

GROUP 9 BOOM, ARM AND BUCKET CYLINDER

1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

(1) Removal

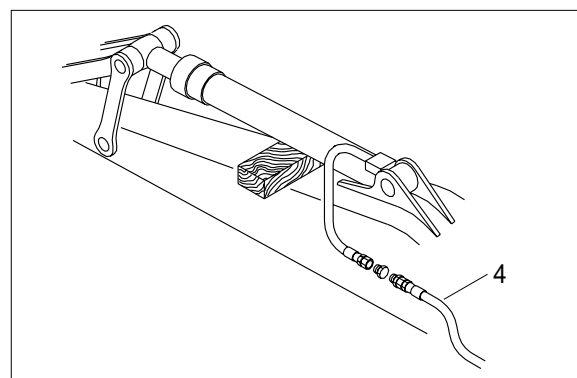
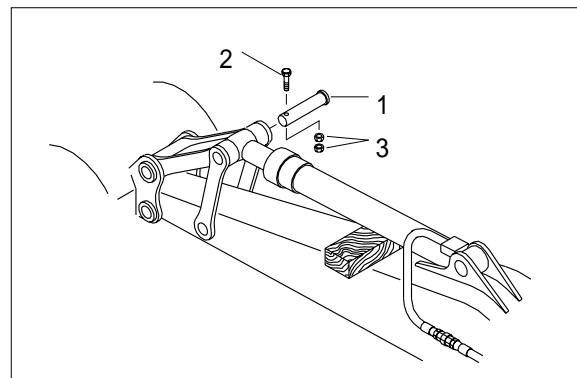
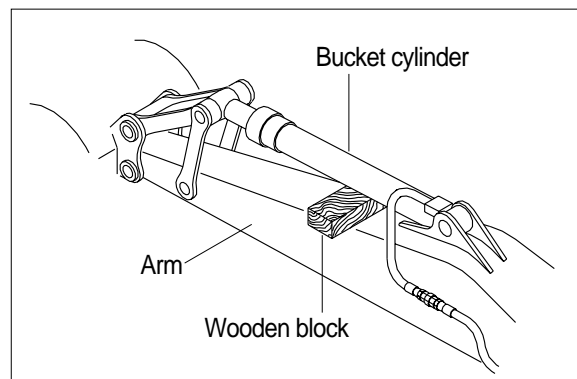
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

① Set block between bucket cylinder and arm.

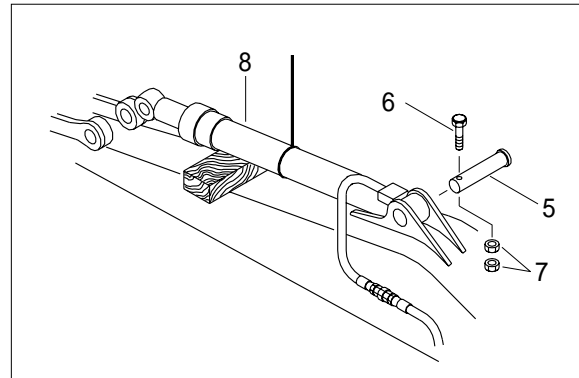
② Remove nut(3), bolt(2) and pull out pin(1).

- ※ Tie the rod with wire to prevent it from coming out.

③ Disconnect bucket cylinder hoses(4) and put plugs on cylinder pipe.



- ④ Sling bucket cylinder assembly, and remove nut(7), bolt(6), then pull out pin(5).
- ⑤ Remove bucket cylinder assembly(8)
 - Weight : 228kg(503lb)



(2) Install

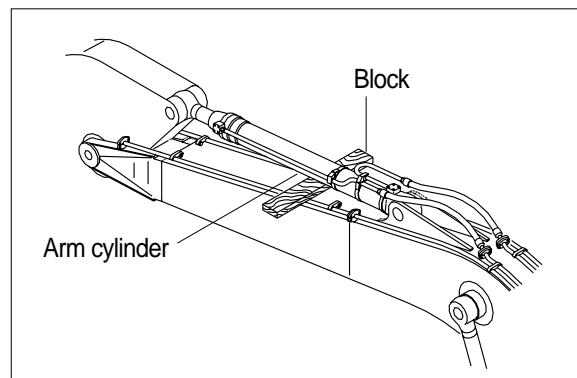
- ① Carry out installation in the reverse order to removal.
- ⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
- ※ Bleed the air from the bucket cylinder.
- ※ Confirmed the hydraulic oil level and check the hydraulic oil leak or not.

2) ARM CYLINDER

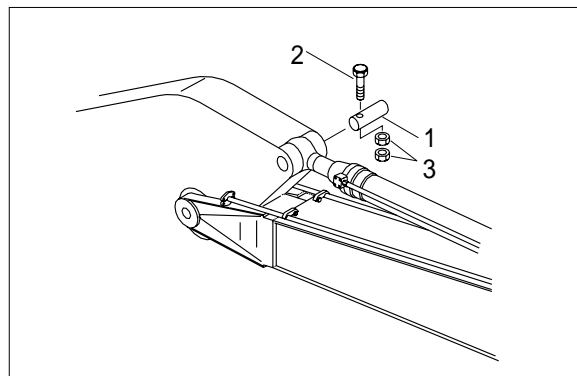
(1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

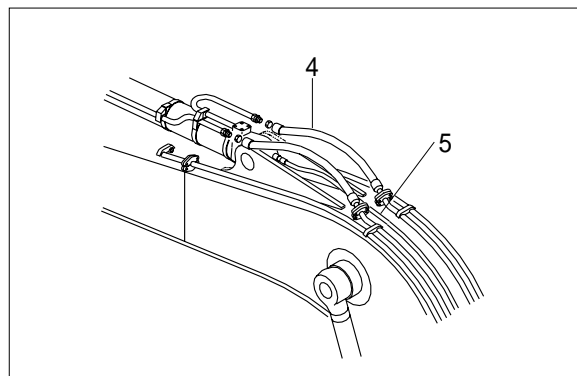
- ① Set block between arm cylinder and boom.



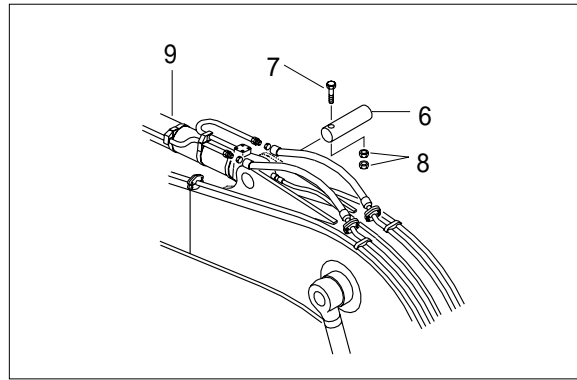
- ② Remove nut(3), bolt(2) and pull out pin(1).
- ※ Tie the rod with wire to prevent it from coming out.



- ③ Disconnect arm cylinder hoses(4) and put plugs on cylinder pipe.
- ④ Disconnect greasing hoses(5).



- ⑤ Sling bucket arm assembly(9), and remove nut(8), bolt(7), then pull out pin(6).
- ⑥ Remove arm cylinder assembly(9)
 - Weight : 350kg(772lb)



(2) Install

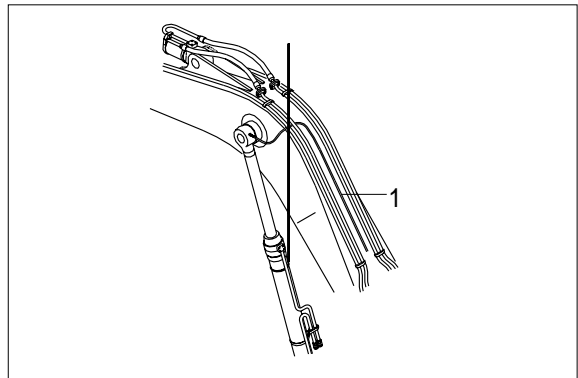
- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
- ※ Bleed the air from the arm cylinder.
- ※ Confirmed the hydraulic oil level and check the hydraulic oil leak or not.

3) BOOM CYLINDER

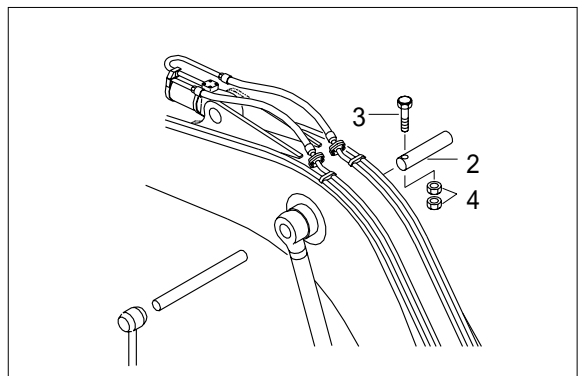
(1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

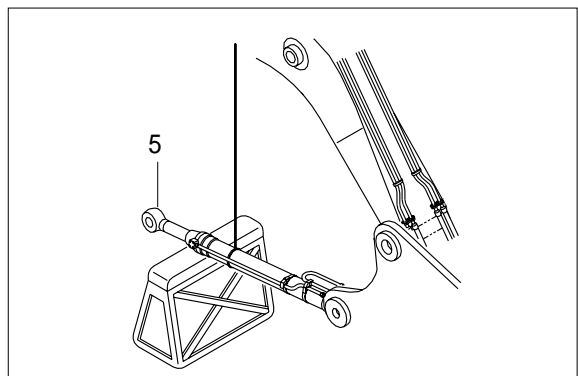
- ① Disconnect greasing hoses(1).
- ② Sling boom cylinder assembly.



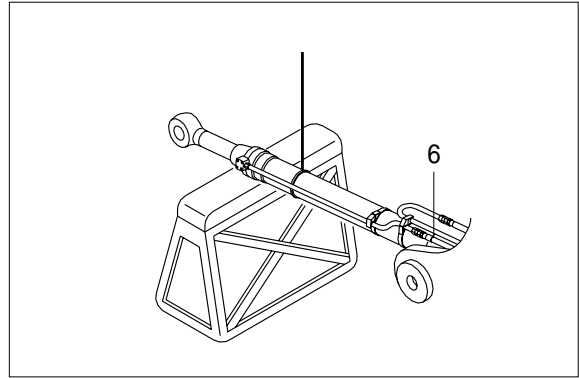
- ③ Remove spring(4), pin stopper(3) and pull out pin(2).
- ※ Tie the rod with wire to prevent it from coming out.



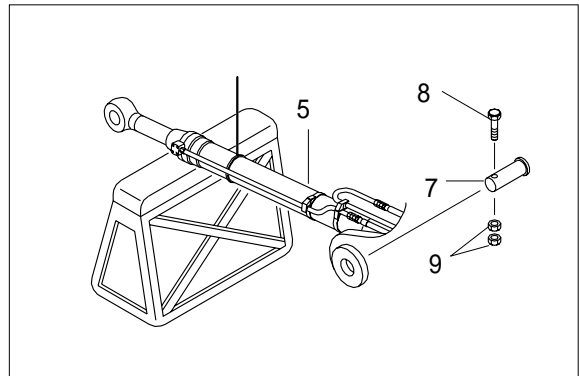
- ④ Lower the boom cylinder assembly(5) on a stand



- ⑤ Disconnect boom cylinder hoses(6), and put plugs on cylinder pipe.



- ⑥ Remove nut(9), bolt(8), then pull out pin(7).
⑦ Remove boom cylinder assembly(5)
· Weight : 260kg(573lb)



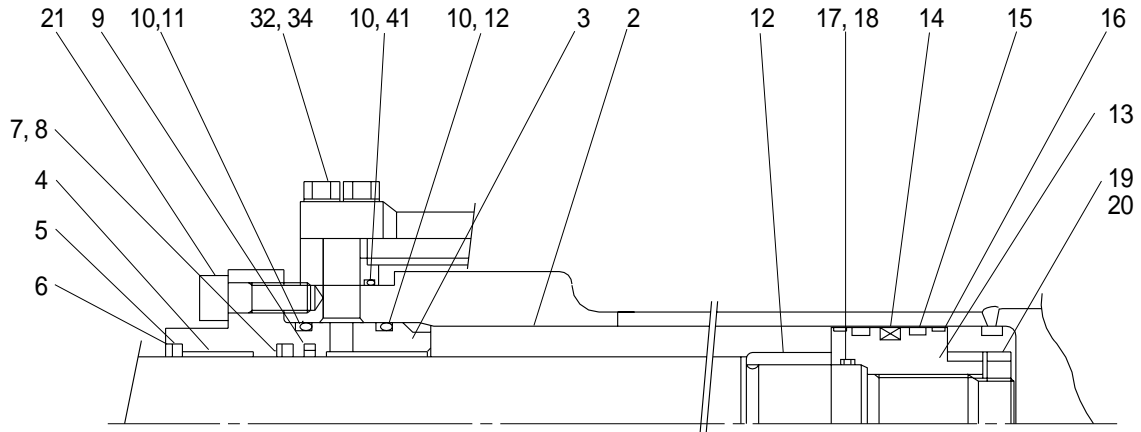
(2) Install

- ① Carry out installation in the reverse order to removal.
- ⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
- ※ Bleed the air from the boom cylinder.
 - ※ Confirmed the hydraulic oil level and check the hydraulic oil leak or not.

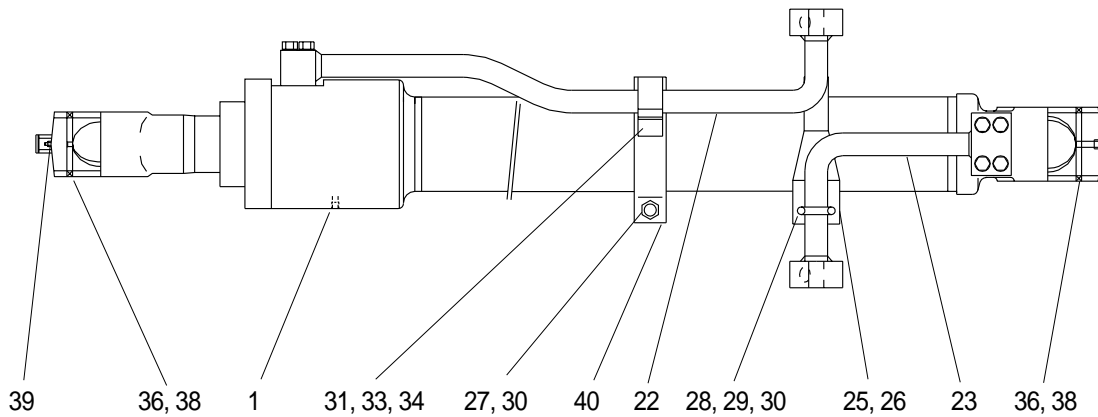
2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

(1) Bucket cylinder

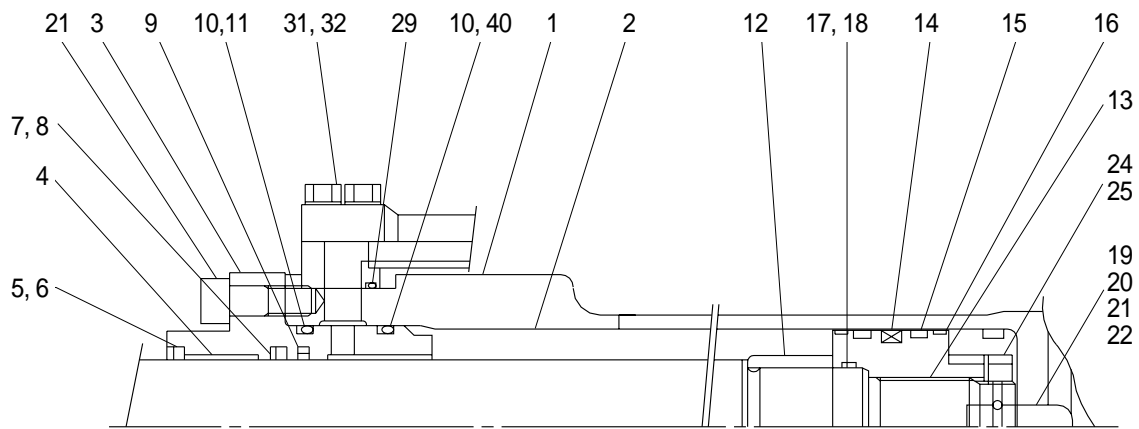


Internal detail

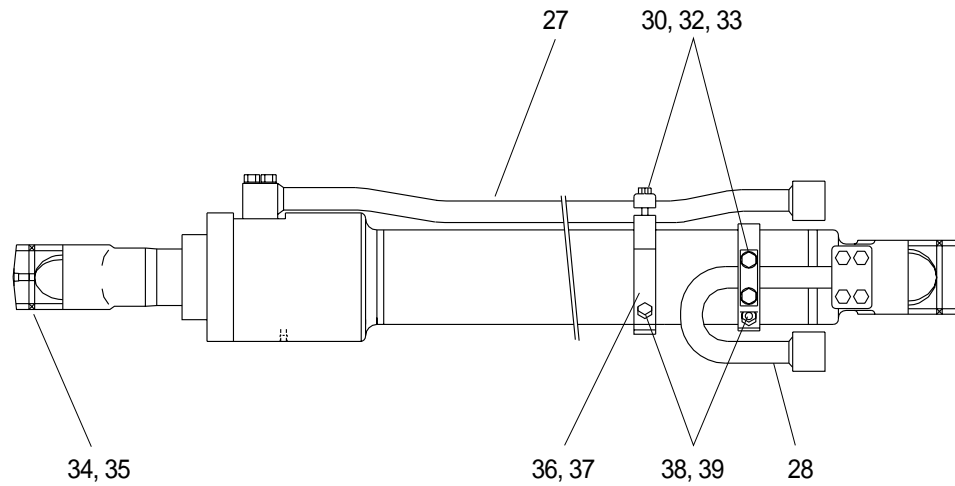


1	Tube assembly	15	Wear ring	29	Hexagon nut
2	Rod assembly	16	Dust ring	30	Spring washer
3	Cylinder head	17	O-ring	31	Pipe clamp
4	Rod bushing	18	Back up ring	32	Hexagon bolt
5	Dust seal	19	Lock nut	33	Hexagon bolt
6	Snap ring	20	Lock washer	34	Spring washer
7	Rod seal	21	Hexagon socket head bolt	35	Pin bushing
8	Back up ring	22	Pipe assembly	36	Pin bushing
9	Step seal	23	Pipe assembly	37	Pin dust seal
10	O-ring	24	O-ring	38	Pin dust seal
11	Back up ring	25	Band assembly	39	Grease nipple
12	Cushion ring	26	Band	40	Band assembly
13	Piston	27	Hexagon bolt	41	Back up ring
14	Piston seal	28	U-bolt		

(2) Arm cylinder

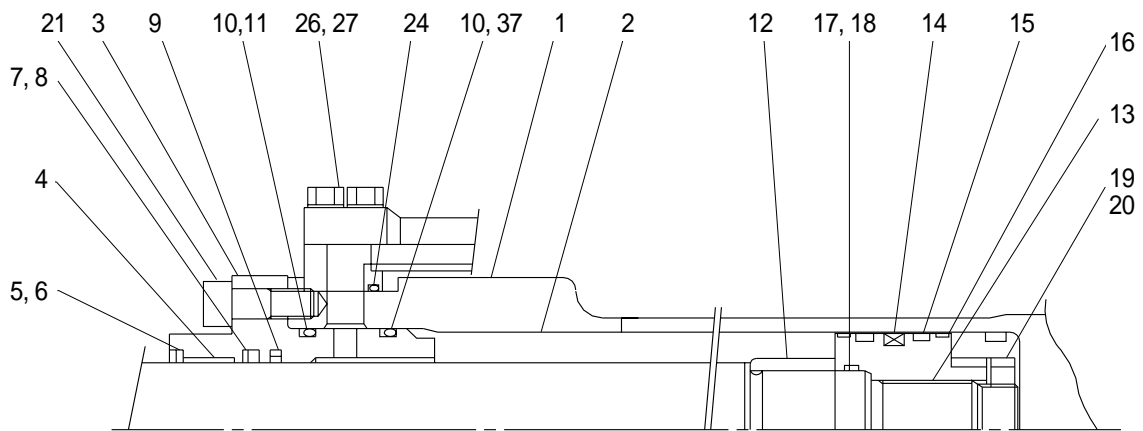


Internal detail

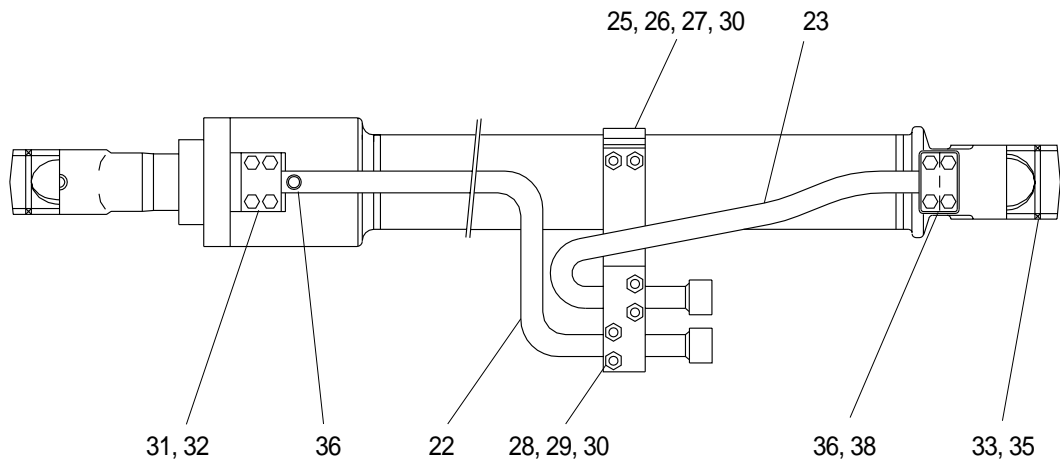


1	Tube assembly	14	Piston seal	28	Pipe assembly
2	Rod assembly	15	Wear ring	29	O-ring
3	Cylinder head	16	Dust ring	30	Pipe clamp
4	Rod bushing	17	O-ring	31	Hexagon bolt
5	Dust seal	18	Back up ring	32	Hexagon bolt
6	Snap ring	19	Cushion spear	33	Spring washer
7	Rod seal	20	Check valve	34	Pin bushing
8	Back up ring	21	Coil spring	35	Pin dust seal
9	Step seal	22	Steel ball	36	Band assembly
10	O-ring	24	Lock nut	37	Band
11	Back up ring	25	Lock washer	38	Hexagon bolt
12	Cushion ring	26	Hexagon socket head bolt	39	Spring washer
13	Piston	27	Pipe assembly	40	Back up ring

(3) Boom cylinder



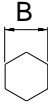
Internal detail



1	Tube assembly	14	Piston seal	26	Band
2	Rod assembly	15	Wear ring	27	Hexagon bolt
3	Cylinder head	16	Dust ring	28	U-bolt
4	Rod bushing	17	O-ring	29	Hexagon nut
5	Dust seal	18	Back up ring	30	Spring washer
6	Snap ring	19	Lock nut	31	Hexagon bolt
7	Rod seal	20	Lock washer	32	Spring washer
8	Back up ring	21	Hexagon socket head bolt	33	Pin bushing
9	Step seal	22	Pipe assembly	34	Pin bushing
10	O-ring	23	Pipe assembly	35	Pin dust seal
11	Back up ring	24	O-ring	36	Pin dust seal
12	Cushion ring	25	Band assembly	37	Back up ring
13	Piston				

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	14	
Spanner	13	
	17	
	19	
(-) Driver	Small and large sizes	
Torque wrench	Capable of tightening with the specified torques.	

(2) Tightening torque

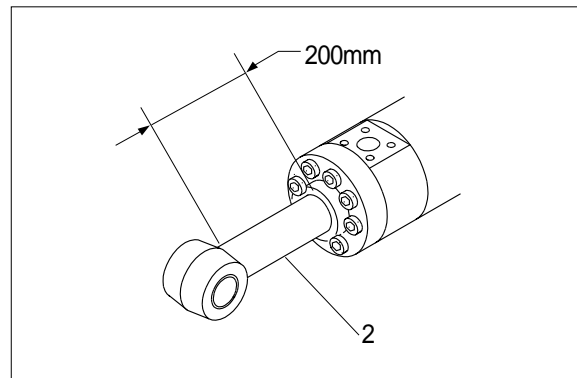
Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Socket head bolt	bucket cylinder	21	M16	62±6.2	448.4±44.8
	boom cylinder				
	arm cylinder	26	M18	80±8	578.6±57.9
Hexagon head bolt	bucker cylinder	32	M10	10±1	72.3±7.2
	arm cylinder	31			
	boom cylinder				
	bucker cylinder	27, 29	M10	2.3±0.23	16.6±1.7
	arm cylinder	32	M10	4±0.4	28.9±2.9
	boom cylinder	27, 29	M10	2.3±0.23	16.6±1.7
	bucker cylinder	33	M12	4±0.4	28.9±2.9
Lock nut	bucker cylinder	19	-	65±6.5	470.1±47
	boom cylinder			70±7	506.3±50.6
	arm cylinder	24	-	75±7.5	542.5±54.2
Piston	bucker cylinder	13	-	70±7	506.3±50.6
	arm cylinder			80±8	578.6±57.9

3) DISASSEMBLY

(1) Remove cylinder head and piston rod

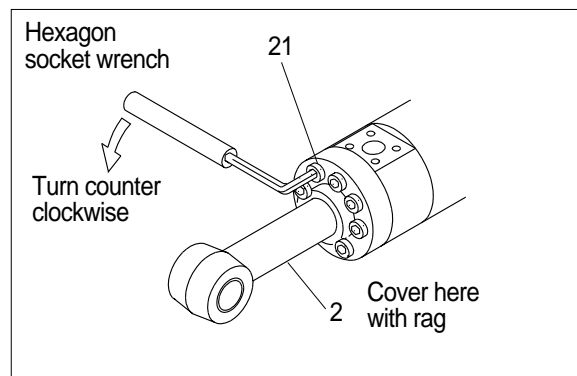
- ① Hold the clevis section of the tube in a vise.
- ※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

- ② Pull out piston rod(2) about 200mm (7.1in). Because the piston rod is rather heavy, finish extending it with air pressure after the oil draining operation.



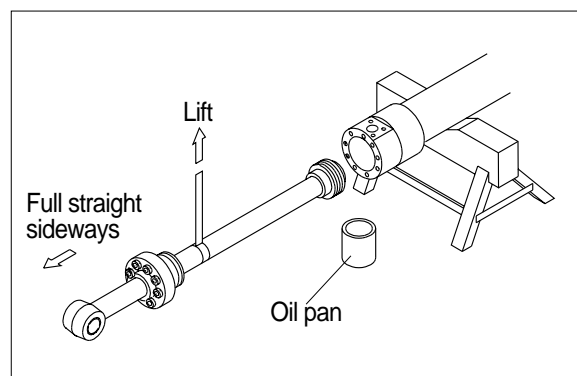
- ③ Loosen and remove socket bolts(21) of the cylinder head in sequence.

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



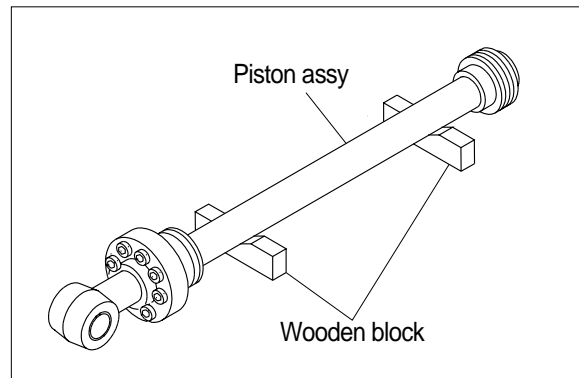
- ④ Draw out cylinder head(3) and piston rod assembly together from cylinder tube(1).

- ※ 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.



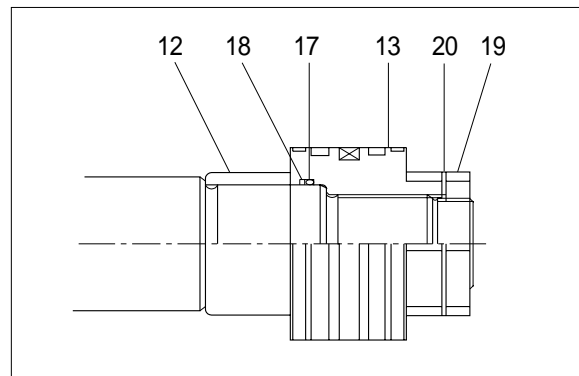
Note that the plated surface of piston rod(2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

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

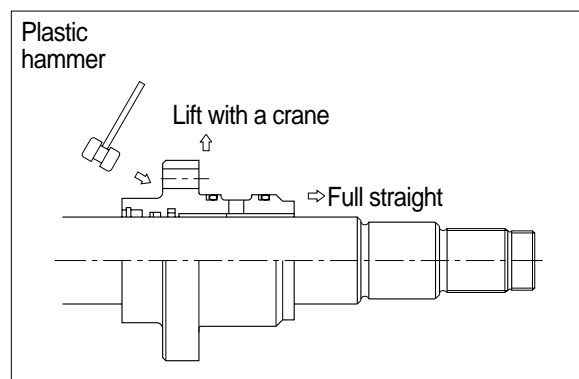


(2) Remove piston and cylinder head

- ① Remove lock nut(19) and washer(20).
- ※ Since lock nut(19) is tightened to a high torque, use a hydraulic and power wrench that utilizes a hydraulic cylinder, to remove the lock nut(19).
- ② Remove piston assembly(13), back up ring(18), O-ring(17) and cushion ring (12).

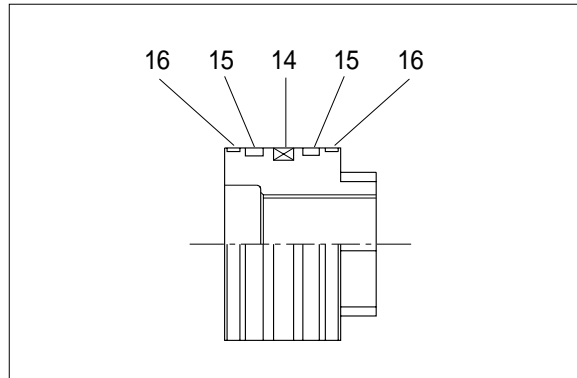


- ③ Remove the cylinder head assembly from piston rod(2).
 - ※ If it is too heavy to move, move it by striking the flanged part of cylinder head (3) with a plastic hammer.
 - ※ Pull it straight with cylinder head assembly lifted with a crane.
- Exercise care so as not to damage the lip of rod bushing(4)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



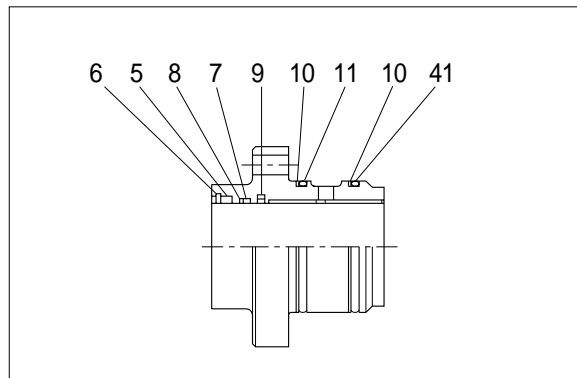
(3) Disassemble the piston assembly

- ① Remove wear ring(15).
 - ② Remove dust ring(16) and piston seal(14).
- ※ Exercise care in this operation not to damage the grooves.



(4) Disassemble cylinder head assembly

- ① Remove back up ring(41), and O-ring (10).
 - ② Remove back up ring(11) and O-ring (10).
 - ③ Remove snap ring(6) and dust seal(5).
 - ④ Remove back up ring(8), rod seal(7) and step seal(9).
- ※ Exercise care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.

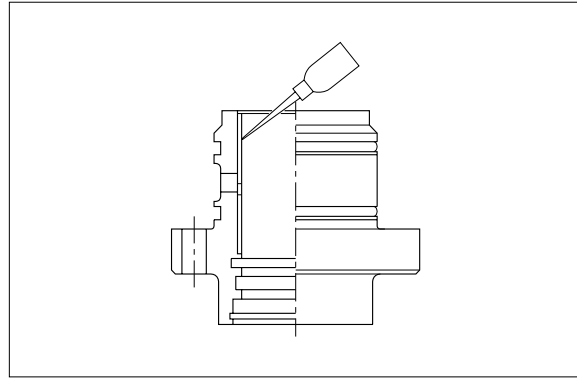


4) ASSEMBLY

(1) Assemble cylinder head assembly

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

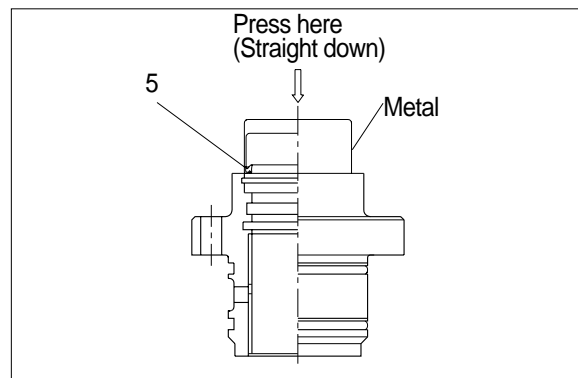
① Coat the inner face of cylinder head(3) with hydraulic oil.



② Coat dust seal(5) with grease and fit dust seal(5) to the bottom of the hole of dust seal.

At this time, press a pad metal to the metal ring of dust seal.

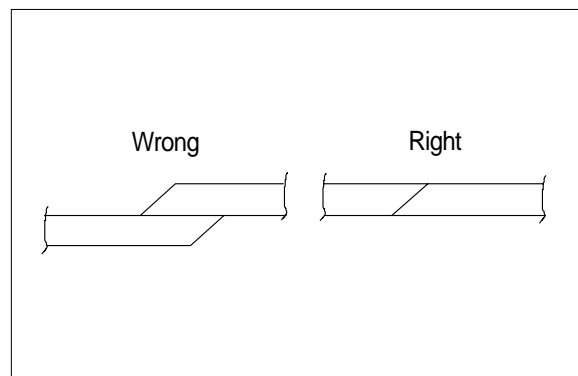
③ Fit snap ring(6) to the stop face.



④ Fit back up ring(8), rod seal(7) and step seal(9) to corresponding grooves, in that order.

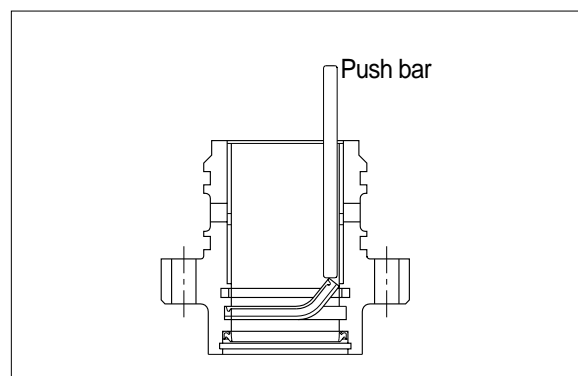
※ Coat each packing with hydraulic oil before fitting it.

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

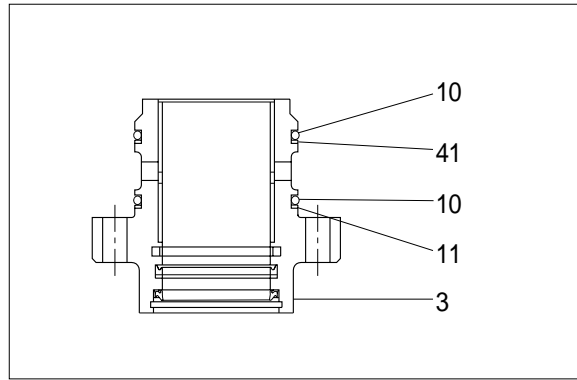


※ Rod seal(7) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting rod seal(7) up side down may damage its lip. Therefore check the correct direction that is shown in fig.

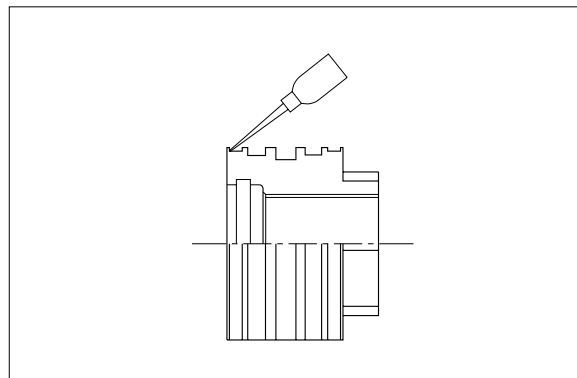


- ⑤ Fit back up ring(11,41) to cylinder head (3).
- ※ Put the backup ring in the warm water of 30~50°C
- ⑥ Fit O-ring(10) to cylinder head(3).

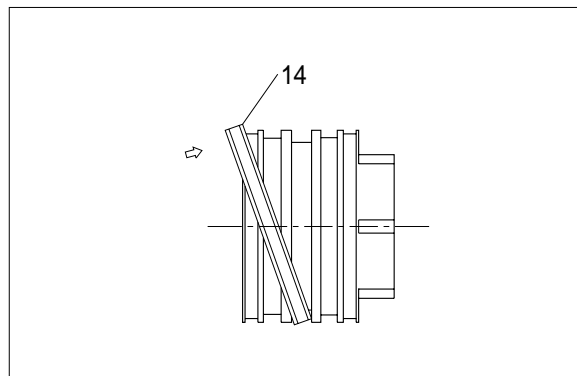


(2) Assemble piston assembly

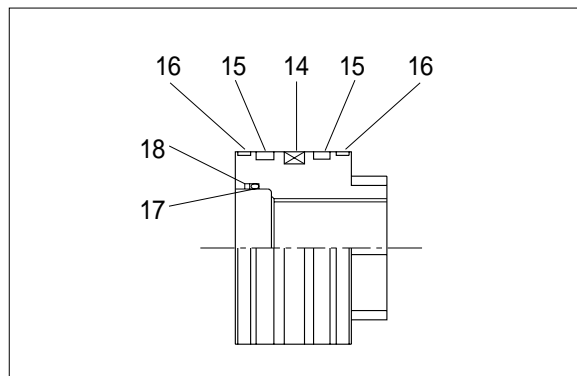
- ※ Check for scratches or rough surfaces. If found smooth with an oil stone.
- ① Coat the outer face of piston(13) with hydraulic oil.



- 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.

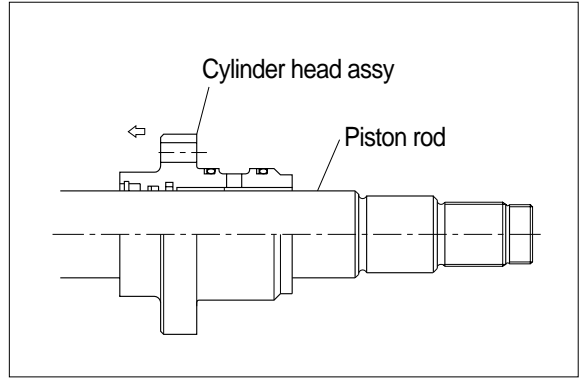


- ③ Fit wear ring(15) and dust ring(16) to piston(13).
- ④ Fit back up ring(18) and O-ring(17) to piston(13).

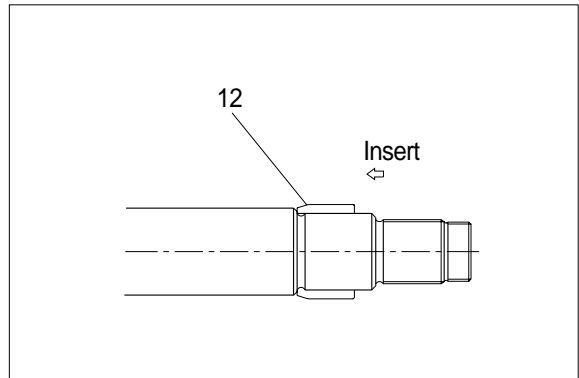


(3) Install piston and cylinder head

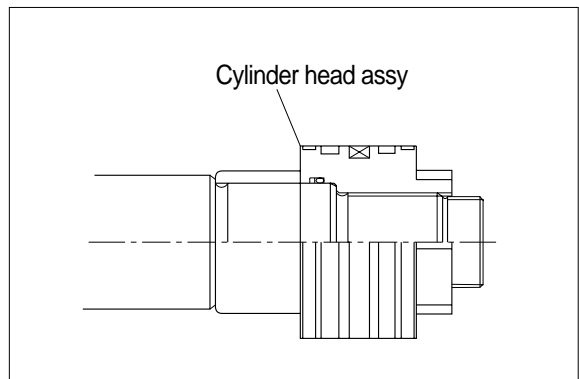
- ① Fix the piston rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of piston rod(2), the inner surface of piston and cylinder head.
- ③ Insert cylinder head assembly to piston rod.



- ④ Insert cushion ring(12) to piston rod.
- ※ Note that cushion ring(12) has a direction in which it should be fitted.

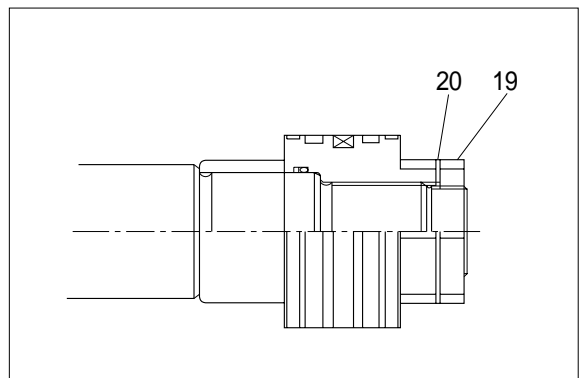


- ⑤ Fit cylinder head assembly to piston rod.
- Tightening torque :
 $80 \pm 8 \text{ kgf} \cdot \text{m}$ ($579 \pm 58 \text{ lbf} \cdot \text{ft}$)



- ⑥ Fit lock washer(20) and lock nut(19) to piston rod.
- Tightening torque :

Item	dgf · m	lbf · ft
bucket	65 ± 6.5	470 ± 47
boom	70 ± 7	506 ± 51
arm	75 ± 7.5	543 ± 54



(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 pin 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.

