

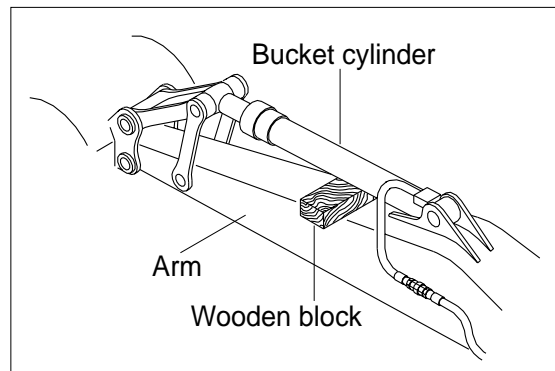
## GROUP 9 BOOM, ARM AND BUCKET CYLINDER

### 1. REMOVAL AND INSTALL

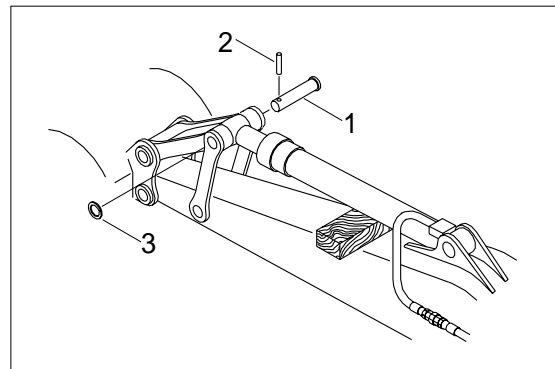
#### 1) BUCKET CYLINDER

##### (1) Removal

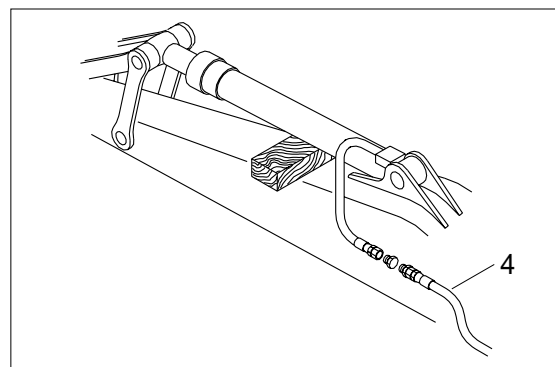
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
  - ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
  - ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
  - ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.
- ① Set block between bucket cylinder and arm.



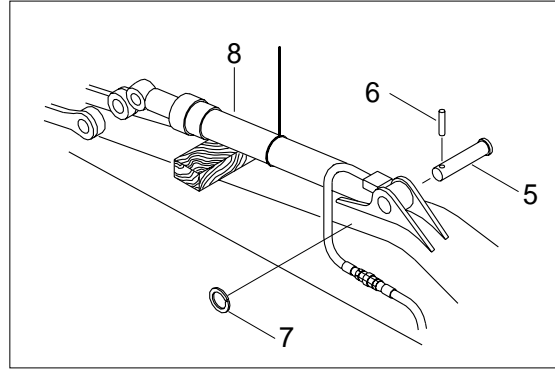
- ② Remove spring(3), pin stopper(2) and pull out pin(1).
- ※ Tie the rod with wire to prevent it from coming out.



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

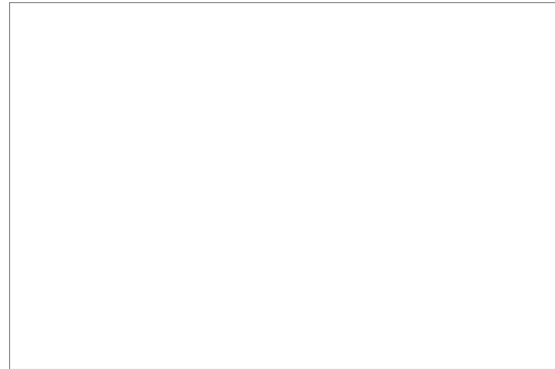


- ④ Sling bucket cylinder assembly, and remove spring(7), pin stopper(6), then pull out pin(5).
- ⑤ Remove bucket cylinder assembly(8)
  - Weight : 97kg



## (2) Install

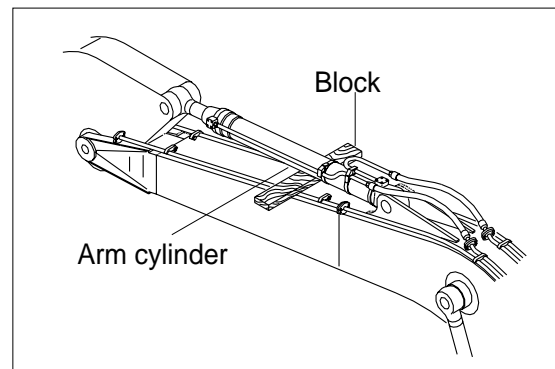
- ① Carry out installation in the reverse order to removal.
- ⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
  - ※ Bleed the air from the bucket cylinder.
  - ※ Confirmed the hydraulic oil level and check the hydraulic oil leak or not.



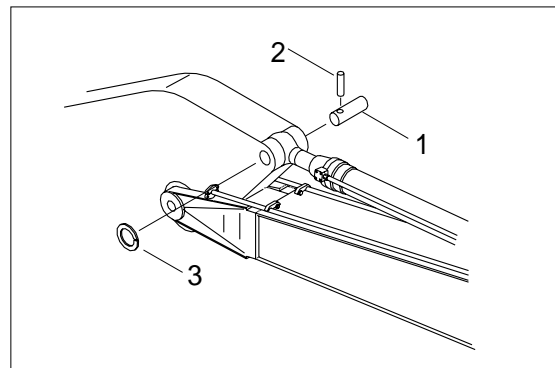
## 1) ARM CYLINDER

### (1) Removal

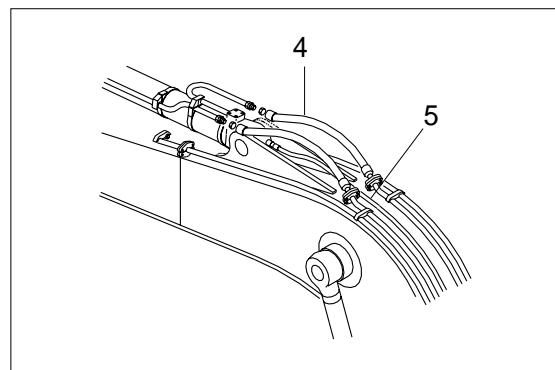
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
  - ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
  - ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
  - ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.
- ① Set block between arm cylinder and boom.



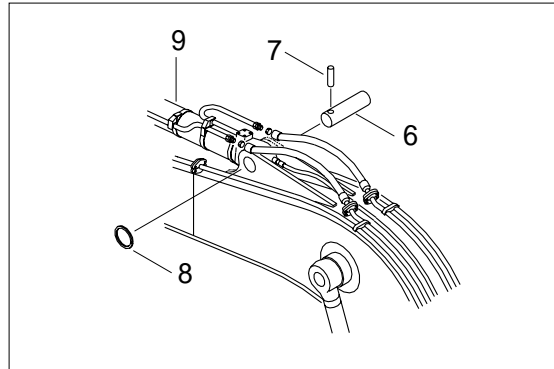
- ② Remove spring(3), pin stopper(2) and pull out pin(1).
- ※ Tie the rod with wire to prevent it from coming out.



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

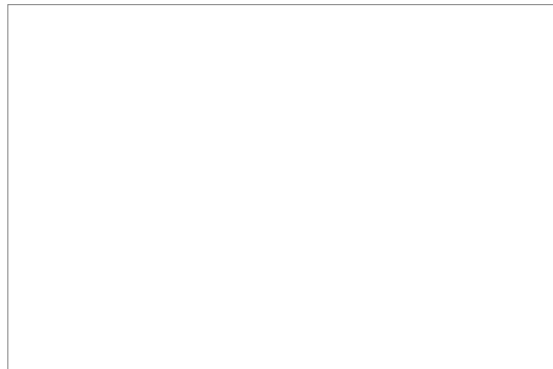


- ⑤ Sling bucket arm assembly(9), and remove spring(8), pin stopper(7), then pull out pin(6).
- ⑥ Remove arm cylinder assembly(9)
  - Weight : 153kg



## (2) Install

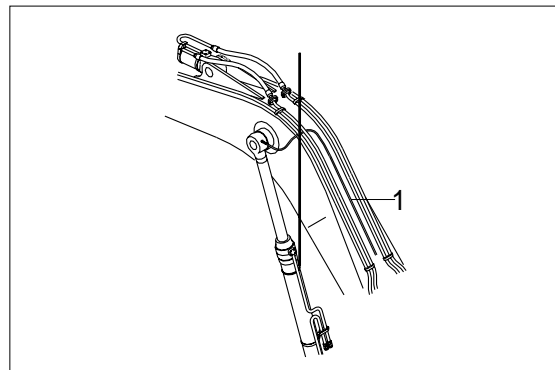
- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
  - ※ Bleed the air from the arm cylinder.
  - ※ Confirmed the hydraulic oil level and check the hydraulic oil leak or not.



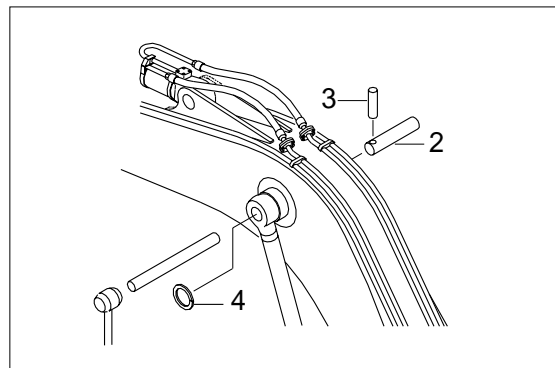
### 3) BOOM CYLINDER

#### (1) Removal

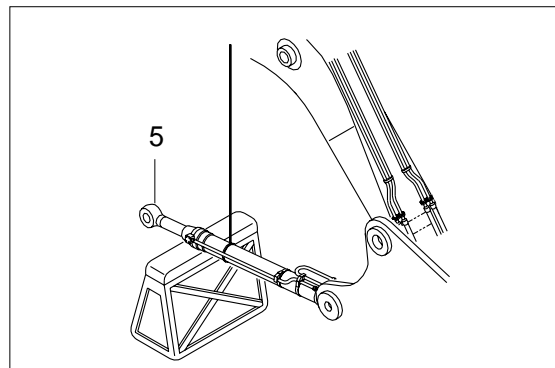
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
  - ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
  - ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
  - ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.
- ① Disconnect greasing hoses(1).
  - ② Sling boom cylinder assembly.



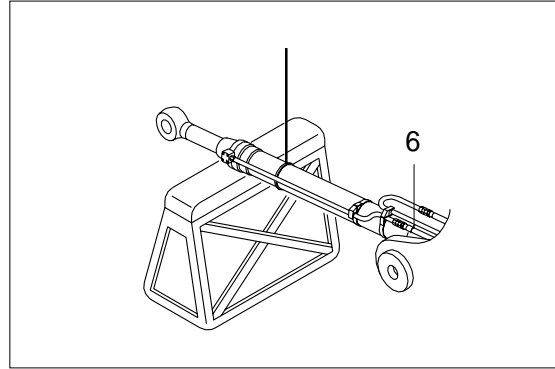
- ③ Remove spring(4), pin stopper(3) and pull out pin(2).
- ※ Tie the rod with wire to prevent it from coming out.



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



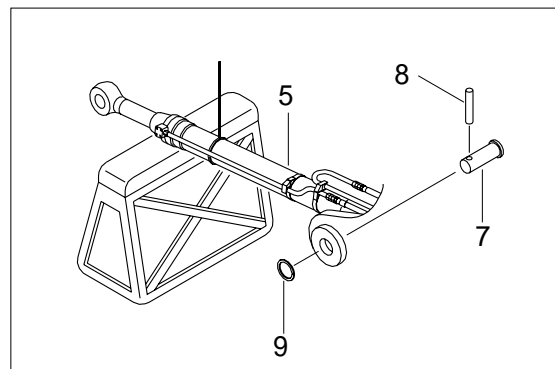
- ⑤ Disconnect boom cylinder hoses(6), and put plugs on cylinder pipe.



- ⑥ Remove spring(9), pin stopper(8), then pull out pin(7).

- ⑦ Remove boom cylinder assembly(5)

· Weight : 123kg

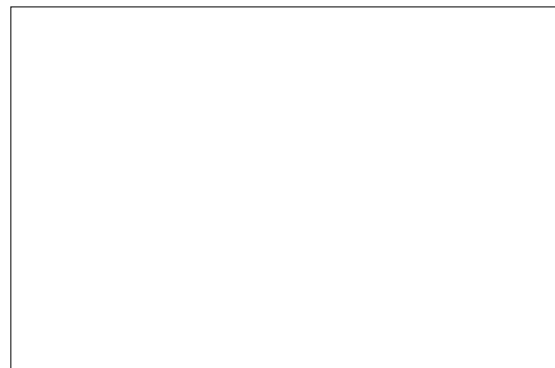


## (2) Install

- 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.

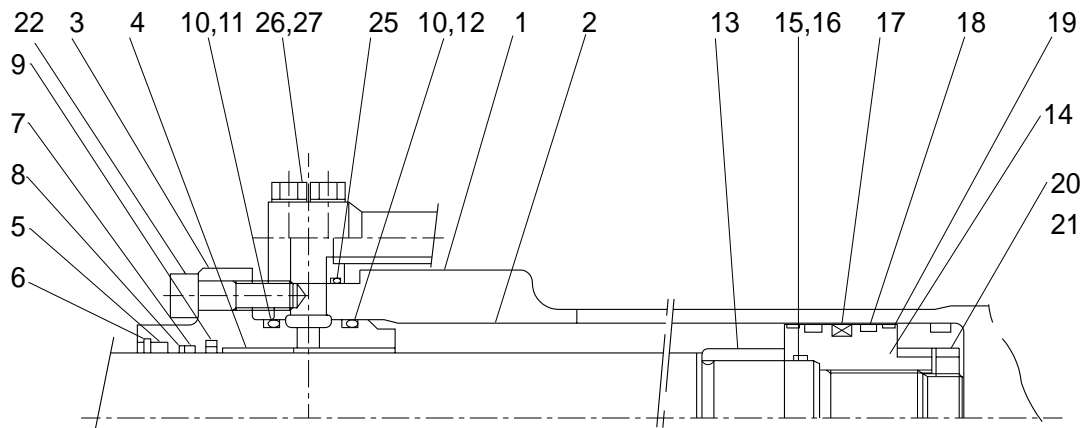
- ※ Bleed the air from the boom cylinder.
- ※ Confirmed the hydraulic oil level and check the hydraulic oil leak or not.



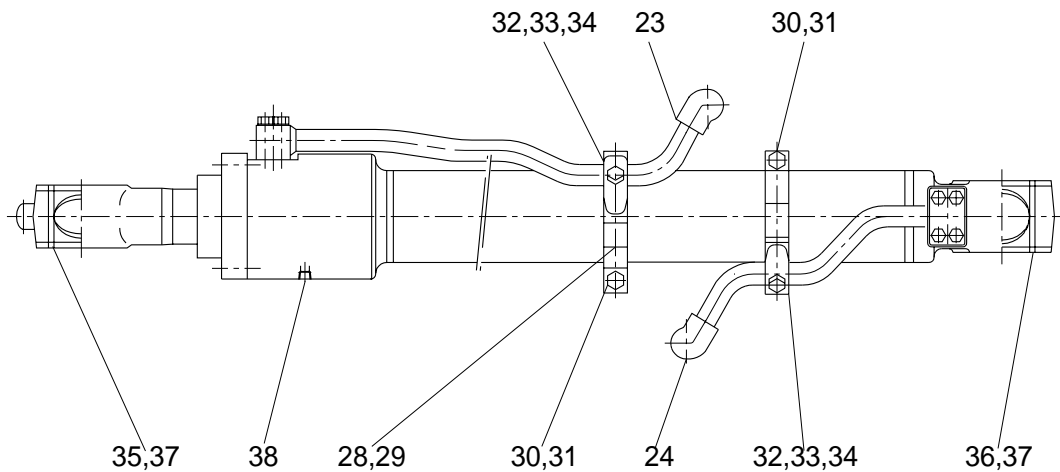
## 2. DISASSEMBLY AND ASSEMBLY

### 1) STRUCTURE

#### (1) Bucket cylinder

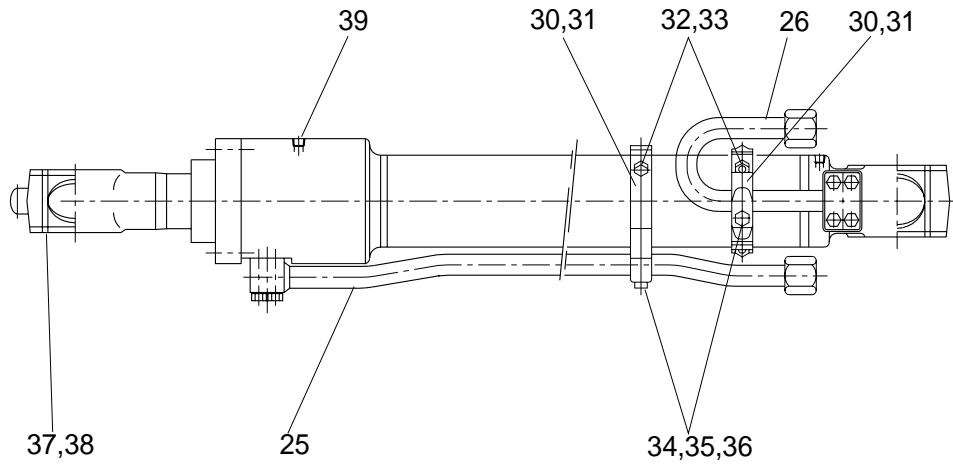
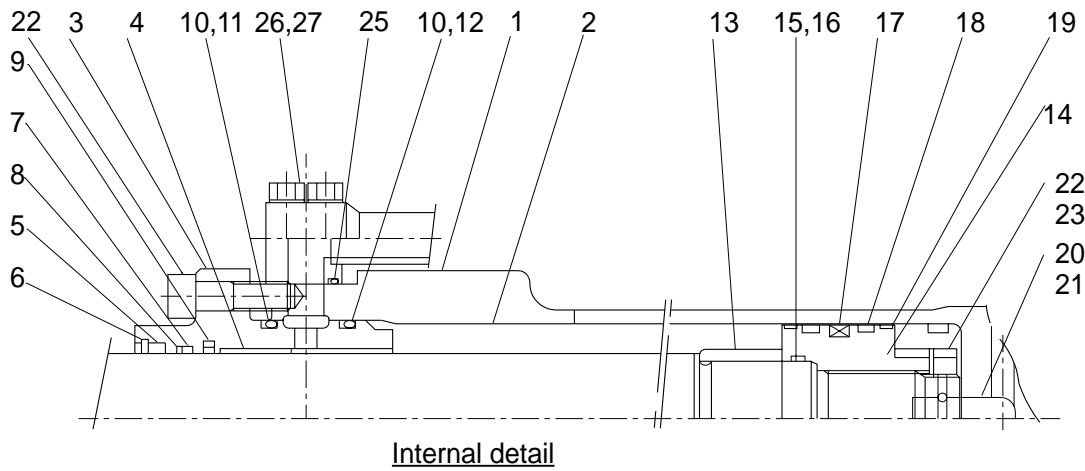


Internal detail



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

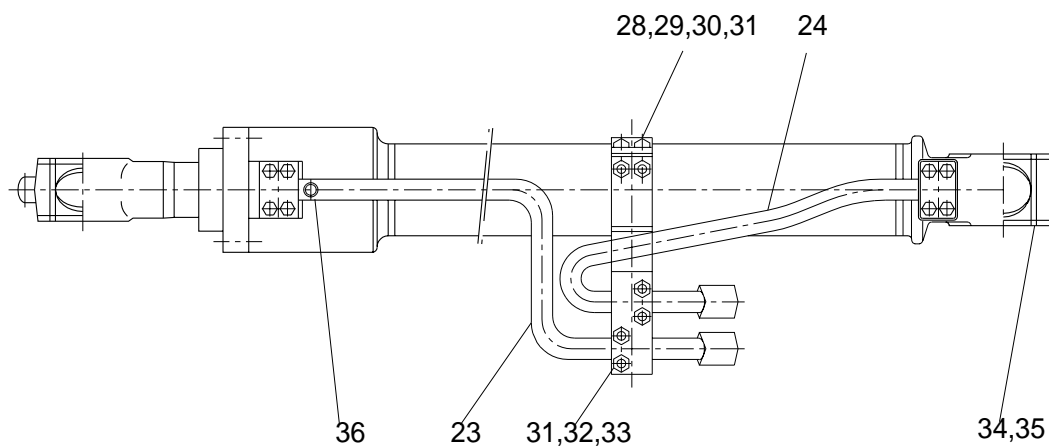
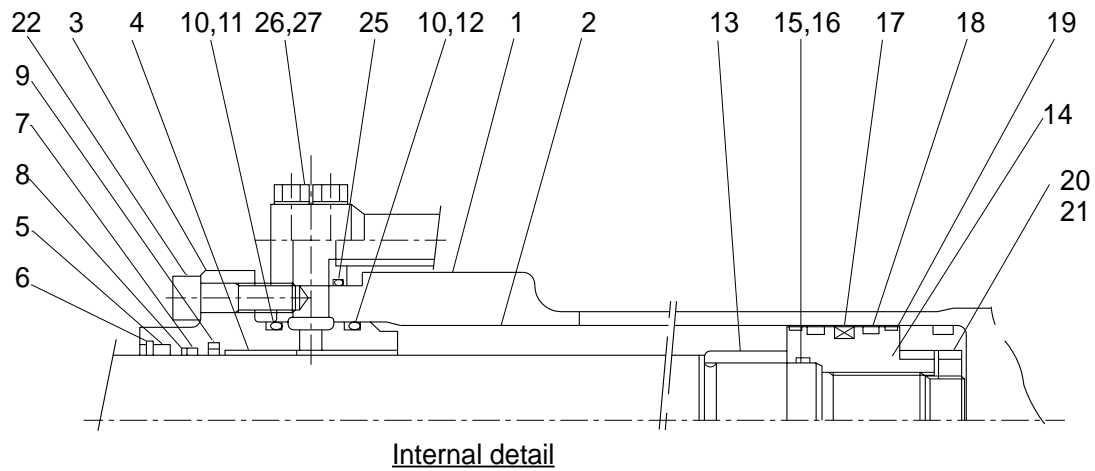
**(2) Arm cylinder**



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



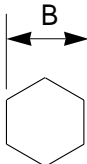
### (3) Boom cylinder



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

## 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	

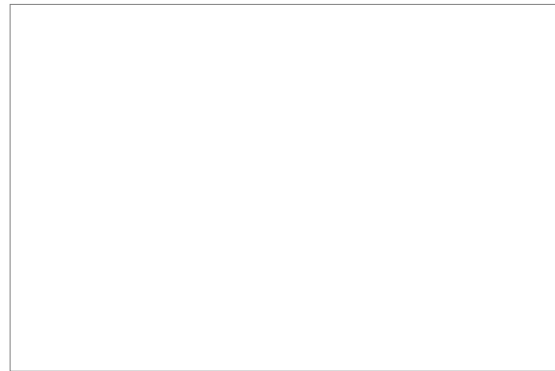
### (2) Tightening torque

Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Socket head bolt	bucket cylinder	22	M 16	23±2.3	166.4±16.6
	boom cylinder				
	arm cylinder	24	M 18	32±3.2	231.5±23.1
Hexagon head bolt	bucket cylinder	26	M 10	5.5±0.6	39.8±4.3
	arm cylinder	28			
	boom cylinder	26	M 8	3.0±0.3	21.7±2.2
	bucket cylinder	30	M 10	3.2±0.3	23.1±2.3
	arm cylinder	32	M 10	3.2±0.3	23.1±2.3
	boom cylinder	33	M 10	3.2±0.3	23.1±2.3
	boom cylinder	30	M 10	3.2±0.3	23.1±2.3
	bucket cylinder	33	M 12	4.1 0.4	29.7±3.0
	arm cylinder	35	M 12	4.1±0.4	29.7±3.0
Lock nut	bucket cylinder	20	-	150±15	1085.0±109
	boom cylinder				
	arm cylinder	22	-		
Piston	bucket cylinder	14	-	100±10	723.3±72.3
	arm cylinder				
	boom cylinder				

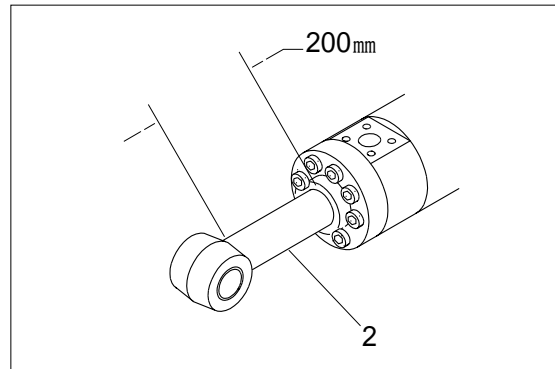
### 3) DISASSEMBLY

#### (1) Remove cylinder head and piston rod

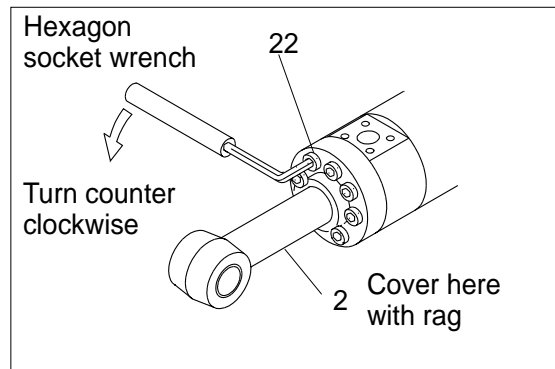
- ① Hold the clevis section of the tube in a vise.
- ※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.



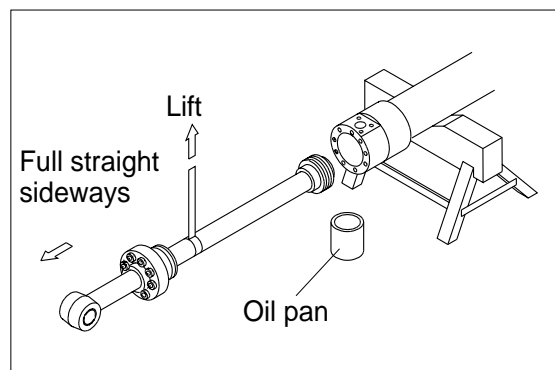
- ② Pull out piston rod(2) about 200mm (7.1in). Because the piston rod is rather heavy, finish extending it with air pressure after the oil draining operation.



- ③ Loosen and remove socket bolts(22) of the cylinder head in sequence.
- ※ Cover the extracted piston rod(2) with rag to prevent it from being accidentally damaged during operation.



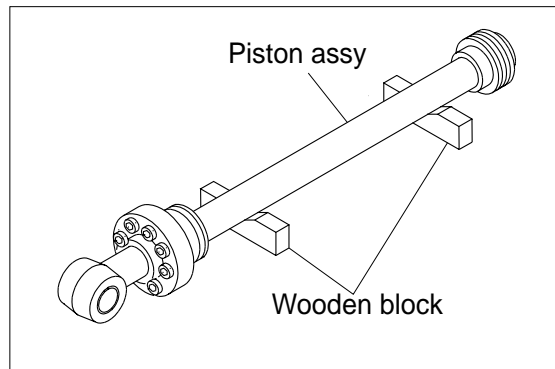
- ④ Draw out cylinder head(3) and piston rod assembly together from cylinder tube(1).
- ※ Since the piston rod assembly is heavy in this case, lift the tip of the piston rod(2) with a crane or some means and draw it out. However, when piston rod(2) has been drawn out to approximately two thirds of its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

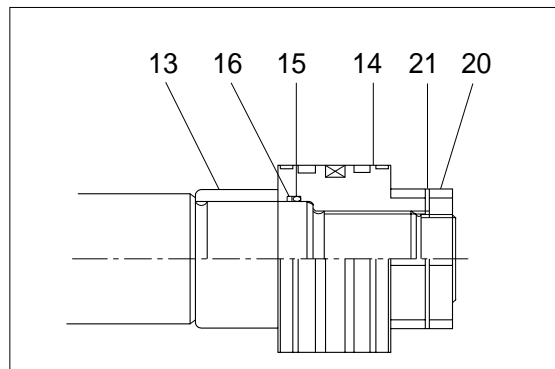


- ⑤ Place the removed piston rod assembly on a wooden V-block that is set level.
- \* Cover a V-block with soft rag.

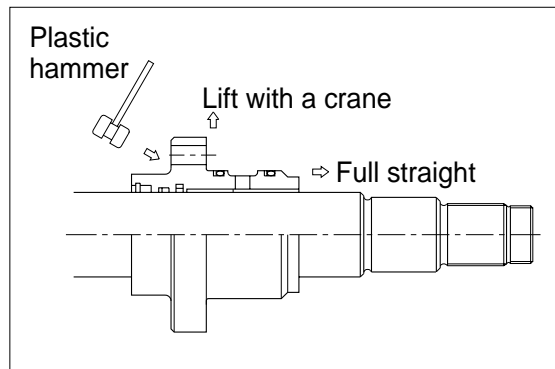


## (2) Remove piston and cylinder head

- ① Remove lock nut(20) and washer(21).
- \* Since lock nut(20) is tightened to a high torque, use a hydraulic and power wrench that utilizes a hydraulic cylinder, to remove the lock nut(20).
- ② Remove piston assembly(14), back up ring(16), O-ring(15) and cushion ring (13).

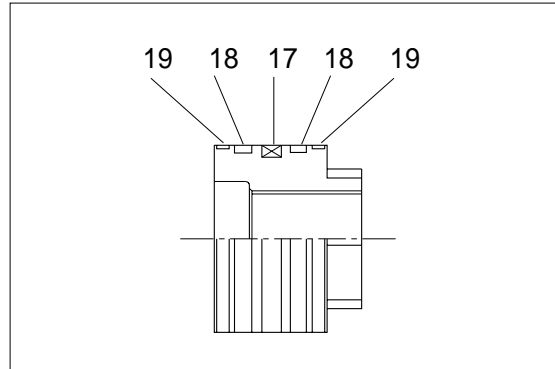


- ③ Remove the cylinder head assembly from piston rod(2).
  - \* If it is too heavy to move, move it by striking the flanged part of cylinder head (3) with a plastic hammer.
  - \* Pull it straight with cylinder head assembly lifted with a crane.
- Exercise care so as not to damage the lip of rod bushing(4)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



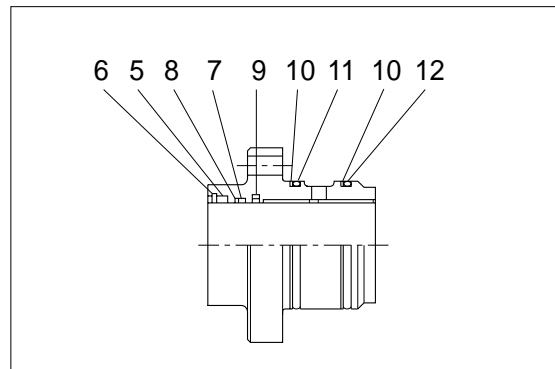
### (3) Disassemble the piston assembly

- ① Remove wear ring(18).
  - ② Remove dust ring(19) and piston seal(17).
- ※ Exercise care in this operation not to damage the grooves.



### (4) Disassemble cylinder head assembly

- ① Remove back up ring(12), 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.

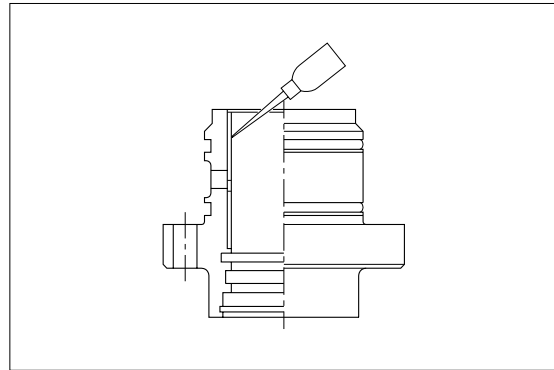


#### 4) ASSEMBLY

##### (1) Assemble cylinder head assembly

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

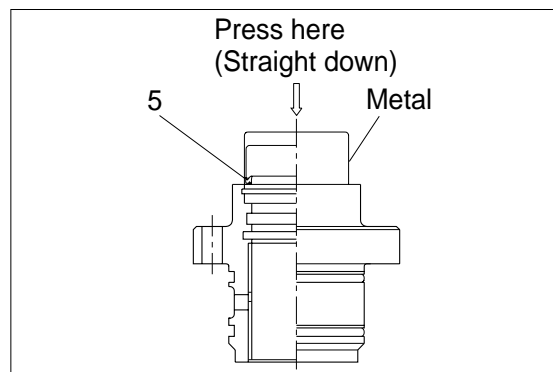
① Coat the inner face of cylinder head(3) with hydraulic oil.



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.

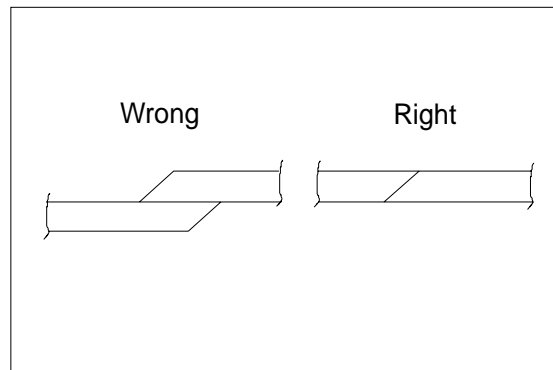
③ Fit snap ring(6) to the stop face.



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

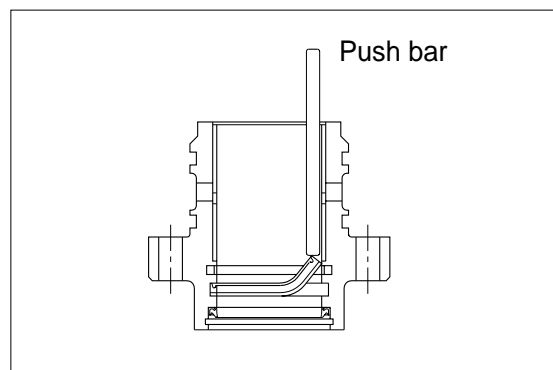
※ Coat each packing with hydraulic oil before fitting it.

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

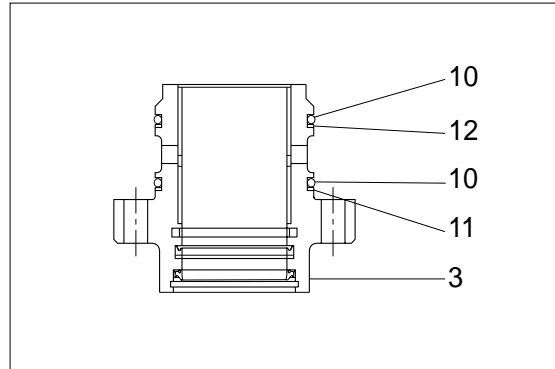


※ Rod seal(7) has its own fitting direction. Therefore, confirm it before fitting them.

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

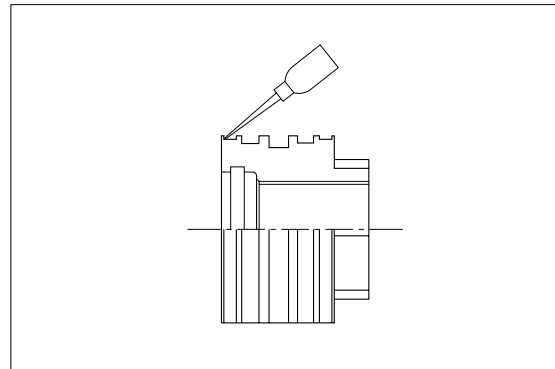


- ⑤ Fit back up ring(11,12) to cylinder head (3).
- ※ Put the backup ring in the warm water of 30~50°C
- ⑥ Fit O-ring(10) to cylinder head(3).

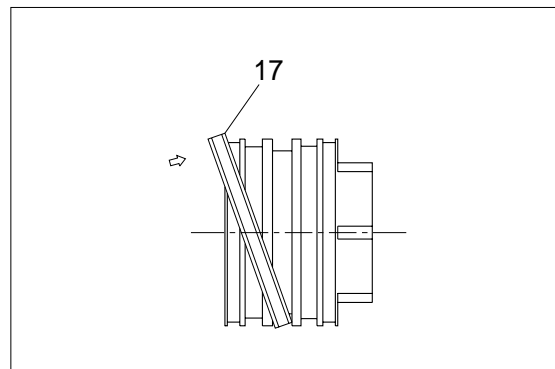


**(2) Assemble piston assembly**

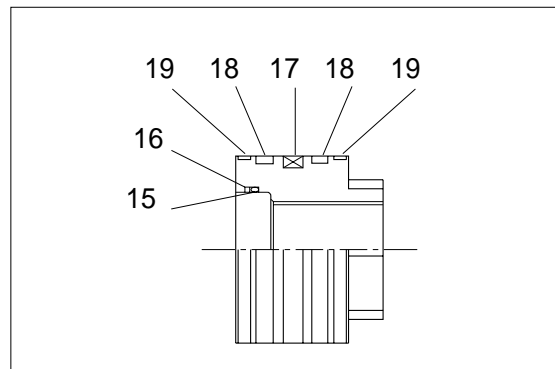
- ※ Check for scratches or rough surfaces. If found smooth with an oil stone.
- ① Coat the outer face of piston(14) with hydraulic oil.



- ② Fit piston seal(17) 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.

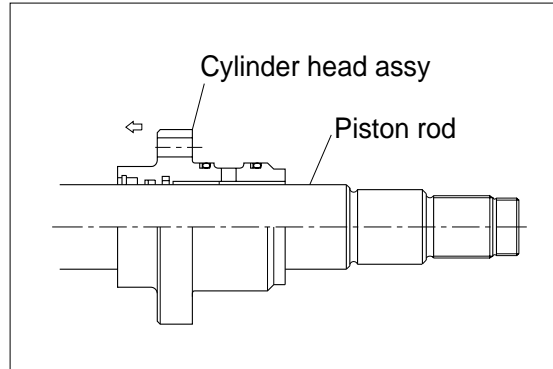


- ③ Fit wear ring(18) and dust ring(19) to piston(14).
- ④ Fit back up ring(16) and O-ring(15) to piston(14).

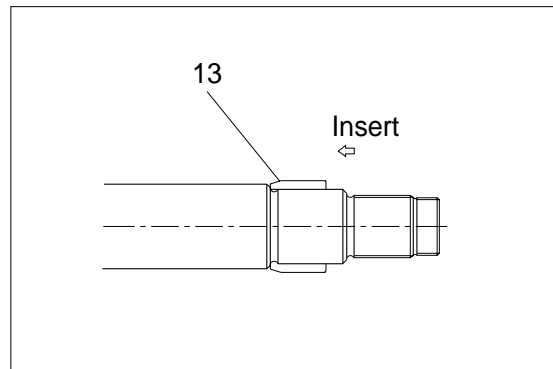


### (3) Install piston and cylinder head

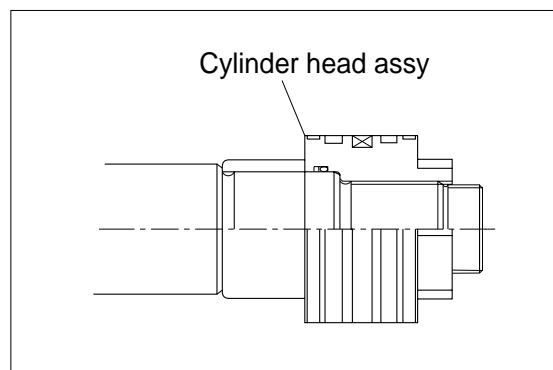
- ① Fix the piston rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of piston rod(2), the inner surface of piston and cylinder head.
- ③ Insert cylinder head assembly to piston rod.



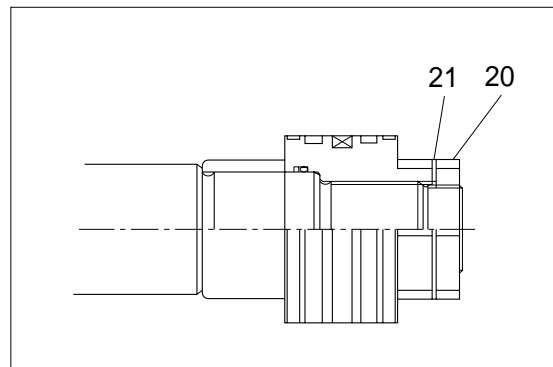
- ④ Insert cushion ring(13) to piston rod.
- \* Note that cushion ring(13) has a direction in which it should be fitted.



- ⑤ Fit cylinder head assembly to piston rod.
- Tightening torque :  
 $100 \pm 10 \text{ kgf} \cdot \text{m} (723 \pm 72 \text{ lbf} \cdot \text{ft})$



- ⑥ Fit lock washer(21) and lock nut(20) to piston rod.
- Tightening torque :  
 $150 \pm 15 \text{ kgf} \cdot \text{m} (7085 \pm 109 \text{ lbf} \cdot \text{ft})$





#### (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.

