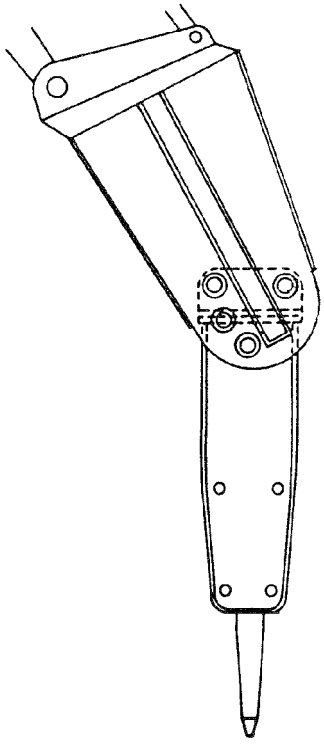
A separate mounting bracket is required for mounting the hammer either on a backhoe boom or on a loader boom.

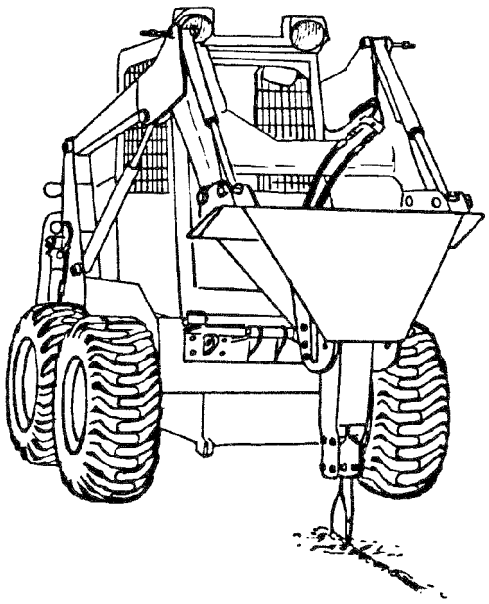
If you want more detailed data of brackets, contact RAMMER.











3.4 Oil cooler

Depending on the viscosity of the hydraulic oil used, the temperature in hammer use should be below 70°C. Maximum temporary is 80°C.
The temperature is checked with an oil temperature gauge. If the carrier is not provided with a gauge, this must be furnished. The temperature depends on the ambient temperature, the carrier cooler capacity and the usage degree of the hammer.

When the S20 is used continuously, 2...3 kW cooling capacity is required.

If the carrier oil cooling capacity is too low, an additional cooler or an oil cooler which is bigger than the original is necessary.

A more effective fan may also adequately increase the cooling capacity.

Check the right operating temperature for the oil used in the oil viscosity table 4.1.

N O T E !

UNDER NO CIRCUMSTANCES IS THE HAMMER TO BE USED IF THE OIL VISCOSITY IS BELOW 15 cSt.

3.5 Circuit measurement and adjusting

The operating pressure of S20 hammer is 120...140 bar. When driving against a plug (oil cannot flow), the pressure restriction must be 140...160 bar.

This to ensure that the relief valve will not leak in hammer use. The maximum back pressure in the hammer return line 10 bar at 25 l/min.

If the back pressure exceeds 6 bar, the orifice in the hammer return port must be removed.

Back pressure should be measured from the hammer's return hose connection.

TEST RUN

Before taking into use, the hammer mounting should be submitted to inspection by an authorized RAMMER specialist.

1. Connect the pressure and return lines together, by -passing the hammer and start the engine.

   Put the hammer's control lever to on -position a few times and follow the control valve operation by observing the hoses.

   A slight movement indicates the starting and stopping of the oil flow in the line.
   Allow the oil flow through the line for a few minutes.
   After this, stop the engine.

2. Connect the pressure and return lines to the hammer.

   Start the engine and let it run slowly.

   Push the hammer steel against stone or concrete and start the hammer.

   Adjust the hammer's oil flow by increasing the engine running speed until the pressure has risen up to 140 bar. This is the correct engine running speed in hammer use.

   Do not increase the running speed more than is enough for 140 bar, otherwise the oil flows through the relief valve and heats hydraulic oil.

3. Finally, tighten all the fittings and screws; the hammer is now ready for operation.

   During operation observe the pressure and re-adjust the engine running speed if needed.

4 HYDRAULIC OIL

Excavating machine's original hydraulic oil can generally be accepted for use in hammer operation. The viscosity of the hydraulic oil must yet be checked because the warming-up of oil in hydraulic hammer operation is more intense than in excavating work.

When the hammer is operated continuously the temperature of the hydraulic oil will settle on some level which depends on the carrier and the prevailing conditions.

At this temperature the oil viscosity must be 20...40 cSt.

The hammer must not be started if the viscosity of the hydraulic oil exceeds 1000cSt, nor should it be operated when the viscosity is below 15 cSt.

Charts 4.1 shows some oils for hammer use.
Suitable oil temperature is chosen so that in continuous use the oil temperature keeps within the ideal operating viscosity range. In this way the best efficiency is achieved with the hydraulic system.

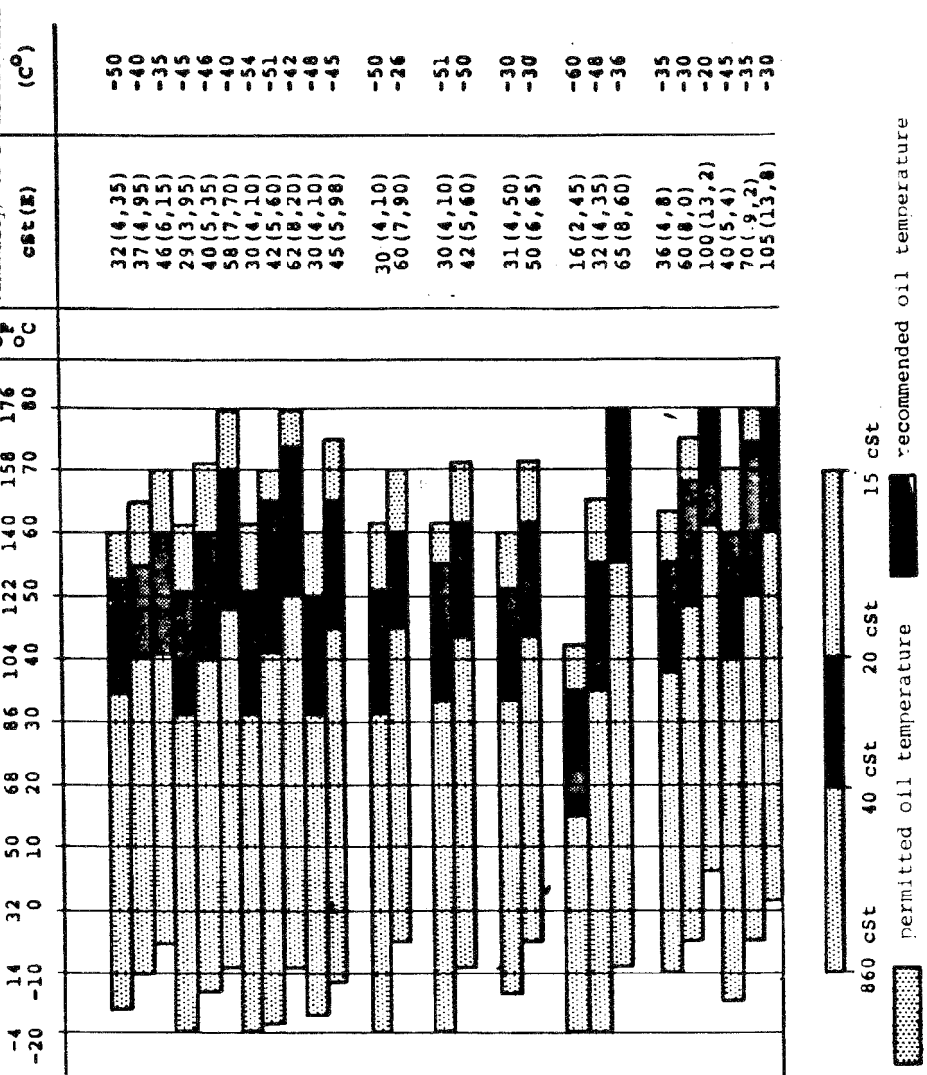
THE FOLLOWING SHOULD BE NOTED WHEN CHOOSING THE HYDRAULIC OIL:

Too thick oil:
- poor engine starting
- functions are sluggish
- hammer strikes at too infrequent intervals
- risk of cavitation in the pumps
- wear to the hammer and pumps
- valves tend to stick
- filtering is by-passed, which results in that the impurities will not become separated from the oil

Too thin oil:
- power losses (internal leaks)
- seal damage and leaks
- wear to the parts (oil does not lubricate properly)

N O T E ! TO ENSURE CORRECT OIL VISCOSITY WE RECOMMEND DIFFERENT HYDRAULIC OIL TO BE USED IN SUMMER AND WINTER PERIODS
(temperature differences more than 35°C).

4.1
Oil recommendations



4.2
Cleanness of the hydraulic oil

The hydraulic hammer must be installed in the excavator's hydraulic circuit so that return oil goes through the excavator's oil filter.

The function of filtering is to remove from the hydraulic oil any impurities which cause component wear, seizing and clog-up and which age and warm the hydraulic oil itself. Also air and water are impurities of oil - these will not be removed by the oil filter. It should be noted that oil impurities cannot be seen with bare eye.

Impurities get into the hydraulic system

- during hydraulic oil changes and replenishments
- in connection with component servicing and repairs
- when the hammer is installed
- as a result of component wear

In the hammer service the excavator's hydraulic oil filter must meet the following requirements:

- absolute filtering capacity 25 microns or nominal 10 microns
- filter material synthetic fibre or metal gauze (capable of withstanding pressure variations)
- adequate volume flow capacity

Oil companies generally quarantee a new oil an absolute purity of 40 microns only, therefore a filling filter must be used when adding hydraulic oil.

Damage caused by impurities in the excavator and hammer hydraulic circuit:

1. Service life of the pumps is rapidly shortened

   - wear of parts
   - cavitation

2. Valves do not function properly

   - sticking of the spindels
   - wear of parts
   - clogging-up of small holes

3. Wear of the cylinders and seals

4. The hammer efficiency is reduced

   - wear of the moving parts and seals
   - piston seizure
   - oil leaks

5. Service life of the hydraulic oil is shortened

   - overheating of the oil
   - ageing of the oil
   - electrochemical changes in the oil

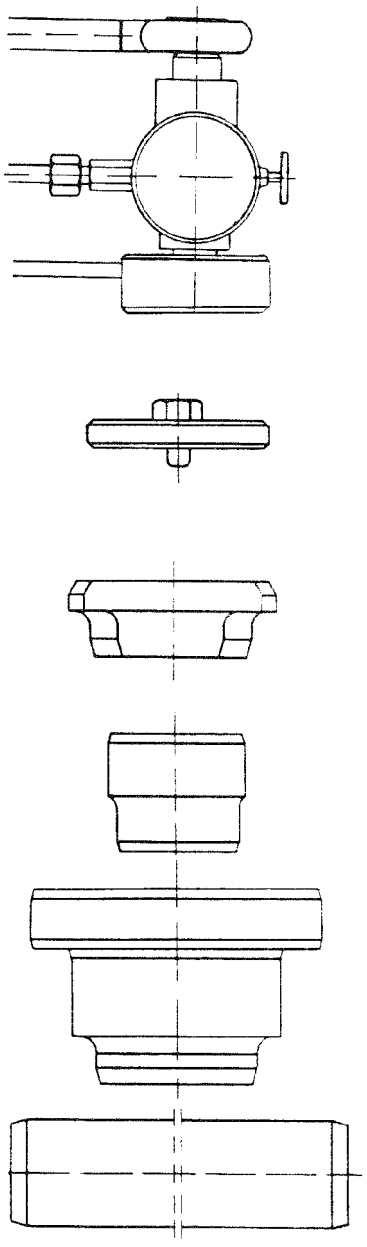
N O T E !

A COMPONENT DAMAGE IS ONLY A "SYMPTOM", THE FAULT ITSELF CANNOT BE CURED BY ELIMINATING THE SYMPTOM. AFTER A COMPONENT DAMAGE THE ENTIRE HYDRAULIC SYSTEM MUST BE CLEANED. WE RECOMMEND CHANGING OF THE CARRIER HYDRAULIC OIL WHEN THE HAMMER IS FIRST MOUNTED ON THE CARRIER.

SERVICE TOOL SET 41754 1
TYÖKALUSARJA

RAMMER S 22 , S 22 W

02.12.1986/0095v/PK/PK



Part No. Osa No.	Description Nimitys	Qty Kpl
31092	Accumulator filling device Akun täyttölaite	1
90670	Opener (Acc.) Avaaja (akku)	1
90669	Outpressing plate Ulospuristuslevy	1
90668	Punch Tuurna	1
90667	Punch Tuurna	1
90666	Punch Tuurna	1
41735	Plastic dolly Muovituurna	1

GENERAL TOOLS 41753 1
YLEISTYÖKALUT

RAMMER S22, S22 W

02.12.1986/0090v/PK/PK

Part no. Osa No.	Description Nimitys	Qty Kpl
90663	Torque wrench Stahlville 720/30 1/2", 60...300 Nm Momenttiavain	1
90662	Plastic hammer Muovivasara	1
90661	Hex.socket 11mm, 1/2" Hylsy	1
90660	Ratchet handle 1/2" Räikkäväännin	1
90683	Hex. socket screw key 6mm Kuusiokoloavain	1
90684	Hex. socket screw key 10mm Kuusiokoloavain	1
90659	Open end wrench 24mm Kiintoavain	1
90658	Open end wrench 27mm Kiintoavain	1
90657	Open end wrench 30mm Kiintoavain	1
90656	Open end wrench 60mm Kiintoavain	1
90655	Screw driver 6x150mm Ruuvimeisseli	1
90654	Oil can 0,5 l Öljykannu	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

Other required tools and equipment

- nitrogen gas bottle (N2)
- hoisting gear
- hydraulic press
- work bench
- wash basin, compressed air
- clean hydraulic oil
- hydraulic circuit pressure gauge

5.2
Removal from the carrier

Detaching the tool

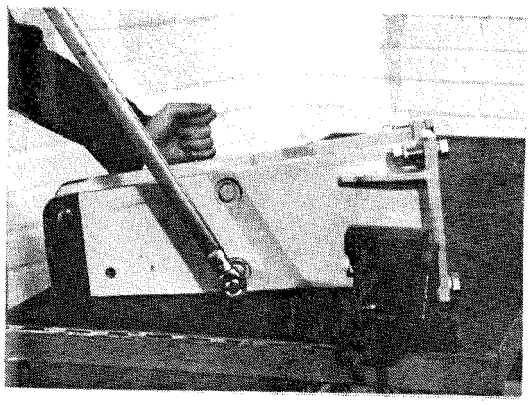
Remove the locking pin spring pin (part no. 28) by knocking it with a ø 9 mm drift. Withdraw the locking pin and pull the tool out of the hammer. Protect the tool's shank part against dirt and knocks.

Removing the hammer from the housing

Disconnect the pressure and return hoses from the hammer and protect the fittings of both the hammer and the hoses with clean plugs. (Hammer's original plugs can be used for protecting its fittings. If the hammer is replaced by a bucket, the pressure and return hoses must be plugged up tightly.)

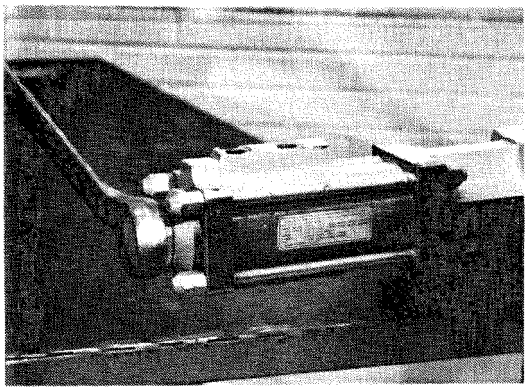
Remove the hammer fastening bolts from the side plates and take the hammer out of housing.

WASH THE OUTSIDE OF THE HAMMER.

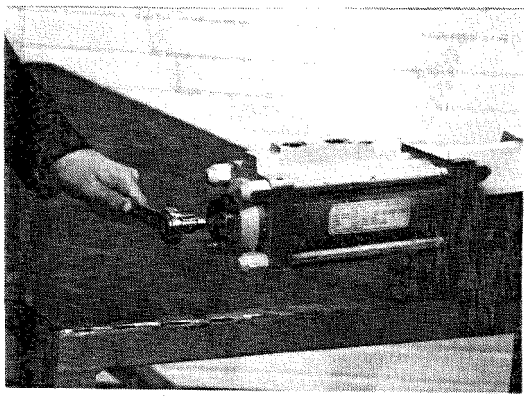


5.3
Dismantling the hammer and inspecting the parts

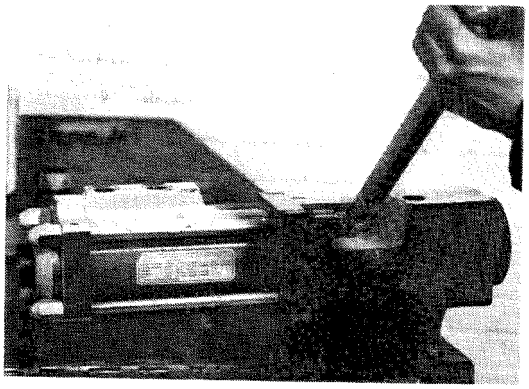
STRICT CLEANNESS AND CAREFULNESS ARE ESSENTIAL WHEN HANDLING HYDRAULIC HAMMER PARTS



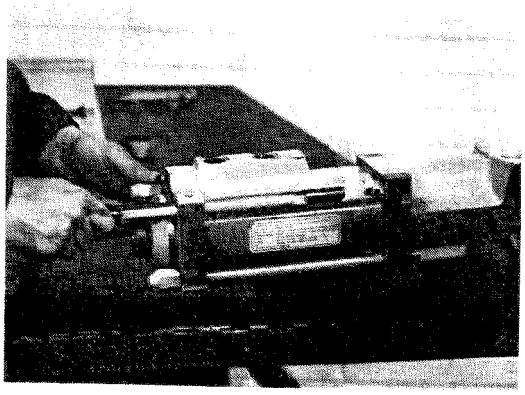
Fasten the machine to the vise from the front cover.

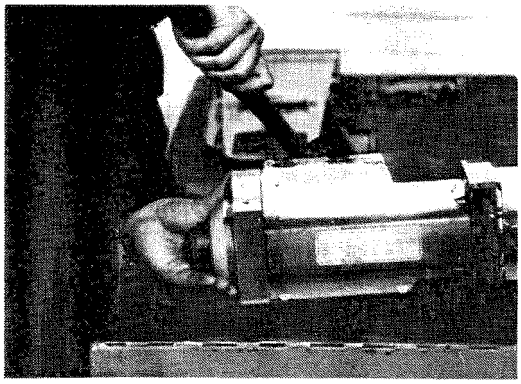


Remove the cap 15 from the rear cover and open the filling plug 30 and discharge the accumulator

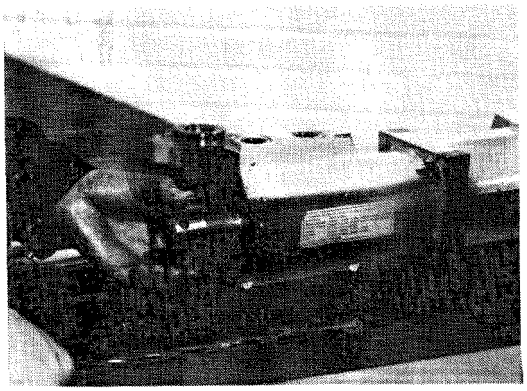


Remove the tie rod nuts 18 and pull the tie rods 21 off. The newer models have tie rods equipped with cap nuts in both ends, do not remove the rear end nut from the tie rod.

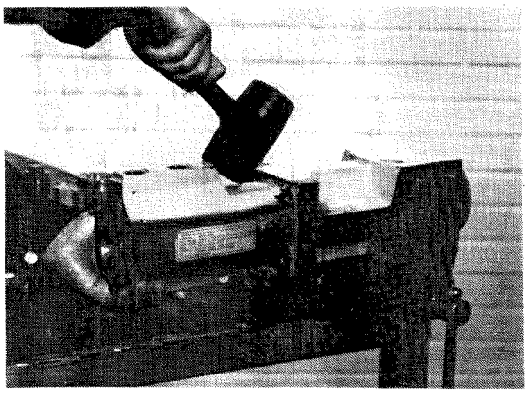




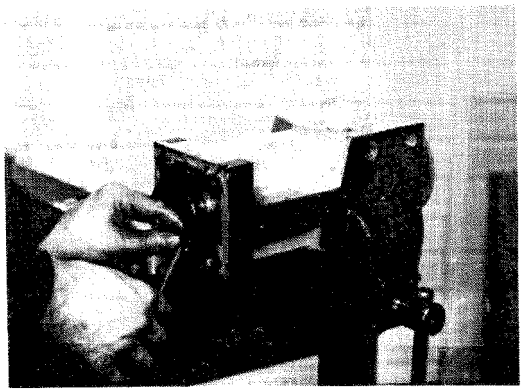
Pull the rear cover off by using a rubber mallet. The pulling can be made easier by opening the plug from the pressure port, so that air can get into the machine.

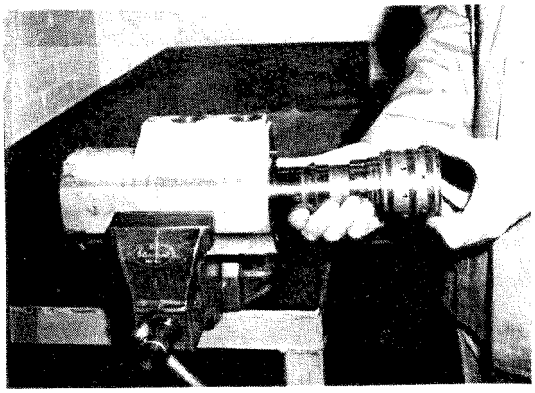


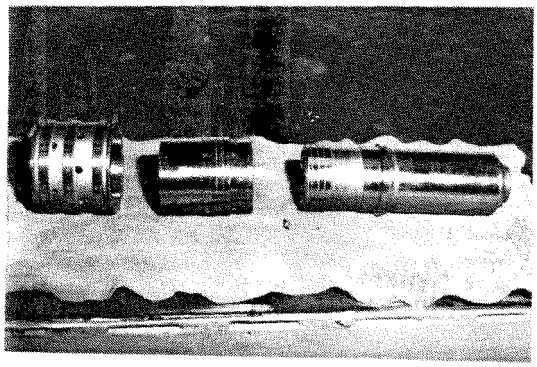
Pull the rear cylinder 12 out.



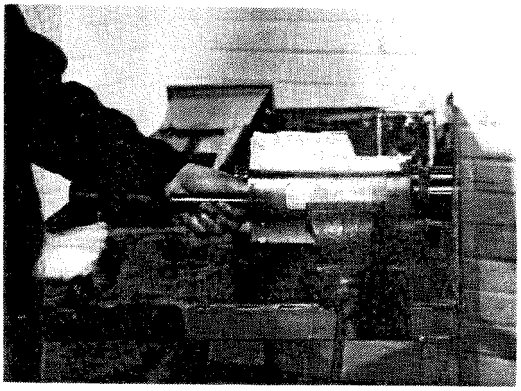
Remove the body cylinder from the front cover and remove the seal 5 and the wiper 6 from the front cover



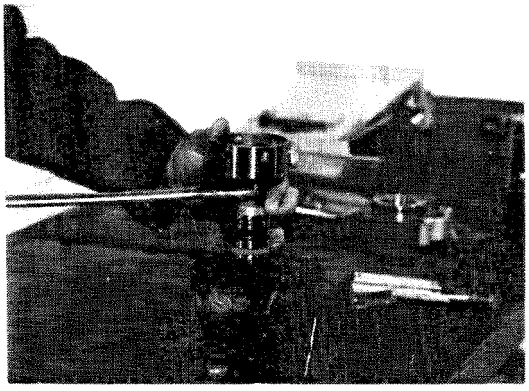




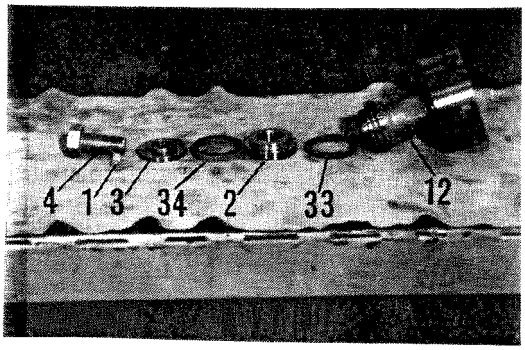
Fasten the body into the vise and hit the piston 14, the distributor cylinder 10 and the distributor 22 out of the body by using the rubber mallet and dolly (\41735).



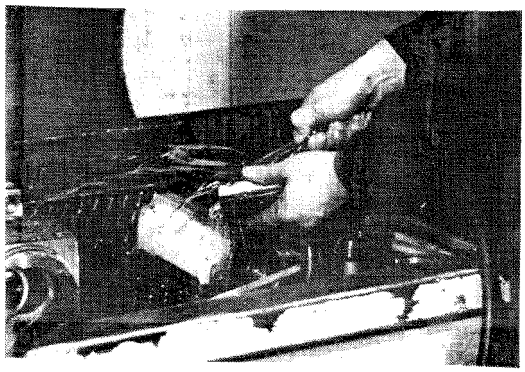
Pull the front cylinder 11 out through the machine's front end.

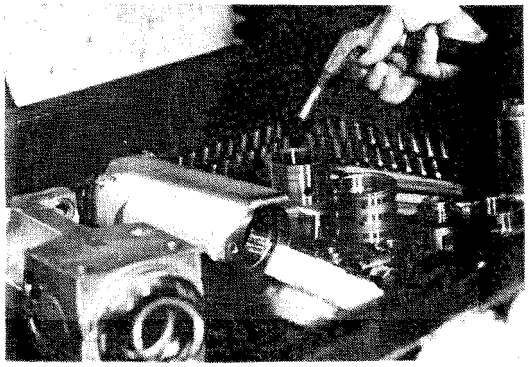


Fasten the rear cylinder assy to the vise at the hexagonal end of the screw and disassemble the assy by turning the cylinder anti-clockwise with a 30 mm open-end wrench.



1.Locking pin
2.Ring
3.Ring
4.Screw
12.Rear cylinder
33.Seal
34.Wiper





Wash all the parts throughly, for example with washing oil. Dry the parts with compressed air and place them on a fluff-free cloth.

INSPECTING THE PARTS

1.
Inspect the piston, front and rear cylinder and the distributor for any seizing marks. Minor marks can be ground off with a fine polishing band. The reason for a seizure may be uneven tightening of the tie rods or impurities in the oil. Badly damaged parts must be changed.

2.
Check the inner surface of the body cylinder and remove any scratches that may cause damage to the o-rings.

3.
Inspect the seal grooves of the rear cylinder. The grooves should be clean and free of any damages.

4.
Inspect the rear cover, body cylinder and the rear cylinder contact surfaces. The surfaces should be flawless. Inspect also the contact surfaces of the front cover and the body cylinder.

5.
Check the degree of wear of the tool chucks, parts 7 and 20. If the grease grooves have worn off in any direction, the chuck must be changed. Measure the wearing degree of the rear chuck bushing 20.(See chapter "Wear Limits").

6.
Check that there are no cuts in the tie rod threads and that the nuts can be screwed all the way down by hand.

7.
Check the condition of the tool and locking pin, part 16. Remove possible burrs from the tool. If the tool shank diameter is at its thinnest point less than 51 mm, the tool must be replaced. (See the Wear Limits Chart). The tool cannot be welded. Change the locking pin if it is worn.

5.4
Servicing and charging the pressure accumulator

ONLY AUTHORIZED RAMMER SPECIALIST IS ALLOWED TO SERVICE ACCUMULATORS!

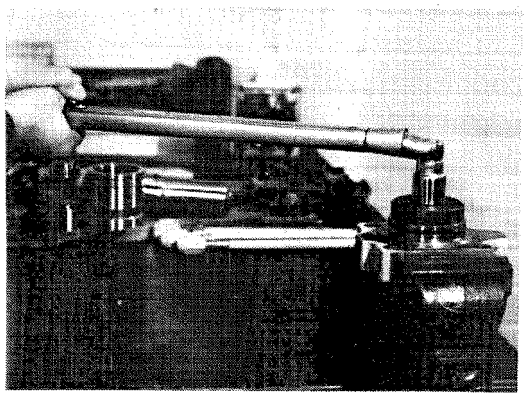
Before detaching the accumulator from the hammer, discharge pressure through the filling plug (part 30).

Before opening the accumulator bottom always make sure that there is no pressure in the accumulator!

Service tools:

-pressure filling device — RAMMER part no. 31092
-nitrogen gas bottle
-hex. socket screw key 6 mm
-opener — RAMMER part no. 90670
-socket M24
-vise
-ratchet handle 1 1/2"
-torque wrench

Dismantling



Unscrew the filling plug (30)carefully, whereupon any possible pressure will discharge.
Secure the rear cover in a vice. Open the accumulator bottom with the opening tool 90670

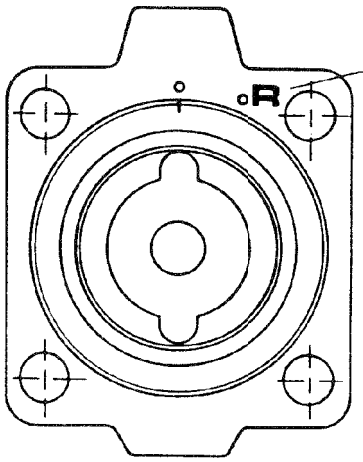
Remove the diaphragm and examine by stretching whether it is damaged. (If there is no pressure in the accumulator, then either the diaphragm is ruptured or the charging valve is damaged.) The diaphragm must also be changed if the metal centre has started to tear off from the rubber.

N O T E ! THE ACCUMULATOR COVER AND BOTTOM HAVE BEEN ADAPTED TO EACH OTHER, DO NOT CHANGE THEM WITH THE OTHER ACCUMULATORS PARTS.

INSPECTING THE ACCUMULATOR PARTS

Wash the accumulator cover and bottom and check for wearing, damaging and corrosions.
If the threads are badly corroded or worn, the accumulator must be destroyed to prevent further use.

NOTE !



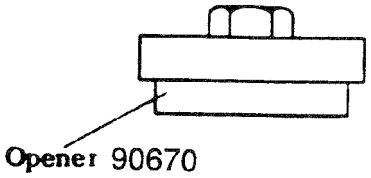
The accumulator is equipped with wear limit markings, check their position;
If the mark in the bottom is between the two markings in the cover, the accumulator is OK.

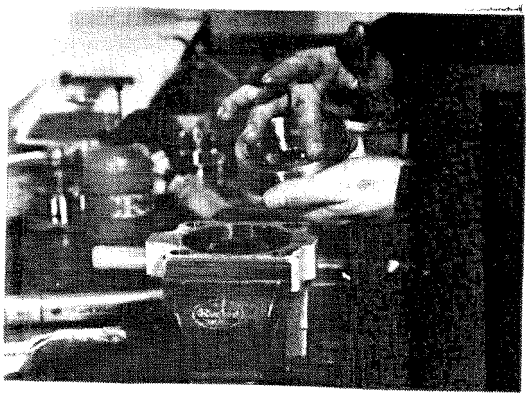
If the mark in the bottom hits the REJECT-mark in the cover, the accumulator is worn out, and it must be replaced.

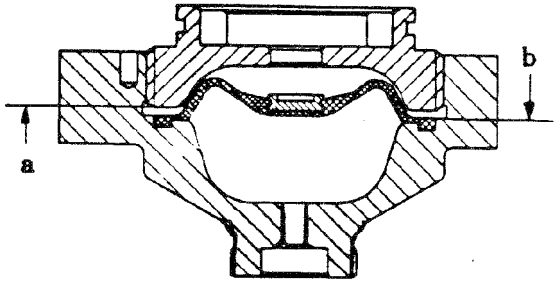
Destroy the worn-out accumulator to prevent further use.

Reassembly

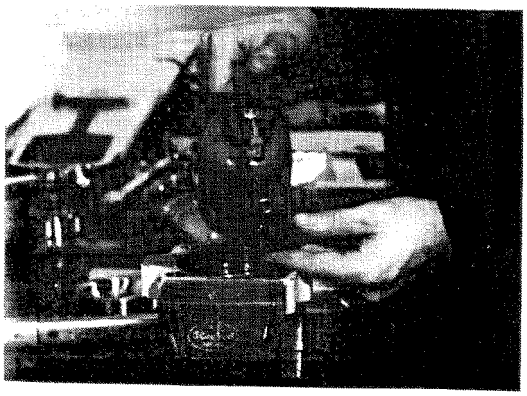
- Lubricate surfaces a and b to reduce friction while assembling.

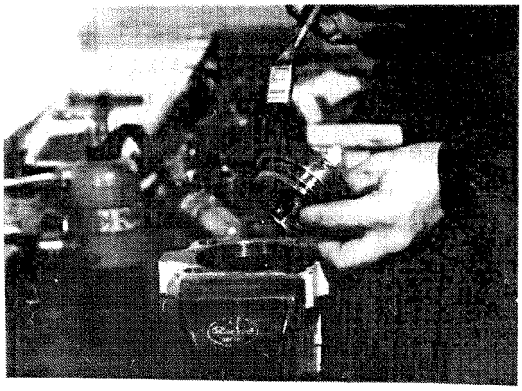




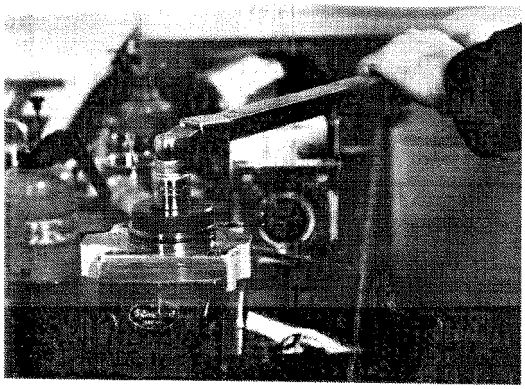


Before installing a new or checked diaphragm to the accumulator cover apply silicon to diaphragm surface, which is against the gas.





Apply thread grease (e.g. ROCOL J 166) to the accumulator threads.



Tighten the bottom to the 150 Nm torque.

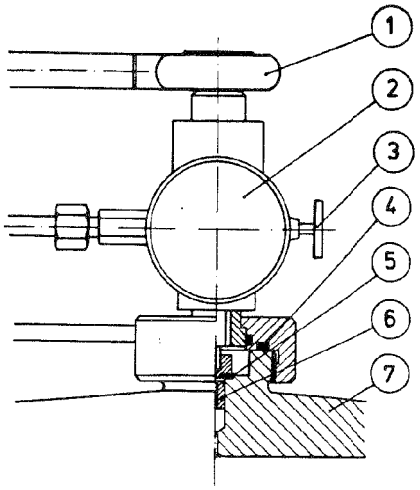
A DAMAGE OR TOO WORN ACCUMULATOR IS LETHAL!

Charging the accumulator

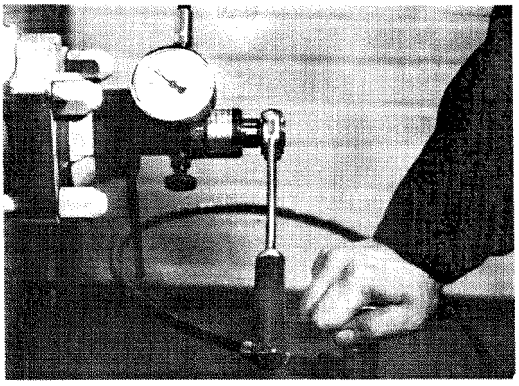
ALWAYS WORK WITH CARE WHEN HANDLING PRESSURIZED GAS

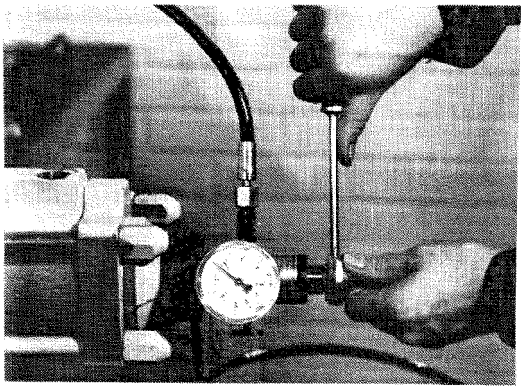
Pressure accumulator filling device

1. Ratchet handle
2. Pressure gauge
3. Discharge valve
4. O-ring
5. Usit-seal
6. Filling plug
7. Cover



CHARGING THE ACCUMULATOR





Renew the Usit seal (5) of the cover and screw the filling plug (6) into the cover leaving it loose.

Screw the refilling device (31092) into the cover of the pressure accumulator. Make sure that the O-ring (4) between the refilling device and the cover (7) is in position (see picture).

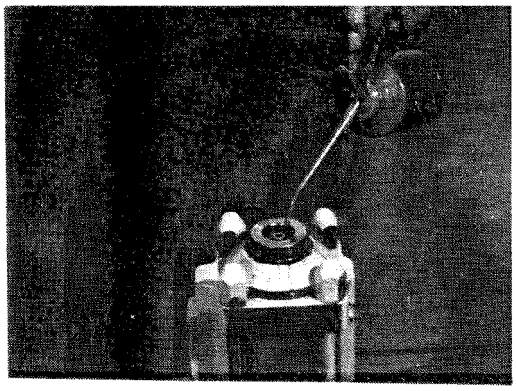
Attach the hose of the refilling device to the nitrogen cylinder (N2). Close the discharge valve (3) by turning it clockwise.

Using a ratchet handle (1) make sure that the filling plug (6) is open.

Open the nitrogen gas cylinder valve carefully and fill the pressure accumulator to 2,5...3,0 MPa (25...30 bar). Close the nitrogen cylinder valve as soon as correct pressure has been reached.

Using the torque wrench (1), close the filling plug (6) to torque of 20Nm

Release the pressure from the refilling device and the hose by opening the discharge valve (13).



Take the refilling device away from the pressure accumulator.

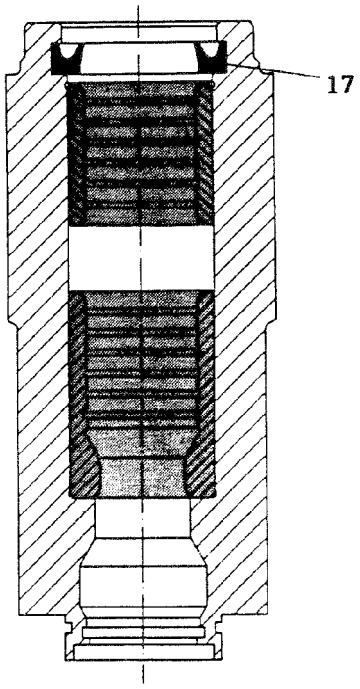
Make sure that Usit-seal (15) does not leak by pouring a little oil into the hole in the filling plug.

W A R N I N G !

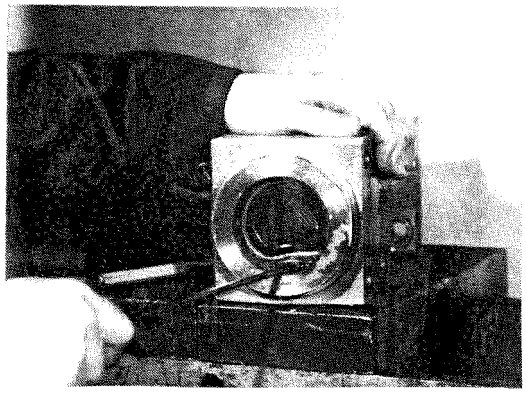
THE ONLY GAS PERMITTED FOR THE FILLING OF THE PRESSURE ACCUMULATOR IS NITROGEN (N2). THE USE OF ANY OTHER GAS MAY CAUSE THE ACCUMULATOR TO EXPLODE.

5.5
Changing the chucks

The chucks are fixed in the front cover with pressed-on fit.

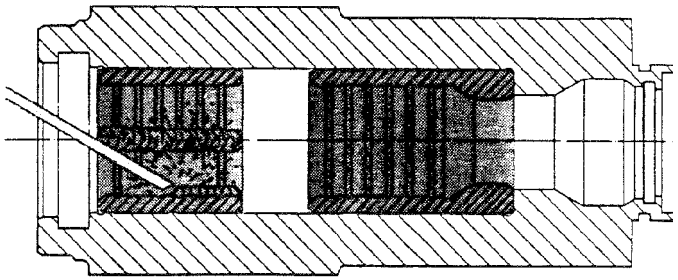


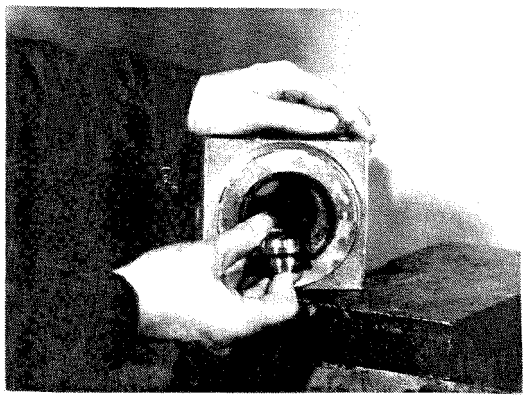
Changing equipment:
Punch 90667
Punch 90666
Punch 90668
Outpressing plate 90669
Hydraulic press



1. Remove the seal 17

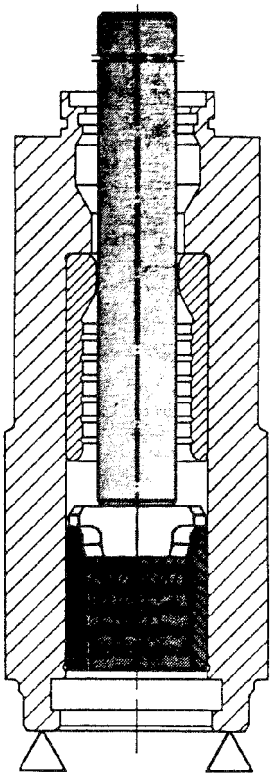
NOTE!
Chuck removal can be made easier by welding. Some weld runs inside the chuck, shrinks the chuck.

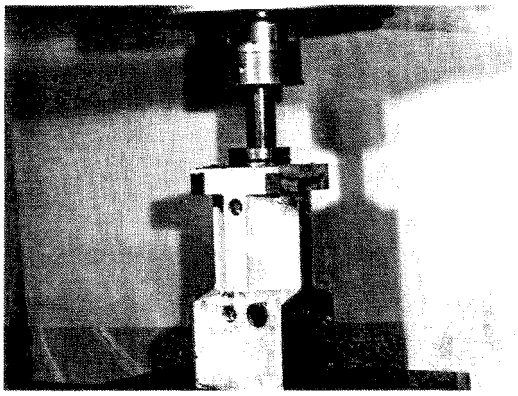




2. Removing the front chuck

Suspend the outpressing plate 90669 on a wire and place it into the front cover between the chucks or place it into the cover by hand.

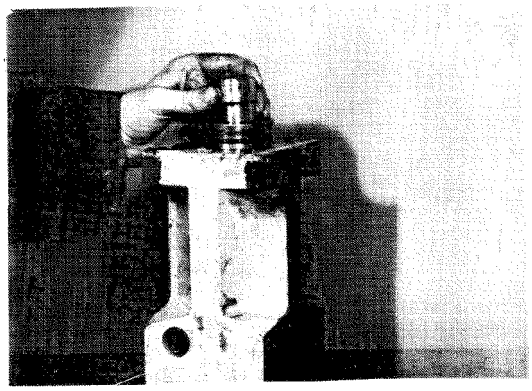


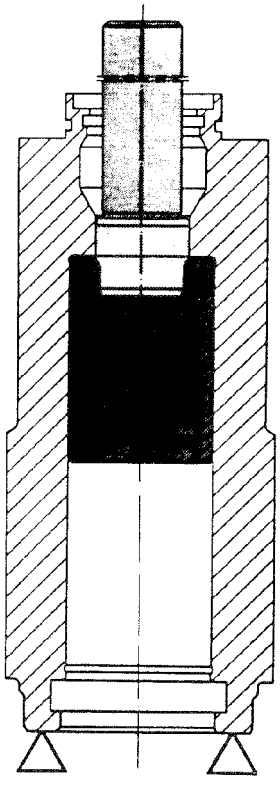


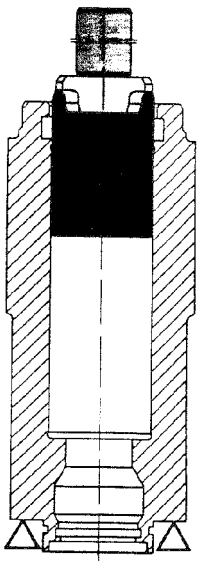
Place the punch 90667 into the front cover and push the front chuck out with a hydraulic press.

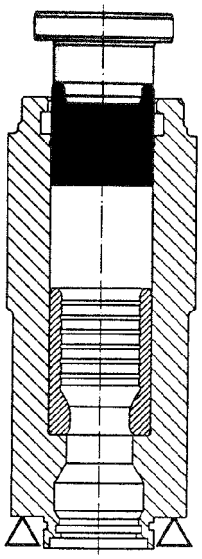
3. Removing the rear chuck

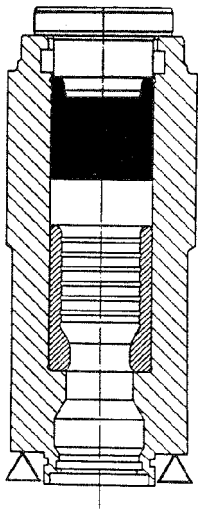
Place the punch 90668 into the front cover and put the punch 90666 on top. Push the rear chuck out with a hydraulic press.











4. Installing the rear chuck

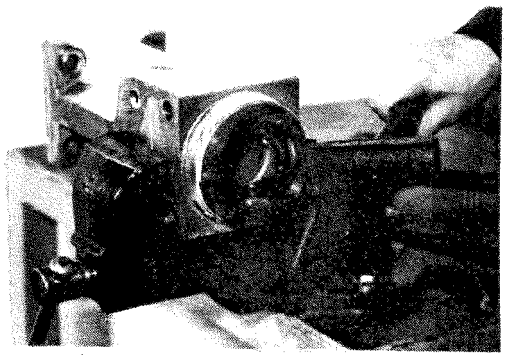
Clean the chuck housing and press the new rear chuck into the front cover with punch 90669 and punch 90666

5. Installing the front chuck

Press the new front chuck into the front cover with punch 90667 . Before this, the locking pin (98163) must be put to its place.

The right position of the front chuck is shown in figure. When using the punch 90667 the chuck slips into its place without measuring.

6. Install a new tool seal

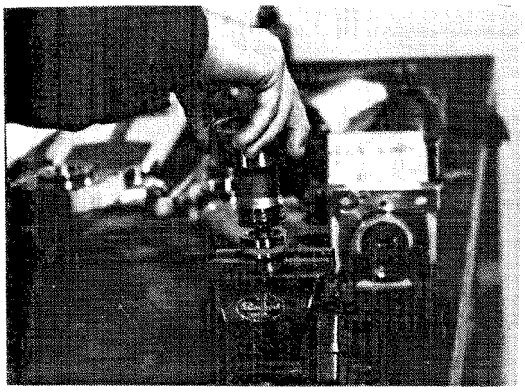


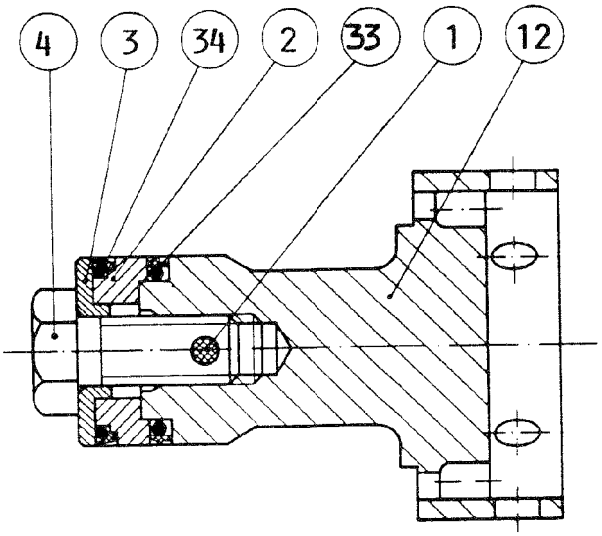
5.6
Assembling the hammer

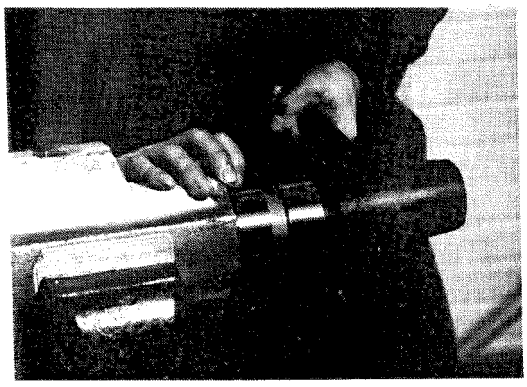
THE PARTS MUST BE THOROUGHLY CLEAN BEFORE THEY ARE ASSEMBLED INTO THE HAMMER.

The piston seals and wipers and all the O-rings must always be changed when the hammer is disassembled.

Clean the rear cylinder 12 and assemble the new seal 33 to the rear cylinder groove.
Install the wiper 34 to the ring 2 and put them together with the rear cylinder as shown in fig.
Assemble the ring and thread the screw 4 with a new locking pin 1 into the rear cylinder.
Tighten the screw first by hand and secure the assembly to the vise for final tightening.
Mount the assembly by the hexagonal head of the screw to the vise and tighten with 30 mm open-end wrench.



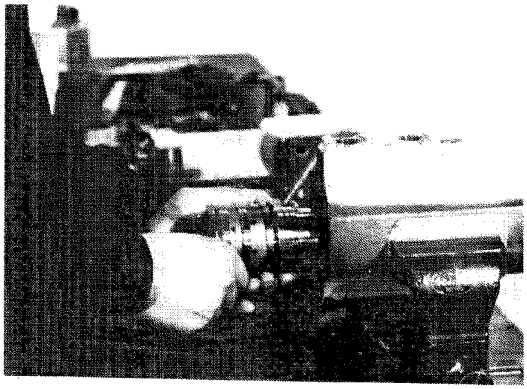




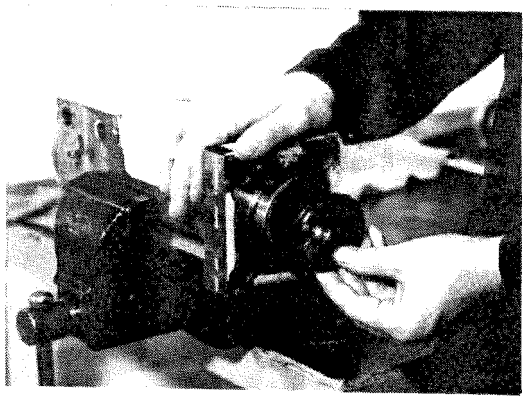
Secure the body cylinder 13 to the vise and push the front cylinder 11 into the body.
Check the right position in the section drawing.

Install the piston 14 into the front cylinder.

Replace the O-rings 29 to the distributor cylinder 10 and install the distributor 22 into the distributor cylinder.

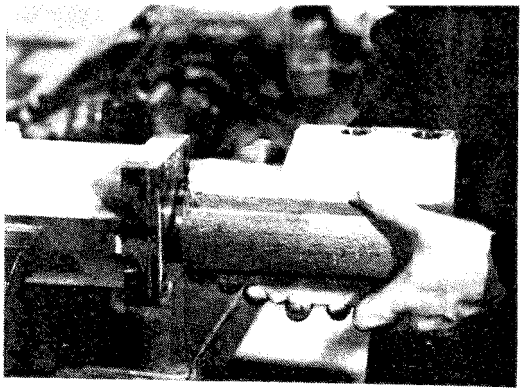


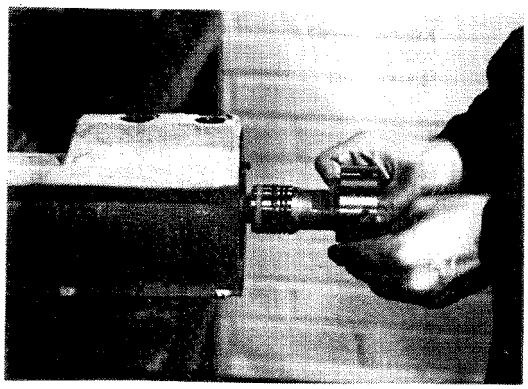
Install the assembly into the body using a rubber mallet and drive it to the right position with a plastic drift.

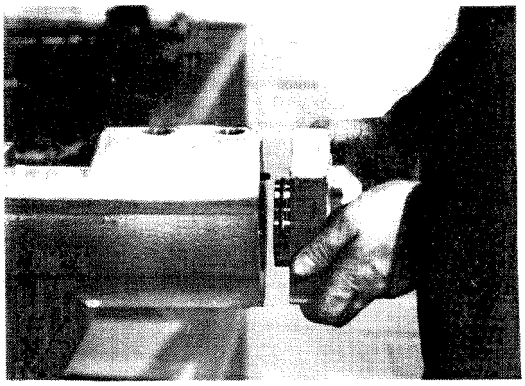


Secure the front cover 24 to the vise. Install the new wiper 6 and the piston seal 5 to the front cover. Check their right position in the section drawing.

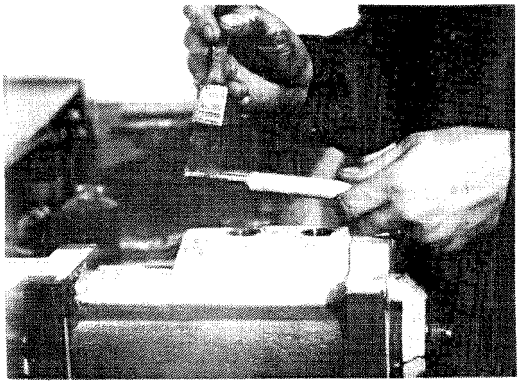
Install the body to the front cover. Lubricate the rear cylinder and push it to the body.



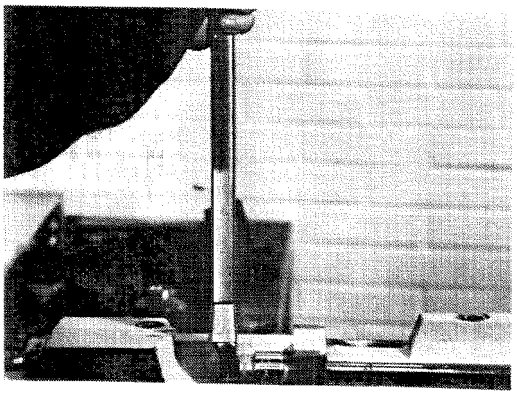




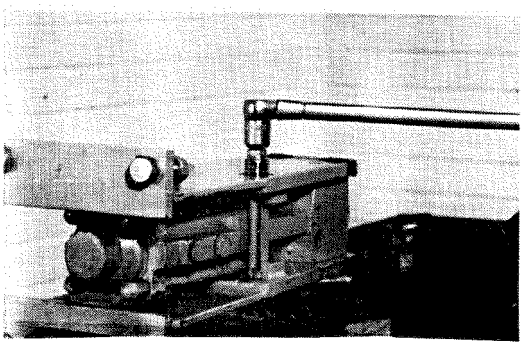
Place the new O-ring 29 to the rear cover and install the rear cover to the body.



Grease the threads of the tie rods with thread grease.



Install tie rods and tighten them with the torque wrench, first to 100Nm and then to 150 Nm. Retighten the tie rods after one shift's operation.



Then install sideplates and tighten screws to 220 Nm torque

6.
TROUBLE SHOOTING

Symptom	Cause	Remedy
6.1 Hammer does not strike at all	Mounting set-up is not in order.	-Measure and check the hammer hydraulic circuit: - volume flow at least 25 l/min/140 bar at normal operating temperature. -back pressure max 6 bar (with orifice) -back pressure max 11 bar (without orifice)
	Piston stuck in the bottom absorber.	Push the machine strongly against the material.
	Hammer is out of order.	-Dismantle and repair the hammer.
	Failed quick coupling.	Replace quick coupling.
6.2 Hammer's impact efficiency is poor	Mounting set up-is not in order.	Measure and check the hammer hydraulic circuit as in 6.1 above.
	Hoses are Flexing strongly.	-Check the pressure in the pressure accumulator 25...30 bar.
	Hammer is out of order.	-Dismantle and repair the hammer.
	Hydraulic oil is too hot.	-Check the oil cooling system. The maximum oil temperature in continuous operation is 70°C. Check the viscosity and cleanness of the oil.

Symptom	Cause	Remedy
	Back pressure is too high.	-Measure the back pressure and do as advised in section 3.5.
	Wrong method of working.	-Push the tool at right angles against the material.
	Failed quick coupling.	-Replace quick coupling.
6.3 Hammer's impact frequency is reduced	Mounting set up- is not in order	- Measure the hammer hydraulic circuit as in 6.1 above.
	Hydraulic oil is too hot.	- Check the oil cooling as in 6.2.
	Oil flows through the relief valve.	- Check the relief valve.
	Hammer is out of order.	- Dismantle and repair the hammer.
6.4 Hydraulic oil overheats	Mounting set up- is not in order.	- Measure the hammer hydraulic circuit as in 6.1 above and check the oil cooling as in 6.2 above.
	Not enough oil in the tank.	- Add oil in the tank.
	Oil flows throug the relief valve.	- Check the relief valve.
	Internal leak in the hammer.	- Dismantle the hammer and change the damaged parts and seals.
6.4 Hydraulic oil overheats (contd.)	Unnecessary use of the control valve and inef-fectual impacts.	- Use the hammer with deliberation.

6.5 Oil leaks	Fittings loose	-	Tighten up or replace.
	Seals worn	-	Change the hammer's piston seals and the O-rings which have squeezed into shape. Check the piston surfaces.
6.6 Continuous hose breakages	Mounting set-up is not in order.	-	Measure the hammer hydraulic circuit as in 6.1 above and check the mounting of the hoses.
	Pressure in the hammer's pressure accumulator is not normal.	-	Check the gas pressure.
6.7 Continuous tool breakages in the machine	Wrong working methods	-	Push the tool against the material at right angles to it. Do not deflect the tool. Grease the tool shank regularly.

7
PERIODIC MAINTENANCE AND CHECKS

1. Mounting inspection
(to be carried out by authorized RAMMER specialist)

MOUNTING INSPECTION SHOULD BE CARRIED OUT ALWAYS BEFORE THE HAMMER IS ATTACHED TO THE CARRIER.

- Check that the mounting has been carried out according the mounting instructions provided.
- Check that the hoses move freely when the boom is driven to extreme positions and they do not chafe on anything.
- Measure the pressure restriction, pressure in pressure line and back pressure in the hammer circuit. The correct values are:

  - 140...160 bar
  - 120...140 bar
  - max. 6 bar (with orifice)
  - " 11 bar (without ")

Test-run the assembly in accordance with section 3.5. Observe the hammer's impact efficiency, impact frequency and smoothness of running as well as running pressure and the oil temperature
- Show the operator the correct working methods and advice him on the daily maintenance of the hammer.

2. Tightening of the tie rods (carried out by the operator)

- When you have taken a new hammer into use or serviced an old one, the tie rods must be retightened after one shift's operation (tightening torque 150 Nm).
- Check the tightening of the tie rods after 50 hours' operation.

3. Fundamental check-up (carried out by the operator)
CARRIED OUT AFTER ABOUT 50 OPERATING HOURS

- Check the hammer's running pressure.
- Watch the oil temperature in continuous operation.
- Check the tightening of all bolts.

4. Daily maintenance (to be carried out by the operator)

- Grease the hammer tool twice a day with open gear grease containing graphite or molybdenum disulphide.
- Check the tightness of the fittings and mounting bolts. Tighten up when necessary.

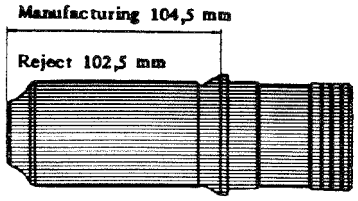
5. Weekly maintenance (to be carried out by operator)

- Remove the locking pin and the tool and check the degree of wear in them as also in the tool chuck.
- Remove any burrs from the tool.
- If the tool shank diameter is at its thinnest point less than 51 mm, then the tool must be replaced.

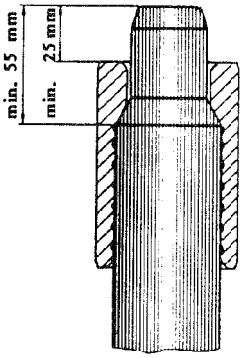
6. Yearly maintenance
(to be carried out by authorized RAMMER specialist)

- Change all the hammer seals.
- Change the rubber diaphragm in the accumulator.
- Inspect all the hammer parts and change or repair any damaged components.
- Measure the piston, the front cover and the tool and repair if they have worn below wear limits.

WEAR LIMITS
Manufacturing 104,5 mm
Reject 102,5 mm

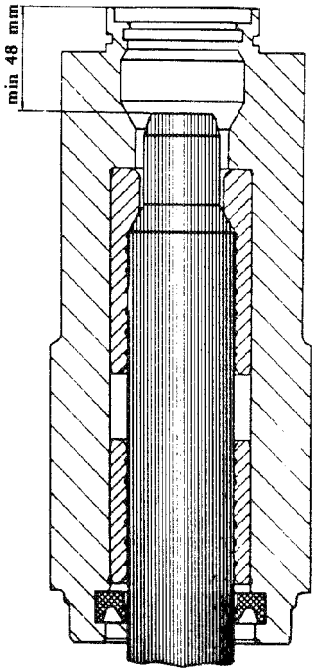


Piston measuring



Tool measuring

Set the worn tool into the new chuck and measure the distance from the upper surface of the chuck to the tool's top surface. If it is less than 25 mm, renew the tool.



Chuck measuring

Set the new tool into the front cover and push it as far as it goes. Measure the distance from the upper surface to the tool's top surface. If the grooves have worn off in any one direction of the inner surface of the chuck, it must be changed.

- Measure the pressure restriction and pressure in the pressure line in the hammer circuit. Adjust when necessary.
- Change the carrier oil filter.
- Check and tighten up all the hydraulic fittings.
- Check all hoses and renew when necessary.
- Check the oil temperature in continuous operation.

W A R N I N G

1. The hammer must not be used when the viscosity of the hydraulic oil is above 1000 cSt or below 15 cSt.
2. The hammer must not be used if the tool or chuck has worn below the wear limits.
3. Do not use the hammer before you have familiarized yourself with its operating and maintenance instructions.

SOME EXAMPLES OF THE SUITABLE GREASES FOR CHUCK LUBRICATION:

Special RAMMER grease is delivered with the hammer, but also following greases are suitable for tool lubrication.

- WYNNS GS 80: part no. 98502
- ESSO EOL 232: part no.90203
- SHELL Kuggfett
- SHELL Extrema MDS
- KLÜBER Unimoly GB2
- LE 3751/3752
- Tebo Gear Grease MDS.

8
OPERATING INSTRUCTIONS

1. ALWAYS USE ADEQUATE ENGINE SPEED IN THE CARRIER

   The oil pressure to the hammer must be between 120...140 bar.

   A lower pressure then this may cause damage to the pressure accumulator. On the other hand an unnecessarily high speed of revolutions is waste of energy and causes temperature rise in the hydraulic oil.

2. WHEN STRIKING WITH THE HAMMER KEEP PRESSING IT AGAINST THE MATERIAL TO BE BROKEN

   Before striking is started and during the entire process of striking the hammer must be fed against the material face so that the tool bit is all the time firmly against the material to be broken. Stop striking as soon as the material has broken up. Start from the smaller pieces and enlarge as necessary until you reach the best working result. Make use of defects, such as cracks, already existing in the structures to the broken.

3. WORK AT THE CORRECT ANGLE

   Apply and feed the hammer at right angles against the surface of the material to be broken.
   As the breaking proceeds keep the tool and the hammer in alignment all the time to avoid subjecting the tool to bending strain. If the impact sound becomes thin and impact gets ineffective, correct immediately the misalignment between the tool and the hammer and push the tool home.

4. CHOOSE THE TOOL ACCORDING TO THE MATERIAL TO BE BROKEN
   R 100 working steels, see section 2.4.

5. IF THE HAMMER IS DETACHED FROM THE CARRIER, HOSES MUST BE CLOSED WITH PRESSURE-PROOF PLUGS.