



Operation Manual

High Vacuum L Type Valve

PRODUCT NAME

XLF Series

MODEL/ Series

Thank you for purchasing this SMC product.

Be sure to read this Operation Manual carefully and understand its contents before operating this product to ensure the safety of the operator and this product.

Please refer to the drawing and other informative documents for the construction and specifications of this product.

Further, ensure your operating environment satisfies the requirements specified for the product.

Keep this Operation Manual available whenever necessary.

SMC Corporation

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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)*1), and other safety regulations.

*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems

ISO 4413: Hydraulic fluid power -- General rules relating to systems

IEC 60204-1: Safety of machinery -- Electrical equipment of machines (Part 1: General requirements)

ISO 10218-1992: Manipulating industrial robots -- Safety



Caution

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



Warning

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



Danger

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious 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. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



Safety Instructions

Caution

1.The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

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.*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 regulation 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.**

1. Product Specific Precautions 1



Common Precautions 1

Be sure to read before handling.

Design



Warning

- All models

1. The body material is A6063, The material of the spring for vacuum is oil hardened and tempered wires (electroless nickel plating treatment) and other metal seal material is SUS304. The sealing material of the vacuum part is FKM as standard, but this can be changed to other materials (refer to "How to Order"). Confirm whether the fluid to be used is compatible with the materials before use.

Grease for vacuum is applied to the sliding part of the vacuum (Fluorine grease: Y-VAC2).

2. Select materials for the pilot pressure piping and fittings whose heat resistance is suitable for the applicable operating temperature.

- Models with auto switch

- 1.Keep the temperature of the switch below 60oC.

- With heater (thermister)

- 1.When using a model with a heater, a mechanism to prevent overheating should be installed.

Selection



Caution

- All models

1. When controlling valve responsiveness, take note of the size and length of piping, as well as the flow rate characteristics of the actuating solenoid valve.
2. Actuating press should be kept within the specified range.0.4 MPa to 0.5 MPa is recommended.
3. Keep within the specified range of the pilot pressure.

- High temperature type

1. If using gases that cause a large amount of deposits, heat the valve body to prevent deposits in the valve.

Mounting



Caution

- All models

1. In high humidity environments, keep the valve packed until the time of installation.
2. For models with switches, secure the lead wires so that they have sufficient slack, without any unreasonable force applied to them.
3. Perform piping so that excessive force is not applied to the flange sections. When there is vibration from heavy objects or attachments, etc., fix piping so that vibration will not apply torque directly to the flange section.

- High temperature type (temperature specification / H0 H2 H3)

1. In models with a heater (thermistor), take care not to damage the insulation components of the lead wires and connector section.
2. The set temperature for models with a heater should be established without any drafts or heat insulation. It will change depending on conditions such as heat insulation measures and the heating of other piping. Fine adjustment is not possible.
3. When installing heater accessories or mounting a heater, check insulation resistance at the actual operating temperature. A current leakage breaker or fuse should be installed.
4. If the valve is to be insulated, only the body should be insulated, excluding the bonnet part.

5. In models with a heater, when the heater is in operation, the entire valve becomes hot. Be careful not to touch it with bare hands, as burns will result.

Piping

Caution

1. Before mounting, clean the surface of the flange seal and the O-ring with ethanol, etc.
2. There is an indentation of 0.1 to 0.2mm in order to protect the flange seal surface, and it should be handled so that the seal surface is not damaged in any way.

Maintenance

Warning

If the fluid or reaction product (deposit) may cause the valve to become unsafe, the valve should be disassembled, cleaned and re-assembled by an operator who has sufficient knowledge and experience (e.g. a specialist).

Caution

1. When removing deposits from the valve, take care not to damage any part of it.
2. Replace the bonnet assembly when the valve is approaching the end of its service life.
*For the endurance cycles, refer to Section 5 (page 10).
3. If damage is suspected prior to the end of the service life, perform early maintenance.
4. SMC specified parts should be used for service. Refer to the Construction / Maintenance parts table.
5. When removing the valve seal and external seal, take care not to damage the sealing surfaces. When installing the valve seal and external seal, be sure that the O-ring is not twisted.

2. Product Specific Precautions 2



Common Precautions 2 Be sure to read before handling

Maintenance Parts



- SMC specified parts should be used for service. Refer to the construction drawing.
1. Replace the bonnet assembly when changing the sealant material. Due to the different materials used, changing only the seal may prove inadequate.

Bonnet assembly/construction part number:1

Temperature specifications	Indicator	Valve size			
		16	25	40	50
General use	without	XLF16-30-1	XLF25-30-1	XLF40-30-1	XLF50-30-1
	with	XLF16A-30-1	XLF25A-30-1	XLF40A-30-1	XLF50A-30-1
High temperature	without	XLF16-30-1H	XLF25-30-1H	XLF40-30-1H	XLF50-30-1H
	with	XLF16A-30-1H	XLF25A-30-1H	XLF40A-30-1H	XLF50A-30-1H

Temperature specifications	Indicator	Valve size			
		63	80	100	160
General use	without	XLF63-30-1	XLF80-30-1	XLF100-30-1	XLF160-30-1
	with	XLF63A-30-1	XLF80A-30-1	XLF100A-30-1	XLF160A-30-1
High temperature	without	XLF63-30-1H	XLF80-30-1H	XLF100-30-1H	XLF160-30-1H
	with	XLF63A-30-1H	XLF80A-30-1H	XLF100A-30-1H	XLF160A-30-1H

Note1) The magnet for auto switch is not provided. When the magnet for auto switch is necessary, add "-M9/" at the suffix of the part number.

Note2) List the optional sealant material symbol after the model number, except for the standard sealant material (FKM: compound No. 1349-80).

External seal / Valve seal

Description Construction No.	Material	Valve size			
		16	25	40	50
External seal (3)	Standard	XLF16-6	XLF25-6	AS568-035V	AS568-039V
	Special	-	-	AS568-035 **	AS568-039 **
Valve seal (2)	Standard	B2401-V15V	B2401-V24V	B2401-P42V	AS568-227V
	Special	B2401-V15 **	B2401-V24 **	B2401-P42 **	AS568-227 **

Description Construction No.	Material	Valve size			
		63	80	100	160
External seal (3)	Standard	AS568-043V	AS568-045V	AS568-050V	AS568-167V
	Special	AS568-043 **	AS568-045 **	AS568-050 **	AS568-167 **
Valve seal (2)	Standard	AS568-233V	B2401-V85V	AS568-349V	B2401-G155V
	Special	AS568-233 **	B2401-V85 **	AS568-349 **	B2401-G155 **

Note1) List the optional sealant material symbol after the model number, except for the standard sealant material (FKM: compound no. 1349-80).

Note2) Refer to the Construction of each series for the construction numbers.

Additional symbols of the seal materials

Seal material	EPDM	Barrel Perfluoro®	Kalrez®	Chemraz®			VMQ	FKM for PLASMA	ULTIC ARMOR®
Combination No.	2101-80	70W	4079	SS592	SS630	SSE38	1232-70	3310-75	UA4640
Symbol	-XN1	-XP1	-XQ1	-XR1	-XR2	-XR3	-XS1	-XT1	-XU1

Note1) Due to the different materials used, changing only the seal may prove inadequate.
 Barrel Perfluoro® is a registered trademark of Matsumura Oil Co.,Ltd.
 Kalrez® is a registered trademark of Dupont Dow Elastomers.
 Chemraz® is a registered trademark of Greene, Tweed & Co.
 ULTIC ARMOR® is a registered trademark of NIPPON VALQUA INDUSTRIES, LTD.

3. Specifications

Model		XLF-16	XLF-25	XLF-40	XLF-50	XLF-63	XLF-80	XLF-100	XLF-160	
Flange (valve) size		16	25	40	50	63	80	100	160	
Actuating type		Normally closed								
Fluid		Vacuum of inert gas								
Operating temperature °C		5 to 60 (5 to 150 for high temperature type)								
Operating pressure Pa		Atmospheric pressure to 1×10^{-5}								
Conductance l/s	Note 1	5	14	45	80	160	200	300	800	
Leakage Pa·m ³ /s	Internal	1.3 x 10 ⁻¹⁰ for the standard material (FKM) at ambient temperatures, excluding gas permeation								
	External	1.3 x 10 ⁻¹⁰ for the standard material (FKM) at ambient temperatures, excluding gas permeation								
Flange type		KF (NW)				KF (NW), K (DN)				
Main material		Body: aluminum alloy, Main part: SUS304 and FKM (standard sealing material) Note 2								
Surface treatment for body		Outside: hard anodized Inside: basis material								
Actuation pressure MPa		0.4~0.7								
Air consumption cm ³ Note 3	for 0.5MPa	19	46	200	360	660	1350	3000	5150	
Port size		M5			Rc 1/8					Rc 1/4
Weight kg		0.25	0.45	1.1	1.6	3	4.8	10	18	
Heater power W rush/ consumption Note 4	(H2)100 °C	-	-	200/40	200/60	400/100	600/150	800/220	1200/350	
	(H3)120 °C	-	200/30	400/70	400/80	600/130	800/180	1200/300	1600/400	

Note 1 The conductance is "molecular flow" measured with an elbow pipe which has the same dimension with each flange.

Note 2 A seal sliding part and an external seal for vacuum use vacuum grease (Y-VAC2).

Note 3 Air consumed by a reciprocating motion of a cylinder.

Note 4 A heater is provided as an option. Rush current of a heater runs for several tens of seconds, but it decreases after a while.

Heater specifications

Rated voltage AC90V to AC125V

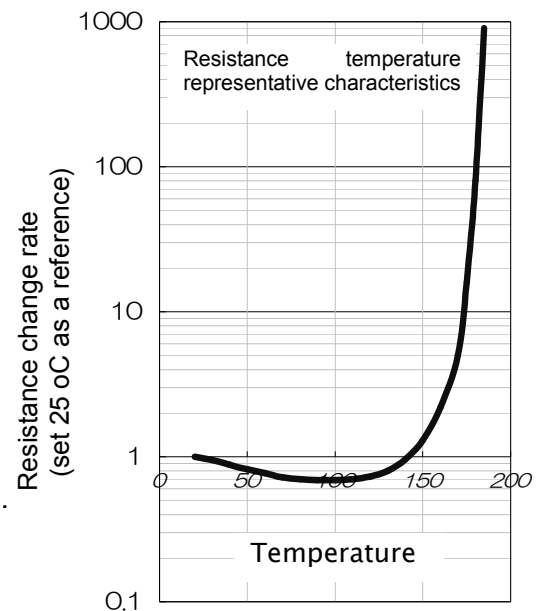
Resistance temperature characteristics:

See the figure on the right.

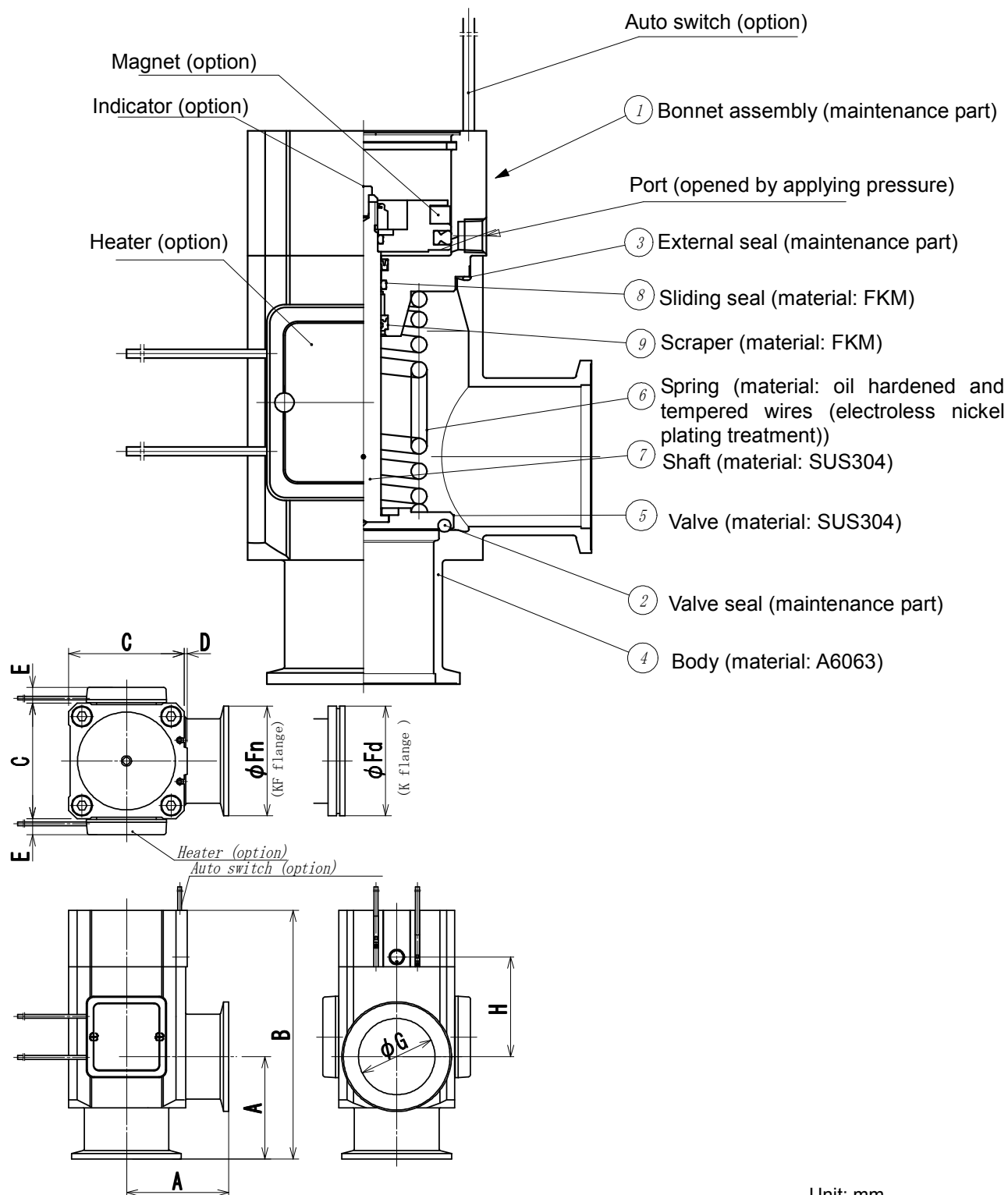
Curie point (C. P.) ≒ 160 oC

The heater used is a PTC thermistor. Temperature characteristics: The resistance decreases until the temperature reaches approx. 100oC, then increases as the temperature increases, then decreases once the temperature reaches approx. 200oC or more.

If the heater is heated from outside, and the temperature of the heater exceeds 200 oC, it will induce more current to flow, causing the heater to burn. If the heater is used in such an environment, use a temperature fuse to prevent overheating.



4. Construction and Outer dimensions



Unit: mm

Model	A	B	C	D	E	F _n	F _d	G	H
XLF-16	40	103	38	1	-	30	-	17	40
XLF-25	50	113	48	1	12	40	-	26	39
XLF-40	65	158	66	2	11	55	-	41	63
XLF-50	70	170	79	2	11	75	-	52	68
XLF-63	88	196	100	3	11	87	95	70	69
XLF-80	90	235	117	3	11	114	110	83	96
XLF-100	108	300	154	3	11	134	130	102	131
XLF-160	138	315	200	3	11	190	180	153	112

5. Period and scope of warranty

The warranty period is 3 million cycles (for size 16, 25 and 40), 2 million cycles (for size 50, 63 and 80) or 1 million cycles (for size 100 and 160) (under SMC endurance test conditions), 18 months after delivery or 12 months in service, whichever comes first.

Notes The endurance will depend on the operating conditions (such as if the flow rate is large). If the valve has been used outside of the specifications, or if a failure occurs as a result of mounting onto a machine or replacement of an assembly, O-ring etc. by the user, the guarantee cannot be applied.

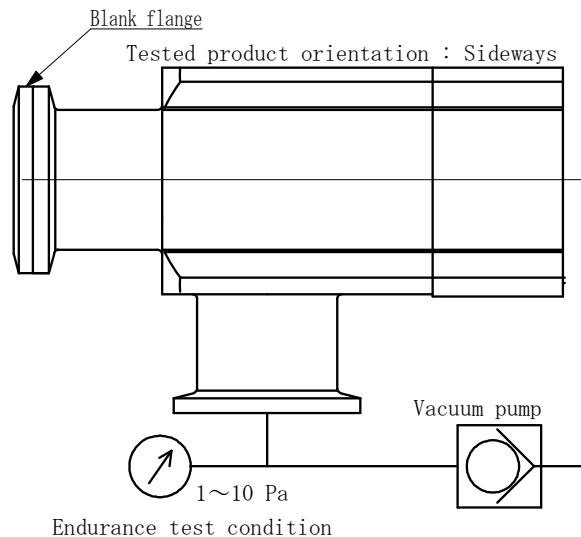
For any failure reported within the warranty period which is clearly our responsibility, the whole valve will be replaced. This guarantee does not apply to any damage incurred due to the failure of the valve.

Result of endurance test (with the circuit shown on the right)

The valve was opened and closed in an internal vacuum state at an ordinary (room) temperature and checked for internal and external leakage and operation.

It was confirmed that XLF-16, XLF-25 and XLF-40 satisfied the product specification up to 3 million cycles, XLF-50, XLF-63 and XLF-80 did up to 2 million cycles. XLF-100, XLF-160 and XLF-80 did up to 1 million cycles.

The test was performed with FKM, the standard sealing material.



6. Parts Replacement Procedure

6-1. Precautions

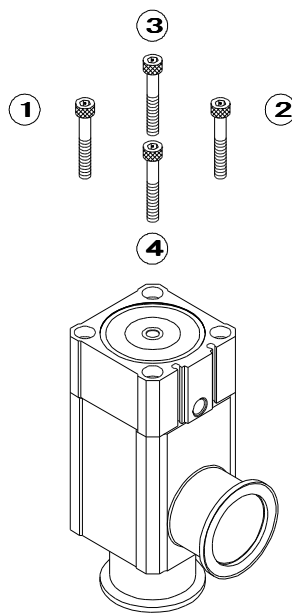
Be sure to follow [1. Precautions 1] when disassembling the product for maintenance. Along with the precautions above, comply with the following precautions too.

Warning

- If it is expected that product materials may get stuck to the product, ensure safety is assured before handling. It is recommended to wear gloves and a mask.
- Pay attention to the handling of components according to the procedure in the next item onwards. Do not apply excessive force or impact. This will not only damage the product but also decrease its performance and life expectancy.
- It is not possible to disassemble the bonnet assembly of this product. If the components and assembly are damaged, or damage is expected, exchange the bonnet assembly itself.
- Do not disassemble the parts that are not explained in this operation manual. The performance and life may decrease. Also, it may cause danger.

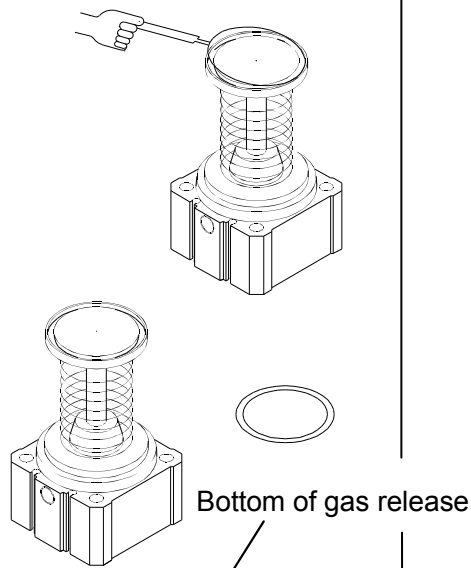
6-2.Replacement Procedure of the valve seal (O-ring)

Step 1



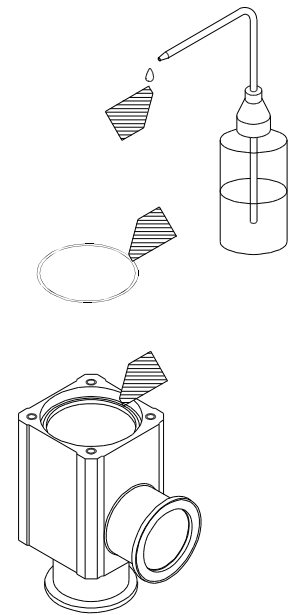
Supply 0.4Mpa of pressure to the port and loosen bolts in numerical order.

Step 2



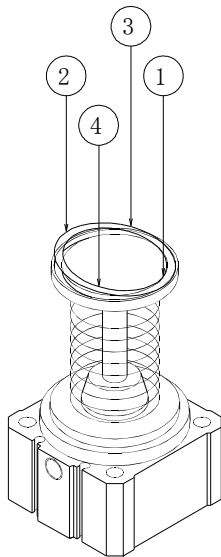
Remove O-ring from the gas release groove with a tool which height is the same as the groove depth. (Mind not to damage O-ring groove)

Step 3



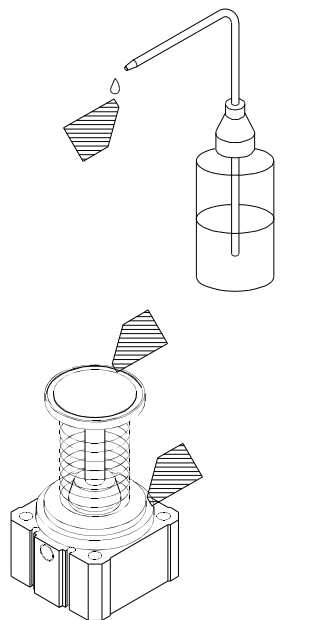
Apply ethanol to clean paper to wipe off the dust in O-ring groove. (Ensure no fiber nor dust are found)

Step 4



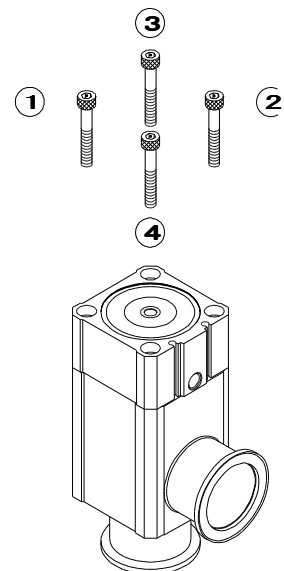
Apply ethanol to clean paper to wipe off dust on O-ring surface, and place the ring to O-ring groove. Press O-ring in numerical order in above drawing (press diagonally) to mount O-ring into the groove. (Put on gloves which generate no particle)

Step 5



Apply ethanol to clean paper to wipe off dust on O-ring surface.

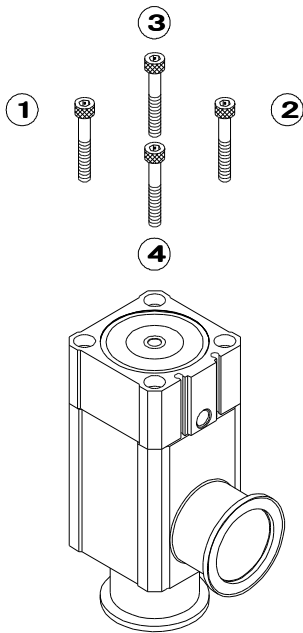
Step 6



Supply 0.4Mpa of pressure to the port to tighten bolts in numerical order in above drawing. First, hand tighten them evenly until just before O- ring is squeezed. Then, tighten them altogether.

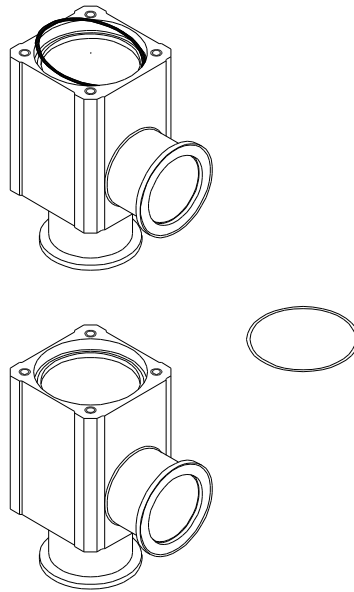
6-3. Replacement Procedure of the External Seal (O-ring)

Step 1



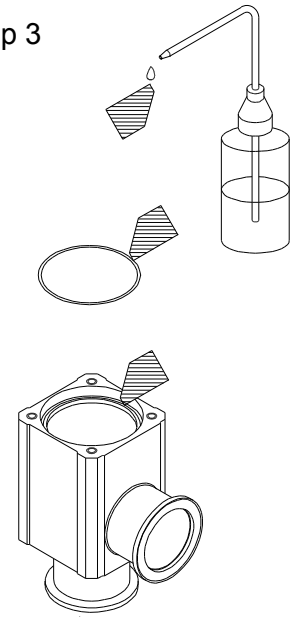
Supply 0.4Mpa of pressure to the port and loosen bolts in numerical order.

Step 2



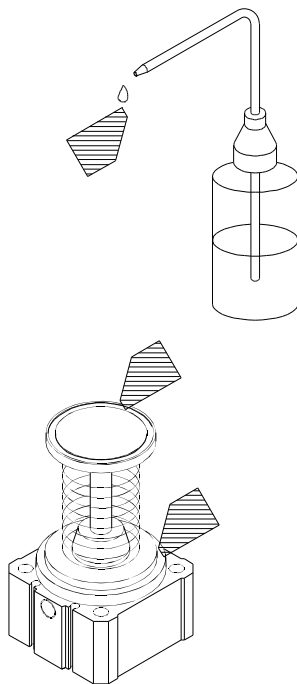
Remove O-ring from the body. (Mind not to damage the body mount surface.)

Step 3



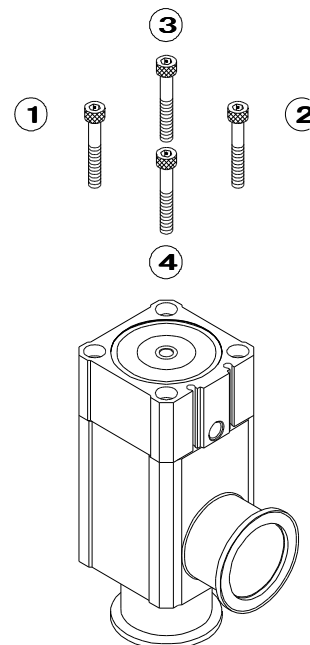
Apply ethanol to clean paper to wipe off the dust on O-ring surface and the body mount surface. Then, mount the O-ring.

Step 4



Apply ethanol to clean paper to wipe off dust on O-ring surface and bellows holder surface.

Step 5



Supply 0.4Mpa of pressure to the port to tighten bolt in numerical order in above drawing. First, hand tighten them evenly until just before O-ring is squeezed. Then, tighten them altogether.

Revision history	
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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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