



Operation Manual

High Vacuum L Type Valve

PRODUCT NAME

XLDV 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

Contents

Safety Instructions	-----	2
1. Product Specific Precautions 1 (Precautions on Design, Selection, Mounting, Piping, Wiring, Maintenance)	-----	4
2. Product Specific Precautions 2 (Maintenance parts)	-----	6
3. Specifications	-----	7
4. Construction	-----	9
5. Dimensions	-----	10
6. Period and scope of warranty	-----	11
7. Parts replacement procedure	-----	12



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.

This valve (XLDV series) is equipped with a solenoid shifting valve. The solenoid shifting valve is a 3-port solenoid valve V100 or SYJ300 series. Be sure to read the Operation Manuals of this valve and V100 or SYJ300 before use.

Design



Warning

● All models

1. The body material is A6063, the bellows is SUS316L, and other metal sealant material is SUS304. The sealant material of the vacuum part is FKM as standard, but this can be changed to other materials (refer "How to Order".) However, the sliding part's sealant material for vacuum is FKM only. For the size 63 to 160, the initial pumping part's sealant material is FKM only. Confirm whether the fluid to be used is compatible with the materials before use. The seal sliding part for vacuum uses vacuum 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. The sensor and its surrounding part should be kept at a temperature no higher than 50°C.

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 within the specified range of the pilot pressure.
3. Use the valve within the specified operating pressure range.
4. Keep residual voltage leakage not more than 3% of rated voltage for DC and 8% of rated voltage for AC.

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.

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.
3. Confirm that any chips, cutting oil, dust, etc., inside the piping is removed by cleaning or air blow (flushing) before piping for pilot air.

Wiring

Caution

1. When a solenoid valve with a DC type (light) and surge voltage suppressing circuit is connected, check whether it has polarity. If there is polarity, and polarity is mistaken, the device of the valve and power supply equipment may burn out and malfunction can occur.
2. When electric power is connected to the solenoid valve, be careful to apply the proper voltage. Improper voltage may cause malfunction or coil burn out.
3. After completing the wiring, confirm that the connections are correct.
4. Secure the lead wire of the switch so that it has sufficient slack, without any excessive force applied to it.

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.
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



Caution

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

Valve size			
	25	40	50
	XLDV25-30-1	XLDV40-30-1	XLDV50-30-1

Valve size			
63	80	100	160
XLDV63-30-1	XLDV80-30-1	XLDV100-30-1	XLDV160-30-1

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

Note3) The auto switch and solenoid valve are not provided. When the auto switch or solenoid valve is necessary as a set, add the symbols of the auto switch at the suffix of the part number.

External seal/Valve seal

Description Constructions no.	Material	Valve size			
		25	40	50	
External 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 assembly 4	Standard		AS568-009V	XLD40-2-9-1A	XLD50-2-9-1A
	Specific		AS568-009**	XLD40-2-9-1A**	XLD50-2-9-1A**

Description Constructions no.	Material	Valve size			
		63	80	100	160
External 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 assembly 4	Standard	XLD80-2-9-3A	XLD80-2-9-3A	XLD100-2-9-3A	XLD160-2-9-1A
	Specific	-	-	-	-

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.

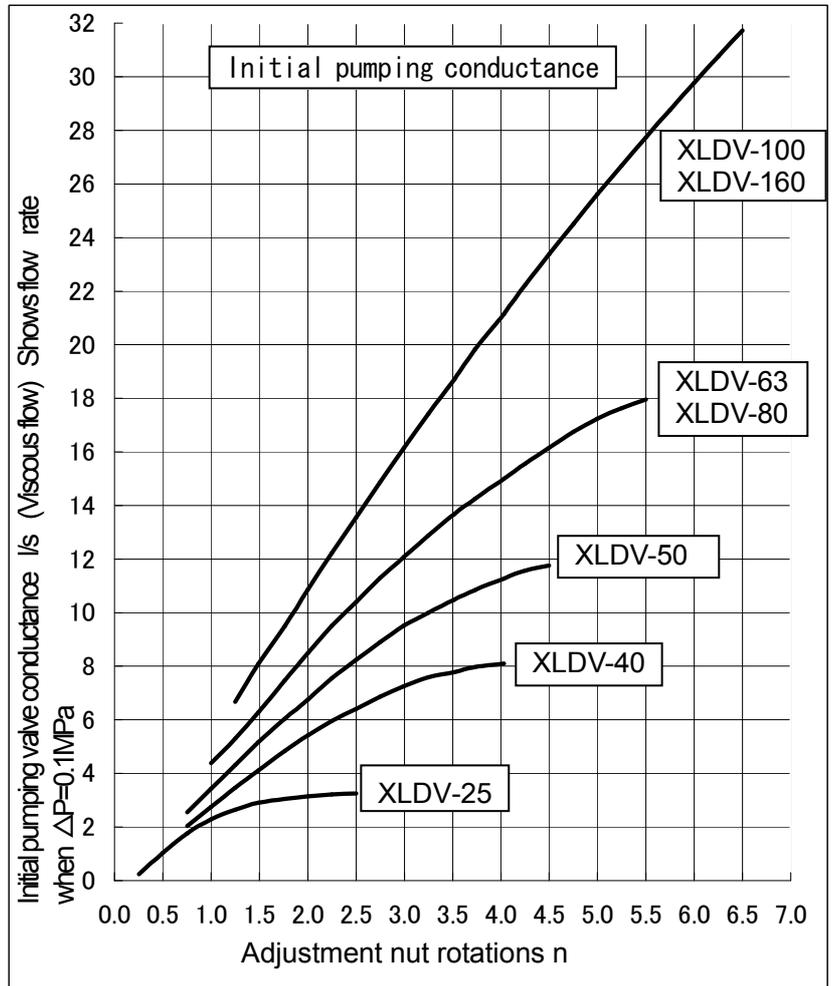
3. Specifications

Model		XLDV-25	XLDV-40	XLDV-50	XLDV-63	XLDV-80	XLDV-100	XLDV-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						
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	0.5~3	2~8	2.5~11	4~8	4~18	6.5~31.5	6.5~31.5
Leakage Pam ³ /s	Internal	1.3×10^{-10} for the standard material (FKM) at ambient temperature, excluding gas permeation						
	External	1.3×10^{-11} for the standard material (FKM) at ambient temperature, 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						
Pilot pressure MPa		0.4~0.7						
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		M5:1(SUP),3(EXE) port						
Weight kg		0.57	1.3	1.9	3.5	5.7	11.6	20.1

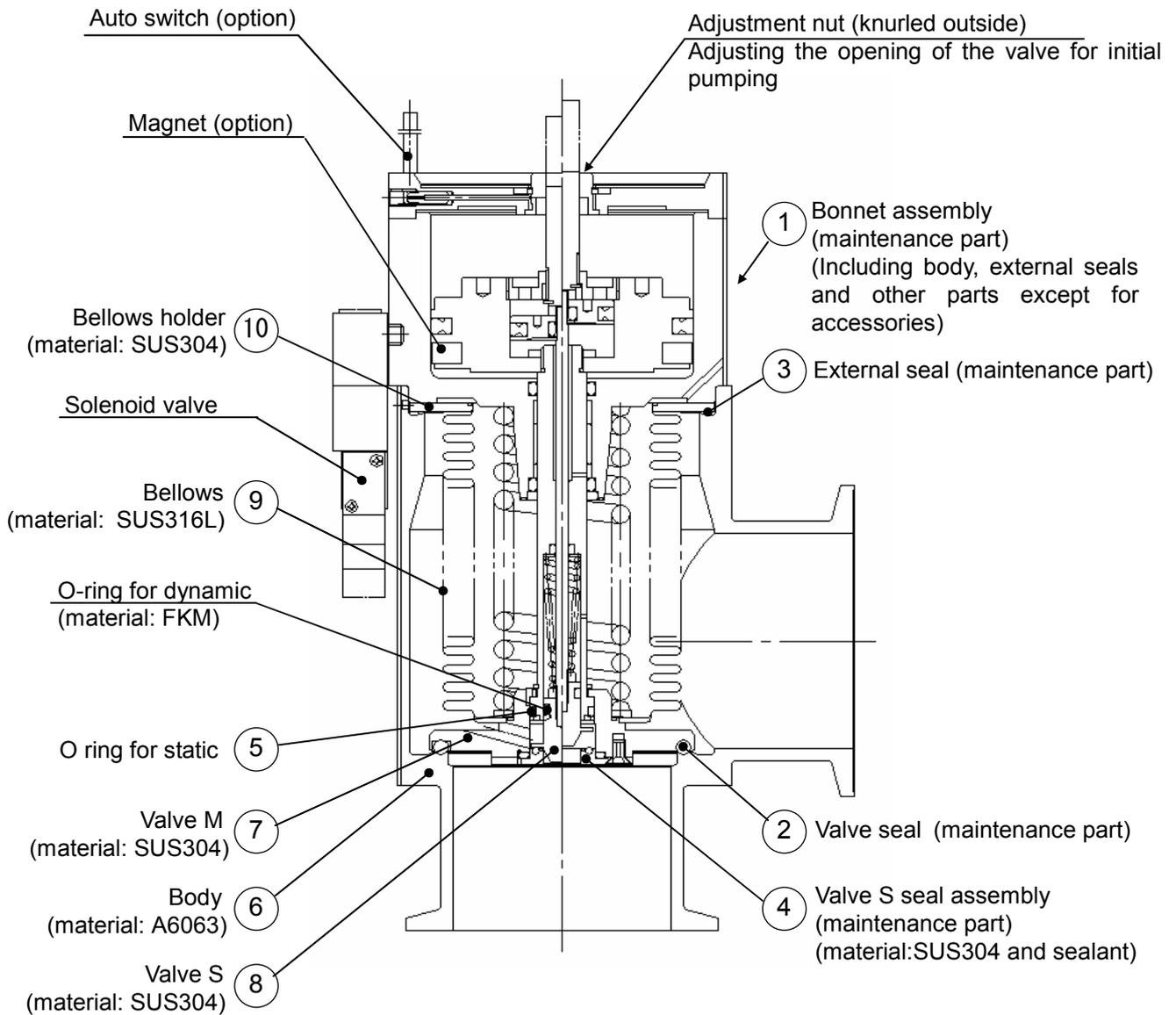
Note1) Main pumping conductance is “molecular flow” measured with an elbow pipe which has the same dimension with each flange.
 Initial pumping conductance is the value for the viscous flow.
 Note2) The seal sliding part for vacuum uses vacuum grease (Y-VAC2).
 Note3) Air consumed by a reciprocating motion of a cylinder.

Operating solenoid shifting valve is V114-** for XLDV-25
 and V114-**,SYJ314-** for XLDV-40,50,63,80,100 and 160.
 For further details on solenoid valve, refer to the SMC solenoid valve catalog “V100, SYJ300”.

See the figure on the right for the relationship between the number of revolutions of the adjustment nut (pitch 1mm) and conductance of the initial pumping valve.
 (The conductance is shown as a guide only.)



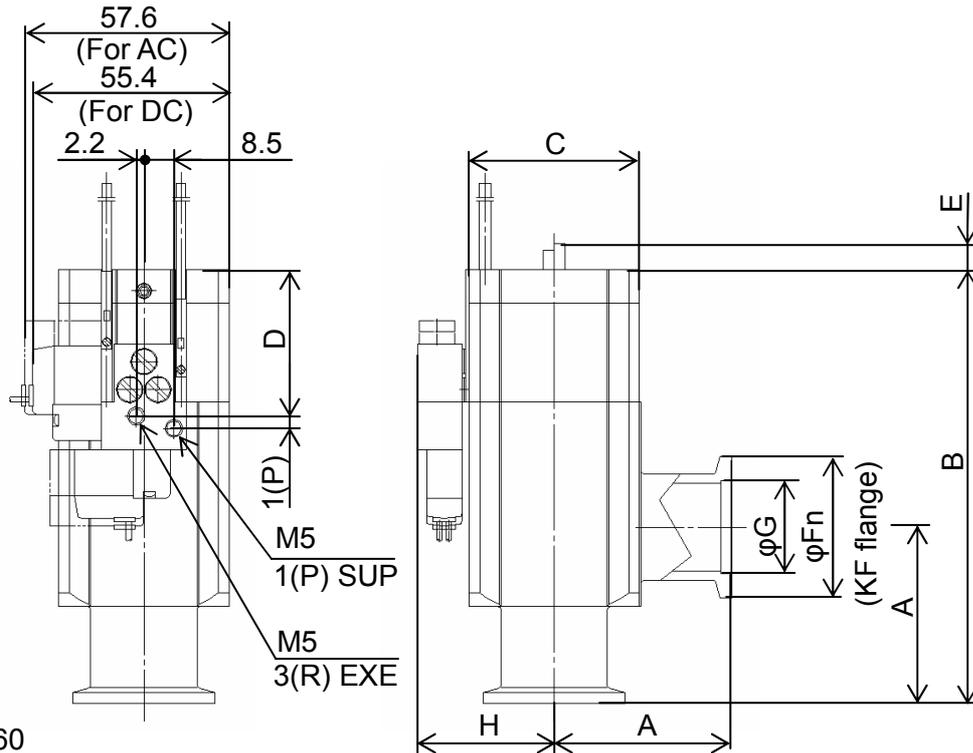
4. Construction



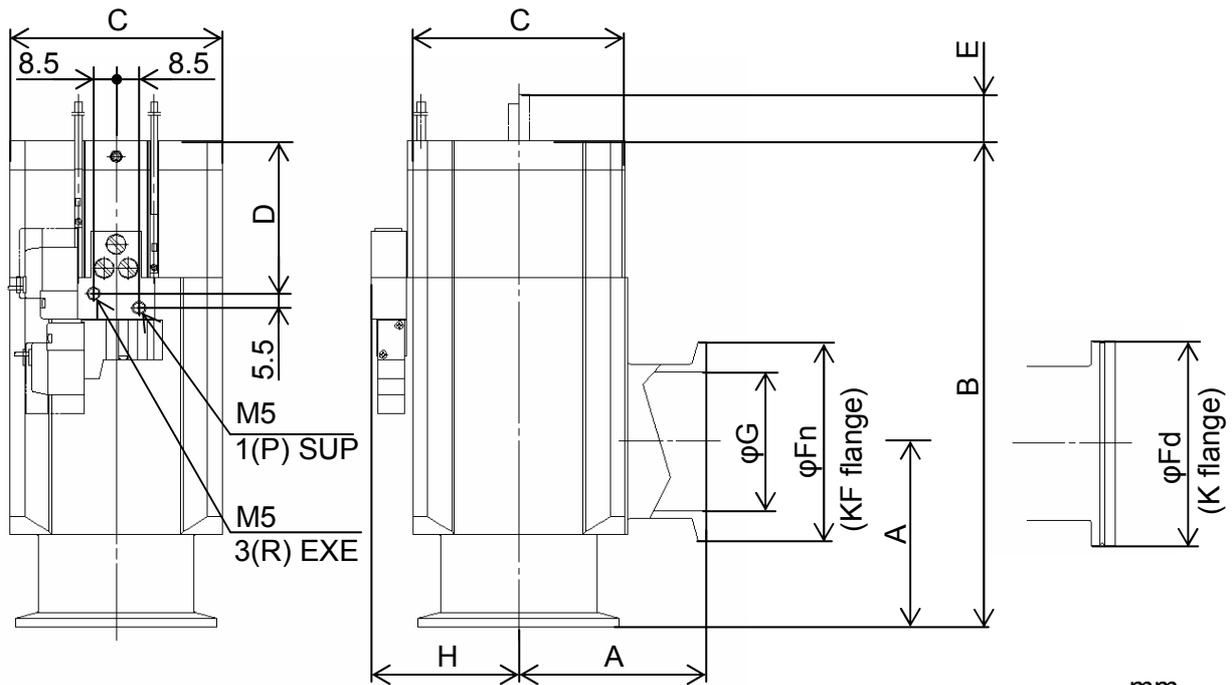
1. Adjusting the opening of the valve for initial pumping
Adjust the initial pumping with no air pressure to the pilot port S before using.
Continue turning the adjustment nut clockwise. When the turning stops gently, the initial pumped amount will be zero. (Do not use a tool.)
For setting the initial pumped amount, turn it counterclockwise.
2. Opening the valve (valve S) for initial pumping
When air pressure is applied to the pilot port 1(P) and the initial pumping solenoid valve is energized, the S valve will release from the S valve seal assembly and open to the adjusted angle.
3. Opening the valve (valve M) for main pumping
When air pressure is applied to the pilot port 1(P) and the main pumping solenoid valve is energized, the valve M will release from the body seat and open fully.
4. Closing the valve for initial pumping and the valve for main pumping
When the initial and main pumping solenoid valves are de-energized, the valve S and M will return and start sealing.

5 Dimensions

XLDV-25



XLDV-40~160



mm

Model	A	B	C	D	E	Fn	Fd	G	H
XLDV-25	50	123	48	41.5	7.5	40	-	26	38.5
XLDV-40	65	170	66	53.5	15.0	55	-	41	48.5
XLDV-50	70	183	79	57.5	17.5	75	-	52	55.0
XLDV-63	88	217	100	72.2	20.0	87	95	70	66.5
XLDV-80	90	256	117	82.6	26.5	114	110	83	75.0
XLDV-100	108	321	154	95.2	38.0	134	130	102	93.5
XLDV-160	138	335	200	101.2	40.0	190	180	153	116.5

6 Period and Scope of Warranty

The warranty period is 2 million cycles (for size 25 to 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.

Note The endurance will depend on operating conditions (such as if the flow rate is large).

If the valve has been used outside of the specifications, or if a non-conformance 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.

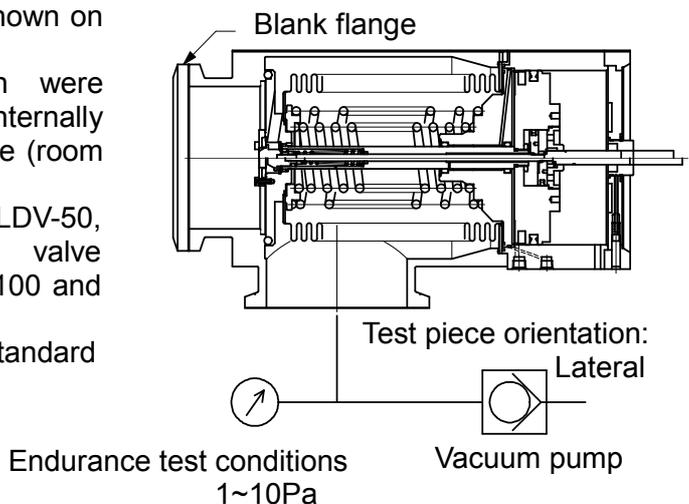
This guarantee does not apply to any damage incurred due to the failure of the valve.

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

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 XLDV-25, XLDV-40, XLDV-50, XLDV-63 and XLDV-80 satisfied the valve specification up to 2 million cycles, XLDV-100 and XLDV-160 did up to 1 million cycles.

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

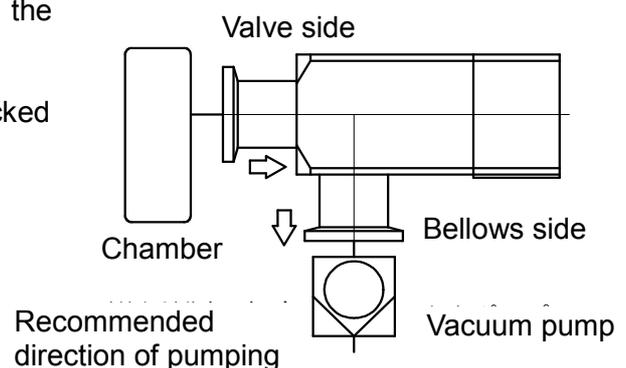


<Reference>

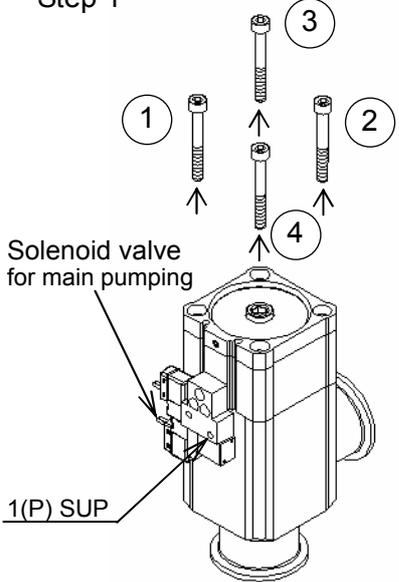
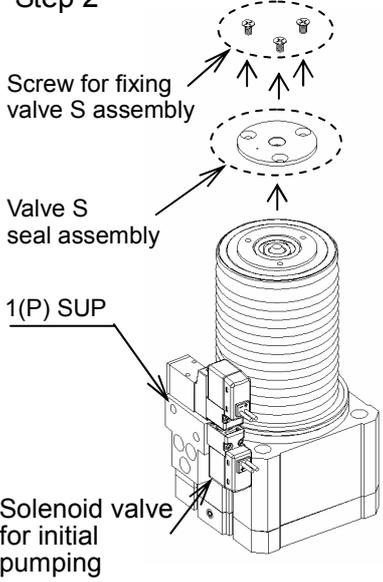
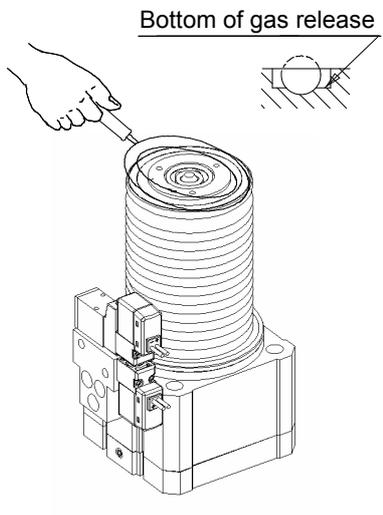
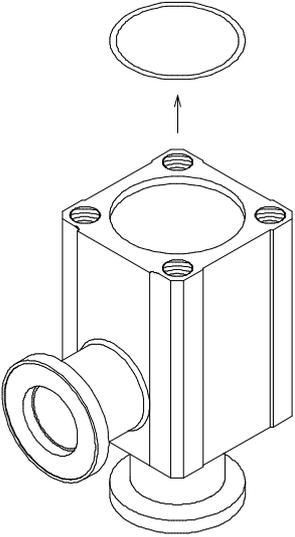
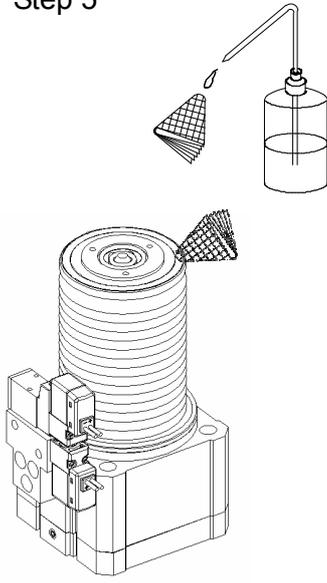
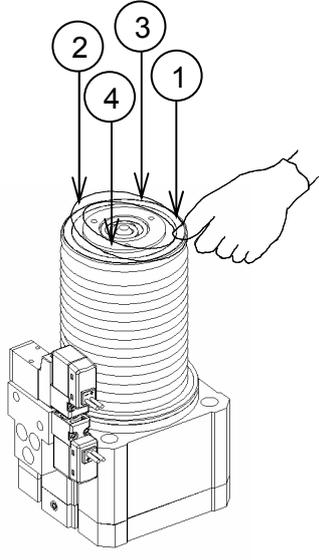
The pumping direction is not limited, but if the pumping creates a flow stream, the endurance of the valve could be impaired.

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.



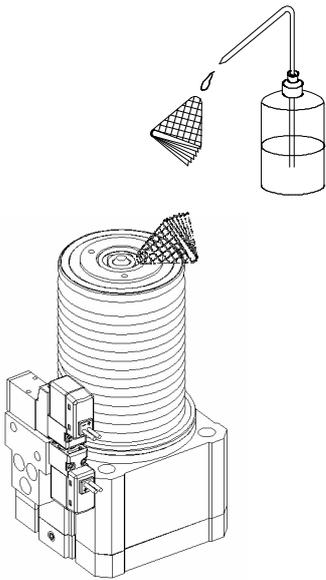
7 Parts Replacement Procedure

		Replacement procedure			
Division	1	Model	High Vacuum Angle Valve		
<p>Step 1</p>  <p>Solenoid valve for main pumping</p> <p>1(P) SUP</p> <p>Apply a pressure of 0.2MPa to the pilot port 1(P), energize the main pumping solenoid valve and gradually loosen the bolts in numerical order to disassemble to the body and bonnet assembly.</p>		<p>Step 2</p>  <p>Screw for fixing valve S assembly</p> <p>Valve S seal assembly</p> <p>1(P) SUP</p> <p>Solenoid valve for initial pumping</p> <p>Apply a pressure of 0.3MPa to the pilot port 1(P), energize the initial pumping solenoid valve and loosen the valve S seal assembly fixing screw to remove the valve S seal assembly.</p>		<p>Step 3</p>  <p>Bottom of gas release</p> <p>Remove the O-ring from the O-ring groove with a tool (made of plastic etc.) whose height is same as the groove depth. <Be careful not to scratch the O-ring groove.></p>	
<p>Step 4</p>  <p>Remove the O-ring from the body. <Be careful not to scratch the O-ring mounting face.></p>		<p>Step 5</p>  <p>Wipe any particles out of the O-ring groove with a clean cloth (such as Bemcot) dipped in ethanol. (Ensure there is no fiber or dust in the groove.)</p>		<p>Step 6</p>  <p>Wipe off any particles from the O-ring surface with a clean cloth (such as Bemcot) dipped in ethanol, and put it 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. (Wear gloves which generate no particles.)</p>	

Replacement procedure

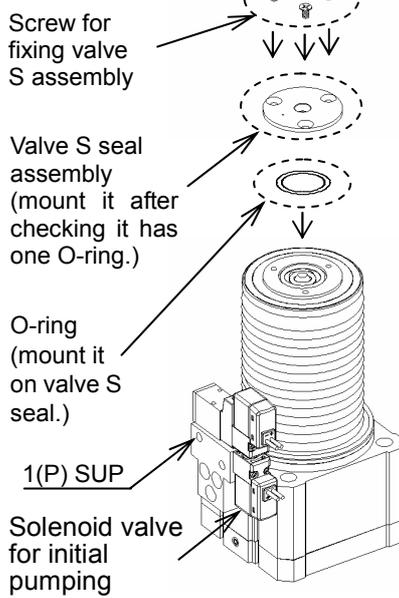
Division 1 Model High Vacuum Angle Valve

Step 7



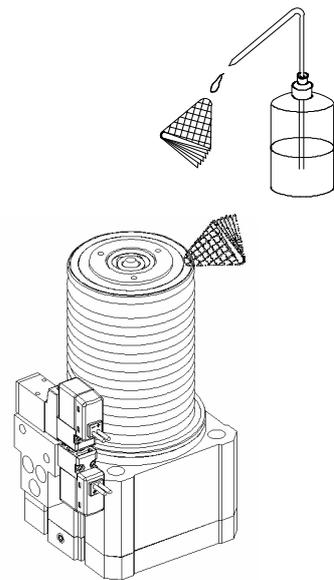
Wipe off any particles from the valve S seal assembly with a clean cloth (such as Bemcot) dipped in ethanol. (Ensure there is no fiber or dust on it.)

Step 8



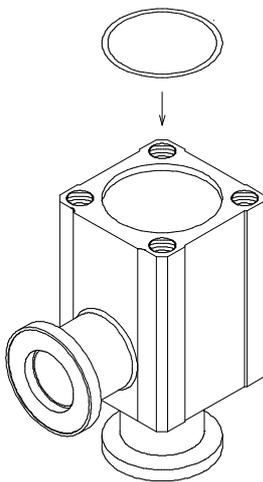
Apply a pressure of 0.3MPa to the pilot port 1(P), energize the initial pumping solenoid valve and mount the valve S seal assembly with O-ring. Then, tighten the valve S seal assembly fixing screw. Tighten by hand firstly and then wholly until the O-ring is compressed. At last, retighten wholly to complete.

Step 9



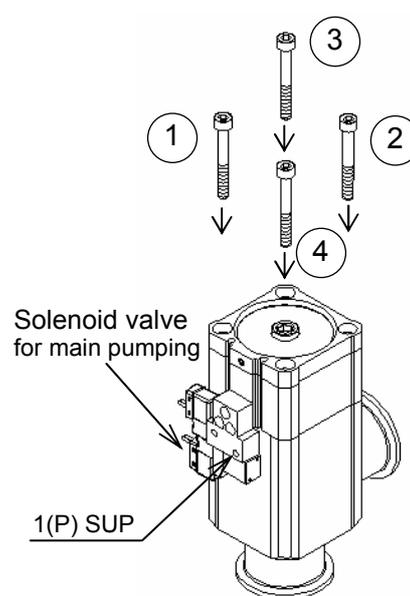
Wipe off any particles from the O-ring surface with a clean cloth (such as Bemcot) dipped in ethanol. (Ensure there is no fiber or dust on it.)

Step 10



Wipe off any particles from the O-ring surface and O-ring mounting surface with a clean cloth (such as Bemcot) dipped in ethanol. (Ensure there is no fiber or dust on it.)

Step 11



Bolt tightening torque

Model	Tightening torque N·m
XLDV-25	1.5
-40	2.5
-50	6.0
-63	6.0
-80	15.0
-100	20.0
-160	100.0

Apply a pressure of 0.2MPa to the pilot port 1(P), energize the initial pumping solenoid valve and tightening the bolts in numerical order to assemble the body and bonnet assembly. Tighten by hand firstly and then wholly until the O-ring is compressed. At last, retighten wholly to complete.

Revision history

A	Safety Instructions	Po
----------	---------------------	-----------

1st Printing :NQ

SMC Corporation

4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021 JAPAN
Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362
URL <http://www.smcworld.com>

Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
© 2009 SMC Corporation All Rights Reserved