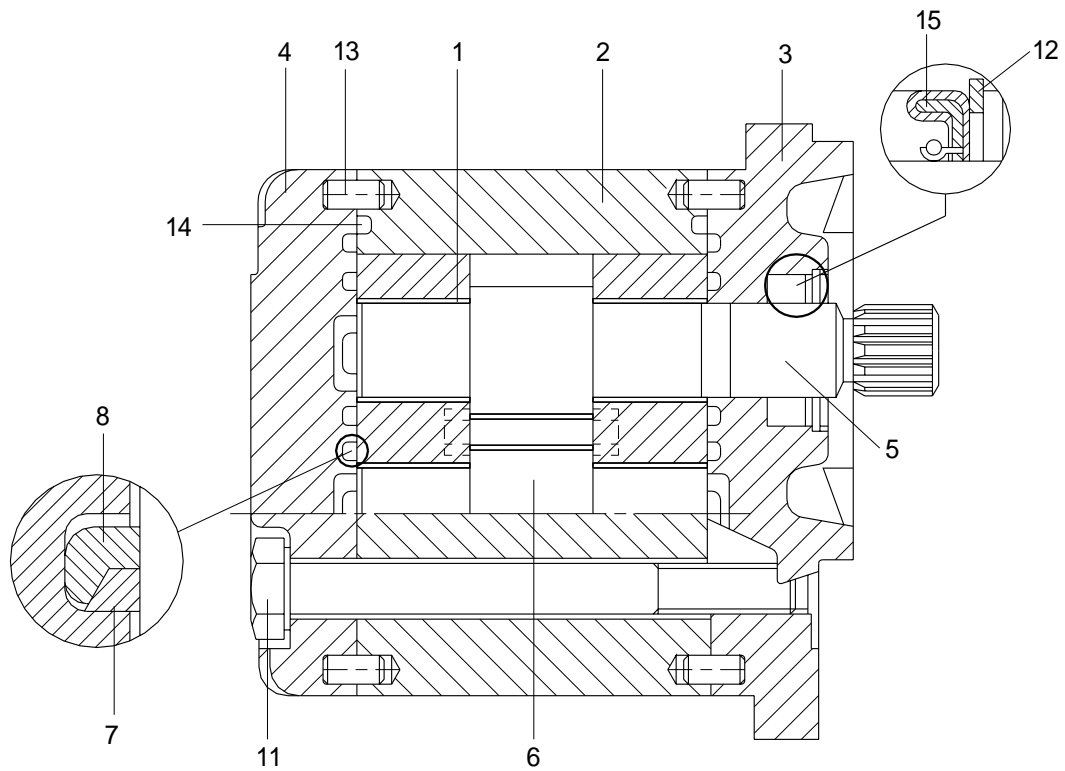


GROUP 4 DISASSEMBLY AND ASSEMBLY

1. BRAKE PUMP(~#0052)

1) STRUCTURE



- | | | | | | |
|---|---------------------|----|--------------------|----|------------|
| 1 | Bearing and bushing | 6 | Idle gear | 13 | Dowel pin |
| 2 | Housing | 7 | Antiextrusion ring | 14 | Seal |
| 3 | Flange | 8 | Seal | 15 | Shaft seal |
| 4 | Cover | 11 | Screw | | |
| 5 | Drive gear | 12 | Snap ring | | |

2) GENERAL INSTRUCTION

In the following pages it is detailed the procedure for disassembling and assembling pumps and motors.

It must be pointed out that prior to proceeding to handle a pump, it is necessary to prepare separately some sub-assemblies.

The details as to the way how to prepare each sub-assembly are given in the following section.

There are also some general recommendations to be borne in mind, as shown below.

(1) Cleanliness

It is one of the main factors for assuring good pump performance and reliability.

Therefore clean and wash all pieces prior to assembling. For doing it, we suggest to use a solvent type FREON TF or equivalent, which is not aggressive for either materials or seals.

Clean again the working flat, taking away the residual oil from disassembling.

(2) Lubrication of moving parts

During assembling, it is imperative to provide to lubricate with a clean hydraulic oil all the running parts of the pump and coat with grease the seals all over. The absence of lubrication during the assembling can cause the seizure of the units after few minutes of running.

(3) Care on the surface treatment

Handle with care all the internal surfaces, with particular references to the bearing, gear and body faces.

Therefore do not touch them with hard metal tools, or cutting edges, but handle with the hands or plastic tools.

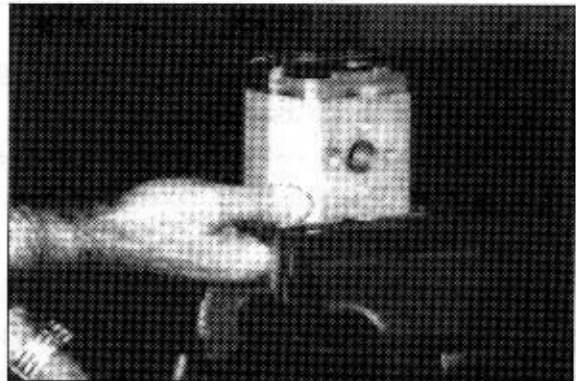
(4) Marking of the parts

Mark the internal parts before to stripping completely a pump ; The marks must allow to reassemble the components in the same initial mutual position. This criteria should be applied especially to the body, bearings and gears.

3) DISASSEMBLY

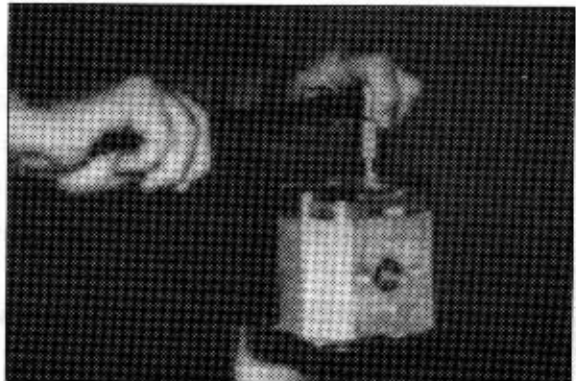
(1) Pump clamping

Clamp the unit on a vice from the flange side. Make sure that the vice jaws are provided with clean and smooth plastic protection to prevent from damaging the pump. Clamping the pump on the body is allowed, but not recommended, because there is a risk to seriously damage the surfaces, on which port arrangements are located.



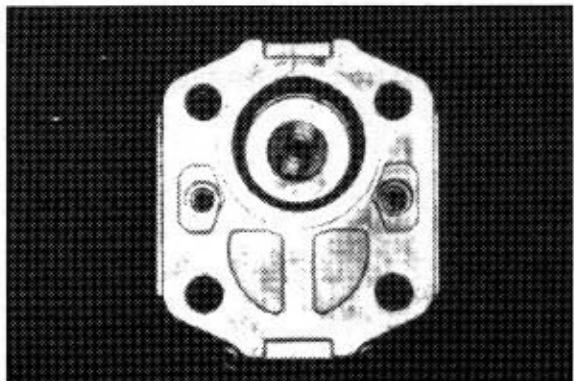
(2) Bolts unscrewing (All except 03 flange)

Use a 17mm socket wrench and loose the 4 hexagon cap screws on the cover, then unscrew completely the bolts and remove and check them, then move directly to the step 3.



(3) Bolts unscrewing (03 flange or stages of multiple pump only)

Use a 4mm hexagon socket. Unlock the two small socket screws placed in the center of the cover. Repeat the same operation for the corresponding screws on the flange.



(4) Flange removal

Place the pump on the table as shown in the picture, and slowly remove the flange.

- * Be careful in carrying out this operation, because the shaft seal could be easily damaged.

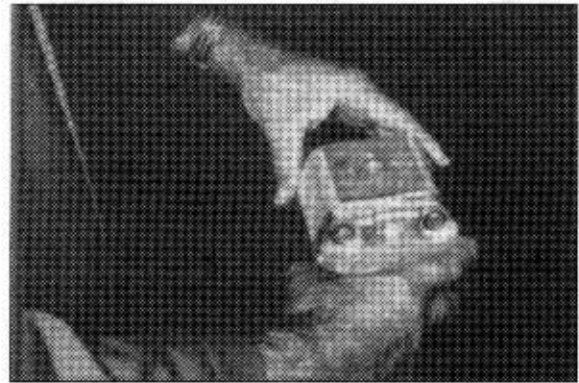
Pay attention to absolutely avoid any possible contact of shaft seal lips with key way edges (In tapered and parallel shafts) or splined shaft teeth.



(5) Cover removal

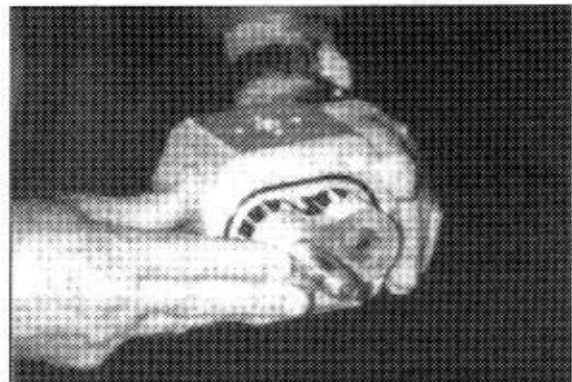
Remove the cover. At this step, prior to going ahead, dry up the oil lost on the table during the previous operations.

It is also recommended to dry the parts already disassembled, and to put them apart.



(6) Bolts unscrewing (All except 03 flange)

Place the pump on one side, and softly remove bearing and gear block, by manually holding the pump as shown in the figure, and pushing with the fingers on the rear bearing.



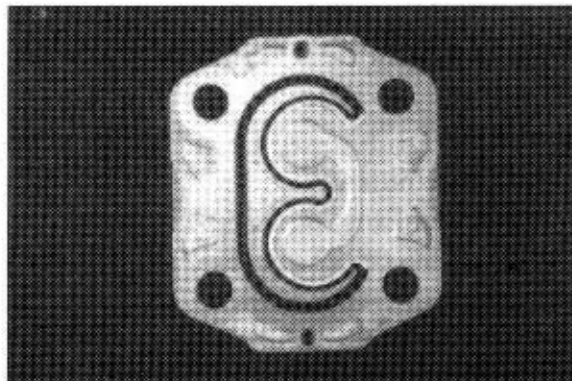
(7) Pressure seals removal

Check for seal status. Replacement is recommended whenever there are burrs on them, extrusion initiations, or marks due to overheatings.

Should seals need to be replaced, carefully remove them on flange and cover, beginning from the antiextrusion ring, then the rubber seal.

- ※ Do not use, for any reason, drills or tools with cutting edges ; consider that a seal, even if slightly damaged, adversely affects pump(Or motor) performance.

After removal, carefully dry up the seals.



(8) Pressure seals removal (SNM/SEM 2 motors)

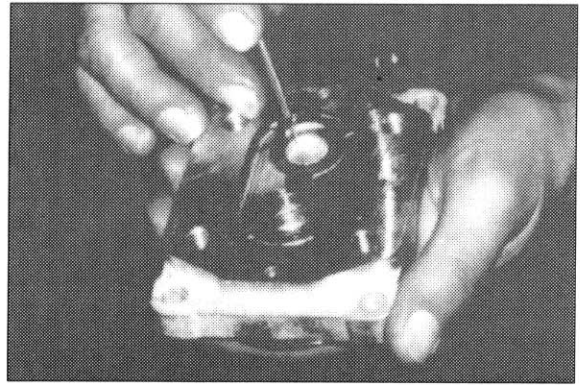
Follow the same recommendations as given for the previous item.

If it is necessary to remove the seals, pay a particular care in this operation.

- ※ Do not force at the removal of the antiextrusion ring, but remove it gradually, to avoid damaging on the edge of the groove.

The rubber seal is very delicate : handle it with care, too.

After removal, carefully dry up seal and antiextrusion rings.

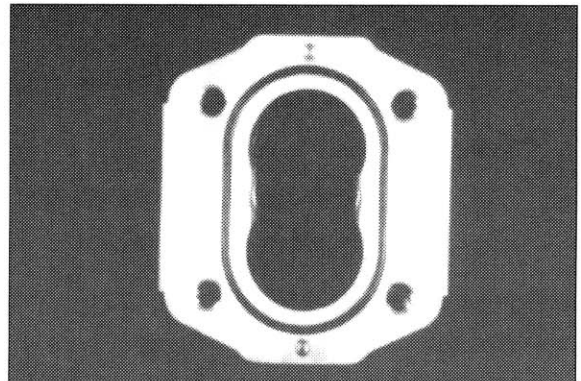


(9) Outer seal removal

Check for the status of this seal and if necessary, replace it.

Follow the same recommendations given for clause(7).

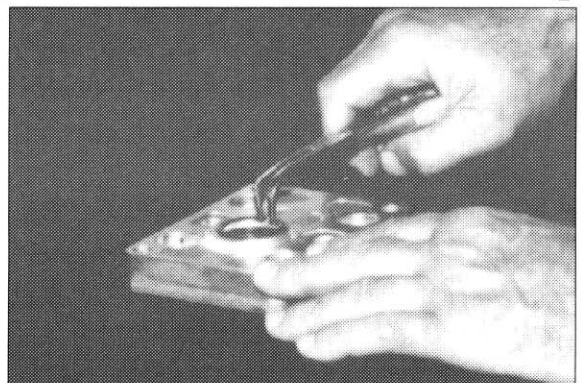
Use a proper tool, clean and dry up.



(10) Circlips removal

Place the flange on the desk.

Using the proper pies, insert them in the circlips eyes and then remove it.

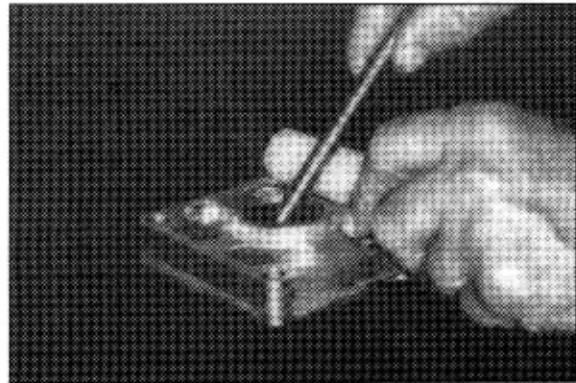


(11) Shaft seal removal

Check for shaft seal status and remove it if necessary.

If so, hook shaft seal bottom by means of a proper tool, and lever in different areas of it, while rotating flange in such a way to lift it up evenly.

- ※ Do not lever on flange spigot, to prevent it from damaging. Use a plastic or wooden rod to help in levering as shown in the figure.



4) ASSEMBLY

(1) Seals preparation

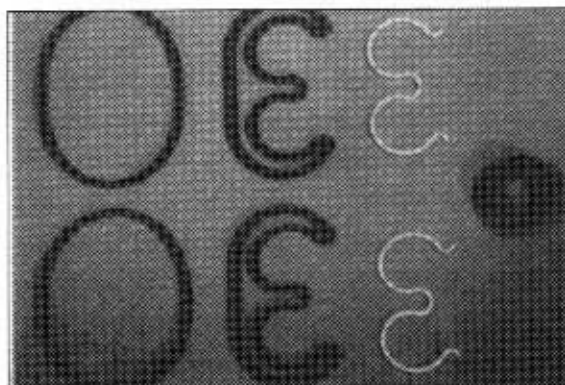
Have available the entire seal kit.

Accurately coat with seal greases all pressure seals and outer seals.

The layer of said grease must be light, because it is just needed to allow seals to adhere to their grooves.

In eventual lack of greases, and hydraulic oil is allowed too.

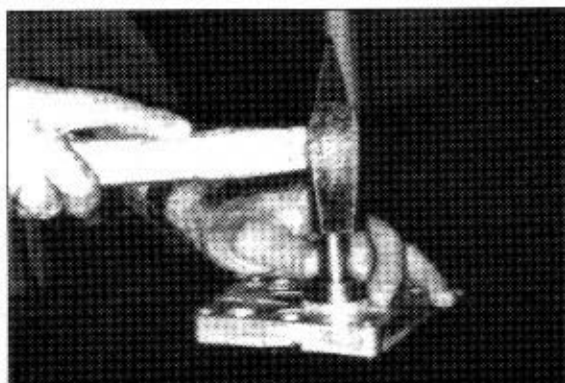
※ Do not fit for any reason dry seals.



(2) Shaft seal assembling

Prepare flange and shaft seal, accurately lubricated with grease on a well cleaned table.

Fit the shaft seal into its seat in the flange with the fingers, and then use the proper tool (As described in the tool list), until completing the fitting operation.



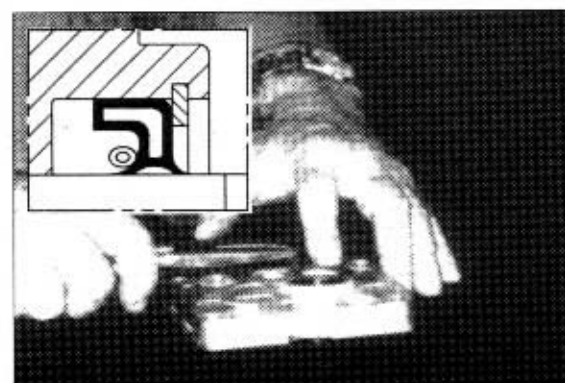
(3) Circlips installation

Install the circlips using the proper pies.

※ Take care that, at the end of this step, the circlips must be perfectly located in its groove.

This is important to prevent the risk of shaft seal to be blown out when a pressure acts from inside, especially when the unit involved is a motor.

※ Apply a light coating of grease on the internal lips of the shaft seal after fitting.



(4) Pressure seals assembling (Pumps only)

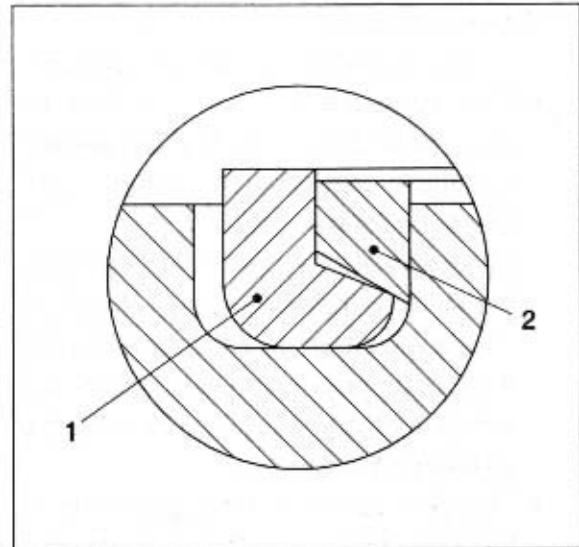
Fit pressure seals on flange and cover.

Fitting operation is easy, because all the seals are molded and preformed.

Fit firstly the rubber seal(1), and secondly place the antiextrusion ring(2) in the seat created by rubber seal and by the side groove.

- ※ Be careful that seal(1) and antiextrusion ring(2) mutual position must match as shown on the drawing.

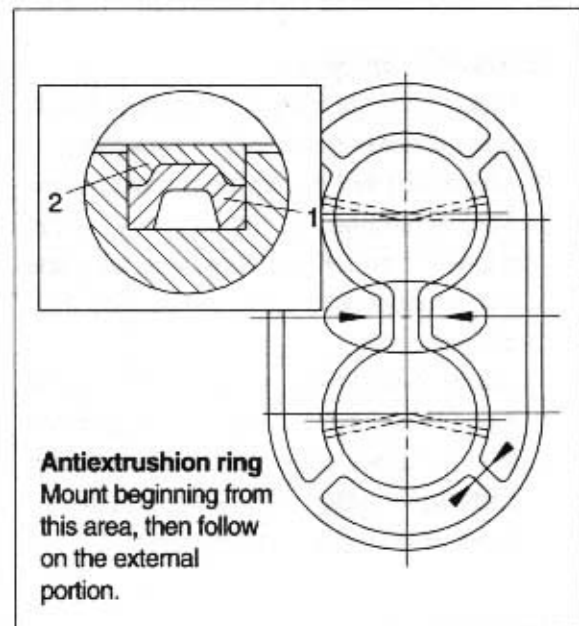
Make sure that seals are perfectly located in their grooves.



(5) Pressure seals assembling (SNM 2 motors only)

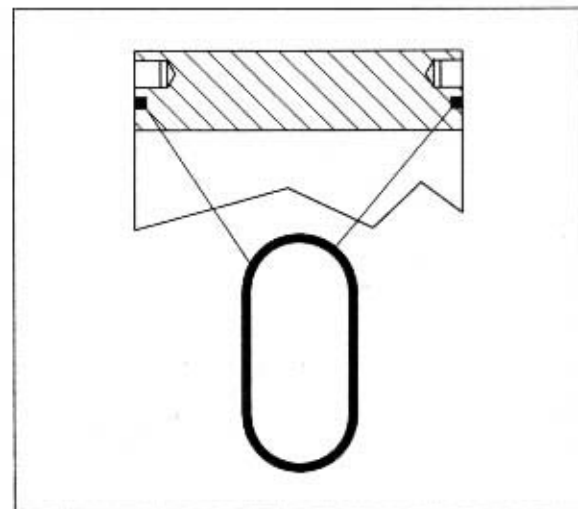
First of all, install the rubber seal(1), paying attention that its position must meet the indication of the figure, then install the antiextrusion ring(2).

- ※ Take care that the antiextrusion ring(2) has been designed for a close fitting within its groove, so that assembling could be difficult. The best suggestion in order to make the assembling easier is to press lightly by hand the antiextrusion ring into the groove beginning from the internal portion of its pattern(B-B in the picture), and as soon as properly located, proceed toward the external portion.



(6) Pressure seals removal

Properly install the outer seals in their grooves on both sides of the body of pump or motor.



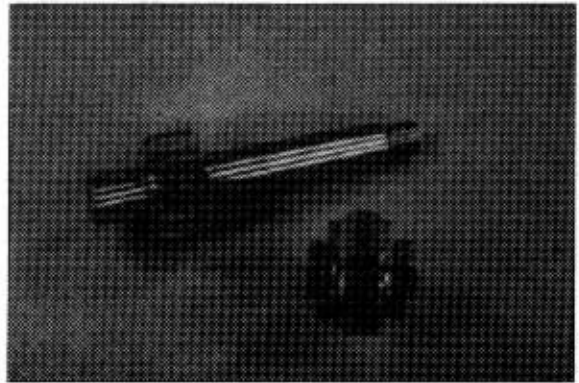
(7) Gear preparation

Prepare the two gears in a clean condition.

- * If the gears are new, i.e. taken from the store, wash them accurately with solvent, to remove completely the anti-corrosion grease on the surfaces.

Check also that the journals and especially the flat faces must be free from scratches, or cutting burrs on the edges on the teeth; If so, clean them with a flat stone and/or very fine emery paper, and re-wash the gears after this operation.

- * The gear surfaces are superfinished, therefore be careful to avoid possible contact with the fingers.

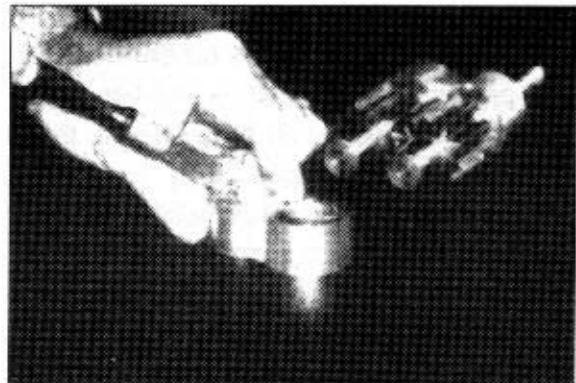


(8) Bearings preparation

Prepare on the desk the two bearings in clean conditions and wash if necessary.

- * Check also that the flat faces must be free from scratches, or cutting burrs on the edges ; If so remove them with very fine emery paper, and wash the bearing after this operation.

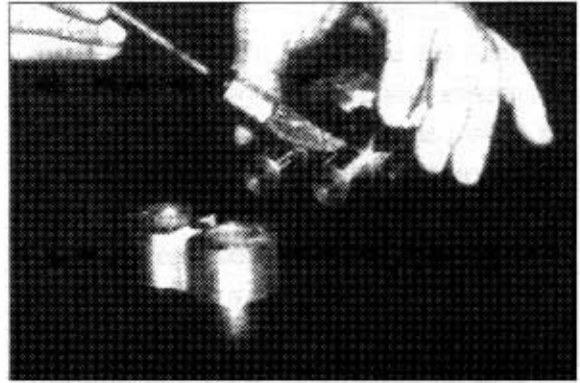
Using clean mineral base oil (Hydraulic oil if possible) lubricate with a soft brush all the surfaces of the bearings paying particular attention to the holes and the flat faces which match with the gears.



(9) Bearing and gear block assembly

Assembly firstly bearings and gear block taking care that the bearings faces with the recesses are to be adjacent to the gear faces. If possible mount the parts in the same mutual position they had before disassembling, maintaining front and rear bearing in the same location and assuring, if possible, that mutual position of gear mating teeth is accomplished as before. If the teeth do not match together in the same position as found in disassembling, a possible increase of operating noise could occur.

- * Lubricate the journal and the gear faces using a soft brush and clean oil in this operation.



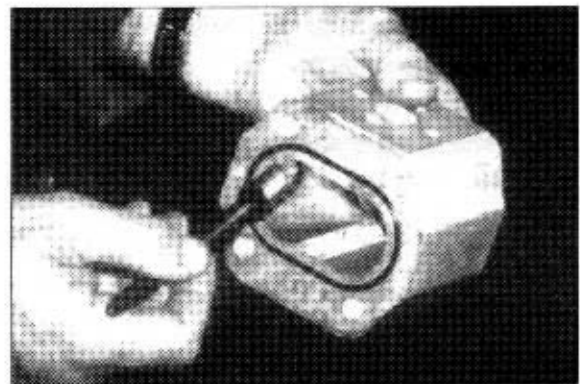
(10) Body preparation

Prepare the body in a well cleaned condition.

Check that the internal surface is free of burrs or scores ; This applies both to the bearing mating surface and the cut-in path.

Should little scores or burrs be found, remove them using carefully an abrasive paper, and clean the body again.

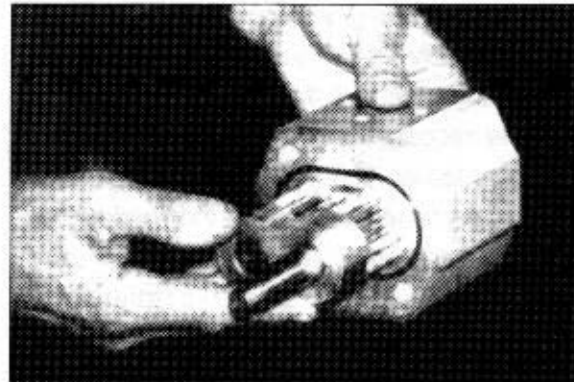
- * After that, lubricate with care the internal cavity of the body.



(11) Gear block fitting

Take the entire bearing and gear block assembly and fit it into the body cavity.

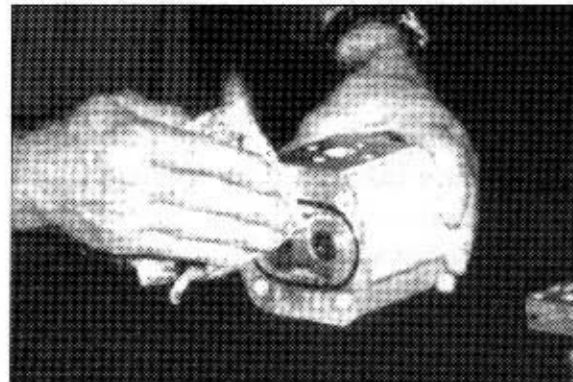
- ※ Take care to assembly the block in the correct position compared with the position of the tooth **Track-In** of the body cavity, to assure correct the sense of rotation to the pump (In a motor this is not mandatory). The best is however that the mutual position of the block and the housing must be exactly the same as before disassembly ; Should this caution not be taken, a volumetric efficiency fall off could result from that.



(12) Surface drying(Body)

Dry, with a soft and clean wiping cloth, the faces of the body and the bearing which, after assembling, will match with cover and flange surfaces.

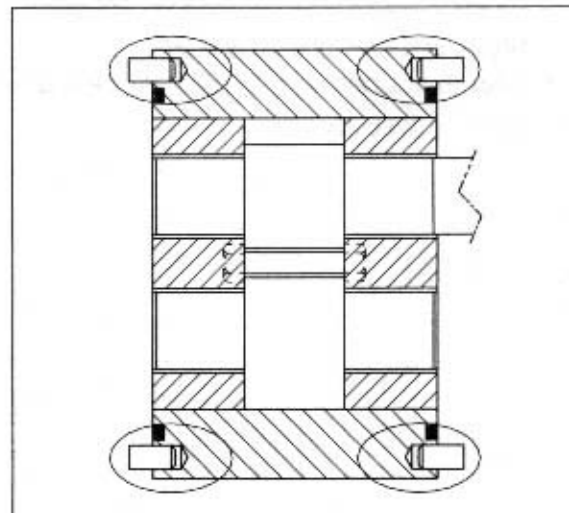
Make sure that surfaces are fully dry before going ahead.



(13) Dowel pins installation

Install the four 5mm dowel pins in the proper cavities on both side of the body.

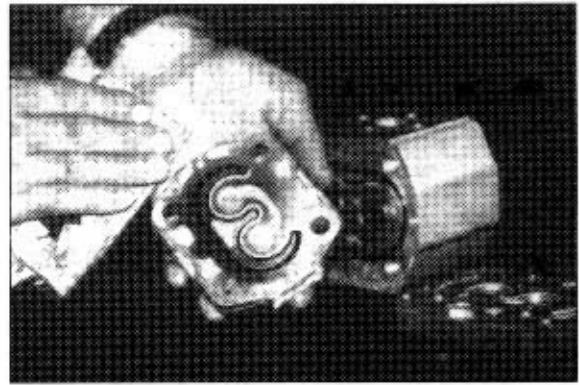
- ※ Do not install the dowels on cover or flange ; Otherwise, there is the risk that a dowel drops inside the pump during the flange/cover assembling.



(14) Surface drying (Cover and flange)

Dry, with a soft and clean wiping cloth, the machined surfaces of flange and cover.

- ※ Check that the pressure seals keep in place after this operation.



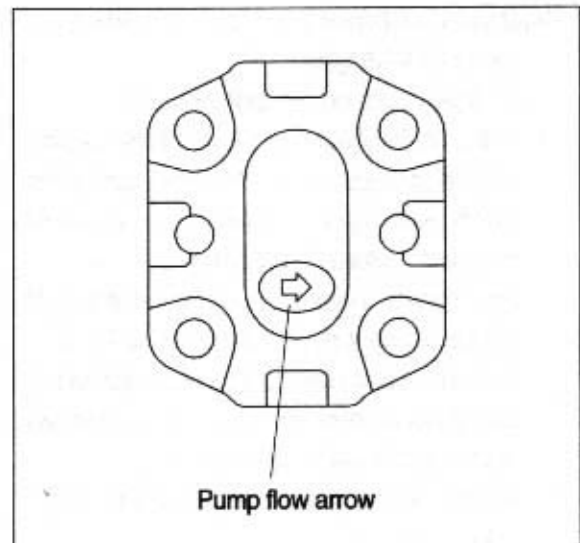
(15) Surface drying(Body)

Mount the cover on the body, paying attention that the arrow on the back will be oriented as :

- ※ In the same sense of the flow if the unit is a **PUMP**.
- ※ Against the sense of the flow if the unit is an **UNI-DIRECTIONAL MOTOR**.

If the unit is a Bi-Directional motor the arrow is not printed on the cover, and any position of the cover is correct.

- ※ Pay attention that all seals do not come off and jump out of their seats, while performing this operation.



(16) Dowel pins installation

Place the pump with the cover in a downwards position.

- ※ Check that the inlet side of the flange is on the inlet side of the pump (The same side of the body Track-in) ; If not there was an error in the gear block assembling, and it is necessary to repeat this operation.

After that, put on the drive shaft the metal protection sleeve; this sleeve is used for avoiding any possible damage on the shaft seal, while fitting the flange onto the body.

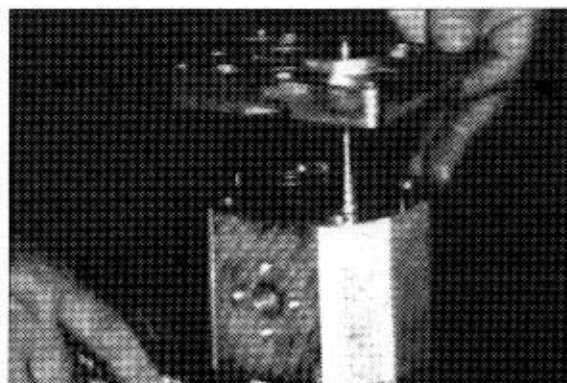


(17) Flange assembling

Fit the flange into the body.

Remove the metal protection sleeve only after completing this operation, as soon as you are sure that the surfaces match properly one with the other.

- ※ Pay attention that seals do not move from their seats, or jump out of them, while carrying out this operation.



(18) Bolt tightening on cover side (All except FR03 type)

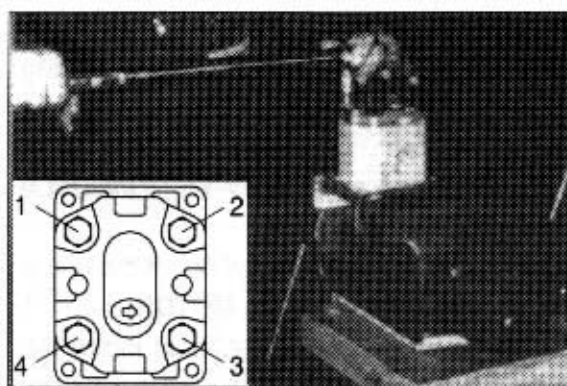
Fit again bolts on the side of cover.

- ※ In the 01 flange, if it is required the sealing on the threads, wash the bolts and treat them with loctite 242 or equivalent products, before assembling.

Pre-tighten them, then tighten at the right torque, using a dynamometrical wrench.

Both pre-tightening and wrench tightening are to be carried out on a 1-3-4-2 way as shown in the explanatory picture.

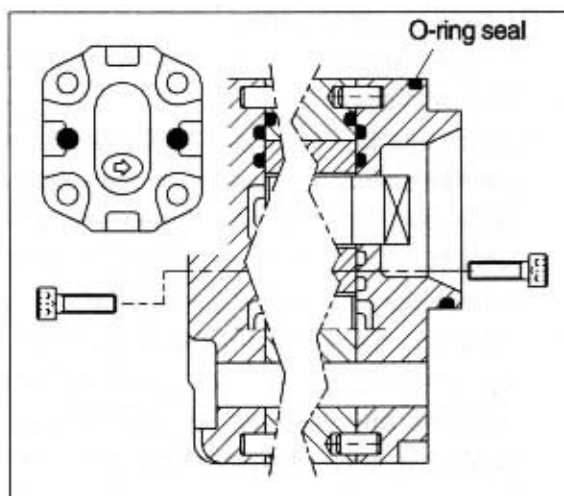
Set the wrench torque at $5.1 \sim 5.6 \text{ kg} \cdot \text{m}$ ($37 \sim 41 \text{ lb} \cdot \text{ft}$)



(19) Bolt mounting(03 type)

Install the 2 socket screws using a 4mm hexagon socket. Do this operation for cover and flange.

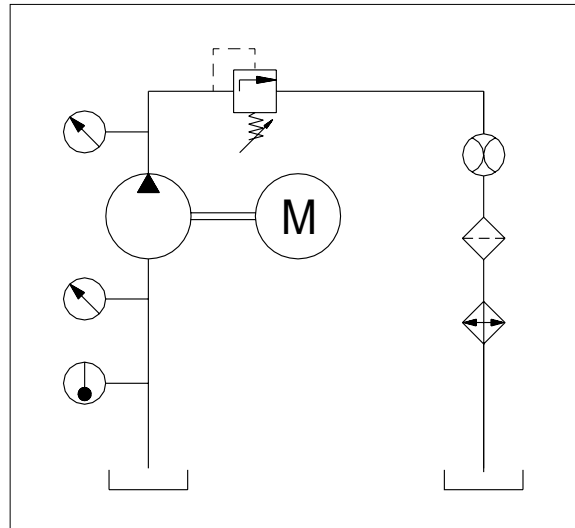
Install the O-ring seal in its groove on the flange spigot.



(20) Testing

If a pump has been completely disassembled and reassembled, (e.g. for repairs) we suggest to put the pump on a test rig and to check the volumetric efficiency.

Before testing check that the oil of the test rig is in perfect cleanliness conditions.

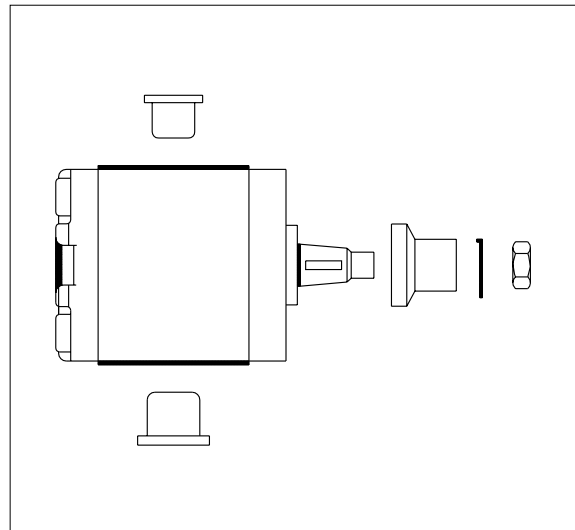


(21) Complement of the unit

Complete the unit by cleaning it and if necessary, by putting grease on the end-shaft.

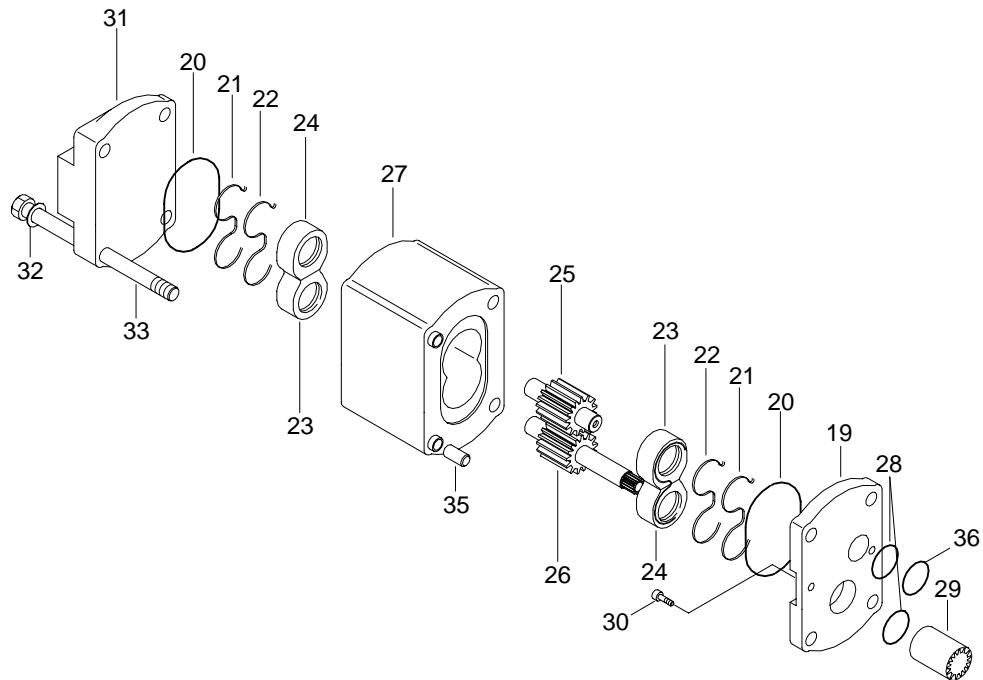
Then mount the following.

- Ports plastic plugs
- End shaft protection.



2. BRAKE PUMP(#0053~)

1) STRUCTURE



19	Spacer plate	25	Drive gear	31	Cover
20	O-ring	26	Drive gear	32	Spring washer
21	Back up seal	27	Rear body	33	Bolt
22	Seal element	28	O-ring	35	Dowel pin
23	Bushing	29	Splined coupling	36	O-ring
24	Bushing	30	Cap screw		

2) GENERAL

(1) Introduction

Each unit comprises an end cover, body housing, the bush/gear assembly and a mounting flange bolted together. The gear/bush assembly consists of a pair of meshing gears supported by plain bearings in the bushes. The drive gear journal extends through the mounting flange to form the drive shaft. A lip type shaft seal and O-rings provide external sealing whilst special lobe seals and backing rings are used internally.

(2) Routine maintenance

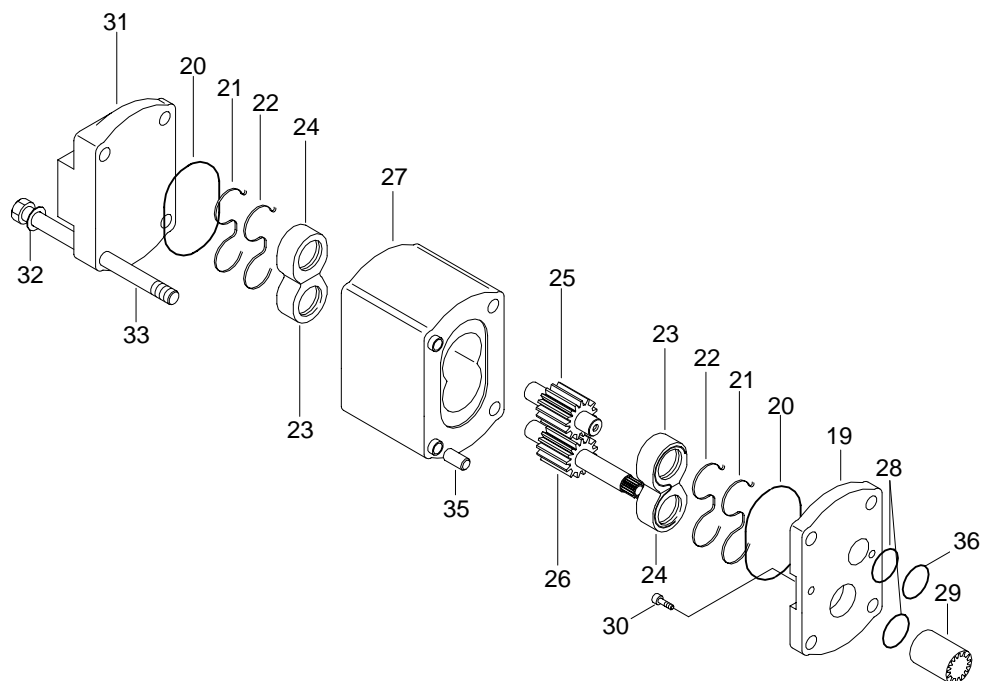
No maintenance is necessary other than periodic checks for tightness of the mounting bolts and visual examination for oil leakage. The unit should be kept externally clean, especially in the area of the shaft seals as dirt can accelerate seal wear and cause leakage.

The unit must be operated only with clean oil and the system manufacturer's directions for periodic renewal of system oil filter elements must be strictly observed.

(3) Field servicing

Seal kits and spare parts are available to enable units to be serviced.

3) DISASSEMBLY



※ Before disassembling ensure that the unit itself, bench and tools are thoroughly clean.

- (1) Lightly mark the end cover(31), body(27) and spacer plate(19) to ensure reassembly in the correct position.
- (2) Remove the bolts(18) and separate the brake pump unit from the main pump using a soft faced hammer.
- (3) Remove splined coupling(29) and O-rings(28) sealing the internal passages between the pump sections.
- (4) Remove the spacer plate(19) from the body(27), free from spacer plate from location dowel(35) using a soft faced hammer.
- (5) Remove the backup seal(21), the seal element(22) and the body O-ring(20).
- (6) Remove the end cover(31) from the body(27).
- (7) Remove the backup seal(21), the seal element(22) and the body O-ring(20).
- ※ Before removing the internal components each bushing(23, 24) must be marked to denote its location within the body. On the plain area of the bush away from the seal location, lightly mark.
- (8) With the unit laying on its side grasp hold of the drive shaft(26) and pull it squarely out of the body (27) bringing the bushing(23, 24) with it.
- (9) Remove the driven gear(25) and the two remaining bushing(23, 24).

4) INSPECTION AND REPAIR

(1) Assessment

Each components should be thoroughly cleaned, carefully examined and assessed for suitability re-use. Below is a guide for inspecting the various components.

(2) Body

- ① Inspect the body bore cut-in where both gears wipe into the body.
- ② The body can only be re-used if the **cut-in** is bright and polished in appearance and the depth does not exceed 0.15mm(0.006").
- ③ The body should be replaced if the surface is scored, has a matt appearance or shows signs that the tip of the gears have dug in and torn away the surface material.
- ④ The body should be inspected to ensure that there is no superficial damage which may adversely effect performance or sealing. Pay particular attention to the port threads and body O-ring seal recesses.

(3) Spacer plate and end cover

- ① The inner surfaces should be inspected to ensure that there is no unusual wear or scoring in the regions where the body O-rings and backing rings contact, which result in external leakage.
- ② Check the shaft seal recess for scoring or damage that could result in oil leakage around the outer diameter of the shaft seal. Replacement shaft seals can be refitted with Loctite hydraulic sealant to overcome slight damage in this area.

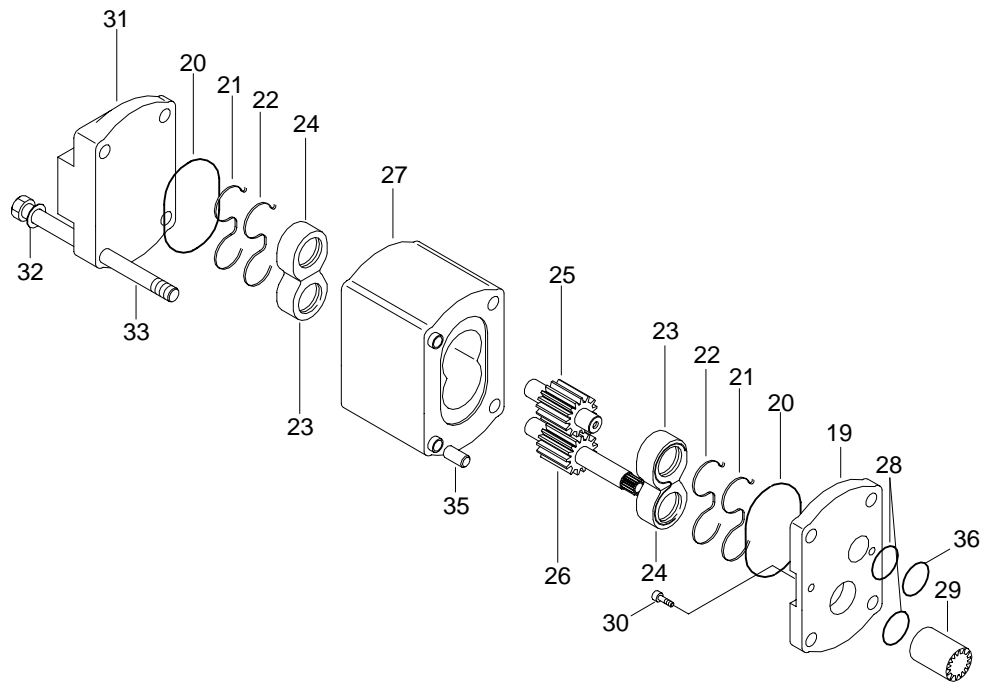
(4) Bushing

- ① The side faces which abut the gears should be perfectly flat showing no sign of scoring. Characteristically there are bright polished areas on this surface caused by loading against the gear side faces, which is often more pronounced on the low pressure side. The bush should be replaced if there is any general scoring or fine scoring with a matt appearance or tearing of the surface material. Often there is a witness where the tips of the opposing gears have wiped an overlap reassembling a half moon shape. There must be no noticeable wear step as it is critical that the bush side face is completely flat to the gear side face.
- ② The bearing liners are acceptable providing that they are not scored or show other damage. The general outside area of the bush should not show any prominent signs of wear.

(5) Gears

- ① The gear side faces should be examined for bruising or scoring. Often operation on contaminated fluid shows scoring between the root of the gear and the journal undercut, which leaves a wear step. If a wear step can be felt, coincidental with the root diameter, by drawing a sharp pointed tool across the surface from the undercut outwards towards the tip of the gear, then the gear is unserviceable.
- ② The gear teeth should then be carefully examined to ensure that there are no signs of bruising or pitting.
- ③ The journal bearing surfaces should be completely free from scoring or bruising. The surface should appear highly polished and smooth to touch.
- ④ Examine the area where the shaft seal lips run on the drive shaft, this shows up as a polished ring or rings. If a noticeable groove can be felt or there is scoring the shaft should be replaced.
- ⑤ Provided the drive shaft is not damaged from the drive-coupling and the gears have not been harmed as described above, then the gears can be re-used. If, however, the gears are damaged they must be replaced as a matched pair.
- ⑥ As a matter of good practice, when pumps have been disassembled, all the seals should be replaced. It is most important that only the genuine seals are used.

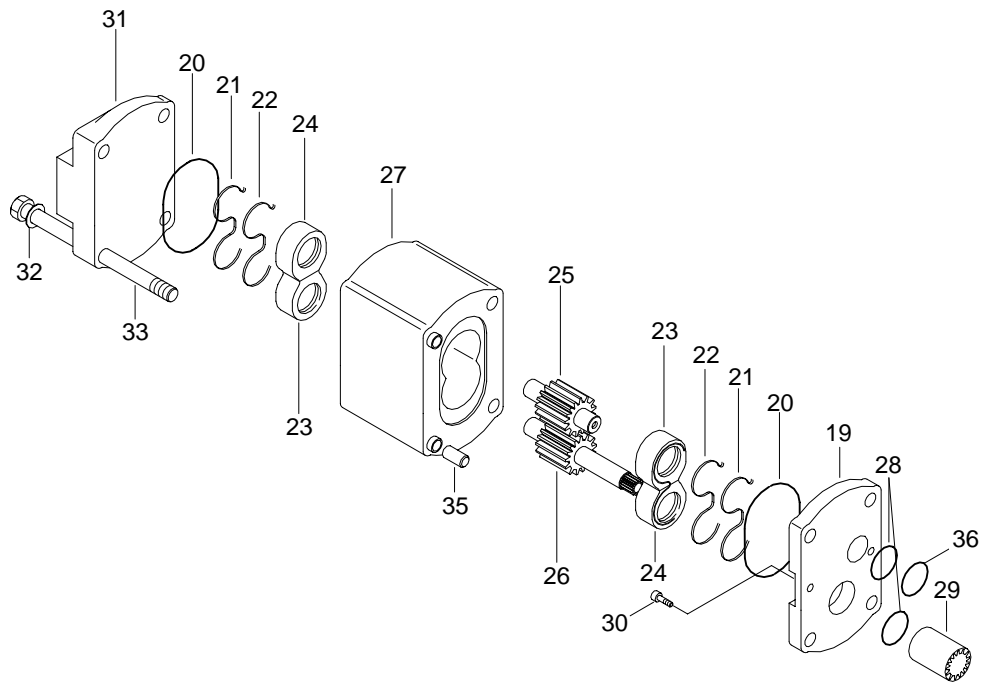
5) ASSEMBLY



※ Ensure that all parts are perfectly clean and lightly lubricate the bushes and gears with hydraulic oil (Ensure body O-ring recess and end faces remain free from oil). This will assist with their assembly when they are later fitted into the body.

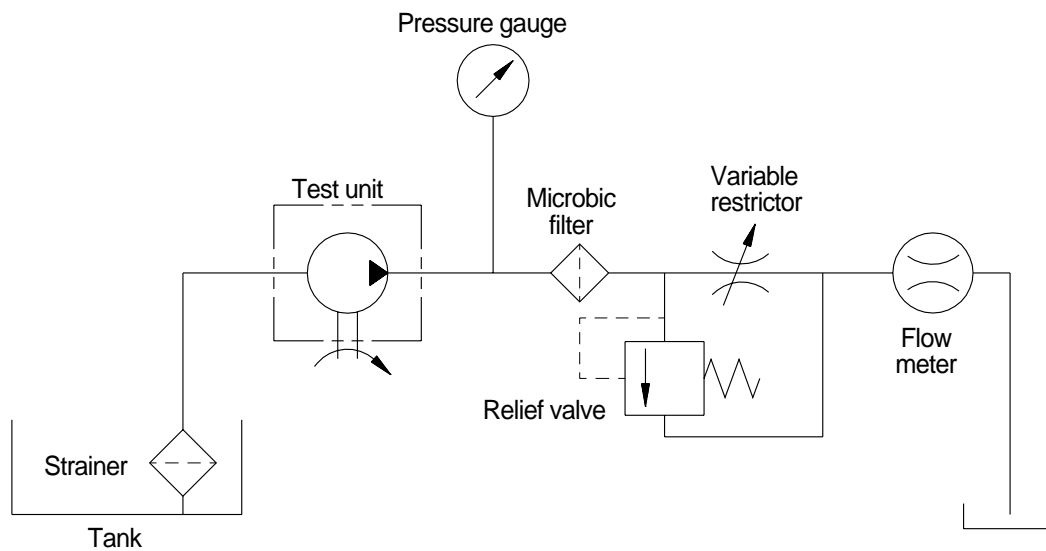
- (1) Refit the cover drive shaft bushing(23) and cover driven bushing(24) into the undowelled end of the body(27) from where they were removed.
- (2) Place the end cover(31) against the body(27) and then stand the assembly on the cover so that the hollow dowels are uppermost, i.e. the bushing should be at the bottom with the bushings against the cover.
- (3) Fit the drive shaft(26) and driven gear(11) back into their original positions in the body(27).
- (4) Refit the separate plate drive shaft bushing(24) and the separate plate driven bushing(23) into their original bores.
- (5) Fit the new body O-ring(20).
- (6) Fit the new seal element(22) and backup seal(21) to the bushing.
- (7) Fit the dowel(35) to the body(27).
- (8) Carefully refit the spacer plate(19) to the body(27). If the spacer plate(19) is not fitted squarely the backup seal(21) may become misplaced and trapped, resulting in internal damage if the unit is run in this condition.

ASSEMBLY



- (9) Fit O-rings(28, 36) and coupling(29) to the spacer plate(19).
 - (10) Holding the whole unit together carefully turn it over, making sure it is supported on the spacer plate(19) not the shaft.
 - (11) Slide off the end over and fit seals as in (5) and (6) above.
 - (12) Fit the end cover(31), taking care not to dislodge the backup seal(21) and bolt(33) the unit together. Tighten the bolts to the torque figures stated below.
 - Tightening torque : $5.0 \pm 0.3 \text{ kgf} \cdot \text{m}$ ($36.2 \pm 2.2 \text{ lbf} \cdot \text{ft}$)
- ※ Pour a small amount of oil into a port and check that the shaft can be rotated without undue force using a smooth jawed hand wrench hooked around the shaft or a suitable half coupling locked against the key.

6) RUNNING-IN



- (1) A unit which has been re-assembled with either new gears, bushes or body, must be carefully run-in before it is subjected to full working conditions.
- (2) Ideally this should be done on a test rig(See figure) where pressure can be gradually applied and any wipings from the body cut-in arrested by filters.
- (3) It is recommended that the unit is run-in at 1500rpm, initially, at zero pressure for one minute then in stages with the pressure increased by 500psi every minute, until maximum rated pressure has been attained. Frequently check the system temperature, ensuring that it does not exceed the maximum permissible figure of 80 °C. If the temperature exceeds the system or unit specification the test must be delayed and operated off-load until acceptable temperatures are obtained.