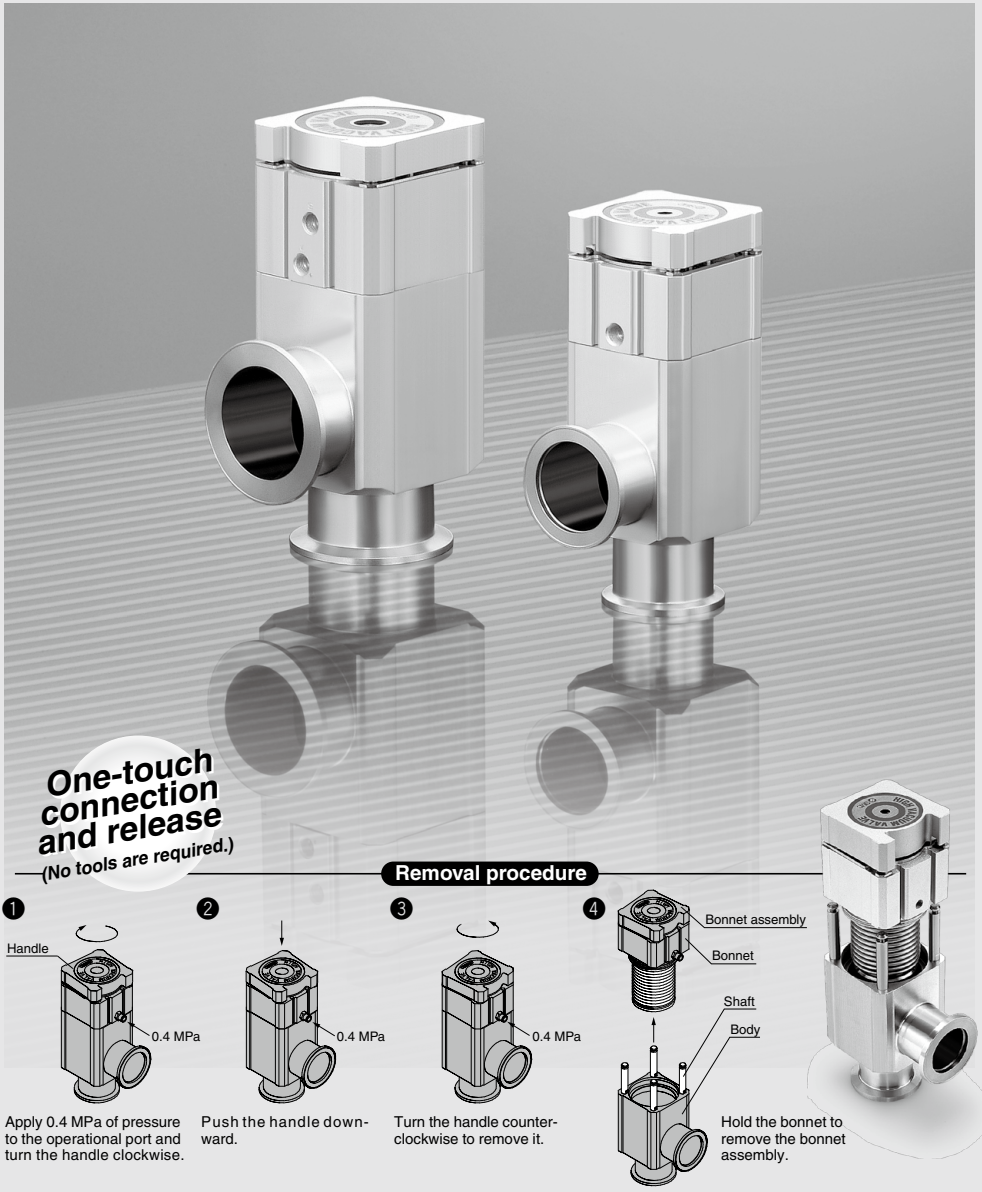
Aluminum One-touch Connection and Release High Vacuum Angle Valve

XLAQ/XLDQ Series



Lightweight, Compact

Large conductance. Small body.

XLAQ Series Case

Model	A* (mm)	B (mm)	Weight (kg)	Conductance* (L/s)
XLAQ-16	40	120	0.33	5
XLAQ-25	50	133	0.6	14
XLAQ-40	65	178	1.3	45
XLAQ-50	70	190	2.0	80

*: Common to the XLAQ/XLDQ series

One-touch Connection and Release (No tools are required.)

Variations

Bellows seal, Single acting/XLAQ

- Bellows type is particulate free and completely cleaned.
- Pressure balancing mechanism.

2-step control, Single acting/XLDQ

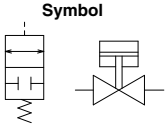
- Initial stage exhaust valve and main exhaust valve are combined. (flow rate 2-step control valve)
- Designed with a compact system and reduced piping.
- Prevents particulate turbulence inside the chamber during exhaustion.
- Prevents pumps from running while overloaded.

Actuation	Applications	Shaft seal system	Model	Valve type	Operating pressure	Flange size				Options		
					Pa	16	25	40	50	Switch	Indicator	High temperature spec.
Air operated	Particle free	Bellows seal	XLAQ 	Single acting (N.C.)	Atmospheric pressure to 1×10^{-6}	●	●	●	●	●	●	●
	Prevents turbulence of particulates. Prevents a pump from running overloaded.	Bellows seal O-ring seal	XLDQ 			—	—	●	●	●	Standard	●

Aluminum One-touch Connection and Release High Vacuum Angle Valve Normally Closed/Bellows Seal

XLAQ Series

Symbol



How to Order

XLAQ – 16 ☐ ☐ – M9N A – ☐

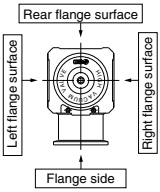
① ② ③ ④ ⑤ ⑥

① Flange size

Size
16
25
40
50

② Indicator/Actuator port direction

Symbol	Indicator	Actuator port direction
Nil	Without indicator	Flange side
A	With indicator	Flange side
F		Left flange surface
G		Rear flange surface
J		Right flange surface
K	Without indicator	Left flange surface
L		Rear flange surface
M		Right flange surface



③ Temperature specifications/Heater

Symbol	Temperature	Heater	Applicable flange size			
			16	25	40	50
Nil	5 to 60°C	None	●	●	●	●
H0	5 to 150°C	None	●	●	●	●
H4		With 100°C heater	—	—	●	●
H5		With 120°C heater	—	●	●	●

Note 1) Size 16 is not applicable for H4, H5, Size 25 not for H4.
Note 2) Heater cannot be retrofitted for the H0 type.

④ Auto switch type

Symbol	Auto switch part no.	Remarks
Nil	—	Without auto switch (Without built-in magnet)
M9N(M)(L)(Z)	D-M9N(M)(L)(Z)	Solid state auto switch
M9P(M)(L)(Z)	D-M9P(M)(L)(Z)	
M9B(M)(L)(Z)	D-M9B(M)(L)(Z)	
A90(L)	D-A90(L)	Reed auto switch (Not applicable to flange size 16)
A93(M)(L)(Z)	D-A93(M)(L)(Z)	
M9//	—	Without auto switch (With built-in magnet)

Note 1) Auto switches are not applicable for high-temperature specifications (Temperature specifications H0, H4, H5). Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired, "M" when 1 m, and "Z" when 5 m.
Example) -M9NL
Note 2) A type with a pre-wired connector is also selectable. Example) -M9NSAPC
Note 3) Refer to the **Auto Switch Catalog** for further information on auto switches.

⑤ Number of auto switches/Mounting position

Symbol	Quantity	Mounting position
Nil	Without auto switch	—
A	2 pcs.	Valve open/closed
B	1 pc.	Valve open
C	1 pc.	Valve closed

⑥ Body surface treatment/Seal material and its changed part

• Body surface treatment

Symbol	Surface treatment
Nil	External: Hard anodized Internal: Raw material
A	External: Hard anodized Internal: Oxalic acid anodized

• Seal material

Symbol	Seal material	Compound no.
Nil	FKM	1349-80*
N1	EPDM	2101-80*
P1	Barrel Perfluoro®	70W
Q1	Kalrez®	4079
R1	Chemraz®	SS592
R2		SS630
R3		SSE38
S1	VMQ	1232-70*
T1	FKM for Plasma	3310-75*
U1	ULTIC ARMOR®	UA4640
F1	FKM	—**

* Produced by Mitsubishi Cable Industries, Ltd.
** Same specifications as the standard FKM type

• Part numbers indicating changed seal material and leakage

Symbol	Changed part (Note 2)	Leakage Pa·m³/s or less (Note 1)	
		Internal	External
Nil	None	1.3×10^{-10} (FKM)	1.3×10^{-10} (FKM)
A	②, ③	1.3×10^{-8}	1.3×10^{-8}
B	②	1.3×10^{-8}	1.3×10^{-10} (FKM)
C	③	1.3×10^{-10} (FKM)	1.3×10^{-8}

Note 1) Values at ambient temperatures, excluding gas permeation.
Note 2) Refer to parts number of "Construction" on the page 470 for changed part. Number indicates parts number of "Construction" accordingly.
Note 3) For option "F1," only "A" can be selected. The leakage amount is the same as that of "Nil" (standard FKM type).

To order something else "Nil" (standard), list the symbols starting with "X", followed by each symbol for "body surface treatment", "seal material" and then "changed parts" at last.

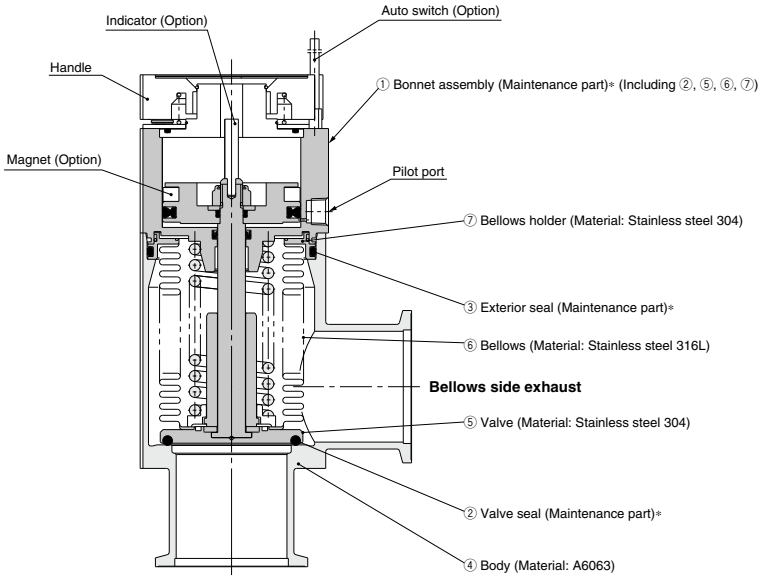
Example) XLAQ-25-M9NA-XAN1A

Specifications

Model		XLAQ-16	XLAQ-25	XLAQ-40	XLAQ-50
Flange (valve) size		16	25	40	50
Valve type		Normally closed (Pressurize to open, Spring seal)			
Fluid		Inert gas under vacuum			
Operating temperature (°C)		5 to 60 (High-temperature type: 5 to 150)			
Operating pressure (Pa) (abs)		Atmospheric pressure to 1 x 10^{-6}			
Conductance (L/s) Note 1)		5	14	45	80
Leakage (Pa·m³/s)	**Internal**	1.3 x 10^{-10} at normal temperatures (in case of standard material, FKM), excluding gas permeation			
	External				
Flange type		KF (NW)			
Principal materials		Body: Aluminum alloy, Bellows: Stainless steel 316L, Bellows holder: Stainless steel 304, FKM (Standard seal material) Note 2)			
Surface treatment		External: Hard anodized Internal: Raw material			
Pilot pressure (MPa) (G)		0.4 to 0.7			
Pilot port size		M5		Rc 1/8	
Weight (kg)		0.33	0.6	1.3	2.0

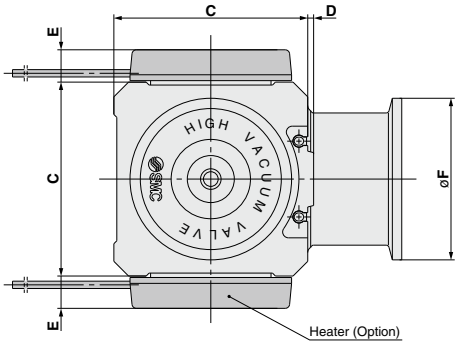
Note 1) Conductance is the value for the "molecular flow" of an elbow with the same dimensions.
Note 2) Vacuum grease (Fluorine-based, Y-VAC2) is applied to the external seal of the vacuum components.

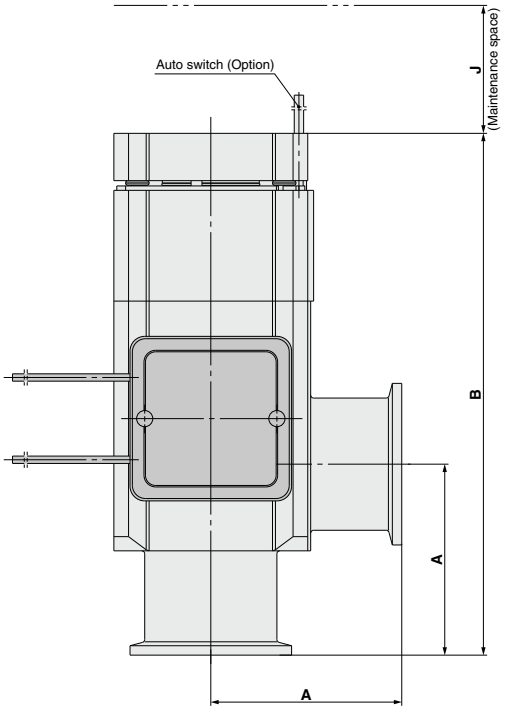
Construction

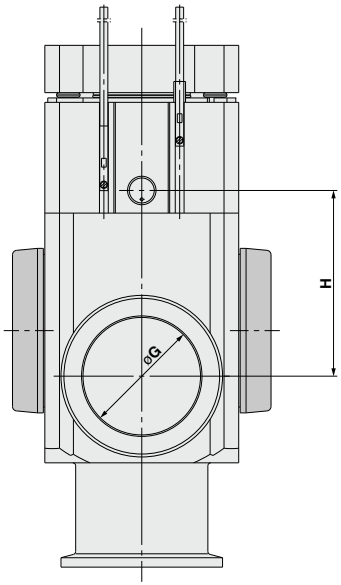


* Refer to page 478 for the maintenance parts.

Dimensions







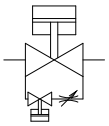
(mm)

Model	A	B	C	D	E	F	G	H	J
XLAQ-16	40	120	38	1	—	30	17	40	87
XLAQ-25	50	133	48	1	12	40	26	39	91
XLAQ-40	65	178	66	2	11	55	41	63	129
XLAQ-50	70	190	79	2	11	75	52	68	142

Note) The heater (Option) is not available with XLAQ-16.

Aluminum One-touch Connection and Release High Vacuum Angle Valve
2-step Control, Single Acting/Bellows Seal, O-ring Seal
XLDQ Series

Symbol



How to Order

XLDQ – 40 □ □ – M9N A – □

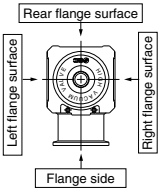
① ② ③ ④ ⑤ ⑥

① Flange size

Size
40
50

② Actuator port direction

Symbol	Actuator port direction
Nil	Flange side
K	Left flange surface
L	Rear flange surface
M	Right flange surface



③ Temperature specifications/Heater

Symbol	Temperature	Heater
Nil	5 to 60°C	None
H0	5 to 150°C	None
H4		With 100°C heater
H5		With 120°C heater

Note) Heater cannot be retrofitted for the H0 type.

④ Auto switch type

Symbol	Auto switch part no.	Remarks
Nil	—	Without auto switch (Without built-in magnet)
M9N(M)(L)(Z)	D-M9N(M)(L)(Z)	Solid state auto switch
M9P(M)(L)(Z)	D-M9P(M)(L)(Z)	
M9B(M)(L)(Z)	D-M9B(M)(L)(Z)	
A90(L)	D-A90(L)	Reed auto switch
A93(M)(L)(Z)	D-A93(M)(L)(Z)	
M9//	—	Without auto switch (With built-in magnet)

Note 1) Auto switches are not applicable for high-temperature specifications (Temperature specifications H0, H4, H5). Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired, "M" when 1 m, and "Z" when 5 m.
Example) -M9NL
Note 2) A type with a pre-wired connector is also selectable. Example) -M9NSAPC
Note 3) Refer to the **Auto Switch Catalog** for further information on auto switches.

⑤ Number of auto switches/Mounting position

Symbol	Quantity	Mounting position
Nil	Without auto switch	—
A	2 pcs.	Valve open/closed
B	1 pc.	Valve open
C	1 pc.	Valve closed

⑥ Body surface treatment/Seal material and its changed part

• Body surface treatment

Symbol	Surface treatment
Nil	External: Hard anodized Internal: Raw material
A	External: Hard anodized Internal: Oxalic acid anodized

• Seal material

Symbol	Seal material	Compound no.
Nil	FKM	1349-80*
N1	EPDM	2101-80*
P1	Barrel Perfluoro®	70W
Q1	Kalrez®	4079
R1	Chemraz®	SS592
R2		SS630
R3		SSE38
S1	VMQ	1232-70*
T1	FKM for Plasma	3310-75*
U1	ULTIC ARMOR®	UA4640
F1	FKM	—**

The material for the sliding parts of the S valve is FKM.
* Produced by Mitsubishi Cable Industries, Ltd.
** Same specifications as the standard FKM type

• Part numbers indicating changed seal material and leakage

Symbol	Changed part Note 2)	Leakage Pa·m³/s or less Note 1)	
		Internal	External
Nil	None	1.3×10^{-10} (FKM)	1.3×10^{-10} (FKM)
A	②, ③, ④, ⑤	1.3×10^{-8}	1.3×10^{-8}
B	②, ④, ⑤	1.3×10^{-8}	1.3×10^{-10} (FKM)
C	③	1.3×10^{-10} (FKM)	1.3×10^{-8}

Note 1) Values at ambient temperatures, excluding gas permeation.
Note 2) Refer to parts number of "Construction" on the page 473 for changed part. Number indicates parts number of "Construction" accordingly.
Note 3) For option "F1," only "A" can be selected. The leakage amount is the same as that of "Nil" (standard FKM type).

To order something else "Nil" (standard), list the symbols starting with "X", followed by each symbol for "body surface treatment", "seal material" and then "changed parts" at last.

Example) XLDQ-40K-M9NA-XAN1A

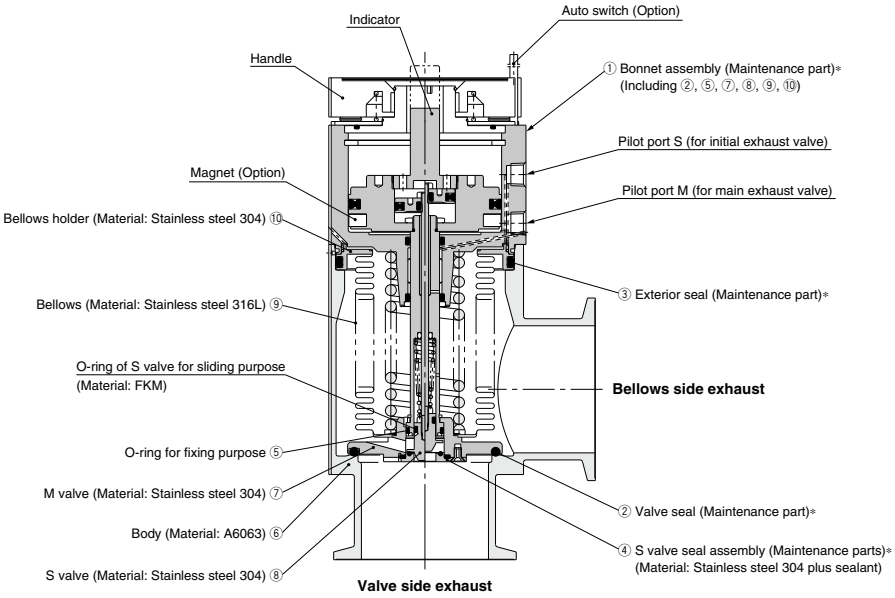
Barrel Perfluoro® is a registered trademark of Matsumura Oil Co., Ltd.
Kalrez® is a registered trademark of E. I. du Pont de Nemours and Company or its affiliates.
Chemraz® is a registered trademark of Greene, Tweed Technologies, Inc.
ULTIC ARMOR® is a registered trademark of VALQUA, LTD.

Specifications

Model		XLDQ-40	XLDQ-50
Flange (valve) size		40	50
Valve type		Normally closed (Pressurize to open, Spring seal) [both main & initial exhaust valves]	
Fluid		Inert gas under vacuum	
Operating temperature (°C)		5 to 60 (High-temperature type: 5 to 150)	
Operating pressure (Pa) (abs)		Atmospheric pressure to 1 x 10^{-6}	
Conductance (L/s) Note 1)	**Main exhaust valve**	45	80
	Initial exhaust valve	8	11
Leakage (Pa·m³/s)	**Internal**	1.3 x 10^{-10} at ordinary temperature (in case of standard material, FKM), excluding gas permeation	
	External		
Flange type		KF (NW)	
Principal materials		Body: Aluminum alloy, Bellows: Stainless steel 316L, Bellows holder: Stainless steel 304, FKM (Standard seal material) Note 2)	
Pilot pressure (MPa) (G)		0.4 to 0.7 [both main & initial exhaust valves]	
Pilot port size		Rc 1/8	
Weight (kg)		1.5	2.2

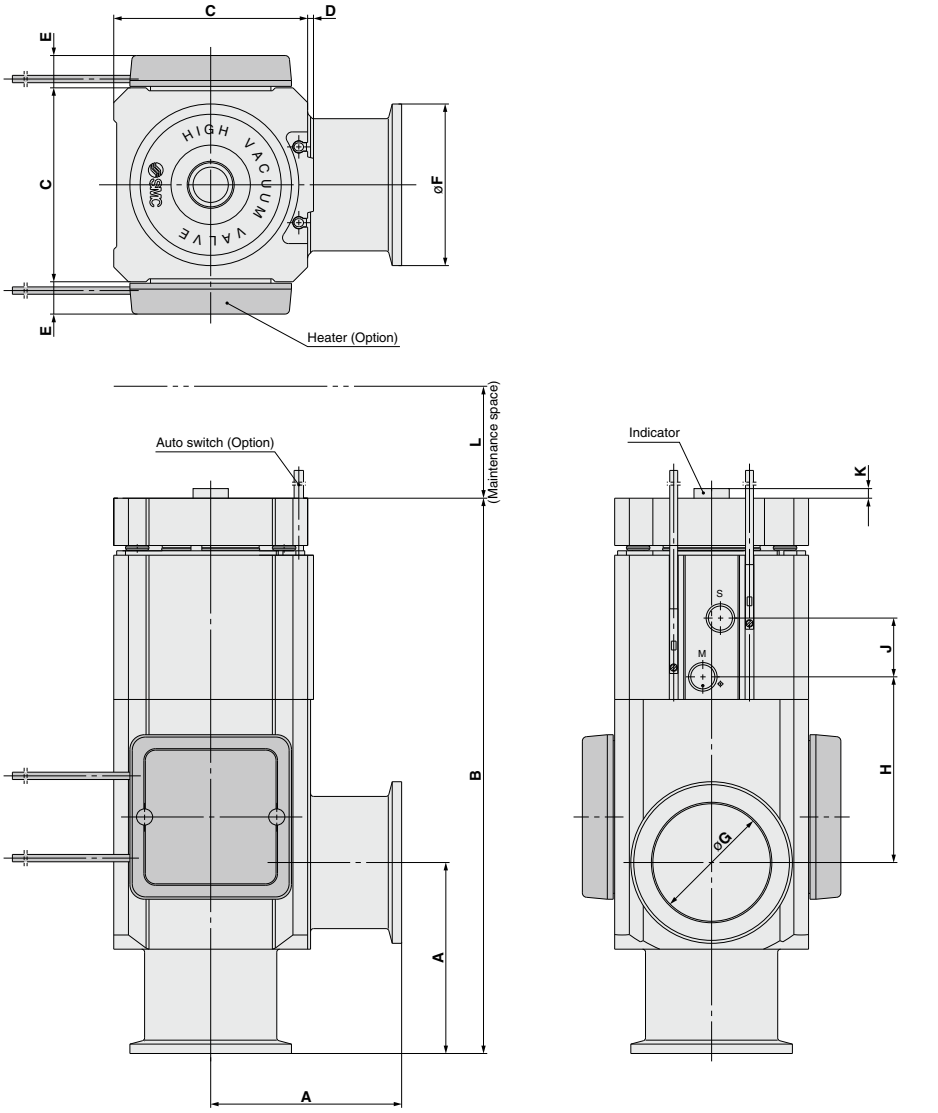
Note 1) The main exhaust valve conductance is the valve for the "molecular flow" of an elbow with the same dimensions. The initial exhaust valve conductance is the value for the "viscous flow". Flow adjustment is not available for the initial exhaust valve.
Note 2) Vacuum grease (Fluorine-based, Y-VAC2) is applied to the external seal of the vacuum components.

Construction



∗ Refer to page 478 for the maintenance parts.

Dimensions



(mm)

Model	A	B	C	D	E	F	G	H	J	K	L
XLDQ-40	65	189	66	2	11	55	41	63	20	Max. 5	143
XLDQ-50	70	198	79	2	11	75	52	68	20	Max. 5	153

XLAQ/XLDQ Series
Glossary of Terms

1 Seal Materials

Please note that the following are general features and subject to change depending on a processing condition. For details, please contact sealing component manufacturerers.

FKM (Fluororubber)
With low outgassing, low permanent-setting and low gas permeation rates, this is the most popular seal material for high vacuums. Standard material used by SMC's high vacuum angle valve is Mitsubishi Cable Industries, Ltd. (Compound No. 1349-80).
It is advisable to choose a model depending on its application, because an improved material compound (3310-75) which reduces the weight reduction ratio with O_2 plasma is also available.

Kalrez® * Kalrez® is a registered trademark of E. I. du Pont de Nemours and Company or its affiliates.
This material, perfluoroelastomer (FFKM), has excellent heat and chemical resistance, but its permanent-setting is large, and special caution is required. Variations are available with improved plasma (O_2, CF_4) and particulate resistance; therefore it is advisable to select types based upon the application.
Compound No. 4079: Standard Kalrez®, excellent in gas and heat resistance.

Chemraz® * Chemraz® is a registered trademark of Greene, Tweed Technologies, Inc.
This material, perfluoroelastomer (FFKM), has excellent chemical and plasma resistance and has slightly higher heat resistance than FKM. Several variations of Chemraz® are available and it is advisable to choose based upon the particular plasma being used and other conditions, etc.
Compound No. SS592: Excellent physical properties and especially effective for moving parts.
Compound No. SS630: Applicable to both fixed and moving parts and compatible with a wide variety of applications.
Compound No. SSE38: The cleanest material among Chemraz®, developed for high-density plasma instruments and its permanent-setting is relatively low.

Barrel Perfluoro® * Barrel Perfluoro® is a registered trademark of Matsumura Oil Co.,Ltd.
Compound No. 70W: Perfluoroelastomer (FFKM) which does not contain a metal filler. Resistant against NF_3, NH_3. Low particle generation under dry process conditions.

ULTIC ARMOR® * ULTIC ARMOR® is a registered trademark of Nippon Valqua Industries, Ltd.
Fluoro-based rubber which does not contain a metal filler. Seal material which is plasma-resistant and has low gas emittance and heat resistance.

Silicone (Silicone rubber, VMQ)
This material is relatively inexpensive, has good plasma resistance, but its gas permeation rate is high.
Optional seal material used by SMC's high vacuum angle valve is Mitsubishi Cable Industries, Ltd. (Compound No. 1232-70, White)
It has a low weight-reduction ratio and low particle generation within O_2 plasma and NH_3 gas environments.

EPDM (Ethylenepropylene rubber)
Relatively lower priced and excellent in weatherability, chemical and heat resistance, but with no resistance at all to general mineral oil.
Optional seal material used by SMC's high vacuum angle valve is Mitsubishi Cable Industries, Ltd. (Compound No. 2101-80)
Resistant to NH_3 gas, etc.

2 Shaft Sealing Method

Bellows
Bellows offer cleaner sealing with reduced particle generation and less outgassing. The two major bellow types are: Formed-bellows and Welded-bellows. Formed-bellows produce less dusts and offer higher dust resistance. Welded-bellows allow longer strokes, but generate more dust particles and offer less dust resistance. Please note, the endurance depends on length and speed of the strokes.

3 Response Time/Operation Time

Valve opening
The time from the application of voltage to the actuation solenoid valve until 90% of the valve stroke has been completed is the valve opening response time. Valve opening operation time indicates the time from the start of the stroke until 90% of movement has been completed. Both of these become faster as the operating pressure is increased.

Valve closing
The time from the cut off of power to the actuation solenoid valve until 90% of the valve return stroke has been completed is the valve closing response time. Valve closing operation time indicates the time from valve opening until 90% of return movement has been completed. Both of these become slower as the operating pressure is increased.

XLAQ/XLDQ Series
Specific Product Precautions 1

Be sure to read this before handling the products.

Caution on Design

⚠ Warning

- **All models**

1. The body material is A6063, the bellows are stainless steel 316L, and other metal seal material is stainless steel 304. Standard seal material in the vacuum section is FKM that can be changed to the other materials (please refer to "How to Order"). Use fluids which are compatible with materials after confirming.
2. Select materials for the actuation pressure piping, and heat resistance for fittings that are suitable for the applicable operating temperatures.

- **Model with auto switch**

1. The switch section should be kept at a temperature no greater than 60°C.

- **Model with heater**

1. When using a model with a heater (thermistor), a device should be installed to prevent overheating.
2. Refer to the XL□ series common option specifications on page 459 for heater specifications.

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 pressure should be kept within the specified range. 0.4 to 0.5 MPa is recommended.
3. Use within the limits of the operating pressure range.
4. The piston chamber and bellows chamber are directly connected to the atmosphere. Use in an environment where particulate discharge will not present a problem.

- **High temperature type**

1. In the case of gases which 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 valves packaged until the time of installation.
2. In case 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. In case there is vibration of heavy objects or attachments, etc., secure them so that torque is not applied directly to the flanges.
4. Vibration resistance allows for normal operation up to 30 m/s^2 (45 to 250 Hz), but continuous vibration may cause a decline in durability. Arrange piping to avoid excessive vibrations or shocks.

Mounting

⚠ Caution

- **High-temperature type (Temperature specifications/ H0, H4, H5)**

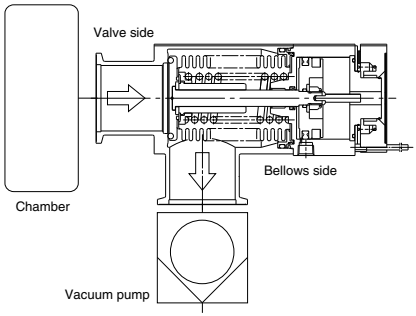
1. In models with heater (thermistor), take care not to damage the insulation components of the lead wires and connector section.
2. The setting temperature for models with heater should be established without a draft or heat insulation. It will change depending on conditions such as heat retaining measures 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 short circuit breaker or fuse should be installed.
4. When a valve is to be heated, only the body section should be heated, excluding the bonnet (handle) section.
5. When a 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 0.2 mm 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. Exhaust direction
   During operation, the direction of the exhaust may be determined freely, but in cases where a flow is generated by the exhaust, a decline in durability may result.
   The exhaust direction shown in the figure below (bellows side exhaust) is recommended.
   Please take all available precautions, as the life of the equipment is affected by conditions of usage.

Recommended exhaust direction
[Vacuum pump connected on bellows side]



Specific Product Precautions 2

Be sure to read this before handling the products.

Maintenance

⚠ Caution

1. Observe the caution plate during maintenance.

2. When removing deposits from a valve, take care not to damage any of its parts.

3. SMC specified parts should be used for service. Refer to "Construction" or "Maintenance Parts."

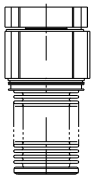
4. When removing valve or exterior seals, take care not to damage the sealing surfaces. When installing the valve seal, be sure that the O-ring is not twisted.

5. Refer to the operation manual for replacement instructions.

Maintenance Parts

⚠ Caution

1. Replace the bonnet assembly when changing the seal material.
It may not be applicable when a seal material different from the current one has been chosen.



Bonnet assembly

Bonnet Assembly: Component Part No.: ①

Model	Temperature specifications	Indicator	Flange (Valve) size			
			16	**25**	**40**	**50**
XLAQ	General use	—	XLAQ16-30-1	XLAQ25-30-1	XLAQ40-30-1	XLAQ50-30-1
		○	XLAQ16A-30-1	XLAQ25A-30-1	XLAQ40A-30-1	XLAQ50A-30-1
	High temperature	—	XLAQ16-30-1H	XLAQ25-30-1H	XLAQ40-30-1H	XLAQ50-30-1H
		○	XLAQ16A-30-1H	XLAQ25A-30-1H	XLAQ40A-30-1H	XLAQ50A-30-1H
XLDQ	General use	○: Standard	—	—	XLDQ40-30-1	XLDQ50-30-1
	High temperature		—	—	XLDQ40-30-1H	XLDQ50-30-1H

Note 1) Add a suffix for the seal material (below Table 1) to the end of the part number when valve seal materials other than the standard (FKM: Compound No. 1349-80: Mitsubishi Cable Industries, Ltd.) are desired.
Note 2) An auto switch magnet is not attached. In cases where an auto switch magnet is attached, please add "-M9//" at the end of the part number. (Not available for high temperature models)
Note 3) Auto switch and solenoid valve are not attached. When a set including auto switch and solenoid valve is required, please add the symbols after the auto switch in "How to Order" at the end of the part number.

External Seal/Valve Seal/S Valve Seal Assembly

Model	Description construction no.	Material	Flange (Valve) size			
			16	**25**	**40**	**50**
XLAQ XLDQ	External seal ③	Standard	AS568-122V	AS568-129V	AS568-140V	AS568-231V
		Special	AS568-122□	AS568-129□	AS568-140□	AS568-231□
	Valve seal ②	Standard	B2401-V15V	B2401-V24V	B2401-P42V	AS568-227V
		Special	B2401-V15□	B2401-V24□	B2401-P42□	AS568-227□
XLDQ	S valve seal assembly ④	Standard	—	AS568-009V	XLD40-2-9-1A AS568-016V	XLD50-2-9-1A AS568-016V
		Special	—	AS568-009□	XLD40-2-9-1A□ AS568-016□	XLD50-2-9-1A□ AS568-016□

Note 1) Add a suffix for the seal material (below Table 1) to the end of the part number (blank box) when valve seal materials other than the standard (FKM: Compound No. 1349-80: Mitsubishi Cable Industries, Ltd.) are desired.
Note 2) Refer to "Construction" of each series for the construction numbers.

Table 1

Optional Seal Material

Symbol	**-XN1**	**-XP1**	**-XQ1**	**-XR1**	**-XR2**	**-XR3**	**-XS1**	**-XT1**	**-XU1**	**-XF1**
Seal material	EPDM	Barrel Perfluoro®	Kalrez®	Chemraz®			VMQ	FKM for Plasma	ULTIC ARMOR®	FKM
Compound no.	2101-80*	70W	4079	SS592	SS630	SSE38	1232-70*	3310-75*	UA4640	**

Note) It may not be appplicable when a seal material different from the current one has been chosen.
* Produced by Mitsubishi Cable Industries, Ltd. ** Same specifications as the standard FKM type