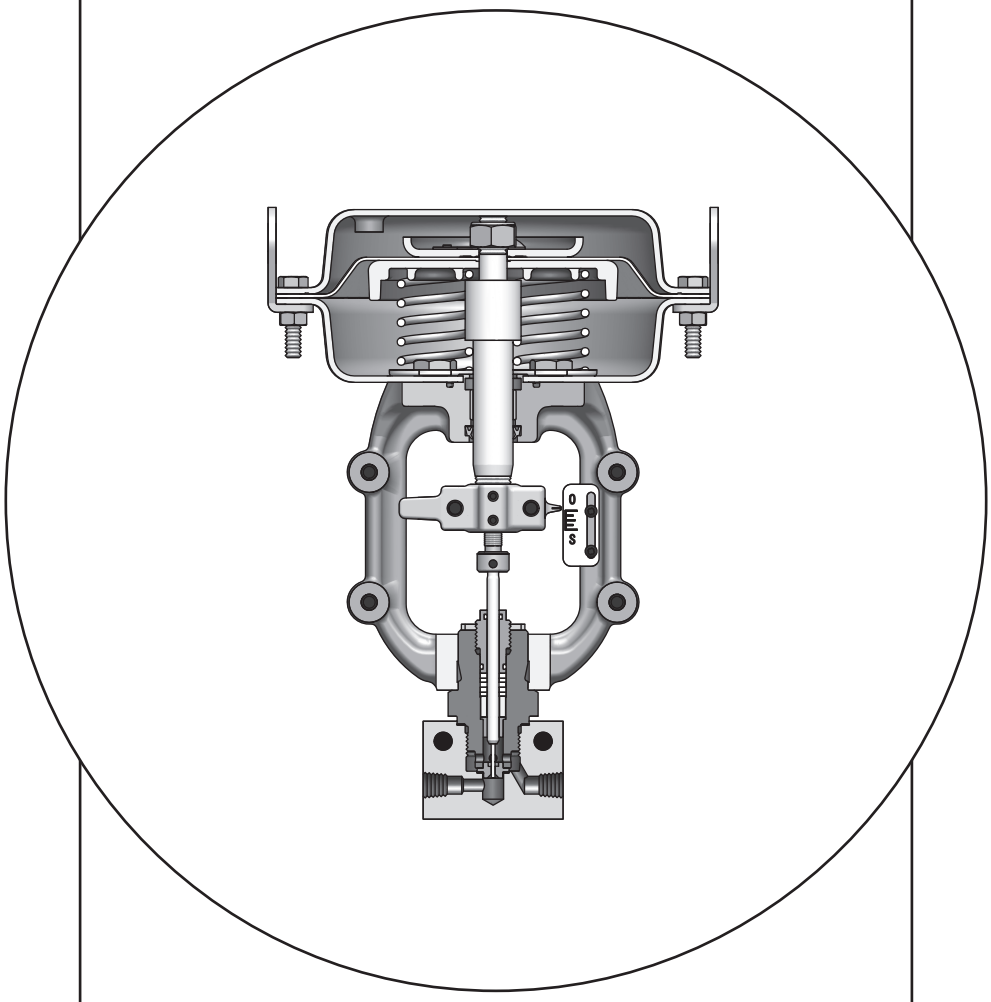
azbil

OM2-8110-0500

Micro-Flow Control Valve
Model: VSM

User's Manual



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NOTICE

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Cautions and Warnings

■ **Precautions for Use**

Cautions and warnings are intended to make sure that you use the product safely and correctly, in order to prevent injury to you and others and to prevent damage to property. Please heed these cautions and warnings.

Various icons appear in this document.

Their meaning is explained below. Please be sure you understand the icons before reading the rest of the manual.

⚠ **WARNING**	Warnings are indicated when mishandling this product might result in death or serious injury to the user.
⚠ **CAUTION**	Cautions are indicated when mishandling this product might result in minor injury to the user or material damage.

■ **Examples:**

	Use caution.
	The indicated action is prohibited.
	Be sure to follow the indicated instructions.

Precautions for safe work

⚠ WARNING	
❗	Before starting to work, check that the pressure in the pipes has dropped to atmospheric pressure. There is a risk of injury if fluid spews out.

⚠ CAUTION	
🚫	Do not stand on the device or use it as a step. There is a risk of falling.
🚫	Do not touch this device without reason during operation. Depending on the operating conditions, the surfaces may be extremely hot or cold.
❗	Since this product is heavy, when handling it, wear safety shoes and watch your step.
❗	During work, wear protective goggles to prevent injury from flying objects.
❗	During work, wear protective gloves to prevent injury due to bolt heads or burrs.
🚫	While this device is operating, do not touch movable parts such as the stem connector. Your hand, etc., May be caught in the mechanism and injured.

Handling Precautions

■ **Installation Precautions**

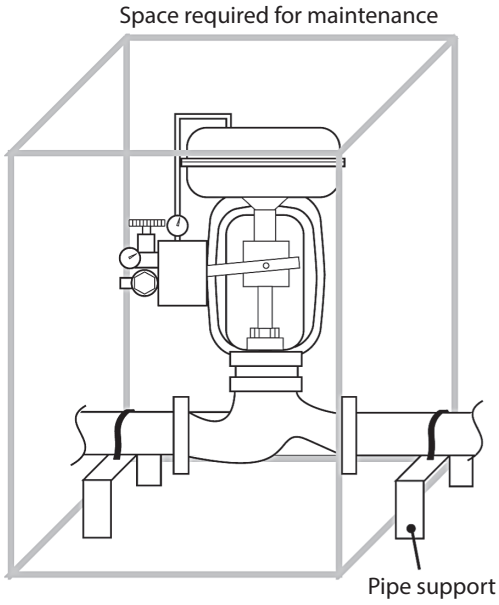
⚠ WARNING	
❗	If the rated pressure or connection rating is ignored when this device is used, a serious accident involving damage or leakage could occur.
🚫	When connecting the valve to the piping, to avoid losing fingers or injuring your foot, do not put your hand or foot under the valve or between flanges.
❗	Before reinstalling the valve after maintenance or modification, wash out any residual fluid in the pipes or replace it with a safe fluid. Otherwise, the residual fluid may cause an injury.

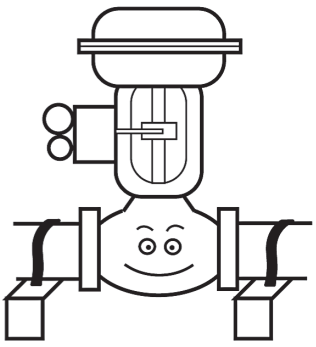
⚠ CAUTION	
❗	Ensure that there is a straight pipe section at least 10 times the pipe diameter on the upstream side and 6 times the pipe diameter on the downstream side. If the straight pipe sections are not long enough, insufficient valve capacity or unusual noise or vibration could result.
❗	Install the valve in the correct direction, leaving clearance around the valve as much as possible for easy maintenance (piping, wiring, adjustment, etc.).
❗	Provide appropriate support for the valve itself and for connected pipes to prevent an excessive load from the weight and action of the valve. (Care is needed especially for large valves and valves for low temperature fluid.)
❗	If the valve is installed along a passageway used by outside persons, install a fence or cover as a protective measure.
🚫	Avoid installing the valve where it may be submerged by rain water, covered with snow, or subject to freezing. Conditions such as these can damage the valve
❗	If the valve is exposed to radiant heat, provide a shielding plate or the like. Failure to do so may result in damage to the actuator or auxiliary equipment.

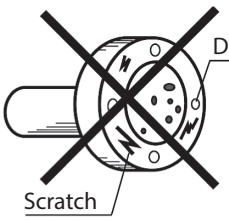
⚠ CAUTION	
	If the valve is exposed to salt damage or a corrosive atmosphere, take countermeasures against corrosion. Otherwise the valve may be damaged.
	Check that there is no damage to the valve (including the actuator and auxiliary equipment).
	Check that there is no damage to the flanges or welded piping. Otherwise fluid leakage could result.
	If a pipe flange connected to the valve is being welded, the valve surface may also heat up. Do not touch the valve unnecessarily.
	Chamfer the edges of the pipe flanges. Sharp edges can cause an injury.
	Check that the pipes on both sides of the valve are firmly supported. Insufficient support may cause leakage from pipe connections.
	After installation, check that the pipes are still properly aligned. Misalignment may cause fluid leakage from pipe connections.
	Install the butterfly valve with the valve (blade or disk) fully closed. Otherwise the valve could be damaged.
	If the eyebolts (eyenuts) attached to the actuator are used to lift the valve, make sure that the mass does not exceed the limit specified in the user's manual. An excessive load may damage the actuator or cause air leakage.
	Use bolts and nuts for flanges that conform to the flange rating. Otherwise fluid leakage could result.
	Use new flange gaskets that are compatible with the fluid properties and operating temperature. Damaged gaskets may cause fluid leakage.
	Open the valve fully before flushing the inside of the piping, and do not change the valve travel while the pipes are being flushed. Otherwise, the valve may be damaged by welding spatter or other foreign matter.

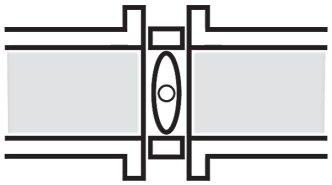
! Handling Precautions:

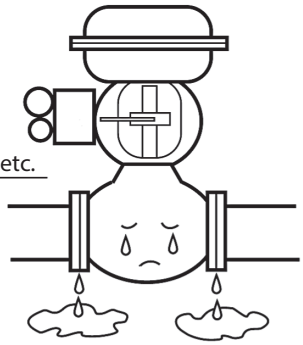
- Avoid installing the valve where it will be subject to vibration or other external forces that may affect its performance.
- There are protective covers on the flanges to protect the gasket-contact-ing surfaces and prevent foreign matter from entering the valve. When installing the valve, remove the covers.
- Check that there is no damage to the valve (including the actuator and auxiliary equipment).
- To prevent valve seat damage and impaired closing performance, re-move foreign matter such as dust, sand, and welding spatters from the inside of the piping, and clean the inside of the valve.
- Check that the distance between the pipe flanges is appropriate for the total of the body length of the valve and the thickness of the gaskets.
- Tighten the bolts and nuts for the flanges evenly in a diagonal pattern.

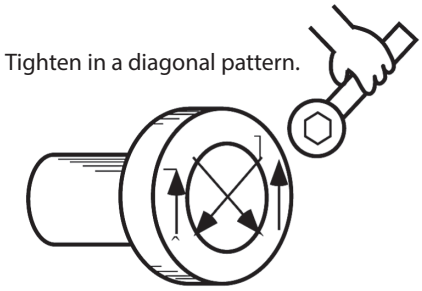


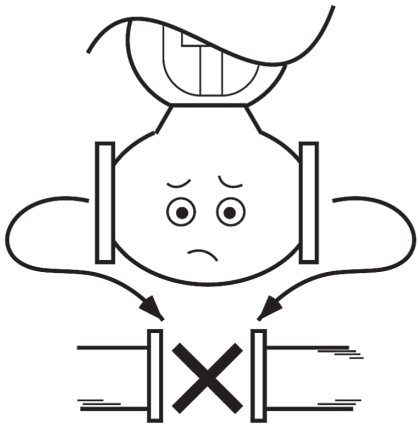


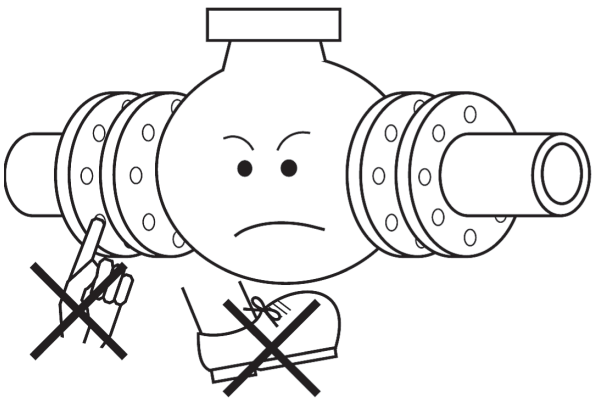


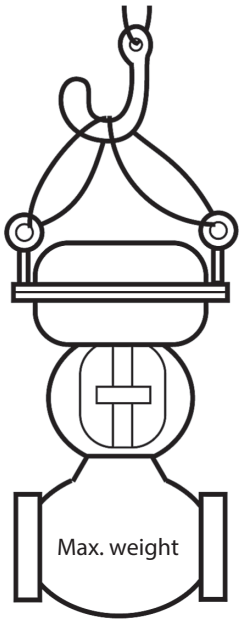










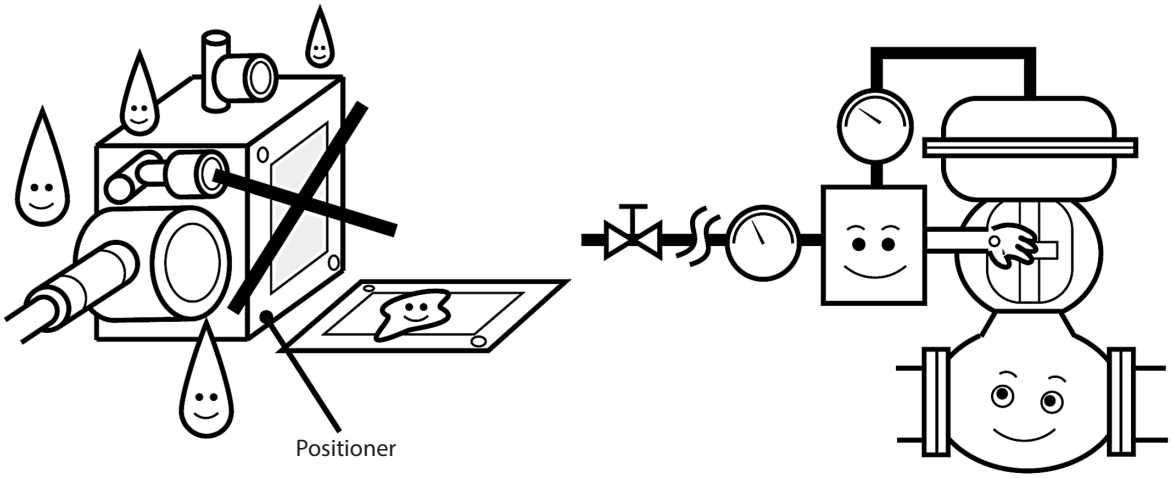


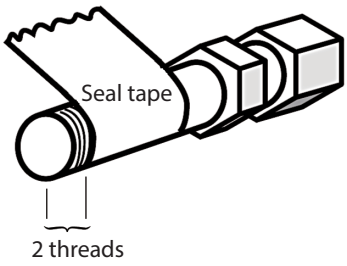
Precautions for air supply piping work and electrical work

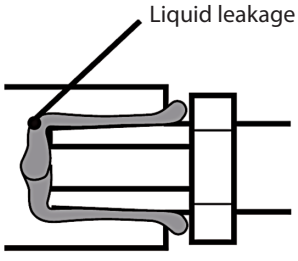
⚠ CAUTION	
❗	For air supply, use pipes whose internal diameter does not cause a pressure drop while the valve is running. Failure to do so could result in poor valve performance.
❗	Wiring work should be carried out only by qualified technicians following local electro technical standards.
❗	Cabling should be carried out according to facility conditions. Use a size of adapter (packing) that is correct for the outer diameter of the cable.
⃠	If seal tape is wrapped around the air supply pipe threads, leave the two threads nearest the tip bare. Failure to do so may cause the valve to malfunction due to clogging by pieces of tape.
❗	If thread lock sealant is used for air supply piping work, do not allow it to enter inside the piping. Doing so may cause the valve to malfunction.
❗	Avoid doing wiring work on a rainy day or in high humidity. Moisture inside a connector or terminal box can cause a short-circuit or rust.

! Handling Precautions:

- There is a gasket in the cap of auxiliary equipment such as positioners. Take care not to lose it during wiring work.
- If air supply piping is bent, make gentle curves (using a dedicated tool like a tube bender), and use a band to hold parallel pipes together.



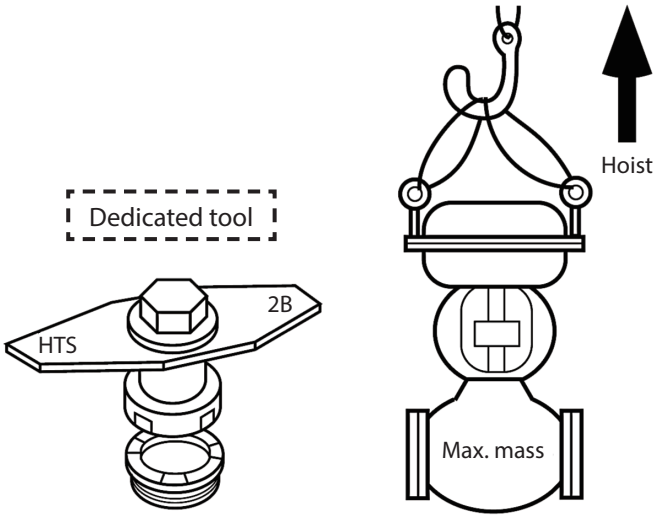


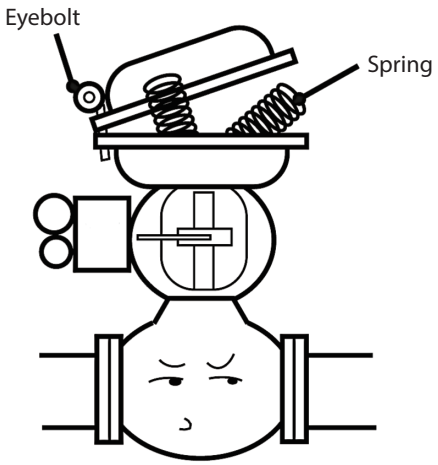


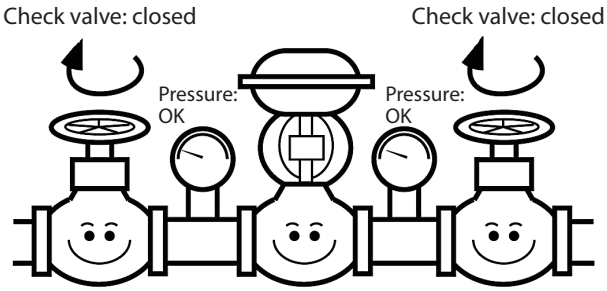
Precautions for assembly and disassembly

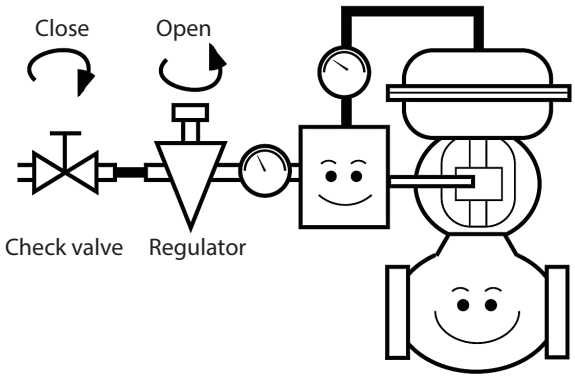
⚠ WARNING	
❗	Before starting work, clean the inside of the valve and replace the gas. Otherwise the remaining gas may cause an injury.
⃠	Do not disassemble the pneumatic actuator while supply air pressure is being applied. The compressed air may cause an injury.
❗	Since damaged or corroded bolts and nuts may damage the valve causing injury, replace them with new ones.

⚠ CAUTION	
❗	Observe the tightening torques indicated in the user's manual when tightening the bolts and nuts during assembly.
❗	In the case of an actuator that incorporates springs, follow the disassembly procedure when removing bolts, nuts, etc. Otherwise, the springs may jump out causing injury.
❗	When removing the valve from the piping, if the eyebolts (eyenuts) attached to the actuator are used to hoist the valve, make sure that the weight does not exceed the limit specified in the user's manual. Otherwise there is a danger of the valve falling.
❗	Before removing or attaching the valve trim, check whether a dedicated tool is necessary. If it is needed, be sure to use it. Otherwise, damaged parts could result.
❗	Follow the procedure for assembling the parts, bolts, nuts, etc. Otherwise, malfunction could result.
❗	When the valve is reassembled, use new packing and gaskets. The reuse of used parts can cause fluid leakage.

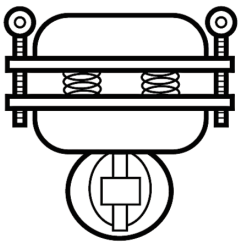


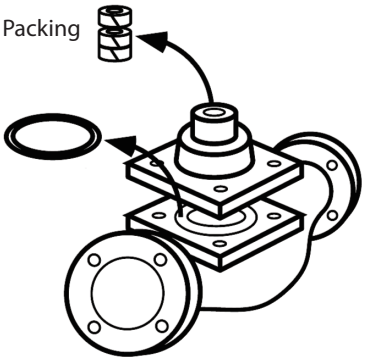


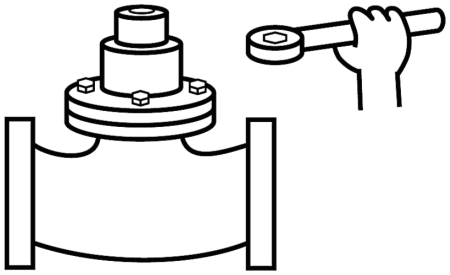




● Observe the assembly procedure ● Replacement of packing and gasket ● Tighten bolts to specified torque







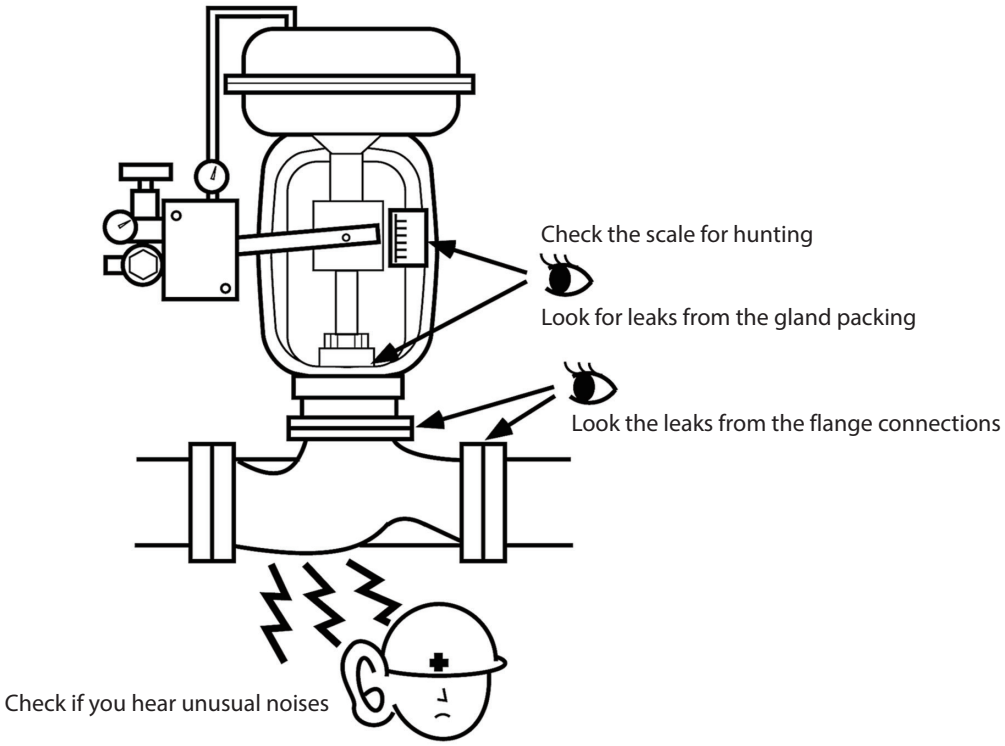
Maintenance Precautions

⚠ WARNING
If fluid leakage from the valve is found, stay away from the valve until safety can be confirmed. Depending on the properties of the fluid, there may be danger of a serious accident or injury.

⚠ CAUTION
Check the status of the packing gland daily, and tighten if leakage is found.
Check valve operation daily, including a visual check for hunting.
During valve operation, look and listen for unusual noise or vibration.

Handling Precautions:

- Avoid installing the valve where it will be subject to vibration or other external forces that can affect valve performance.
- There is a gasket in the cap of auxiliary equipment such as positioners. Take care not to lose it during wiring work.
- Take care not to lose the retaining screws for the cap of auxiliary equipment such as positioners.
- Seal cable gland and electrical conduit threads well to prevent the entry of moisture.
- Dispose of old parts replaced during valve disassembly or maintenance as industrial waste. If they are burned or discarded carelessly, environmental pollution will result.
- After checking that the gasket in the positioner cap, etc., Is in place, tighten the retaining screws evenly to prevent uneven compression of the gasket.



Contents

Chapter 1. General

1-1. Scope

The VSM type micro flow control valve is a small-size, light-weight micro flow control valve. The major structural unit is comprised of a valve body, pneumatic actuator, and positioner. The valve body is comprised of a body and bonnet. The port and seat are detachable as a unit from the valve body.

The actuator is the PSK type actuator comprising multiple springs and diaphragm and comes in two types, direct and reverse action types.

For the valve positioners, refer the following operators manuals.

- Model VPE OM2-8310-0410 Pneumatic valve positioner for small actuators
- Model HTP OM2-83 10-0200 Pneumatic valve positioner (Single Acting type)
- Model HEP 15, l6, l7 OM2-8313-0100 Electro-Pneumatic Valve Positioner (Single Acting Type)
- Model AVP 300/301/302/200/201/202 CM2-AVP300-2001 Electro-pneumatic positioner
- Model AVP 303/203 CM2-AVP303-2001 Electro-pneumatic positioner
- Model AVP701/702 CM2-AVP702-2001 Smart valve positioner 700 series (HART)
- Model AVP703 CM2-AVP703-2001 Smart valve positioner 700 series (FOUNDATION Fieldbus)

1-2. Structure

The structure of the VSM is shown in Fig. 1-1.

The VSM type control valve has a variable stroke (Cv value) mechanism which allows the stroke of the valve to be readily changed for the input signal span {4 to 20 mA DC or 20 to 100 kPa (0.2 to 1.0 kgf/cm^2)}, making it possible to obtain proper control characteristics suitable for the process conditions.

The tools required for handling the VSM type control valve are shown in Section 7. (These are not accessories.)

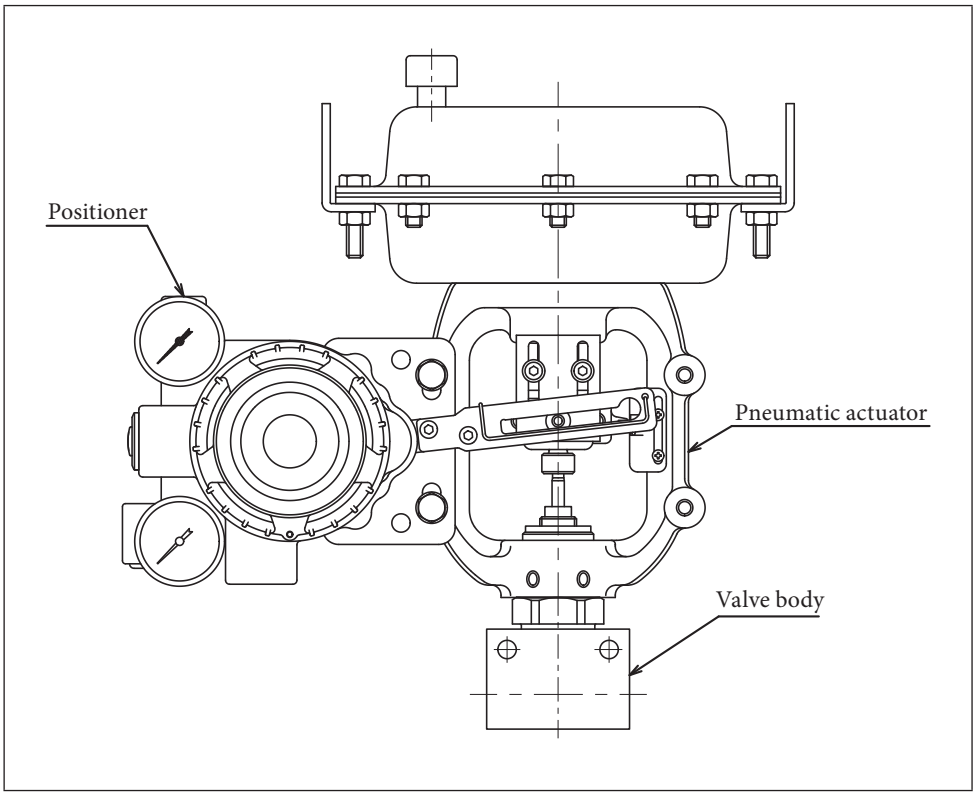


Fig. 1-1. VSM

1-3. Nameplate

A nameplate as shown in Fig. 1-2 is posted on each control valve. The nameplate indicates the model number, valve size, pressure rating, trim material, date of manufacture and other major specifications of the control valve. Before installing the control valve, make sure that the specifications indicated on the nameplate conform with the conditions of use. The nameplate indicate also the product number (PROD. NO.) of the control valve. Please mention this number also when consulting your Azbil Corporation agent for replacement of parts or other modification of the control valve.

Fig. 1-2. Nameplate

Chapter 2. Installation and piping

Before the valve is installed, removed and clean scale, welding chips, dust, and dirt from the process pipelines upstream and downstream of the valve.

2-1. Installing direction

Make sure that the flow direction (arrow) inscribed on the valve body coincides with the flow direction of the pipeline and install the valve in a vertical position with the actuator up.

2-2. Installation method

Taking advantage of the support holes provided in the valve body (on the ANSI600 class, the M8 threaded hole at the bottom of the body), secure the valve to a rack or bracket with bolts. (Refer to Fig. 1-1)

2-3. Process pipeline

Connect the process pipeline into the NPT or Rc threaded hole. If a threaded hole of a different standard is required, have a separate adapter ready and connect the pipeline.

2-4. Pneumatic pipeline

Connect the pneumatic pipeline to appropriate position of the positioner or actuator. Air-purge and clean the pipeline before installation.

2-5. Inspection after installation

After the valve has been installed, check the following points:

1. Check the air pipeline for looseness and air leakage.
2. Check the bolts and nuts of the diaphragm case for looseness.
3. Check the bolt of the stem connector coupling (the actuator stem with the stem adapter) for looseness.
4. Check the set screw holding the yoke and bonnet of the actuator in position for looseness.
5. Check the looseness between the valve body and bonnet.

Chapter 3. Structure and maintenance

3-1. General

The valve body of the VSM type micro flow control valve consists of a valve body, bonnet, valve plug, seat ring and gland parts.

Coaxial and vertical parts (such as the valve plug, seat ring, and guide bushing) are attached of the bonnet, so they are easy to disassemble and reassemble.

3-2. Construction

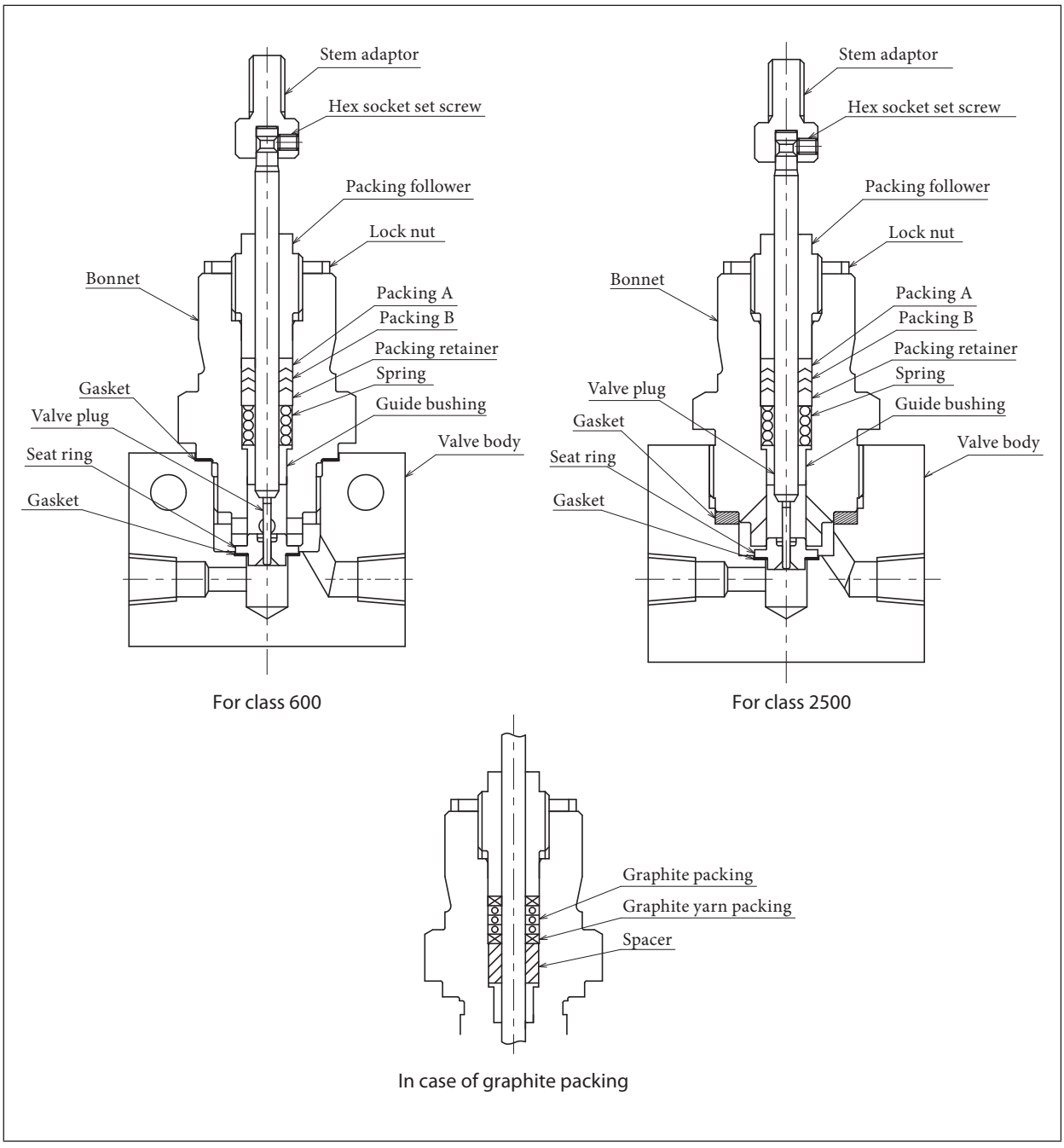
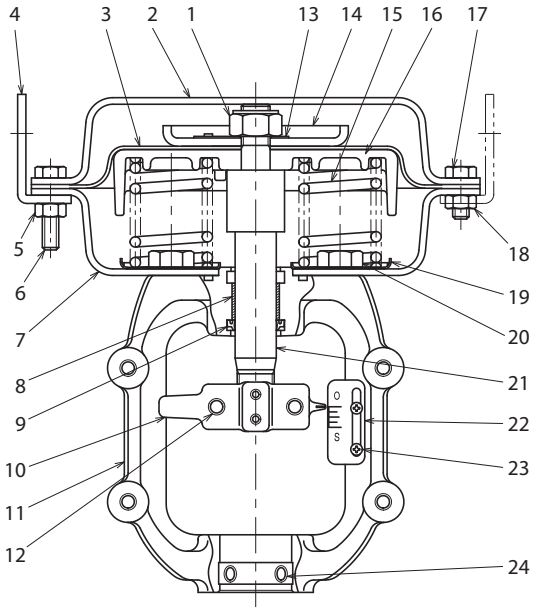
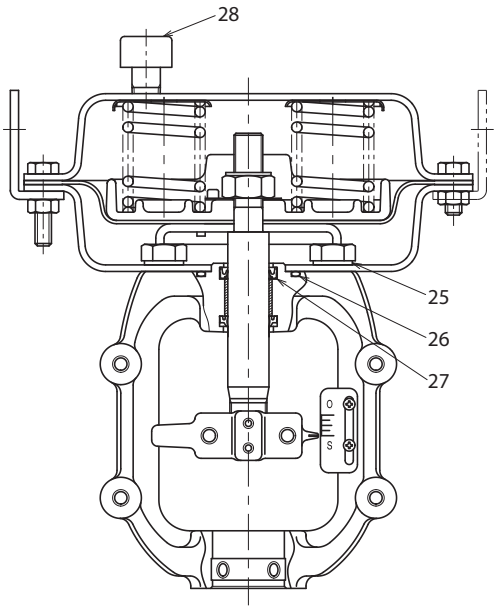


Fig. 3-1. Structure of valve body



Direct action



Reverse action

No.	Parts name
1	Locknut
2	Diaphragm case (top)
3	Diaphragm
4	Hanging hook
5	Hex nut
6	Hex bolt
7	Diaphragm case (bottom)
8	Rolled bushing
9	Dust seal
10	Stem connector
11	Yoke
12	Bolt
13	Single tab washer
14	Diaphragm retainer

No.	Parts name
15	Spring
16	Diaphragm plate
17	Hex bolt
18	Hex nut
19	Spring plate
20	Bolt
21	Rod
22	Scale plate
23	Truss screw
24	Hex socket head set screw
25	Seal washer
26	O-ring
27	Rod packing
28	Cap

Fig. 3-2. Model PSK1 Actuator

3-3. Maintenance

The VSM type control valve is functionally maintenance-free; however, the valve is designed a tiny amount of flow so contamination of the ports and seats could cause a large effect on control characteristics. It is therefore advisable to clean the valve plug and seat ring at regular intervals, depending on conditions.

For cleaning, refer to section on “Disassembly and reassembly”.

In case deterioration is found after a long period of service, replacement of the sealing elements such as diaphragm, O-ring, and packing, or even the valve plug and seat ring may be required. For replacement of damaged parts, refer to the section on “Disassembly and reassembly”. In either case, readjustment is necessary. (Refer to the section on “Adjustment”.) The VSM type control valve does not need to be greased.

■ Valve plug and seat ring replacement procedures

On control valves over 0.16 in the rated Cv value, replacement of only the valve plug and only the seat ring can be accomplished. (On control valves less than 0.1 in the rated Cv value, the valve plug and seat ring are used as a set. If either one of them is defective, replace them as a set.)

(1) Lift the valve plug all the way (For a direct action type, remove the air pressure. For a reverse action type, supply air pressure into the actuator.)

(2) Loosen the lock nut of the gland portion and loosen the packing follower. (Refer to Fig. 4-4.)

(3) Using a spanner, detach the bonnet from the body. (Refer to Fig. 4-5.)

(4) Remove and replace the seat ring.

To replace the valve plug, proceed as follows:

(5) Loosen the hexagon slotted set screw of the stem adapter.

(6) Carefully remove the valve plug downward.

(7) Install a new valve plug and reassemble by reversing the above procedures. Refer to note under “4-5. Reassembly procedures”.

Chapter 4. Disassembly

Before the control valve is disassembled, shut off the flow in the pipeline and check to ensure that the there is no pressure in the valve and that the temperature of the valve body is close to the room temperature.

Note: When only the valve plug and seat ring are to be replaced, refer to the Valve plug and seat ring replacement procedures section.

4-1. Removal of positioner

(1) After checking to ensure that there is no pressure in the pneumatic pipeline, remove the pneumatic pipeline.

(2) Loosen the hexagon slotted set screw tightening the actuator yoke and remove the positioner.

4-2. Detaching actuator from valve body

(1) For reverse action type, apply air so that the pointer will indicate point slightly above full-close position. For direct action type, do not apply air to actuator.

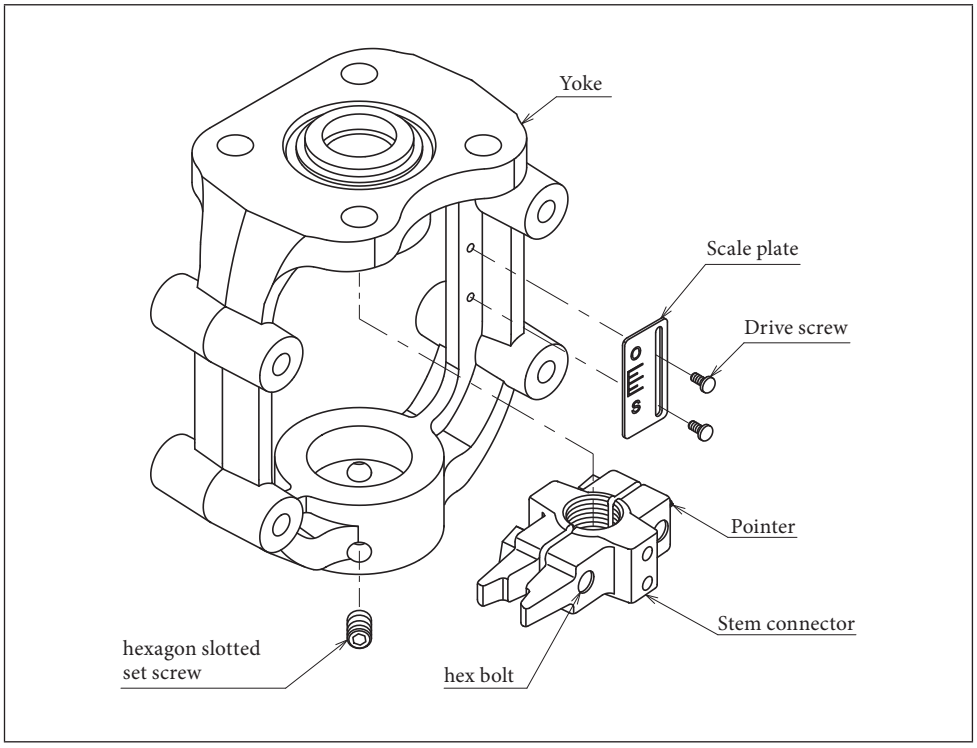


Fig. 4-1.

(2) Disconnect actuator stem and valve stem by removing stem connector and remove air pressure.

(3) Remove actuator from valve body by loosening four hexagon slotted set screw at lower end of yoke.

(4) Remove air connection.

(5) Hold down the body and lift the actuator by turning clockwise and counter-clockwise unit it is detached.

4-3. Disassembly of actuator

(1) The components of the direct action and reverse action types are different. Refer to Fig. 4-2. and Fig. 4-3..

(2) After stem connector is attached again, carefully remove hex bolts of diaphragm case. (Springs are preloaded.)

(3) Remove anti-looseness nut to disassemble diaphragm unit.

(4) For direct action type, remove hex bolt in diaphragm case. For reverse action type, remove hex bolts in diaphragm case, using care to prevent loss of small O rings.

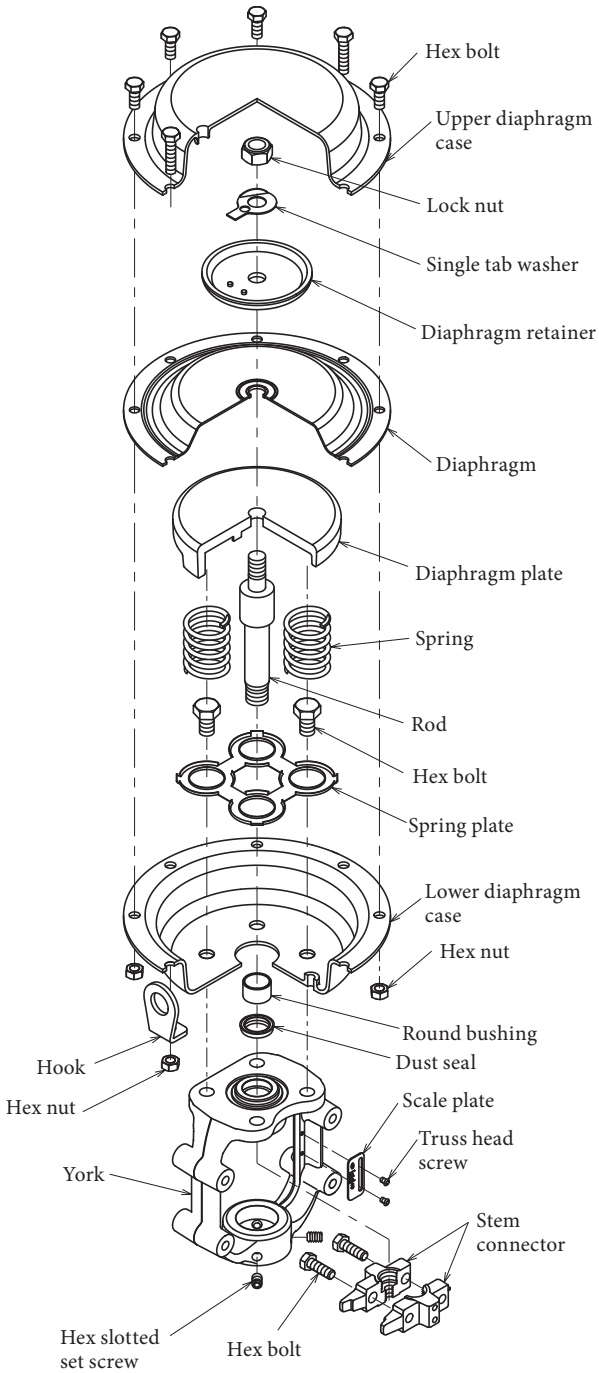


Fig. 4-2. Direct action type Model PSK1D

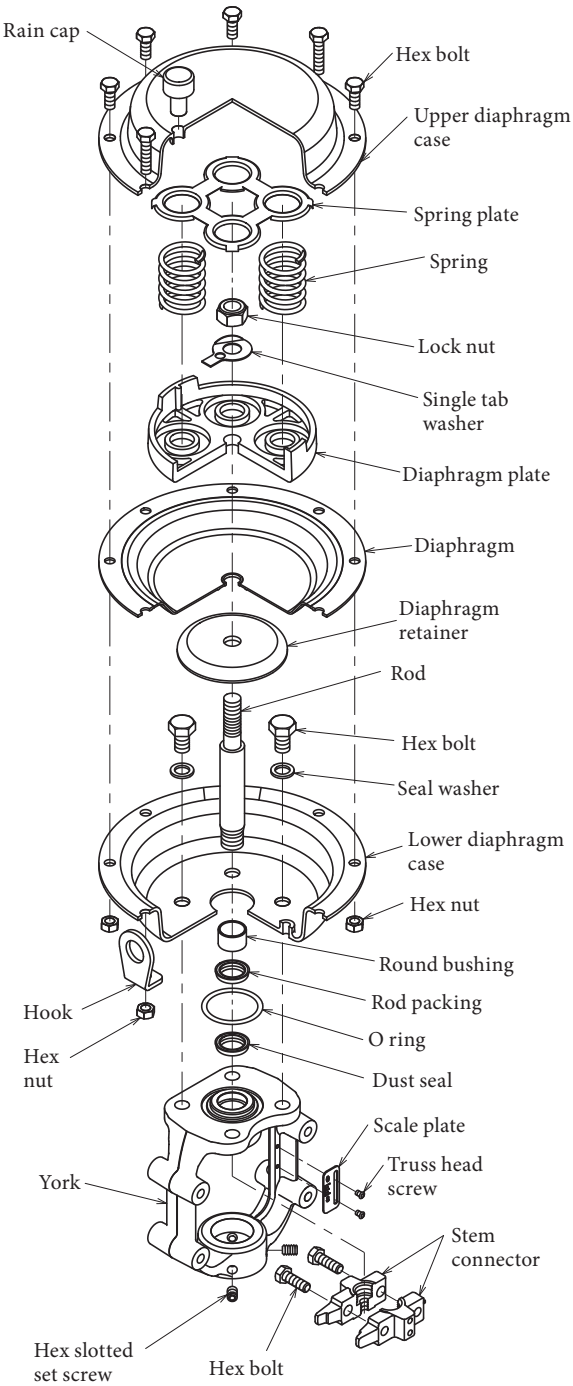


Fig. 4-3. Reverse action type Model PSK1R

4-4. Disassembly of valve body

(1) Loosen and remove the gland locknut and loosen the packing follower.

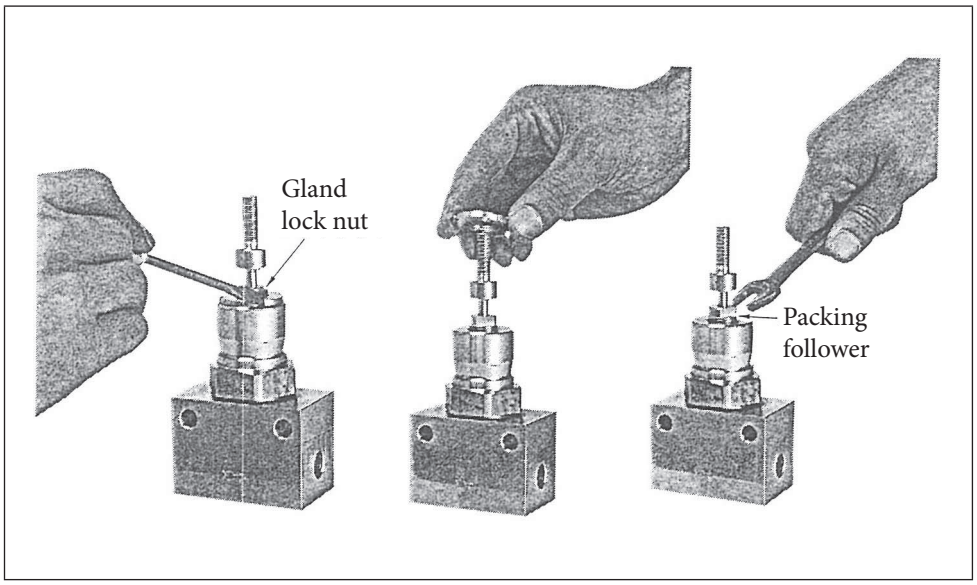


Fig. 4-4.

(2) Using spanner, remove the bonnet from the valve body

Note: Lift the valve plug about 10 mm upward.

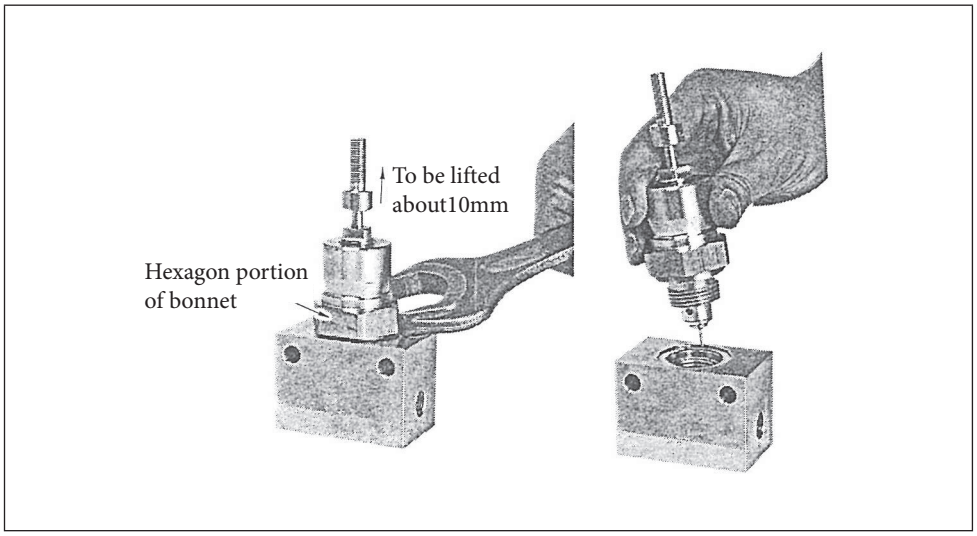


Fig. 4-5.

(3) Remove gaskets from the valve body. Large and small gaskets are provided.

(4) Loosen the packing follower completely and remove gland parts such as the valve plug and packing from the bonnet.

Note: Handle the gland packing carefully not to damage or scratch it.

(5) Remove the seat ring from the bonnet.

(6) Loosen hexagon slotted set screw and remove the valve plug from the stem adapter.

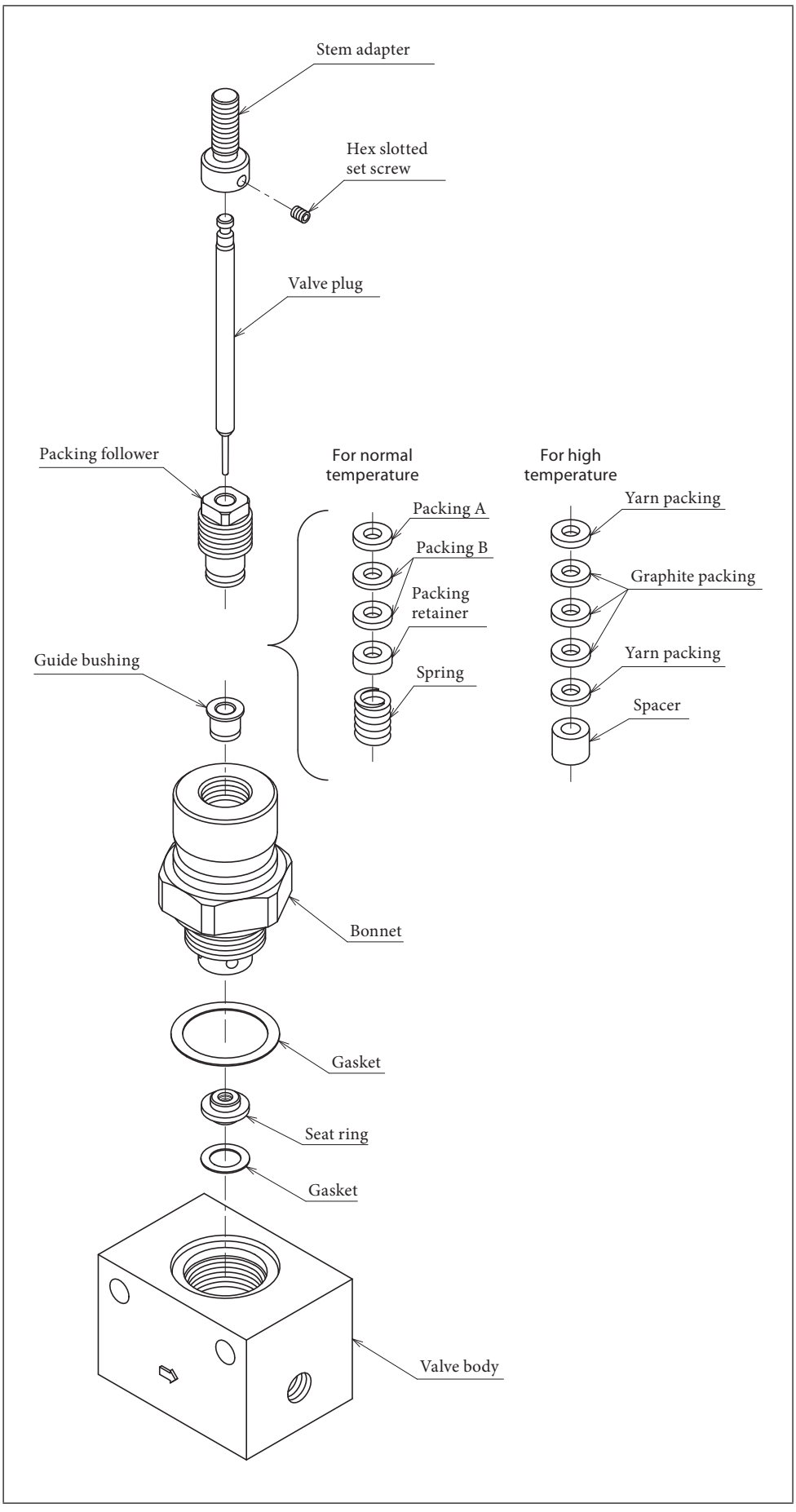

Stem adapter
Hex slotted
set screw
Valve plug
Packing follower
For normal
temperature
For high
temperature
Packing A
Packing B
Packing
retainer
Spring
Yarn packing
Graphite packing
Yarn packing
Spacer
Guide bushing
Bonnet
Gasket
Seat ring
Gasket
Valve body

Fig. 4-6.

4-5. Reassembly procedures

For reassembly, reverse the disassembly procedures.

(1) Carefully and fully tighten the threaded parts.

(2) For installation of the stem connector, refer to the “Lift adjustment” subsection and adjust to make sure that the threaded portions of the actuator stem and stem adapter are inserted the same length.

(3) Prior to reassembly, clean the sealing part of attaching surfaces and apply a lubricant (silicone grease, etc.)

(4) When the seat ring is installed, pay attention to its direction as direction as shown in Fig. 4-7.

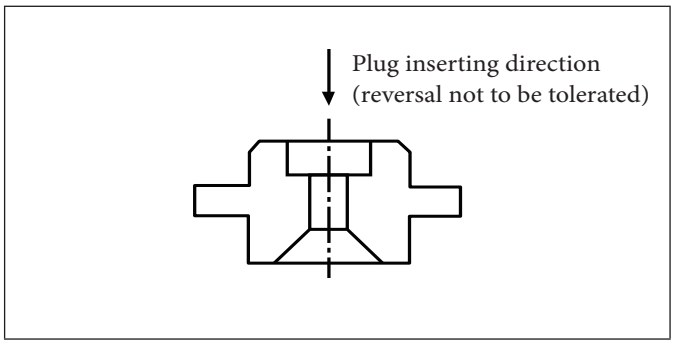


Fig. 4-7.

(5) Tightening torque values of the bonnet are shown below.

Class 600: 400 to 450 N·m (4000 to 4500 kgf/cm)*

Class 900: 750 to 850 N·m (7500 to 8500 kgf/cm)

Class 2500: 950 to 1050 N·m (9500 to 10500 kgf/cm)

* When the gasket material is tantalum, tightening torque value is 300 N·m (3000 kgf/cm)

Chapter 5. Adjustment

5-1. Lift adjustment

The diaphragm type actuator, itself, does not require adjustment. Procedures to be followed when the actuator is disassembled and checked are as described below.

5-2. Direct action type

(1) Remove the stem connector, and then pull the valve plug fully down to the close position (where the plug touches the seat).

(2) Connect the air pipeline to the actuator and apply air pressure of the maximum value of the spring range {120, 160, 210 kPa (1.2, 1.6, 2.1 kgf/cm^2)} to the diaphragm.

(3) Connect the actuator stem and stem adapter at the stem connector.

(4) Loosen the lock screw of the scale and adjust the pointer of the stem connector to the lower limit value of the scale (Position "S").

(5) Check the rated lift stroke by increasing and reducing the air pressure.

5-3. Reverse action type

Remove the stem connector, and then pull the valve plug fully down to the close position (where the plug touches the seat).

Connect the air pipeline to the actuator and apply an air pressure of the minimum value {40, 80, 120 kPa (4.0, 8.0, 12.0 kgf/cm^2)}

Loosen the lock screw of the scale and adjust the pointer of the stem connector to the lower limit value of the scale (Position "S").

Check the rated lift stroke by increasing or reducing the air pressure.

For removal and installation of the stem connector, refer to "4-2. Detaching actuator from valve body".

Chapter 6. Troubleshooting

Symptom	Cause	Remedy
Leakage of fluid from gland portion	◆ Packing not tight ◆ Damaged sealing parts	◆ Retighten packing follower ◆ Disassemble and remove packing and other gland parts
Leakage of fluid from valve body and bonnet connecting portion	◆ Gasket not tight enough ◆ Damaged gasket	◆ Retighten bonnet ◆ Replace gasket
Insufficient flow rate even in fully opened position	◆ Cv value insufficient*	◆ Increase stroke (on control valve with positioner) ◆ Replace with plug of larger rated Cv value
ON and OFF near fully closed position	◆ Cv value excessive*	◆ Replace with plug of smaller rated Cv value
Excessive leakage from seat	◆ Gasket of seat ring not tight enough ◆ Damaged gasket ◆ Foreign matter in seat ◆ Damaged plug and seat ring	◆ Retighten bonnet ◆ Replace gasket ◆ Check plug seat and seat ring seat ◆ Replace plug seat ring

* Choose adequate rated Cv value which allows the maximum and minimum required Cv value and rangeability of the valve, but some control margin must be taken in to consideration.

(1) Maximum Cv value – As for the maximum Cv value, it is advisable, taking into consideration the control margin or tolerance (±20 %) on the rated Cv value, to select a rated Cv value which will provide less than 80 % opening for both equal percent and linear characteristics.

(2) Normal Cv value – From the standpoint of control characteristics, a valve opening of 50 to 80 % is desirable for better control results.

(3) Even of the minimum Cv value is within the specific rangeability of the valve, when fluid is actually set flowing through the valve, a change in the valve opening often causes a corresponding change in the differential pressure, and the relation between the valve opening and flow rate shows characteristics (effective flow characteristics) somewhat different from the specific flow characteristics, so the effective rangeability becomes narrower.

A preferred valve opening at the minimum Cv value is 10 to 20 % more. Where control with smaller valve opening is a requirement, use two large and small valves selectively. In some applications two valves are used in split ranges. (See Fig. 6-1.)

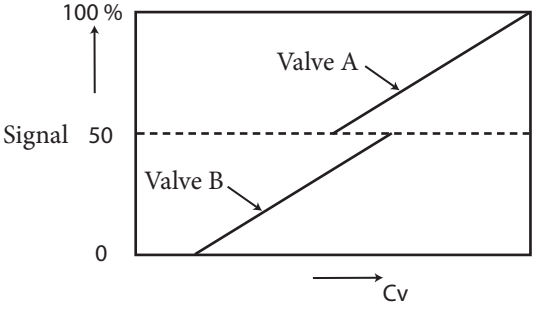


Fig. 6-1.

Chapter 7. Tools necessary for maintenance

Tool name	Location of use
Spanner 13 (JIS B4630)	Stem connector (M8 hex bolt)
	Packing follower
Spanner 41 (JIS B4630)	Bonnet
Hex bar spanner 2 (JIS B4648)	Stem adaptor (M4 hex slotted set screw)
Hex bar spanner 4 (JIS B4648)	Yoke and bonnet coupling portion (M8 hex slotted set screw)
	VPE Positioner case (M5 hex slotted set screw)
Cross slot screwdriver (JIS B4633)	Scale plate (tapping)

Chapter 8. Recommended spare parts

It is most recommendable to replace the following parts when servicing the control valve.

- Valve body

  Be sure to replace the following parts with fresh ones whenever the valve body is disassembled:

  Gland packing

  Gaskets

- Actuator

  Replace the following Parts at every 5 years or thereabout.

  Diaphragm
  Bushing
  Seal washer
  Dust seal
  Rod packing

  } Be sure to replace these parts whenever the actuator is disassembly.

  Please mention the parts name and the product number indicated on the name plate when ordering those spare parts.

Chapter 9. Parts list

9-1. Valve plug

Cv value	Flow characteristics	Material	Qty
Cv=0.63	%C	SUS316	1
		MS No. 6B	1
	LC	SUS316	1
		MS No. 6B	1
Cv=0.4	%C	SUS316	1
		MS No. 6B	1
	LC	SUS316	1
		MS No. 6B	1
Cv=0.25	%C	SUS316	1
		MS No. 6B	1
	LC	SUS316	1
		MS No. 6B	1
Cv=0.16	LC	SUS316	1
		MS No. 6B	1
Cv=0.1	LC	MS No. 6B	1
Cv=0.05	LC	MS No. 6B	1
Cv=0.02	LC	MS No. 6B	1
Cv=0.01	LC	MS No. 6B	1
Cv=0.005	LC	MS No. 6B	1
Cv=0.002	LC	MS No. 6B	1
Cv=0.001	LC	MS No. 6B	1

9-2. Seat ring

Cv value	Material	Qty
Cv=0.63	SUS316	1
	MS No. 6B	1
Cv=0.1 to 0.02	MS No. 6B	1
Cv=0.01 to 0.001	MS No. 6B	1

9-3. Gland packing

- V shaped PTFE packing (–30 to +200 deg C)

Parts name	Qty
V packing (A)	1
V packing (B)	2

- Yarn packing (201 deg C or more)

Parts name	Qty
P6610A	3
P6710CH	2

9-4. Gasket

- Gasket (A)

Parts name	Qty	Remarks
P2600G	1	class 2500
V560 tantalum	1	
SUS316L (PTFE coating)	1	

- Gasket (B)

Parts name	Qty	Remarks
V560 tantalum	1	
SUS316L (PTFE coating)	1	

Chapter 10. Disposal

If this device is no longer needed, dispose of it appropriately as industrial waste, in accordance with local regulations. Do not reuse all or a part of this device.

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products. You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

(1) Failure caused by your improper use of azbil product
(noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
(2) Failure caused for other reasons than Azbil Corporation's product;
(3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
(4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
(5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
(6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

(1) Regulations and standards or laws that your Equipment is to comply with.
(2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
(3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down.
You are required to provide your Equipment with safety design such as fool-proof design, *1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance, *3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

*1. A design that is safe even if the user makes an error.
*2. A design that is safe even if the device fails.
*3. Avoidance of device failure by using highly reliable components, etc.
*4. The use of redundancy.

3. Precautions and restrictions on application

Azbil Corporation's products other than those explicitly specified as applicable (e.g. azbil Limit Switch For Nuclear Energy) shall not be used in a nuclear energy controlled area (radiation controlled area).
Any Azbil Corporation's products shall not be used for/with medical equipment.
The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.
In addition,
you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below.
Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

(1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals

(2) For use of specific purposes, such as:
    * Nuclear energy/radiation related facilities
      [For use outside nuclear energy controlled areas] [For use of Azbil Corporation's Limit Switch For Nuclear Energy]
    * Machinery or equipment for space/sea bottom
    * Transportation equipment
      [Railway, aircraft, vessels, vehicle equipment, etc.]
    * Antidisaster/crime-prevention equipment
    * Burning appliances
    * Electrothermal equipment
    * Amusement facilities
    * Facilities/applications associated directly with billing
(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification.
Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.
In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used.
Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc.
as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals.
System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts.
For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason.
For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice.
For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts.
For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service.
Accordingly, a separate fee will be charged in any of the following cases:
(1) Installation, adjustment, guidance, and attendance at a test run
(2) Maintenance, inspection, adjustment, and repair
(3) Technical guidance and technical education
(4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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