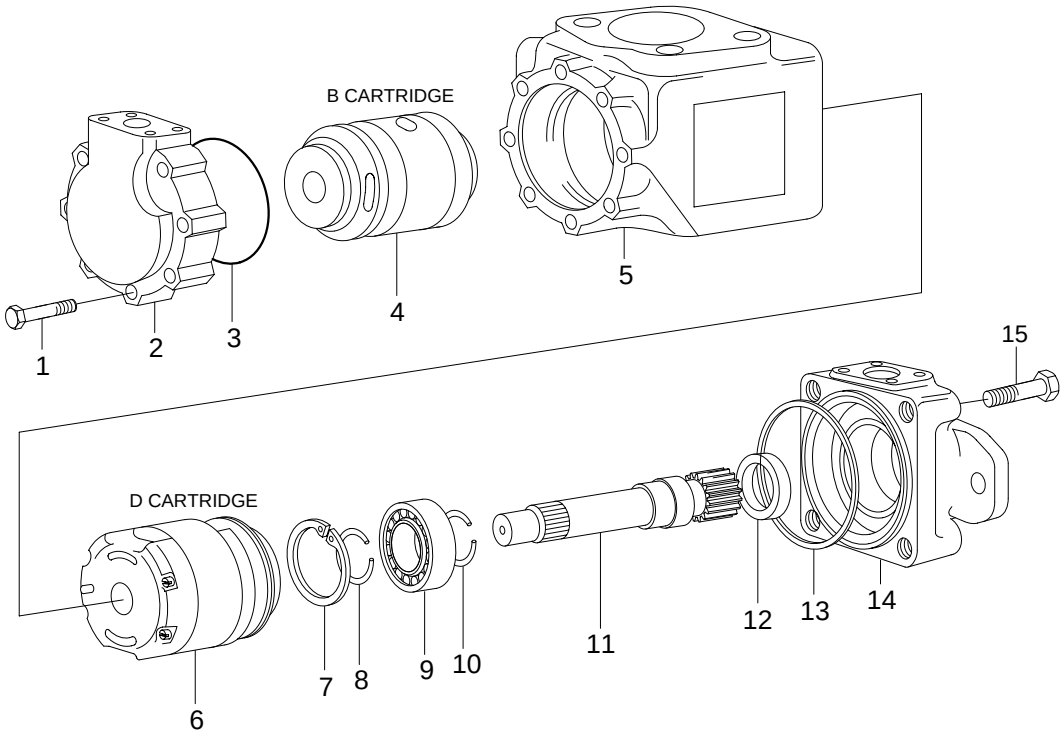
GROUP 4 DISASSEMBLY AND ASSEMBLY

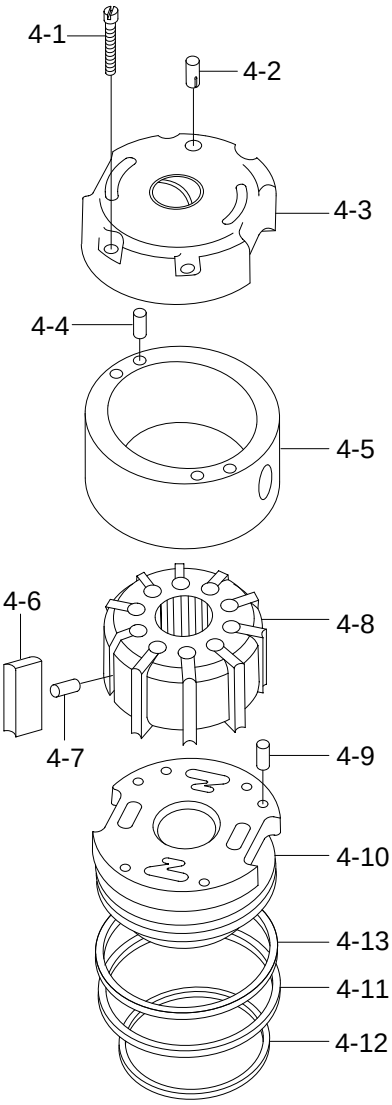
1. MAIN PUMP

1) STRUCTURE(1/2)

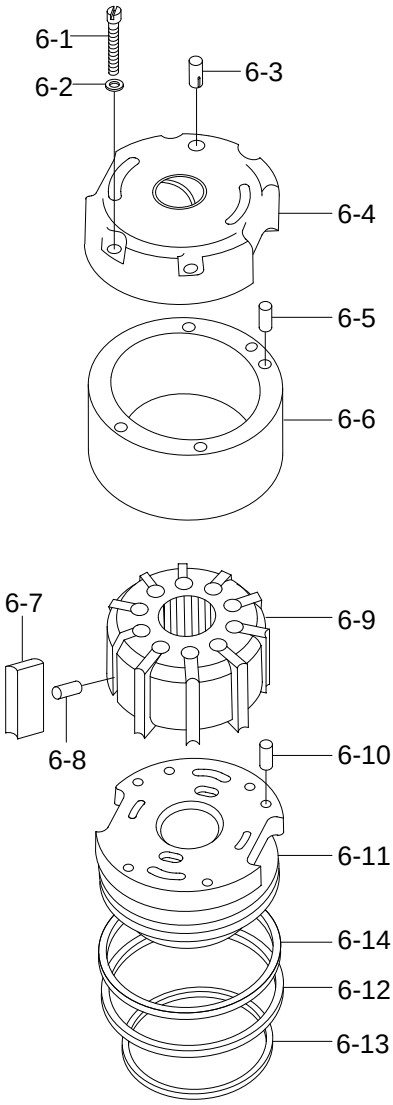


1	Cap screw	9	Ball bearing
2	End cap	10	External snap ring
3	Seal	11	Splined shaft
4	Cartridge B assy	12	Shaft seal
5	Center housing	13	Seal
6	Cartridge D assy	14	Mounting cap
7	Internal snap ring	15	Cap screw
8	External snap ring		

STRUCTURE(2/2)



B CARTRIDGE



D CARTRIDGE

4	Cartridge assy	4-10	Pressure plate	6-6	Cam ring
4-1	Screw	4-11	Seal	6-7	Vane
4-2	Lock pin	4-12	Seal	6-8	Vane holdout pin
4-3	Port plate	4-13	Back up ring	6-9	Rotor assy
4-4	Dowel pin	6	Cartridge assy	6-10	Dowel pin
4-5	Cam ring	6-1	Screw	6-11	Pressure plate
4-6	Vane	6-2	Lock washer	6-12	Seal
4-7	Vane holdout pin	6-3	Lock pin	6-13	Seal
4-8	Rotor assy	6-4	Port plate	6-14	Back up ring
4-9	Dowel pin	6-5	Dowel pin		

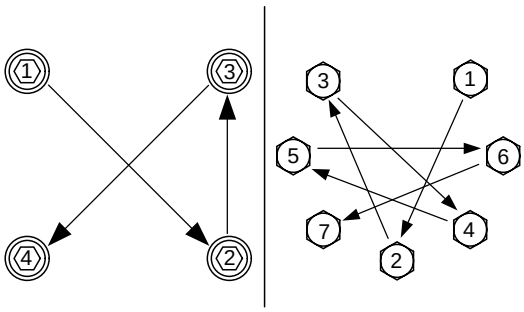
2) GENERAL INSTRUCTION

(1) Preliminary

※ Any servicing work done on main pump is to be done in a clean environment to prevent potential contamination by foreign particles.

※ Appropriate tools and equipment are required in order to insure proper disassembly and reassembly in suitable conditions. In case of repetitive service, a specific working bench is recommended.

※ To prevent oil leakage and body tilting during assembly, housing bolts are to be tightened as per the following pattern !



(2) Parts

※ Parts must be kept clean at all time. If cleaning is needed, solvent is to be used. It is needed to check and oil the inner parts before assembly.

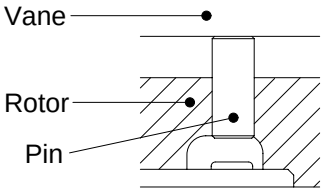
※ In case of replacement of parts with mulitiple numbers, such as vanes and holdout pins, all the parts are to be changed.

① **Vanes**

The faces and edges should be free of scratch from contamination. Vanes should move smoothly in the rotor slots, without excessive clearance. Edges may be stoned with a fine India stone to remove burrs.

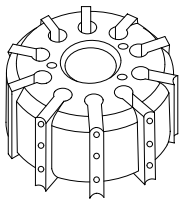
② **Vane holdout pins :**

Holdout pins should have no matting marks.



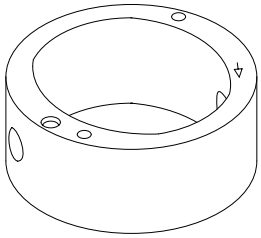
③ **Rotor :**

Side surfaces and vane slots should be free of scratches. Side feeds, vane slots and holdout pin orifices should be free of any contamination. Serration(driving splines) should not be deformed by the shaft.



④ **Camring :**

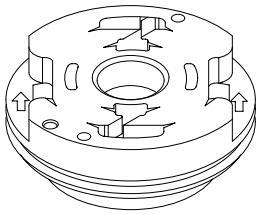
No scratches or vane shock marks(waves) should be seen. Visual axial waves on new camring are from grinding process and therefore normal.



⑤ **Port plates :**

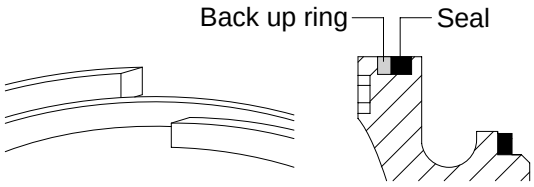
Faces should not be scratched. No cavitation/aeration/fretting corrosion marks should be seen. When there, the bronze bushing should be clean, with no abnormal wear sign.

※ Bi-directional cartridges use same port plates for CW and CCW rotation. **Unit-directional** cartridges require different port plates.



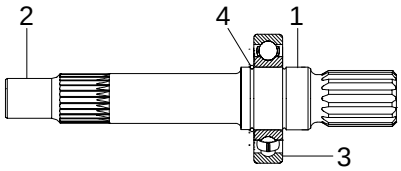
⑥ **Seals :**

- All oil seals must be cleaned, with no wear or cutting mark. When servicing a pump from field operation, it is highly recommended to change all seals. All seals are to be greased lightly before assembly.
- Use seal driver tool to install shaft seal, and protective cone to install shaft assembly.
- Backup rings(1) on pressure plates are to be replaced, anytime a cartridge is taken out of a pump. Backup rings are to be installed as follow, behind the square seal :



⑦ **Shaft :**

- Key-way should be clean and not worn on the sides by excessive torque. No fretting corrosion due to poor coupling should be visible. On spline shaft, splines should not be deformed.
- No axial scratch should be on the sealing area(1). The shaft seal lip contact line may be visible, but should not be a groove. Bronze-bushing contact area(2) should be clean and cylindrical, without scratch marks.



· Ball bearing(3) should turn freely and snap ring(4) should be in place. Some shaft assemblies have 2 snap rings, before and after the ball bearing.

※ **Never insert a snap ring from shaft seal side, to avoid scratching the sealing surface.**

※ Use protective cone to install shaft assembly. If not available, make sure not to damaged the shaft seal lips.

(3) Pre start check and priming.

① Before operating the pump again, the following points are to be checked :

· Pump rotation is as per electric motor or engine.
· All fittings are properly connected and tight. No oil-leak and/or air intake being allowed.
· If any, valve on suction line is to be fully opened.

② When electric motor or engine is started up, the pump should prime immediately. However, depending on installation and amount of air in the discharge lines, priming may take a few seconds.

③ In case priming does not occur within 15 seconds, equipment should be switched off at once.

· Then :
· Manually fill the pump housing with fluid.
· Bleed off air that may be trapped in the pump.
· Check air bleed-off valves.

3) DISASSEMBLY

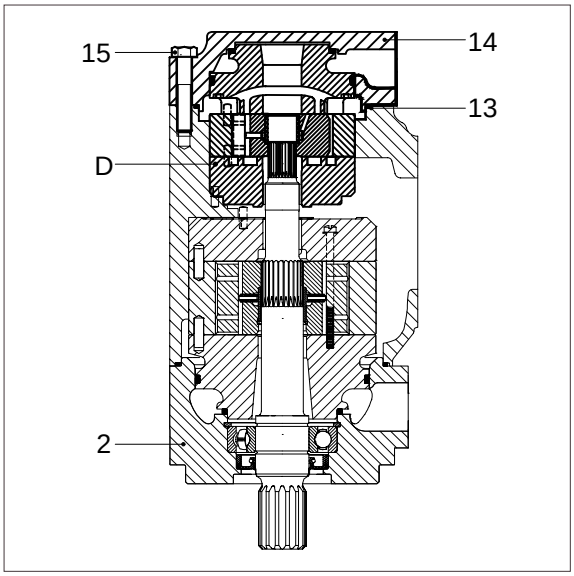
(1) Pump

① Securely hold the pump in a vise or similar equipment, at front cap(2) level.

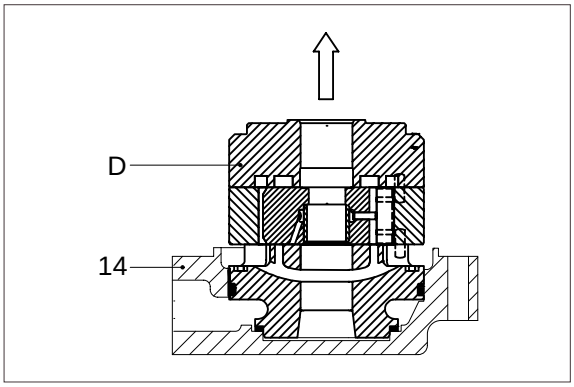
② Unscrew the endcap bolts(15).

③ Note the porting then remove end cap (14) and cartridge D together.

④ Remove seal(13).



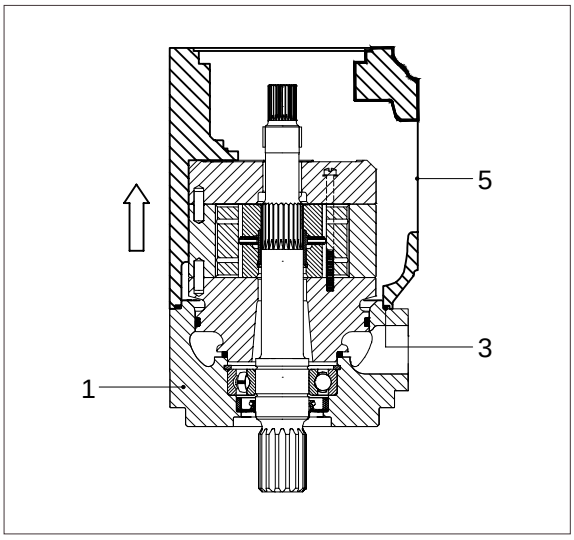
⑤ Extract D cartridge from end cap(14) by using a gear puller or by prying upward. Care must be taken not to damage the parts.



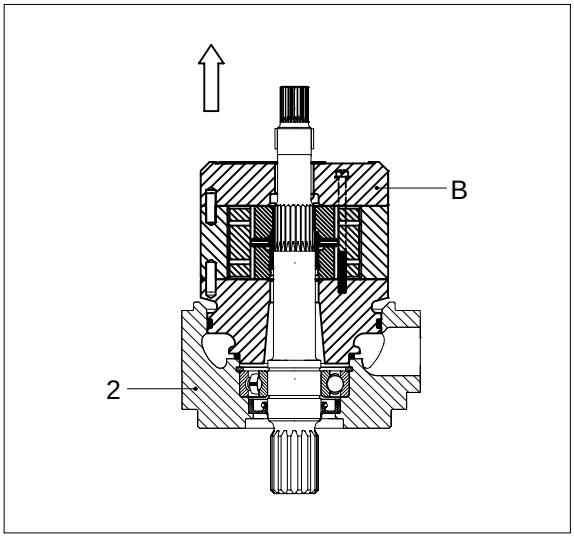
⑥ Unscrew the 7 bolts(1).

⑦ Note the porting then remove central housing(5).

⑧ Remove seal(3).



⑨ Extract B cartridge from front cap(2) by using a gear puller or by prying upward. Care must be taken not to damage the parts.



(2) Camring replacement, cartridge change of rotation

· Camring change

① Unscrew the 2 bolts(4-1) holding the cartridge together.

② Remove rear plate(4-3), save dowel pin(4-4).

③ Take out camring(4-5) carefully, save dowel pin(4-9). Leave rotor and vane in place.

④ Install dowel pin(4-9) in pressure plate(4-10) orifice.

※ Rotation should match the arrow in the port cutout(a) closest to the dowel pin.

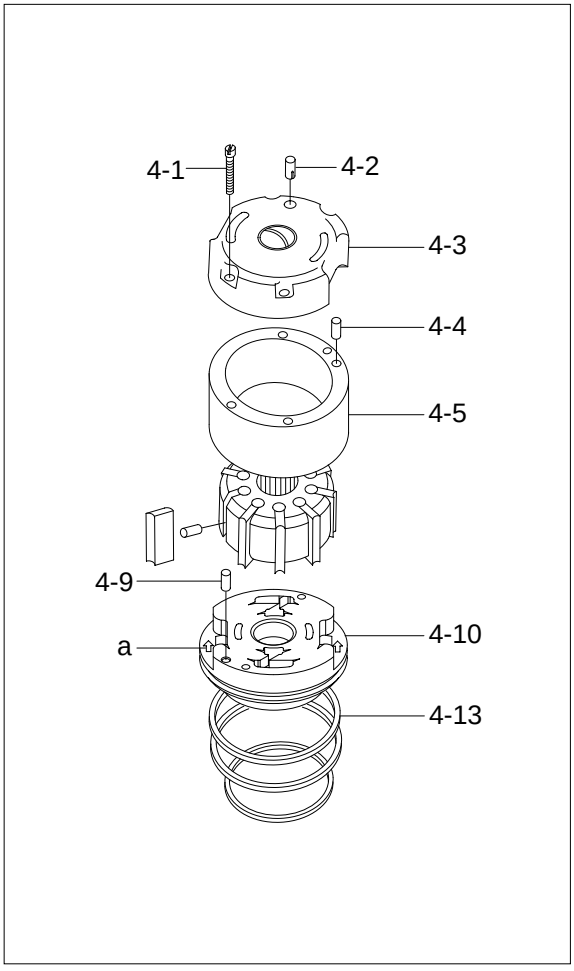
⑤ Install new camring.

※ Arrow on the camring size should be as per required rotation.

⑥ Install dowel pin(4-4) on camring.

⑦ Install back rear plate(4-3), then tighten the bolts(4-1). Make sure dowel pin(4-2) is in place.

⑧ Replace back up ring(4-13). Change other seals if damaged.



Change rotation

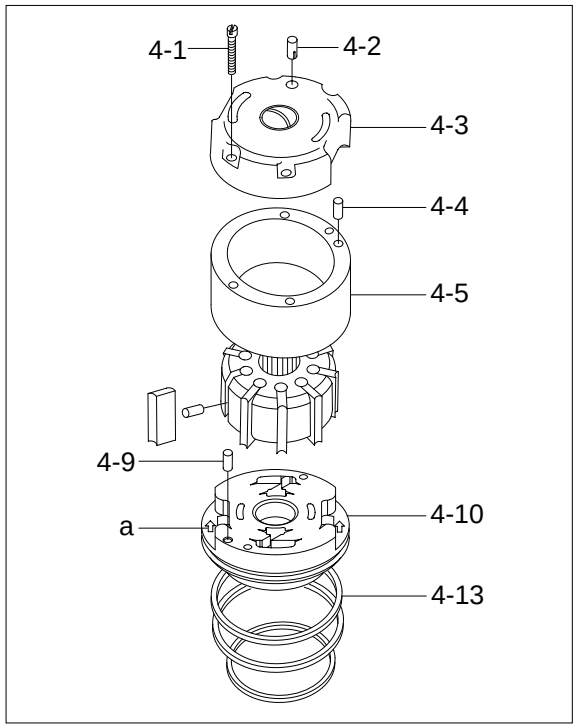
① Proceed as per above for disassembly.

② Save camring(4-5), remove rotor+vanes+pins.

※ Change of rotation requires exchange of port plates.

③ Install carefully rotor+vanes+pins on new pressure plate(4-10).

④ Flip camring from previous position. Then proceed reassembly as per above, with new rear plate(4-3).

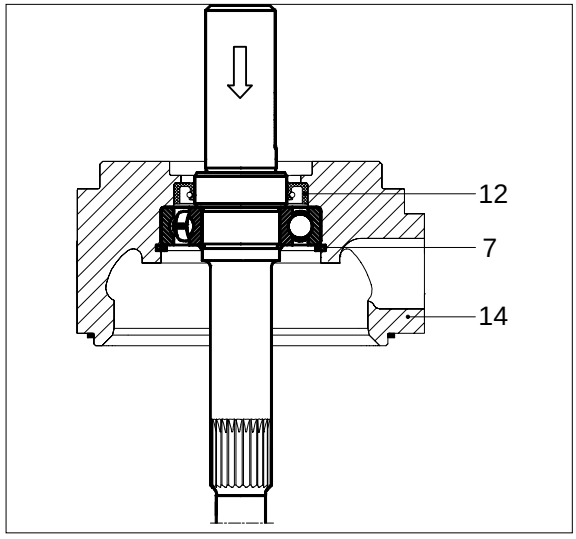


(3) Shaft

① Remove circlip(7) from front cap(14).

② Gently tap the shaft end with a plastic tipped hammer to extract the shaft assembly.

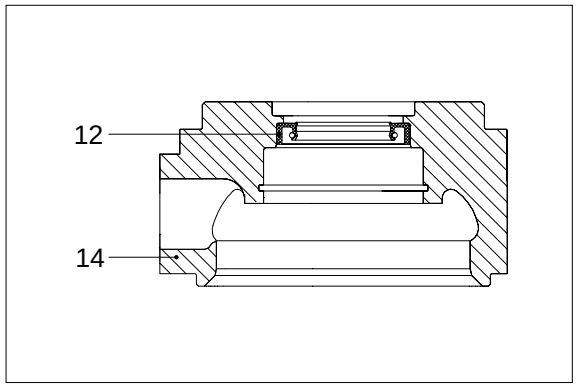
※ Unless pump is new, when changing the shaft assembly always install a new shaft seal(12).



(4) Shaft seal

① Remove shaft seal(12) from front cap(14).

※ Removed shaft seal should not be reused.
It must be disposed of as per local environ-mental regulation.



4) ASSEMBLY

(1) Shaft seal

(2) Shaft

(3) Pump

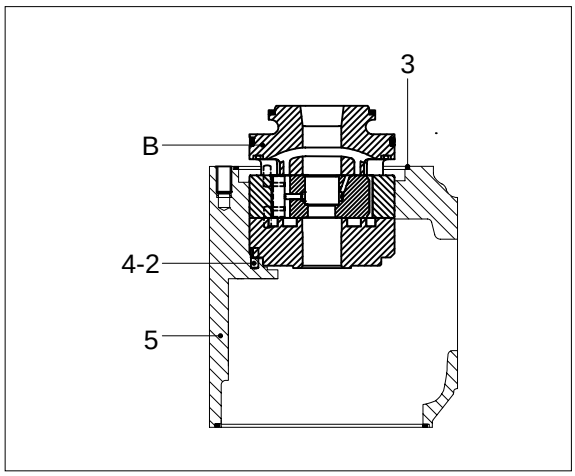
① Securely hold the pump in a vise or similar equipment, at central housing(5) level(light grip).

② Insert **B** cartridge carefully.

※ If not new, seals and back up ring are to be replaced.

※ Make sure the dowel pin(4-2) is properly inserted in the corresponding hole in the central housing (5).

③ Install new seal(3) in central housing(5).



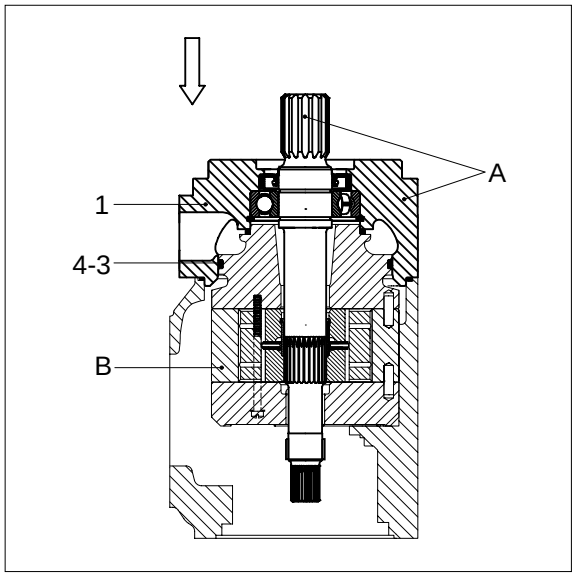
④ Insert front cap+shaft assembly(A) carefully. Shaft should go through **B** cartridge smoothly.

※ When inserting **B** cartridge in front cap, make sure the white Teflon back-up ring (4-13) is not damaged and securely in place.

⑤ Use the bolts(1) to insure the front cap goes down straight and does not tilt.

⑥ Tighten bolts(1) to the indicated torque.

· Tightening torque : 19.4kgf · m(140lbf · ft)



⑦ Return the pump then securely hold it again in the vise at front cap level.

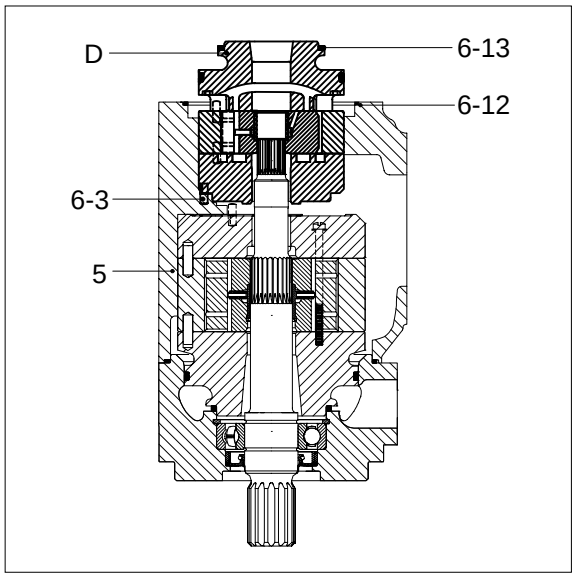
⑧ Insert **D** cartridge carefully.

※ If not new, seals and back up ring are to be replaced.

※ Make sure the dowel pin(6-3) is properly inserted in the corresponding hole in the central housing(5).

⑨ Make sure seal(6-13) is on **B** cartridge.

⑩ Install seal(6-12) in central housing(5).



⑪ Insert end cap(14) carefully on **D** cartridge.

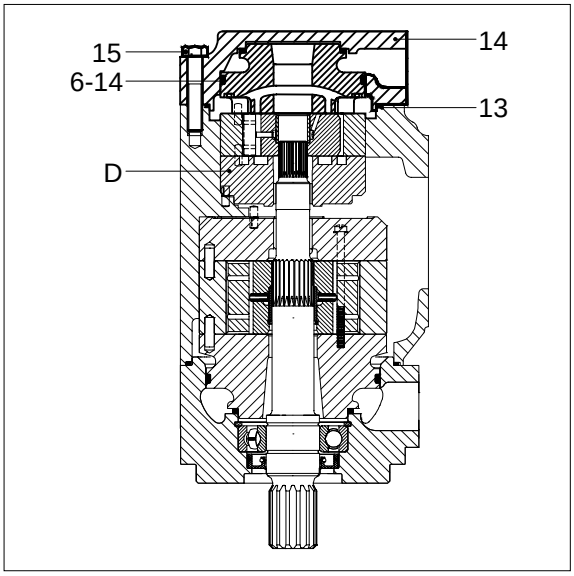
※ When inserting **D** cartridge in end cap, make sure the white Teflon backup ring(6-14) is not damaged and securely in place.

⑫ Use the bolts(15) to insure the end cap goes down straight and does not tilt.

⑬ Tighten to bolts(15) to the indicated torque.

· Tightening torque : 19.4kgf · m(140lbf · ft)

※ **Final check** : shaft must rotate when turn by hand.



(2) Shaft

① Install the protective cone(A) on the shaft end (11). Grease the protective cone external surface.

② Apply small amount of grease on the shaft seal lip.

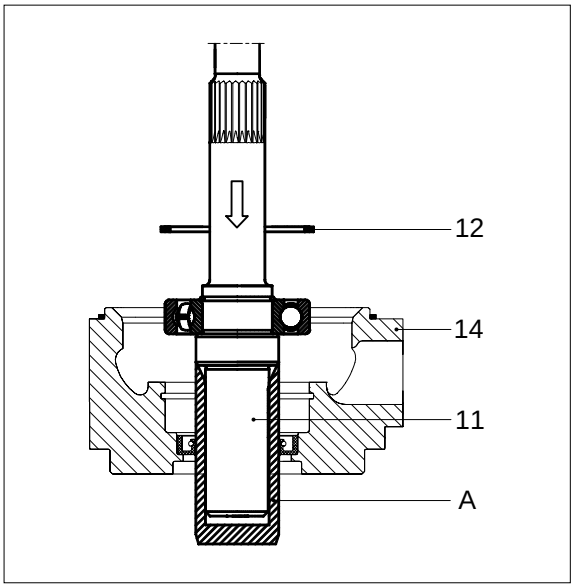
③ Insert very carefully the shaft assembly with protective cone in the front cap(14).

※ Do not damage the seal lips(12).

④ Complete insertion using a constant press load on the bearing outer ring.

※ Do not use hammer.

⑤ Install circlip(7) in front cap(14).



(3) Shaft seal

① Install very carefully the shaft seal(12) on the seal driver(B).

※ Grease the seal driver seal lips(12)

※ damage.

② Make sure seal is mounted as per above.

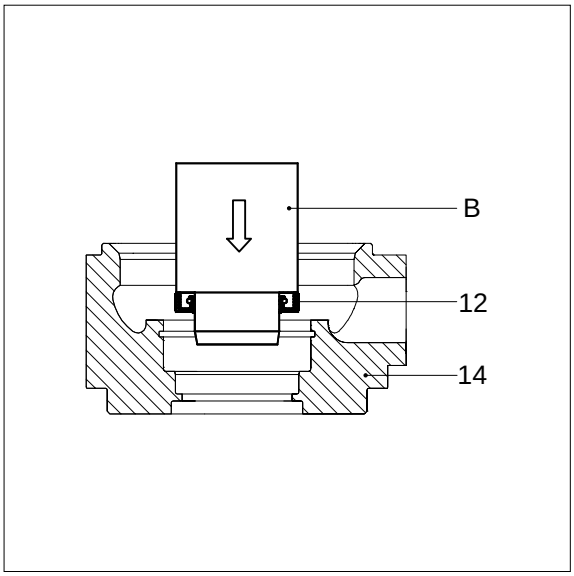
With the shaft seal securely installed on the seal driver, insert the shaft seal(12) in the front-cap(14).

③

Complete insertion using a constant

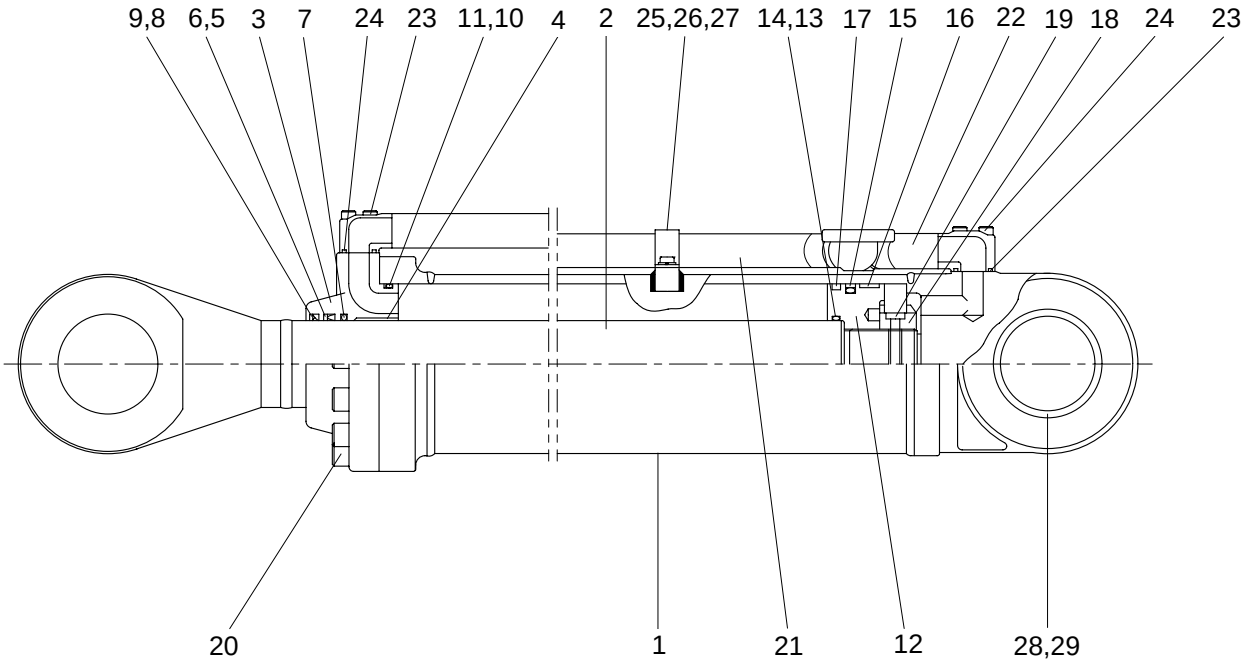
※ press load (1020kgf · m[7376lbf · ft] Max).

Do not use hammer.



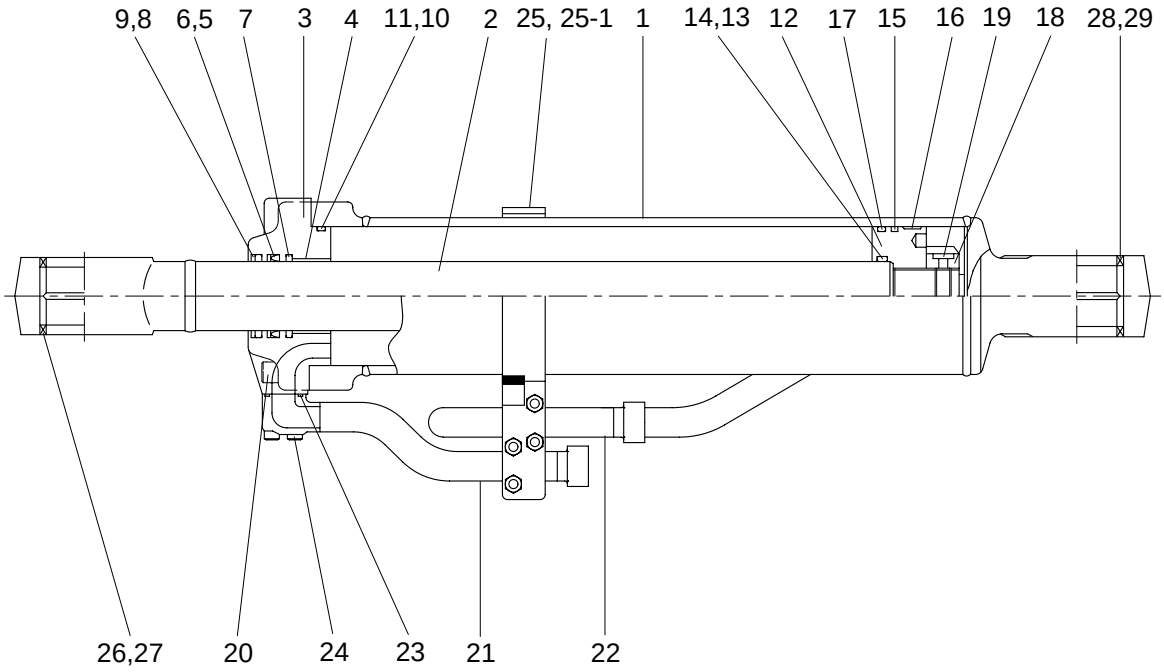
2. BOOM AND BUCKET CYLINDER

1) BOOM CYLINDER



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

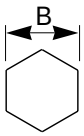
2) BUCKET CYLINDER



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

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	8	
	10	
	14	
	17	
Spanner	17	
	19	
(-) Driver	Small and large sizes	
Tourque wrench	Capable of tightening with the specified torques	

(2) Tightening torque

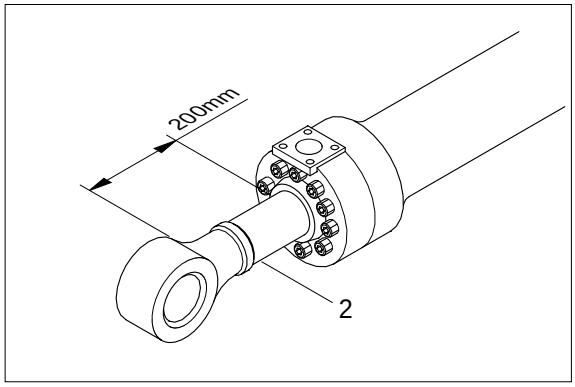
Part name		Item	Size	Size	
				kgf · m	lbf · ft
Socket head bolt	Bucket cylinder	20	M16×2.0×65	23±2	166±14
	Boom cylinder	20	M20×2.5×70	46±5	333±36
Set screw	Bucket cylinder	19	M10×1.5×12	5.4±0.5	39±3.6
	Boom cylinder	19	M10×1.5×12	5.4±0.5	39±3.6
Piston nut	Bucket cylinder	18	M64×3.0×38	150±15	1085±108
	Boom cylinder	18	M90×3.0×45	150±15	1085±108
Piston	Bucket cylinder	12	D160×63	100±10	723±72
	Boom cylinder	12	D200×77	100±10	723±72
Socket head bolt	Bucket cylinder	24	M10×1.5×55	5.4±0.5	39±3.6
	Boom cylinder	24	M12×1.75×60	9.4±1	68±7.2
Hex head bolt	Bucket cylinder	25-1	M12×1.75×45	5.5±0.6	40±4.3
	Boom cylinder	26	M10×1.5×15	3.2±0.5	23±3.6

3) DISASSEMBLY

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

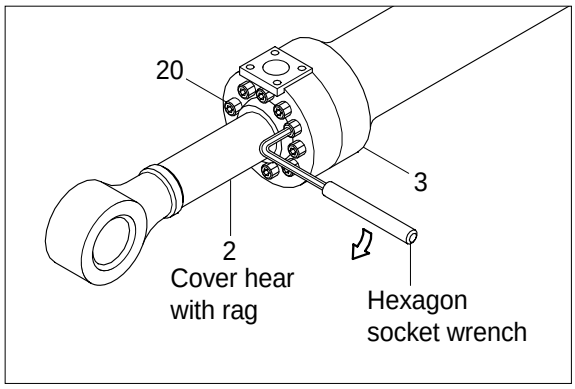
① Hold the clevis section of the tube in a vise. Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

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



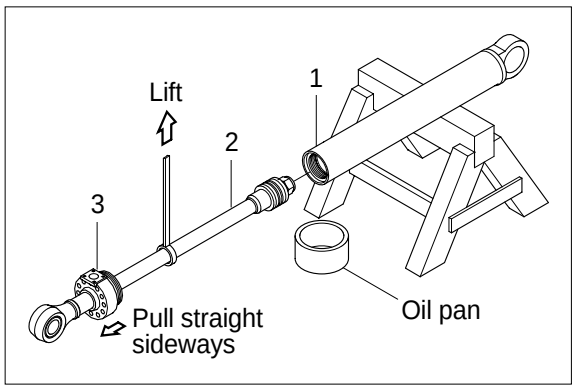
③ Loosen and remove socket blots(20) of the gland(3) in sequence.

※ 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).

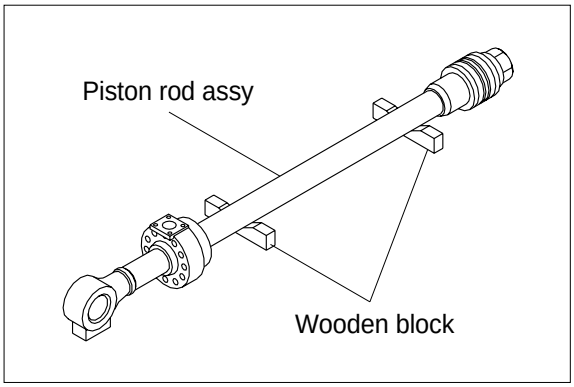
※ Since the piston rod assembly is heavy in this case, lift the tip of the piston rod(2) with a crane or some means and draw it out. However, when piston rod(2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



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.

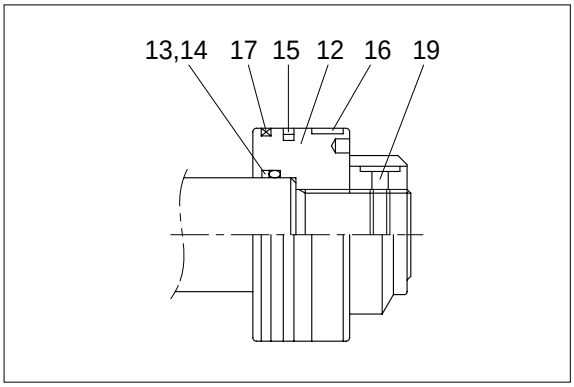
※ Cover a V-block with soft rag.



(2) Remove piston and gland assembly

① Loosen the screw(19) and remove the piston nut(18).

② Remove piston assembly(12), back up ring(14), O-ring(13).

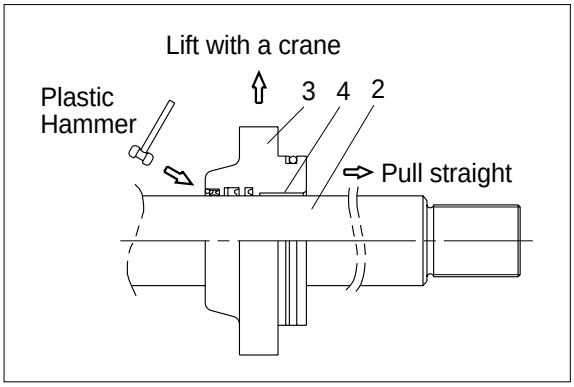


③ Remove the gland assembly from piston rod(2).

※ If is too heavy to move, move it by striking the flanged part of gland(3) with a plastic hammer.

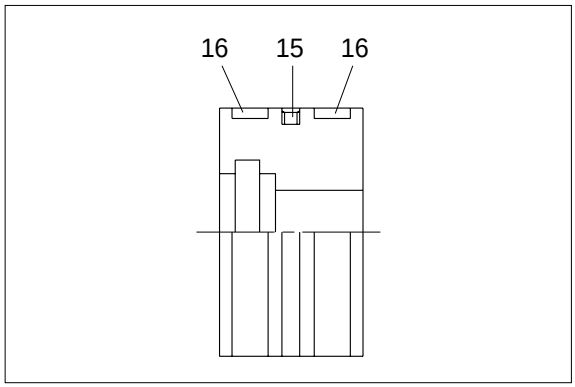
※ Pull it straight with gland assembly lifted with a crane.

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).



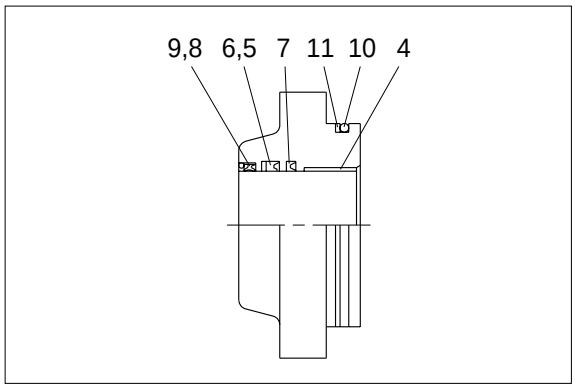
(3) Disassemble the piston assembly

① Remove wear ring(16).
Remove and piston seal(15).
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.

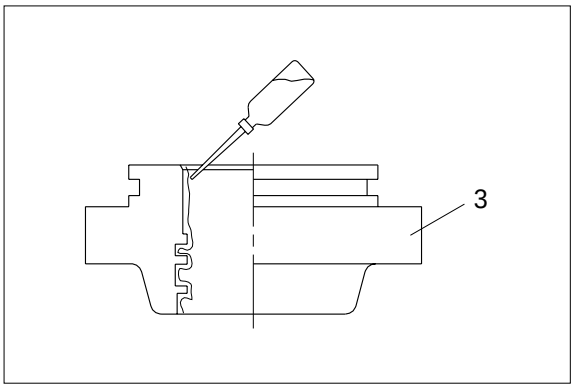


4) ASSEMBLY

(1) Assemble gland assembly

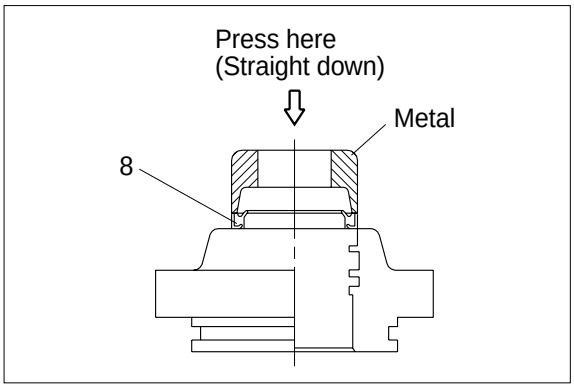
※ Check for scratches or rough surfaces if found smooth with an oil stone.

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.

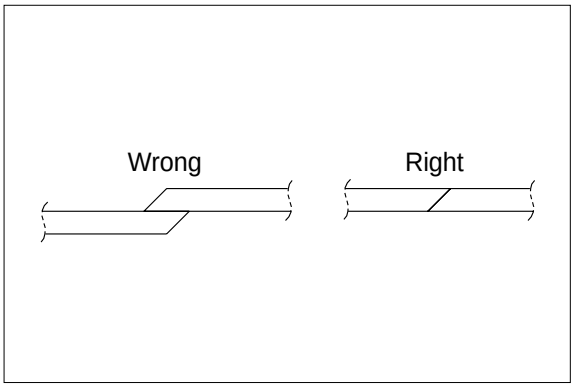
③ At this time, press a pad metal to the metal ring of dust seal.
Fit snap ring(9) to the stop face.



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

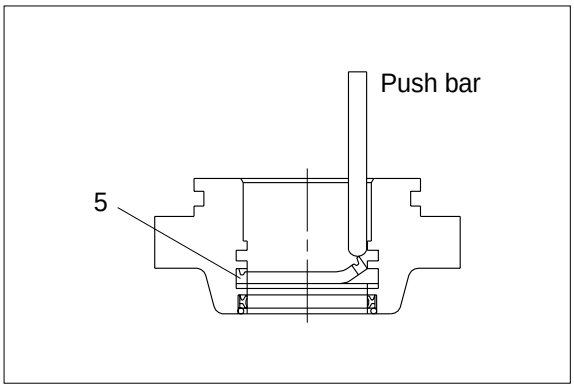
※ Coat each packing with hydraulic oil before fitting it.

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



※ Rod seal(5) has its own fitting direction. Therefore, confirm it before fitting them.

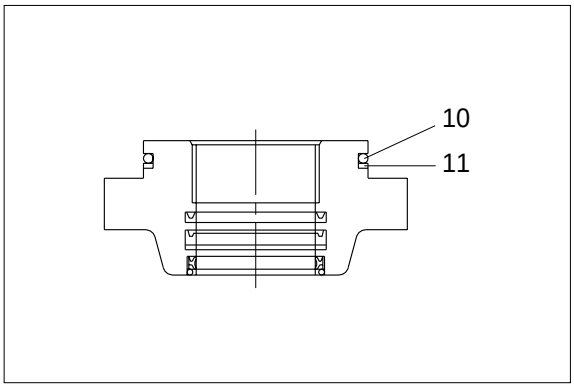
※ Fitting rod seal(5) up side down may damage its lip. Therefore check the correct direction that is shown in fig.



⑤ Fit back up ring(11) to gland(3).

※ Put the backup ring in the warm water of 30~50°C.

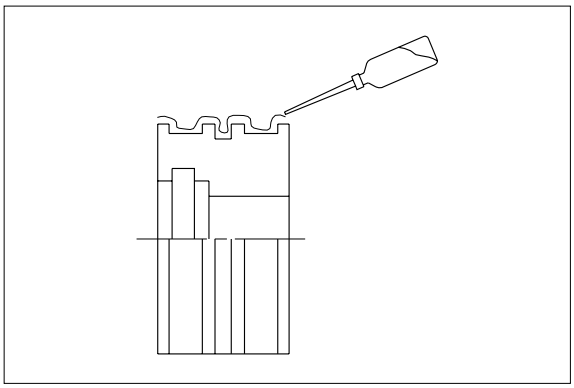
⑥ Fit O-ring(9) to gland(3).



(2) Assemble piston assembly

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

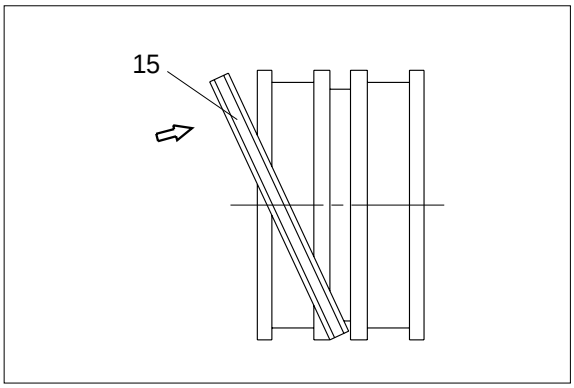
① Coat the outer face of piston(12) with hydraulic oil.



② Fit piston seal(15) to piston

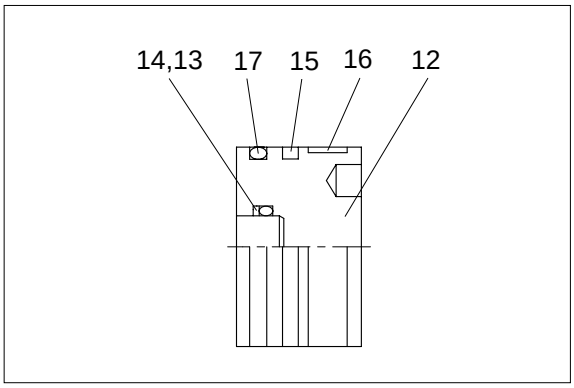
※ Put the piston seal in the warm water of 60~100°C for more than 5 minutes.

※ After assembling the piston seal, press its outer diameter to fit in.



③ Fit wear ring(16) and dust ring(17) to piston(12).

④ Fit back up ring(14) and O-ring(13) to piston(12).

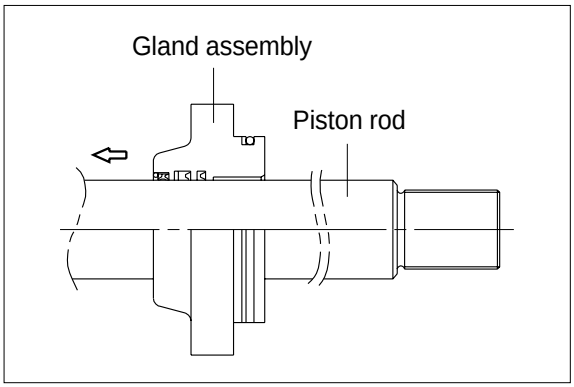


(3) Install piston and gland assembly

① Fix the piston rod assembly to the work bench.

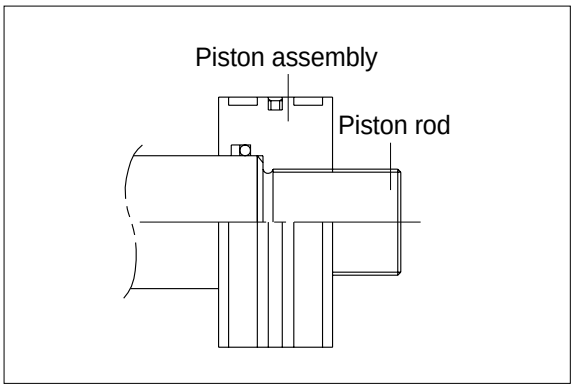
② Apply hydraulic oil to the outer surface of piston rod(2), the inner surface of piston and gland.

③ Insert gland assembly to piston rod(2).



④ Fit piston assembly to piston rod.

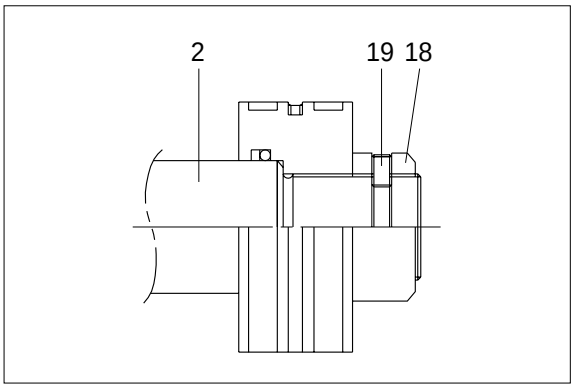
· Tightening torque : 100±10kgf · m
(723±72lbf · ft)



⑤ Tighten piston nut(18) and screw(19) to piston rod(2).

· Tightening torque

Item	kgf · m	lbf · ft
18	150 ± 15	1085 ± 108
19	5.4 ± 0.5	39 ± 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.