



# Operation Manual

High Vacuum L Type Valve

PRODUCT NAME

XLA Series

MODEL / Series / Product Number

**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,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 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



## Precautions 1

Be sure to read before handling.

### Design



## Warning

- All models

1. The body material is A6063, the bellows is SUS316L, and other metal seal material is SUS304. Standard seal material in the vacuum section is FKM that can be changed to the other materials (please refer "How to Order"). Use fluids those are compatible with using materials after confirming.
2. Select materials for the actuation pressure piping, and heat resistance for fittings that are suitable for the applicable operating temperatures.

- Models with auto switch

1. Keep the temperature of the switch below 60°C

- With heater (thermistor)

1. When using a model with a heater, a mechanism to prevent overheating should be installed.
2. If using gases that generate a large amount of deposits, it is recommended that the valve body be heated to prevent deposits from sticking to the valve surfaces.

### 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. Keep the pilot pressure within the specified range.
3. Operate within the specified operating pressure range.
4. Operate within the specified operating temperature range.
5. Please note, when selecting a product without an auto switch(es) (excluding those with built-in magnet), it is not possible to mount an auto switch(es) following receipt of the product from an SMC factory.

### 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.
4. Vibration resistance allows for normal operation of up to 30 m/s<sup>2</sup> (45 to 250Hz), but continuous vibration may cause a decline in durability.  
Arrange piping to avoid excessive vibration or impacts.

- High temperature type (temperature specification / H0 H4 H5)

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.
6. The temperature of the product which temperature is controlled by the heater will be stabilized at several percent lower than the set temperature in a certain time after the start of the heater. (There are 5 to 10% of decrease of temperature due to individual difference )

#### 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 details regarding endurance cycles, please reference Section 5 of this Operation manual titled Period and scope of warranty. (pages 11)
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. (Refer to Section 6 Parts Replacement Procedure (pages 12 to 15) for details.)

## 2. Product Specific Precautions 2



### Precautions 2

Be sure to read before handling

Maintenance Parts



### Caution

SMC specified parts should be used for service. Refer to the construction drawing.

1. Replace the bonnet assembly when changing the seal 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	XLA16-30-1	XLA25-30-1	XLA40-30-1	XLA50-30-1
	with	XLA16A-30-1	XLA25A-30-1	XLA40A-30-1	XLA50A-30-1
High temperature	without	XLA16-30-1H	XLA25-30-1H	XLA40-30-1H	XLA50-30-1H
	with	XLA16A-30-1H	XLA25A-30-1H	XLA40A-30-1H	XLA50A-30-1H

Temperature specifications	Indicator	Valve size			
		63	80	100	160
General use	without	XLA63-30-1	XLA80-30-1	XLA100-30-1	XLA160-30-1
	with	XLA63A-30-1	XLA80A-30-1	XLA100A-30-1	XLA160A-30-1
High temperature	without	XLA63-30-1H	XLA80-30-1H	XLA100-30-1H	XLA160-30-1H
	with	XLA63A-30-1H	XLA80A-30-1H	XLA100A-30-1H	XLA160A-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) An auto switch for high temperature is available with a different part number.

Note3) List the optional seal material symbol after the model number, except for the standard sealant material (FKM: compound No. 1349-80).

e.g) XLA16-30-1-M9// -XN1

Note4) The bonnet assembly contains the valve seal.

#### Exterior seal, valve seal

Description Constructions No.	Material	Valve size			
		16	25	40	50
Exterior seal (3)	Standard	AS568-025V	AS568-030V	AS568-035V	AS568-039V
	Specific	AS568-025 **	AS568-030 **	AS568-035 **	AS568-039 **
Valve seal (2)	Standard	B2401-V15V	B2401-V24V	B2401-P42V	AS568-227V
	Specific	B2401-V15 **	B2401-V24 **	B2401-P42 **	AS568-227 **

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

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

e.g) AS568-025-XN1

Note2) Refer to the Chapter 4, "Construction and Dimensions" (P10) for the part indication numbers.

Note3) We do not guarantee the quality if the seal material is changed by customer.

**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
<b>Symbol</b>	<b>-XN1</b>	<b>-XP1</b>	<b>-XQ1</b>	<b>-XR1</b>	<b>-XR2</b>	<b>-XR3</b>	<b>-XS1</b>	<b>-XT1</b>	<b>-XU1</b>

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 E. I. du Pont de Nemours and Company.  
 Chemraz® is a registered trademark of the Greene, Tweed Technologies,inc.  
 ULTIC ARMOR® is a registered trademark of NIPPON VALQUA INDUSTRIES, LTD.

### 3. Specifications

#### 3-1. Vale specifications

Model	XLA-16	XLA-25	XLA-40	XLA-50	XLA-63	XLA-80	XLA-100	XLA-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(abs)	Atmospheric pressure to $1 \times 10^{-6}$								
Conductance l/s Note 1	5	14	45	80	160	200	300	800	
Leakage Pa·m <sup>3</sup> /s	Internal	1.3 x 10 <sup>-10</sup> for the standard material (FKM) at ambient temperatures , excluding gas permeation							
	External	1.3 x 10 <sup>-11</sup> for the standard material (FKM) at ambient temperatures , excluding gas permeation							
Flange type	KF (NW)				KF (NW) , K (DN)				
Main material	Body: aluminum alloy, Bellows: SUS316L, Main part: SUS304 and FKM (standard sealing material)								
Surface treatment for body	Outside: hard anodized Inside: basis material								
Actuation pressure MPa(G)	0.4 to 0.7								
Air consumption cm <sup>3</sup> Note 2	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	2.9	5.0	10.6	18.5	

Note1) Conductance is “molecular flow” measured with an elbow pipe which has the same dimension as each applicable flange.

Note2) For one cycle of cylinder.

### 3-2. Heater specifications

Item		XL□-25	XL□-40	XL□-50	XL□-63	
Rated voltage of the heater		90 to 240 ACV				
S y m b o l	H 4	Heater assembly number	-	XLA25-60S-1	XLA25-60S-1	XLA25-60S-2
		No. of heater assemblies	-	1 pc.	1 pc.	1 pc.
		Initial power / Power consumption (W)	100 VAC	-	200/40	200/50
	200 VAC		-	800/40	800/50	800/100
	H 5	Heater assembly number	XLA25-60S-1	XLA25-60S-2	XLA25-60S-2	XLA25-60S-3
		No. of heater assemblies	1 pc.	1 pc.	1 pc.	1 pc.
Initial power / Power consumption (W)		100 VAC	200/40	400/70	400/80	600/130
	200 VAC	800/40	1600/80	1600/80	2400/130	

Item		XL□-80	XL□-100	XL□-160	
Rated voltage of the heater		90 to 240 ACV			
S y m b o l	H 4	Heater assembly number	XLA25-60S-3	XLA25-60S-2	XLA25-60S-2
		No. of heater assemblies	1 pc.	2 pcs.	3 pcs.
		Initial power/ Power consumption (W)	100 VAC	600/150	800/220
	200 VAC		2400/150	3200/220	4800/350
	H 5	Heater assembly number	XLA25-60S-2	XLA25-60S-2	XLA25-60S-2
		No. of heater assemblies	2 pcs.	3 pcs.	4 pcs.
Initial power/ Power consumption (W)		100 VAC	800/180	1200/300	1600/400
	200 VAC	3200/180	4800/300	6400/400	

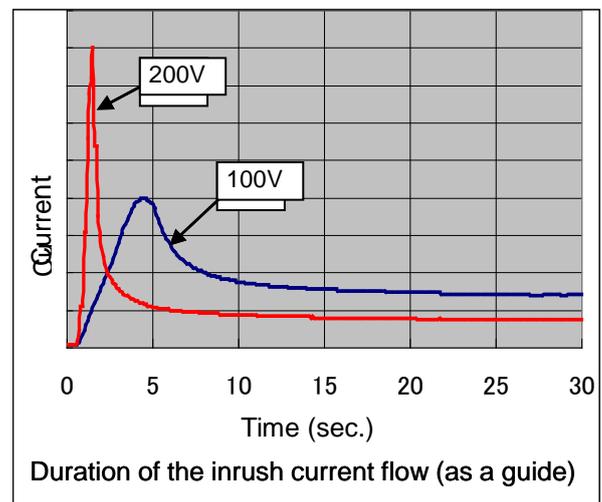
Note 1) Initial power and power consumption are nominal values.

Note 2) Heaters are not available for the size 16 models.

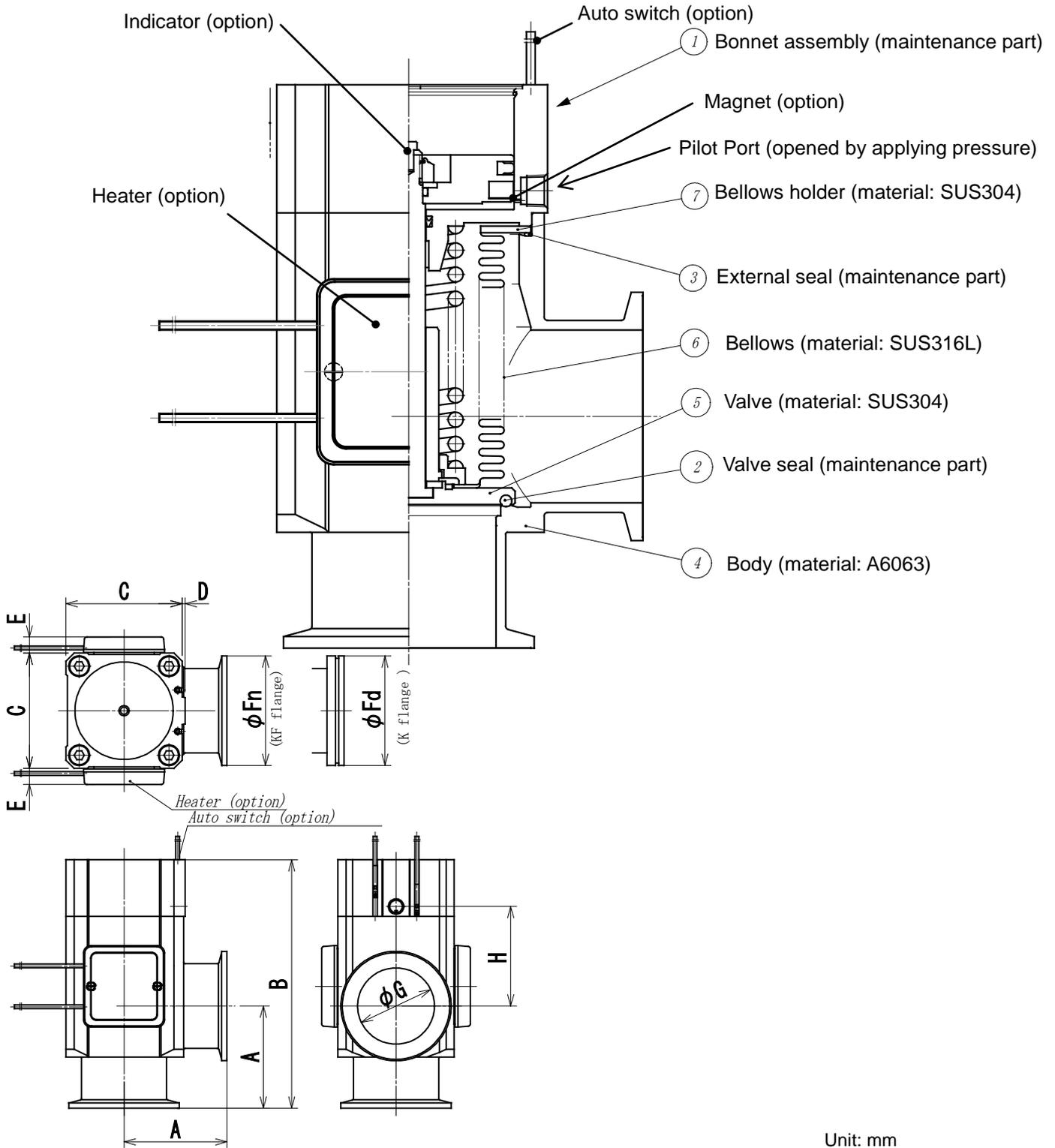
The heaters are PTC thermistor type design. These thermistors self regulate their temperature by switching the resistance at certain critical temperatures, so a separate temperature controller is unnecessary.

If the temperature of the PTC heaters fitted exceeds 200°C, then it may fail. The maximum operating temperature for the valve is 150°C. If the heater temperature is over 200°C or valve temperature is over 150°C, please use thermostat to control the heaters to prevent overheating.

With PTC type heaters, there is an initial surge of current (inrush current) after the power is supplied. These inrush current will reduce overtime. If multiple heater assemblies are used, the inrush current to the heaters will be magnified and care should be taken. When multiple heater assemblies or valves are used, do not apply power to the heater assemblies simultaneously. Keep approximately 30 seconds between applications of power to each heater assembly. This will allow for incremental spacing to prevent harmful large initial surge.



## 4. Construction and Outer dimensions



Unit: mm

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

## 5. Period and scope of warranty

The guaranteed period covers the period which finishes the earliest among 2 million operating cycles (for size 16 to 80) or 1 million operating cycles (for size 100 and 160) [with our durability test conditions], 18 months after shipping from us, and 12 months after starting the use of the product at your place or your customer's place.

Note) 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.

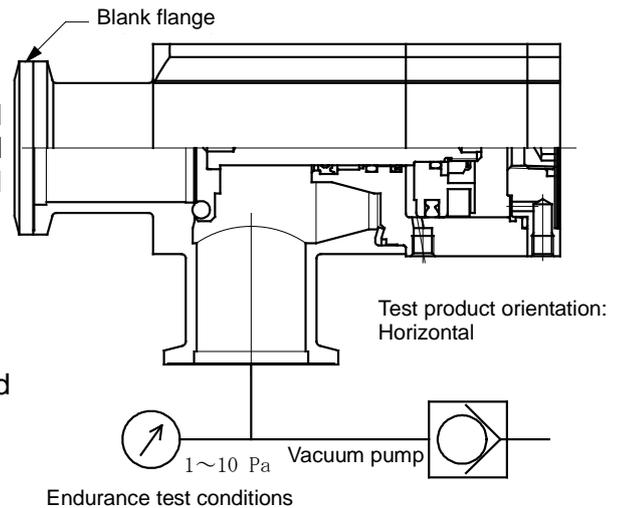
For any failure reported within the warranty period which is clearly our responsibility, the whole valve will be replaced. This guarantee does not apply to any damage incurred due to the failure of the valve.

### 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 XLA-16, XLA-25, XLA-40, XLA-50, XLA-63 and XLA-80 satisfied the product specification up to 2 million cycles, XLA-100 and XLA-160 did up to 1 million cycles.

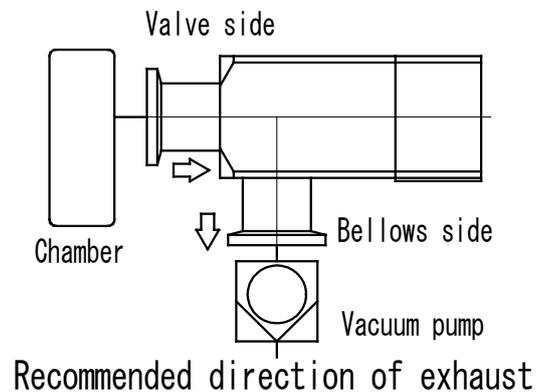
The test was performed with FKM, the standard sealant material.



### <Reference>

The pumping direction is not limited, but if the pumping creates a flow stream, the durability of the product could be impaired.

Therefore, the pumping direction shown on the right figure (bellows side pumping) is recommended. Also, the operating conditions should be checked beforehand because it affects the life.



## 6. Parts Replacement Procedure

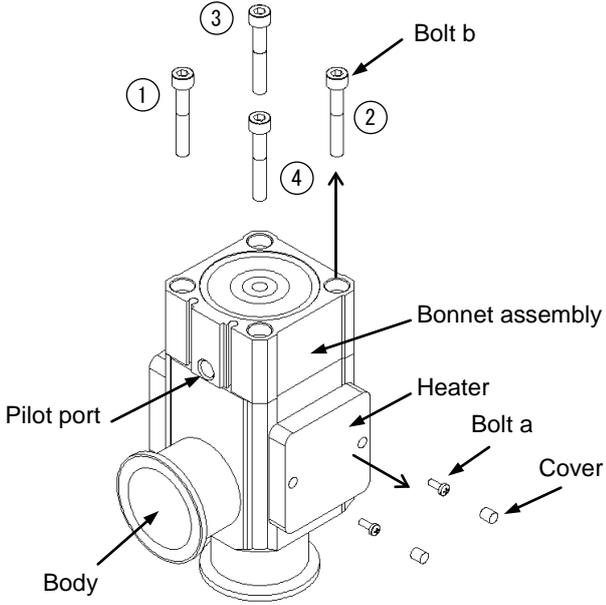
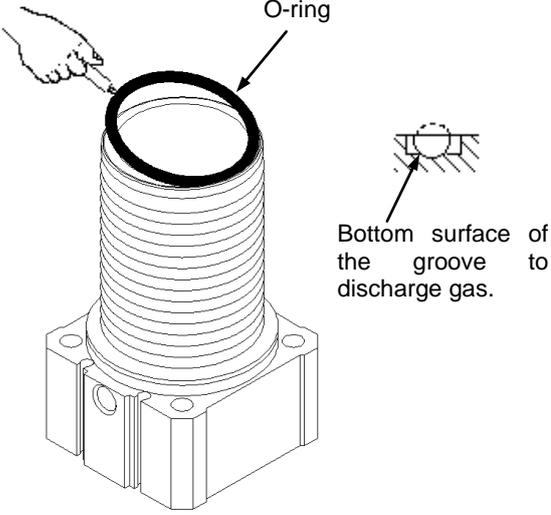
### 6-1. Precautions

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

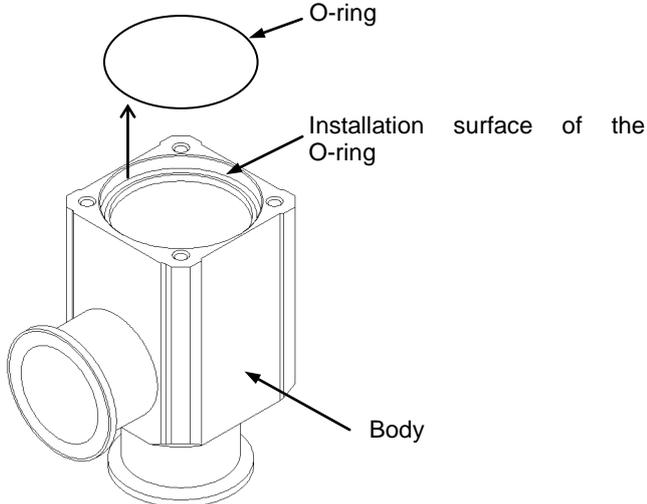
### **Warning**

- If it is expected that product materials may get stuck to the product, ensure safety is confirmed before handling. It is recommended that the user wear gloves and a mask.
- Pay attention to the handling of components in accordance with the procedures outlined, hereafter. Do not apply excessive force or impact. This may damage the product, as well as, decrease its performance and life expectancy.
- The cylinder portion of this product cannot be disassembled. When the cylinder portion or the bonnet assembly is damaged or is expected to have been damaged, replace the whole product or the bonnet assembly.
- Do not disassemble the parts that are not explained in this operation manual. This may decrease the performance and life expectancy of these parts. In addition, disassembly may cause danger.
- **Torque values specified in this manual must be followed.** Not adhering to these specifications, can result in damage to the product.

6-2. Disassembly procedure

<p style="text-align: center;"><b>Step 1</b></p>  <p>The heater is removed by loosening bolt a. Bolt a is behind the cover. Remove the cover using a watchmaker's screwdriver. Apply 0.4MPa of air pressure to the pilot port. Loosen bolt b in numerical order to disassemble the body and the bonnet assembly.</p>	<p style="text-align: center;"><b>Step 2</b></p>  <p>Remove the O-ring from the groove for discharging gas using a plastic tool to prevent scratch the O-ring groove. (Take care not to scratch the O ring groove. &gt;</p>
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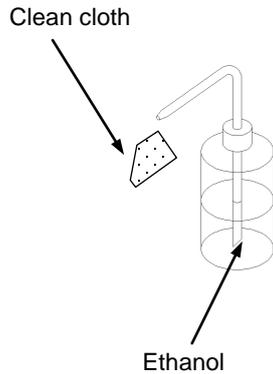
**Step 3**



Remove the outer seal O-ring from the Body  
(Take care to prevent the mounting surface of O ring from being damaged )

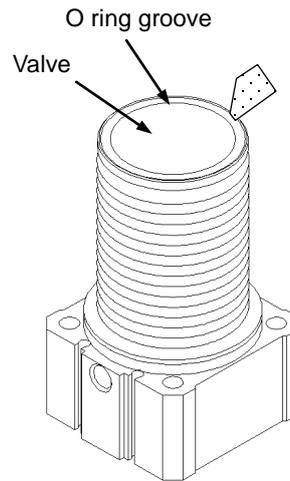
6-3. Assembly Procedure

Step 1



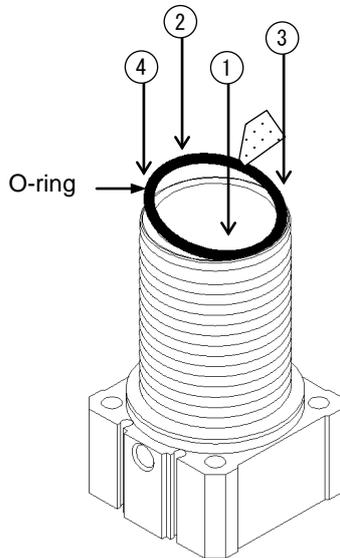
Assemble parts eliminating any dust or debris. Wipe off dust with a clean cloth soaked with ethanol. Blow parts with clean air if necessary. (Ensure there is no fibers or dust.)

Step 2



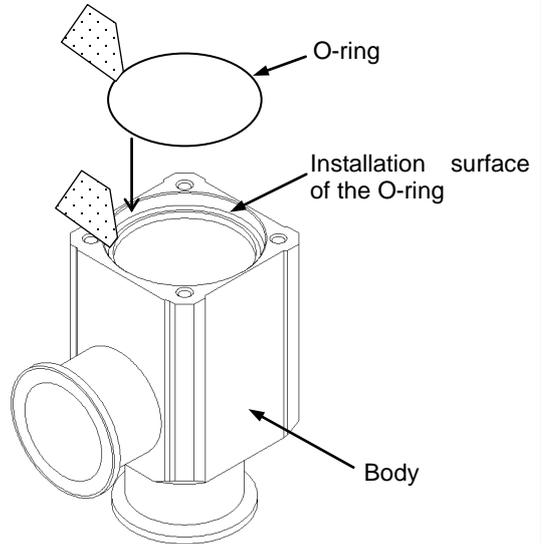
Eliminate any dust within O-ring groove of the valve.

Step 3



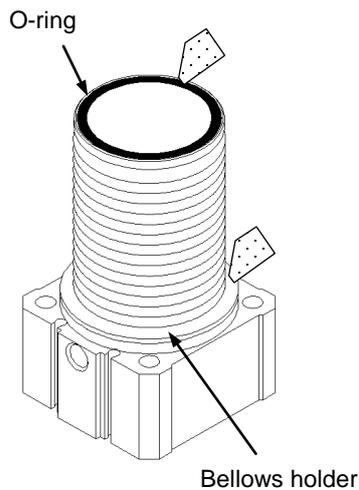
Wipe off any dust on the valve seal O ring surface. Place the O ring on the O ring groove. Press the O-ring into the groove in numerical order (press diagonally) to fit the O-ring into the groove. Take care not to twist the O ring. (Use dust-free gloves.)

Step 4



Wipe off any dust from the external O-ring seal and the mounting surface of the Body. Place the O-ring on the O-ring mounting surface.

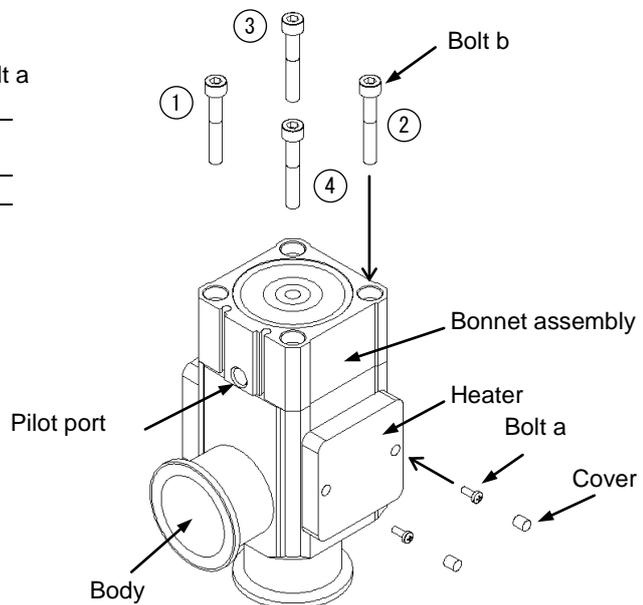
### Step 5



Wipe off any dust from the valve seal O-ring and the Bellows holder surface.

### Step 6

Tightening torque of bolt b N·m		Tightening torque of bolt a N·m	
Valve size	Tightening torque	Valve size	Tightening torque
XLA-16	0.7	All sizes	0.3
-25	1.5		
-40	2.5		
-50	6		
-63	6		
-80	15		
-100	20		
-160	102		



Apply 0.4MPa of air pressure to the pilot port. Tighten bolt b in numerical order to assemble the Body and the Bonnet assembly. When tightening bolt b, tighten manually until the O ring is compressed, then perform extra tightening in diagonal order. For models with heater, tighten bolt a to mount the heater to the body. Insert the cover.

Revision		
E	Precaution for mounting added.	2018.9

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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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