



Maintenance Procedure

PRODUCT NAME

Rotary Cylinder

MODEL / Series / Product Number

MRQ Series

MRQ\*32, MRQ\*40

**SMC Corporation**



# Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)\*<sup>1)</sup>, and other safety regulations.

\*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components  
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components  
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements  
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots  
etc.



## **Danger**

**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



## **Warning**

**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



## **Caution**

**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

## **Warning**

### **1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### **2. Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

### **3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### **4. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.**

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.



# Safety Instructions

## Caution

**We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.**

**Use in non-manufacturing industries is not covered.**

Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

## Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

### Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)  
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.  
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

**\*2) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

### Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

# Maintenance Procedure

Rotary Cylinder MRQ Series

Model : MRQ\*32, MRQ\*40

Rotary cylinder require periodic maintenance appropriate for the operating conditions to be used in the best condition.

Annual maintenance is desirable in general and replacement of consumable parts such as piston seal is recommended every three years even if there is no problem.

For precautions, refer to the catalogue and operation manual.

Rotary cylinder maintenance procedures are described below.

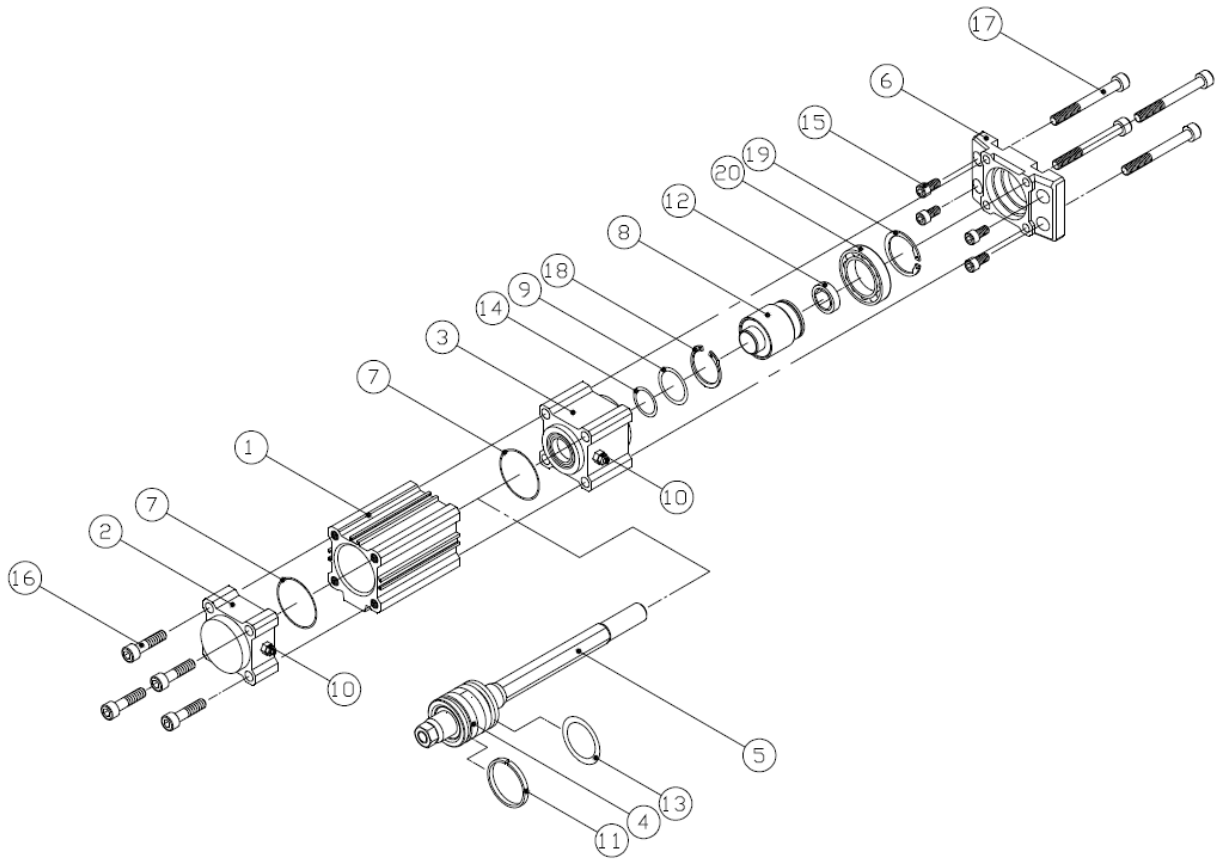
## 1. Precautions on Maintenance

- a. Disassembling the product will void SMC's warranty. If disassembly is really necessary it is recommended to fully understand the internal construction before disassembling the products.
- b. Disassemble in a clean and spacious workplace.
- c. Make sure to protect ports to avoid dust from entering the inside when rotary cylinder is removed.
- d. Be careful to ensure not to damage internal sliding surface of the rotary cylinder when disassembling it.
- e. When applying grease on replacement parts, apply it thoroughly so that they look glossy.
- f. Contact SMC whenever a question arises in maintenance.

## 2. Component parts

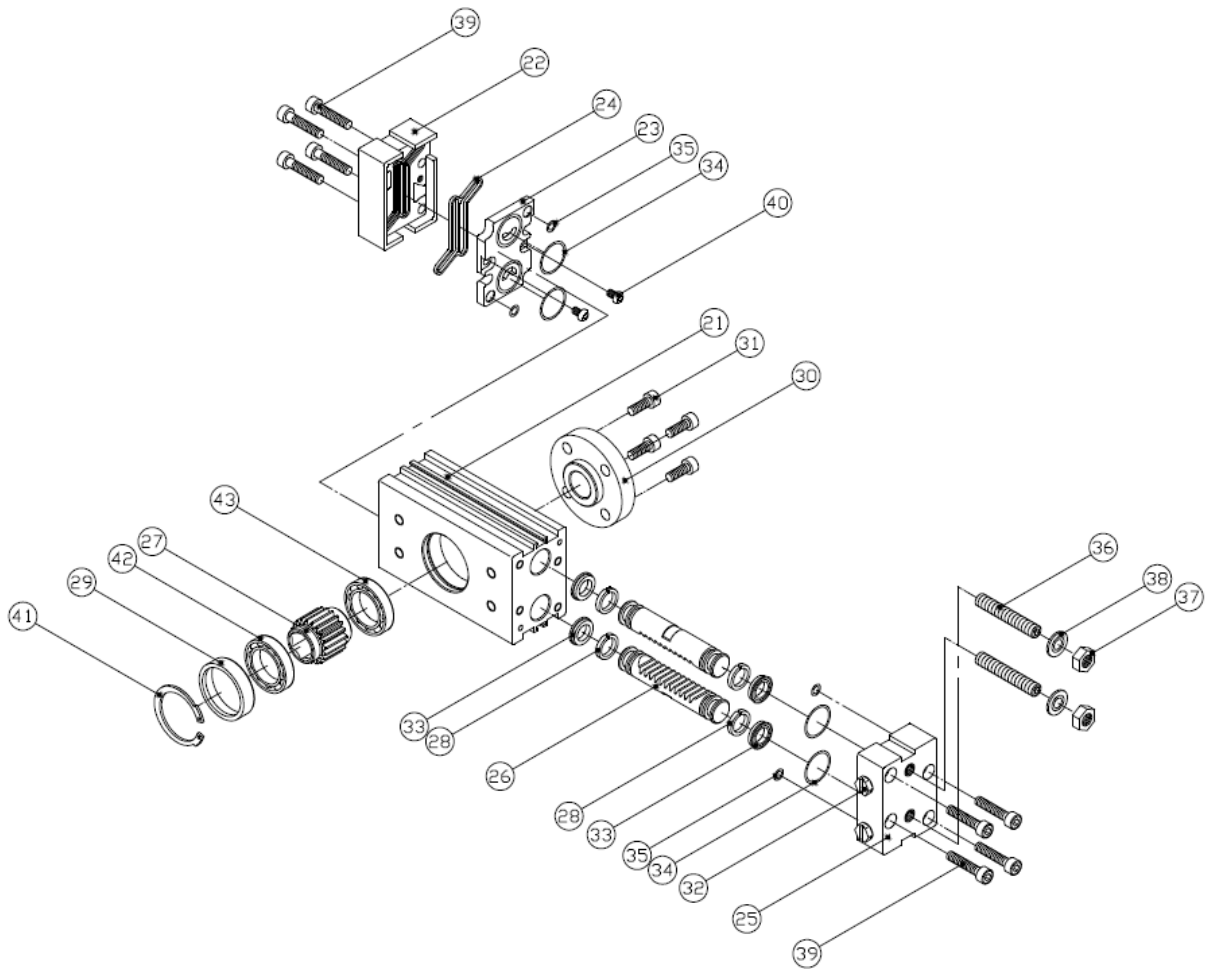
The components of MRQ\*S32 and 40 are as shown below.  
Note that only maintenance related components are shown.

[ Linear motion ]



10	Cushion valve assembly	2	20	Bearing	1
9	O-ring retainer	1	19	S-Shape retaining ring	1
8	Rod packing guide	1	18	R-Shape retaining ring	1
7	O-ring	2	17	Hexagon socket head cap screw	4
6	Flange	1	16	Hexagon socket head cap screw	4
5	Piston rod Assembly	1	15	Hexagon socket head cap screw	4
4	Piston	1	14	O-ring	1
3	Rod cover	1	13	Piston seal	1
2	Head cover	1	12	Rod packing	1
1	Tube	1	11	Wearing	1
No	Description	Qty	No	Description	Qty

[ Rotary motion ]



32	Plug	2			
31	Hexagon socket head cap screw	4	43	Bearing	1
30	Steady brace cover	1	42	Bearing	1
29	Bearing color (Size 32 only)	1	41	R-Shape retaining ring	1
28	Wearing	4	40	Round head Phillips screw	2
27	Pinion gear	1	39	Hexagon socket head cap screw	8
26	Piston	2	38	Seal washer	2
25	End cover	1	37	Hexagon small nut	2
24	Seal	1	36	Hexagon socket head set screw	2
23	Plate	1	35	O-ring	4
22	Cover	1	34	O-ring	4
21	Body	1	33	Piston seal	4
No	Description	Qty	No	Description	Qty

### 3. Disassembling Procedure

#### 3.1 Disassembling procedure for linear motion and rotary motion.

- a. Loosen the hexagon socket head cap screws to separate the linear actuator from the rotary actuator.

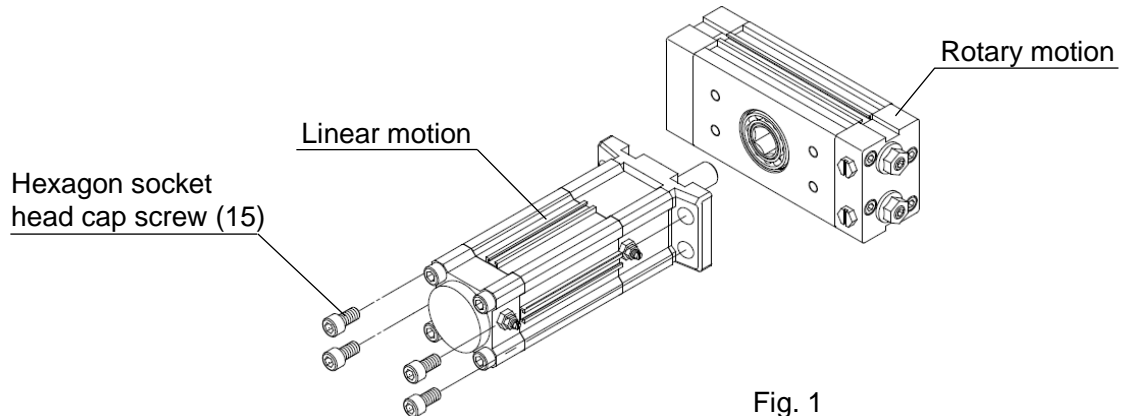


Fig. 1

#### 3.2 Disassembling procedure for linear motion.

- a. Loosen the hexagon socket head cap screws (17) and remove the flange (6).
- b. Remove the rod packing guide assembly from the rod cover (3).

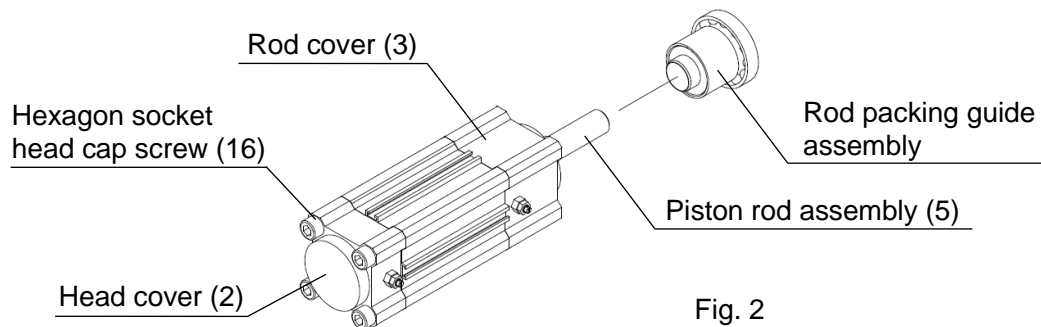


Fig. 2

- c. Remove the rod cover (3) from the tube (1).
- d. Pull out the Piston rod assembly (5) from the tube (1).
- e. Loosen the hexagon socket head cap screws (16) and remove the head cover (2).

#### 3.3 Disassembling procedure for rotary motion.

- a. Loosen the hexagon socket head cap screws (31) and remove the steady brace cover (30).
- b. Loosen the hexagon socket head cap screws (39) and remove the end cover (25).
- c. Loosen the hexagon socket head cap screws (39) and remove the end cover (22).
- d. Remove the R-shaped retaining ring and pull out the bearing collar, the bearing, and then the pinion gear in that order. (Only the size 32 has a bearing collar)
- e. Push out piston (26) from one side as its end face can be seen inside the body(21).
- f. Take out the bearing (43) from the body (21).

#### 4. Spare Parts Replacement Procedure

All the consumable parts such as piston packing are available as a maintenance kit. The part numbers are shown in Table 1 below.

Table 1 Maintenance Kit Part Number

Model	Maintenance kit part number	Contents	Qty
MRQ*S32	P31701-1	Seal (24)	1
		Wearing (28)	4
		O-ring (7)	2
		Rod seal (12)	1
		Piston seal (33)	4
		O-ring (14)	1
		O-ring (34)	4
		O-ring (35)	4
		Piston seal (13)	1
		Seal washer (38)	2
		Wearing (11)	1
MRQ*S40	P31702-1	Seal (24)	1
		Wearing (28)	4
		Tube gasket (7)	2
		Rod seal (12)	1
		Piston seal (33)	4
		O-ring (14)	1
		O-ring (34)	4
		O-ring (35)	4
		Piston seal (13)	1
		Seal washer (38)	2
		Wearing (11)	1

A grease pack (10g) included.

Order with the following part number when only the grease pack is needed.

Grease pack part number : GR-S-010 (10g)

A



[ Linear motion ]

#### 4.1 Replacing the rod packing (12)

- a. Apply grease to new rod packing (12).
- b. Remove old rod packing (12) from rod packing guide (8).
- c. Attach new rod packing (12) inside the rod packing guide (8).  
The rod seal has a specified mounting direction as shown in Fig. 3 and care should be taken to install it in the correct direction.
- d. Position the rod seal so that it contacts the hexagon of the non-rotating guide.  
(See Picture 1)

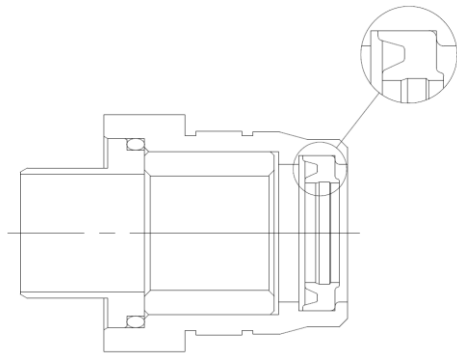
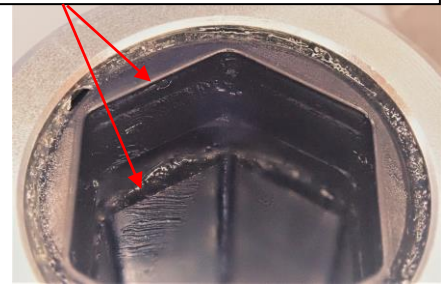


Fig. 3 Rod packing Orientation

Position the rod seal so that it contacts the hexagon of the non-rotating guide.



Picture 1 Rod seal mounting position

#### 4.2 [ Rod cover side ] Replacing the O-ring (7)(14)

- a. Apply grease to new O-ring (7)(14).
- b. Remove old O-ring (7) from rod cover (3).
- c. Remove the R-shaped retaining ring from the rod cover and then remove the O-ring retainer and then the old O-ring in that order.
- d. Attach new O-ring (7)(14).
- e. Mount the O-ring retainer (9) and the R-shape retaining ring (18) on the rod cover (3) in this order.

#### 4.3 Replacing the wearing(11) and piston seal (13)

- a. Apply grease to new piston seal (13).
- b. Remove the old wear ring and the piston seal from the piston rod assembly.  
As the wear ring has a cut in the circumference, loosen and remove it.
- c. Insert a new wear ring and piston seal in the corresponding grooves.  
Stretch the wear ring to insert it into the wear ring groove.

[ Rotary motion ]

4.4 Replacing the wearing (28) and piston seal (33).

- a. Apply grease to new piston seal (33).
- b. Remove old wearing (28) and piston seal (33) from piston (26).  
As the wear ring has a cut in the circumference, loosen and remove it.
- c. Attach new wearing (28).  
Stretch the wear ring to insert it into the wear ring groove.
- d. Attach new piston seal (33).  
Set new piston seal : fit a part of piston seal on packing grooves and pull it to the opposite side for setting. Do not use a tool so as not to scratch packing.  
Follow the direction shown in Figure 4 for piston seal orientation.
- e. Check to see whether if piston seal (33) and wear rings (28) are set properly.  
Give special care for the position of piston seal.

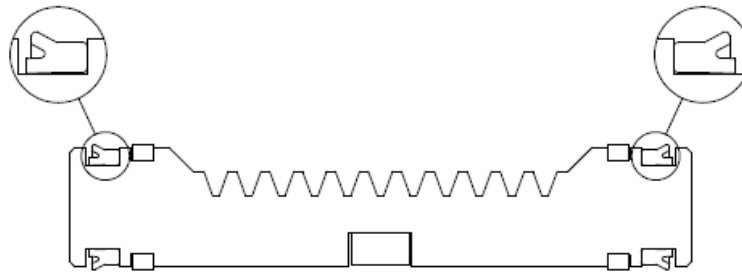


Fig.4 Piston Seal Orientation

4.5 [ Cover side ] Replacing the seal (24) and O-ring (34)(35)

- a. Apply grease to new seal (24) and O-ring (34)(35).
- b. Remove old O-ring (34)(35) from plate (23).
- c. Loosen the round head Phillips screw (40) and take off plate (23).
- d. Remove old seal (24) from cover (22).
- e. Set new seal (24) into packing groove of cover (22).
- f. Check to see whether if seal (24) is positioned in groove properly and put plate (23) back.
- g. Tighten round head Phillips screw (40) to fix plate (23). (Tightening torque: Table2-1)
- h. Attach new O-ring (34)(35) into groove of plate (23).

4.6 [ End cover side] Replacing the O-ring (34)(35)

- a. Apply grease to new O-ring (34)(35).
- b. Remove old O-ring (34)(35) from end cover (25).
- c. Attach new O-ring (34)(35) into groove of end cover (25).

#### 4.7 Replacing the seal washer (38)

- a. Loosen the hexagon small nut (37) and remove hexagon socket head set screw (36), hexagon small nut (37), and seal washer (38) from end cover (25).
- b. Pull out old seal washer (38) from hexagon socket head set screw (36).
- c. Attach new seal washer (38) to hexagon socket head set screw (36).
- d. Set hexagon socket head set screw (36) in end cover (25) and fix them with hexagon small nut (37). (Tightening torque: Table2-2)

### 5. Reassembly Procedure

#### 5.1 Reassembly procedure for linear motion

- a. Apply grease to inner cylinder surface of tube (1).
- b. Mount the head cover (2) on the tube (1) and fix it with the hexagon socket head cap screw (16). (Tightening torque: Table2-3)  
Pay attention to the direction of the tube (1) and head cover (2). \*
- c. Mount the piston rod assembly (5) on the tube (1).
- d. Mount the rod cover (3) on the tube (1).  
Pay attention to the direction of the tube (1) and rod cover (3). \*

(\*Assemble the components so that the tube mounting screws, the head cover, and the cushion valves on the rod cover are positioned as shown in Fig. 5.)

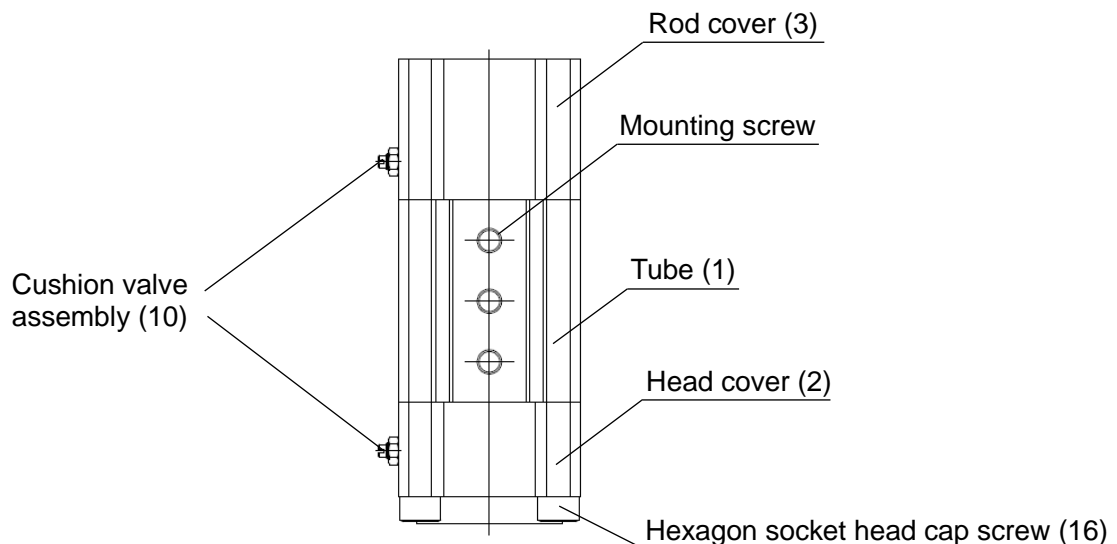


Fig. 5

- e. Mount the rod packing guide assembly on the rod cover (3).
- f. Mount the flange (6) on the rod cover (3) and fix it with the hexagon socket head cap screw (16). (Tightening torque : Table2-4)

## 5.2 Reassembly procedure for rotary motion

- a. Apply grease to inner cylinder surface of body (21).
- b. Mount the bearing (43) on the body (21).
- c. Insert the two piston assemblies into the body (21).

Please refer to Figure 6 for the position and orientation of the piston assembly.  
Be careful not to damage piston seal in Section A, Figure 6, while inserting.

(Press down piston seal (33) with a round-ended spatula and pass it through Section A.)

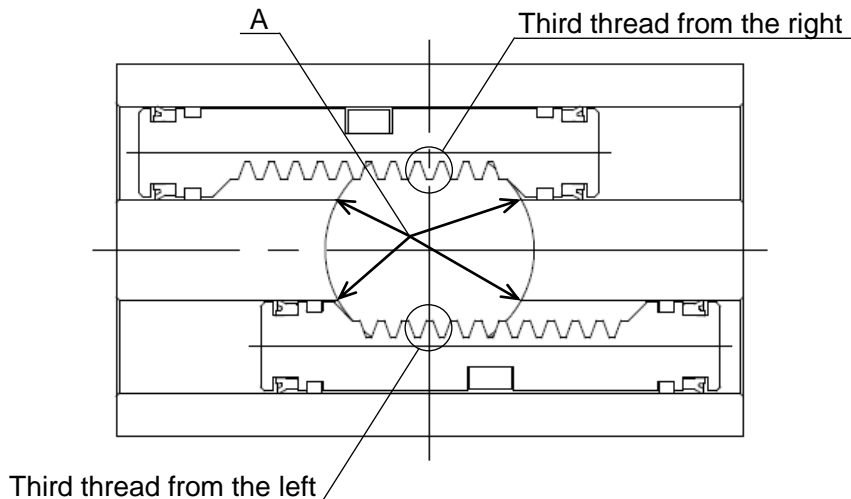


Fig. 6

- e. Insert pinion gear (27) into body (21).  
Confirm piston position with Figure 6 and insert pinion gear (27) as shown in Figure 7.

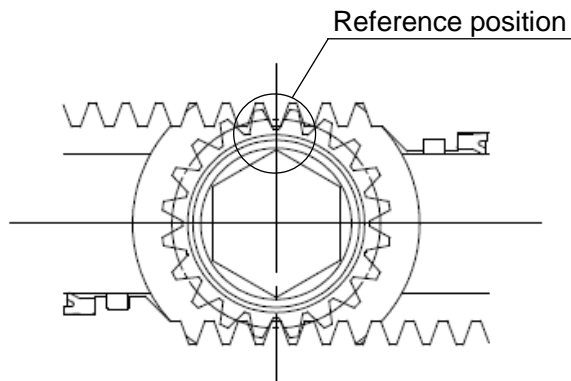


Fig. 7

- f. Mount the bearing (42), bearing color (29), and R-shape retaining ring (41) on the body (21) in this order. (Bearing color is size 32 only.)
- g. Fix cover (22) with hexagon socket head cap screw (39) on the body (21).  
(Tightening torque: Table2-5)  
Check to see whether if O-ring(34)(35) is set properly into grooves.
- h. Fix end cover (25) with hexagon socket head cap screw (39) on the body (21).  
(Tightening torque: Table2-5)  
Check to see whether if O-ring(34)(35) is set properly into grooves.

- i. Fix steady brace cover (30) with hexagon socket head cap screw (31) on the body (21).  
(Tightening torque: Table2-6)

5.3 Reassembly procedure for linear motion and rotary motion

- a. Fix linear motion and rotary motion with hexagon socket head cap screw (15).  
(Tightening torque: Table2-7)

Pay attention to the assembly direction.

(Assemble the components so that the plugs and the cushion valves are positioned as shown in Fig. 8.)

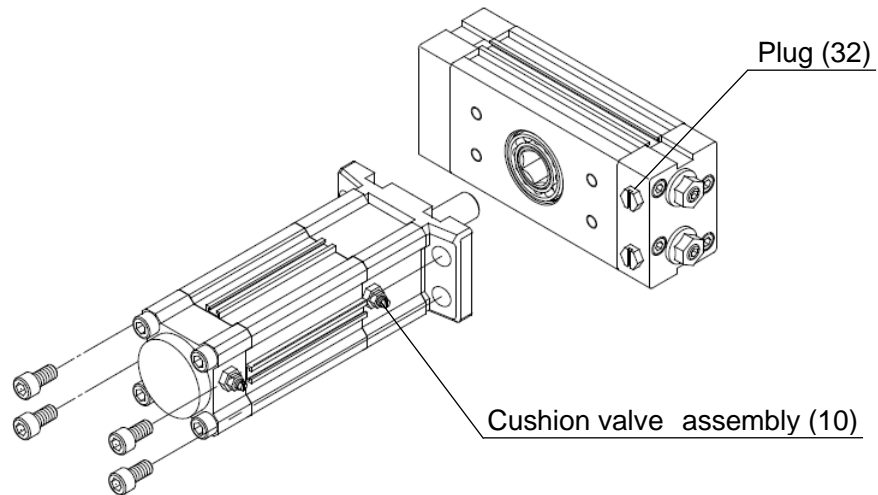


Fig. 8

- b. Perform operation test and external leak check when reassembly is completed.

Table2 Recommended tightening torque [ N·m ]

Size No	32	40
1	0.3 to 0.4	
2	1.0 to 1.7	
3	7.0 to 10.0	
4	7.0 to 10.0	
5	3.0 to 5.0	4.0 to 6.0
6	4.0 to 6.0	
7	4.0 to 6.0	7.0 to 10.0

Revision history
A: Corrected spare parts part numbers. B: Revised safety instructions.

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.  
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