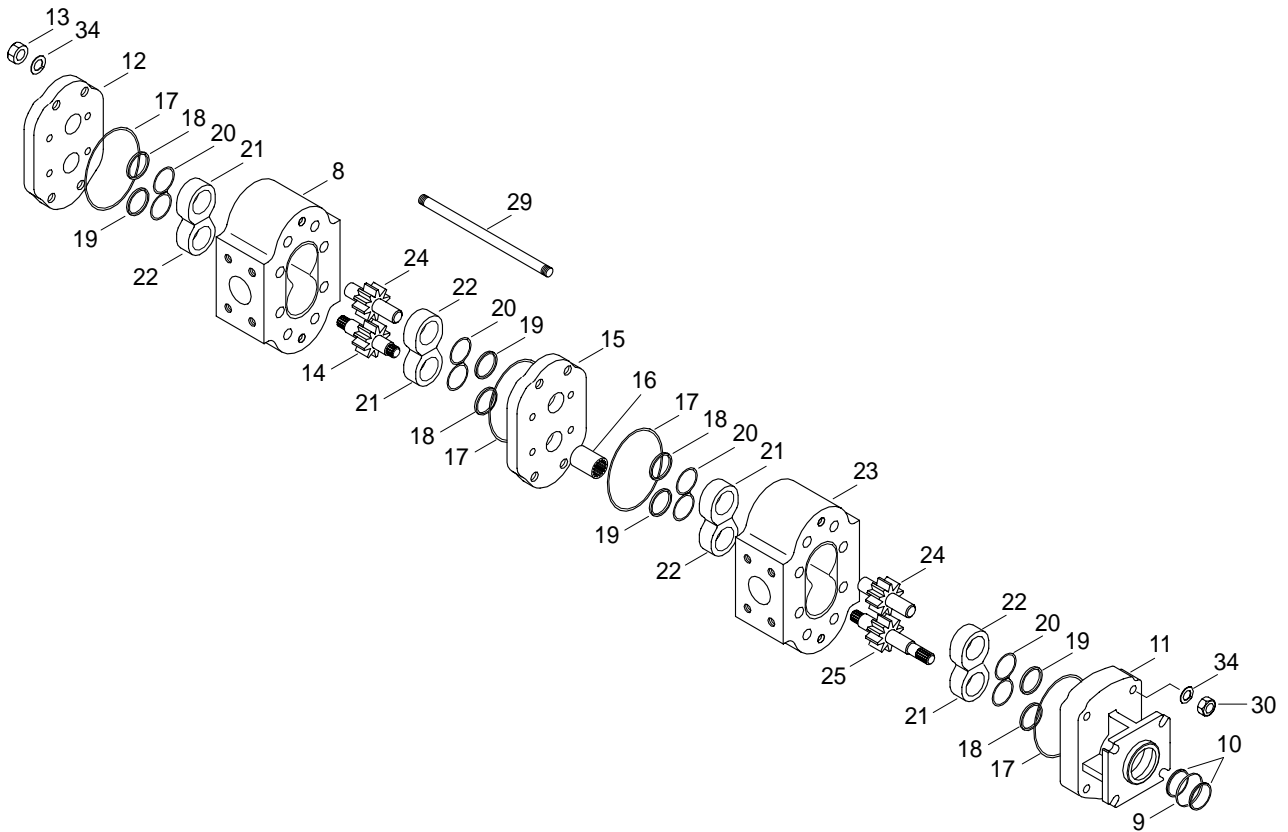


## GROUP 4 DISASSEMBLY AND ASSEMBLY

### 1. MAIN PUMP

#### 1) STRUCTURE



8	Rear body	15	Spacer plate	22	Bushing
9	Circlip	16	Coupling	23	Front body
10	Shaft seal	17	O-ring	24	Idler gear
11	Flange	18	Backing ring	25	Drive gear
12	End cover	19	Backing ring	29	Bolt
13	Fastener	20	Lobe seal	30	Fastener
14	Drive gear	21	Bushing	34	Spring washer

## 2) GENERAL INSTRUCTION

### (1) Cleanliness

① Cleanliness is the primary means of assuring satisfactory hydraulic pump life. Components such as flanges and covers are best cleaned in soap and hot water, then air dried. Gears should be washed in solvent, air dried, and oiled immediately.

**▲ Certain cleaning solvents are flammable. Do not allow sources of ignition in the area when using cleaning solvents.**

② Protect all exposed surfaces and open cavities from damage and foreign material.

※ **Gear journals and gear faces are super finished. Take care not to touch these surfaces after oil and solvent have been removed.**

### (2) Lubrication of moving parts

During assembly, all running surfaces(Bushing and spacer plate) must be lightly lubricated with a clean oil or aerosol lubricant.

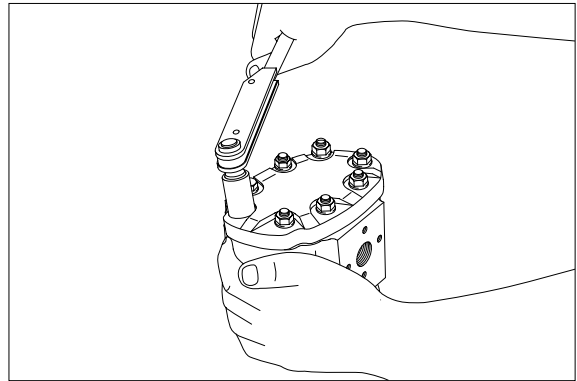
### (3) Tools required for assembly

- ① Torque wrench
- ② Open end wrenches
- ③ Seal installation tools(Inner and outer)
- ④ Shaft bullet(Seal protector)
- ⑤ Installation plate

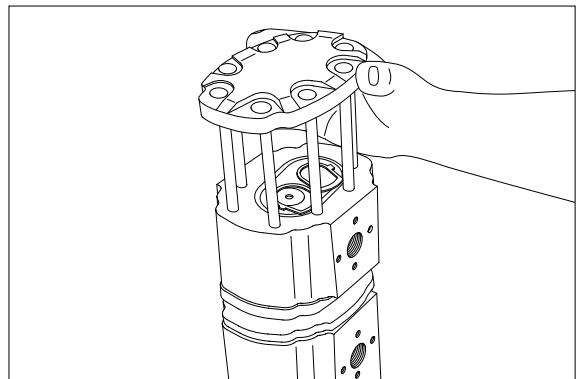
### 3) DISASSEMBLY

- ※ Before disassembling ensure that the unit itself, bench and tools are thoroughly clean.
- ※ Lightly mark the rear cover(12), rear body (8), spacer plate(15), front body(23) and flange(11) to ensure reassembly in the correct position and take note of the direction of rotation.

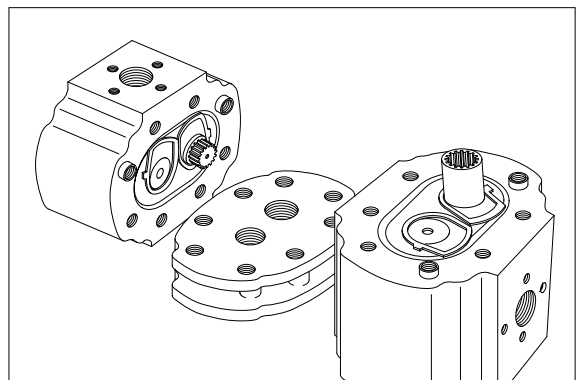
(1) Loosen the fastener(13, 30).



(2) Remove the rear cover(12) and stud bolt (29).



(3) Remove rear body(8) and spacer plate (15).



(4) Remove the body O-ring(17), the backing ring(18, 19) and the bushing lobe seal (20).

※ Before removing the internal components each bushing(21, 22) must be marked to denote its location within the body. On the plain area of the bush away from the seal location, lightly mark:

FD = Flange drive shaft

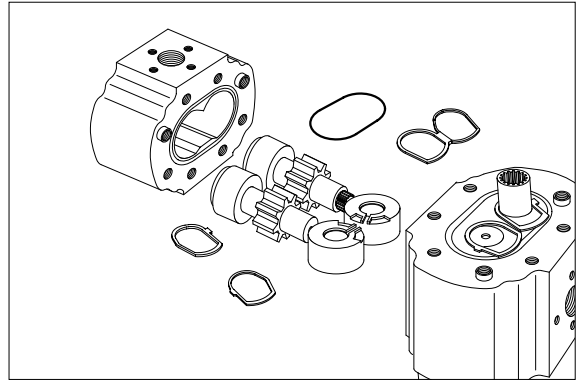
FI = Flange driven(Idler) gear

CD = Cover drive shaft

CI = Cover driven(Idler) gear

(5) With the unit laying on its side grasp hold of the drive shaft(14) and pull it squarely out of the body(8) bringing the bushes(21, 22) with it.

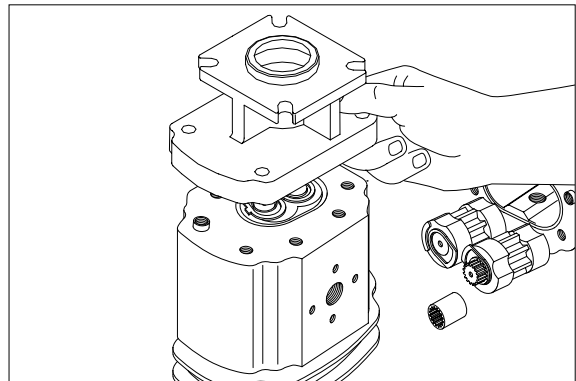
Remove the driven gear(24) and the two remaining bushes.



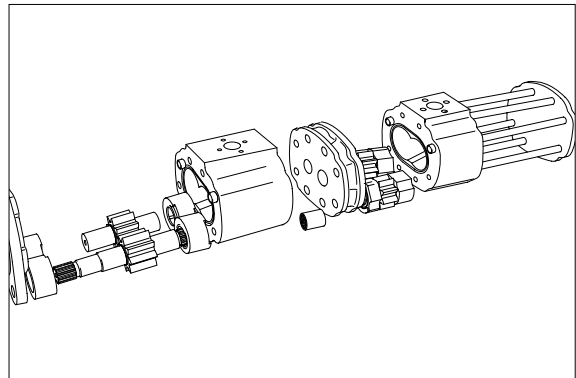
(6) Remove the circlip(9), shaft seals(10) and then remove the flange(11).

※ Be careful not to damage the shaft seal.

※ Inner parts disassembling of front section is same as above (4), (5) and (6) of rear section.



(7) This completes disassembly.



## 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 0.08mm(0.003").
- 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) Mounting flange 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) Bushes

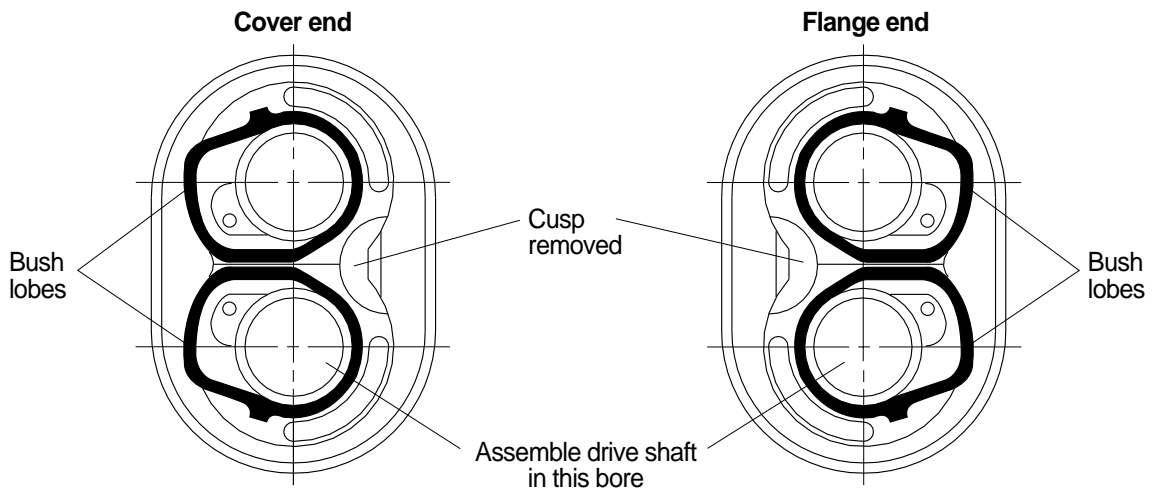
- ① The side faces which abut the gears should be perfectly flat showing no sign of scoring. Characteristically there are bright polished areas on this surface caused by loading against the gear side faces, which is often more pronounced on the low pressure side. The bush should be replaced if there 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

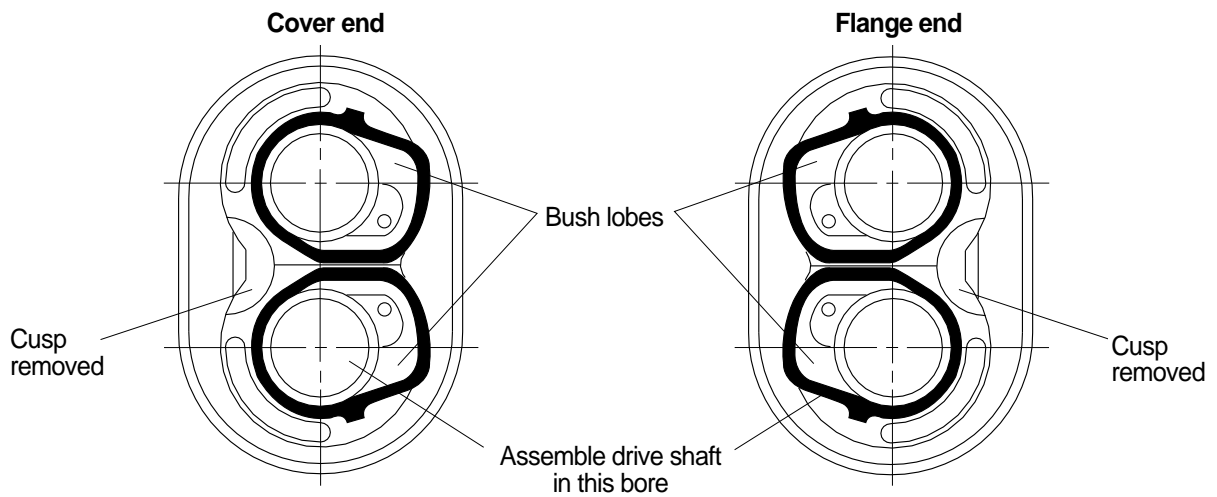
- ① The gear side faces should be examined for bruising or scoring. Often operation on contaminated fluid shows scoring between the root of the gear and the journal undercut, which leaves a wear step. If a wear step can be felt, coincidental with the root diameter, by drawing a sharp pointed tool across 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.

**(6) Arrangement of bushes in body**

**① Clockwise pump**



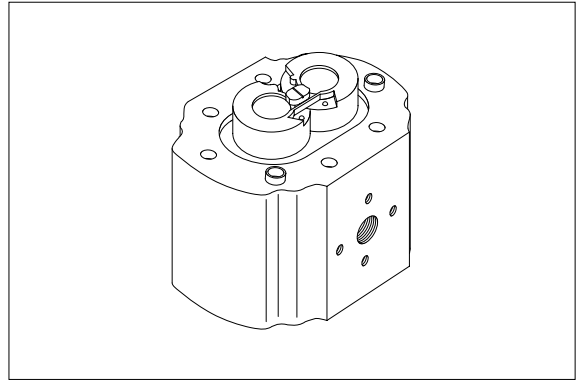
**② Anti-clockwise pump**



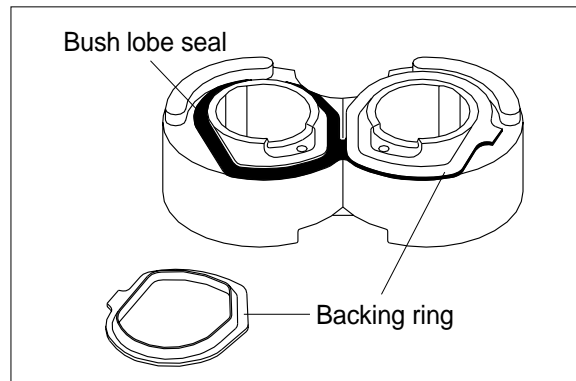
※ In the bushes are always assembled in the body with the C shape mating with the cusp removal flat the body.

## 5) ASSEMBLY

- (1) Refit the cover drive shaft bush CD(22) and cover driven bush CI(21) into the body(8).

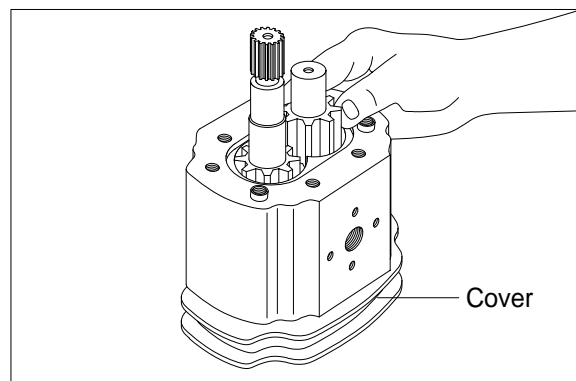


- (2) Fit the new bush lobe seal(20) and backing ring(18, 19) to the bush lobes, and the new O-ring(17).

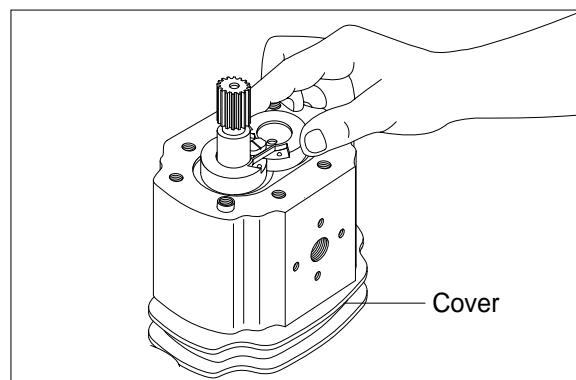


- ※ Place the end cover(12) against the body (8) and then stand the assembly on the cover so that the hollow dowels are uppermost.

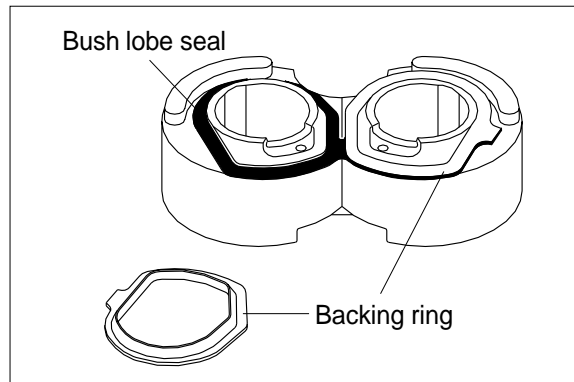
- (3) Fit the drive shaft(14) and driven gear(24) back into their original positions in the body(8).



- (4) Refit the flange drive shaft bush FD(21) and the flange driven bush FI(22) into their original bores.

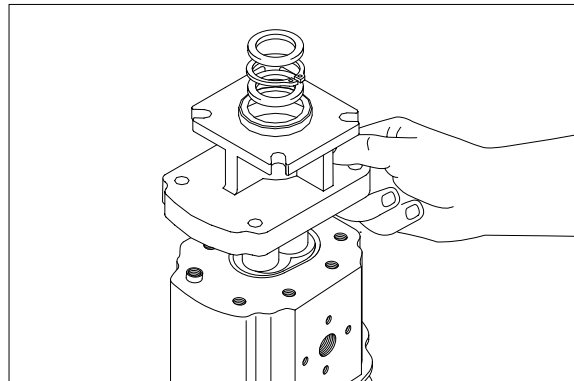


- (5) Fit the new bush lobe seal(20) and backing rings(18, 19) to the bush lobes.  
Fit the new body O-ring(17).
- ※ Inner parts assembling of front section is same as above (1)~(5) of rear section.

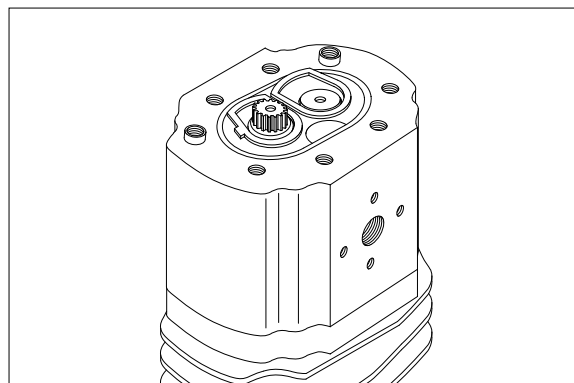


- (6) Fit shaft seal(10) and circlip(9) into the flange(11).
- ※ Pay attention the circlip must be perfectly located in its groove.  
This is important to prevent the risk of shaft seal to be blown out when a pressure acts from inside.
  - ※ Apply a light coating of grease on the internal tips of the shaft seals after fitting.

- (7) Carefully refit the mounting flange(11) to the body(23). If the mounting flange is not fitted squarely the backing rings may become misplaced and trapped, resulting in internal damage if the unit is run in this condition.

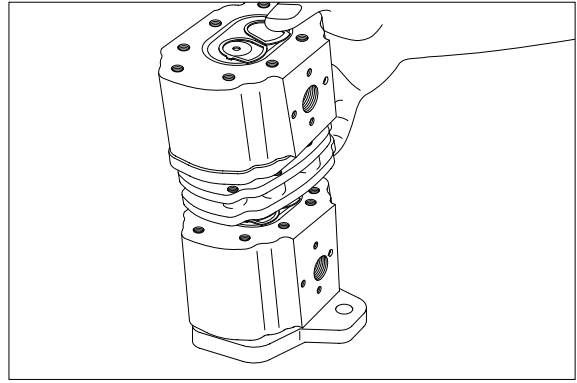


- (8) Holding the whole unit together carefully turn it over, making sure it is supported on the mounting flange not the shaft.

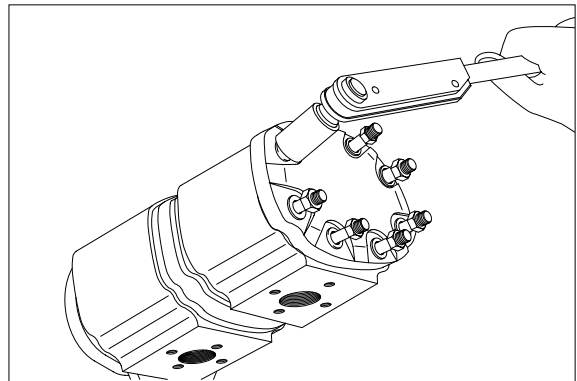




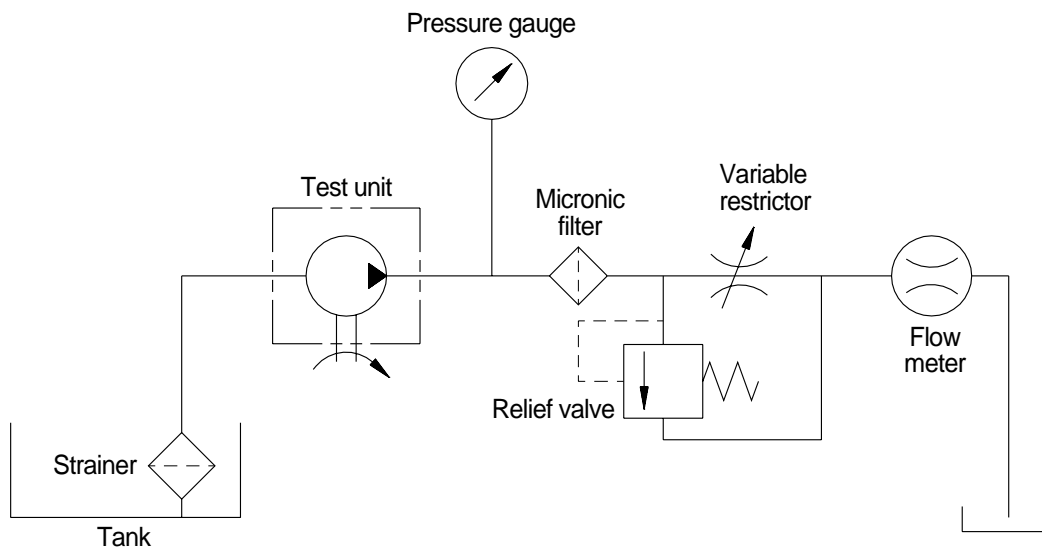
- (9) Fit the spacer plate(15) and rear body(8).  
※ Take care not to misplaced or trapped the seals.



- (10) Fit the end cover(12), taking care not to misplaced or trapped the seals. Tighten the fastener(13, 30).  
· Tightening torque :  $4.8 \pm 0.4 \text{ kg} \cdot \text{m}$   
( $35 \pm 3 \text{ lb} \cdot \text{ft}$ )



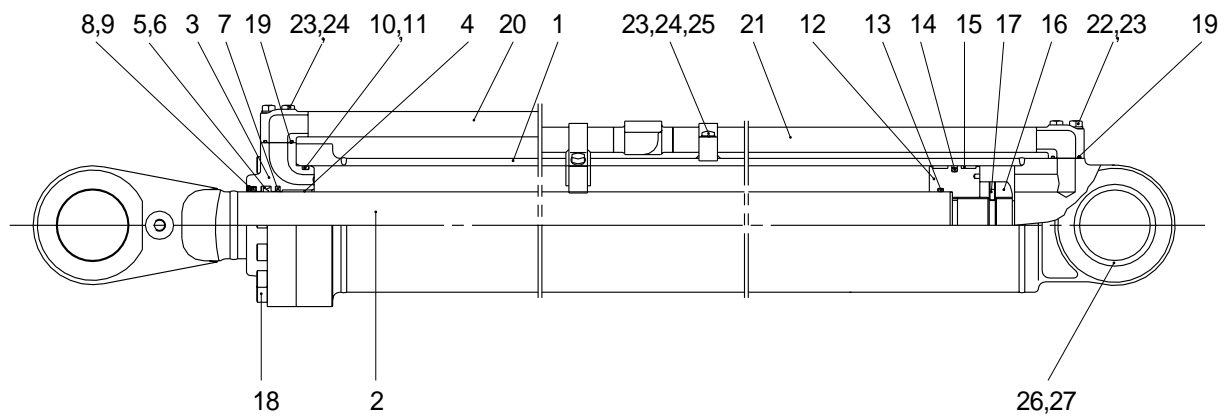
## 6) RUNNING-IN



- (1) A unit which has been reassembled 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.

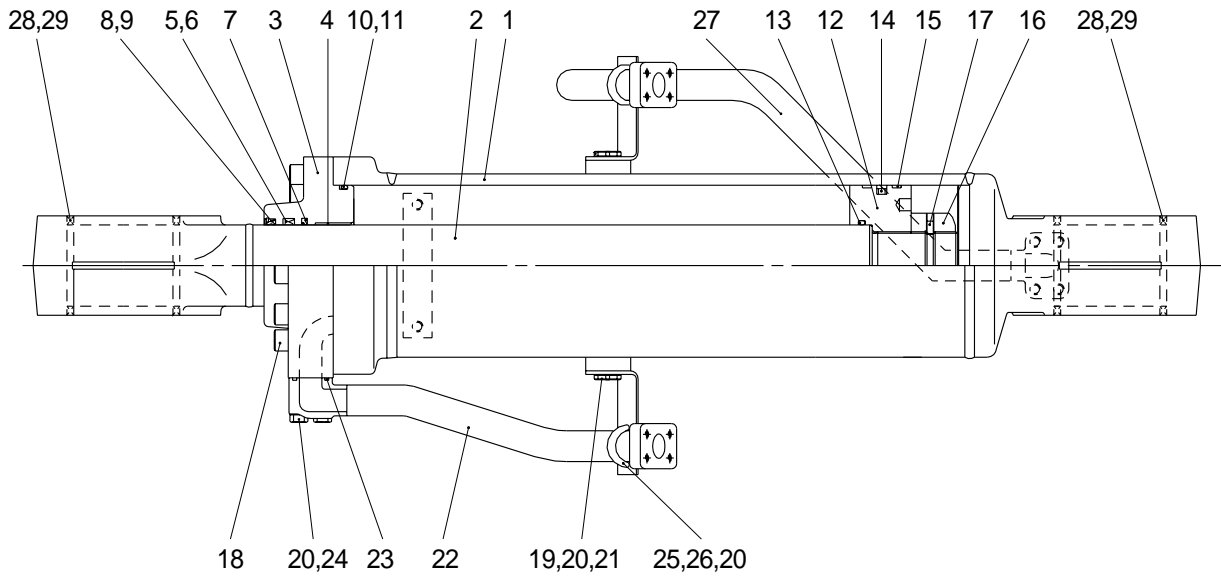
## 2. BOOM AND BUCKET CYLINDER

### 1) BOOM CYLINDER



1	Tube assy	10	O-ring	19	O-ring
2	Rod assy	11	Back up ring	20	Pipe assy
3	Gland	12	Piston	21	Pipe assy
4	Bushing	13	O-ring	22	Bolt
5	Rod seal	14	Piston seal	23	Spring washer
6	Back up ring	15	Wear ring	24	Bolt
7	Buffer ring	16	Piston nut	25	Band
8	Dust wiper	17	Screw	26	Bushing
9	Snap ring	18	Bolt	27	Dust seal

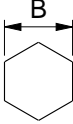
# BUCKET CYLINDER



- |    |              |    |               |    |           |
|----|--------------|----|---------------|----|-----------|
| 1  | Tube assy    | 11 | Back up ring  | 21 | Bolt      |
| 2  | Rod assy     | 12 | Piston        | 22 | Pipe assy |
| 3  | Gland        | 13 | O-ring        | 23 | O-ring    |
| 4  | Bushing      | 14 | Piston seal   | 24 | Bolt      |
| 5  | Rod seal     | 15 | Wear ring     | 25 | U-bolt    |
| 6  | Back up ring | 16 | Piston nut    | 26 | Nut       |
| 7  | Buffer ring  | 17 | Screw         | 27 | Pipe assy |
| 8  | Dust wiper   | 18 | Bolt          | 28 | Bushing   |
| 9  | Snap ring    | 19 | Bracket       | 29 | Dust seal |
| 10 | O-ring       | 20 | Spring washer |    |           |

## 2) TOOLS AND TIGHTENING TORQUE

### (1) Tools

Tool name	Remark	
Allen wrench	8	
	14	
	17	
Spanner	17	
(-) Driver	Small and large sizes	
Torque wrench	Capable of tightening with the specified torques	

### (2) Tightening torque

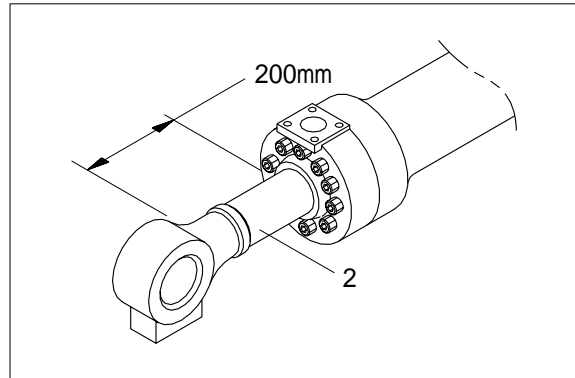
Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Socket head bolt	Bucket cylinder	18	M18 × 2.5 × 65	32 ± 3	231 ± 22
	Boom cylinder	18	M16 × 2.0 × 65	23 ± 2	166 ± 14.5
Set screw	Bucket cylinder	17	M10 × 1.5 × 12	5.4 ± 0.5	39 ± 3.6
	Boom cylinder	17	M10 × 1.5 × 12	5.4 ± 0.5	39 ± 3.6
Piston nut	Bucket cylinder	16	M75 × 3 × 48	150 ± 10	1085 ± 72
	Boom cylinder	16	M75 × 3 × 55	150 ± 10	1085 ± 72
Piston	Bucket cylinder	12	D180 × 65	100 ± 15	723 ± 108
	Boom cylinder	12	D160 × 63	100 ± 15	723 ± 108
Hex head bolt	Bucket cylinder	24	M10 × 1.5 × 60	5.4 ± 0.5	39 ± 3.6
	Boom cylinder	22	M10 × 1.5 × 60	5.4 ± 0.5	39 ± 3.6

### 3) DISASSEMBLY

#### (1) Remove gland and piston rod

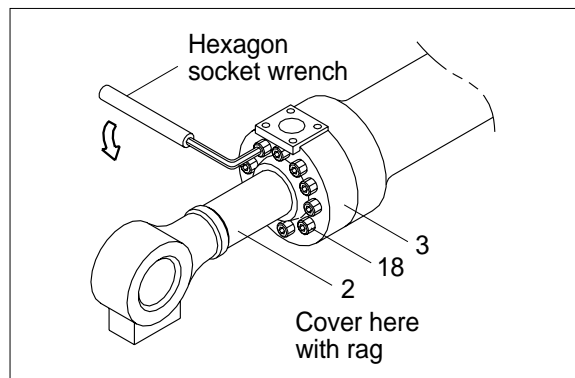
① Hold the clevis section of the tube in a vise. Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

② Pull out piston rod(2) about 200mm (7.8 in). Because the piston rod is rather heavy, finish extending it with air pressure after the oil draining operation.



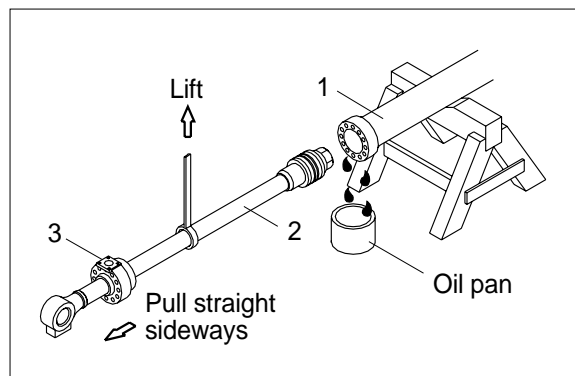
③ Loosen and remove socket bolts(18) of the gland(3) in sequence.

\* Cover the extracted piston rod(2) with rag to prevent it from being accidentally damaged during operation.



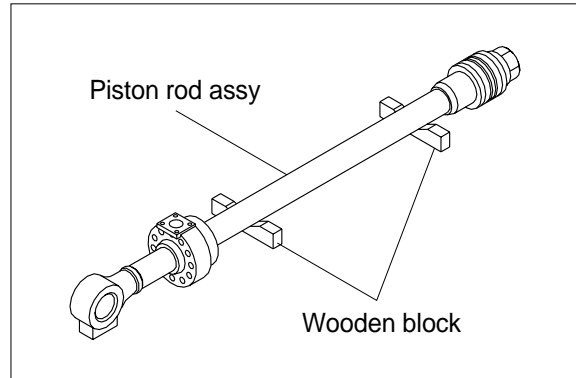
④ Draw out gland(3) and piston rod (2) assembly together from cylinder tube(1).

\* Since the piston rod assembly is heavy in this case, lift the tip of the piston rod(2) with a crane or some means and draw it out. However, when piston rod(2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



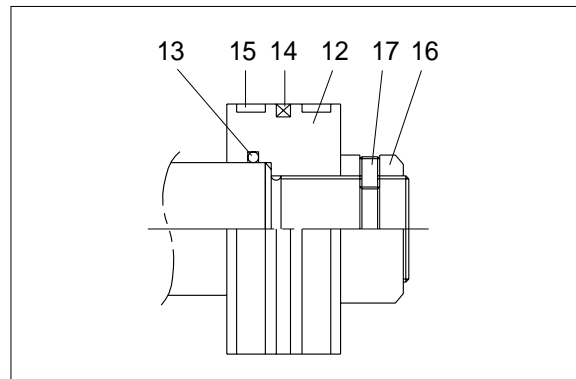
※ Note that the plated surface of piston rod(2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

- ⑤ Place the removed piston rod assembly on a wooden V-block that is set level.
- ※ Cover a V-block with soft rag.

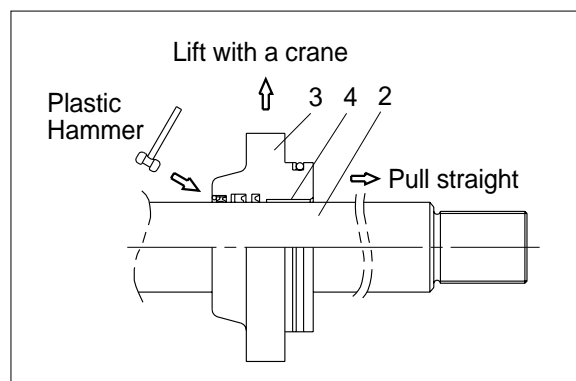


**(2) Remove piston and gland assembly**

- ① Loosen the screw(17) and remove the piston nut(16).
- ② Remove piston assembly(12) and O-ring (13).

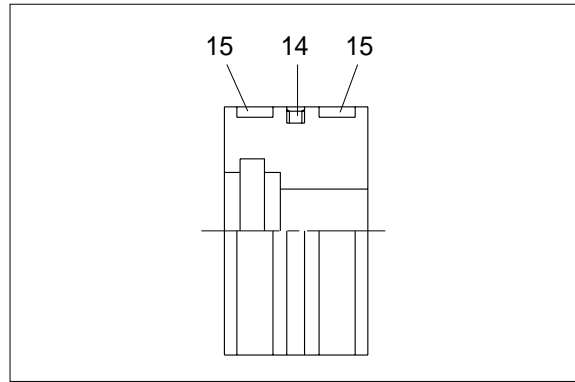


- ③ Remove the gland assembly from piston rod(2).
  - ※ If is too heavy to move, move it by striking the flanged part of gland(3) with a plastic hammer.
  - ※ Pull it straight with gland assembly lifted with a crane.
- Exercise care so as not to damage the lip of rod bushing(4) and packing(5, 6, 7, 8, 9) by the threads of piston rod(2).



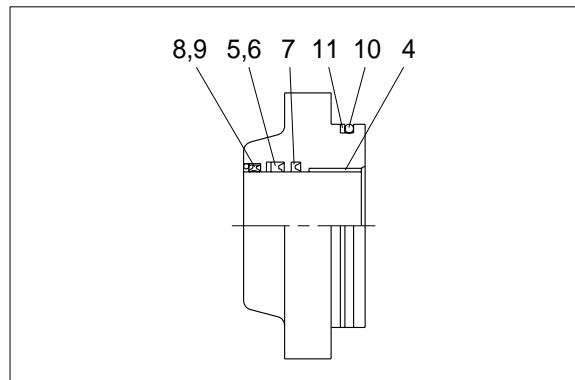
### (3) Disassemble the piston assembly

- ① Remove wear rings(15) and piston seal (14).
- ※ Exercise care in this operation not to damage the grooves.



### (4) Disassemble gland assembly

- ① Remove back up ring(11), and O-ring (10).
  - ② Remove snap ring(9) and dust wiper(8).
  - ③ Remove back up ring(6), rod seal(5) and buffer ring(7).
- ※ Exercise care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.



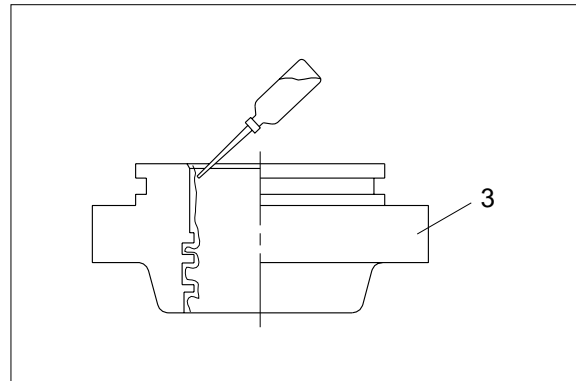


#### 4) ASSEMBLY

##### (1) Assemble gland assembly

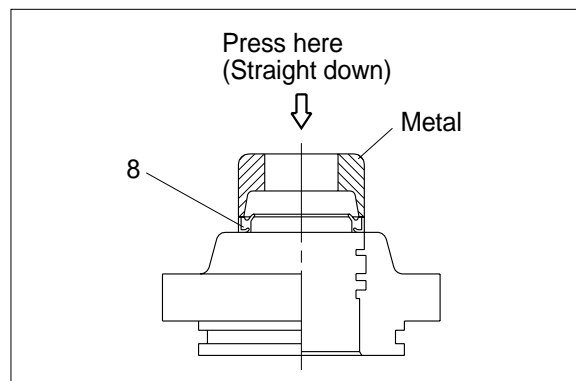
※ Check for scratches or rough surfaces if found smooth with an oil stone.

- ① Coat the inner face of gland(3) with hydraulic oil.



- ② Coat dust wiper(8) with grease and fit dust wiper(8) to the bottom of the hole of dust wiper.

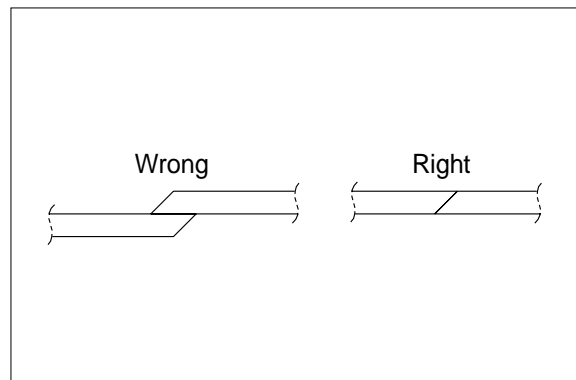
- ③ At this time, press a pad metal to the metal ring of dust seal.  
Fit snap ring(9) to the stop face.



- ④ Fit back up ring(6), rod seal(5) and buffer ring(7) to corresponding grooves, in that order.

※ Coat each packing with hydraulic oil before fitting it.

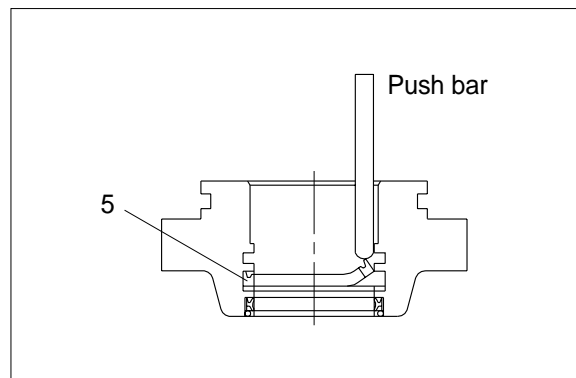
※ Insert the backup ring until outside of it is inserted into groove.



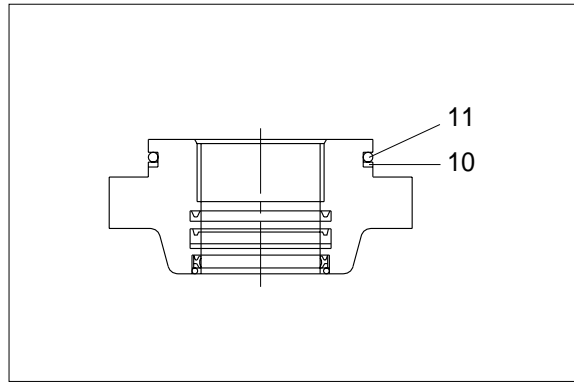
※ Rod seal(5) has its own fitting direction.

Therefore, confirm it before fitting them.

※ Fitting rod seal(5) up side down may damage its lip. Therefore check the correct direction that is shown in fig.

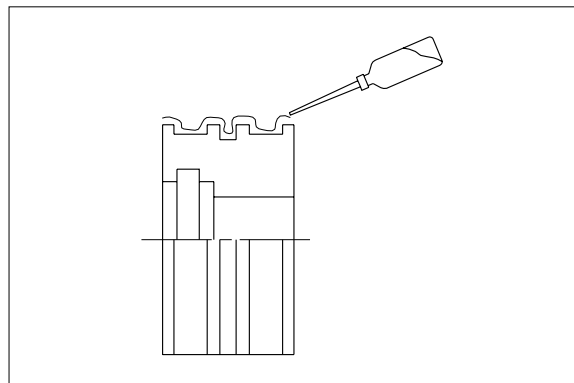


- ⑤ Fit back up ring(11) to gland(3).
- ※ Put the backup ring in the warm water of 30~50°C.
- ⑥ Fit O-ring(9) to gland(3).

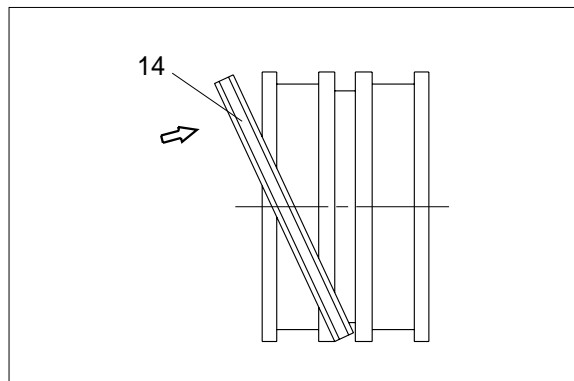


**(2) Assemble piston assembly**

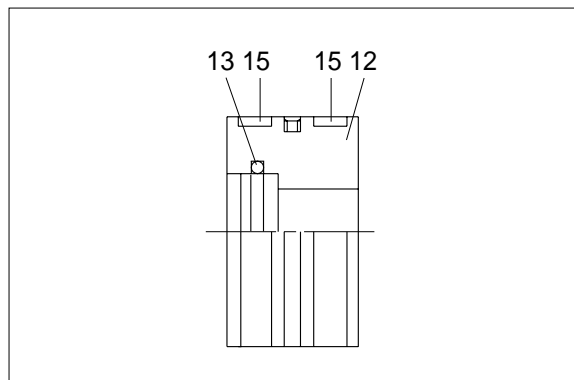
- ※ Check for scratches or rough surfaces if found smooth with an oil stone.
- ① Coat the outer face of piston(12) with hydraulic oil.



- ② Fit piston seal(14) to piston
- ※ Put the piston seal in the warm water of 60~100°C for more than 5 minutes.
- ※ After assembling the piston seal, press its outer diameter to fit in.

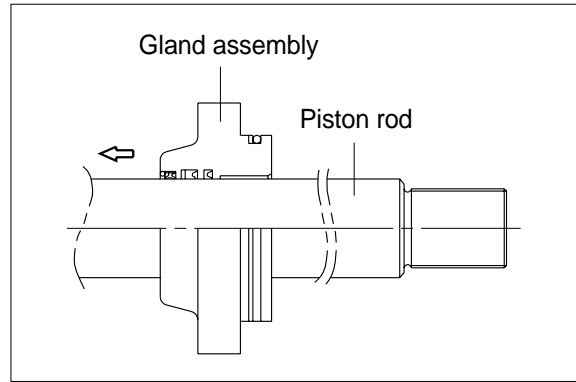


- ③ Fit wear rings(15) to piston(12).
- ④ Fit O-ring(13) to piston(12).



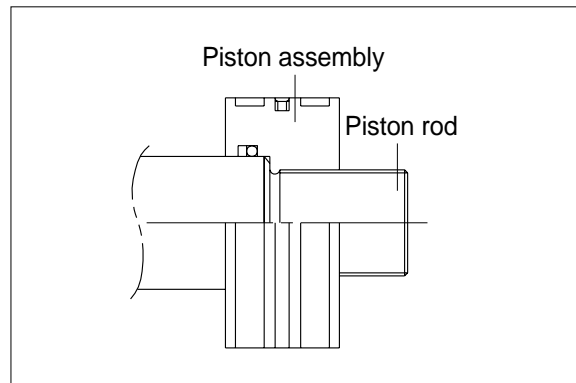
**(3) Install piston and gland assembly**

- ① Fix the piston rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of piston rod(2), the inner surface of piston and gland.
- ③ Insert gland assembly to piston rod(2).



④ Fit piston assembly to piston rod.

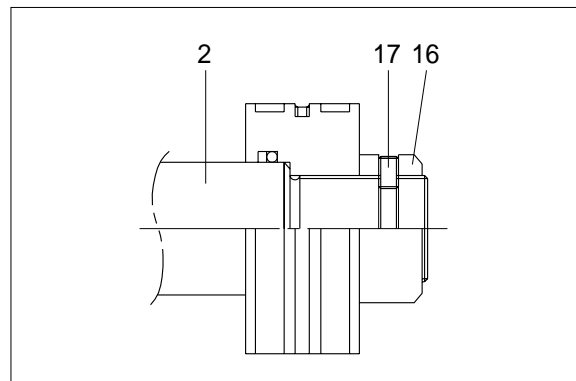
- Tightening torque :  $100 \pm 10 \text{kgf} \cdot \text{m}$   
 $(723 \pm 72 \text{lb} \cdot \text{ft})$



⑤ Tighten piston nut(16) and screw(17) to piston rod(2)

- Tightening torque

Item	kgf · m	lbf · ft
16	$150 \pm 10$	$1085 \pm 72$
17	$5.4 \pm 0.5$	$39 \pm 3.6$



#### (4) Overall assemble

- ① Place a V-block on a rigid work bench.  
Mount the cylinder tube assembly(1) on it and fix the assembly by passing a bar through the clevis hole to lock the assembly.
- ② Insert the piston rod assembly in to the cylinder tube assembly, while lifting and moving the piston rod assembly with a crane.
  - ※ Be careful not to damage piston seal by thread of cylinder tube.
- ③ Match the bolts holes in the cylinder head flange to the tapped holes in the cylinder tube assembly and tighten socket bolts to a specified torque.
  - ※ Refer to the table of tightening torque.

