

GROUP 9 BOOM, ARM AND BUCKET CYLINDER

1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

(1) Removal

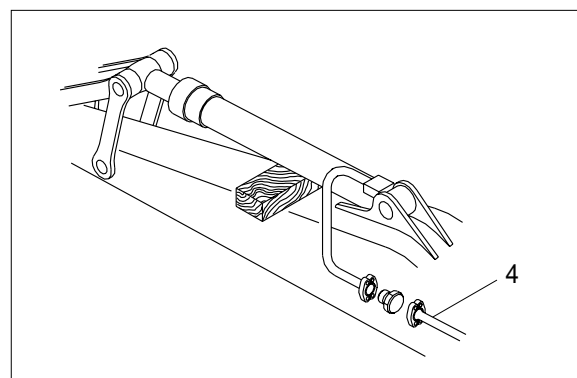
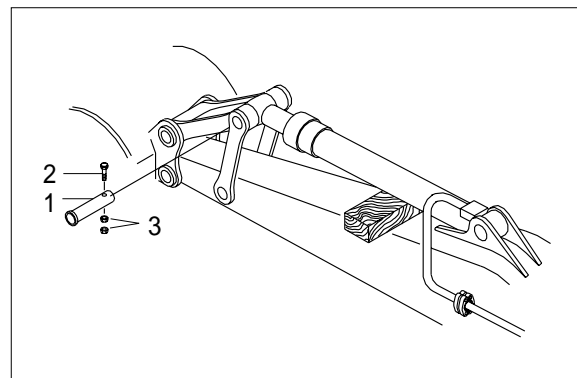
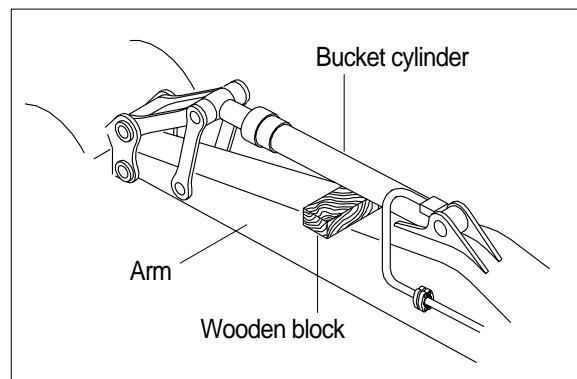
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ▲ Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ※ Escaping 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.

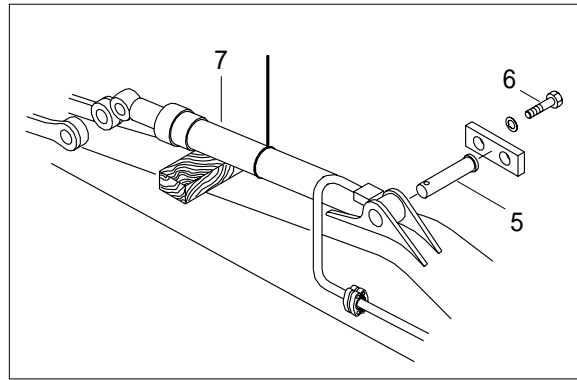
② Remove bolt(2), nut(3) and pull out pin(1).

- ※ 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(7), and remove bolt(6), then pull out pin(5).
- ⑤ Remove bucket cylinder assembly(7)
 - Weight : 343kg (760 lb)



(2) Install

- ① Carry out installation to the reverse order of 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.
 - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

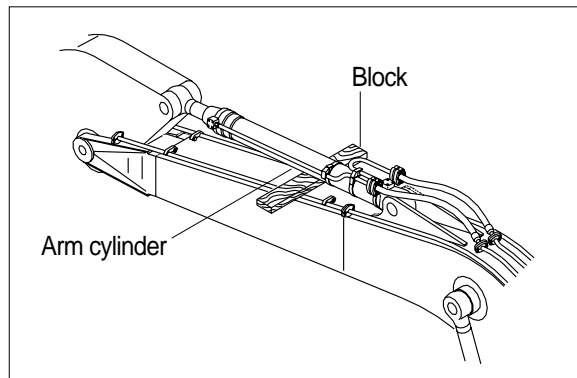
2) ARM CYLINDER

(1) Removal

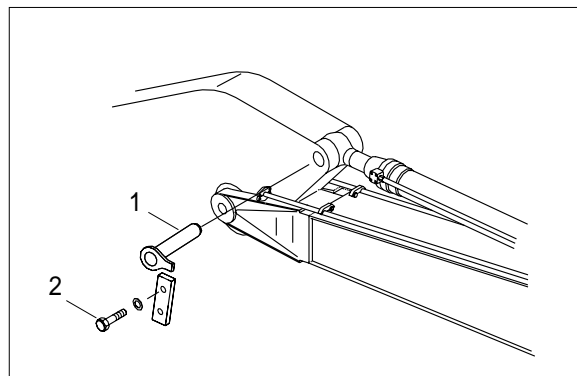
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

- ▲ 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.

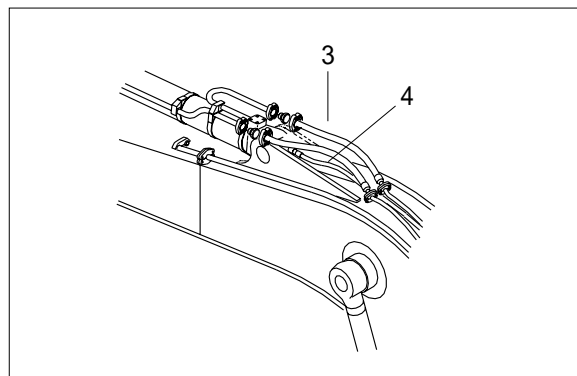
- ① Set block between arm cylinder and boom.



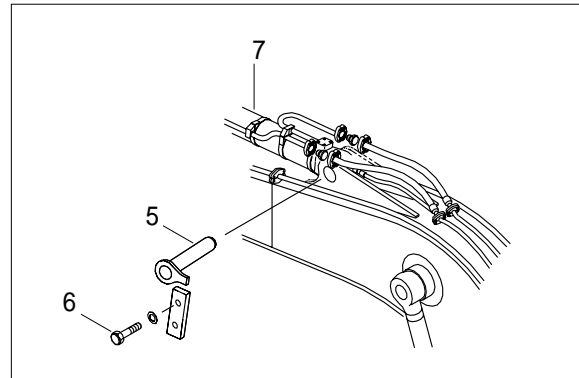
- ② Remove bolt(2) and pull out pin(1).
- ※ Tie the rod with wire to prevent it from coming out.



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



- ⑤ Sling arm cylinder assembly(7), and remove bolt(6), then pull out pin(5).
- ⑥ Remove arm cylinder assembly(7)
 - Weight : 540kg(1190 lb)



(2) Install

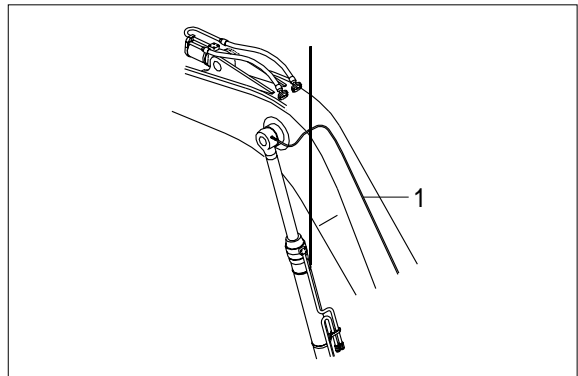
- ① Carry out installation to the reverse order of removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
- ※ Bleed the air from the arm cylinder.
- ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

3) BOOM CYLINDER

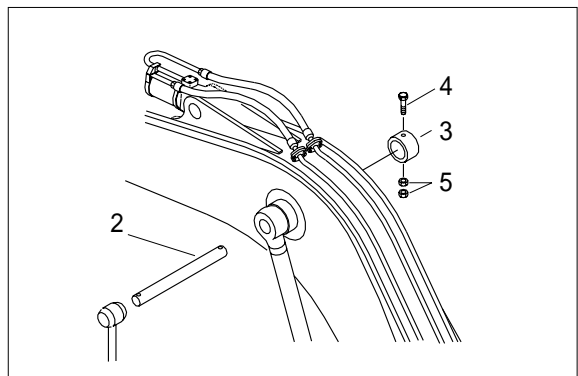
(1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ 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.

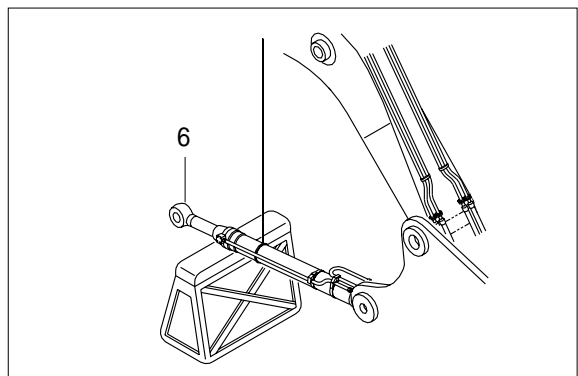
- ① Disconnect greasing hoses(1).
- ② Sling boom cylinder assembly.



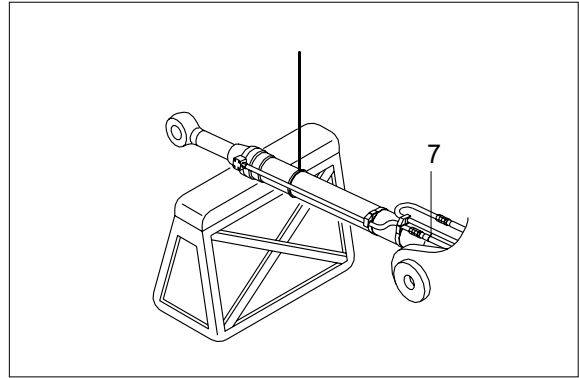
- ③ Remove bolt(4), nut(5), pin stopper(3) and pull out pin(2).
- ※ Tie the rod with wire to prevent it from coming out.



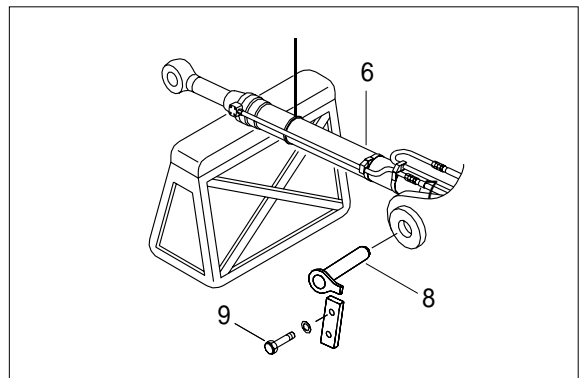
- ④ Lower the boom cylinder assembly(6) on a stand.



- ⑤ Disconnect boom cylinder hoses(7), and put plugs on cylinder pipe.



- ⑥ Remove bolt(9) and pull out pin(8).
⑦ Remove boom cylinder assembly(6)
· Weight : 404kg(890lb)



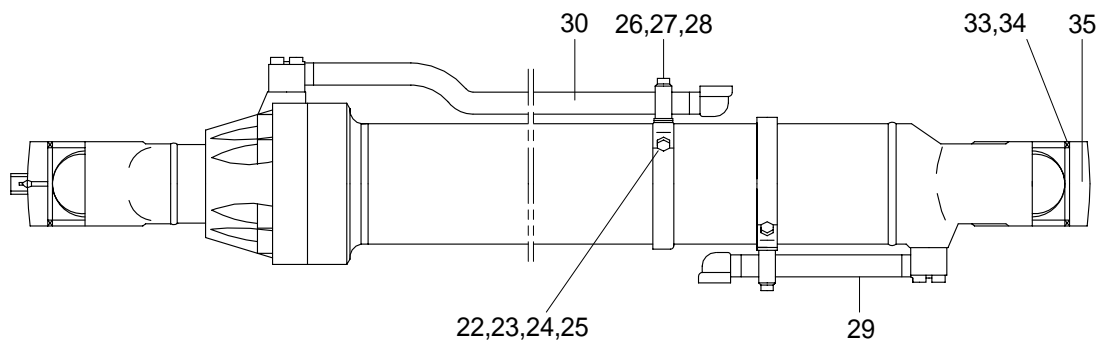
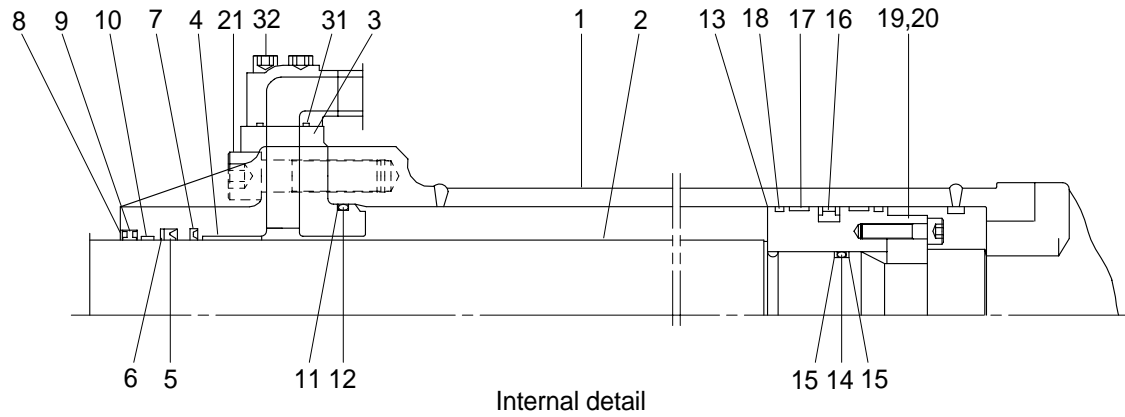
(2) Install

- ① Carry out installation to the reverse order of 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.
 - ※ Conform the hydraulic oil level and check the hydraulic oil leak or not.

2. DISASSEMBLY AND ASSEMBLY

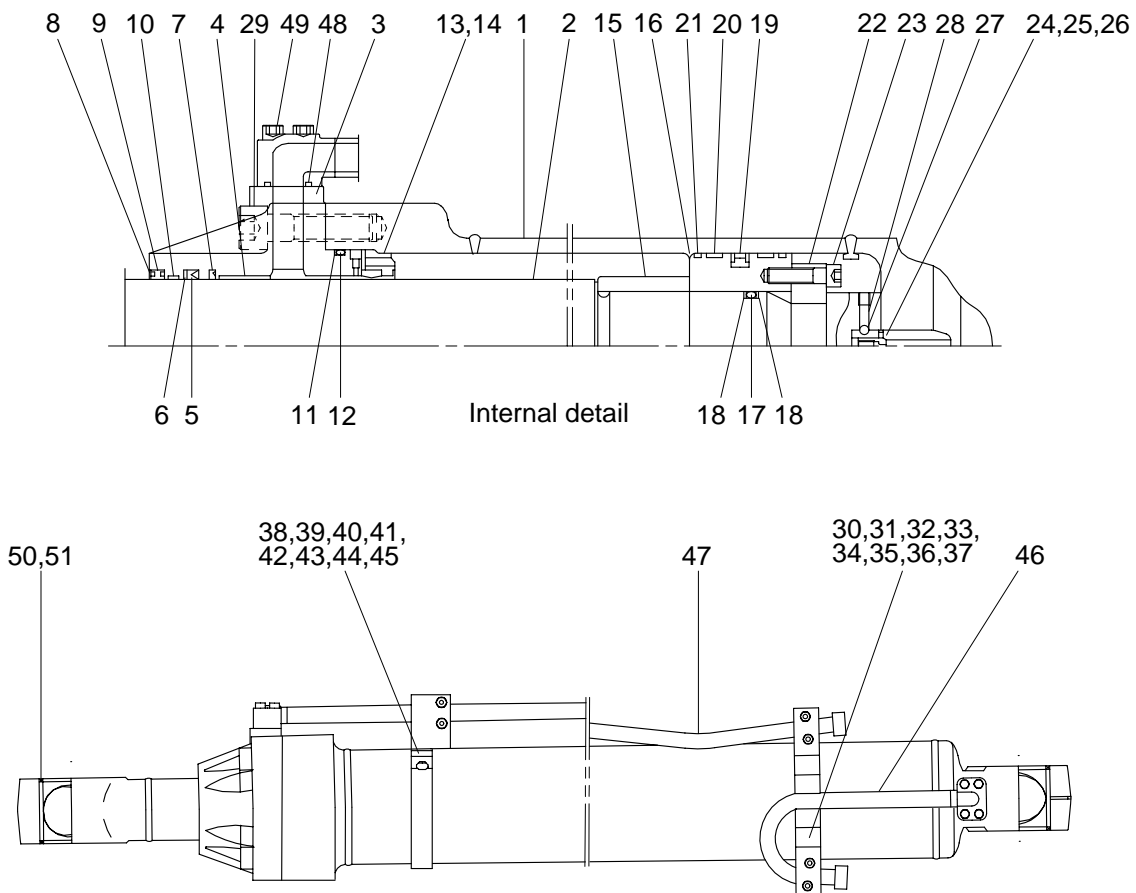
1) STRUCTURE

(1) Bucket cylinder



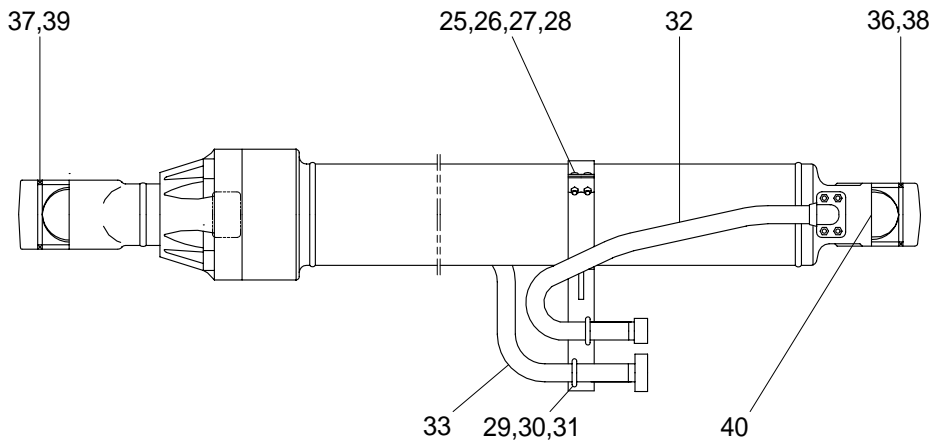
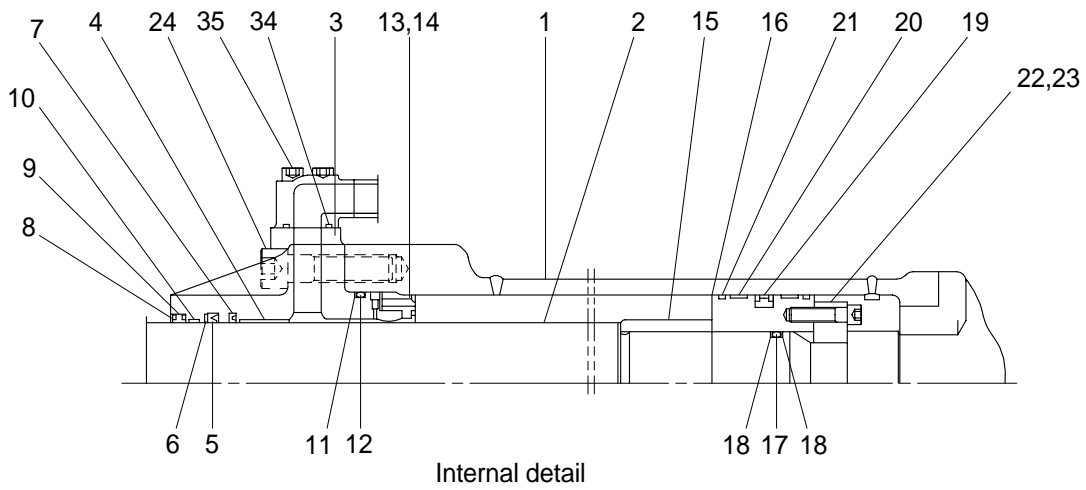
1	Tube assembly	13	Piston	25	Spring washer
2	Rod assembly	14	O-ring	26	Pipe clamp
3	Gland	15	Back up ring	27	Hexagon bolt
4	Du bushing	16	Piston seal	28	Spring washer
5	Rod seal	17	Wear ring	29	Pipe assembly(B)
6	Back up ring	18	Piston ring	30	Pipe assembly(R)
7	Buffer ring	19	Spacer	31	O-ring
8	Dust wiper	20	Hexagon socket head bolt	32	Hexagon socket head bolt
9	Snap ring	21	Hexagon socket head bolt	33	Pin bushing
10	Wear ring	22	Band assembly	34	Dust seal
11	O-ring	23	Band	35	Grease nipple
12	Back up ring	24	Hexagon bolt		

(2) Arm cylinder



1	Tube assembly	18	Back up ring	35	U-bolt
2	Rod assembly	19	Piston seal	36	Hexagon nut
3	Gland	20	Wear ring	37	Spring washer
4	Du bushing	21	Piston ring	38	Band assembly(R)
5	Rod seal	22	Spacer	39	Band sub assembly
6	Back up ring	23	Hexagon socket head bolt	40	Band
7	Buffer ring	24	Cushion spear	41	Hexagon bolt
8	Dust wiper	25	Check valve	42	Spring washer
9	Snap ring	26	Spring	43	U-bolt
10	Wear ring	27	Steel ball	44	Hexagon nut
11	O-ring	28	Set screw	45	Spring washer
12	Back up ring	29	Hexagon socket head bolt	46	Pipe assembly(B)
13	Collar	30	Band assembly(B)	47	Pipe assembly(R)
14	Ring	31	Band sub assembly	48	O-ring
15	Cushion ring	32	Band	49	Hexagon socket head bolt
16	Piston	33	Hexagon blot	50	Pin bushing
17	O-ring	34	Spring washer	51	Dust seal

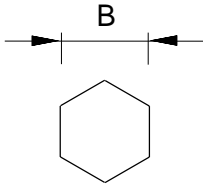
(3) Boom cylinder



1	Tube assembly	15	Cushion ring	29	U-bolt
2	Rod assembly	16	Piston	30	Nut
3	Gland	17	O-ring	31	Spring washer
4	Du bushing	18	Back up ring	32	Pipe assembly(B)
5	Rod seal	19	Piston seal	33	Pipe assembly(R)
6	Back up ring	20	Wear ring	34	O-ring
7	Buffer ring	21	Piston ring	35	Hexagon socket head bolt
8	Dust wiper	22	Spacer	36	Pin bushing(B)
9	Snap ring	23	Hexagon socket head bolt	37	Pin bushing(R)
10	Wear ring	24	Hexagon socket head bolt	38	Dust seal
11	O-ring	25	Band assembly	39	Dust seal
12	Back up ring	26	Band	40	Grease nipple
13	Collar	27	Hexagon bolt		
14	Ring	28	Spring washer		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark		
Allen wrench	8		
	12		
	14		
	19		
	22		
Spanner	17		
	19		
(-) Driver	Small and large sizes		
Torque wrench	Capable of tightening with the specified torques.		

(2) Tightening torque

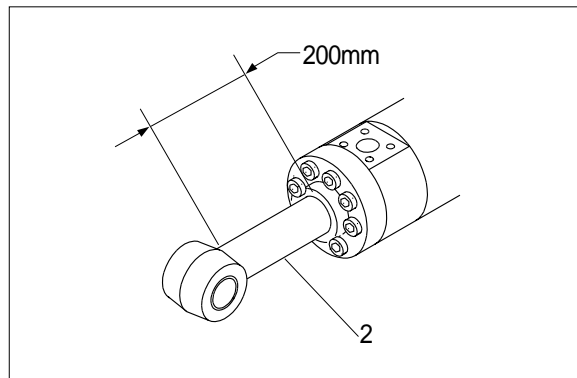
	Part name	Item	Size	Torque	
				kgf · m	lbf · ft
Socket head bolt	Bucket cylinder	21	M24	78±8	564±57.9
	Boom cylinder	24	M24	78±8	564±57.9
	Arm cylinder	29	M30	157±16	1136±116
Socket head bolt	Bucket cylinder	20	M14	15±2	109±14.5
	Boom cylinder	23	M14	15±2	109±14.5
	Arm cylinder	23	M18	32±3	232±21.7
Socket head bolt	Bucket cylinder	32	M10	6±1	43.4±7.2
	Boom cylinder	35	M10	6±1	43.4±7.2
	Arm cylinder	42	M10	6±1	43.4±7.2
Hexagon bolt	Bucket cylinder	24	M12	5.5±0.6	39.8±4.3
	Boom cylinder	27	M12	5.5±0.6	39.8±4.3
	Arm cylinder	33,41	M12	5.5±0.6	39.8±4.3
Hexagon bolt	Bucket cylinder	27	M10	3.2±0.4	23.1±2.9
Nut	Boom cylinder	30	M10	3.2±0.4	23.1±2.9
	Arm cylinder	36,44	M10	3.2±0.4	23.1±2.9

3) DISASSEMBLY

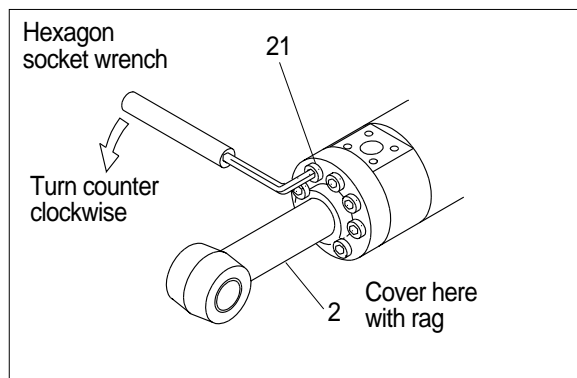
(1) Remove cylinder head and piston rod

- 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.

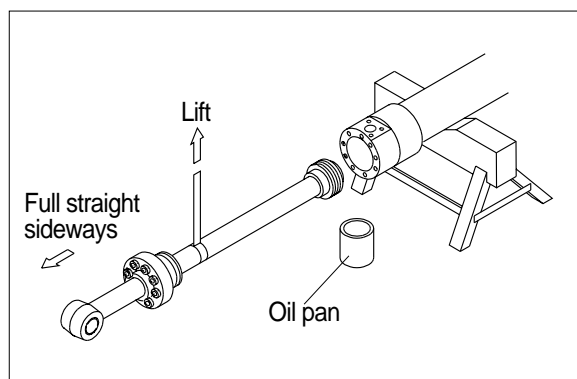
- ② Pull out piston rod(2) about 200mm (7.1in). Because the piston rod is rather heavy, finish extending it with air pressure after the oil draining operation.



- 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.

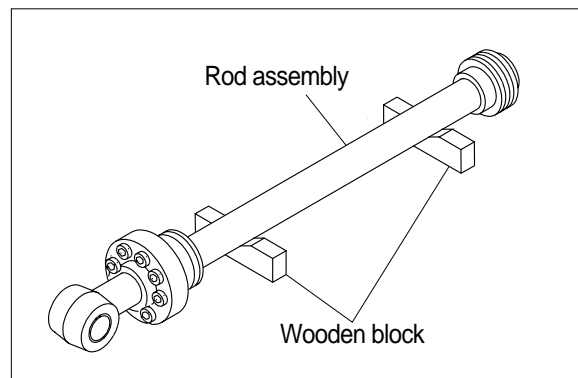


- ④ Draw out cylinder head(3) and piston rod assembly together from cylinder tube(1).
- ※ Since the piston rod assembly is heavy in this case, lift the tip of the piston rod(2) with a crane or some means and draw it out. However, when piston rod(2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



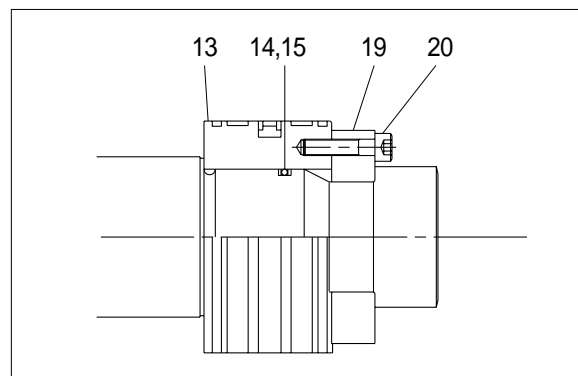
- ※ Note that the plated surface of piston rod(2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

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



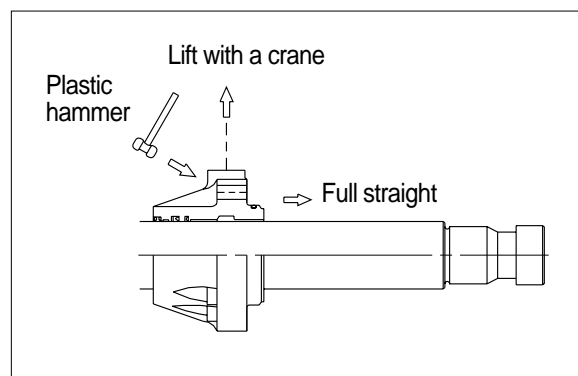
(2) Remove piston and cylinder head

- ① Remove spacer(19) and hex socket bolt (20).
 - ※ Since hex socket bolt(20) is tightened to a high torque, use a hydraulic and power wrench that utilizes a hydraulic cylinder, to remove the hex socket bolt(20).
- ② Remove piston assembly(13), back up ring(15) and O-ring(14).



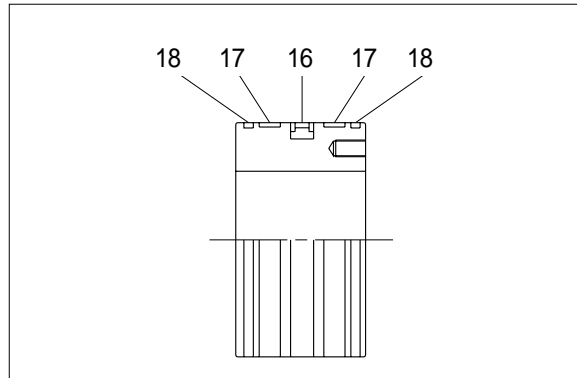
- ③ Remove the cylinder head assembly from piston rod(2).
 - ※ If it is too heavy to move, move it by striking the flanged part of cylinder head (3) with a plastic hammer.
 - ※ Pull it straight with cylinder head assembly lifted with a crane.

Exercise with care so as not to damage the lip of du bushing(4) and packing (5,6,7,8,9,10) by the threads of piston rod(2).



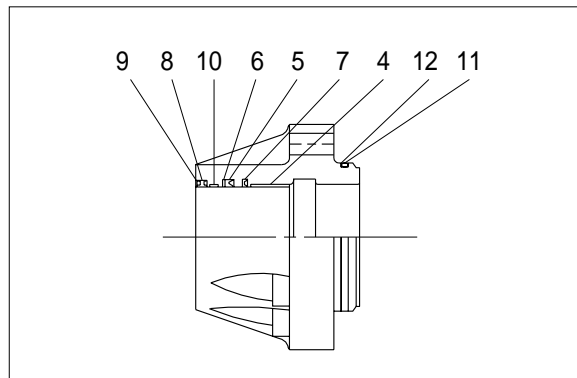
(3) Disassemble the piston assembly

- ① Remove wear ring(17).
 - ② Remove dust ring(18) and piston seal(16).
- ※ Exercise with care in this operation not to damage the grooves.



(4) Disassemble cylinder head assembly

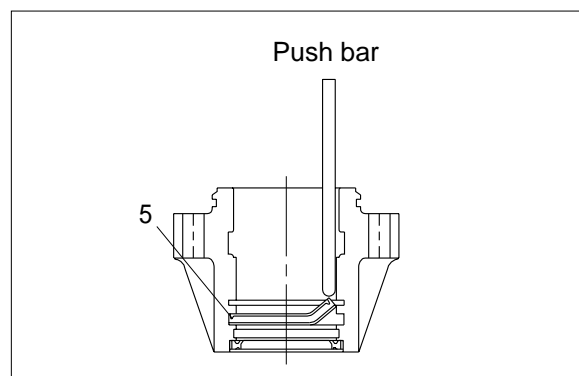
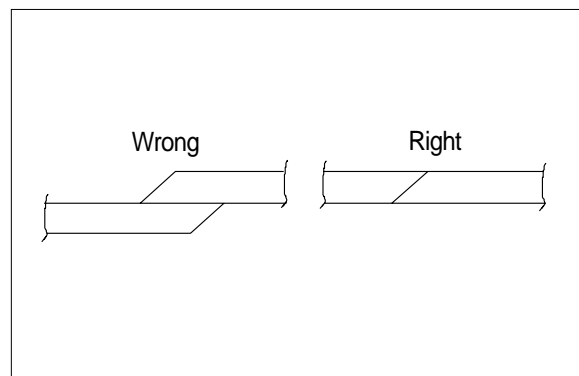
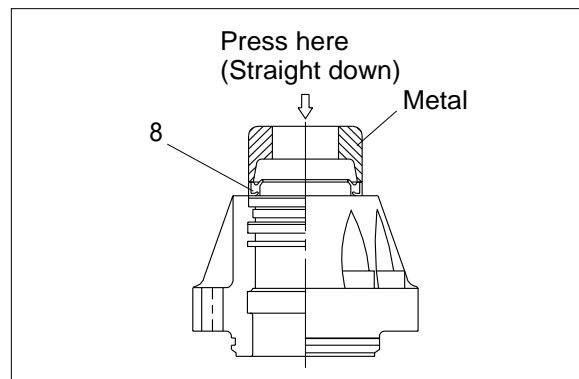
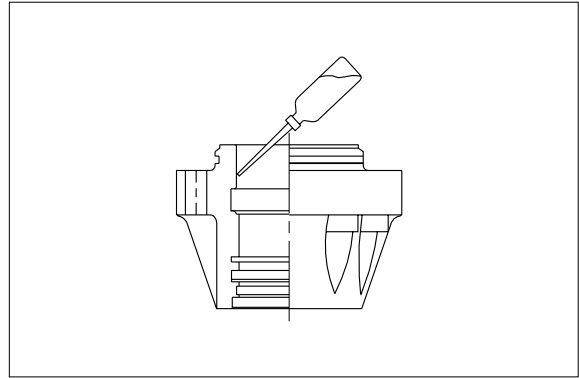
- ① Remove back up ring(12) and O-ring (11).
 - ② Remove snap ring(9) and dust wiper(8).
 - ③ Remove wear ring(10), back up ring(6), rod seal(5) and buffer ring(7).
- ※ Exercise with care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.



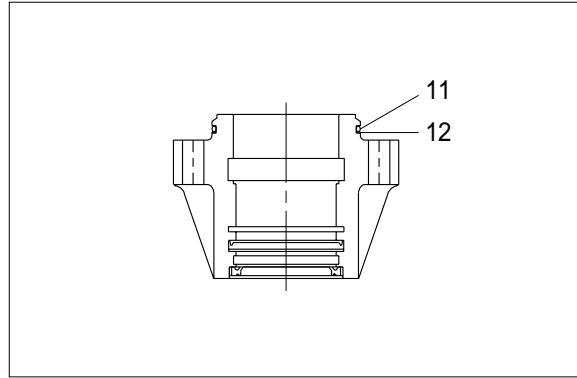
4) ASSEMBLY

(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 wiper(8) with grease and fit dust wiper(8) to the bottom of the hole of dust wiper.
At this time, press a pad metal to the metal ring of dust wiper.
- ③ Fit snap ring(9) to the stop face.
- ④ Fit wear ring(10), 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 one side 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 figure.

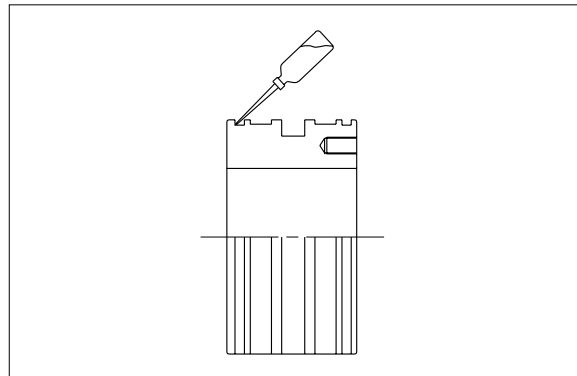


- ⑤ Fit back up ring(12) to cylinder head (3).
- ※ Put the back up ring in the warm water of 30~50°C
- ⑥ Fit O-ring(11) to cylinder head(3).

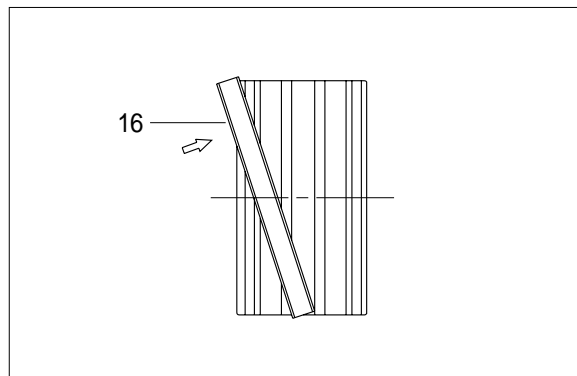


(2) Assemble piston assembly

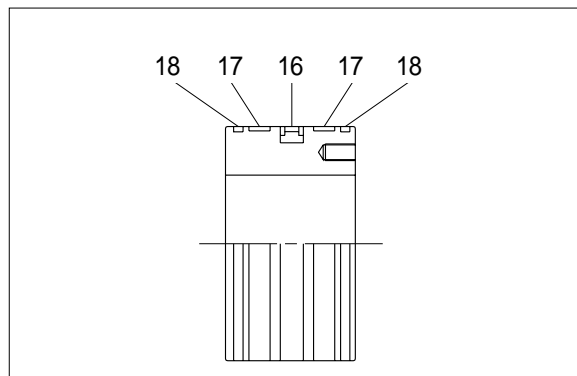
- ※ Check for scratches or rough surfaces. If found, smooth with an oil stone.
- ① Coat the outer face of piston(13) with hydraulic oil.



- ② Fit piston seal(16) 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.

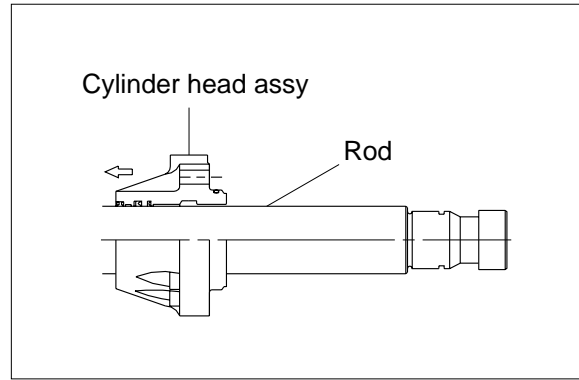


- ③ Fit wear ring(17) and piston ring(18) to piston(13).

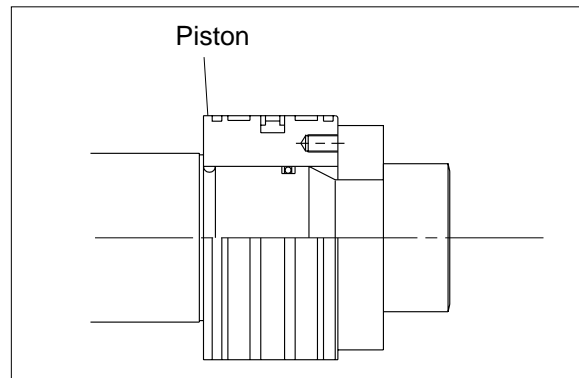


(3) Install piston and cylinder head

- 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.



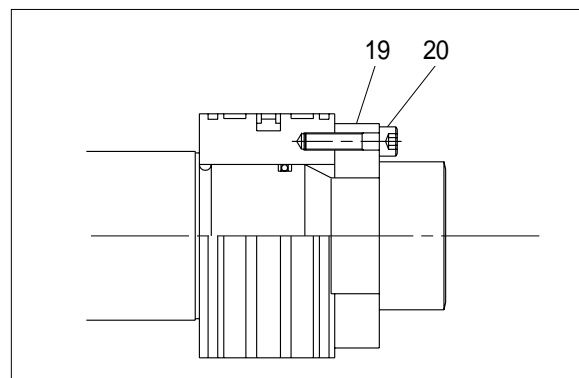
- ④ Fit rod assembly to piston.



- ⑤ Fit spacer(19) and hex socket bolt(20) to piston.

· Tightening torque :

Item	kgf · m	lbf · ft
Bucket	15±2	108±14
Boom	15±2	108±14
Arm	32±3	231±22



(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 into 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.

