



Operation Manual

High Vacuum L Type Valve

PRODUCT NAME

XLD 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 bellows is SUS316L, and other metal components of the vacuum part are made of 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 60 °C.

- With heater (thermistor)

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. Keep the pilot pressure 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 7 (page 13).
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	Valve size		
	25	40	50
General use	XLD25-30-1	XLD40-30-1	XLD50-30-1
High temperature	XLD25-30-1H	XLD40-30-1H	XLD50-30-1H

Temperature specifications	Valve size			
	63	80	100	160
General use	XLD63-30-1	XLD80-30-1	XLD100-30-1	XLD160-30-1
High temperature	XLD63-30-1H	XLD80-30-1H	XLD100-30-1H	XLD160-30-1H

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

Note4) The bonnet assembly includes the valve seal, S valve seal assembly and the initial pumping valve seal.

Exterior seal, valve seal

Description Constructions No.	Material	Valve size		
		25	40	50
Exterior seal (3)	Standard	AS568-030V	AS568-035V	AS568-039V
	Specific	AS568-030 **	AS568-035 **	AS568-039 **
Valve seal (2)	Standard	B2401-V24V	B2401-P42V	AS568-227V
	Specific	B2401-V24 **	B2401-P42 **	AS568-227 **
S Valve seal Ass'y (4)	Standard		XLD40-2-9-1A	XLD50-2-9-1A
	Specific		XLD40-2-9-1A **	XLD50-2-9-1A **
Initial pumping valve seal (5).	Standard	AS568-009V	AS568-016V	AS568-016V
	Specific	AS468-009 **	AS568-016 **	AS568-016 **

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 **
S Valve seal Ass'y (4)	Standard	XLD63-2-9-1A	XLD80-2-9-1A	XLD100-2-9-1A	XLD160-2-9-1A
	Specific	XLD63-2-9-1A **	XLD80-2-9-1A **	XLD100-2-9-1A **	XLD160-2-9-1A **
Initial pumping valve seal (5).	Standard				AS568-020V
	Specific				AS568-020 **

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.

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
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 Performance Elastomers.

Chemraz® is a registered trademark of Greene, Tweed & Co.,

ULTIC ARMOR® is a registered trademark of NIPPON VALQUA INDUSTRIES, LTD.

3. Specifications

Model		XLD-25	XLD-40	XLD-50	XLD-63	XLD-80	XLD-100	XLD-160	
Flange (valve) size		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^{-6}							
Conductance l/s Note 1)	Main pumping	14	45	80	160	200	300	800	
	Initial pumping	0.5 to 3	2 to 8	2.5 to 11	4 to 18	4 to 18	6.5 to 31.5	6.5 to 31.5	
Leakage $\text{Pa} \cdot \text{m}^3/\text{s}$	Internal	1.3×10^{-10} for the standard material (FKM) at ambient temperatures, excluding gas permeation							
	External	1.3×10^{-11} 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) Note 2)							
Surface treatment for body		Outside: hard anodized Inside: basis material							
Actuation pressure MPa		0.4 to 0.7							
Air consumption cm^3 for 0.5MPa Note 3)	Main pumping	46	200	360	660	1350	3000	5150	
	Initial pumping	3.5	12	15.5	30	42	54	54	
Port size		M5	Rc 1/8					Rc 1/4	
Weight kg		0.5	1.2	1.8	3.4	5.6	11.5	20	
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	

Note1) Main pumping conductance is "molecular flow" measured with an elbow pipe which has the same dimension as each applicable flange.

Initial pumping conductance is the value for "viscous flow".

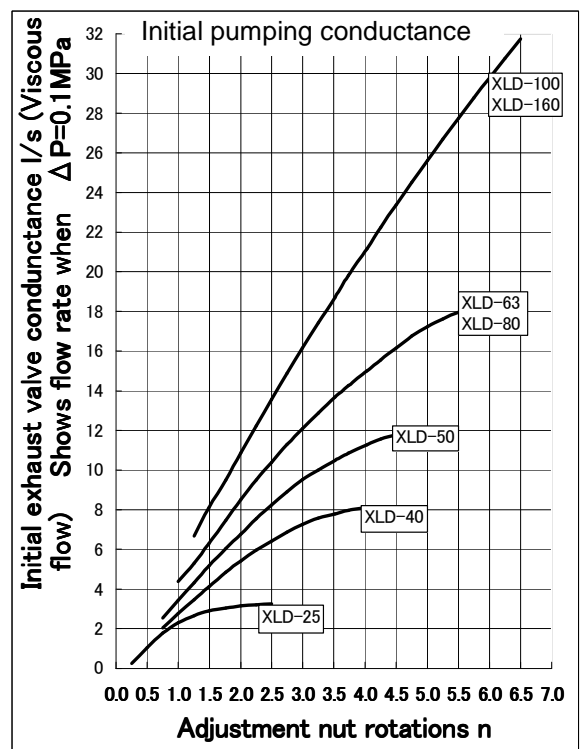
Note2) A seal sliding part for vacuum use vacuum grease (Y-VAC2).

Note3) For one cycle of cylinder.

Note4) A heater is provided as an option. Rush current of a heater runs for several tens of seconds, but it decreases after a while.

See the figure on the right for the relation between the numbers of revolution of adjustment nut (pitch 1mm) and conductance of the initial exhausting valve.

(The conductance is just a reference.)



Heater specifications

Rated voltage AC90V to AC125V

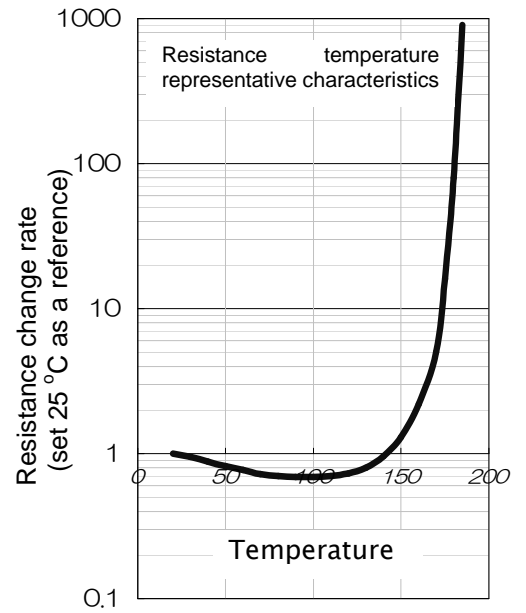
Resistance temperature characteristics:

See the figure on the right.

Curie point (C. P.) \cong 160 °C

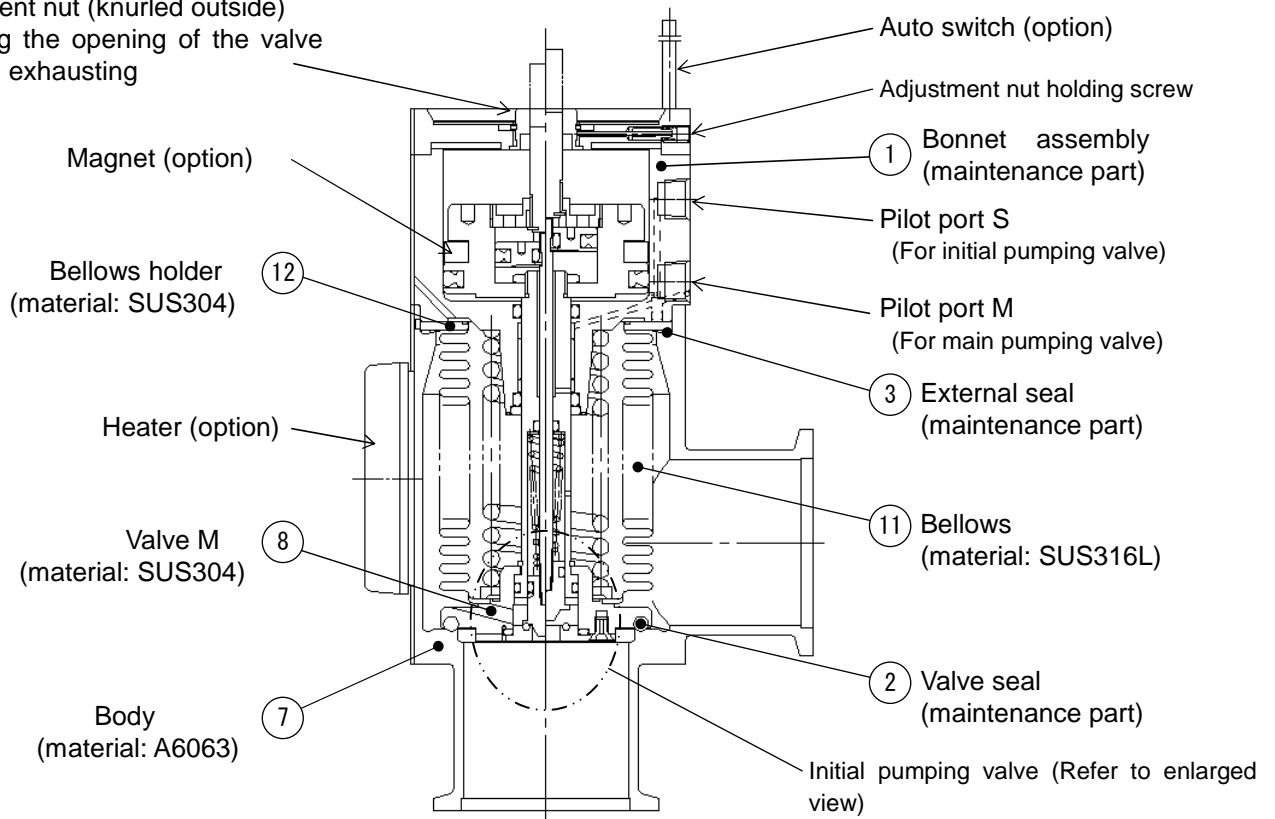
The heater used is a PTC thermistor. Temperature characteristics: The resistance decreases until the temperature reaches approx. 100 °C, then increases as the temperature increases, then decreases once the temperature reaches approx. 200 °C or more.

If the heater is heated from outside, and the temperature of the heater exceeds 200 °C, 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.

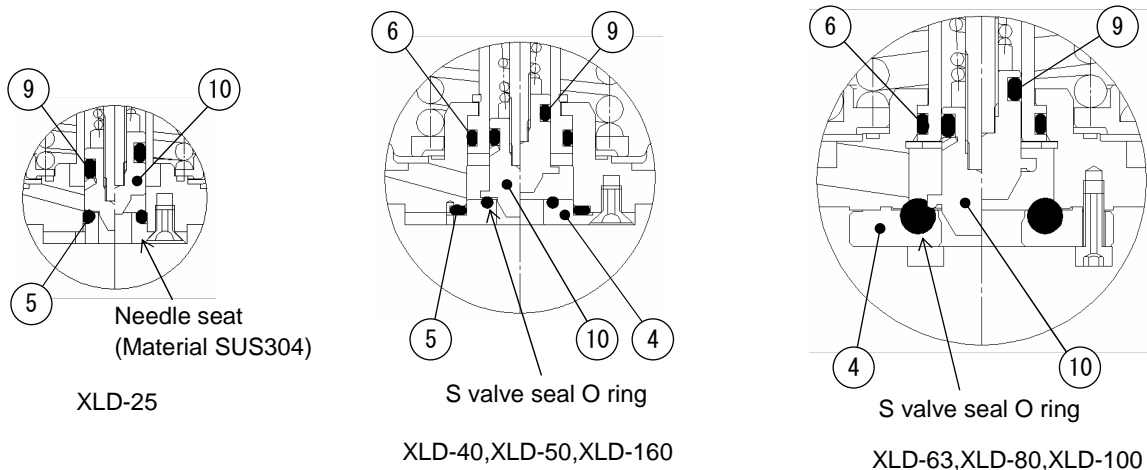


4. Construction

Adjustment nut (knurled outside)
Adjusting the opening of the valve
for initial exhausting



Initial pumping valve (Enlarged view)



- ④ S valve assembly (Maintenance part) Note 1
(Material SUS304 + Seal material)
- ⑤ Initial pumping valve seal (Maintenance part)
- ⑥ Fixing ring
- ⑨ O-ring for sliding of S valve Note 2
(material:FKM)
- ⑩ S valve
(material: SUS304)

Note1) The O ring of the S valve seal assembly cannot be replaced. It is necessary to replace the whole assembly.

Note2) The material of the O ring for sliding of S valve is FKM. This cannot be changed.

5. Operation

5-1. Adjusting the opening of the valve for initial pumping

Adjust the initial pumping amount with no air pressure to the pilot port S before using. Initial flow is reduced by turning the adjustment nut clockwise. It is increased by turning it counterclockwise. The location where the nut gently stops during rotation clockwise and counterclockwise indicates the initial flow zero and the maximum flow. If the nut is rotated too much, it may damage the nut.

The adjustment nut shall be operated by hand. Do not use any tool. If the rotation of the adjustment nut feels heavy, please refer to the following items.

The adjustment nut is fully closed when the completed product is shipped. The nut is fully open when the bonnet assembly (maintenance part) is shipped. Use caution.

5-2. Fixing adjustment nuts

The adjustment nut does not rotate during the operation of the valve. It can be fixed to prevent incorrect operation, if required. If the adjustment nut is fixed after adjusting the initial flow, tighten the adjustment nut set screw to the tightening torque shown in the table below. When loosening the set screw, loosen until it stops gently. Do not remove the adjustment nut set screw.

The adjustment nut is not fixed when the product is shipped. If the rotation of the adjustment nut feels heavy, loosen the adjustment nut set screw.

Adjustment nut tightening torque

Model	XLD-25	XLD-63
	XLD-40	XLD-80
	XLD-50	XLD-100
		XLD-160
Tightening torque	0.08 N · m or less	0.3 N · m or less

5-3. Opening the valve (s valve) for initial pumping

When the air pressure is applied to the pilot port S, the S valve will release from the S valve seal assembly and open to the adjusted opening.

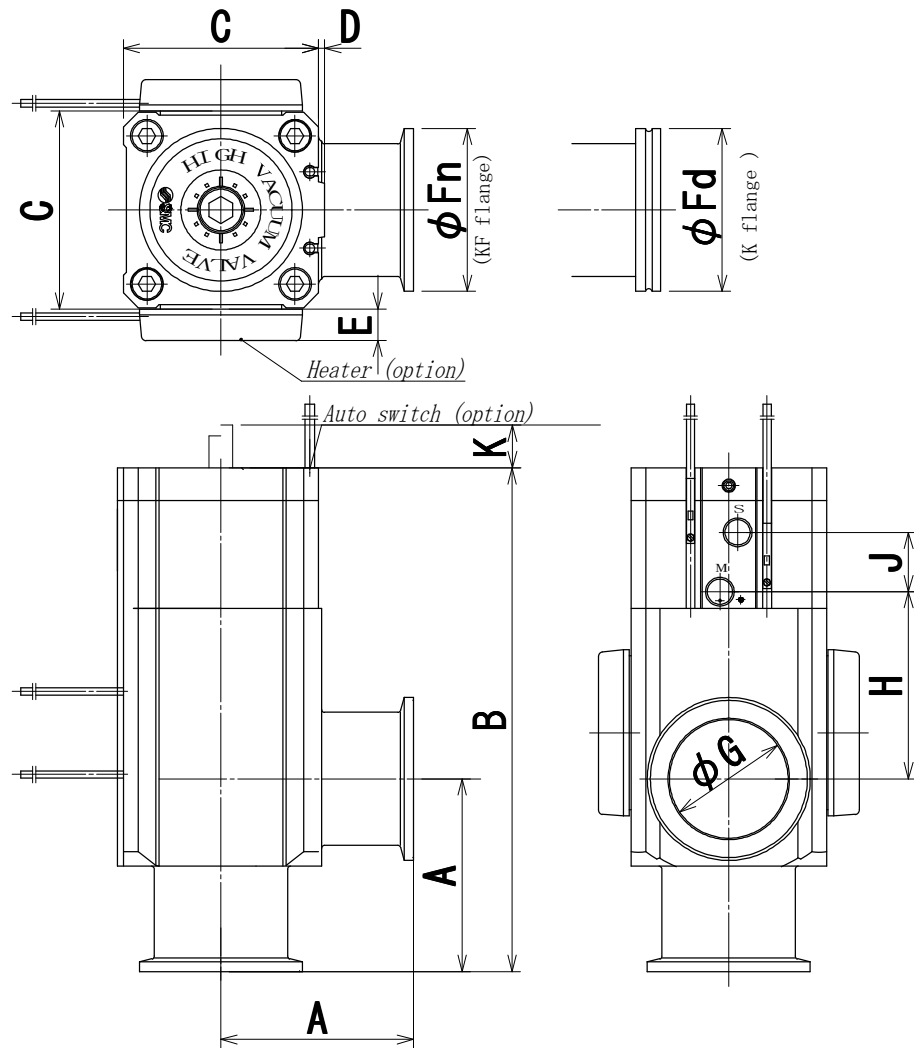
5-4. Opening the valve (valve M) for main pumping

When the air pressure is applied to the pilot port M, the valve will release from the body seat and fully open. It operates even when air pressure is not applied to the pilot port S.

5-5. Closing the valve for initial pumping and main pumping

When the air pressure is released from the pilot port S and M, S and M valve will return and start sealing.

6. Dimensions



Unit: mm

Model	A	B	C	D	E	F _n	F _d	G	H	J	K
XLD-25	50	123	48	1	12	40	-	26	41	16	7.5
XLD-40	65	170	66	2	11	55	-	41	63	20	15
XLD-50	70	183	79	2	11	75	-	52	68	20	17.5
XLD-63	88	217	100	3	11	87	95	70	72	20	20
XLD-80	90	256	117	3	11	114	110	83	98	20	26.5
XLD-100	108	321	154	3	11	134	130	102	133	20	38
XLD-160	138	335	200	3	11	190	180	153	114	30	40

7. Guaranteed term and guaranteed range

The guaranteed period covers the period which finishes the earliest among 2 million operating cycles (for size 25 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 product durability is varied depending on the operating conditions (such as a use with large flow rate).

If the specification is not kept, or any non-conformance derived from mounting or replace of a device, an assembly, or an O-ring at your place occurs, the guarantee cannot be applied.

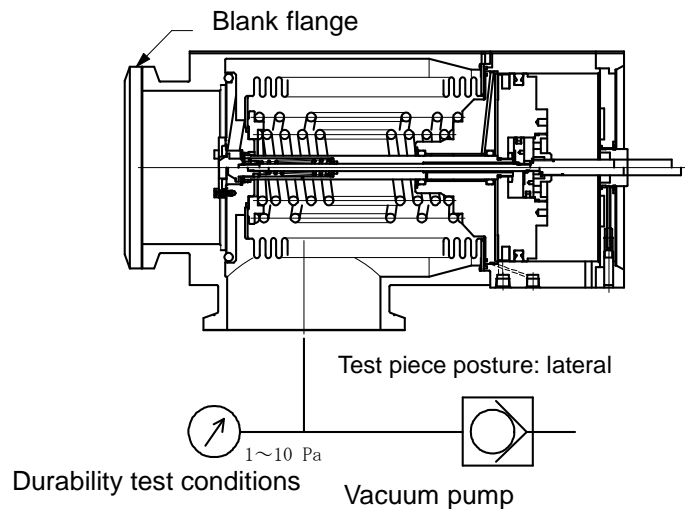
If any failure occurs due to our fault during the guaranteed period, we will guarantee the non-conformance by delivering a substitute in the worst case. However, responsibility of any damage which is led by the product failure is not taken by us.

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

Internal/ external leakage and operation were checked by opening and closing a valve in internally evacuated condition at ordinary temperature (room temperature).

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

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

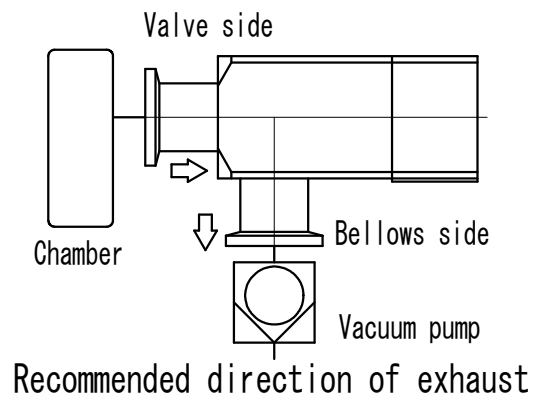


<Reference>

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.



8. Parts Replacement Procedure

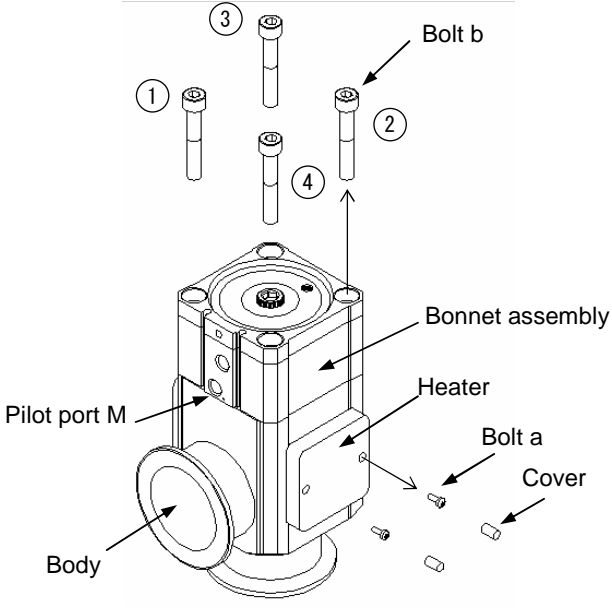
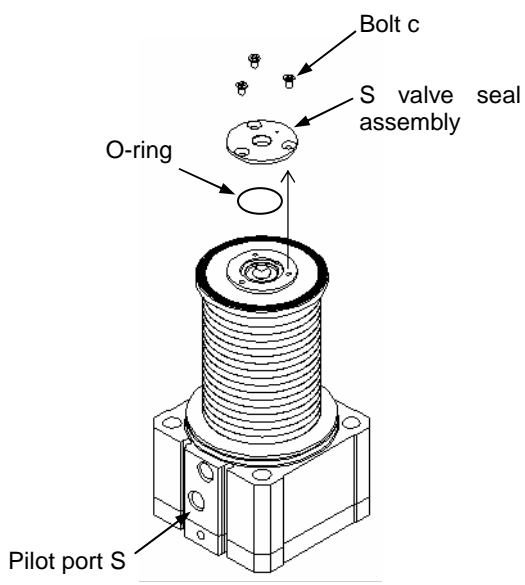
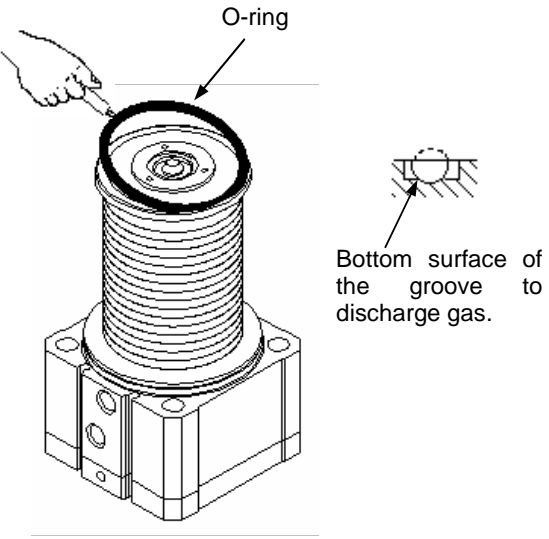
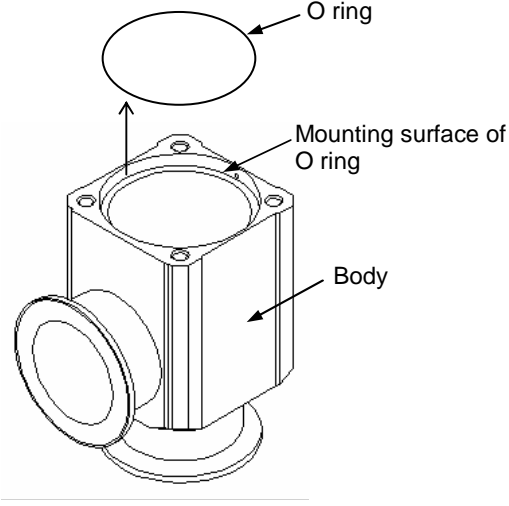
8-1. Precautions

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

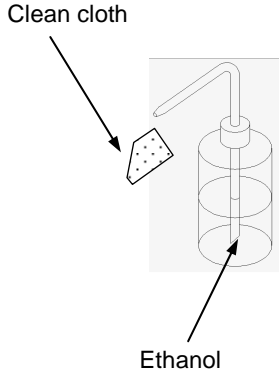
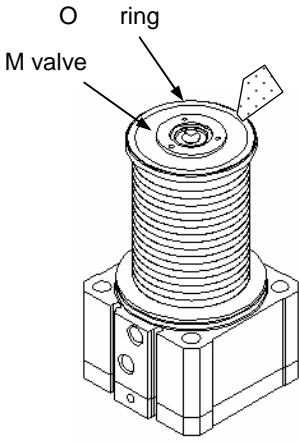
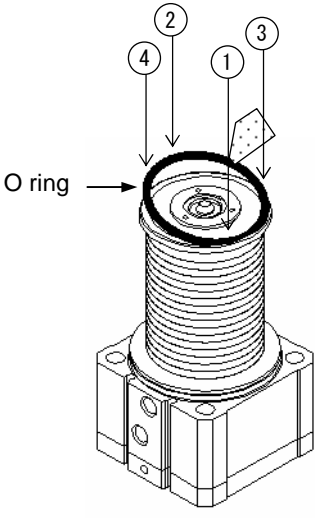
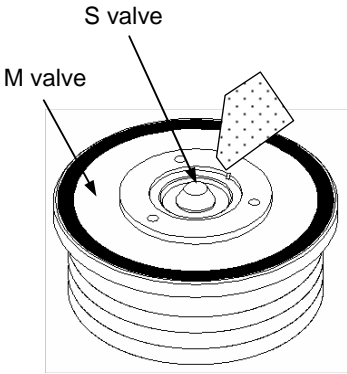
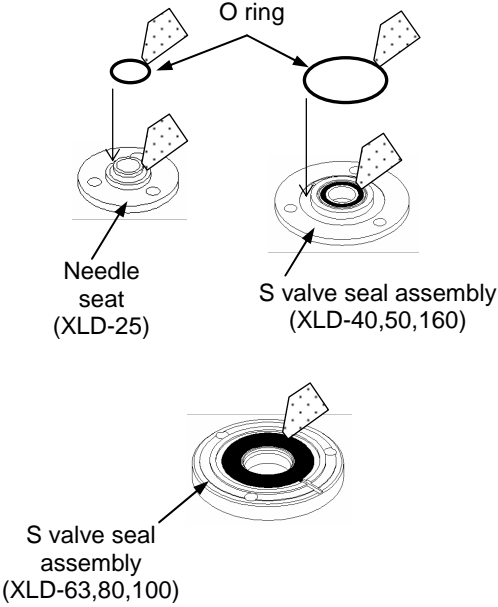
Warning

- 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.

8-2. Disassembly procedure

<p style="text-align: center;">Step 1</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 0.2MPa of air pressure to the pilot port M. Loosen bolt b in numerical order to disassemble the body and the bonnet assembly.</p>	<p style="text-align: center;">Step 2</p>  <p>Apply 0.3MPa of air pressure to the pilot port S. Loosen bolt c to remove S valve seal assembly. Initial pumping valve seal O ring is removed from 25, 40, 50, and 160.</p>
<p style="text-align: center;">Step 3</p>  <p>Remove the O ring from the groove for discharging gas using a tool (plastic) whose height is the same as the groove for discharging gas. <Take care not to damage the O ring groove></p>	<p style="text-align: center;">Step 4</p>  <p>Remove the outer seal O ring from the body <Take care to prevent the mounting surface of O ring from being damaged></p>

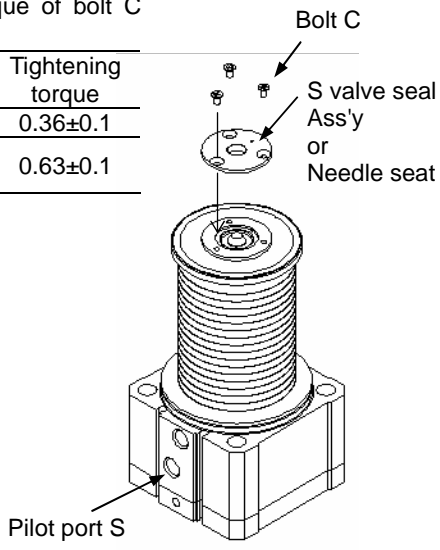
8-3. Assembly Procedure

<p style="text-align: center;">Step 1</p>  <p>Assemble parts eliminating dust. Wipe off dust with a clean cloth soaked with ethanol. Blow parts with clean air if necessary. (Ensure there is no fiber or dust)</p>	<p style="text-align: center;">Step 2</p>  <p>Eliminate the dust of O ring groove of pilot valve M.</p>	<p style="text-align: center;">Step 3</p>  <p>Wipe off the 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></p>
<p style="text-align: center;">Step 4</p>  <p>Wipe off the dust of the S valve and around it.</p>	<p style="text-align: center;">Step 5</p>  <p>Remove dust from the needle seat or S valve seal assembly. For size 25, 40, 50, and 160, remove the dust from the initial pumping valve seal O ring. Mount the needle seat or S valve seal assembly.</p>	

Step 6

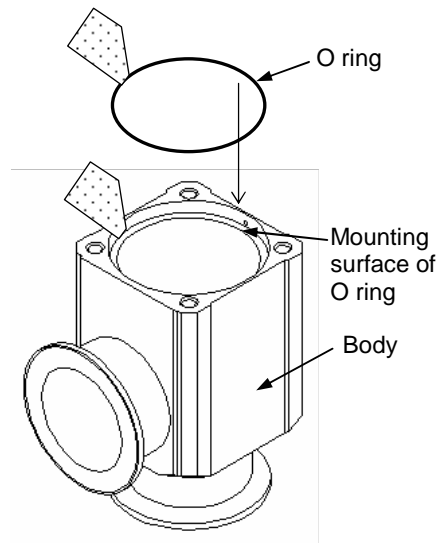
Tightening torque of bolt C
N · m

Model	Tightening torque
XLD-25	0.36±0.1
Other than XLD-25	0.63±0.1



Apply 0.3MPa of air pressure to the pilot port S. Place the needle seat or S valve seal assembly, and tighten bolt c to fix them. When tightening bolt c, first tighten manually until the O ring is compressed, then perform extra tightening.

Step 7



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

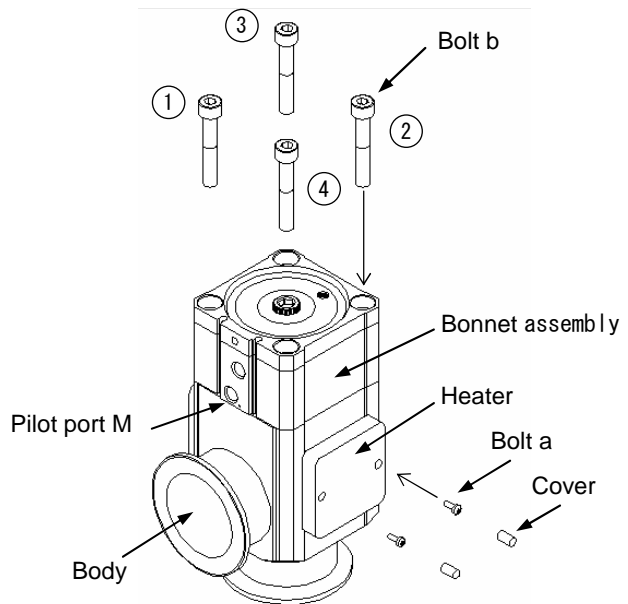
Step 8

Tightening torque of bolt b
N · m

Valve Size	Tightening Torque
XLD-25	1.5
-40	2.5
-50	6
-63	6
-80	15
-100	20
-160	102

Tightening torque of bolt a
N · m

Valve Size	Tightening Torque
All size	0.3



Apply 0.2MPa of air pressure to the pilot port M (for main pumping). 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 history

C	Revision	PQ
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1st Printing :Ky

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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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