azbil

CM2-PSA100-2001

CV3000 Alphaplus Series Spring type Piston Cylinder

Model: PSA6R

User's Manual

Azbil Corporation

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Table of Contents

Chapter 1: General

1-1: Structure 1-1
1-2: Assembly on valve body 1-1
1-3: Pneumatic tubing 1-1
1-4: Calibration 1-2
1-5: Caution in operation and handling 1-2

Chapter 2: AUTO/MANUAL Switchover of Manual Handwheel

Chapter 3: Disassembly and Assembly of Actuator

3-1: Separating valve body from actuator 3-1
3-2: Disassembly of actuator 3-1
    Disassembly procedure 3-1
3-3: Disassembling spring unit 3-5
3-4: Assembling actuator 3-6
    Assembly of actuator with manual handwheel 3-6
    Assembly of actuator without manual handwheel 3-7

Chapter 4: Major Replacement Parts

Chapter 5: Tightening Torque of Actuator Assembly

Chapter 6: Trouble-shooting

List of Figure

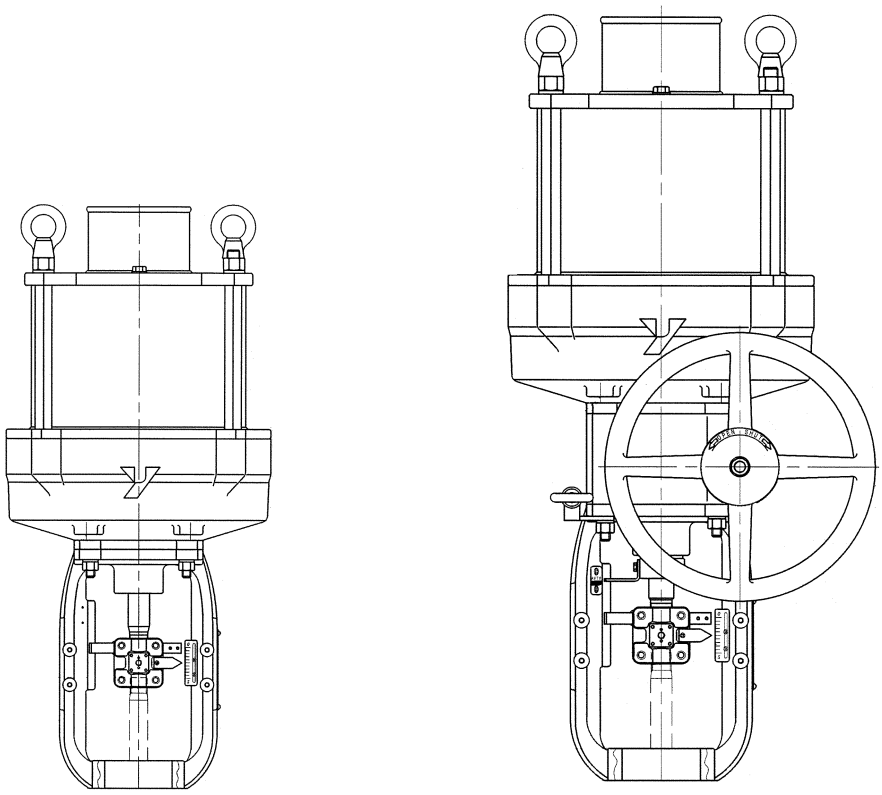
Figure P-1 Name plate i
Figure 1-1 Exterior of PSA6R 1-1
Figure 2-1 AUTO/MANUAL switchover scheme 2-1
Figure 2-2 Operator's instruction label 2-1
Figure 2-3 2-2
Figure 3-1 PSA6R 3-3
Figure 3-2 Spring unit 3-4
Figure 3-3 3-6
Figure 5-1 Tightening torque of actuator threads 5-1

Chapter 1 : General

1-1 : Structure

This actuator consists of cylinder, spring unit, lift stopper, spring retainer, hexagon stay, yoke, manual handwheel and single action positioner.

For an external view of the actuator, refer to Figure 1-1, External appearance of PSA6R.



(1) Without manual handwheel (2) With manual handwheel

Figure 1-1 Exterior of PSA6R

1-2 : Assembly on valve body

Assembling nuts integral to the valve body fastens the yoke and valve body. The stem connector connects the actuator's rod and valve stem.

1-3 : Pneumatic tubing

Tubing is provided with the single action positioner when it is to be used as control valve. Refer to the following instruction manuals for more details.

Pneumatic positioner (Model HTP)	No. OM2-8310-0200
Elector-pneumatic positioner (Model HEP)	No. OM2-8310-0100
Electro-pneumatic positioner (Model AVP300/301)	No. CM2-AVP300-2001

1-4 : Calibration

This actuator does not need calibration

When connecting the valve stem of the valve body to the actuator's rod with a stem connector, due adjustment should be made to property seat the valve plug on the seat ring. Then loosen the screws on actuator's scale plate and then match the stroke and index to the correct position on the scale plate.

1-5 : Caution on operation and handling

⚠ **CAUTION**

- When automatically operating an actuator that has a manual handwheel, verify that the AUTO/MANUAL switchover pin has been inserted into the pin holder, the chain is engaged on the handwheel and the indicator is in AUTO position before start of operation.
- When disassembling or assembling, always hold the actuator in the upright position (spring unit on top and yoke on bottom).
- While eyebolts are used to suspend the actuator, the assembled valve should not be suspended only from the eyebolts.

Chapter 2 : AUTO/MANUAL Switchover for the Manual Handwheel

Refer to Figure 2-1 for details on the AUTO/MANUAL switchover for the handwheel.

With an actuator with AUTO/MANUAL switchover functions, switchover is possible between automatic operation and manual operation.

AUTO/MANUAL switchover can be done at any time during operation.

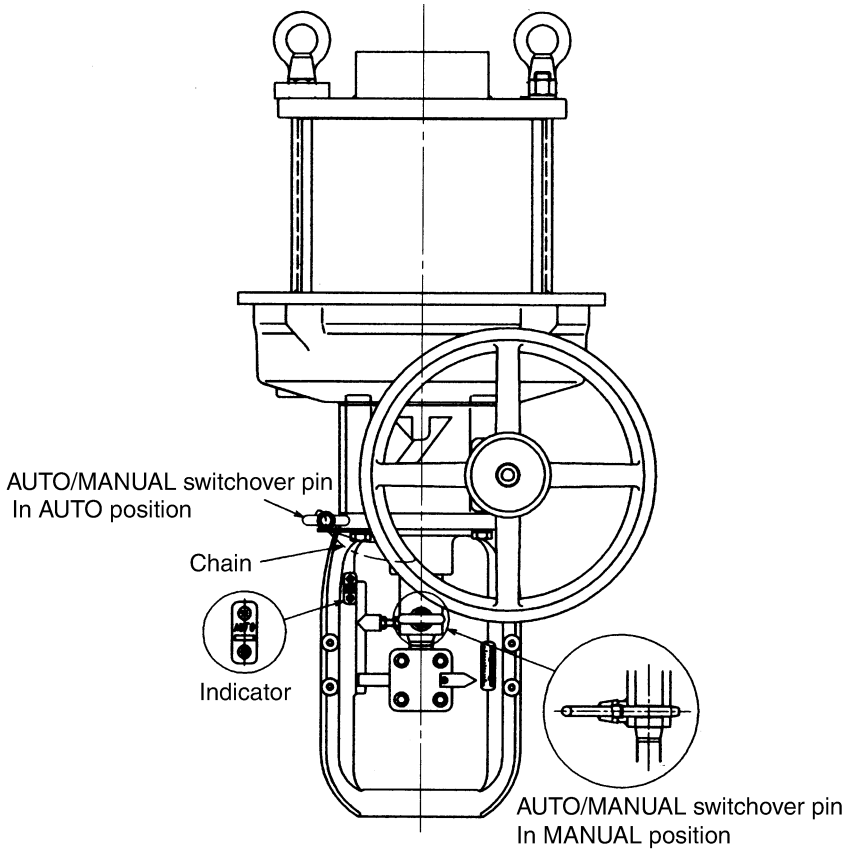


Figure 2-1 AUTO/MANUAL switchover scheme

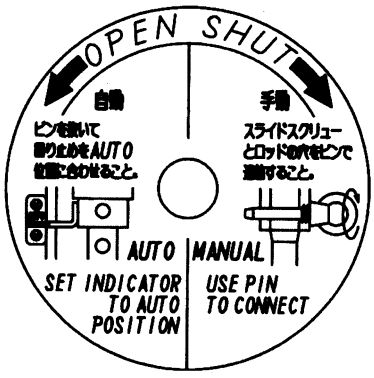
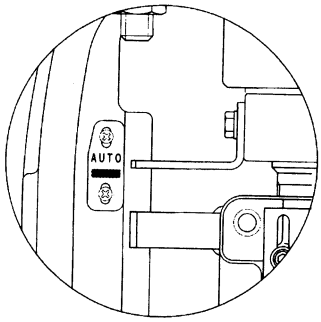


Figure 2-2 Operator's instruction label

Step	Procedure
1	Pull the AUTO/MANUAL switchover pin out of its holder and disengage the chain, which binds handwheel to the wheel.
2	While verifying with operating label on the handwheel, turn the handle in the direction of SHUT and lower the slide screw.
3	Align the round holes of the slide screw and actuator's rod, and insert the pin. Push it all the way in and fix it there.
4	Verify OPEN, SHUT arrows on the label, and turn the handwheel to either direction to open or close the valve. The turning torque should be less than 127 N (13 kgf)
5	Once the handwheel turns no any further, check the valve opening and end operation. **⚠ CAUTION** Do not apply undue force on the valve once it reaches mechanical stop. Otherwise, the valve stem may be damaged. Refer to "Chapter 6 : Trouble-shooting" for remedial action.
6	To resume automatic operation, remove the switchover pin, turn handwheel until the slide screw stop reaches the AUTO position (refer to Figure 2-3 below). Run the chain on the pin through in order to restrict handwheel movement then fix the pin onto the holder. Resume automatic operation after verifying this condition.  *Figure 2-3*

Chapter 3 : Disassembly and Assembly of Actuator

Disassembly and assembly procedures are described herein. Refer to them whenever performing for periodic maintenance or in the event of a malfunction which may call for the disassembly or assembly of the actuator.

3-1 : Separating valve body from actuator

Refer to the instruction manual for the valve body.

3-2 : Disassembly of actuator

Disassembly procedure

Disassembly procedure of actuator is described herein.

Refer to "Figure 3-1 PSA6R" on page 3-3 and "Figure 3-2 Spring unit" on page 3-4 for information.

1. Marking and protection

Step	Procedure
1	Match mark on spring retainer on the top of actuator, lift stopper, cylinder and cylinder assembling yoke boss.
2	Wrap PVC tape around the rod bushing to protect sealing parts, guide bushing.

2. Removing slide screw detent

Step	Procedure
1	Loosen hexagon head bolt No.50 and hex nuts No.51 which fasten slide screw detent No.49.
2	Remove slide screw detent No.49.

3. Removing the spring retainer

Step	Procedure
1	Loosen hexagon nuts No.2 and eye nut No.1 from the top of the actuator and remove.
2	Lift spring retainer No.17 straight up and remove.

4. Removing the lift stopper and spring unit

Step	Procedure
1	Loosen hexagon stays No.4 and No.9 (four), which fasten lift stopper No.20 and cylinder No.21, and remove.

Step	Procedure
2	Raise lift stopper No.20 straight up and remove.
3	Screw eyebolts into threaded holes (M12×2) on the spring retainer No.59, which is located on the top of spring unit, and the lift spring unit (approximately 120 kg) up with a crane.
4	While suspended by crane, remove piston No.57's sealing parts (tape liner No.7, O-ring No.8).

5. Removing slide screw and cylinder

Step	Procedure
1	Turn slide screw No.34 by hand and extract from the bottom.
2	Loosen hexagon head bolts No.12 (four), which fasten cylinder and manual handwheel, and remove.
3	Lift cylinder up straight and remove.

6. Removing worm wheel unit

Step	Procedure
1	Remove in sequential order the bearing holder No.27, single column angular bearing, (upper) No.32, worm wheel No.33, and single column angular bearing (lower) No.32.
2	Loosen hexagon head bolts No.12 (four), which fasten gear case No.30 and yoke, and remove.

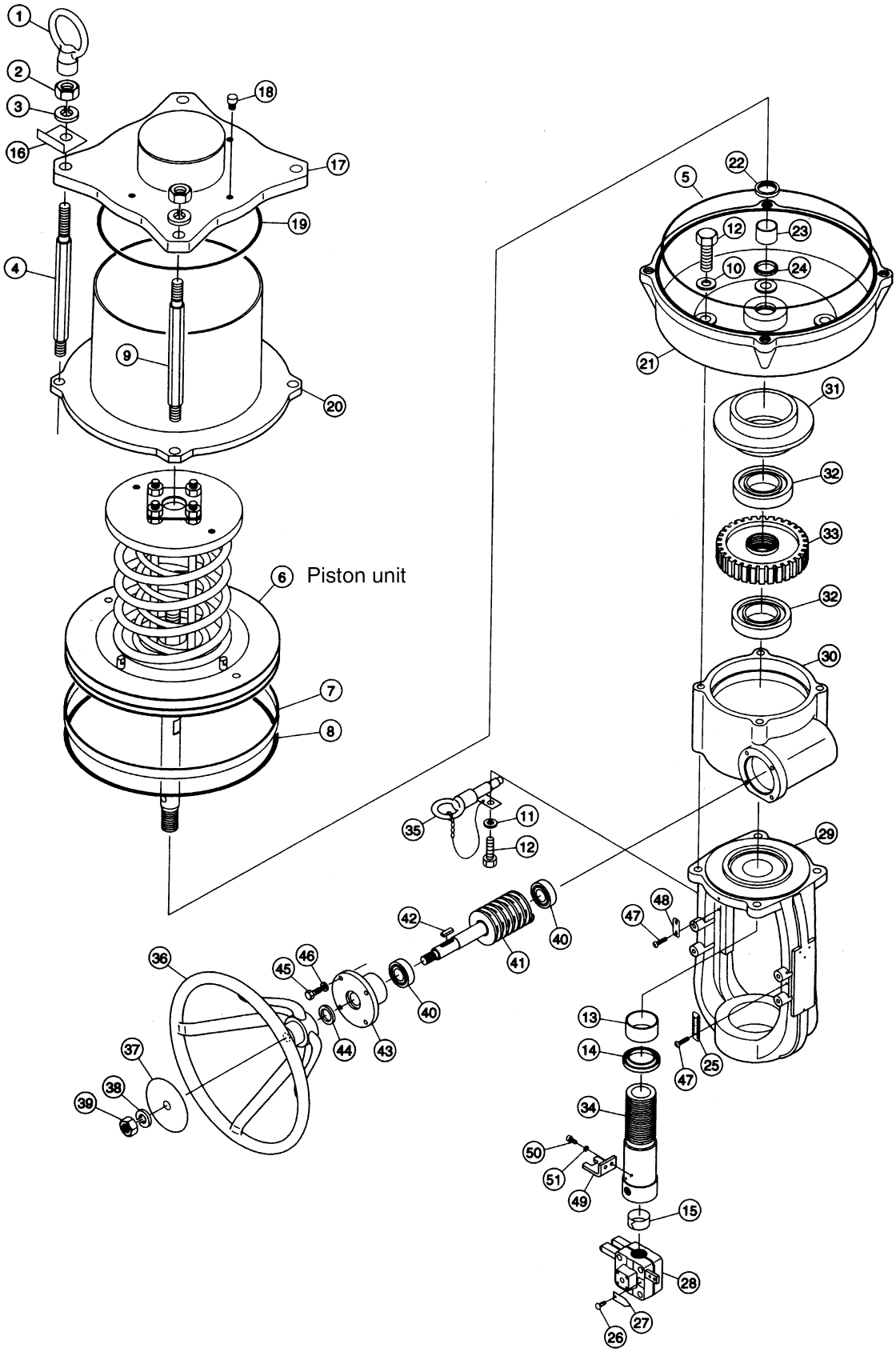


Figure 3-1 PSA6R

Table 3-1: Parts reference list

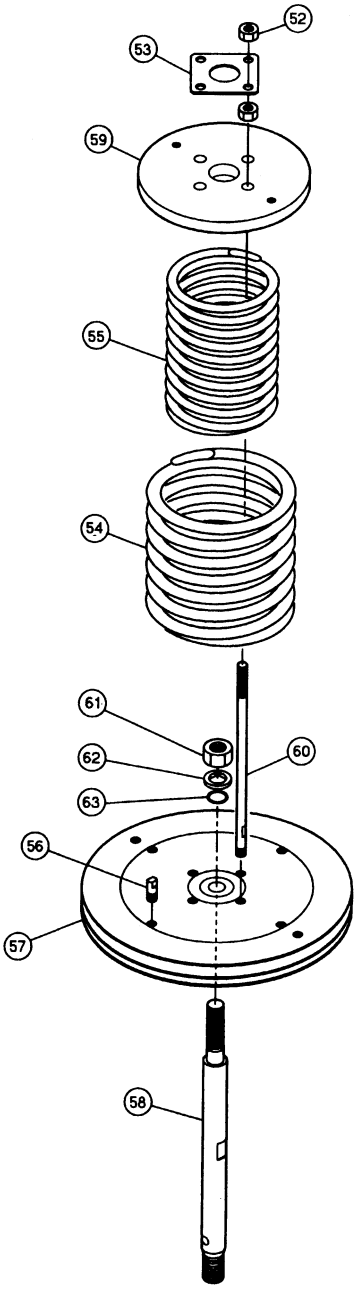


Figure 3-2 Spring unit

No	Parts nomenclature	No	Parts nomenclature
1	Eye nut	33	Worm wheel
2	Hexagon nut	34	Slide screw
3	Spring washer	35	Locking pin
4	Hexagon stay (long)	36	Handwheel
5	O-ring	37	Operating instruction label
6	Piston unit	38	Spring washer
7	Tape liner	39	Locknut
8	O-ring	40	Single column bearing
9	Hexagon stay (short)	41	Worm shaft
10	Seal washer	42	Key
11	Spring washer	43	Gear case cap
12	Hexagon head bolt	44	Dust seal
13	Round bushing	45	Hexagon head bolt
14	Dust seal	46	Spring washer
15	Wearing	47	Truss screw (small)
16	Name plate	48	Indicator
17	Spring retainer	49	Slide screw lock
18	Rain shield cap	50	Hexagon head bolt
19	O-ring	51	Hexagon nut
20	Lift stopper	52	Hexagon nut
21	Cylinder	53	Stopper retainer
22	Rod packing	54	Spring (large)
23	Guide bushing	55	Spring (small)
24	Dust seal	56	Spring stopper
25	Scale plate	57	Piston
26	Truss screw (small)	58	Rod
27	Index	59	Spring receptacle
28	Stem connector	60	Stopper
29	Yoke	61	Detent nut
30	Gear case	62	Spring washer
31	Bearing holder	64	O-ring
32	Single column angular bearing		

3-3 : Disassembling spring unit

Disassembly procedure

The disassembly procedure of spring unit is described herein.

Refer to "Figure 3-2 Spring unit" on page 3-4 for a parts reference list.

Disassembly is not required if only the piston's sealing parts (tape liner, O-ring) are to be replaced.

1. Removing the spring unit

Step	Procedure
1	Loosen hexagon nuts No.52 (four on top) and remove
2	Remove stopper retainer No.53
3	Evenly loosen hexagon nuts No.52 (four on bottom) until there is no more tension on springs No.54 and No.55. ⚠ **CAUTION** Carefully follow the disassembly procedure for spring unit when removing bolts and nuts. Physical injury can result otherwise.
4	Remove spring retainer No.59
5	Remove springs (large No.54, small No.55)

2. Removing the piston unit

Step	Procedure
1	Loosen stopper No.60 and remove
2	Loosen detent nut No.61 and remove using the flat faces of rod No.58
3	Remove spring washer No.62 and O-ring No.61. Exercise care so as not to damage the O-ring with rod's screw.
4	Separate rod No.58 from piston No.57.

3-4 : Assembling actuator

Cautions regarding assembly

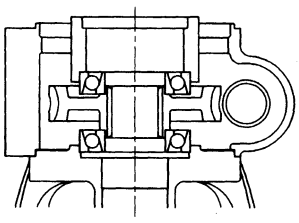
- Refer to the chapter of inspection items during disassembly and verify that no abnormality is found on parts. If found, replace or repair as required.
- The O-ring of the sliding parts should always be replaced at the time of periodic disassembly. Replace the O-ring on the fixed part if it has become deform, or damaged, or scarred during disassembly.
- Clean the O-ring, oil seal, wearing and tape line O-ring recess and apply plenty of lubricant.
- Ensure that no dust or dirt from maintenance work prior to disassembly remains on sliding part of cylinder or guide bushing.

Assembly of actuator with manual handwheel

Assembly procedure

Refer to Figure 3-1 for an exploded view of the parts.

1. Assembly procedure of the manual handwheel and cylinder assembly

Step	Procedure
1	While the yoke No.29 is in an upright position, place gear No.30 and temporarily fasten with hexagon head bolts No.12 (four)
2	Apply lubricant on single column angular bearing (top and bottom) and assemble in sequential order the bearing (lower) No.32, worm wheel No.33, bearing (upper) No.32 and bearing holder No.31. Refer to Figure 3-3 below.  *Figure 3-3*
3	From the bottom, screw in slide screw No.34 assembled with tape liner No.13. Apply lubricant on the threaded parts of slide screw No.34.
4	Assemble slide screw No.34 with slide screw detent No.49, hexagon head bolt No.50 and nut No.51.
5	Apply lubricant on rod packing No.22 and dust seal No.24 and assemble them on cylinder No.21.
6	Place cylinder No.21 on gear case No.30 and temporarily fasten it with hexagon head bolts No.12 (four) and seal washer No.10.

Step	Procedure
7	Use rod No.58 to set the position of the cylinder by ensuring that the rod moves smoothly and tighten in using the torque given in "Table 5-1: " on page 5-1. If the rod does not move smoothly, tap cylinder or gear case with plastic hammer and set the position.

2. Assembling piston unit, lift stopper and spring retainer

Step	Procedure
1	Screw eyebolts into the threaded holes (M12×2) on the top of the spring retainer No.59 on the piston unit, lift upright and suspend by crane.
2	While suspended upright, assemble the lubricated O-ring No.8 and tape liner No.7 onto piston No.57.
3	Assemble piston unit in cylinder No.21 from the top. See to it that the round hole on rod No.58 faces the front.
4	Place the lift stopper O-ring No.5 into the slot on the top of cylinder No.21.
5	Insert lift stopper No.20 from the top and fix with hexagon stays No.4 and No.9 (four). Tighten the ones of the same length in a criss-cross pattern.
6	Assemble so that the hexagon stays No.4, No.9 fit into the bolt holes of spring retainer No.17.
7	Fix spring retainer No.17 with hexagon head nuts No.2 (four).
8	Install eye nuts No.1 (two) on hexagon stay No.4

Assembly of actuator without manual handwheel

When assembling actuator without manual handwheel, follow the procedure given in “Assembly of actuator with manual handwheel” on page 3-6 except the applicable parts of the actuator.

Chapter 4 : Major Replacement Parts

The actuator's parts have been designed to withstand prolonged usage. However it is recommended that the following parts be replaced at the intervals listed below:

Tape liner .....Every five years

Busing .....Every five years

Seal washer .....Every five years

Dust seal.....Every five years (to be replaced when disassembled)

Rod seal.....Every five years (to be replaced when disassembled)

O-ring.....Every five years (to be replaced when disassembled)

Chapter 5 : Tightening Torque of Actuator Assembly

The table below lists the tightening torques for actuator assembly. Refer to Figure 5-1, tightening torque of actuator's threaded parts.

Table 5-1:

Key no.	Size	Tightening torque [N-m {kgf.cm}]
1	M14	80 - 120 {800 - 1200}
2	M20	270 - 360 {2700 - 3650}
3	M24	300 - 410 {3050 - 4150}
4	M14	80 - 120 {800 - 1200}
5	M12	50 - 60 {500 -600}

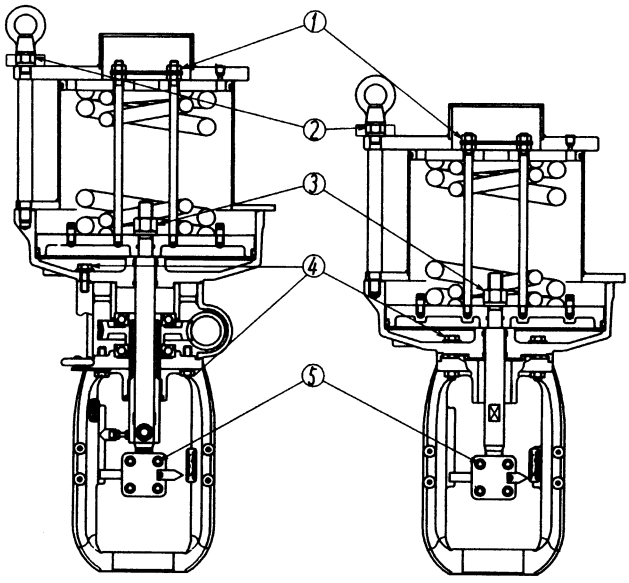


Figure 5-1 Tightening torque of actuator threads

Chapter 6 : Trouble-shooting

This section covers the symptoms, causes, and remedies for problems that may be encountered. Parts may need to be replaced. If more information is required, please contact an Azbil Corp. representative.

Table 6-1: Trouble-shooting

Symptom	Cause and remedy
Unstable valve operation -Valve hunts when almost fully closed	• CV value is too large. • Reduce CV value. • For a single seat valve, the valve is installed in the reverse flow direction.
Air supply pressure is unstable	• Large pneumatic equipment is connected up to the same air supply line. • Check air supply capacity, piping capacity, and restriction capacity are appropriate. • Supply air pressure regulator is inadequate or not operating properly.
Signal pressure is unstable	• Controller is not properly tuned. • Properly tune the controller (properly set the proportional band and other parameters). • Check that the controller output does not greatly fluctuate.
Valve hunts even when signal pressure is stable	• Hunting output of positioner itself. • Check and repair or replace the positioner. • The valve is affected a change in process fluid pressure as the power of the actuator is insufficient. Replace the actuator with a larger model.
Vibration of valve -Valve vibrates (generates noise) at any position of valve plug	• Piping vibrates. • Securely fasten the piping. • Check for other sources of vibration • Worm valve plug or guides • Check the parts and replace them as required.
Valve vibrates (generates noise) only when valve plug is set at a certain position	• Check for changes in process fluid flow conditions (change in restriction orifice, CV value, etc.) • Check for changes in plug configuration (change in flow control characteristics.)

Table 6-1: Trouble-shooting

Symptom	Cause and remedy
Sluggish valve operation or inoperative valve	• Air leak from piping. • Air leak from actuator. • Foreign matter trapped in guide section of valve plug. Aged and hardened gland packing, causing increased hysteresis. • Malfunctioning positioner (check the positioner by operating it directly on an air supply known to be operating normally).
Fluid leakage from gland section	• Check for loose nuts on bonnet. • Check for damaged valve shaft.
Even when valve plug is in a closed position, large flow leak to the downstream side	• Air leak from the actuator section. • Apply the air supply pressure or atmospheric pressure to the actuator. Check the air supply source and positioner. • Check for whether the valve plug is actually in the closed position. • Check the plug seat ring for corrosion or erosion. • Check the guide sections for binding.

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