# Aluminum Angle Valves Series XL High fluorine resistance Minimal outgassing Minimal contamination from heavy metals Addition of Ø100, Ø160 XLF(V)

#### Smooth Vent Valve

#### Series XVD

- Valve / needle valve integrated construction requires only 1/4 the piping space of previous models.
- Particulates significantly reduced through the use of a metal diaphragm in the sheet portion
- Flow of both initial air supply and main air supply can be adjusted.



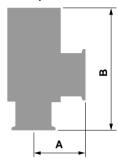


#### **Aluminum High Vacuum Angle Valves**

## Series X

#### Lightweight, Compact

Large conductance, small body



#### XI \* Series Case

AL Selles Ca	30			
Model	<b>A</b> * (mm)	B (mm)	Weight (kg)	Conductance* (e/s)
XLA-16	40	103	0.25	5
XLA-25	50	113	0.45	14
XLA-40	65	158	1.1	45
XLA-50	70	170	1.6	80
XLA-63	88	196	2.9	160
XLA-80	90	235	5.0	200
XLF-100	108	154	10.6	300
XLF-160	138	200	18.5	800

#### \* Common to all series.

#### High fluorine resistance

Excellent resistance against fluorine corrosion

#### Low outgassing

Low outgassing makes it possible to use a lower capacity pump and also to shorten evacuation time.

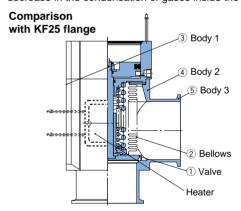


#### Little heavy metal contamination

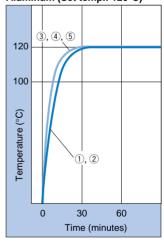
The valve does not contain heavy metals such as Ni (nickel) or Cr (chrome) and a low sputtering yield also helps to minimize heavy metal contamination of semiconductor wafers.

#### Uniform baking temperature

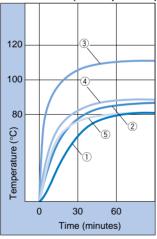
Excellent thermal conductivity results in a uniform temperature for the entire valve body and a marked decrease in the condensation of gases inside the valve.



#### Aluminum (Set temp.: 120°C)



#### Stainless steel (Set temp.: 120°C)



#### High Vacuum Angle Valves XL□ Series Features

#### XLA/XLAV (Bellows seal, Single acting)

- Particulate-free and clean room compatible bellows
- Pressure-balance mechanism

#### XLC/XLCV (Bellows seal, Double acting)

- Particulate-free and clean room compatible bellows
- Pressure-balance mechanism

#### XLF/XLFV (O-ring seal, Single acting)

- · Low gas entrainment with employment of O-ring seal system
- High speed response
- · Particulates are reduced through special surface treatment of shaft seal.

#### XLG/XLGV (O-ring seal, Double acting)

- · Low gas entrainment with employment of O-ring seal system
- High speed response
- Particulates are reduced through special surface treatment of shaft seal.

#### XLD/XLDV (2-Step control, Single acting)

- 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.
- Initial exhaust valve flow is adjustable.

#### XLH (Bellows seal, Manual)

- Bellows type is particulate free and cleaned.
- Pressure balance mechanism allows unrestricted exhaust direction.
- Low actuation torque (0.5 N·m or less)
- · Spring provides standard sealing load.
- · Handle height is the same when valve is open or
- Indicator to confirm opening and closing of valve is standard equipment.

#### XLS (Bellows pressure balance, Normally closed electromagnetic)

- Particulates are reduced because there are no sliding metal parts.
- Pressure balance mechanism allows unrestricted exhaust direction.
- A control power supply circuit for solenoid valve drive has been made standard.
- Can be used in portable equipment since air for drive is not necessary.

#### XVD (Supply line)

- · Valve / needle valve integrated construction requires only 1/4 the piping space of previous models.
- Particulates significantly reduced through the use of a metal diaphragm in the sheet portion
- Flow of both initial air supply and main air supply can be adjusted.



#### **Series Variations**

#### **High Vacuum Angle Valves**

ctua-		Shaft seal		Valve	Operating		(Pa·m³/s)			_	Fla	ang	e siz	е	_					Op	tion	I.e.		Page												
tion	Application	system	Model	type	pressure	Note) Internal	Note 1) External	16	2	5	40	50	63	80	0 10	00 1	60	Swit	ch H	eater	Indicat	High temp ture	era-	3-												
	Particle (as-		XLAV (With solenoid valves)	Single acting (N.C.)				•				•	•		<u> </u>				(Size	16: No	one)			P.1 to 4												
	Particle free completely cleaned	Bellows seal	XLC XLCV	Double acting	Atmospheric pressure to 10 <sup>-6</sup>	10 <sup>-10</sup>	10 <sup>-11</sup>	•	<b>—</b>	_	•	•	+	-	_			•	(Size	16: N	one)			P.5 to 8												
d			(With solenoid valves)				•	<b>—</b>		t	•	+	1	-			†		t	+																
Air operated			XLFV	Single acting (N.C.)				•	<b>—</b>		t	•	+	-	<b>—</b>			1	(Size	16: N	one)			P.9 to 18												
Air c	High speed operation High volume	O-ring seal	(With solenoid valves)		Atmospheric pressure to 10 <sup>-5</sup>	pressure to	pressure to 10 <sup>-5</sup>	pressure to	pressure to	pressure to	essure to 10 <sup>-10</sup>	10-10 10-10	•	<b>—</b>		•	•	<b>†</b>	1	No.	e 2) No	2)	•		t	•										
	operation		XLG XLGV	Double acting																										•	<b>—</b>			<b>†</b>	•	
			(With solenoid valves)					•	<b>—</b>		t	†	•	1	-			†		t	1															
	Prevents turbulence of particulates. Prevents a	Bellows seal	XLD	Single acting		pressure to	pressure to	pressure to	: 10 <sup>-10</sup>	0 10 <sup>-11</sup>	+	<b>—</b>		<u> </u>	•	•	-	-			+		t	Standa	ard —		P.33 to 3									
	pump from running overloaded.	O-ring seal	XLDV (With solenoid valves)	(N.C.)	10 <sup>-6</sup>			$\parallel$	<b>—</b>	-	+	+	+	-	-			+		t	Standa	ard —														
Manual	Particle free completely cleaned	Bellows seal	XLH	Manual	Atmospheric pressure to 10 <sup>-6</sup>	10 <sup>-10</sup>	10 <sup>-11</sup>		<b>—</b>	_	<u> </u>	<b> </b>	<u> </u>						(Size		– Standa one)	rd = Stan	dard :	P.39, 40												
Electromagnetic	For portable equipment not requiring air	(Bellows balance)	XLS	Single acting (N.C.)	0.1 MPa (G) to 10 <sup>-6</sup>	10 <sup>-8</sup>	10-11		-	_			<u> </u>								<u> </u>			P.41 to 4												

Note 1) In case of standard seal material (FKM) Note 2) Made to Order

#### **Smooth Vent Valve**



Model	Valve	Piping	Orifice	Effective area	Operating pressure	I	Service life cycles			
Wodei	type	size	(mmø)	(mm²)	(Pa)	Internal	External	Fitting	(10 thousand)	
XVD2-02V	Single	1/4		Main air supply: 4.6		5 x 10 <sup>-9</sup>	5 x 10 <sup>-9</sup> 1.3 x 10 <sup>-11</sup> For VCR <sup>®</sup> 1.3 x 10 <sup>-11</sup>		50	P.44 to
XVD2-02S	acting (N.C.)	1/4	3	Initial air supply: 0.2 to 4.6	0.2 MPa (G) to 1 x 10 <sup>-6</sup>	Values at norm	Values at normal temperature, excluding gas permeation		50	

P.44 to 46

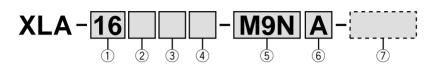


 $<sup>\</sup>ast$  Heater and high temperature specifications are not available with switches.

# Aluminum High Vacuum Angle Valve Series XLA/XLAV Normally Closed/Bellows Seal



#### **How to Order**



**XLA** 

#### 1 Flange size

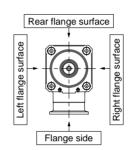
_		
	Size	
	16	
	25	
	40	
	50	
	63	
	80	

#### 2 Flange type

Symbo	ol Type	Applicable flange
Nil	KF (NW)	16, 25, 40, 50, 63, 80
D	K (DN)	63, 80

#### 3 Indicator/Pilot port direction

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



#### 4 Temperature specifications/Heater

Symbol	Temperature	Heater
Nil	5 to 60°C	_
High HC		<del>_</del>
temperature H2	5 to 150°C	With 100°C heater
type H3		With 120°C heater

Note) Size 16 is not applicable for H2, H3, Size 25 not for H2.

#### 6 Switch quantity/Mounting position

Symbol	Qty	Mounting position
Nil	Without auto switch	_
Α	2 pcs.	Valve open/closed
В	1 pc.	Valve open
С	1 pc.	Valve closed

#### **5** Auto switch type

Symbol	Auto switch model	Remarks
Nil	_	Without auto switch (without built-in magnet)
M9N(L)	D-M9N(L)	
M9P(L)	D-M9P(L)	Solid state switch
M9B(L)	D-M9B(L)	
A90(L)	D-A90(L)	Reed switch (Not applicable to
A93(L)	D-A93(L)	flange size 16)
M9//	_	Without auto switch (with built-in magnet)

Auto switches are not applicable for high temperature specifications (Temperature specifications H0, H2, H3). Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9NL  $\_$ 

#### (7) Body surface treatment/Seal material and its changed part

#### Body surface treatment

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

#### Seal material

• Seal materia	31	
Symbol	Seal material	Compound No.
Nil	FKM	1349-80*
N1	EPDM	2101-80*
P1	Barrel Perfluoro <sup>®</sup>	70W
Q1	Kalrez <sup>®</sup>	4079
R1		SS592
R2	Chemraz <sup>®</sup>	SS630
R3		SSE38
S1	VMQ	1232-70*
T1	FKM for Plasma	3310-75*
U1	ULTIC ARMOR®	UA4640

\* Produced by Mitsubishi Cable Industries, Ltd.

#### • Seal material changed part and leakage

Symbol	Note 2) Changed	Leakage (Pa·m	3/s or less) Note 1)		
Cyrribor	part	Internal	External		
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)		
Α	2,3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-9</sup>		
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)		
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>		

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 3 for changed part.

Number indicates parts number of "Construction" accordingly.

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

Example) XLA-16-M9NA-XAN1A

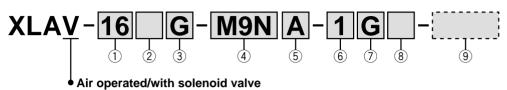
Barrel Perfluoro® is a registered trademark of Matsumura Oil Co., Ltd. Kalrez® is a registered trademark of DuPont Performance Elastomers. Chemraz® is a registered trademark of Greene, Tweed & Co.

ULTIC ARMOR® is a registered trademark of Nippon Valqua Industries, Ltd.

#### Air Operated/with Solenoid Valve



#### **How to Order**



#### 1 Flange size

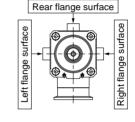
Si	ze
1	6
2	5
4	0
5	0
6	3
8	0

#### 2 Flange type

Symbol	Туре	Applicable flange			
Nil	KF (NW)	16, 25, 40, 50, 63, 80			
D	K (DN)	63, 80			

#### (3) Indicator/Pilot port direction

Symbol	Indicator	Pilot port direction		
F	With indicator	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		



<sup>\*</sup> M type plug connector (AC power supply) not attached for J, M of sizes 16 and 25.

#### 4 Auto switch type

_	7.1	
Symbol	Auto switch model	Remarks
Nil		Without auto switch (without built-in magnet)
M9N(L)	D-M9N(L)	
M9P(L)	D-M9P(L)	Solid state switch
M9B(L)	D-M9B(L)	
A90(L)	D-A90(L)	Reed switch (Not applicable to
A93(L)	D-A93(L)	flange size 16)
M9//	_	Without auto switch (with built-in magnet)

#### (5) Switch quantity/Mounting position

Symbol	Qty Mounting position			
Nil	Without auto switch	vitch —		
A 2 pcs. Valv		Valve open/closed		
В	B 1 pc. Valve open			
С	C 1 pc. Valve closed			

Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9NL

#### 6 Rated voltage

<u> </u>	
1	100 VAC, 50/60 Hz
2	200 VAC, 50/60 Hz
3	110 VAC, 50/60 Hz
4	220 VAC, 50/60 Hz
5	24 VDC
6	12 VDC

#### (7) Electrical entry

G	Grommet (Lead wire length 300 mm)
Н	Grommet (Lead wire length 600 mm)
L	L type plug connector
M	M type plug connector

#### 8 Light/Surge voltage suppressor

Nil	None
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
U	With light/surge voltage suppressor (Non-polar type)

<sup>\*</sup> S type: Not available for AC.

#### Body surface treatment/Seal material and its changed part

#### Body surface treatment

Symbol	Surface treatment				
Nil	External: Hard anodized Internal: Raw material				
Α	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 <sup>®</sup>	70W		
Q1	Kalrez <sup>®</sup>	4079		
R1		SS592		
R2	Chemraz <sup>®</sup>	SS630		
R3		SSE38		
S1	VMQ	1232-70*		
T1	FKM for Plasma	3310-75*		
U1	ULTIC ARMOR®	UA4640		

<sup>\*</sup> Produced by Mitsubishi Cable Industries, Ltd.

#### • Seal material changed part and leakage

Symbol	Note 2) Changed	Leakage (Pa·m³/s or less) Note 1)			Leakage (Pa·m³/s or less) Note 1)	
Cymbol	part	Internal	External			
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)			
Α	2,3	1.3 x 10 <sup>-8</sup> 1.3 x 10 <sup>-9</sup>				
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)			
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>			

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 3 for changed part. Number indicates parts number of "Construction" accordingly.

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

#### Example) XLAV-16-M9NA-1G-XAN1A

Note 1) Option specifications/Combinations

This model has indicator, auto switch and K(DN) flange options, but high temperature/heater options are not available.

Note 2) Solenoid valves

XLAV-16, 25, 40, 50: SYJ319, XLAV-63, 80: SYJ519

Example) SYJ319-1GS, etc.

For further details on solenoid valves, refer to the SMC solenoid valve catalog "SYJ300/500/700" (ES11-86).



<sup>\*</sup> U type: DC only.

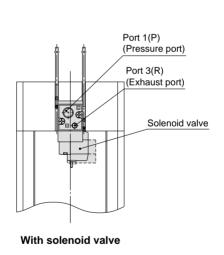
#### Series XLA/XLAV

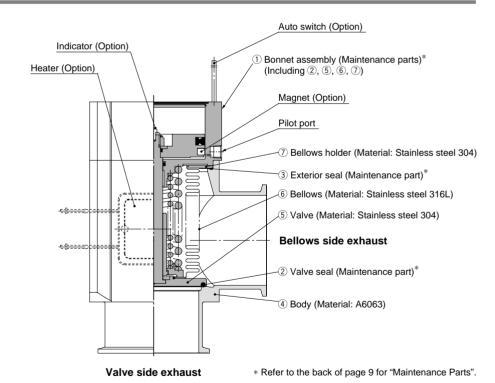
#### **Specifications**

Model		XLA(V)-16 XLA(V)-25 XLA(V)-40 XLA(V)-50 XLA(V)-63 XLA(V)			XLA(V)-80		
Valve type		Normally closed (Pressurize to open, Spring seal)					
Fluid		Inert gas under vacuum					
Operating	XLA		5 to 60 (High temperature type: 5 to 150)			50)	
temperature (°C)	XLAV	5 to 50					
Operating pressure (F	Pa)			Atmospheric pre	essure to 1 x 10 <sup>-6</sup>		
Conductance (&s) Note	1)	5	14	45	80	160	200
Laskana (Da. m³/a)	Internal	In case of standard material FKM: 1.3 x 10 <sup>-10</sup> at normal temperature, excluding gas permeation					
Leakage (Pa•m³/s)	External	In case of standard material FKM: 1.3 x 10 <sup>-11</sup> at normal temperature, excluding gas permeation				permeation	
Flange type		KF (NW) KF (NW), K (DN)		), K (DN)			
Principal materials		Body: Aluminum alloy, Bellows: Stainless steel 316L, Main part: Stainless steel, FKM (Standard seal mater			lard seal material)		
Surface treatment		External: Hard anodized Internal: Raw material					
Pilot pressure (MPa)				0.4 t	to 0.7		
XLA XLA		M5 Rc1/8					
Pilot port size	XLAV	M5: Port 1(P), Port 3(R)			Rc1/8: Port 1(P), M5: Port 3(R)		
	XLA	0.25	0.45	1.1	1.6	2.9	5.0
Weight (kg)	XLAV	0.29	0.49	1.14	1.64	2.96	5.06

Note 1) Conductance is the value for an elbow with the same dimensions.

#### **Construction/Operation**





#### <Working principle>

By applying pressure from the pilot port, the piston-coupled valve overcomes the force of the spring or operating force by pressure, and the valve opens.

In the case of the XLAV, port 1(P) is normally pressurized, and the valve opens when the solenoid valve is turned ON and closes when it is turned OFF.

#### <Options>

Auto switch: The magnet activates the auto switch. With 2 auto switches, the open and closed

positions are detected, and with 1 auto switch, either the open or closed position is detected. Auto switches are applicable at ordinary temperatures only (5 to 60°C).

Heater: Simple heating is performed using thermistors. The valve body can be heated to approximately 100 or 120°C, depending on the heater option and the valve size. The type and number of thermistors to be used will vary depending upon size and setting temperature. In the case of high temperature specifications, the bonnet assembly is a heat resistant structure. This does not apply in cases where a solenoid valve is at-

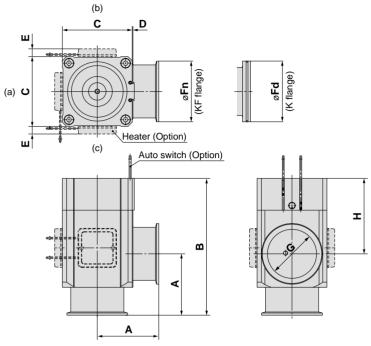
Indicator: When the valve is open, an orange marker appears in the center of the name plate.



Note 2) For valve heater specifications, refer to "Common Option [1] Heater" on page 47.

#### **Dimensions**

#### XLA/Air operated



									(mm)
Model	Α	В	С	D	E Note 1)	Fn	Fd	G	Н
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

Note 1) Dimension E applies when heater option is included. (Lead wire length: approx. 1 m)

Note 2) (a), (b) and (c) in the above drawing indicate heater mounting positions. Moreover, heater mounting positions will differ depending on the type of heater. For further details, refer to mounting positions under "Replacement Heaters" on the back of page 9.

### XLAV/With solenoid valve Port P (Pressure port) Port R (Exhaust port)

					(mm)
Model	J	K	L	M	N
XLAV-16	35.5	13.4	8.5	2.7	3
XLAV-25	40.5	14.9	8.5	2.7	3
XLAV-40	50.5	22.7	8.5	2.7	3

<sup>(</sup>mm) K М N Model L XLAV-50 8.5 57 25.7 2.7 3 XLAV-63 78.5 28.7 12 4 2 XLAV-80 38.7 2

<sup>\*</sup> Other dimensions are the same as the XLA. Note) For further details on solenoid valves, refer to the SMC solenoid valve catalog "SYJ300/500/700" (ES11-86).

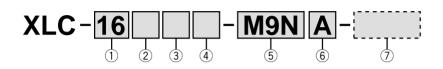


<sup>\*</sup> Other dimensions are the same as the XLA.

# Aluminum High Vacuum Angle Valve Series XLC/XLCV Double Acting/Bellows Seal



#### **How to Order**



XI C

#### 1 Flange size

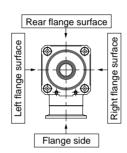
Size	
16	
25	
40	
50	
63	
80	

#### 2 Flange type

	<u> </u>	
Symbol	Type	Applicable flange
Nil	KF (NW)	16, 25, 40, 50, 63, 80
D	K (DN)	63, 80

#### 3 Pilot port direction

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



#### (4) Temperature specifications/Heater

Symbol	Temperature	Heater
Nil	5 to 60°C	_
High H		_
temperature H	5 to 150°C	With 100°C heater
type H	3	With 120°C heater

Note) Size 16 is not applicable for H2, H3, Size 25 not for H2.

#### 6 Switch quantity/Mounting position

Symbol	Qty	Mounting position
Nil	Without auto switch	_
Α	2 pcs.	Valve open/closed
В	1 pc.	Valve open
С	1 pc.	Valve closed

#### (5) Auto switch type

Symbol	Auto switch model	Remarks	
Nil	_	Without auto switch (without built-in magnet)	
M9N(L)	D-M9N(L)		
M9P(L)	D-M9P(L)	Solid state switch	
M9B(L)	D-M9B(L)		
A90(L)	D-A90(L)	Reed switch (Not applicable to	
A93(L)	D-A93(L)	flange size 16)	
M9//	_	Without auto switch (with built-in magnet)	

Auto switches are not applicable for high temperature specifications (Temperature specifications H0, H2, H3). Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9NL

#### 7 Body surface treatment/Seal material and its changed part

#### Body surface treatment

\* Produced by Mitsubishi Cable Industries, Ltd.

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

#### Seal material

• Seai materia	ai	
Symbol	Seal material	Compound No.
Nil	FKM	1349-80*
N1	EPDM	2101-80*
P1	Barrel Perfluoro <sup>®</sup>	70W
Q1	Kalrez <sup>®</sup>	4079
R1		SS592
R2	Chemraz <sup>®</sup>	SS630
R3		SSE38
<b>S</b> 1	VMQ	1232-70*
T1	FKM for Plasma	3310-75*
U1	ULTIC ARMOR®	UA4640

#### • Seal material changed part and leakage

Symbol	Note 2) Changed	Leakage (Pa·m³/s or less) Note 1)		
Cymbol	part	Internal	External	
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)	
Α	2,3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-9</sup>	
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)	
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>	

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 7 for changed part.

Number indicates parts number of "Construction" accordingly.

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

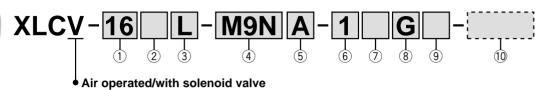
Example) XLC-16-M9NA-XAN1A



#### Air Operated/with Solenoid Valve



#### **How to Order**



**XLCV** 

#### 1 Flange size

Size
16
25
40
50
63
80

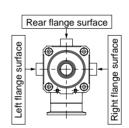
#### 2 Flange type

Symbol	Type	Applicable flange		
Nil	KF (NW)	16, 25, 40, 50, 63, 80		
D	K (DN)	63, 80		

#### (3) Solenoid valve direction

Symbol	Solenoid valve direction Left flange surface		
K			
L	Rear flange surface		
M	Right flange surface		

<sup>\*</sup> M type plug connector (AC power supply) not attached for J, M of sizes 16 and 25.



#### 4 Auto switch type

Symbol Auto switch model		Remarks		
Nil —		Without auto switch (without built-in magnet)		
M9N(L)	D-M9N(L)			
M9P(L)	D-M9P(L)	Solid state switch		
M9B(L)	D-M9B(L)			
A90(L)	D-A90(L)	Reed switch (Not applicable to		
A93(L)	D-A93(L)	flange size 16)		
M9//	_	Without auto switch (with built-in magnet		

#### **5** Switch quantity/Mounting position

Symbol	Qty	Mounting position		
Nil	Without auto switch	_		
Α	2 pcs.	Valve open/closed		
В	1 pc.	Valve open		
С	1 pc.	Valve closed		

Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9N $\underline{L}$ 

#### (6) Rated voltage

1	100 VAC, 50/60 Hz
2	200 VAC, 50/60 Hz
3	110 VAC, 50/60 Hz
4	220 VAC, 50/60 Hz
5	24 VDC
6	12 VDC

#### 7 Type of actuation

Nil	2 position single
W	2 position double

#### 8 Electrical entry

G	Grommet (Lead wire length 300 mm)
Н	Grommet (Lead wire length 600 mm)
L	L type plug connector
M	M type plug connector

#### (9) Light/Surge voltage suppressor

Nil	None
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
C	With light/surge voltage suppressor (Non-polar type)

- \* S type: Not available for AC.
- \* U type: DC only.

#### 10 Body surface treatment/Seal material and its changed part

#### Body surface treatment

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

#### Seal material

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

<sup>\*</sup> Produced by Mitsubishi Cable Industries, Ltd.

#### • Seal material changed part and leakage

		<u> </u>			
Symb	Ol Changed	Leakage (Pa·m³/s or less) Note 1)			
Cyllio	part	Internal	External		
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)		
Α	2,3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-9</sup>		
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)		
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>		

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 7 for changed part. Number indicates parts number of "Construction" accordingly.

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

#### Example) XLCV-16-M9NA-1G-XAN1A

Note 1) Option specifications/Combinations

This model has indicator, auto switch and K(DN) flange options, but high temperature/heater options are not available.

Note 2) Solenoid valves

2 position single: XLCV-16, 25, 40, 50: SYJ3190, XLCV-63, 80: SYJ5190 2 position double: XLCV-16, 25, 40, 50: SYJ3290, XLCV-63, 80: SYJ5290 Example) SYJ3190-1GS, SYJ3290-1GS

For further details on solenoid valves, refer to the SMC solenoid valve catalog "SYJ3000/5000/7000" (ES11-84).



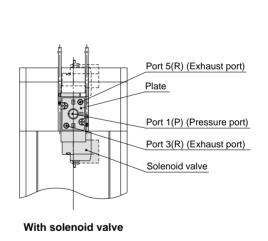
#### Series XLC/XLCV

#### **Specifications**

Model		XLC(V)-16	XLC(V)-25	XLC(V)-40	XLC(V)-50	XLC(V)-63	XLC(V)-80
Valve type		Double acting (Dual operation), Pressurize to open/close					
Fluid				Inert gas un	der vacuum		
Operating	XLA	5 to 60 (High temperature type: 5 to 150)					
temperature (°C)	XLAV		5 to 50				
Operating pressure (Pa)				Atmospheric pre	ssure to 1 x 10 <sup>-6</sup>		
Conductance (ds) Note 1)		5	14	45	80	160	200
Lankawa (Da. ma³(a)	Internal	In case of standard material FKM: 1.3 x 10 <sup>-10</sup> at normal temperature, excluding gas permeation					
Leakage (Pa·m³/s)	External	In case of standard material FKM: 1.3 x 10 <sup>-11</sup> at normal temperature, excluding gas permeation					permeation
Flange type		KF (NW) KF (NW), K (DN)				), K (DN)	
Principal materials		Body: Aluminum alloy, Bellows: Stainless steel 316L, Main part: Stainless steel, FKM (Standard seal material)					
Surface treatment		External: Hard anodized Internal: Raw material					
Pilot pressure (MPa)		0.3 to 0.6					
Dilet next size	XLA	M5 Rc1/8					
Pilot port size	XLAV XLAV		M5: Port 1(P), Port 3(R), Port 5(R) Rc1/8: Port 1(P), M5: I			: Port 3(R), Port 5(R)	
Woight (kg)	XLA	0.28	0.46	1.1	1.7	3.1	5.1
Weight (kg)	XLAV	0.32	0.5	1.15	1.74	3.16	5.16

Note 1) Conductance is the value for an elbow with the same dimensions.

#### **Construction/Operation**



Magnet (Option) Auto switch (Option) Pilot port (pressurize to close) P-2 Heater (Option) 1) Bonnet assembly (Maintenance parts)\* (Including 2, 5, 6, 7) Pilot port (pressurize to open) P-1 7 Bellows holder (Material: Stainless steel 304) ③ Exterior seal (Maintenance part)\* 6 Bellows (Material: Stainless steel 316L) 5 Valve (Material: Stainless steel 304) Bellows side exhaust ② Valve seal (Maintenance part)\* 4 Body (Material: A6063)

Valve side exhaust

\* Refer to the back of page 9 for "Maintenance Parts".

#### <Working principle>

By applying pressure from the pilot port P-1, the pistoncoupled valve overcomes the operating force by the pressure, and the valve opens. (Pilot port P-2 is open)

Alternatively, by applying pressure to actuation port P-2, the valve closes. (Pilot port P-1 is open)

In the case of the XLCV, port 1(P) is normally pressurized, and the valve opens when the solenoid valve is turned ON and closes when it is turned OFF. In the case of a double solenoid, the valve moves to the opposite side from that in which the solenoid valve is turned ON.

#### <Options>

Auto switch: The magnet activates the auto switch. With 2 auto switches, the open and closed positions are detected, and with 1 auto switch, either the open or closed position is detected. Auto switches are applicable at ordinary temperatures only (5 to 60°C).

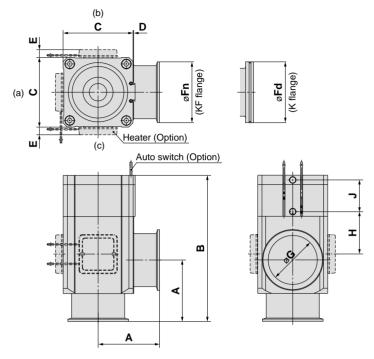
Heater: Simple heating is performed using thermistors. The valve body can be heated to approximately 100 or 120°C, depending on the heater option and the valve size. The type and number of thermistors to be used will vary depending upon size and setting temperature. In the case of high temperature specifications, the bonnet assembly is a heat resistant structure. This does not apply in cases where a solenoid valve is attached.



Note 2) For valve heater specifications, refer to "Common Option [1] Heater" on page 47.

#### **Dimensions**

#### XLC/Air operated



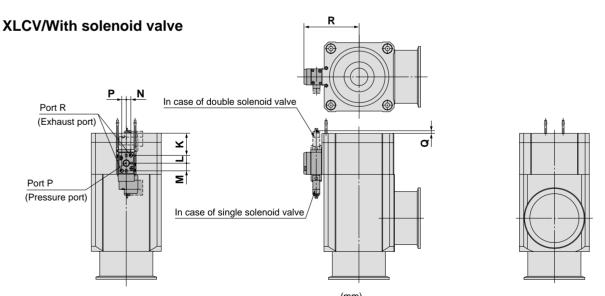
			·							(mm)
Model	Α	В	С	D	E Note 1)	Fn	Fd	G	Н	J
XLC-16	40	110	38	1	_	30	_	17	40	26
XLC-25	50	121	48	1	12	40	_	26	39	28
XLC-40	65	171	66	2	11	55	_	41	63	36
XLC-50	70	183	79	2	11	75	_	52	68	38
XLC-63	88	209	100	3	11	87	95	70	69	45
XLC-80	90	250	117	3	11	114	110	83	96	56

Note 1) Dimension E applies when heater option is included. (Lead wire length: approx. 1 m)

Note 2) (a), (b) and (c) in the above drawing indicate heater mounting positions.

Moreover, heater mounting positions will differ depending on the type of heater.

For further details, refer to mounting positions under "Replacement Heaters" on the back of page 9.



							(111111)
Model	K	L	M	N	P	Q	R
XLCV-16	14.3	9.2	6.4	3.5	2.7	17.3	36
XLCV-25	15.8	9.2	6.4	3.5	2.7	15.8	41
XLCV-40	29	9.2	6.4	3.5	2.7	2.6	51

<sup>(</sup>mm) Р Model K L М N Q R XLCV-50 32.3 9.2 6.4 3.5 2.7 57.5 XLCV-63 32 11 11 6.5 6.5 79 XLCV-80 43.7 6.5 87.5

Note) For further details on solenoid valves, refer to the SMC solenoid valve catalog "SYJ3000/5000/7000" (ES11-84).



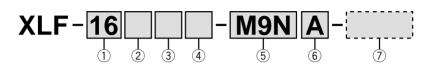
<sup>\*</sup> Other dimensions are the same as the XLC.

<sup>\*</sup> Other dimensions are the same as the XLC.

# Aluminum High Vacuum Angle Valve Series XLF/XLFV Normally Closed/O-ring Seal



#### **How to Order**



XLF

#### 1 Flange size

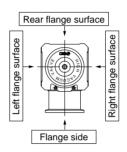
_		
	Size	
	16	
	25	
	40	
	50	
	63	
	80	
	100	
	160	

#### 2 Flange type

Symbol Type		Applicable flange
Nil	KF (NW)	16, 25, 40, 50, 63 80, 100, 160
D	K (DN)	63, 80, 100, 160

#### 3 Indicator/Pilot port direction

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



#### 4 Temperature specifications/Heater

Symbol		Temperature	Heater
Nil		5 to 60°C	_
High	H0		_
temperature	H2	5 to 150°C	With 100°C heater
type	Н3		With 120°C heater

Note) Size 16 is not applicable for H2, H3, Size 25 not for H2.

#### 6 Switch quantity/Mounting position

Symbol	Qty	Mounting position
Nil	Without auto switch	_
Α	2 pcs.	Valve open/closed
В	1 pc.	Valve open
С	1 pc.	Valve closed

(5) Auto switch type

Symbol	Auto switch model	Remarks
Nil	_	Without auto switch (without built-in magnet)
M9N(L)	D-M9N(L)	
M9P(L)	D-M9P(L)	Solid state switch
M9B(L)	D-M9B(L)	
A90(L)	D-A90(L)	Reed switch (Not applicable to
A93(L)	D-A93(L)	flange size 16)
M9//		Without auto switch (with built-in magnet)

Auto switches are not applicable for high temperature specifications (Temperature specifications H0, H2, H3). Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9NL

#### (7) Body surface treatment/Seal material and its changed part

#### • Body surface treatment

| \* Produced by Mitsubishi Cable Industries, Ltd.

	Symbol	Surface treatment			
i	Nil	External: Hard anodized Internal: Raw material			
i	Α	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 <sup>®</sup>	70W
Q1	Kalrez <sup>®</sup>	4079
R1		SS592
R2	Chemraz <sup>®</sup>	SS630
R3		SSE38
S1	VMQ	1232-70*
T1	FKM for Plasma	3310-75*
U1	ULTIC ARMOR®	UA4640

• Seal material changed part and leakage

Symbol	Note 2) Changed	Leakage (Pa⋅m	3/s or less) Note 1)
Cymbol	part	Internal	External
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-10</sup> (FKM)
Α	2,3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-8</sup>
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-10</sup> (FKM)
ဂ	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-8</sup>

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 11 for changed part.

Number indicates parts number of "Construction" accordingly.

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

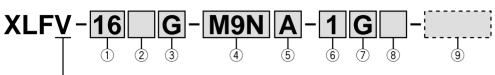
Example) XLF-16-M9NA-XAN1A



#### Air Operated/with Solenoid Valve



#### **How to Order**



♠ Air operated/with solenoid valve

#### 1 Flange size

Size
16
25
40
50
63
80
100
160

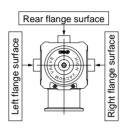
#### 2 Flange type

Symbol	Type	Applicable flange			
Nil	KF (NW)	16, 25, 40, 50, 63 80, 100, 160			
D	K (DN)	63, 80, 100, 160			

#### ③ Indicator/Pilot port direction

		•		
Symbol	Indicator	Pilot port direction		
F	With indicator	Left flange surface		
G		Rear flange surface		
J		Right flange surface		
K	Without	Left flange surface		
L	M viithout indicator	Rear flange surface		
M		Right flange surface		

\* M type plug connector (AC power supply) not attached for J, M of sizes 16 and 25.



(4) Auto switch type

	7.1	
Symbol	Auto switch model	Remarks
Nil	_	Without auto switch (without built-in magnet)
M9N(L)	D-M9N(L)	
M9P(L)	D-M9P(L)	Solid state switch
M9B(L)	D-M9B(L)	
A90(L)	D-A90(L)	Reed switch (Not applicable to
A93(L)	D-A93(L)	flange size 16)
M9//	_	Without auto switch (with built-in magnet)

#### 5 Switch quantity/Mounting position

Symbol	Qtv	Mounting position		
Nil	Without auto switch	—		
Α	2 pcs.	Valve open/closed		
<b>B</b> 1 pc.		Valve open		
С	1 pc.	Valve closed		

Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9NL

#### 6 Rated voltage

1	100 VAC, 50/60 Hz
2	200 VAC, 50/60 Hz
3	110 VAC, 50/60 Hz
4	220 VAC, 50/60 Hz
5	24 VDC
6	12 VDC

#### (7) Electrical entry

G	Grommet (Lead wire length 300 mm)
Н	Grommet (Lead wire length 600 mm)
L	L type plug connector
M	M type plug connector

#### 8 Light/Surge voltage suppressor

Nil	None
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
U	With light/surge voltage suppressor
	(Non-polar type)

- \* S type: Not available for AC.
- \* U type: DC only.

#### 9 Body surface treatment/Seal material and its changed part

#### · Body surface treatment

	Symbol	Surrace treatment						
	Nil	External: Hard anodized Internal: Raw material						
	Α	External: Hard anodized Internal: Oxalic acid anodized						
Seal material								
	Symbol	Seal material	Compound No					

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

\* Produced by Mitsubishi Cable Industries, Ltd.

• Seal ı	Seal material changed part and leakage							
Symbol	Note 2) Changed	Leakage (Pa·m³/s or less) Note 1)						
Cyllibol	part	Internal	External					
Nil	None	1.3 x 10 <sup>-10</sup> (FKM) 1.3 x 10 <sup>-10</sup> (FKM)						
Α	2,3	1.3 x 10 <sup>-8</sup> 1.3 x 10 <sup>-8</sup>						
В	2	1.3 x 10 <sup>-8</sup> 1.3 x 10 <sup>-10</sup> (FKM)						
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-8</sup>					

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 11 for changed part. Number indicates parts number of "Construction" accordingly.

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

#### Example) XLFV-16-M9NA-1G-XAN1A

Note 1) Option specifications/Combinations

This model has indicator, auto switch and K(DN) flange options, but high temperature/heater options are not available.

Note 2) Solenoid valves

XLFV-16, 25, 40: SYJ319, XLFV-50, 63, 80, 100, 160: SYJ519 Example) SYJ319-1GS.

For further details on solenoid valves, refer to the SMC solenoid valve catalog "SYJ300/500/700" (ES11-86).



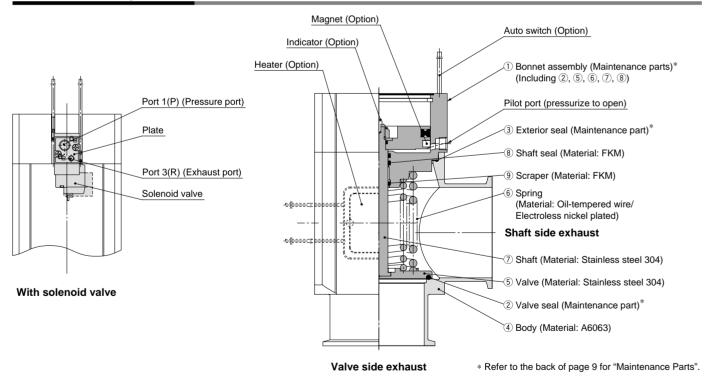
#### Series XLF/XLFV

#### **Specifications**

Model		XLF(V)-16	XLF(V)-25	XLF(V)-40	XLF(V)-50	XLF(V)-63	XLF(V)-80	XLF(V)-100	XLF(V)-160
Valve type			Normally cl	osed (Pressu	rize to open, S	Spring seal)			
Fluid					Inert gas un	der vacuum			
Operating	XLF			5 to 60	(High temper	rature type: 5	to 150)		
temperature (°C)	XLFV				5 to	50			
Operating pressure (Pa)				Atmospheric	pressure to	1 x 10 <sup>-5</sup> {760 t	to 7.5 x 10 <sup>-8</sup> }		
Conductance (#s) Note	1)	5	5 14 45 80			160	200	300	800
Laskaga (Da. m³/a)	Internal	In case	In case of standard material FKM: 1.3 x 10 <sup>-10</sup> at normal temperature, excluding gas permeation						neation
Leakage (Pa·m³/s)	External	In case	In case of standard material FKM: 1.3 x 10 <sup>-10</sup> at normal temperature, excluding gas permeation						neation
Flange type		KF (NW), K (DN)							
Principal materials		Body: Aluminum alloy, Main part: Stainless steel, FKM (Standard seal material)							
Surface treatment				External: H	lard anodized	Internal: Ra	aw material		
Pilot pressure (MPa)		0.4 to 0.7							
Pilot port cizo	XLF	M5 Rc1/8					Rc1/4		
Pilot port size	XLFV	M5: F	M5: Port 1(P), Port 3(R) Rc1/8: Port 1(P), M5: Port 3(R)					Port 3(R)	
Weight (kg)	XLF	0.25	0.45	1.1	1.6	3.0	4.8	10	18
	XLFV	0.29	0.49	1.14	1.66	3.06	4.86	10.1	18.1

Note 1) Conductance is the value for an elbow with the same dimensions.

#### Construction/Operation



#### <Working principle>

By applying pressure from the pilot port, the piston-coupled valve overcomes the force of the spring or operating force by pressure, and the valve opens.

In the case of the XLFV, port 1(P) is normally pressurized, and the valve opens when the solenoid valve is turned ON and closes when it is turned OFF.

#### <Options>

Auto switch: The magnet activates the auto switch. With 2 auto switches, the open and closed

positions are detected, and with 1 auto switch, either the open or closed position is detected. Auto switches are applicable at ordinary temperatures only (5 to 60°C).

Heater: Simple heating is performed using thermistors. The valve body can be heated to approximately 100 or 120°C, depending on the heater option and the valve size. The type and number of thermistors to be used will vary depending upon size and setting temperature. In the case of high temperature specifications, the bonnet assembly is a heat resistant structure. This does not apply in cases where a solenoid valve is at-

tached.

Indicator: When the valve is open, an orange marker appears in the center of the name plate.

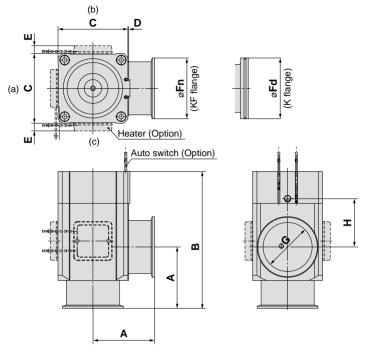


Note 2) For valve heater specifications, refer to "Common Option [1] Heater" on page 47.

Note 3) A coating of vacuum grease [Y-VAC2] is applied to the seal-material sliding portion of the vacuum part.

#### **Dimensions**

#### XLF/Air operated



									(mm)
Model	Α	В	С	D	E Note 1)	Fn	Fd	G	Н
XLF-16	40	103	38	1	_	30	_	17	40
XLF-25	50	113	48	1	12	40	_	26	39
XLF-40	65	158	66	2	11	55	_	41	63
XLF-50	70	170	79	2	11	75	_	52	68
XLF-63	88	196	100	3	11	87	95	70	69
XLF-80	90	235	117	3	11	114	110	83	96
XLF-100	108	300	154	3	11	134	130	102	131
XLF-160	138	315	200	3	11	190	180	153	112

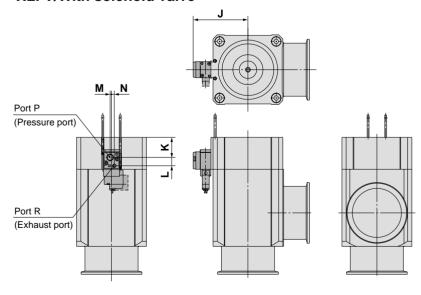
Note 1) Dimension E applies when heater option is included. (Lead wire length: approx. 1 m)  $\,$ 

Note 2) (a), (b) and (c) in the above drawing indicate heater mounting positions.

Moreover, heater mounting positions will differ depending on the type of heater.

For further details, refer to mounting positions under "Replacement Heaters" on the back of page 9.

#### XLFV/With solenoid valve



					(mm)
Model	J	K	L	М	N
XLFV-16	35.5	13.4	8.5	3	2.7
XLFV-25	40.5	15	8.5	3	2.7
XLFV-40	50.5	22.7	8.5	3	2.7
XLFV-50	67	21.7	12	4	2
XLFV-63	78.5	28.7	12	4	2
XLFV-80	87	38.7	12	4	2
XLFV-100	105.5	49.7	12	4	2
XLFV-160	128.5	58	12	4	2

Other dimensions are the same as the XLF.
 Note) For further details on solenoid valves, refer to the SMC solenoid valve catalog "SYJ300/500/700" (ES11-86).



#### Aluminum High Vacuum Angle Valve/Normally Closed/O-ring Seal

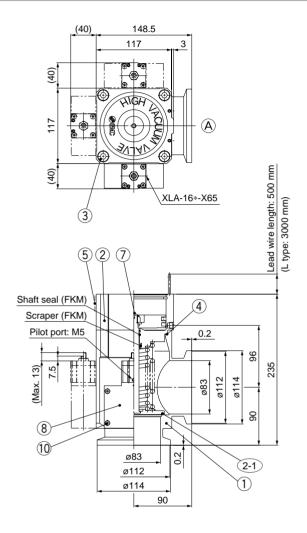
#### Series XLF

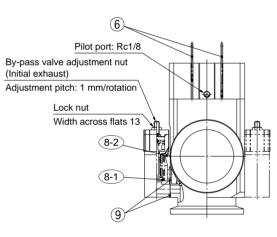
#### Made to Order 1



Please contact SMC for detailed dimensions, specifications, and lead times.

#### With By-pass Valve (Flange size: 80)





#### Symbol



#### **Component Parts**

	pononii i arto		
No.	Description	Material	Remarks
1	Body	A6063-T6	Refer to part no.
2	Bonnet assembly		Refer to part no.
2-1	O-ring		Refer to part no.
3	Hexagon socket head cap screw	SUSXM7	M10, ℓ = 60
4	O-ring		Refer to part no.
5	Computer name plate		
6	Auto switch		Option
7	Indicator	A5056	Option
8	By-pass valve		Refer to part no.
8-1	O-ring		Refer to part no.
8-2	O-ring		Refer to part no.
9	O-ring		Refer to part no.
10	Hexagon socket head cap screw	SUSXM7	M4, ℓ = 40

#### O-ring Part No.

Seal material symbol	Internal seal 2-1	External seal 4
Nil	B2401-V85V	AS568-045V
N1	B2401-V85-XN1	AS568-045-XN1
P1	B2401-V85-XP1	AS568-045-XP1
Q1	B2401-V85-XQ1	AS568-045-XQ1
R1	B2401-V85-XR1	AS568-045-XR1
R2	B2401-V85-XR2	AS568-045-XR2
R3	B2401-V85-XR3	AS568-045-XR3
S1	B2401-V85-XS1	AS568-045-XS1
T1	B2401-V85-XT1	AS568-045-XT1
U1	B2401-V85-XU1	AS568-045-XU1

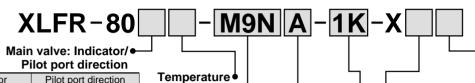
#### O-ring Part No

O-ring Part No.			
Seal material symbol	Internal seal 8-1	External seal 8-2	External seal 9
Nil	B2401-V15V	AS568-025V	AS568-017V
N1	B2401-V15-XN1	AS568-025-XN1	AS568-017-XN1
P1	B2401-V15-XP1	AS568-025-XP1	AS568-017-XP1
Q1	B2401-V15-XQ1	AS568-025-XQ1	AS568-017-XQ1
R1	B2401-V15-XR1	AS568-025-XR1	AS568-017-XR1
R2	B2401-V15-XR2	AS568-025-XR2	AS568-017-XR2
R3	B2401-V15-XR3	AS568-025-XR3	AS568-017-XR3
<b>S</b> 1	B2401-V15-XS1	AS568-025-XS1	AS568-017-XS1
T1	B2401-V15-XT1	AS568-025-XT1	AS568-017-XT1
U1	B2401-V15-XU1	AS568-025-XU1	AS568-017-XU1

Note) A coating of vacuum grease (fluorinated grease: Y-VAC2) is applied to the shaft seal, scraper and O-ring (9).



#### **How to Order Valve**



specifications

Symbol Temperature 5 to 60°C 5 to 150°C

H0

Symbol	Indicator	Pilot port direction
Nil	Without indicator	Flange side
Α		Flange side
F	With indicator	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

\* Flange: A

Auto switch type [ (Operating temperature 5 to 60°C)●

Reed switch

(Operating temperature of the operation)			
Symbol	Auto switch model	Switch type	
Nil		Without auto switch (without built-in magnet)	
M9N(L)	D-M9N(L)		
M9P(L)	D-M9P(L)	Solid state switch	
M9B(L)	D-M9B(L)		

Without auto switch (with built-in magnet) Note) Types with auto switches are not available in case of high temperature types. L type: Lead wire length 3000 mm

Switch quantity/Mounting position

		<u> </u>
Symbol	Qty	Mounting position
Nil	Without auto switch	_
Α	2 pcs.	Valve open/closed
В	1 pc.	Valve open
С	1 pc.	Valve closed

#### By-pass valve mounting position/ Pilot port direction

Symbol	Mounting position	Symbol	Pilot port direction
	1 -4 4	Nil	Flange side
1	Left flange surface	K	Left flange surface
	Suriace	L	Rear flange surface
	Dialet flores	Nil	Flange side
2	Right flange surface	L	Rear flange surface
	Juliace		Right flange surface
	D #	K	Left flange surface
3	Rear flange surface	L	Rear flange surface
	Suriace	M	Right flange surface

#### Seal material

Symbol	Seal material	Compound No.
Nil	FKM	1349-80
N1	EPDM	2101-80
P1	Barrel Perfluoro®	70W
Q1	Kalrez <sup>®</sup>	4079
R1		SS592
R2	Chemraz <sup>®</sup>	SS630
R3		SSE38
S1	VMQ	1232-70
T1	FKM FOR PLASMA	3310-75
U1	ULTIC ARMOR®	UA4640

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.

Seal material changed part

X65

None 8-1)(8-2

(8-1)

8-2

seal materials

of How to

Order Valve.

Seal material: Same as the

Seal material changed part Symbol Changed part

Nil

В

С

1.3 x 10<sup>-7</sup>

Leakage (Pa·m³/s or less) Note) Symbol Changed part Internal External Nil None 1.3 x 10<sup>-9</sup> (FKM) 1.3 x 10<sup>-9</sup> (FKM) Α 2-1 8-1 4 8-2 9 1.3 x 10<sup>-7</sup> 1.3 x 10<sup>-7</sup> В 2-1)(8-1) 1.3 x 10<sup>-7</sup> 1.3 x 10<sup>-9</sup> (FKM)

1.3 x 10<sup>-9</sup> (FKM)

Note) Values at normal temperature, excluding gas permeation.

(4)(8-2)(9)

#### **Maintenance Parts**

**A90(L)** D-A90(L)

**A93(L)** D-A93(L)

1) Body Part No.

XLAR80-1S-

By-pass valve mounting position

Symbol	Mounting position
1	Left flange surface
2	Right flange surface
3	Rear flange surface

(8) By-pass	Valve Part N	0
VIA	40	

XLA-16

ymbol	Pilot port direction
Nil	Rear (as seen from body connection point)
K	Left (as seen from body connection point)
M	Right (as seen from body connection point)

\* Flange: (A)

Pilot port direction

Symbol Temperature

5 to 60°C

5 to 150°C

2 Bonnet As	sembly Part	No.		Nil	OI
YI FRO	\-30-1H -	MONA	LVN1		
VEI OUL	1-30-111	IVISINA	4-VIA I		
	i			Specifications	2

How to Order.

Bonnet assembly

Temperature	Indicator	Part no.
⊥ 5 to 60°C:	Without indicator	XLF80-30-1
	With indiator	XLF80A-30-1
5 to 150°C	Without indicator	XLF80-30-1H
	With indiator	XLF80A-30-1H

Same as

Specifications		
Valve type	Main valve: Normally closed	By-pass valve: Normally closed
Shaft seal type	O-ring seal Bellows seal	
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa	
Fluid	Inert gas under vacuum	
Operating temperature	5 to 60°C (Option: 5 to 150°C)	
Conductance	200 <i>e</i> /s	Max. 25 t/s (Calculated value)
Operating pressure	0.4 to 0.7 MPa	
Flange	KF80	



#### Aluminum High Vacuum Angle Valve/Normally Closed/O-ring Seal

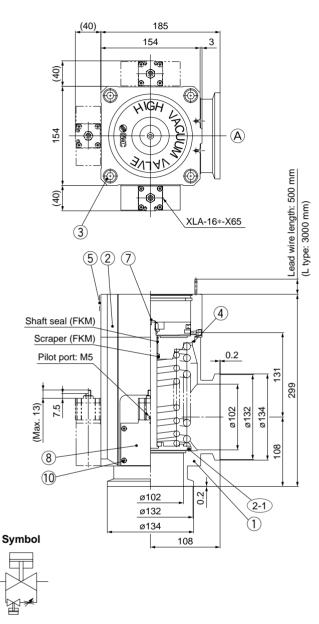
#### Series XLF

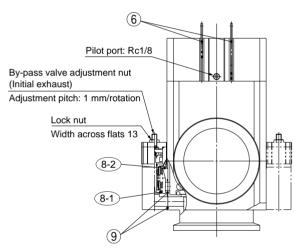
#### **Made to Order 2**



Please contact SMC for detailed dimensions, specifications, and lead times.

#### With By-pass Valve (Flange size: 100)





#### O-ring Part No.

Seal material symbol	Internal seal 2-1	External seal 4
Nil	AS568-349V	AS568-050V
N1	AS568-349-XN1	AS568-050-XN1
P1	AS568-349-XP1	AS568-050-XP1
Q1	AS568-349-XQ1	AS568-050-XQ1
R1	AS568-349-XR1	AS568-050-XR1
R2	AS568-349-XR2	AS568-050-XR2
R3	AS568-349-XR3	AS568-050-XR3
S1	AS568-349-XS1	AS568-050-XS1
T1	AS568-349-XT1	AS568-050-XT1
U1	AS568-349-XU1	AS568-050-XU1

#### O-ring Part No.

o mig rantito.			
Seal material symbol	Internal seal 8-1	External seal 8-2	External seal 9
Nil	B2401-V15V	AS568-025V	AS568-017V
N1	B2401-V15-XN1	AS568-025-XN1	AS568-017-XN1
P1	B2401-V15-XP1	AS568-025-XP1	AS568-017-XP1
Q1	B2401-V15-XQ1	AS568-025-XQ1	AS568-017-XQ1
R1	B2401-V15-XR1	AS568-025-XR1	AS568-017-XR1
R2	B2401-V15-XR2	AS568-025-XR2	AS568-017-XR2
R3	B2401-V15-XR3	AS568-025-XR3	AS568-017-XR3
<b>S</b> 1	B2401-V15-XS1	AS568-025-XS1	AS568-017-XS1
T1	B2401-V15-XT1	AS568-025-XT1	AS568-017-XT1
U1	B2401-V15-XU1	AS568-025-XU1	AS568-017-XU1

Note) A coating of vacuum grease (fluorinated grease: Y-VAC2) is applied to the shaft seal, scraper and O-ring 9.

Component Parts			
No.	Description	Material	Remarks
1	Body	A6063-T6	Refer to part no.
2	Bonnet assembly		Refer to part no.
2-1	O-ring		Refer to part no.
3	Hexagon socket head cap screw	SUSXM7	M12, ℓ = 70
4	O-ring		Refer to part no.
5	Computer name plate		
6	Auto switch		Option
7	Indicator	A5056	Option
8	By-pass valve		Refer to part no.
8-1	O-ring		Refer to part no.
8-2	O-ring		Refer to part no.
9	O-ring		Refer to part no.
10	Hexagon socket head cap screw	SUSXM7	M4, ℓ = 40



Seal material

#### **How to Order Valve**

#### **XLFR-100** M9N A - 1K - X

#### Main valve: Indicator/● Pilot port direction

Symbol	Indicator	Pilot port direction
Nil	Without indicator	Flange side
Α		Flange side
F	\\/ith indicator	Left flange surface
G	With indicator	Rear flange surface
J		Right flange surface
K		Left flange surface
L	Without indicator	Rear flange surface
M		Right flange surface

Switch type

(without built-in magnet)

Without auto switch

Solid state switch

Reed switch

M9// Without auto switch (with built-in magnet)

#### \* Flange: (A)

Nil

M9N(L)

#### Temperature •

emperature
to 60°C
to 150°C

#### 

Symbol	Qty	Mounting position
Nil	Without auto switch	_
Α	2 pcs.	Valve open/closed
В	1 pc.	Valve open
С	1 pc.	Valve closed
	•	

#### By-pass valve mounting position/Pilot port direction •

	Symbol	Mounting position	Symbol	Pilot port direction
	1 -4 4		Nil	Flange side
	1	Left flange surface	K	Left flange surface
1		Suriace	L	Rear flange surface
		Dialet flagge	Nil	Flange side
	2 Right flange surface	L	Rear flange surface	
		Suriace	M	Right flange surface
	3 Rear fla surface	Б "	K	Left flange surface
]			Ĺ	Rear flange surface
_		Suriace	M	Right flange surface

Note 2) Types with auto switches are not available in \* Flange: (A)

#### Symbol Seal material Compound No. Nil FKM 1349-80 **EPDM** N1 2101-80 P1 Barrel Perfluoro 70W Q1 Kalrez® 4079 R1 SS592 R2 Chemraz<sup>®</sup> SS630

SSE38 **S**1 VMQ 1232-70 T1 FKM FOR PLASMA 3310-75 ULTIC ARMOR® UA4640 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.

#### Seal material changed part

Symbol	Changed part	Leakage (Pa·m³/s or less) Note)		
Symbol	Changeu part	Internal	External	
Nil	None	1.3 x 10 <sup>-9</sup> (FKM)	1.3 x 10 <sup>-9</sup> (FKM)	
Α	2-1 8-1 4 8-2 9	1.3 x 10 <sup>-7</sup>	1.3 x 10 <sup>-7</sup>	
В	2-1 8-1	1.3 x 10 <sup>-7</sup>	1.3 x 10 <sup>-9</sup> (FKM)	
С	4 8-2 9	1.3 x 10 <sup>-9</sup> (FKM)	1.3 x 10 <sup>-7</sup>	
Note) Values at normal temperature, excluding gas permeation.				

#### **Maintenance Parts**

Symbol Auto switch model

M9P(L) D-M9P(L)
M9B(L) D-M9B(L)

**A90(L)** D-A90(L) **A93(L)** D-A93(L)

D-M9N(L)

Note 1) L type: Lead wire length 3000 mm

case of high temperature types.

1 Body Part No.

XLAR100-1S-

#### 

Symbol	Mounting position
1	Left flange surface
2	Right flange surface
3	Rear flange surface

	3	Rear flange surface
Ronnot	٨٥٥٨	mbly Part No

#### Bonnet assembly

#### Same as How to Order.

	Temperature	Indicator	Part no.
	5 to 60°C	Without indicator	XLF100-30-1
3 10 00 C	With indiator	XLF100A-30-1	
	5 to 150°C	Without indicator	XLF100-30-1H
	5 10 150 0	With indiator	XLF100A-30-1H

#### Specifications

opcomoations			
Valve type	Main valve: Normally closed	By-pass valve: Normally closed	
Shaft seal type	O-ring seal Bellows seal		
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa		
Fluid	Inert gas under vacuum		
Operating temperature	5 to 60°C (Option: 5 to 150°C)		
Conductance	300 t/s Max. 31.5 t/s (Calculated value		
Operating pressure	0.4 to 0.7 MPa		
Flange	KF100		

#### **8** By-pass Valve Part No.

<b>XLA-16</b>			X65
---------------	--	--	-----

#### Pilot port direction

Symbol	Pilot port direction
Nil	Rear (as seen from body connection point)
K	Left (as seen from body connection point)
М	Right (as seen from body connection point)

#### Temperature specifications •

Symbol	Temperature
Nil	5 to 60°C
H0	5 to 150°C

#### Seal material: Same as the seal materials of How to

(8-2)

Order Valve.

Seal material changed part Symbol Changed part None 8-1)(8-2) (8-1)

В

C

#### Specifications

opecifications			
Valve type	Main valve: Normally closed	By-pass valve: Normally closed	
Shaft seal type	O-ring seal	Bellows seal	
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa		
Fluid	Inert gas under vacuum		
Operating temperature	5 to 60°C (Option: 5 to 150°C)		
Conductance	200 t/s Max. 25 t/s (Calculated value)		
Operating pressure	0.4 to 0.7 MPa		
Flange	KF80		



#### Aluminum High Vacuum Angle Valve/Normally Closed/O-ring Seal

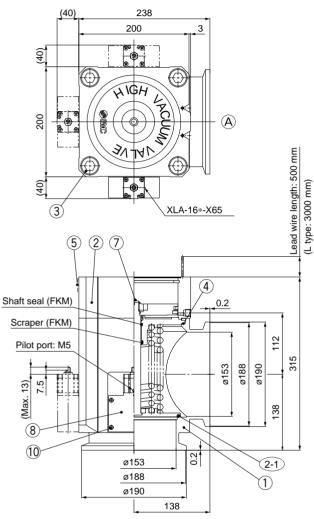
#### Series XLF

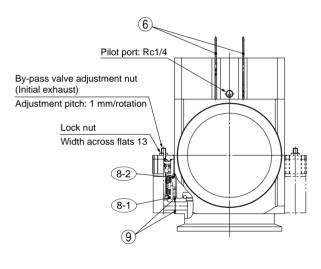
#### **Made to Order 3**



Please contact SMC for detailed dimensions, specifications, and lead times.

#### With By-pass Valve (Flange size: 160)





#### Symbol



#### O-ring Part No.

Seal material symbol	Internal seal 2-1	External seal 4
Nil	B2401-G155V	AS568-167V
N1	B2401-G155-XN1	AS568-167-XN1
P1	B2401-G155-XP1	AS568-167-XP1
Q1	B2401-G155-XQ1	AS568-167-XQ1
R1	B2401-G155-XR1	AS568-167-XR1
R2	B2401-G155-XR2	AS568-167-XR2
R3	B2401-G155-XR3	AS568-167-XR3
S1	B2401-G155-XS1	AS568-167-XS1
T1	B2401-G155-XT1	AS568-167-XT1
U1	B2401-G155-XU1	AS568-167-XU1

#### **Component Parts**

COIII	omponent i arts			
No.	Description	Material	Remarks	
1	Body	A6063-T6	Refer to part no.	
2	Bonnet assembly		Refer to part no.	
2-1	O-ring		Refer to part no.	
3	Hexagon socket head cap screw	SUSXM7	M20, ℓ = 70	
4	O-ring		Refer to part no.	
5	Computer name plate			
6	Auto switch		Option	
7	Indicator	A5056	Option	
8	By-pass valve		Refer to part no.	
8-1	O-ring		Refer to part no.	
8-2	O-ring		Refer to part no.	
9	O-ring		Refer to part no.	
10	Hexagon socket head cap screw	SUSXM7	M4, $\ell$ = 40	

#### O-ring Part No.

O Thing I dire too.			
Seal material symbol	Internal seal 8-1	External seal 8-2	External seal 9
Nil	B2401-V15V	AS568-025V	AS568-017V
N1	B2401-V15-XN1	AS568-025-XN1	AS568-017-XN1
P1	B2401-V15-XP1	AS568-025-XP1	AS568-017-XP1
Q1	B2401-V15-XQ1	AS568-025-XQ1	AS568-017-XQ1
R1	B2401-V15-XR1	AS568-025-XR1	AS568-017-XR1
R2	B2401-V15-XR2	AS568-025-XR2	AS568-017-XR2
R3	B2401-V15-XR3	AS568-025-XR3	AS568-017-XR3
S1	B2401-V15-XS1	AS568-025-XS1	AS568-017-XS1
T1	B2401-V15-XT1	AS568-025-XT1	AS568-017-XT1
U1	B2401-V15-XU1	AS568-025-XU1	AS568-017-XU1

Note) A coating of vacuum grease (fluorinated grease: Y-VAC2) is applied to the shaft seal, scraper and O-ring ③.



#### **How to Order Valve**



#### Main valve: Indicator/● Pilot port direction

Symbol	Indicator	Pilot port direction
Nil	Without indicator	Flange side
Α		Flange side
F	With indicator	Left flange surface
G		Rear flange surface
J		Right flange surface
K	Without indicator	Left flange surface
L		Rear flange surface
М		Right flange surface

#### \* Flange: A

Nil

M9N(L)

#### Temperature •

specifications		
Symbol	Temperature	
Nil	5 to 60°C	
H0	5 to 150°C	

#### Switch quantity/Mounting position

Symbol	Qty	Mounting position
Nil	Without auto switch	_
Α	2 pcs.	Valve open/closed
В	1 pc.	Valve open
ဂ	1 pc.	Valve closed

#### By-pass valve mounting position/Pilot port direction

	Symbol	Mounting position	Symbol	Pilot port direction
		Left flange surface	Nil	Flange side
	1		K	Left flange surface
			L	Rear flange surface
	2	Right flange surface	Nil	Flange side
			L	Rear flange surface
			M	Right flange surface
		Rear flange surface	K	Left flange surface
	3		Ĺ	Rear flange surface
			M	Right flange surface

Seal material

- Ocai i	• Ocal Illaterial		
Symbol	Seal material	Compound No.	
Nil	FKM	1349-80	
N1	EPDM	2101-80	
P1	Barrel Perfluoro®	70W	
Q1	Kalrez <sup>®</sup>	4079	
R1		SS592	
R2	Chemraz <sup>®</sup>	SS630	
R3		SSE38	
<b>S</b> 1	VMQ	1232-70	
T1	FKM FOR PLASMA	3310-75	
U1	ULTIC ARMOR®	UA4640	

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.

#### Seal material changed part

Symbol	Changed part	Leakage (Pa⋅m	<sup>3</sup> /s or less) Note)
Symbol	Changeu part	Internal	External
Nil	None	1.3 x 10 <sup>-9</sup> (FKM)	1.3 x 10 <sup>-9</sup> (FKM)
Α	2-1 8-1 4 8-2 9	1.3 x 10 <sup>-7</sup>	1.3 x 10 <sup>-7</sup>
В	2-1 8-1	1.3 x 10 <sup>-7</sup>	1.3 x 10 <sup>-9</sup> (FKM)
С	4 8-2 9	1.3 x 10 <sup>-9</sup> (FKM)	1.3 x 10 <sup>-7</sup>

Note) Values at normal temperature, excluding gas permeation.

#### **Maintenance Parts**

Symbol Auto switch model

M9P(L) D-M9P(L)
M9B(L) D-M9B(L)

**A90(L)** D-A90(L) **A93(L)** D-A93(L)

D-M9N(L)

Note 1) L type: Lead wire length 3000 mm

case of high temperature types.

1 Body Part No.

XLAR160-1S-

#### By-pass valve mounting position

	Symbol	Mounting position	
	1	Left flange surface	
2		Right flange surface	
	3	Rear flange surface	

(8) By-pass Valve Part No.

XLA-16 

Symbol Temperature

5 to 60°C **H0** 5 to 150°C

Symbol	Pilot port direction
Nil Rear (as seen from body connection p	
K Left (as seen from body connection poin	
M	Right (as seen from body connection point)

Same as

How to Order.

#### 2 Bonnet Assembly Part No.

#### XLF160A-30-1 - M9NA-XN1

Switch type

(without built-in magnet)

Without auto switch

Solid state switch

Reed switch

Note 2) Types with auto switches are not available in \* Flange: (A)

M9// Without auto switch (with built-in magnet)

#### Bonnet assembly

	Temperature	Indicator	Part no.
5 to 60°C	Without indicator	XLF160-30-1	
	5 10 00 C	With indiator	XLF160A-30-1
	5 to 150°C	Without indicator	XLF160-30-1H
	5 10 150 C	With indiator	XLF160A-30-1H

#### Specifications

opecinications		
Valve type	Main valve: Normally closed	By-pass valve: Normally closed
Shaft seal type	O-ring seal Bellows seal	
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa	
Fluid	Inert gas under vacuum	
Operating temperature	5 to 60°C (Option: 5 to 150°C)	
Conductance	Conductance 800 t/s Max. 31.5 t/s (Cald	
Operating pressure	0.4 to 0.7 MPa KF160	
Flange		

	Temperature specifications
M	Right (as seen from body connection point)
K	Left (as seen from body connection point)
1411	real (as seen from body connection point)

#### Seal material changed part

Symbol	Changed part
Nil	None
Α	8-1 8-2
В	8-1
С	8-2

Seal material: Same as the seal materials of How to Order Valve.

#### Specifications

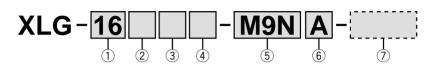
ppechications		
Valve type	Main valve: Normally closed	By-pass valve: Normally closed
Shaft seal type	O-ring seal Bellows seal	
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa	
Fluid	Inert gas under vacuum	
Operating temperature	5 to 60°C (Option: 5 to 150°C)	
Conductance	200 t/s Max. 25 t/s (Calculated value	
Operating pressure	0.4 to 0.7 MPa	
Flange	KF80	



# Aluminum High Vacuum Angle Valve Series XLG/XLGV Double Acting/O-ring Seal



#### **How to Order**



XLG

#### 1) Flange size

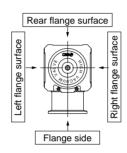
_		
	Size	
	16	
	25	
	40	
	50	
	63	
	80	

#### 2 Flange type

	<u> </u>	
Symbol	Type	Applicable flange
Nil	KF (NW)	16, 25, 40, 50, 63, 80
D	K (DN)	63, 80

#### 3 Pilot port direction

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



#### 4 Temperature specifications/Heater

Symbo	l	Temperature	Heater
Nil		5 to 60°C	_
High	H0		_
temperature	H2	5 to 150°C	With 100°C heater
type	Н3		With 120°C heater

Note) Size 16 is not applicable for H2, H3, Size 25 not for H2.

#### 6 Switch quantity/Mounting position

Symbol Qty		Mounting position
Nil Without auto switch		_
A 2 pcs.		Valve open/closed
<b>B</b> 1 pc.		Valve open
С	1 pc.	Valve closed

(5) Auto switch type

Symbol	Auto switch model	Remarks
Nil	_	Without auto switch (without built-in magnet)
M9N(L)	D-M9N(L)	
M9P(L)	D-M9P(L)	Solid state switch
M9B(L)	D-M9B(L)	
A90(L)	D-A90(L)	Reed switch (Not applicable to
A93(L)	D-A93(L)	flange size 16)
M9//	_	Without auto switch (with built-in magnet)

Auto switches are not applicable for high temperature specifications (Temperature specifications H0, H2, H3). Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9N $\underline{L}$ 

#### (7) Body surface treatment/Seal material and its changed part

#### Body surface treatment

\* Produced by Mitsubishi Cable Industries, Ltd.

	Symbol	Surface treatment	
ı	Nil	External: Hard anodized Internal: Raw material	
i	Α	External: Hard anodized Internal: Oxalic acid anodized	

#### Seal material

• Seai material		
Symbol	Seal material	Compound No.
Nil	FKM	1349-80*
N1	EPDM	2101-80*
P1	Barrel Perfluoro <sup>®</sup>	70W
Q1	Kalrez <sup>®</sup>	4079
R1		SS592
R2	Chemraz <sup>®</sup>	SS630
R3		SSE38
<b>S</b> 1	VMQ	1232-70*
T1	FKM for Plasma	3310-75*
U1	ULTIC ARMOR®	UA4640

#### • Seal material changed part and leakage

Symbol	Note 2) Changed	Leakage (Pa·m³/s or less) Note 1)		
Cymbol	part	Internal	External	
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-10</sup> (FKM)	
Α	2,3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-8</sup>	
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-10</sup> (FKM)	
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-8</sup>	

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 21 for changed part.

Number indicates parts number of "Construction" accordingly.

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

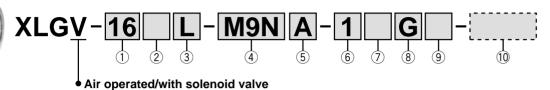
Example) XLG-16-M9NA-XAN1A



#### Air Operated/with Solenoid Valve



#### **How to Order**



#### 1 Flange size

Size
16
25
40
50
63
80

#### 2 Flange type

Symbol	Type	Applicable flange
Nil	KF (NW)	16, 25, 40, 50, 63, 80
D	K (DN)	63, 80

#### (3) Solenoid valve direction

Symbol	Solenoid valve direction
K	Left flange surface
L	Rear flange surface
М	Right flange surface

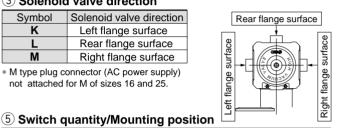
\* M type plug connector (AC power supply) not attached for M of sizes 16 and 25.

Qty

Without auto switch

2 pcs. 1 pc.

1 pc.



Mounting position

Valve open/closed

Valve open

Valve closed

#### (4) Auto switch type

	7.1	
Symbol	Auto switch model	Remarks
Nil	_	Without auto switch (without built-in magnet)
M9N(L)	D-M9N(L)	
M9P(L)	D-M9P(L)	Solid state switch
M9B(L)	D-M9B(L)	
A90(L)	D-A90(L)	Reed switch (Not applicable to
A93(L)	D-A93(L)	flange size 16)
M9//	_	Without auto switch (with built-in magnet)

Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9NL

#### 6 Rated voltage

1	100 VAC, 50/60 Hz
2	200 VAC, 50/60 Hz
3	110 VAC, 50/60 Hz
4	220 VAC, 50/60 Hz
5	24 VDC
6	12 VDC

#### 7 Type of actuation

Nil	2 position single
W	2 position double

#### (8) Electrical entry

G	Grommet (Lead wire length 300 mm)
Н	Grommet (Lead wire length 600 mm)
L	L type plug connector
M	M type plug connector

Symbol

Nil

В

C

#### (9) Light/Surge voltage suppressor

Nil	None
S	With surge voltage suppressor
Z	With light/surge voltage suppressor
U	With light/surge voltage suppressor (Non-polar type)

- \* S type: Not available for AC
- \* U type: DC only.

#### 10 Body surface treatment/Seal material and its changed part

#### Body surface treatment

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

#### Seal material

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

\* Produced by Mitsubishi Cable Industries, Ltd.

#### Seal material changed part and leakage

Symbol	Note 2) Changed	Leakage (Pa·m³/s or less) Note 1)			
Cyllibol	part	Internal External			
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-10</sup> (FKM)		
Α	2,3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-8</sup>		
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-10</sup> (FKM)		
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-8</sup>		

Note 1) Values at normal temperature, excluding gas permeation. Note 2) Refer to parts number of "Construction" on page 21 for changed part. Number indicates parts number of "Construction" accordingly.

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

#### Example) XLGV-16-M9NA-1G-XAN1A

Note 1) Option specifications/Combinations

This model has auto switch and K(DN) flange options, but high temperature/heater options are not available.

Note 2) Solenoid valves

2 position single: XLGV-16, 25, 40: SYJ3190, XLGV-50, 63, 80: SYJ5190 2 position double: XLGV-16, 25, 40: SYJ3290, XLGV-50, 63, 80: SYJ5290 Example) SYJ3190-1GS, SYJ3290-1GS

For further details on solenoid valves, refer to the SMC solenoid valve catalog "SYJ3000/5000/7000" (ES11-84).



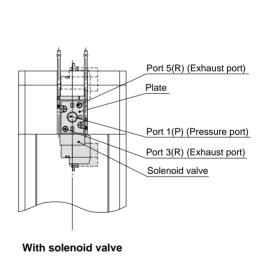
#### Series XLG/XLGV

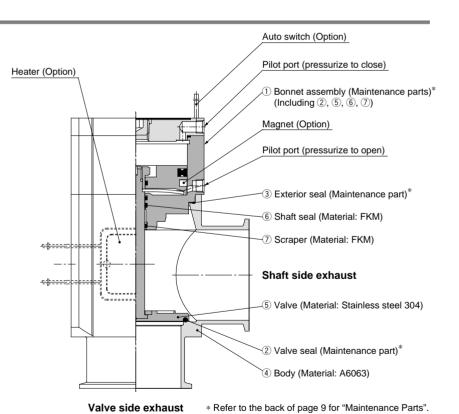
#### **Specifications**

Model	XLG(V)-16	XLG(V)-25	XLG(V)-40	XLG(V)-50	XLG(V)-63	XLG(V)-80	
Valve type		Double acting (Dual operation), Pressurize to open/close					
Fluid				Inert gas un	der vacuum		
Operating temperature (°C)	XLG		5 to	60 (High temper	rature type: 5 to	150)	
Operating temperature ( C)	XLGV			5 to	50		
Operating pressure (Pa)				Atmospheric pre	ssure to 1 x 10-	5	
Conductance (ds) Note 1)	5	14	45	80	160	200	
Leakage (Pa∙m³/s)	Internal	In case of standard material FKM: 1.3 x 10 <sup>-10</sup> at normal temperature, excluding gas permeation					
Leakage (i aviii /5)	External	In case of star	In case of standard material FKM: 1.3 x 10 <sup>-10</sup> at normal temperature, excluding gas permeation				
Flange type		KF (NW) KF (NW), K (DN)					
Principal materials		Body: Aluminum alloy, Main part: Stainless steel, FKM (Standard seal material)					
Surface treatment		External: Hard anodized Internal: Raw material					
Pilot pressure (MPa)		0.3 to 0.6					
Dilet port size	XLG	N	15	Rc1/8			
Pilot port size	XLGV	M5: Port 1(P), Port 3(R), Port 5(R) Rc1/8: Port			Rc1/8: Port	1(P), M5: Port 3(R), Port 5(R)	
Weight (kg)	XLG	0.28	0.46	1.1	1.7	3.1	5.1
	XLGV	0.32	0.5	1.14	1.76	3.16	5.16

Note 1) Conductance is the value for an elbow with the same dimensions.

#### Construction/Operation





<Options>

<Working principle> By applying pressure from the pilot port P-1, the pistoncoupled valve overcomes the operating force by the pres-

sure, and the valve opens. (Pilot port P-2 is open) Alternatively, by applying pressure to pilot port P-2, the valve closes. (Pilot port P-1 is open)

In the case of the XLGV, port 1(P) is normally pressurized, and the valve opens when the solenoid valve is turned ON and closes when it is turned OFF. In the case of a double solenoid, the valve moves to the opposite side from that in which the solenoid valve is turned ON.

Auto switch: The magnet activates the auto switch. With 2 auto switches, the open and closed positions are detected, and with 1 auto switch, either the open or closed position is detected. Auto switches are applicable at

ordinary temperatures only (5 to 60°C).

Heater: Simple heating is performed using thermistors. The valve body can be heated to approximately 100 or 120°C, depending on the heater option and the valve size. The type and number of thermistors to be used will vary depending upon size and setting temperature. In the case of high temperature specifications, the bonnet assembly is a heat resistant structure. This does not apply in cases where a solenoid valve is attached.

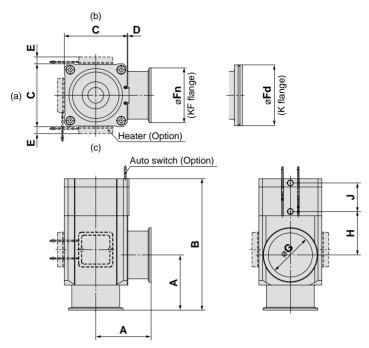


Note 2) For valve heater specifications, refer to "Common Option [1] Heater" on page 47.

Note 3) A coating of vacuum grease [Y-VAC2] is applied to the seal-material sliding portion of the vacuum part.

#### **Dimensions**

#### XLG/Air operated



										(111111)
Model	Α	В	С	D	E Note 1)	Fn	Fd	G	Н	J
XLG-16	40	110	38	1	_	30	_	17	40	26
XLG-25	50	121	48	1	12	40	_	26	39	28
XLG-40	65	171	66	2	11	55	_	41	63	36
XLG-50	70	183	79	2	11	75	_	52	68	38
XLG-63	88	209	100	3	11	87	95	70	69	45
XLG-80	90	250	117	3	11	114	110	83	96	56

Note 1) Dimension E applies when heater option is included. (Lead wire length: approx. 1 m)

Note 2) (a), (b) and (c) in the above drawing indicate heater mounting positions.

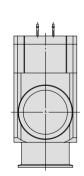
Moreover, heater mounting positions will differ depending on the type of heater. For further details, refer to mounting positions under "Replacement Heaters" on the back of page 9.

# Port P (Pressure port)

In case of single solenoid valve

R

XLGV/With solenoid valve



							(mm)
Model	K	L	M	N	Р	Q	R
XLGV-16	14.3	9.2	6.4	3.5	2.7	17.3	36
XLGV-25	15.8	9.2	6.4	3.5	2.7	15.8	41
XLGV-40	29	9.2	6.4	3.5	2.7	2.6	51
XLGV-50	25	11	11	6.5	6.5	7.7	67.5
XLGV-63	32.3	11	11	6.5	6.5	0.3	79
XLGV-80	43.7	11	11	6.5	6.5	_	87.5

 $<sup>\</sup>ast$  Other dimensions are the same as the XLG.

Note) For further details on solenoid valves, refer to the SMC solenoid valve catalog "SYJ3000/5000/7000" (ES11-84).



#### Aluminum High Vacuum Angle Valve/Double Acting/O-ring Seal

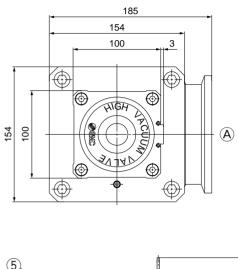
#### Series XLG

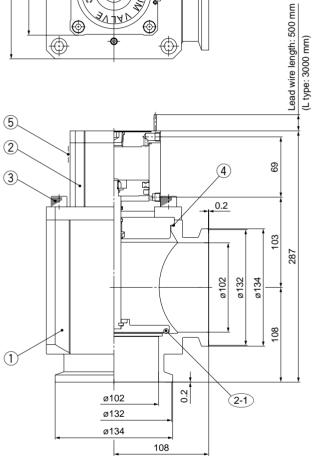
#### **Made to Order 1**

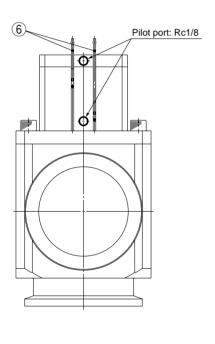


Please contact SMC for detailed dimensions, specifications, and lead times.

#### Flange size: 100







#### Symbol





JISB0125 JISZ8207

Component Parts

COIII	ponent i arts		
No.	Description	Material	Remarks
1	Body	A6063-T6	XLA100-1S-X898
2	Bonnet assembly		Refer to part no.
2-1	O-ring	FKM	AS568-349V
3	Hexagon socket head cap screw	SUSXM7	M12, ℓ = 30
4	O-ring	FKM	AS568-050V
5	Computer name plate		
6	Auto switch		Refer to part no.



#### **How to Order Valve**



#### Pilot port direction

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

\* Flange: (A)

#### Temperature specifications

Symbol	Temperature
Nil	5 to 60°C
H0	5 to 150°C

#### Switch quantity/Mounting position

Symbol	Qty	Mounting position
Nil Without auto switch		_
Α	2 pcs.	Valve open/closed
В	1 pc.	Valve open
С	1 pc.	Valve closed

#### Auto switch type (Operating temperature 5 to 60°C)

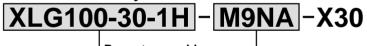
Symbol	Auto switch model	Switch type	
Nil	_	Without auto switch (without built-in magnet)	
M9N(L)	D-M9N(L)		
M9P(L)	D-M9P(L)	Solid state switch	
M9B(L)	D-M9B(L)		
A90(L)	D-A90(L)	Dood switch	
A93(L)	D-A93(L)	Reed switch	
M9//	Without auto switch (with built-in magnet)		

Note) Types with auto switches are not available in case of high temperature types.

L type: Lead wire length 3000 mm

#### **Maintenance Parts**

**② Bonnet Assembly Part No.** 



Same as How to Order.

#### **Specifications**

Valve type	Double acting		
Shaft seal type	O-ring seal		
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa		
Fluid	Inert gas under vacuum		
Internal leakage	1.3 x 10 <sup>-9</sup> Pa⋅m³/s or less*		
External leakage	1.3 x 10 <sup>-9</sup> Pa⋅m <sup>3</sup> /s or less*		
Operating temperature	5 to 60°C (Option: 5 to 150°C)		
Conductance	300 <i>t</i> /s		
Operating pressure	0.4 to 0.6 MPa		
Flange	KF100		

<sup>\*</sup> Values at normal temperature, excluding gas permeation.

#### Aluminum High Vacuum Angle Valve/Double Acting/O-ring Seal

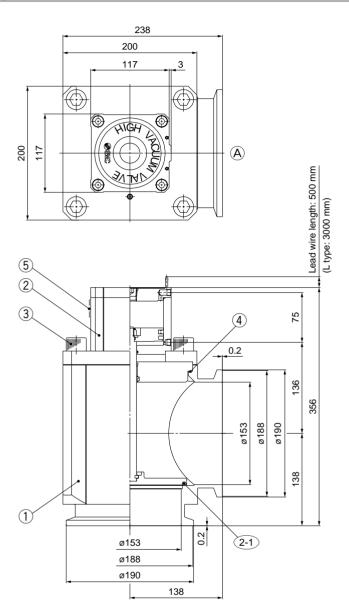
#### Series XLG

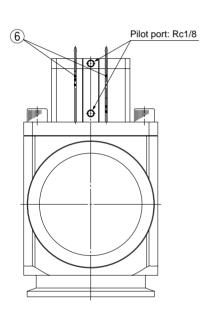
#### **Made to Order 2**



Please contact SMC for detailed dimensions, specifications, and lead times.

#### Flange size: 160





#### Symbol





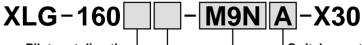
JISB0125 JISZ8207

**Component Parts** 

No.	Description	Material	Remarks	
1	Body	A6063-T6	XLA160-1S	
2	Bonnet assembly		Refer to part no.	
2-1	O-ring	FKM	B2401-G155V	
3	Hexagon socket head cap screw	SUSXM7	M20, ℓ = 40	
4	O-ring	FKM	AS568-167V	
5	Computer name plate			
6	Auto switch		Refer to part no.	



#### **How to Order Valve**



#### Pilot port direction

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

\* Flange: (A)

Temperature specifications

Symbol	Temperature		
Nil	5 to 60°C		
H0	5 to 150°C		

#### Switch quantity/Mounting position

	Symbol Qty		Mounting position	
	Nil Without auto switch		_	
	A 2 pcs.		Valve open/closed	
	В	1 pc.	Valve open	
Ī	С	1 pc.	Valve closed	

Auto switch type (Operating temperature 5 to 60°C)

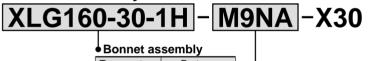
Symbol	Auto switch model	Switch type	
Nil	_	Without auto switch (without built-in magnet)	
M9N(L)	D-M9N(L)		
M9P(L)	D-M9P(L)	Solid state switch	
M9B(L)	D-M9B(L)		
A90(L)	D-A90(L)	Dood switch	
A93(L)	D-A93(L)	Reed switch	
M9//	Without auto switch (with built-in magnet)		

Note) Types with auto switches are not available in case of high temperature types.

L type: Lead wire length 3000 mm

#### **Maintenance Parts**

**② Bonnet Assembly Part No.** 



Temperature	Part no.
	XLG160-30-1
5 to 150°C	XLG160-30-1H

Same as How to Order.

#### **Specifications**

Valve type	Double acting	
Shaft seal type	O-ring seal	
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa	
Fluid	Inert gas under vacuum	
Internal leakage	1.3 x 10 <sup>-9</sup> Pa⋅m³/s or less*	
External leakage	1.3 x 10 <sup>-9</sup> Pa⋅m³/s or less*	
Operating temperature	5 to 60°C (Option: 5 to 150°C)	
Conductance	800 <i>t</i> /s	
Operating pressure	0.4 to 0.6 MPa	
Flange	KF160	

Note) Values at normal temperature, excluding gas permeation.



#### Aluminum High Vacuum Angle Valve/Double Acting/O-ring Seal

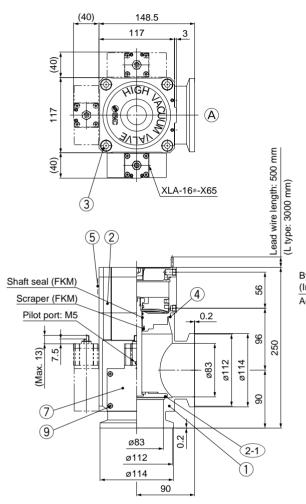
#### Series **XLG**

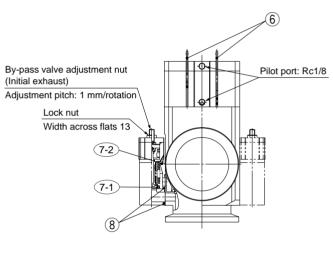
#### Made to Order 3



Please contact SMC for detailed dimensions, specifications, and lead times.

#### With By-pass Valve (Flange size: 80)





#### Symbol



Component Parts				
No.	Description	Material	Remarks	
1	Body	A6063-T6	Refer to part no.	
2	Bonnet assembly		Refer to part no.	
2-1	O-ring		Refer to part no.	
3	Hexagon socket head cap screw	SUSXM7	M10, ℓ = 75	
4	O-ring		Refer to part no.	
5	Computer name plate			
6	Auto switch		Option	
7	High vacuum angle valve (By-pass valve)		Refer to part no.	
7-1	O-ring		Refer to part no.	
7-2	O-ring		Refer to part no.	
8	O-ring		Refer to part no.	
9	Hexagon socket head cap screw	SUSXM7	M4, ℓ = 40	

#### O-ring Part No.

Seal material symbol	Internal seal 2-1	External seal 4
Nil	B2401-V85V	AS568-045V
N1	B2401-V85-XN1	AS568-045-XN1
P1	B2401-V85-XP1	AS568-045-XP1
Q1	B2401-V85-XQ1	AS568-045-XQ1
R1	B2401-V85-XR1	AS568-045-XR1
R2	B2401-V85-XR2	AS568-045-XR2
R3	B2401-V85-XR3	AS568-045-XR3
S1	B2401-V85-XS1	AS568-045-XS1
T1	B2401-V85-XT1	AS568-045-XT1
U1	B2401-V85-XU1	AS568-045-XU1

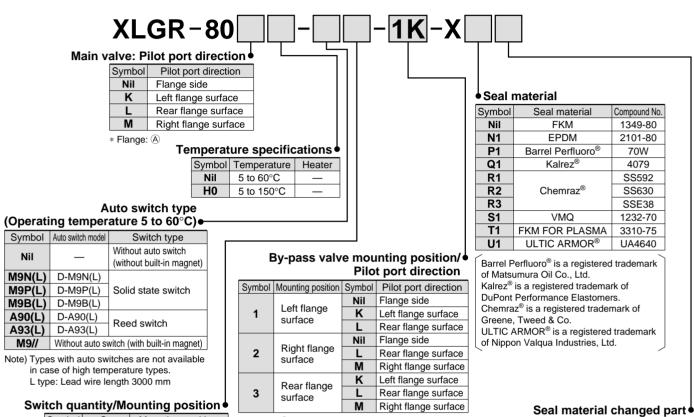
#### O-ring Part No.

			_
Seal material symbol	Internal seal (7-1)	External seal (7-2)	External seal ®
Nil	B2401-V15V	AS568-025V	AS568-017V
N1	B2401-V15-XN1	AS568-025-XN1	AS568-017-XN1
P1	B2401-V15-XP1	AS568-025-XP1	AS568-017-XP1
Q1	B2401-V15-XQ1	AS568-025-XQ1	AS568-017-XQ1
R1	B2401-V15-XR1	AS568-025-XR1	AS568-017-XR1
R2	B2401-V15-XR2	AS568-025-XR2	AS568-017-XR2
R3	B2401-V15-XR3	AS568-025-XR3	AS568-017-XR3
S1	B2401-V15-XS1	AS568-025-XS1	AS568-017-XS1
T1	B2401-V15-XT1	AS568-025-XT1	AS568-017-XT1
U1	B2401-V15-XU1	AS568-025-XU1	AS568-017-XU1

Note) A coating of vacuum grease (fluorinated grease: Y-VAC2) is applied to the shaft seal, scraper and O-ring ®.







Symbol	Qty	Mounting position	
Nil	_	Without auto switch	
A 2 pcs.		Valve open/closed	
В	1 pc. Valve open		
С	1 pc.	Valve closed	

\* Flange: (A)

M9NA-XN1

#### Leakage (Pa·m³/s or less) Note) Symbol Changed part Internal External Nil None 1.3 x 10<sup>-9</sup> (FKM) 1.3 x 10<sup>-9</sup> (FKM) 2-1)(7-1)(4)(7-2)(8) 1.3 x 10<sup>-7</sup> 1.3 x 10<sup>-7</sup> 1.3 x 10<sup>-9</sup> (FKM) В 2-1 (7-1) 1.3 x 10<sup>-7</sup> C 4)(7-2)(8) 1.3 x 10<sup>-9</sup> (FKM) 1.3 x 10<sup>-7</sup>

Note) Values at normal temperature, excluding gas permeation.

#### **Maintenance Parts**

1) Body Part No. XLAR80-1S-1

By-pass valve mounting position

	<u> </u>	
Symbol	nbol Mounting position	
1	Left flange surface	
2	Right flange surface	
3	Rear flange surface	

\* Flange: A

XLG80-30-1H

(8) By-pass Valve Part No.

**XLA-16** X65 Pilot port direction Seal material

#### Pilot port direction

Symbol Nil Rear (as seen from body connection point) Left (as seen from body connection point) K Right (as seen from body connection point)

② Bonnet Assembly Part No.

Temperature specifications

no opeomoaneme			
Symbol Temperature			
Nil	5 to 60°C		
H0	5 to 150°C		

changed part Symbol Changed part Nil None 7-1)(7-2

В

С

Seal material: Same as the seal materials of How to Order Valve.

(7-1)

(7-2)

#### Bonnet assembly

Temperature		Part no.
	5 to 60°C	XLG80-30-1
	5 to 150°C	XLG80-30-1H

Same as How to Order.

#### **Specifications**

•			
Valve type	Main valve: Double acting	By-pass valve: Normally closed	
Shaft seal type	O-ring seal Bellows seal		
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa		
Fluid	Inert gas under vacuum		
Operating temperature	5 to 60°C (Option: 5 to 150°C)		
Conductance	200 t/s Max. 25 t/s (Calculated value		
Operating pressure	0.3 to 0.6 MPa		
Flange	KF80		



#### Aluminum High Vacuum Angle Valve/Double Acting/O-ring Seal

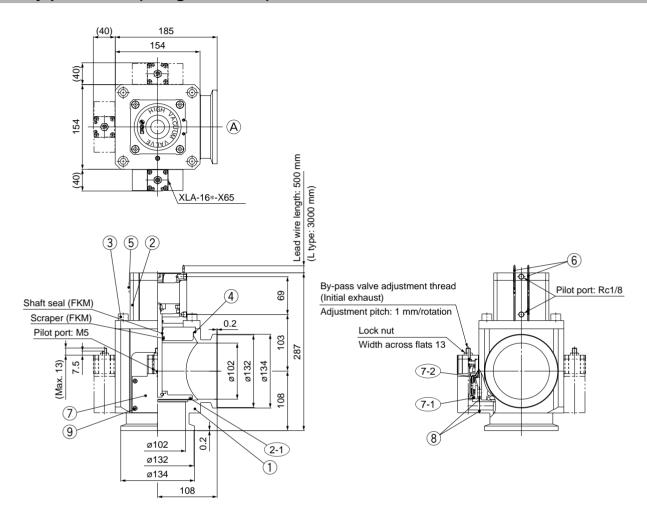
#### Series XLG

#### Made to Order 4



Please contact SMC for detailed dimensions, specifications, and lead times.

#### With By-pass Valve (Flange size: 100)



#### Symbol



#### **Component Parts**

Component Parts					
No.	Description	Material	Remarks		
1	Body	A6063-T6	Refer to part no.		
2	Bonnet assembly		Refer to part no.		
2-1	O-ring		Refer to part no.		
3	Hexagon socket head cap screw	SUSXM7	M12, ℓ = 30		
4	O-ring		Refer to part no.		
5	Computer name plate				
6	Auto switch		Option		
7	High vacuum angle valve (By-pass valve)		Refer to part no.		
7-1	O-ring		Refer to part no.		
7-2	O-ring		Refer to part no.		
8	O-ring		Refer to part no.		
9	Hexagon socket head cap screw	SUSXM7	M4, $\ell$ = 40		

#### O-ring Part No.

Seal material symbol	Internal seal 2-1	External seal 4
Nil	AS568-349V	AS568-050V
N1	AS568-349-XN1	AS568-050-XN1
P1	AS568-349-XP1	AS568-050-XP1
Q1	AS568-349-XQ1	AS568-050-XQ1
R1	AS568-349-XR1	AS568-050-XR1
R2	AS568-349-XR2	AS568-050-XR2
R3	AS568-349-XR3	AS568-050-XR3
S1	AS568-349-XS1	AS568-050-XS1
T1	AS568-349-XT1	AS568-050-XT1
U1	AS568-349-XU1	AS568-050-XU1

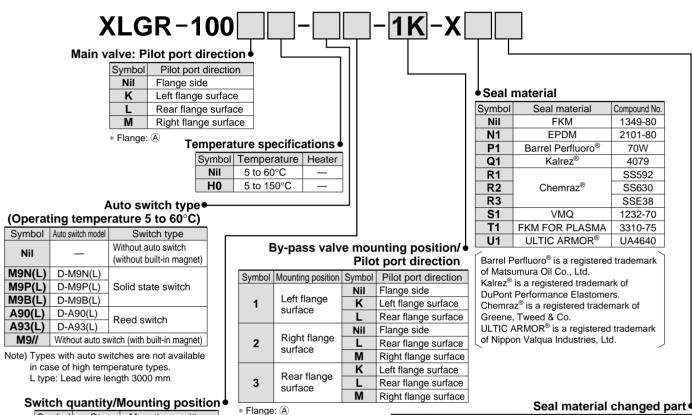
#### O-ring Part No.

Internal seal (7-1)	External seal (7-2)	External seal ®
B2401-V15V	AS568-025V	AS568-017V
B2401-V15-XN1	AS568-025-XN1	AS568-017-XN1
B2401-V15-XP1	AS568-025-XP1	AS568-017-XP1
B2401-V15-XQ1	AS568-025-XQ1	AS568-017-XQ1
B2401-V15-XR1	AS568-025-XR1	AS568-017-XR1
B2401-V15-XR2	AS568-025-XR2	AS568-017-XR2
B2401-V15-XR3	AS568-025-XR3	AS568-017-XR3
B2401-V15-XS1	AS568-025-XS1	AS568-017-XS1
B2401-V15-XT1	AS568-025-XT1	AS568-017-XT1
B2401-V15-XU1	AS568-025-XU1	AS568-017-XU1
	B2401-V15-XN1 B2401-V15-XP1 B2401-V15-XQ1 B2401-V15-XR1 B2401-V15-XR2 B2401-V15-XR3 B2401-V15-XS1 B2401-V15-XT1	B2401-V15V         AS568-025V           B2401-V15-XN1         AS568-025-XN1           B2401-V15-XP1         AS568-025-XP1           B2401-V15-XQ1         AS568-025-XQ1           B2401-V15-XR1         AS568-025-XR1           B2401-V15-XR2         AS568-025-XR2           B2401-V15-XR3         AS568-025-XR3           B2401-V15-XS1         AS568-025-XS1           B2401-V15-XT1         AS568-025-XT1

Note) A coating of vacuum grease (fluorinated grease: Y-VAC2) is applied to the shaft seal, scraper and O-ring  $\circledR$ .







Symbol	Qty	Mounting position	
Nil	_	Without auto switch	
Α	2 pcs.	Valve open/closed	
В	1 pc.	Valve open	
С	1 pc.	Valve closed	

Symbol	Changed part	Leakage (Pa·m³/s or less) Note)		
Syllibol	Changeu part	Internal	External	
Nil	None	1.3 x 10 <sup>-9</sup> (FKM)	1.3 x 10 <sup>-9</sup> (FKM)	
Α	2-1 7-1 4 7-2 8	1.3 x 10 <sup>-7</sup>	1.3 x 10 <sup>-7</sup>	
В	2-1 (7-1)	1.3 x 10 <sup>-7</sup>	1.3 x 10 <sup>-9</sup> (FKM)	
С	47-28	1.3 x 10 <sup>-9</sup> (FKM)	1.3 x 10 <sup>-7</sup>	

Note) Values at normal temperature, excluding gas permeation.

#### **Maintenance Parts**

1) Body Part No.

XLGR100-1S-1 By-pass valve mounting position

\* Flange: (A)

	<u> </u>	
Symbol	Mounting position	
1	Left flange surface	
2	Right flange surface	
3	Rear flange surface	

#### ② Bonnet Assembly Part No. M9NA-XN1 .GR100-30-1H

#### 

Temperature	Part no.
5 to 60°C	XLGR100-30-1
5 to 150°C	XLGR100-30-1H

Same as How to Order.

#### (8) By-pass Valve Part No.

XLA-16		X65
--------	--	-----

#### Pilot port direction

Symbol	Pilot port direction
	Rear (as seen from body connection point)
	Left (as seen from body connection point)
M	Right (as seen from body connection point)

Temperature specifications

Symbol	Temperature	
Nil 5 to 60°C		
H0	5 to 150°C	

#### Seal material changed part

Symbol	Changed part	
Nil	None	
Α	7-1 7-2	
В	7-1	
С	7-2	

Seal material: Same as the seal materials of How to

Order Valve.

#### **Specifications**

Valve type	Main valve: Double acting	By-pass valve: Normally closed	
Shaft seal type	O-ring seal Bellows seal		
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa		
Fluid	Inert gas under vacuum		
Operating temperature	5 to 60°C (Option: 5 to 150°C)		
Conductance	300 t/s Max. 31.5 t/s (Calculated value		
Operating pressure	0.3 to 0.6 MPa		
Flange	KF100		



#### Aluminum High Vacuum Angle Valve/Double Acting/O-ring Seal

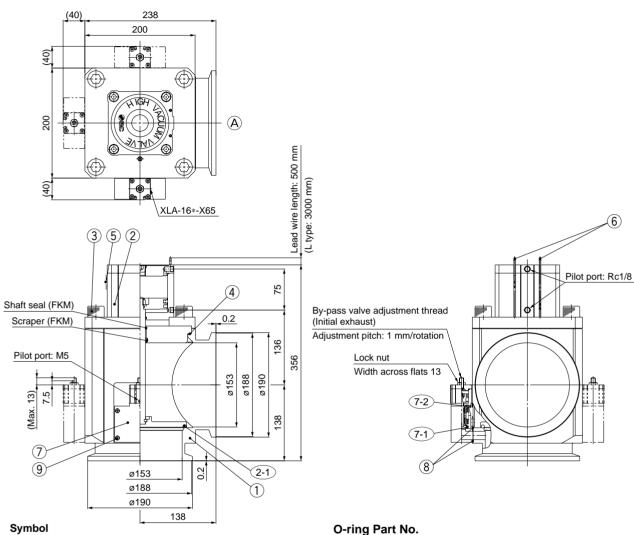
#### Series XLG

#### **Made to Order 5**



Please contact SMC for detailed dimensions, specifications, and lead times.

#### With By-pass Valve (Flange size: 160)



#### **Component Parts**

00111	ponent i arts		
No.	Description	Material	Remarks
1	Body	A6063-T6	Refer to part no.
2	Bonnet assembly		Refer to part no.
2-1	O-ring		Refer to part no.
3	Hexagon socket head cap screw	SUSXM7	M20, ℓ = 40
4	O-ring		Refer to part no.
5	Computer name plate		
6	Auto switch		Option
7	High vacuum angle valve (By-pass valve)		Refer to part no.
7-1	O-ring		Refer to part no.
7-2	O-ring		Refer to part no.
8	O-ring		Refer to part no.
9	Hexagon socket head cap screw	SUSXM7	M4, ℓ = 40

Internal seal 2-1	External seal 4
B2401-G155V	AS568-167V
B2401-G155-XN1	AS568-167-XN1
B2401-G155-XP1	AS568-167-XP1
B2401-G155-XQ1	AS568-167-XQ1
B2401-G155-XR1	AS568-167-XR1
B2401-G155-XR2	AS568-167-XR2
B2401-G155-XR3	AS568-167-XR3
B2401-G155-XS1	AS568-167-XS1
B2401-G155-XT1	AS568-167-XT1
B2401-G155-XU1	AS568-167-XU1
	B2401-G155V B2401-G155-XN1 B2401-G155-XP1 B2401-G155-XQ1 B2401-G155-XR1 B2401-G155-XR2 B2401-G155-XR3 B2401-G155-XS1 B2401-G155-XS1

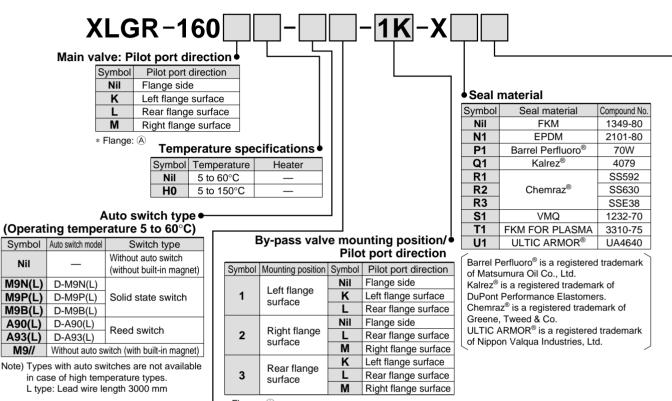
#### O ring Bort No

O-ring Part No.			
Seal material symbol	Internal seal (7-1)	External seal (7-2)	External seal ®
Nil	B2401-V15V	AS568-025V	AS568-017V
N1	B2401-V15-XN1	AS568-025-XN1	AS568-017-XN1
P1	B2401-V15-XP1	AS568-025-XP1	AS568-017-XP1
Q1	B2401-V15-XQ1	AS568-025-XQ1	AS568-017-XQ1
R1	B2401-V15-XR1	AS568-025-XR1	AS568-017-XR1
R2	B2401-V15-XR2	AS568-025-XR2	AS568-017-XR2
R3	B2401-V15-XR3	AS568-025-XR3	AS568-017-XR3
<b>S</b> 1	B2401-V15-XS1	AS568-025-XS1	AS568-017-XS1
T1	B2401-V15-XT1	AS568-025-XT1	AS568-017-XT1
U1	B2401-V15-XU1	AS568-025-XU1	AS568-017-XU1

Note) A coating of vacuum grease (fluorinated grease: Y-VAC2) is applied to the shaft seal, scraper and O-ring 8.



#### **How to Order Valve**



#### Switch quantity/Mounting position

Symbol	Qty	Mounting position	
Nil	_	Without auto switch	
Α	2 pcs.	Valve open/closed	
В	1 pc.	Valve open	
C	1 nc	Valve closed	

#### Flange: A

Symbol

Nil

M9NA-XN1

#### Seal material changed part

Symbol	Changed part	Leakage (Pa⋅m	<sup>3</sup> /s or less) Note)
Symbol	Changed part	Internal	External
Nil	None	1.3 x 10 <sup>-9</sup> (FKM)	1.3 x 10 <sup>-9</sup> (FKM)
Α	2-1 7-1 4 7-2 8	1.3 x 10 <sup>-7</sup>	1.3 x 10 <sup>-7</sup>
В	2-1 (7-1)	1.3 x 10 <sup>-7</sup>	1.3 x 10 <sup>-9</sup> (FKM)
С	4 7-2 8	1.3 x 10 <sup>-9</sup> (FKM)	1.3 x 10 <sup>-7</sup>

Note) Values at normal temperature, excluding gas permeation.

#### **Maintenance Parts**

Nil

M9//

1) Body Part No. XLAR160-1S-

(LGR160-30-1H

By-pass valve mounting position

Symbol	Mounting position	
1 Left flange surface		
2	Right flange surface	
3 Rear flange surface		
* Flange: A		

② Bonnet Assembly Part No.

#### Temperature specification

XLA-16

Pilot port direction

Rear (as seen from body connection point) Left (as seen from body connection point) Right (as seen from body connection point)

Pilot port direction

(8) By-pass Valve Part No.

u	ure specifications		
	Symbol	Temperature	
	Nil	5 to 60°C	
	H0	5 to 150°C	

Seal material changed part

X65

Symbol	Changed part	
Nil	None	
Α	7-1 7-2	
В	7-1	
С	(7-2)	

Seal material: Same as the seal materials of How to Order Valve.

#### Bonnet assembly

Temperature	Part no.
5 to 60°C	XLGR160-30-1
5 to 150°C	XLGR160-30-1H

Same as How to Order.

#### Specifications

Specifications			
Valve type	Main valve: Double acting By-pass valve: Normally closed		
Shaft seal type	O-ring seal Bellows seal		
Operating pressure range	Atmospheric pressure to 1 x 10 <sup>-5</sup> Pa		
Fluid	Inert gas under vacuum		
Operating temperature	5 to 60°C (Option: 5 to 150°C)		
Conductance	800 t/s Max. 31.5 t/s (Calculated value)		
Operating pressure	0.3 to 0.6 MPa		
Flange	KF160		



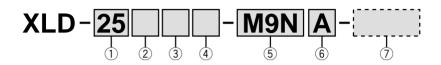
## **Aluminum**

## High Vacuum Angle Valve Series XLD/XLDV

2-Step Control, Single Acting/Bellows Seal, O-ring Seal



#### **How to Order**



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#### 1) Flange size

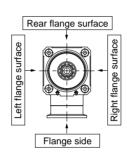
Size	
25	
40	
50	
63	
80	

#### 2 Flange type

	<u> </u>	
Symbol	Type	Applicable flange
Nil	KF (NW)	25, 40, 50, 63, 80
D	K (DN)	63, 80

#### 3 Pilot port direction

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



#### 4 Temperature specifications/Heater

Symbo	l	Temperature	Heater
Nil		5 to 60°C	<u> </u>
High	H0		_
High temperature	H2	5 to 150°C	With 100°C heater
type	Н3		With 120°C heater

Note) Size 25 is not applicable for H2.

#### 6 Switch quantity/Mounting position

Symbol	Qty	Mounting position
Nil	Without auto switch	<del>_</del>
Α	2 pcs.	Valve open/closed
В	1 pc.	Valve open
С	1 pc.	Valve closed

#### 5 Auto switch type

Symbol	Auto switch model	Remarks
Nil	_	Without auto switch (without built-in magnet)
M9N(L)	D-M9N(L)	
M9P(L)	D-M9P(L)	Solid state switch
M9B(L)	D-M9B(L)	
A90(L)	D-A90(L)	Do and assistable
A93(L)	D-A93(L)	Reed switch
M9//	_	Without auto switch (with built-in magnet)

Auto switches are not applicable for high temperature specifications (Temperature specifications H0, H2, H3). Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9NL

#### (7) Body surface treatment/Seal material and its changed part

#### Body surface treatment

Symbol	Surface treatment		
Nil	External: Hard anodized	Internal: Raw material	
Α	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 <sup>®</sup>	70W	
Q1	Kalrez <sup>®</sup>	4079	
R1		SS592	
R2	Chemraz <sup>®</sup>	SS630	
R3		SSE38	
S1	VMQ	1232-70*	
T1	FKM for Plasma	3310-75*	
U1	ULTIC ARMOR®	UA4640	

<sup>\*</sup> Produced by Mitsubishi Cable Industries, Ltd.

#### Seal material changed part and leakage

_ com marchan changea part and roundge				
Symbol	Note 2), 3) Changed	Leakage (Pa·m³/s or less) Note 1)		
	part	Internal	External	
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)	
Α	2, 3, 4, 5	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-9</sup>	
В	2, 4, 5	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)	
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>	

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 36 for changed part. Number indicates parts number of "Construction" accordingly.

Note 3) Changes to seal material for part no. ④ S valve seal assembly are only applicable for sizes 25, 40 and 50.

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

Example) XLD-25-M9NA-XAN1A

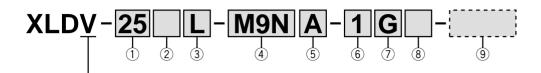


## Air Operated/with Solenoid Valve



#### **How to Order**

Air operated/with solenoid valve



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#### 1 Flange size

Size	
25	
40	
50	
63	
80	

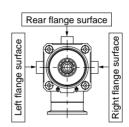
#### 2 Flange type

Symbol	Type	Applicable flange	
Nil	KF (NW)	25, 40, 50, 63, 80	
D	K (DN)	63, 80	

#### (3) Solenoid valve direction

Symbol	Solenoid valve direction	
K	Left flange surface	
L	Rear flange surface	
M	Right flange surface	

<sup>\*</sup> M type is not available for size 25.



#### 4 Auto switch type

	7 1		
Symbol	Auto switch model	Remarks	
Nil	_	Without auto switch (without built-in magnet)	
M9N(L)	D-M9N(L)		
M9P(L)	D-M9P(L)	Solid state switch	
M9B(L)	D-M9B(L)		
A90(L)	D-A90(L)	Do and assistant	
A93(L)	D-A93(L)	Reed switch	
M9//	_	Without auto switch (with built-in magnet)	

Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9N $\underline{L}$ 

#### 6 Rated voltage

1	100 VAC, 50/60 Hz
2	200 VAC, 50/60 Hz
3	110 VAC, 50/60 Hz
4	220 VAC, 50/60 Hz
5	24 VDC
6	12 VDC

#### 7 Electrical entry

G	Grommet (Lead wire length 300 mm)		
Н	Grommet (Lead wire length 600 mm)		
L	L type plug connector		
M	M type plug connector		

## 5 Switch quantity/Mounting position

Symbol	Qty	Mounting position	
Nil	Without auto switch	<u> </u>	
Α	2 pcs.	Valve open/closed	
В	1 pc.	Valve open	
С	1 pc.	Valve closed	

#### **8** Light/Surge voltage suppressor

Nil	None		
S	With surge voltage suppressor		
Z	With light/surge voltage suppressor		
U	With light/surge voltage suppressor (Non-polar type)		

- \* S type: Not available for AC.
- \* U type: DC only.

#### 9 Body surface treatment/Seal material and its changed part

#### Body surface treatment

Symbol	Surface treatment	
Nil	External: Hard anodized Internal: Raw material	
Α	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 <sup>®</sup>	70W		
Q1	Kalrez <sup>®</sup>	4079		
R1		SS592		
R2	Chemraz <sup>®</sup>	SS630		
R3		SSE38		
S1	VMQ	1232-70*		
T1	FKM for Plasma	3310-75*		
U1	U1 ULTIC ARMOR® UA4640			

<sup>\*</sup> Produced by Mitsubishi Cable Industries, Ltd.

#### ,

Seal material changed part and leakage					
Symbol	Note 2), 3) Changed	Leakage (Pa·m³/s or less) Note 1)			
Symbol	part	Internal	External		
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)		
Α	2, 3, 4, 5	1.3 x 10 <sup>-8</sup> 1.3 x 10 <sup>-9</sup>			
В	2, 4, 5	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)		
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>		

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 36 for changed part.

Number indicates parts number of "Construction" accordingly.

Note 3) Changes to seal material for part no. (4) S valve seal assembly are only applicable for sizes 25, 40 and 50.

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

#### Example) XLDV-25-M9NA-1G-XAN1A

Note 1) Option specifications/Combinations

This model has auto switch and K(DN) flange options, but high temperature/heater options are not available.

Note 2) Solenoid valves

Model	Initial exhaust valve	Main exhaust valve	Example
XLDV-25	SY114 will be changed to V114 after the		SY114-1GS
XLDV-40/50/63/80	stock of SY114 runs out. SYJ314		SYJ314-1GS

For further details on solenoid valves, refer to the SMC solenoid valve catalog "SY100" (Best Pneumatics 2004 Vol. 4) and "SYJ300/500/700" (ES11-86).



## Series XLD/XLDV

## **Specifications**

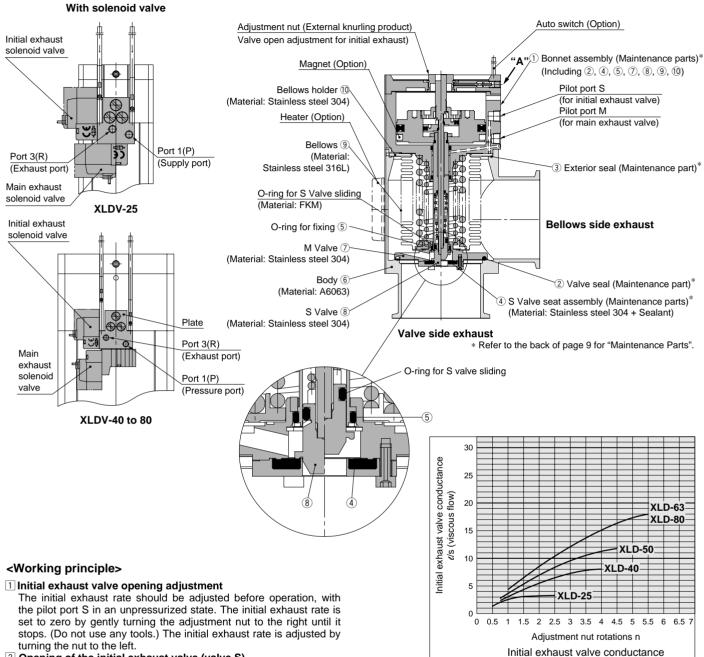
Model			XLD(V)-25	XLD(V)-40	XLD(V)-50	XLD(V)-63	XLD(V)-80	
Valve type			Normally	closed (Spring Retu	urn and seal) [Both	main & initial exhau	ıst valves]	
Fluid				In	ert gas under vacuu	ım		
On anoting to manage time (0	<b>C</b> \	XLD		5 to 60 (Hi	gh temperature type	e: 5 to 150)		
Operating temperature (°	C)	XLDV			5 to 50			
Operating pressure (Pa)			Atmospheric pressure to 1 x 10 <sup>-6</sup>					
Conductance (ds) Note 1)	Mair	n exhaust valve	14	45	80	160	200	
Conductance (as)	Initia	al exhaust valve	0.5 to 3	2 to 8	2.5 to 11	4 to 18	4 to 18	
Leakage (Pa·m³/s)		Internal	In case of standard material FKM: 1.3 x 10 <sup>-10</sup> at normal temperature, excluding gas permeation					
Leakage (Fa•III /S)		External	In case of standard material FKM: 1.3 x 10 <sup>-11</sup> at normal temperature, excluding gas permeation					
Flange type				KF (NW)		KF (NW	), K (DN)	
Principal materials Note 3)			Body: Aluminum alloy	, Bellows: Stainless st	teel 316L, Main part: S	tainless steel, FKM (S	tandard seal material)	
Surface treatment				External: Hard	anodized Interna	l: Raw material		
Pilot pressure (MPa)				0.4 to 0.7 [Bo	oth main & initial ex	haust valves]		
Dilat mant aims		XLD	M5		Ro	1/8		
Pilot port size		XLDV	M5: Port 1(P), Port 3(R)					
Maight (kg)		XLD	0.5	1.2	1.8	3.4	5.6	
Weight (kg)		XLDV	0.57	1.3	1.9	3.5	5.7	

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".

Note 2) For valve heater specifications, refer to "Common Option [1] Heater" on page 47.

Note 3) A coating of vacuum grease [Y-VAC2] is applied to the seal-material sliding portion (initial exhaust valves sliding parts) of the vacuum part.

#### Construction/Operation



#### 2 Opening of the initial exhaust valve (valve S)

When pressure is applied to the pilot port S, the valve S is removed from the valve S seal assembly, and the valve opens the adjusted amount. When the initial exhaust solenoid valve is turned ON and pressure is constantly applied to port 1(P) on model XLDV, the valve opens the adjusted amount.

#### 3 Opening of the main exhaust valve (valve M)

When pressure is applied to the pilot port M, the valve M is removed from the body sheet portion, and the valve fully opens. When the initial exhaust solenoid valve is turned ON and pressure is constantly applied to port 1(P) on model XLDV, the valve fully opens.

#### 4 Closing of the initial exhaust / main exhaust valves

By removing pressure from pilot port S and pilot port M, both S and M valves revert to their previous positions and are sealed. By turning OFF the initial exhaust valve and main exhaust valve on model XLDV, both valves revert to their previous position and are sealed.

#### <Options>

Auto switch: (for main exhaust valve The magnet actuates the auto switch. With two auto switches, the open and closed positions are detected, and with one auto switch, either the open or closed position is detected. Auto switches are applicable at ordinary temperatures only (5 to  $60^{\circ}$ C).

Heater:

Simple heating is performed using thermistors. The valve body can be heated to approximately 100 or 120°C, depending on the heater option and valve size. The type and number of thermistors to be used will vary depending upon size and setting temperature. In the case of high temperature specifications, the bonnet assembly is a heat resistant structure. This is not available with solenoid valve.

Note) After the opening adjustment of the initial exhaust valve, it will be lightly locked in place and will not rotate. To fix it in place, please tighten with the tightening torque shown in the below table. (Tightening with excessive torque can result in damaged components or the generation of abnormal noise.)

#### "A" Section Thread Tightening Torque

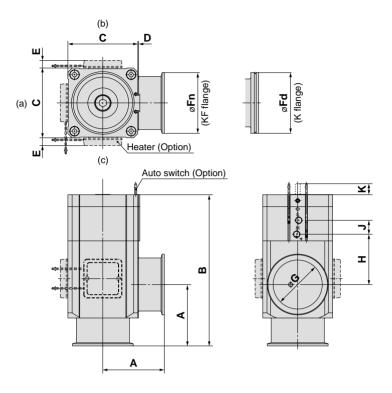
Model	XLD(V)-25	XLD(V)-40	XLD(V)-50	XLD(V)-63	XLD(V)-80
Tightening torque	0.08	N·m (0.8 kgf·cm) or	less	0.3 N⋅m (3 kg	gf·cm) or less



## Series XLD/XLDV

### **Dimensions**

#### XLD/Air operated



												(111111)
Ī	Model	Α	В	С	D	E	Fn	Fd	G	Н	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
Ī	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

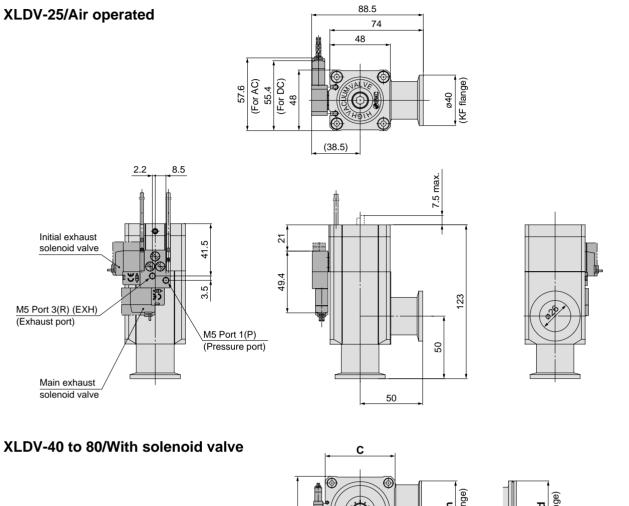
Note 1) Dimension E applies when heater option is included. (Lead wire length: approx. 1 m)

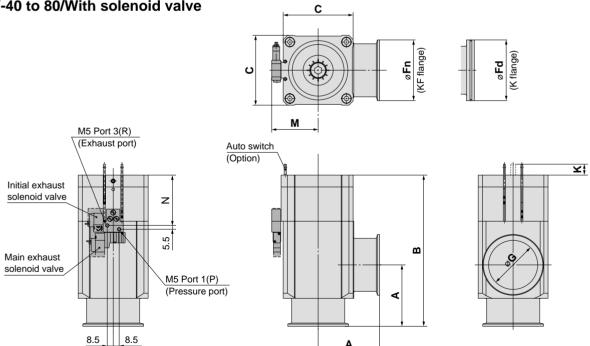
Note 2) (a), (b) and (c) in the above drawing indicate heater mounting positions.

Moreover, heater mounting positions will differ depending on the type of heater.

For further details, refer to mounting positions under "Replacement Heaters" on the back of page 9.

#### **Dimensions**





									( )
Model	Α	В	С	Fn	Fd	G	M	N	K
XLDV-40	65	170	66	55	_	41	48.5	53.5	15
XLDV-50	70	183	79	75	_	52	55	57.5	17.5
XLDV-63	88	217	100	87	95	70	66.5	72.2	20
XLDV-80	90	256	117	114	110	83	75	82.6	26.5

Note) For further details on solenoid valves, refer to the SMC solenoid valve catalog "SY100" (Best Pneumatics 2004 Vol. 4) and "SYJ300/500/700" (ES11-86).

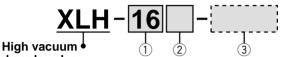


(mm)

## **Aluminum** High Vacuum Angle Valve Series XLH Manual/Bellows Seal



#### **How to Order**



manual angle valve

(Bellows seal)

#### 1) Flange size

$\sim$		
	Size	
	16	
	25	
	40	
	50	

#### (4) Temperature specifications/Heater

Symbol		Tomporotura	Llootor	Applicable flange size			
		Temperature	Heater	16	25	40	50
Nil		5 to 60°C	_				•
Nil High temperature H2 type H3		5 to 150°C	With 100°C heater	_	_		•
			With 120°C heater	_		•	

#### 3 Body surface treatment/Seal material and its changed part

#### Body surface treatment

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

#### Seal material

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

<sup>\*</sup> Produced by Mitsubishi Cable Industries, Ltd.

#### · Seal material changed part and leakage

Symbol	Note 2) Changed	Leakage (Pa·m³/s or less) Note 1)					
Cyllibol	part	Internal	External				
Nil	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)				
Α	2,3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-9</sup>				
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)				
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>				

Note 1) Values at normal temperature, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on page 40 for changed part. Number indicates parts number of "Construction" accordingly.

To order something other than "Nil" (standard), list the symbols starting with "X", followed by each symbol for "seal material" and then "changed part".

Example) XLH-16-XAN1A

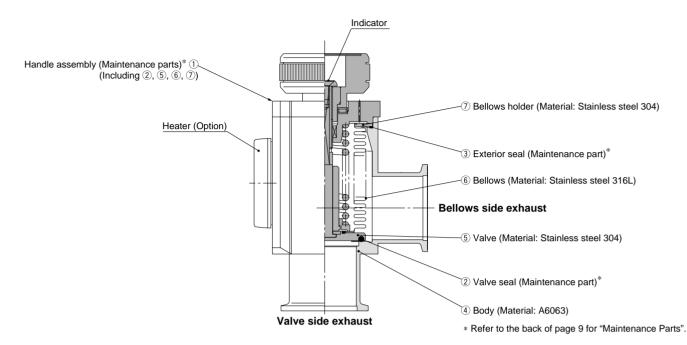
#### **Specifications**

Model		XLH-16	XLH-25	XLH-40	XLH-50	
Valve type		Inert gas under vacuum				
Fluid (°C)		5 to 150				
Operating pressure (Pa)		Atmospheric pressure to 10 <sup>-6</sup>				
Conductance (ds) Note 1)		5 14 45 80				
	Internal	In case of standard material FKM: 1.3 x 10 <sup>-10</sup> at normal temperature, excluding gas permeation				
Leakage (Pa·m³/s)	External	In case of standard material FKM: 1.3 x 10 <sup>-11</sup> at normal temperature, excluding gas permeation				
Flange type			KF (I	NW)		
Principal materials		Body: Aluminum alloy, Bell	lows: Stainless steel 316L, M	lain part: Stainless steel, FK	M (Standard seal material)	
Surface treatment			External: Hard anodized	Internal: Raw materia	l	
Actuation torque (N⋅m)		0.1≤ 0.15≤ 0.35≤ 0.5≤				
Handle revolutions		5 7 10 13				
Weight (kg)		0.23	0.41	1.05	1.62	

Note 1) The conductance is the same as that of an elbow of the same dimensions. Note 2) For valve heater specifications, refer to "Common Option [1] Heater" on page 47.



#### **Construction/Operation**



#### <Working principle>

By turning the handle to the left, the valve opens. The handle does not move up and down, but the indicator shows the open or closed position of the valve. As the handle is turned to the right, the valve closes, and when the turning force of the handle suddenly ceases to be felt, the valve is sealed. The sealing force for the valve comes from the spring, and is constant.

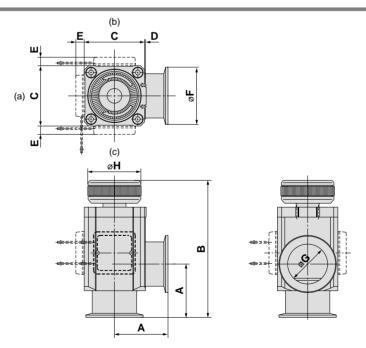
#### <Options>

Heater: Simple heating is performed using thermistors. The valve body can be heated to approximately 100 or 120°C, depending on the valve size.

The type and number of thermistors to be used will vary depending upon size and setting temperature.

Indicator: When the valve is open, an orange marker appears in the center of the name plate.

#### **Dimensions**



								(111111)
Model	Α	В	С	D	E Note 1)	F	G	Н
XLH-16	40	100.5	38	1	_	30	17	35
XLH-25	50	114	48	1	12	40	26	41
XLH-40	65	162.5	66	2	11	55	41	57
XLH-50	70	179.5	79	2	11	75	52	70

Note 1) Dimension E applies when heater option is included. (Lead wire length: approx. 1 m)

Note 2) (a), (b) and (c) in the above drawing indicate heater mounting positions.

Moreover, heater mounting positions will differ depending on the type of heater.

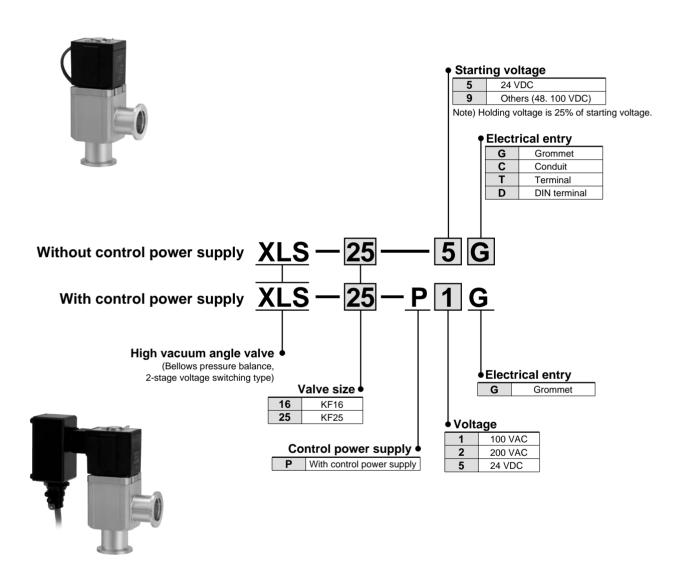
For further details, refer to mounting positions under "Replacement Heaters" on the back of page 9.



# Aluminum High Vacuum Angle Valve Series XLS

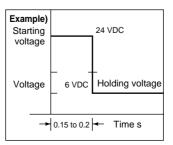
**Electromagnetic/Bellows Pressure Balance** 

#### **How to Order**



## **.** Marning

(1) In case there is no control power supply (XLS-25-□□: 24/48/100 VDC), starting voltage should be applied for only 0.15 to 0.2 s, in accordance with the prescribed method (indicated on the back of the coil). Continuously applying starting voltage can cause overheating of the coil and fire. Holding voltage is 25% of the starting voltage (the application method is shown on the back of the solenoid coil).





#### **Specifications**

Model		XLS-16	XLS-25	XLS-16-P□G	XLS-25-P□G	
Valve type			Normally cl	osed (N.C.)		
Fluid			Inert gas ur	nder vacuum		
Operating temperature (°C)		5 to 40				
Operating pressure (Pa)			0.1 MPa (G) to	o 1 x 10 <sup>-6</sup> (abs)		
Conductance (ds) Note 1)		5 8 5 8				
Laskana (Da. m.3/a)	Internal	1.3 x	10 <sup>-8</sup> at normal temperatu	ure, excluding gas perme	eation	
Leakage (Pa·m³/s)	External	1.3 x 10 <sup>-11</sup> at normal temperature, excluding gas permeation				
Flange type/size		KF16	KF25	KF16	KF25	
Principal materials Note 2)		Body: Aluminum a	illoy, Main part: Stainles	s steel, PFA, FKM (Stan	dard seal material)	
Surface treatment			External: Hard anodized	Internal: Raw materia	I	
Control power supply		N	lo	Υ	es	
Operating power supply volt	age	24/6, 48/12,	100/24 VDC	24 VDC, 10	00/200 VAC	
Allowable voltage fluctuation	ı (%)		±	10		
Electrical entry		G, C, D	), T type	G typ	e only	
Coil insulation		Class B				
Maximum operating frequence	cy (Hz)	0.17				
Weight (kg)		0.4	0.7	0.7	1.0	

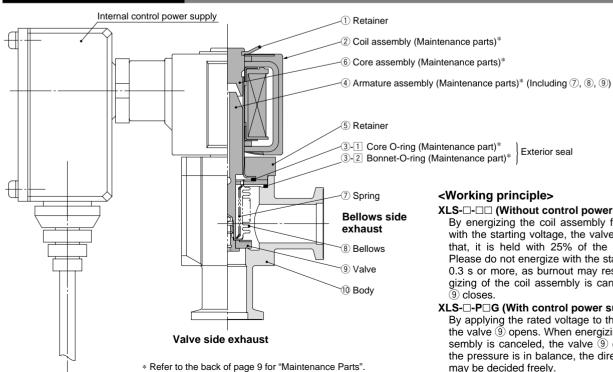
Note 1) Conductance is the value for an elbow with the same dimensions.

#### Power/Voltage

#### At the Rated Voltage

	Model			rting	Holding		
iviodei			Power (W)	Current (A)	Power (W)	Current (A)	
	□G/C/D/T,	P5G	36	1.5	4.8	0.38	
	P1G	50 Hz	20.5	0.47	14.8	0.35	
XLS-16-	PIG	60 Hz	30.5	0.47	10	0.27	
	Dac	<b>P2G</b> 50 Hz 30	30	0.24	4.9	0.11	
	PZG	60 Hz	30		2.3	0.10	
	□G/C/D/T, P5G		47	2.0	5.3	0.5	
	S-25- P1G	50 Hz	40	0.62	20	0.46	
XLS-25-		60 Hz	42	0.62	13.5	0.36	
	D2C	50 Hz	45	0.25	6.7	0.15	
	P2G	60 Hz	45	0.35	3.0	0.12	

#### **Construction/Operation**



#### <Working principle>

#### **XLS-**□-□□ (Without control power supply)

Exterior seal

By energizing the coil assembly for 0.15 to 0.2 s with the starting voltage, the valve 9 opens. After that, it is held with 25% of the starting voltage. Please do not energize with the starting voltage for 0.3 s or more, as burnout may result. When energizing of the coil assembly is canceled, the valve 

#### XLS-□-P□G (With control power supply)

By applying the rated voltage to the coil assembly, the valve 9 opens. When energizing of the coil assembly is canceled, the valve 9 closes. Because the pressure is in balance, the direction of exhaust may be decided freely.

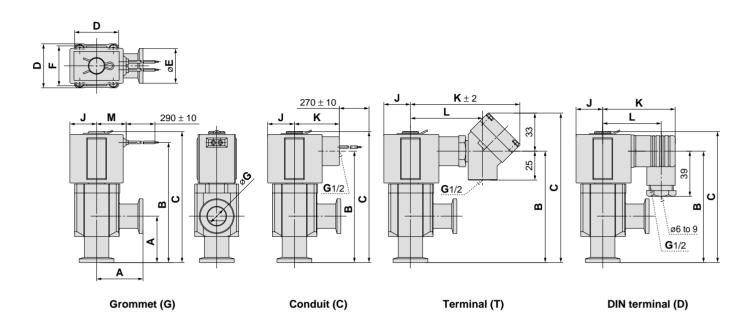


Note 2) A coating of vacuum grease [Y-VAC3] is applied to the valve seat of the vacuum part.

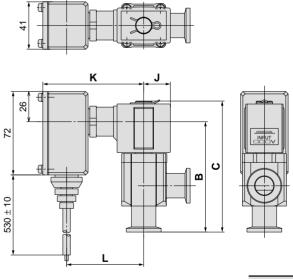
## Series XLS

## **Dimensions**

## XLS/Without control power supply



## XLS/With control power supply

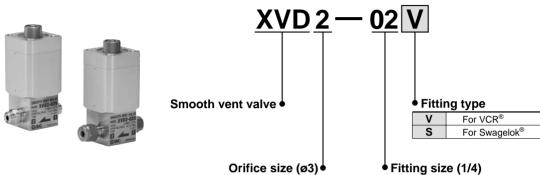


Grommet (G)

											(mm)							
Model	Α	В	С	D	Е	F	G	J	K	L	M							
XLS-16-□G		104							_	_	25.5							
XLS-16-□C	40		113	38	30	35	17	23	41	_	_							
XLS-16-□D	40	96		36	36 30	35	17	23	60	48	_							
XLS-16-□T			129						95	62	_							
XLS-25-□G		128.5							_	_	28							
XLS-25-□C	50	F0	[	F0	F0	F0			121.5	138.5	48	40	40	26	25.5	43	_	_
XLS-25-□D		120.5		40	40	40	20	25.5	63	51	_							
XLS-25-□T		121.5	154.5						97	66	_							
XLS-16-P□G	40	96	113	38	30	35	17	23	87	66.5								
XLS-25-P□G	50	121.5	138.5	48	40	40	26	25.5	89.5	69								

# Series XVD Smooth Vent Valve (Supply Line)

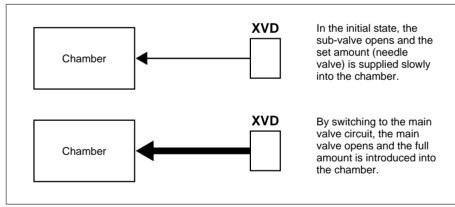
#### **How to Order**

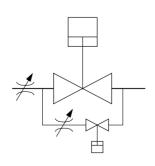


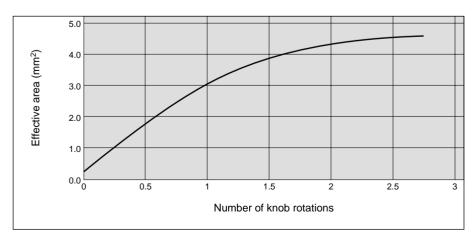
- Space-saving Valve / needle valve integrated construction – requires only 1/4 the piping space of previous models.
- Particulates significantly reduced through the use of a metal diaphragm in the sheet portion
- Flow of both initial air supply and main air supply can be adjusted.

#### **Application**

Introducing the full amount of supply pressure (Clean air /  $N_2$ ) all at once when returning the vacuum chamber to the atmosphere will cause particulates to get into the chamber. To prevent this, after slowly introducing the initial air supply and setting the pressure, switch to the main valve circuit to supply the full amount.





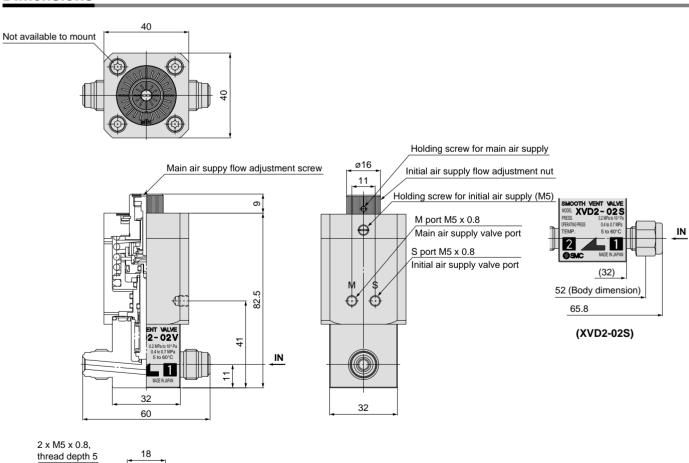


## Series XVD

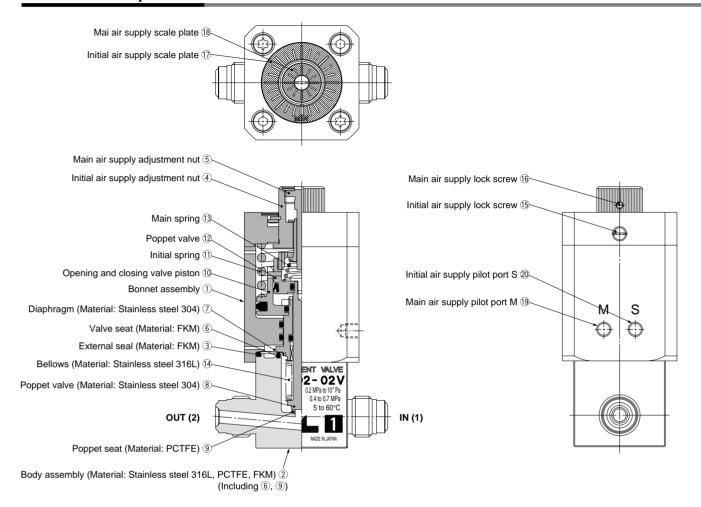
## **Specifications**

Mode		XVD2-02V	XVD2-02S		
Valve type		Normally closed (Pressurize to open, Spring seal)			
Fluid		Nitrogen, Air, Inert gas, etc.			
Operating temperature (	°C)	5 to 60°C (Baking temperature 150°C or less)			
Operating pressure (Pa)		0.2 MPa (G) t	o 1 x 10 <sup>-6</sup> (abs)		
Orifice diameter (mm)		Q	<b>7</b> 3		
Effective area (mm²)	Main air supply	4	1.6		
Effective area (mm²) Initial air supply		0.2 to 4.6			
	Internal	5 x 10 <sup>-9</sup>	At normal temperature, excluding gas permeation		
Leakage (PaNm³/s)	External	1.3 x 10 <sup>-11</sup>	At normal temperature, excluding gas permeation		
	Fitting	1.3 x 10 <sup>-11</sup>	1.3 x 10 <sup>-10</sup>		
Piping connection type		For VCR®	For Swagelok®		
Connection size		1/4			
Principal materials		Body: Stainless steel 316L, Main part: Stainless steel 316L, Stainless steel 304, FKM (Seal material)			
Internal surface treatme	nt	Body EP treatment			
Operating pressure (MP	a)	0.4 to 0.7 (Both main & initial supply valves)			
Pilot port size		M5 x 0.8			
Weight (kg)		0.5			

## **Dimensions**



#### Construction/Operation



#### <Initial air supply flow adjustment> XVD series

Use a flat head screwdriver to gently turn the initial air supply lock screw ⓑ to the left, loosening it until it stops. Keep rotating the initial air supply adjustment nut ④ to the right, and the minimum possible initial air supply flow is the point at which the name plate and adjustment nut mark align closest to where torque is felt. (Be careful not to tighten the initial air supply adjustment nut ④ further than this point, as it may result in component damage.)

After confirming the position of the initial air supply adjustment nut 4 and the angle alignment scale of the initial air supply scale plate 7, adjust the initial air supply amount by rotating the nut to the left. According to the "Number of rotations and flow characteristics" as shown, set the initial air supply flow. After setting, lock by tightening the initial air supply lock screw 5 with a torque of 0.5 N·cm.

#### Main air supply flow adjustment

Use a flat head screwdriver to gently loosen the main air supply lock screw  $\textcircled{1}{6}$ , and also to confirm that the main air supply adjustment nut 5 is rotating freely. Keep rotating the main air supply adjustment nut 5 to the right, and the point at which it stops is the "initial air supply adjustment amount." After confirming the position of the main air supply adjustment nut 5 and the angle alignment scale of the main air supply scale plate 6, set the main air supply amount by rotating the nut to the left. After setting, lock by tightening the main air supply lock screw 6 with a torque of 0.3 N·cm.

#### Initial air supply feed

Gas filling in from the IN (1) port side pushes the initial spring ① down the opening and closing valve piston ⑩, and seals the diaphragm ⑦ and valve seat ⑥ to stop the gas. Air pressure is applied on pilot port S ⑳. The air pressure is loaded into the lower part of the opening and closing piston ⑪, and the opening and closing valve piston ⑪ stops after moving the assigned amount. The movement of the opening and closing valve piston ⑪ causes the diaphragm ⑦ to remove from the valve seat ⑥, and gas to flow. When the gas begins to flow, it passes through the opening between the poppet valve ⑥ and poppet seat ⑨ (initial air supply set amount) and flows from the OUT (2) port.

#### Main air supply feed

With the initial air supply pilot port S ② in a pressurized state, pressure is applied to pilot port M ③. The air pressure fills into the lower part of the poppet valve piston ①, and the poppet valve piston ② moves upward, stopping when it strikes the main air supply adjustment nut ⑤. The movement of the poppet valve piston ② causes the attached poppet valve ③ to move further from the initial air supply adjustment position, and a greater volume of gas flows from the OUT (2) port.

#### Stoppage of the initial and main air supply

It is possible for the initial and main air supply to stop at the same time. The force of the main spring 3 activated by the exhaust from the pilot port S 2 causes the opening and closing valve piston 3 to move downward, and the diaphragm 7 and valve seat 6 to close, stopping the gas feed. The force of the initial spring 1 activated by the exhaust from the pilot port M 9 causes the poppet valve piston 1 to move downward, and the initial air supply to revert to its previous adjusted position.

Remarks 1: The feeding of the main air supply is carried out with the initial air supply pilot port S (19) in a pressurized state.

Increasing the initial air supply amount in the mechanism will cause a decrease in the range of the main air supply amount.

**SMC** 

## **Common Option**

## 1 Heater

Valve heaters are common for models **XLA**, **XLC**, **XLD**, **XLF**, **XLG** and **XLH**. Power consumption specifications are shown in the below table.

Item	XL□-25	XL□-40	XL□-50	XL□-63	XL□-80	XL□-100	XL□160	
Rated heater voltage		90 to 125 VAC						
Heater power W (Nominal value) In-rush/Power consumption (Option symbol)	<b>H2</b> 100°C	_	200/40	200/60	400/100	600/150	800/220	1200/350
	<b>H3</b> 120°C	200/30	400/70	400/80	600/130	800/180	1200/300	1600/400

Note) In-rush current will flow to the heater for a few dozen seconds and will then subside.

Refer to "Maintenance Parts" on the back of page 9 for further details regarding quantity and type.



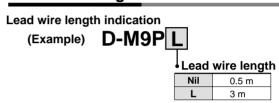
## Series XL

## **Auto Switch Specifications**

#### **Auto Switch Common Specifications**

Туре	Reed switch	Solid state switch			
Leakage current	None	3-wire: 100 μA or less 2-wire: 0.8 mA or less			
Operating time	1.2 ms	1 ms or less			
Impact resistance	300 m/s <sup>2</sup>	1000 m/s <sup>2</sup>			
Insulation resistance	50 M $\Omega$ or more at 500 VDC Mega (between lead wire and case)				
Withstand voltage	1500 VAC for 1 minute (between lead wire and case) 1000 VAC for 1 minute (between lead wire and				
Ambient temperature	-10 to 60°C				
Enclosure	IEC529 standard IP67, JIS C 0920 waterproof construction				
Standard	Conforming to	CE Standards			

#### **Lead Wire Length**



Note) Lead wire length tolerance

Lead wire length	Tolerance		
0.5 m	±15 mm		
3 m	±90 mm		

#### **Contact Protection Boxes: CD-P11, CD-P12**

#### <Applicable switch model>

D-A9□ type

The auto switches below do not have a built-in contact protection circuit. Therefore, please use a contact protection box with the switch for any of the following cases:

- 1) Where the operation load is an inductive load.
- ② Where the wiring length to load is greater than 5 m.
- ③ Where the load voltage is 100/200 VAC.

The contact life may be shortened (due to permanent energizing conditions). Since the solid state auto switch is a semiconductor switch which has no contacts, no contact protection box is needed.

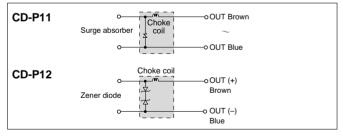
#### **Specifications**

Part no.	CD-	CD-P12	
Load voltage	100 VAC	200 VAC	24 VDC
Max. load current	25 mA	12.5 mA	50 mA

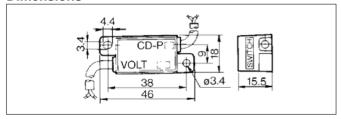
\* Lead wire length — Switch connection side 0.5 m Load connection side 0.5 m



#### **Internal Circuit**



#### **Dimensions**



#### Connection

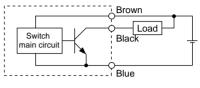
To connect a switch unit to a contact protection box, connect the lead wire from the side of the contact protection box marked SWITCH to the lead wire coming out of the switch unit. Keep the switch as close as possible to the contact protection box, with a lead wire length of no more than 1 meter.



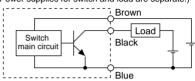
## **Auto Switch Connections and Examples**

#### **Basic Wiring**

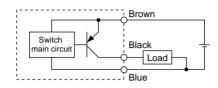
#### Solid state 3-wire, NPN



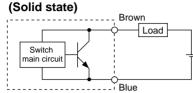
#### (Power supplies for switch and load are separate.)

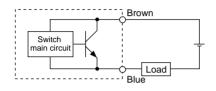


#### Solid state 3-wire, PNP



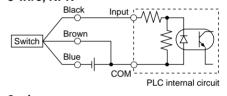
## 2-wire



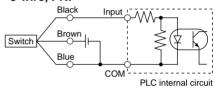


### **Example of Connection to PLC (Programmable Logic Controller)**

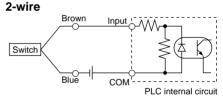
#### Sink input specification 3-wire, NPN



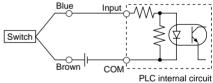
#### Source input specification 3-wire, PNP



Connect according to the applicable PLC input specifications, since the connection method will vary depending on the PLC input specifications.



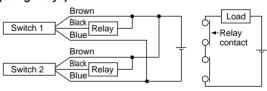
## 2-wire



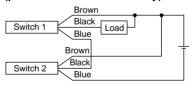
#### **Example of AND (Serial) and OR (Parallel) Connection**

#### • 3-wire

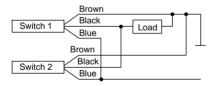
#### **AND connection for NPN output** (using relays)



#### AND connection for NPN output (performed with switches only)

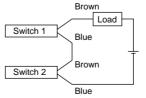


#### **OR connection for NPN output**



The indicator lights will illuminate when both switches are turned ON.

#### 2-wire with 2-switch AND connection



When two switches are connected in series, a load may malfunction because the load voltage will decrease when in the ON state.

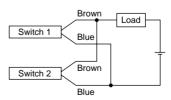
The indicator lights will illuminate if both of the switches are in the ON state.

Load voltage at ON = 
$$\frac{\text{Power supply}}{\text{voltage}} - \frac{\text{Residual}}{\text{voltage}} \times 2 \text{ pcs.}$$
  
= 24 V - 4 V x 2 pcs.  
= 16 V

Example: Power supply is 24 VDC.

Internal voltage drop in switch is 4 V.

#### 2-wire with 2-switch OR connection



(Solid state) When two switches are connected in parallel, a malfunction may occur because the load voltage will increase when in the OFF state.

Load voltage at OFF = Leakage current x 2 pcs. x Load impedance = 1 mA x 2 pcs. x 3 k $\Omega$ = 6 V

Example: Load impedance is 3 kQ. Leakage current from switch is 1 mA.

#### (Reed)

Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes dim or not light because of the dispersion and reduction of the current flowing to the switches.



## Solid State Switch: Direct Mounting Style D-M9N/D-M9P/D-M9B

#### **Grommet**

- 2-wire load current is reduced (2.5 to 40 mA).
- Lead free
- UL certified (style 2844) lead cable is used.
- Flexibility is 1.5 times greater than the conventional model (SMC comparison).
- Using flexible cable as standard spec.



#### **△**Caution

#### **Precautions**

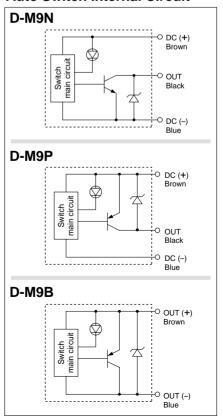
When the cable sheath is stripped, confirm the stripping direction.

The insulator may be split or damaged depending on the direction.





#### **Auto Switch Internal Circuit**



#### **Auto Switch Specifications**

PLC: Programmable Logic Controller

D-M9□ (With indi	D-M9□ (With indicator light)						
Auto switch part no.	D-M9N	D-M9P	D-M9B				
Wiring type	3-v	vire	2-wire				
Output type	NPN	PNP	_				
Applicable load	IC circuit, F	24 VDC relay, PLC					
Power supply voltage	5, 12, 24 VDC (4.5 to 28 V)		_				
Current consumption	10 mA or less		_				
Load voltage	28 VDC or less	28 VDC or less —					
Load current	40 mA	or less	2.5 to 40 mA				
Internal voltage drop	0.8 V	0.8 V or less					
Leakage current	100 μA or les	0.8 mA or less					
Indicator light	Red LED illuminates when turned ON.						
Standard	С	onforming to CE Standa	rds				

 Lead wires — Oilproof, flexible heavy-duty vinyl cable: Ø2.7 x 3.2 ellipse D-M9B 0.15 mm² x 2 cores

D-M9N, D-M9P 0.15 mm<sup>2</sup> x 3 cores

Note 1) Refer to page 48 for solid state switch common specifications.

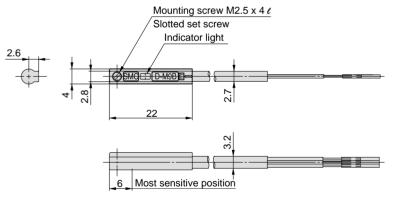
Note 2) Refer to page 48 for lead wire lengths.

## Weight

Auto switch part no.		D-M9N	D-M9P	D-M9B
Lead wire length	0.5	8	8	7
(m)	3	41	41	38

## **Dimensions** Unit: mm

#### **D-M9**□



Unit: g

## Reed Switch: Direct Mounting Style D-A90/D-A93



#### **Grommet**

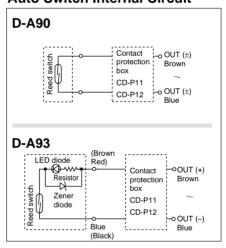


#### **∧**Caution

#### **Precautions**

Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied is used.

#### **Auto Switch Internal Circuit**



- Note) ① In a case where the operation load is an inductive load.
  - ② In a case where the wiring load is greater than 5 m.
  - ③ In a case where the load voltage is 100 VAC.

Use the auto switch with a contact protection box in any of the above mentioned cases. (For details about the contact protection box, refer to page 48.)

#### **Auto Switch Specifications**

	PLC: Programmable Logic Controller			
D-A90 (Without indic	cator light)			
Auto switch part no.		D-A	90	
Applicable load		IC circuit, R	elay, PLC	
Load voltage	24 VAC/DC or less	48 VAC/D	C or less	100 VAC/DC or less
Maximum load current	50 mA	40 r	nA	20 mA
Contact protection circuit	None			
Internal resistance	1 $\Omega$ or less (including lead wire length of 3 m)			
D-A93 (With indicator light)				
Auto switch part no.	D-A93			
Applicable load		Relay,	PLC	
Load voltage	24 VDC			100 VAC
Load current range and max. load current	5 to 40 mA 5 to 20 mA		5 to 20 mA	
Contact protection circuit	None			
Internal voltage drop	D-A93 — 2.4 V or less (to 20 mA)/3 V or less (to 40 mA)			
Indicator light	Red LED illuminates when turned ON.			
Standard	Co	onforming to	CE Standar	rds

Lead wires

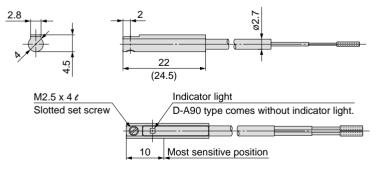
D-A90/D-A93 — Oilproof heavy-duty vinyl cable:  $\emptyset$ 2.7, 0.18 mm² x 2 cores (Brown, Blue), 0.5 m Note 1) Refer to page 48 for reed switch common specifications. Note 2) Refer to page 48 for lead wire lengths.

Weight Unit: g

Auto switch part n	0.	D-A90	D-A93
Lead wire length	0.5	6	6
(m)	3	30	30

## **Dimensions** Unit: mm

#### D-A90/D-A93



( ): dimensions for D-A93

## **Glossary**

### 1 Seal Materials

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

#### **FKM (Fluoro rubber)**

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 DuPont Performance Elastomers. 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 (O₂, CF₄) 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 & Co. 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.

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<sub>3</sub>, NH<sub>3</sub>. 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<sub>3</sub> 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<sub>3</sub> 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.

#### O-ring, etc.

Due to entrainment of gases and generation of particulates, vacuum performance is somewhat inferior to the bellows type. However, high speed operation is possible and durability is comparatively high. In general, fluorinated grease is affixed to the shaft seal portion.

## 3 Response Time/Operation Time

#### Valve opening

The time from the application of voltage to the actuation solenoid valve ( $XL\Box$ ) 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 (XL $\square$ ) 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.

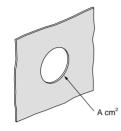


## **Glossary**

### 4 Molecular Flow Conductance

#### Orifice conductance

In the case of a ØA (cm²) hole in an ultrathin plate, conductance "C" results from "V", the average velocity of the gas; "R", the gas constant; "M", the molecular weight; and "T", the absolute temperature. From the formula C=11.6A  $\ell$ /sec, at an air tempearture of 20°C.

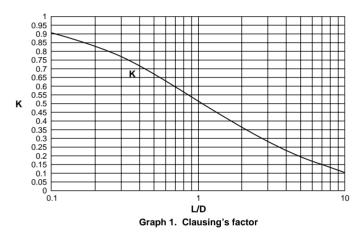


#### Cylinder conductance

With length "L" (cm) and diameter "D" (cm) where L>>D, from the formula  $C=(2\pi RT/M)^{0.5}D^3/6L$ , the conductance  $C=12.1D^3/L\ell/sec$ , at an air temperature of  $20^{\circ}C$ .

#### Short pipe conductance

From the Clausing's factor "K" and hole conductance "C" in Graph 1. (Clausing's factor drawing), the short pipe conductance  $C_K$  is easily found as  $C_K$ =KC.



#### **Conductances combined**

When each of the separate conductances are given as  $C_1$ ,  $C_2$  and  $C_1$ , the composite conductance  $\Sigma C$  is expressed as:  $\Sigma C=1/(1/C_1+1/C_2+\cdots+1/C_n)$  when in series, and  $\Sigma C=C_1+C_2+\cdots+C_n$ ,

when in parallel. when in series, and  $2C=C_1+C_2+\cdots+C_n$ ,

## 5 He Leakage

#### Surface leakage

This leakage occurs between surfaces of the sealing and the seal material. In the case of elastic body seal (elastomer), leakage values are confirmed within minutes of operation. Leakage rate is measured at room temperature (20 to 30°C).

#### Gas permeation

This is leakage caused by diffusion through the elastic body seal material. As temperature increases, the diffusion rate increases, and in many cases, becomes greater than surface leakage. The diffusion rate is proportional to the cross-sectional area (cm²) of the seal, and inversely proportional to the seal width (distance between the atmosphere and the vacuum side). In the case of metal gaskets, only hydrogen diffusion should be considered.

#### 6 Outgassing

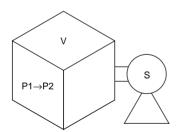
This is a phenomenon where gases adhered or adsorbed to the metallic surface or its inside parts are released from the surface and drawn into the vacuum according to the pressure decrease. The smoothness of the surface and closeness of the oxidized layer can effect (increase/decrease) this.

#### 7 Ultimate Pressure

Ultimate pressure P (Pa) is P=Q/S, where the sum of mass flow rates for outgassing (Qg) and leakage (Q $\ell$ ) is Q(Pa•m³/s), and the exhaust speed is S(m³/s). The ultimate pressure is measured with Qg, Q $\ell$ S shown as above, and the ultimate pressure of the pump itself. In the case of very low pressure, the exhaust characteristics of the actual pump can be the limiting factor. In particular, a deterioration of exhaust characteristics due to an unclean pump and invasion of the atmospheric moisture can be the major factor.

## 8 Exhaust Time (Low/Medium Vacuum)

The time ( $\triangle$ t) required to exhaust a chamber at low vacuum with volume V ( $\ell$ ), from pressure P1 to P2, using a pump with pumping speed S ( $\ell$ /sec) is  $\triangle$ t=2.3(V/S)log(P1/P2). In high vacuum, this is subject to the ultimate pressure limit imposed by outgassing and leakage as characterized above.



## 9 Baking

Gases such as oxygen and nitrogen, which have a small adsorption activation energy (E) and a short adsorption residence time  $(\tau)$ , are evacuated quickly. However, in the case of water, which has a high activation energy, evacuation does not progress quickly unless the temperature (T: absolute temperature) is raised to shorten residence time. This time is characterized as  $\tau=\tau 0$  exp(E/RT) where R is the ideal gas constant and  $\tau 0=(approx.)$   $10^{-13}$  sec.

Residence time of water at  $20^{\circ}$ C is  $5.5 \times 10^{-6}$  sec, whereas at  $150^{\circ}$ C, it is  $2.8 \times 10^{-8}$  sec, or about 200 times shorter. The objective of baking is to exhaust water with long adsorption residence time more quickly.





These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by labels of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

Caution: Operator error could result in injury or equipment damage.

**Warning**: Operator error could result in serious injury or loss of life.

⚠ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

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

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

## **△Warning**

1. The compatibility of the pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or post analysis and/or tests to meet the specific requirements. The expected performance and safety assurance are the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

- 2. Only trained personnel should operate pneumatically operated machinery and equipment.

  Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.
- 3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.
  - Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driven objects have been confirmed.
  - 2. When equipment is removed, confirm that safety process as mentioned above. Turn off the supply pressure for this equipment and exhaust all residual compressed air in the system.
  - 3. Before machinery/equipment is restarted, take measures to prevent quick extension of a cylinder piston rod, etc.
- 4. If the equipment will be used in the following conditions or environment, please contact SMC first and be sure to take all necessary safety precautions.
  - 1. Conditions and environments beyond the given specifications, or if product is used outdoors.
  - 2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
  - 3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

#### **■** Exemption from Liability

- 1. SMC, its officers and employees shall be exempted from liability for any loss or damage arising out of earthquakes or fire, action by a third person, accidents, customer error with or without intention, product misuse, and any other damages caused by abnormal operating conditions.
- 2. SMC, its officers and employees shall be exempted from liability for any direct or indirect loss or damage, including consequential loss or damage, loss of profits, or loss of chance, claims, demands, proceedings, costs, expenses, awards, judgments and any other liability whatsoever including legal costs and expenses, which may be suffered or incurred, whether in tort (including negligence), contract, breach of statutory duty, equity or otherwise.
- 3. SMC is exempted from liability for any damages caused by operations not contained in the catalogs and/or instruction manuals, and operations outside of the specification range.
- 4. SMC is exempted from liability for any loss or damage whatsoever caused by malfunctions of its products when combined with other devices or software.





#### **Design and Selection**

## **<b>⚠** Warning

#### 1. Confirm the specifications.

Read the specifications carefully and use this product appropriately. The product may be damaged or malfunction if it is used outside the range of specifications of current load, voltage, temperature or impact. We do not guarantee any damage in any case the product is used outside of the specification range.

## 2. Pay attention to the length of time that a switch is on at an intermediate stroke position.

When an auto switch is placed at an intermediate position of the stroke and a load is driven at the time the piston passes, the auto switch will operate. However if the speed is too great, the operating time will be shortened and the load may not operate properly. The maximum detectable piston speed is:

#### 3. Keep wiring as short as possible.

#### <Reed switch>

As the length of the wiring to a load gets longer, the rush current at switching ON becomes greater, and this may shorten the product's life. (The switch will stay ON all the time.) Use a contact protection box when the wire length is 5 m or longer.

#### <Solid state switch>

Although wire length should not affect switch function, use a wire 100 m or shorter.

If the wiring is longer it will likely increase noise although the length is less than 100 m.

When the wire length is long, we recommend attaching the ferrite core to the both ends of the cable to prevent excess noise.

#### 4. Do not use a load that generates surge voltage. If a surge voltage is generated, the discharge occurs at the contact, possibly resulting in the shortening of product life.

#### <Reed switch>

If driving a load such as a relay that generates a surge voltage, use a contact protection box.

#### <Solid state switch>

Although a zener diode for surge protection is connected at the output side of a solid state auto switch, damage may still occur if the surge is applied repeatedly. When a load, such as a relay or solenoid, which generates surge is directly driven, use a type of switch with a built-in surge absorbing element.

#### 5. Cautions for use in an interlock circuit

When an auto switch is used for an interlock signal requiring high reliability, devise a double interlock system to avoid trouble by providing a mechanical protection function, or by also using another switch (sensor) together with the auto switch. Also perform periodic maintenance and confirm proper operation.

#### 6. Do not make any modifications to the product.

Do not take the product apart. It may cause human injuries and accidents.

## **⚠** Caution

#### Take precautions when multiple actuators are used close together.

When two or more actuators are lined up in close proximity to each other, magnetic field interference may cause the switches to malfunction. Maintain a minimum cylinder separation of 40 mm.

(When the allowable interval is specified for each cylinder series, use the indicated value.) The auto switches may malfunction due to the interference from the magnetic fields.

## 2. Take note of the internal voltage drop of the switch. <Reed switch>

- 1) Switches with an indicator light (D-A93)
  - If auto switches are connected in series as shown below, take note that there will be a large voltage drop because of internal resistance in the light emitting diodes. (Refer to internal voltage drop in the auto switch specifications.)
     [The voltage drop will be "n" times larger when "n" auto switches are connected.]

Even though an auto switch operates normally, the load may not operate.



In the same way, when operating under a specified voltage, although an auto switch may operate normally, the load may not operate. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.

 If the internal resistance of a light emitting diode causes a problem, select a switch without an indicator light (Model D-A90).

#### <Solid state switch>

3) Generally, the internal voltage drop will be greater with a 2-wire solid state auto switch than with a reed switch. Take the same precautions as in 1).

Also, note that a 12 VDC relay is not applicable.

#### **Design and Selection**

## **⚠** Caution

#### 3. Pay attention to leakage current.

#### <Solid state switch>

With a 2-wire solid state auto switch, current (leakage current) flows to the load to operate the internal circuit even when in the OFF state.

Operating current of load (OFF condition) > Leakage current

If the criteria given in the above formula are not met, it will not reset correctly (stays ON). Use a 3-wire switch if this specification will not be satisfied.

Moreover, leakage current flow to the load will be "n" times larger when "n" auto switches are connected in parallel. Refer to page 49.

## 4. Ensure sufficient clearance for maintenance activities.

When designing an application, be sure to allow sufficient clearance for maintenance and inspections.

#### 5. Minimum stroke for auto switch mounting

The minimum stroke value for mounting one or two auto switches is obtained when the switch can detect at the product.

However, even if the switch is mounted at the proper position within the minimum stroke range, it may not be able to detect when the piston stops in the middle of the stroke due to a stopper, etc. It may also turn on in the middle of a stroke.

#### 6. When multiple auto switches are required

"n" indicates the number of switch which can be physically mounted. Detection intervals depends on the switch mounting structure and set position, therefore some required interval and set positions may not be available.

#### **Mounting and Adjustment**

## **△**Warning

#### 1. Instruction manual

Install the products and operate them only after reading the instruction manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

#### 2. Do not drop or bump.

Do not drop, bump or apply excessive impacts (300 m/s $^2$  or more for reed switches and 1000 m/s $^2$  or more for solid state switches) while handling. Although the body of the switch may not be damaged, the inside of the switch could be damaged and cause a malfunction.

#### 3. Mount switches using the proper fastening torque.

When a switch is tightened beyond the range of fastening torque, the mounting screws, mounting bracket or switch may be damaged. On the other hand, tightening below the range of fastening torque may allow the switch to slip out of position. (For mounting and moving auto switches, tightening torque, etc., refer to each series.)

#### 4. Mount a switch at the center of the operating range.

Adjust the mounting position of an auto switch so that the piston stops at the center of the operating range (the range in which a switch is ON). (The mounting position shown in a catalog indicates the optimum position at stroke end.) If mounted at the end of the operating range (around the borderline of ON and OFF), operation will be unstable or the service life will be shortened.

#### <D-M9□>

When the D-M9 auto switch is used to replace old series auto switch, it may not activate depending on operating condition because of its shorter operating range.

Such as

- Applications where the stop position of actuator may vary and exceed the operating range of the auto switch, for example, pushing, pressing, clamping operation, etc.
- Applications where the auto switch is used for detecting an intermediate stop position of the actuator. (In this case the detecting time will be reduced.)

In these applications, set the auto switch to the center of the required detecting range.

## **∧** Caution

 Do not carry an actuator by the auto switch lead wires.

Never carry a cylinder (actuator) by its lead wires. This may not only cause broken lead wires, but it may cause internal elements of the switch to be damaged by the stress.

2. Fix the switch with appropriate screw installed on the switch body. If using other screws, switch may be damaged.



#### Wiring

## **<b>⚠** Warning

#### 1. Confirm proper insulation of wiring.

Be certain that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

#### 2. Do not wire with power lines or high voltage lines.

Wire separately from power lines or high voltage lines, avoiding parallel wiring or wiring in the same conduit with these lines. Control circuits, including auto switches, may malfunction due to noise from these other lines.

## **⚠** Caution

#### 1. Avoid repeatedly bending or stretching lead wires.

Repeated bending or tensile force applied to the lead wire may cause the sheath to fall off or disconnection of the wire. If bending or tensile force are not avoidable, fix the lead wire close to the switch and allow a bend radius of R40 to 80 mm or larger. Please consult SMC for details. Stress and tensile force applied to the connection between the cable and switch increases the possibility of disconnection.

Fix the cable in the middle so that it is not movable in the area where it connects with the switch.

## 2. Be sure to connect the load before power is applied.

#### <2-wire type>

If the power is turned ON when an auto switch is not connected to a load, the switch will be instantly damaged because of excess current.

It is the same as when the 2-wire brown cord (+, output) is directly connected to the (+) power supply terminal.

#### 3. Do not allow short circuit of loads.

#### <Reed switch>

If the power is turned ON with a load in a short circuited condition, the switch will be instantly damaged because of excess current flow into the switch.

#### <Solid state switch>

Model D-M9□ switches do not have built-in short circuit prevention circuits. If loads are short circuited, the switches will be instantly damaged, as in the case of reed switches.

Take special care to avoid reverse wiring with the power supply line (brown) and the output line (black) on 3-wire type switches.

## **⚠** Caution

#### 4. Avoid incorrect wiring.

#### <Reed switch>

A 24 VDC switch with indicator light has polarity. The brown lead wire is (+) and the blue lead wire is (-).

1) If connections are reversed, a switch will operate, however, the light emitting diode will not light up.

Also note that a current greater than that specified will damage a light emitting diode and it will no longer operate. Applicable model:

D-A93

#### <Solid state switch>

- If connections are reversed on a 2-wire type switch, the switch will not be damaged if protected by a protection circuit, but the switch will always stay in an ON state. However, it is still necessary to avoid reversed connections, since the switch could be damaged by a load short circuit in this condition.
- 2) If connections are reversed (power supply line + and power supply line -) on a 3-wire type switch, the switch will be protected by a protection circuit. However, if the power supply line (+) is connected to the blue wire and the power supply line (-) is connected to the black wire, the switch will be damaged.

#### <D-M9□>

D-M9□ does not have built-in short circuit protection circuit. Be aware that if the power supply connection is reversed (e.g. (+) power supply wire and (–) power supply wire connection is reversed), the switch will be damaged.

 When the cable sheath is stripped, confirm the stripping direction. The insulator may be split or damaged depending on the direction. (D-M9□ only)





#### **Recommended Tool**

Model name	Model no.
Wire stripper	D-M9N-SWY

<sup>\*</sup> Stripper for a round cable (ø2.0) can be used for a 2-wire type cable.



#### **Operating Environment**

## **△**Warning

1. Never use in an atmosphere of explosive gases.

The construction of auto switches is not intended to prevent explosion. Never use in an atmosphere with an explosive gas since this may cause a serious explosion.

2. Do not use in an area where a magnetic field is generated.

Auto switches will malfunction or magnets inside products will become demagnetized.

Do not use in an environment where the auto switch will be in water or continually exposed to water.

Although switches satisfy IEC standard IP67 construction (JIS C 0920: waterproof construction), do not use switches in applications where continually exposed to water splash or spray. Poor insulation or swelling of the potting resin inside switches may cause malfunction.

4. Do not use in an environment with oil or chemicals.

Please consult SMC if auto switches will be used in an environment with coolant, cleaning solvent, various oils or chemicals. If auto switches are used under these conditions for even a short time, they may be adversely affected by improper insulation, malfunction due to swelling of the potting resin, or hardening of the lead wires.

Do not use in an environment with temperature cycles.

Please consult SMC if switches are used where there are temperature cycles other than normal temperature changes, as they may be adversely affected internally.

6. Do not use in an environment where there is excessive impact shock.

#### <Reed switch>

When excessive impact (300 m/s² or more) is applied to a reed switch during operation, the contact point will malfunction and generate or cut off a signal momentarily (1 ms or less). Please consult SMC regarding the need to use a solid state switch depending upon the environment.

7. Do not use in an area where surges are generated. <Solid state switch>

When there are units (solenoid type lifter, high frequency induction furnace, motor, radio equipment etc.) which generate large surges or electromagnetic waves in the area around products with solid state auto switches, this may cause deterioration or damage to the switches. Avoid sources of surge generation and crossed lines.

## **⚠** Caution

1. Avoid accumulation of iron debris or close contact with magnetic substances.

When a large amount of ferrous debris such as machining chips or spatter is accumulated, or a magnetic substance (something attracted by a magnet) is brought into close proximity with products with auto switches, it may cause the auto switch to malfunction due to a loss of the magnetic force inside the product.

- 2. Please consult SMC concerning water resistance, elasticity of lead wires, usage at welding sites, etc.
- 3. Do not use in direct sunlight.
- 4. Do not mount the product in locations where it is exposed to radiant heat.

#### **Maintenance**

## **⚠** Warning

- Perform the following maintenance periodically in order to prevent possible danger due to unexpected auto switch malfunction.
  - Securely tighten switch mounting screws.
     If screws become loose or the mounting position is dislocated, retighten them after readjusting the mounting position.
  - Confirm that there is no damage to lead wires.
     To prevent faulty insulation, replace switches or repair lead wires, etc., if damage is discovered.
  - 3) Confirm the lighting of the green light on the 2-color indicator type switch.

Confirm that the green LED is turned on when stopped at the established position. If the red LED is turned on, the mounting position is not appropriate. Readjust the mounting position until the green LED lights up.

2. Maintenance procedures are outlined in the operation manual.

Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.

Removal of equipment, and supply/exhaust of compressed air

Before any machinery or equipment is removed, first ensure that the appropriate measures are in place to prevent the fall or erratic movement of driven objects and equipment, then cut off the electric power and reduce the pressure in the system to zero. Only then should you proceed with the removal of any machinery and equipment.

When machinery is restarted, proceed with caution after confirming that appropriate measures are in place to prevent actuators from sudden movement.



## Series XL Specific Product Precautions 1

Be sure to read this before handling.

#### Air Operated Angle Valves/Series XLA(V), XLC(V), XLD(V), XLF(V), XLG(V)

#### 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.
- Select materials for the actuation pressure piping, and heat resistance for fittings that are suitable for the applicable operating temperatures.
- Model with auto switch/XLA(V), XLC(V), XLD(V), XLF(V), XLG(V)
- The switch section should be kept at a temperature no greater than 60°C.
- Model with heater/XLA, XLC, XLD, XLF, XLG
- When using a model with a heater (thermistor), a device should be installed to prevent overheating.
- Model with solenoid valve/XLAV, XLCV, XLDV, XLFV, XLGV
- 1. For models with a solenoid valve, the temperature of the solenoid valve section should be no greater than 50°C.

#### Selection

## **⚠** Caution

#### • All models

- For high vacuum valves used in the main exhaust lines of flat panel display manufacturing equipment and other large manufacturing equipment, the XLF(V) or XLG(V) series, employing O-ring seal type for improved durability, is recommended.
- 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.
- 3. Actuating pressure should be kept within the specified range.  $0.4\ \text{to}\ 0.5\ \text{MPa}$  is recommended.
- 4. Use within the limits of the operating pressure range.
- The actuating piston chamber and the bellows chamber [except for XLF(V)/XLG(V)] are directly connected to atmosphere.
   Please use in an environment in which dust emissions will not cause
  - problems. (Please consult SMC if the release of dust must be avoided.)

#### High temperature type/XLA, XLC, XLD, XLF, XLG

 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.
- In case with switches and solenoid valves, secure the lead wires so that they have sufficient slack, without any unreasonable force applied to them.
- 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.

#### Mounting

### **⚠** Caution

- Vibration resistance allows for normal operation up to 30 m/s² (45 to 250 Hz), but continuous vibration may cause a decline in durability. Arrange piping to avoid excessive vibrations or shocks
- High temperature type (Model/XLA, XLC, XLD, XLF, XLG; Temperature specifications/H0, H2, H3)
- In models with heater (thermistor), take care not to damage the insulation components of the lead wires and connector section.
- 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.
- 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 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

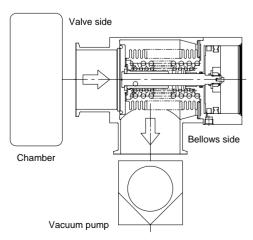
- Before mounting, clean the surface of the flange seal and the Oring with ethanol, etc.
- There is an indentation of 0.1 to 0.2 mm in order to protect the flange seal surface, and it should be handled so that the seal surface is not damaged in any way.
- 3. Exhaust direction

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]





## Series XL Specific Product Precautions 2

Be sure to read this before handling.

#### Air Operated Angle Valves/Series XLA(V), XLC(V), XLD(V), XLF(V), XLG(V)

#### **Maintenance**

## 

- When removing deposits from a valve, take care not to damage any of its parts.
- Replace the bonnet assembly when the end of its service life is approached.
- If damage is suspected prior to the end of the service life, perform early maintenance.

#### Maintenance

## **⚠** Caution

- 4. SMC specified parts should be used for service. Refer to "Construction", "Replacement Parts," or "Maintenance Parts."
- 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.

#### Manual Angle Valve/Series XLH

#### Design

## **⚠** Caution

- The body material is A6063, the bellows are stainless steel 316L, other vacuum parts are stainless steel 304.
   FKM is the standard seal material for the vacuum part, but other
  - materials may be selected (please refer to How to Order). Please check the material used, and use only fluids that will not interfere with the material.
- When using a model with a heater (thermistor), a device should be installed to prevent over heating.

### Selection

## **∧** Caution

- 1. Use within the limits of the operating pressure range.
- In the case of gases which cause a large amount of deposits, heat the valve body or use a model with heater to prevent deposits in the valve.

#### Mounting

## **⚠** Caution

- In models with heater (thermistor), take care not to damage the insulation components of the lead wires and connector section.
- 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.
- 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 (excluding handle part) should be heated.
- In high humidity environments, keep valves packaged until the time of installation.
- When a heater is in operation, the entire valve becomes hot. Be careful not to touch it with bare hands, as burns will result.
- 7. 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.

#### **Piping**

## **⚠** Caution

- 1. Before mounting, clean the surface of the flange seal and the Oring 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. When using an outer ring, be sure that the O-ring is compressed sufficiently. (There is basically no problem with the outer ring.)

#### **Maintenance**

## **∧** Caution

- When removing deposits from a valve, take care not to damage any of its parts.
- Replace the handle assembly when the end of its service life is approached.
- If damage is suspected prior to the end of the service life, perform early maintenance.
- SMC specified parts should be used for service. Refer to "Construction", "Replacement Parts," or "Maintenance Parts."
- 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.





## Series XL/XVD Specific Product Precautions 3

Be sure to read this before handling.

#### **Angle Solenoid Valve/Series XLS**

Design

## **⚠** Warning

- 1. The body material is A6063, the bellows are stainless steel 316L, the other metal materials used in the vacuum part are 13Cr stainless steel, stainless steel 304, and A2017, and the seal material is FKM. In addition, a fluorinated resin (PFA) is used in the armature assembly of the vacuum part. The valve of the vacuum part has a fluorinated grease coating. Please check the material used, and in the course of maintenance, use only liquids that will not interfere with the material.
- 2. In cases without an operating power supply, the starting voltage is applied for only 0.15 to 0.2 s, and after this, a holding voltage (25% of the starting voltage) must be applied. If not performed properly, this can cause burning of the coil and fire, etc.
- Be certain to install a fuse or short circuit breaker in the power supply circuit.

#### Selection

## **⚠** Caution

1. Use within the limits of the operating pressure range.

#### Mounting

## **⚠** Caution

 In high humidity environments, keep valves packaged until the time of installation.

#### Mounting

## **⚠** Caution

2. Please secure in such a way that the lead wire has sufficient curvature, and that no excessive force is applied to it.

#### **Piping**

## **⚠** Caution

- Before mounting, clean the surface of the flange seal and the Oring 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. When using an outer ring, be sure that the O-ring is compressed sufficiently. (There is basically no problem with the outer ring.)

#### Maintenance

## **⚠** Caution

- Replace the core and armature assemblies when the end of their service life is approached.
- If damage is suspected prior to the end of the service life, perform early maintenance.
- 3. SMC specified parts should be used for service parts. Refer to "Replacement Parts" on back of page 9 for further details.

#### Smooth Vent Valve/Series XVD

#### Design

## 

 The body material and bellows are stainless steel 316L, the other materials that may be exposed to fluids are stainless steel 304 and PCTFE, and the seal material is FKM. Please check the material used, and only fluids that will not interfere with the material.

#### Selection

## **⚠** Caution

- 1. Please use within the operating pressure range.
- Leaks may result when the supplied pressure exceeds 0.2 MPa(G). When adjusting the pressure on the supply side with a regulator, etc., please take precautions against rising pressure to prevent leakage from the regulator.
- 3. Do not tighten the initial air supply flow any further than the "minimum supply flow" position, as this may result in component damage, or in increased time needed to attain a vacuum in the vacuum chamber due to a decline in the displacement capabilities of the gas accumulation part (bellows chamber).

#### **Mounting**

## **∧** Caution

In high humidity environments, keep valves packaged until the time of installation

#### **Piping**

## **⚠** Caution

- 1. Before mounting, clean the sealing surface with ethanol, etc.
- Fasten the VCR® and Swagelok® properly, in accordance with the specified torque and methods prescribed by Swagelok. Reference) For VCR®: 1/8 turn after tightening by hand For Swagelok®: 1 1/4 turns after tightening by hand
- 3. Attach the valve using body bottom mounting screws (2-M5).

#### **Maintenance**

## **⚠** Caution

- 1. Replace the bonnet assembly part and body assembly part when the end of their service life is approached.
- If damage is suspected prior to the end of the service life, perform early maintenance.
- 3. SMC specified parts should be used for service parts.





## Series XL Specific Product Precautions 4

Be sure to read this before handling.

#### **Maintenance Parts**

#### Air operated angle valve/Manual valve



When replacing seal materials, please replace bonnet assembly or handle assembly.
 This may not be applicable in cases where the seal material differs from that used in the products.





Bonnet Assembly, Handle Assembly Component Parts No.: (1)

Bonner	Assen	nbiy	, Handle Ass	embly Compo	onent Parts N	10.: (1)			assemb	ly assembly
Model	Temperature specifications	la dianta r				Valve	e size			
Model	specifications	indicator	16	25	40	50	63	80	100	160
	General use	None	XLA16-30-1	XLA25-30-1	XLA40-30-1	XLA50-30-1	XLA63-30-1	XLA80-30-1	_	_
XLA		Yes	XLA16A-30-1	XLA25A-30-1	XLA40A-30-1	XLA50A-30-1	XLA63A-30-1	XLA80A-30-1	_	_
ALA	High temperature	None	XLA16-30-1H	XLA25-30-1H	XLA40-30-1H	XLA50-30-1H	XLA63-30-1H	XLA80-30-1H	_	_
	temperature	Yes	XLA16A-30-1H	XLA25A-30-1H	XLA40A-30-1H	XLA50A-30-1H	XLA63A-30-1H	XLA80A-30-1H	_	_
XLAV	General use	None	XLAV16-30-1	XLAV25-30-1	XLAV40-30-1	XLAV50-30-1	XLAV63-30-1	XLAV80-30-1	_	_
ALAV		Yes	XLAV16A-30-1	XLAV25A-30-1	XLAV40A-30-1	XLAV50A-30-1	XLAV63A-30-1	XLAV80A-30-1	_	_
XLC	General use		XLC16-30-1	XLC25-30-1	XLC40-30-1	XLC50-30-1	XLC63-30-1	XLC80-30-1	_	_
	High temperature	None	XLC16-30-1H	XLC25-30-1H	XLC40-30-1H	XLC50-30-1H	XLC63-30-1H	XLC80-30-1H	_	_
XLCV	General use	None	XLCV16-30-1	XLCV25-30-1	XLCV40-30-1	XLCV50-30-1	XLCV63-30-1	XLCV80-30-1	_	_
	General use	None	XLF16-30-1	XLF25-30-1	XLF40-30-1	XLF50-30-1	XLF63-30-1	XLF80-30-1	XLF100-30-1	XLF160-30-1
XLF		Yes	XLF16A-30-1	XLF25A-30-1	XLF40A-30-1	XLF50A-30-1	XLF63A-30-1	XLF80A-30-1	XLF100A-30-1	XLF160A-30-1
\LI		None	XLF16-30-1H	XLF25-30-1H	XLF40-30-1H	XLF50-30-1H	XLF63-30-1H	XLF80-30-1H	XLF100-30-1H	XLF160-30-1H
	temperature	Yes	XLF16A-30-1H	XLF25A-30-1H	XLF40A-30-1H	XLF50A-30-1H	XLF63A-30-1H	XLF80A-30-1H	XLF100A-30-1H	XLF160A-30-1H
XLFV	General use	None	XLFV16-30-1	XLFV25-30-1	XLFV40-30-1	XLFV50-30-1	XLFV63-30-1	XLFV80-30-1	XLFV100-30-1	XLFV160-30-1
ALI V	Octional use	Yes	XLFV16A-30-1	XLFV25A-30-1	XLFV40A-30-1	XLFV50A-30-1	XLFV63A-30-1	XLFV80A-30-1	XLFV100A-30-1	XLFV160A-30-1
XLD	General use			XLD25-30-1	XLD40-30-1	XLD50-30-1	XLD63-30-1	XLD80-30-1	_	_
ALD	High temperature	Standard	_	XLD25-30-1H	XLD40-30-1H	XLD50-30-1H	XLD63-30-1H	XLD80-30-1H	_	
XLDV	General use			XLDV25-30-1	XLDV40-30-1	XLDV50-30-1	XLDV63-30-1	XLDV80-30-1	_	_
XLG	General use			XLG25-30-1	XLG40-30-1	XLG50-30-1	XLG63-30-1	XLG80-30-1	_	_
ALG	High temperature	None	XLG16-30-1H	XLG25-30-1H	XLG40-30-1H	XLG50-30-1H	XLG63-30-1H	XLG80-30-1H	_	_
XLGV	General use	None	XLGV16-30-1	30-1 XLGV25-30-1 XLG		XLGV50-30-1	XLGV63-30-1	XLGV80-30-1	_	_
XLH	Standard	Standard	XLH16-30-1	XLH25-30-1	XLH40-30-1	XLH50-30-1	_	_	_	_

Note 1) In cases where the valve seal material is other than the standard (FKM: includes Compound no. 1349-80: made by Mitsubishi Cable Industries, Inc.), please add suffix symbol for seal material (shown in the below table) at the end of the part number.

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.

#### Exterior Seal, (M) Valve Seal, S Valve Seal Assembly

Madal	Description	Maradal	Valve size							
Model	Construction No.	Material	16	25	40	50	63	80	100	160
XLA(V) XLC(V)	Exterior seal	Standard	AS568-025V	AS568-030V	AS568-035V	AS568-039V	AS568-043V	AS568-045V	_	_
XLD(V) XLH	3	Special	AS568-025□	AS568-030□	AS568-035□	AS568-039□	AS568-043□	AS568-045□	_	_
XLF(V)	Exterior seal	Standard	XLF16-6	XLF25-6	AS568-035V	AS568-039V	AS568-043V	AS568-045V	AS568-050V	AS568-167V
XLG(V)	3	Special	_	_	AS568-035□	AS568-039□	AS568-043□	AS568-045□	AS568-050□	AS568-167□
Common	Valve seal	Standard	B2401-V15V	B2401-V24V	B2401-P42V	AS568-227V	AS568-233V	B2401-V85V	AS568-349V	B2401-G155V
Common	3	Special	B2401-V15□	B2401-V24□	B2401-P42□	AS568-227□	AS568-233□	B2401-V85□	AS568-349□	B2401-G155□
XLD(V)	S valve seal assembly	Standard	_	AS568-009V	XLD40-2-9-1A	XLD50-2-9-1A	XLD80-2-9-3A	XLD80-2-9-3A	_	_
VLD(A)	4	Special	_	AS568-009□	XLD40-2-9-1A□	XLD50-2-9-1A□	_	-	_	_

Note 3) In cases where the seal material is other than the standard (FKM: includes Compound no. 1349-80: made by Mitsubishi Cable Industries, Inc.), please add suffix symbol for seal material (shown in the below table) at the end of the part number (the place of  $\Box$ ).

Note 4) Refer to "Construction" of each series for component parts numbers.

#### **Table 1: Seal Material Symbol**

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

Note 5) This may not be applicable in cases where the seal material differs from that used in the products, although the seal material is changed.

\* Produced by Mitsubishi Cable Industries, Ltd.

Replacement He	Replacement Heaters											
Temperature				Valve size								
specification	25	40	50	63	80	100	160					
H2 (100°C heater)	_	XLA25-60M-1	XLA25-60M-1	XLA25-60M-2	XLA25-60M-3	XLA25-60M-2 (2 sets)	XLA25-60M-2 (3 sets)					
H3 (120°C heater)	XI A25-60M-1	XLA25-60M-2	XI A25-60M-2	XLA25-60M-3	XI A25-60M-2 (2 sets)	XI A25-60M-2 (3 sets)	XI A25-60M-2 (4 sets)					

Example) In the case of a replacement heater for XL $\square$ -80-H3, two sets of XLA25-80M-2 (including two M type heaters) are required.

#### **Angle Solenoid Valve**

Construction No.	Description	XLS-16-□□ XLS-16-P□□		XLS-25-□□ XLS-25-P			
2	Coil assembly	XLS16-20- <b>∄</b> G, C, T, D	C, T, D XLS16-20-P⊮G XLS25-20-⊮G, C, T, D XLS				
6	Core assembly	XLS16-30	)-1	XLS25-30-1			
4	Armature assembly	XLS16-30	)-2	XLS25-30-2			
3-1	O-ring	AS568-01	8V	AS568-018V			
3-2	O-ring	AS568-02	25V	AS568-03	030V		

Note 1) In case of coil assembly, please enter voltage symbol in ®. "G" after ® is grommet, "C" for conduit, "T" for terminal, and "D" for DIN.

Note 2) Refer to "Construction" for component parts numbers.





## Series XVD Specific Product Precautions 5

Be sure to read this before handling.

#### **Smooth Vent Valve/Series XVD**

#### **Maintenance Parts**

#### **XVD Smooth Vent Valve**

Construction No.	Description	Part no.				
1	Bonnet assembly	XVD2-02A-30-1				
(2)	Bady sasambly	XVD2-02V-30-2 (For VCR®)				
(2)	Body assembly	XVD2-02S-30-2 (For Swagelok®)				
3	Exterior seal	AS568-024V				



#### Record of changes

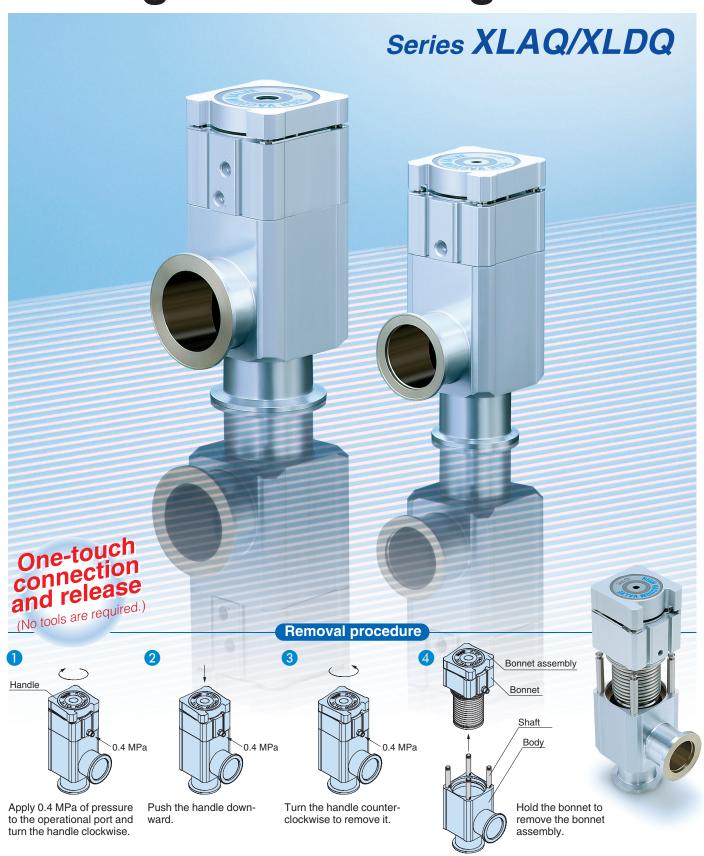
- B edition \* Addition of ø100 and ø160 of High Vacuum Angle Valve Series XLF(V).
  - \* Addition of Made to Order Series VLF and Series VLG.
  - \* Addition of Smooth Vent Valve Series XVD.
  - \* Change of appearance of shape.
  - \* Change of auto switch F9 $\square$   $\rightarrow$  M9 $\square$ .
  - \* Deletion of Straight Solenoid Valve (with Metallic Seal Fitting), Series XSA.
  - \* Number of pages from 48 to 68.

## **SMC** Corporation

Akihabara UDX 15F, A-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, JAPAN Phone: 03-5207-8249 FAX: 03-5298-5362 URL http://www.smcworld.com © 2007 SMC Corporation All Rights Reserved



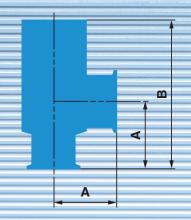
# Aluminum One-touch Connection and Release High Vacuum Angle Valves



## Lightweight, Compact

Large conductance. Small body.

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



#### **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

<sup>\*:</sup> Common to the XLAQ/XLDQ series



## **Variations**

## Bellows seal, Single acting/XLAQ

- Particulate-free and clean room compatible bellows type
- The pressure-balance mechanism allows freedom in exhaust direction.

## 2-step control, Single acting/XLDQ

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

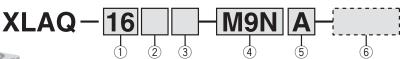
	Actua-	Applications	Shaft seal	Madal	Valve	Operating pressure					Options		
	tion	Applications	system	Model	type	Pa	16	25	40	50	Switch	Indicator	High tem- perature spec.
	Air operated	Particle free	Bellows seal	XLAQ	Single acting	Atmospheric	•	•	•	•	•	•	•
		Prevents turbulence of particulates. Prevents a pump from running overloaded.	Bellows seal O-ring seal	XLDQ	(N.C.)	pressure to 1 x 10 <sup>-6</sup>			•	•	•	Standard	•

## **Aluminum One-touch Connection and Release High Vacuum Angle Valve**

## Series XLAQ

Normally Closed/Bellows Seal PAT.

#### **How to Order**



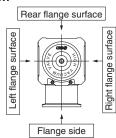


#### 1) Flange size

Size
16
25
40
50

#### 2 Indicator/Actuator port direction

		<u> </u>						
Symbol	Indicator	Actuator port direction						
-	Without indicator	Flange side						
Α	VACAL.	Flange side						
F	With	Left flange surface						
G	indicator	Rear flange surface						
J		Right flange surface						
K	\\/ithaut	Left flange surface						
L	Without	Rear flange surface						
M	indicator	Right flange surface						



#### ③ Temperature specifications/Heater

Cumbal	Tomporoturo	Llootox	Appli	cable flange size			
Symbol	Temperature	Heater	16	25	40	50	
-	5 to 60°C	None	•			•	
H0		None	•				
H4	5 to 150°C	With 100°C heater	_	_		•	
H5		With 120°C heater	_	•		•	

#### 5 Switch quantity/Mounting position

Symbol	Quantity	Mounting position	
-	Without auto switch	_	
Α	2 pcs.	Valve open/closed	
В	1 pc.	Valve open	
С	1 pc.	Valve closed	

#### 4 Auto switch type

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

Auto switches are not applicable for high-temperature specifications (Temperature specifications H0, H2, H3). Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9NL

#### 6 Body surface treatment/Seal material and its changed part

#### Body surface treatment

\* Produced by Mitsubishi Cable Industries, Ltd.

Symbol	Surface treatment		
-	External: Hard anodised Internal: Raw material		
Α	External: Hard anodised Internal: Oxalic acid anodised		

#### Seal material

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

#### Part numbers for indicating the changed seal material and leakage

		<u> </u>		
Symbol	Note 2) Changed	Leakage Pa•m³/s or less Note 1)		
	part	Internal	External	
-	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-10</sup> (FKM)	
Α	2,3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-8</sup>	
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-10</sup> (FKM)	
С	(3)	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-8</sup>	

Note 1) Values at ambient temperatures, excluding gas permeation.

Note 2) Refer to the part number in "Construction" on page 2 for the changed part.

The number above indicates the part number from "Construction" accordingly.

To order something else than "-" (standard), list the symbols starting with "X", followed by the symbol for "seal material" and then the symbol for "changed parts" last.

Example) XLAQ-25-M9NA-XAN1A

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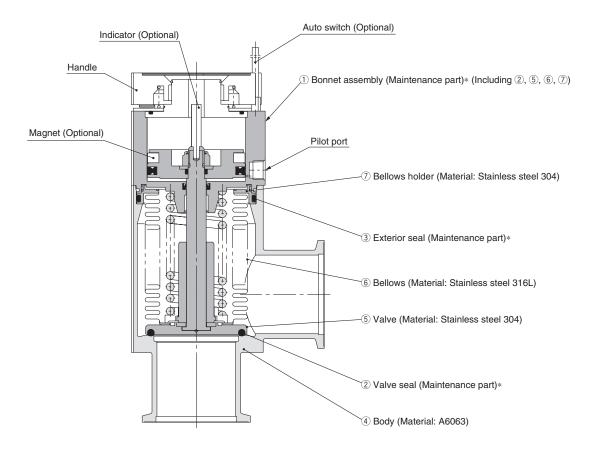


## Series XLAQ

### **Specifications**

Model		XLAQ-16	XLAQ-25	XLAQ-40	XLAQ-50
Flange (valve) size		16	25	40	50
Valve type		Normally closed (Pressurise 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 <sup>-6</sup>			
Conductance (ds) Note 1)		5	14	45	80
Leekere (De. m³/e)	Internal	4.0 4.010			
Leakage (Pa·m³/s)	External	1.3 x 10 <sup>-10</sup> at normal temperatures (in case of standard material, FKM), excluding gas permeation			
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		1/8	
Weight (kg)		0.33	0.6	1.3	2.0

#### Construction

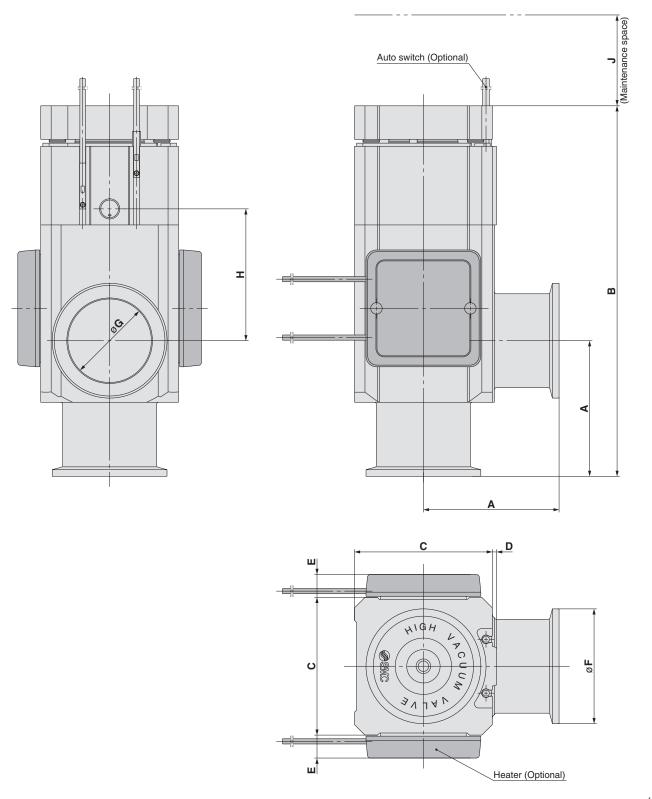


 $\ast$  Refer to back page 3 for the maintenance parts.



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.

## **Dimensions**



									(mm)
Model	Α	В	С	D	E	F	G	Н	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 (Optional) is not available with XLAQ-16.

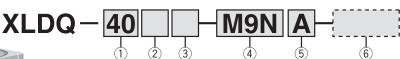


# **Aluminum One-touch Connection and Release High Vacuum Angle Valve**

# Series XLDQ

2-step Control, Single Acting/Bellows Seal, O-ring Seal PAT.

#### **How to Order**



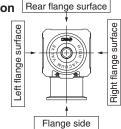


#### 1 Flange size

Size					
40					
50					

#### 2 Indicator/Actuator port direction Rear flange surface

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



#### ③ Temperature specifications/Heater

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

#### 5 Switch quantity/Mounting position

Symbol	Quantity	Mounting position		
-	Without auto switch			
Α	2 pcs.	Valve open/closed		
В	1 pc.	Valve open		
С	1 pc.	Valve closed		

#### 4 Auto switch type

<u> </u>	, 60				
Symbol	Auto switch part no.	Remarks			
-	_	Without auto switch (Without built-in magnet)			
M9N(M)(L)(Z)	D-M9N(M)(L)(Z)				
M9P(M)(L)(Z)	D-M9P(M)(L)(Z)	Solid state switch			
M9B(M)(L)(Z)	D-M9B(M)(L)(Z)				
A90(L)	D-A90(L)	Donal assitate			
A93(M)(L)(Z)	D-A93(M)(L)(Z)	Reed switch			
M9//	_	Without auto switch (With built-in magnet)			

Auto switches are not applicable for high-temperature specifications (Temperature specifications H0, H2, H3). Standard lead wire length is 0.5 m. Add "L" to the end of the part number when 3 m is desired. Example) -M9NL

#### 6 Body surface treatment/Seal material and its changed part

#### Body surface treatment

Symbol	Surface treatment						
-	External: Hard anodized Internal: Raw material						
Α	External: Hard anodized Internal: Oxalic acid anodized						

#### Seal material

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

The material for the sliding parts of the S valve is FKM.

\* Produced by Mitsubishi Cable Industries, Ltd.

#### Part numbers for indicating the changed seal material and leakage

Symbol	Note 2) Changed	Leakage Pa•m³/s or less Note 1)				
Cymbol	part	Internal	External			
-	None	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-10</sup> (FKM)			
Α	2, 3, 4, 5	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-8</sup>			
В	2, 4, 5	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-10</sup> (FKM)			
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-8</sup>			

Note 1) Values at ambient temperatures, excluding gas permeation.

Note 2) Refer to the part number in "Construction" on page 5 for the changed part. |

The number above indicates the part number from "Construction" accordingly.

To order something else than "-" (standard), list the symbols starting with "X", followed by the symbol for "seal material" and then the symbol for "changed parts" last.

#### Example) XLDQ-40K-M9NA-XAN1A

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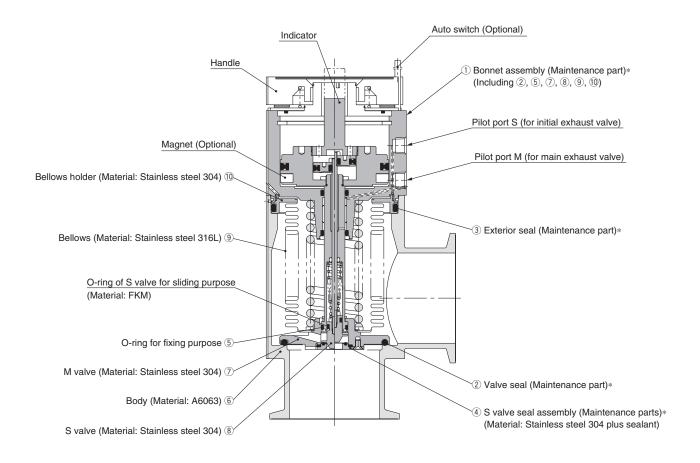
Chemraz® is a registered trademark of Greene, Tweed Technologies, Inc. ULTIC ARMOR® is a registered trademark of Nippon Valqua Industries, Ltd.

#### **Specifications**

Mod	lel	XLDQ-40 XLDQ-50				
Flange (valve) size		40 50				
Valve type		Normally closed (Pressurise to open, Sprir	ng seal) [both main & initial exhaust valves)			
Fluid		Inert gas un	der vacuum			
Operating temperatu	re (°C)	5 to 60 (High-temper	rature type: 5 to 150)			
Operating pressure (	(Pa) (abs)	Atmospheric pre	ssure to 1 x 10 <sup>-6</sup>			
Conductance Note 1)	Main exhaust valve	45	80			
(ds)	Initial exhaust valve	8	11			
	Internal	1.3 x 10 <sup>-10</sup> at ordinary temperature (in case of standard material, FKM), excluding gas permeation				
Leakage (Pa·m³/s)	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 exha			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.

#### Construction



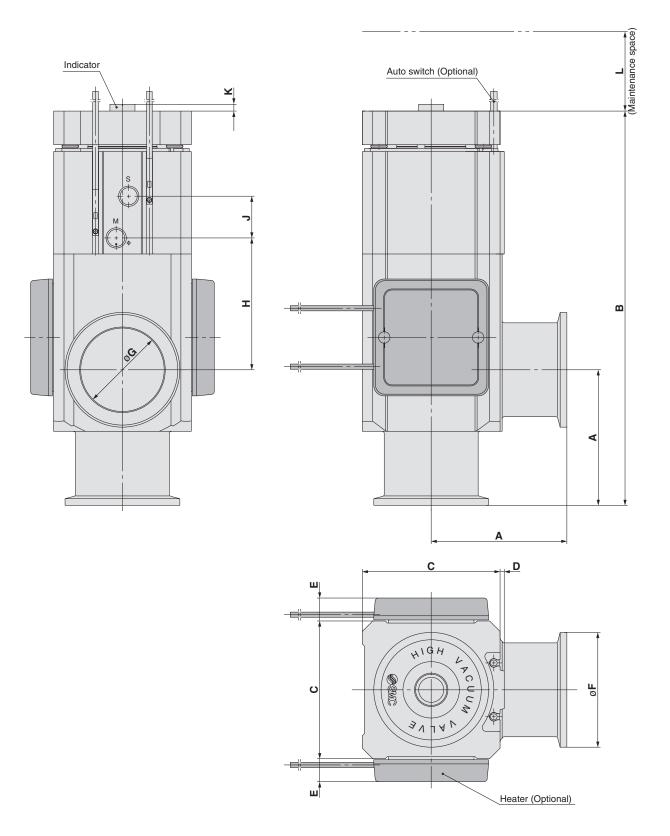
<sup>\*</sup> Refer to back page 3 for the maintenance parts.



Note 2) Vacuum grease (Fluorine-based, Y-VAC2) is applied to the external seal of the vacuum components.

## Series XLDQ

## **Dimensions**



											(mm)
Model	Α	В	С	D	Е	F	G	Н	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



# **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 (Fluoro rubber)**

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.

#### **FFKM**

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 FFKM, excellent in gas and heat resistance.

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

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 NF3,

NH3. 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<sub>2</sub> plasma and NH<sub>3</sub> 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<sub>3</sub> 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 dust 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 the length and speed of the stroke.

## **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.



## **Glossary of Terms**

## 4 Molecular Flow Conductance

#### Orifice conductance

In the case of a  $\emptyset$ A (cm²) hole in an ultra-thin plate, conductance "C" results from "V", the average velocity of the gas; "R", the gas constant; "M", the molecular weight; and "T", the absolute temperature. From the formula C=11.6A ( $\emptyset$ /sec), at an air tempearture of 20°C.

#### Cylinder conductance

With length "L" (cm) and diameter "D" (cm) where L>>D, from the formula C= $(2\pi RT/M)^{0.5}D^3/6L$ , the conductance C=12.1D³/L ( $\ell$ /sec), at an air temperature of 20°C.

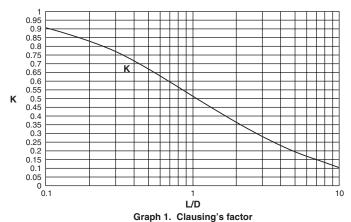
#### Short pipe conductance

From Clausing's factor "K" and the hole conductance "C" in Graph 1. (Clausing's factor drawing), the short pipe conductance  $C_K$  is easily found as  $C_K$ =KC.

#### Conductances combined

When each of the separate conductances are given as  $C_1$ ,  $C_2$ ,  $C_3$  and Cn, the composite conductance  $\Sigma C$  is expressed as:

 $\Sigma C = 1/(1C_1 + 1/C_2 + 1/C_3 \dots 1/Cn)$  when in series, and  $\Sigma C = C_1 + C_2 + C_3 \dots Cn,$  when in parallel.



## 5 He Leakage

#### Surface leakage

This leakage occurs between surfaces of the sealing and the seal material. In the case of elastic body seal (elastomer), leakage values are confirmed within minutes of operation. Leakage rate is measured at room temperature (20 to 30°C).

#### Gas permeation

This is leakage caused by diffusion through the elastic body seal material. As temperature increases, the diffusion rate increases, and in many cases, becomes greater than surface leakage. The diffusion rate is proportional to the cross-sectional area (cm²) of the seal, and inversely proportional to the seal width (distance between the atmosphere and the vacuum side). In the case of metal gaskets, only hydrogen diffusion should be considered.

### 6 Outgassing

This is a phenomenon where gases adhered or adsorbed to the metallic surface or its inside parts are released from the surface and drawn into the vacuum according to the pressure decrease. The smoothness of the surface and closeness of the oxidized layer can effect (increase/decrease) this.

### 7 Ultimate Pressure

Ultimate pressure is P=Q/S, where the sum of mass flow rates for outgassing (Qg) and leakage (Q $\ell$ ) is Q(Pa•m³/s), and the exhaust speed is S(m³/s). The ultimate pressure is measured with Qg, Q $\ell$ S shown as above, and the ultimate pressure of the pump itself. In the case of very low pressure, the exhaust characteristics of the actual pump can be the limiting factor. In particular, a deterioration of exhaust characteristics due to an unclean pump and invasion of the atmospheric moisture can be the major factor.

## 8 Exhaust Time (Low/Medium Vacuum)

The time ( $\triangle$ t) required to exhaust a chamber at low vacuum with volume V ( $\ell$ ), from pressure P1 to P2, using a pump with pumping speed S ( $\ell$ /sec) is  $\triangle$ t=2.3(V/S)log(P1/P2). In high vacuum, this is subject to the ultimate pressure limit imposed by outgassing and leakage as characterised above.

## 9 Baking

Gases such as oxygen and nitrogen, which have a small adsorption activation energy (E) and a short adsorption residence time ( $\tau$ ), are evacuated quickly. However, in the case of water, which has a high activation energy, evacuation does not progress quickly unless the temperature (T: absolute temperature) is raised to shorten residence time. This time is characterised as  $\tau$ = $\tau$ 0 exp(E/RT) where R is the ideal gas constant and  $\tau$ 0=(approx.)  $\tau$ 10-13 sec.

Residence time of water at  $20^{\circ}$ C is  $5.5 \times 10^{-6}$  sec, whereas at  $150^{\circ}$ C, it is  $2.8 \times 10^{-8}$  sec, or about 200 times shorter. The objective of baking is to exhaust water with long adsorption residence time more quickly.



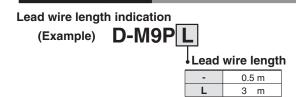
## Series XLAQ/XLDQ

## **Auto Switch Specifications**

## **Auto Switch Common Specifications**

Туре	Reed switch	Solid state switch						
Leakage current	None	3-wire: 100 μA or less 2-wire: 0.8 mA or less						
Operating time	1.2 ms	1 ms or less						
Impact resistance	300 m/s <sup>2</sup>	1000 m/s <sup>2</sup>						
Insulation resistance	50 M $\Omega$ or more at 500 VDC Me	$50~\text{M}\Omega$ or more at $500~\text{VDC}$ Mega (between lead wire and case)						
Withstand voltage	1500 VAC for 1 minute (between lead wire and case)	1000 VAC for 1 minute (between lead wire and case)						
Ambient temperature	-10 to	−10 to 60°C						
Enclosure	IEC529 standard IP67, JIS C	IEC529 standard IP67, JIS C 0920 waterproof construction						

### **Lead Wire Length**



### **Contact Protection Boxes: CD-P11, CD-P12**

#### <Applicable switch model>

D-A9□/A9□V

The auto switches above do not have a built-in contact protection circuit. Therefore, please use a contact protection box with the switch for any of the following cases:

- 1) Where the operation load is an inductive load.
- 2 Where the wiring length to load is greater than 5 m.
- ③ Where the load voltage is 100 VAC, 200 VAC.

The contact life may be shortened. (Due to permanent energising conditions.)

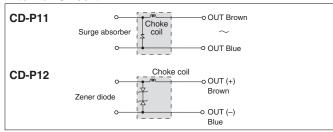
#### **Specifications**

Part no.	CD-	P11	CD-P12
Load voltage	100 VAC	200 VAC	24 VDC
Maximum load current	25 mA	12.5 mA	50 mA

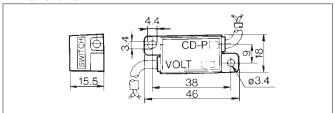
\* Lead wire length — Switch connection side 0.5 m Load connection side 0.5 m



#### **Internal Circuit**



#### **Dimensions**



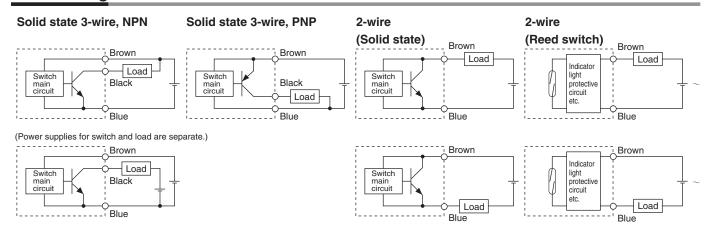
#### Connection

To connect a switch unit to a contact protection box, connect the lead wire from the side of the contact protection box marked SWITCH to the lead wire coming out of the switch unit. Keep the switch as close as possible to the contact protection box, with a lead wire length of no more than 1 metre.



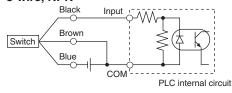
## Series XLAQ/XLDQ Auto Switch Connections and Examples

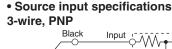
#### **Basic Wiring**

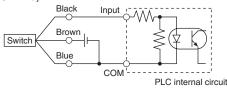


### **Example of Connection to PLC (Programmable Logic Controller)**

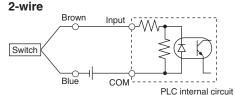
## Sink input specifications3-wire, NPN

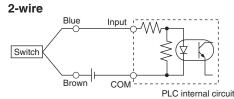






Connect according to the applicable PLC input specifications, since the connection method will vary depending on the PLC input specifications.

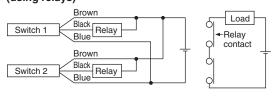




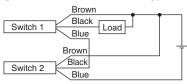
### **Example of AND (Serial) and OR (Parallel) Connection**

#### • 3-wire

## AND connection for NPN output (using relays)

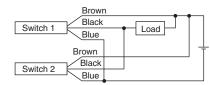


## AND connection for NPN output (performed with switches only)

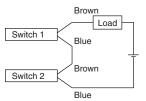


The indicator lights will illuminate when both switches are turned ON.

#### **OR connection for NPN output**



#### 2-wire with 2-switch AND connection

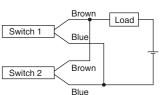


When two switches are connected in series, a load may malfunction because the load voltage will decrease when in the ON state. The indicator lights will illuminate if both of the switches are in the ON state.

Example: Power supply is 24 VDC.

Internal voltage drop in switch is 4 V.

#### 2-wire with 2-switch OR connection



(Solid state)
When two switches are connected in parallel, a malfunction may occur because the load voltage will increase when in the OFF state.

Load voltage at OFF = Leakage current x 2 pcs. x Load impedance = 1 mA x 2 pcs. x 3 k $\Omega$ 

Example: Load impedance is 3 k $\Omega$ . Leakage current from switch is 1 mA.

#### (Reed switch)

Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes dim or not light because of the dispersion and reduction of the current flowing to the switches.



# Solid State Switch: Direct Mounting Style D-M9N/D-M9P/D-M9B

#### Grommet

- 2-wire load current is reduced (2.5 to 40 mA)
- Lead free
- UL certified (style 2844) lead cable is used.



#### **△**Caution

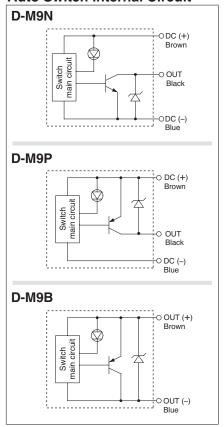
#### **Operating Precautions**

When the cable sheath is stripped, confirm the stripping direction. The insulator may be slit or damaged depending on the direction.





#### **Auto Switch Internal Circuit**



## **Auto Switch Specifications**



PLC: Programmable Logic Controller

		1 = 011 109	Tarririable Legie Controlle		
D-M9□ (With indicator light)					
Auto switch part no.	D-M9N	D-M9P	D-M9B		
Wiring type	3-v	vire	2-wire		
Output type	NPN	PNP	_		
Applicable load	IC circuit, F	Relay, PLC	24 VDC relay, PLC		
Power supply voltage	5, 12, 24 VDC	C (4.5 to 28 V)	_		
Current consumption	10 mA	or less	_		
Load voltage	28 VDC or less	_	24 VDC (10 to 28 VDC)		
Load current	40 mA	40 mA or less			
Internal voltage drop	0.8 V	4 V or less			
Leakage current	100 μA or les	0.8 mA or less			
Indicator light	Red LED illuminates when ON.				

Lead wires

Oilproof heavy-duty vinyl cable: ø2.7 x 3.2 ellipse D-M9B 0.15 mm² x 2 cores D-M9N/D-M9P 0.15 mm² x 3 cores

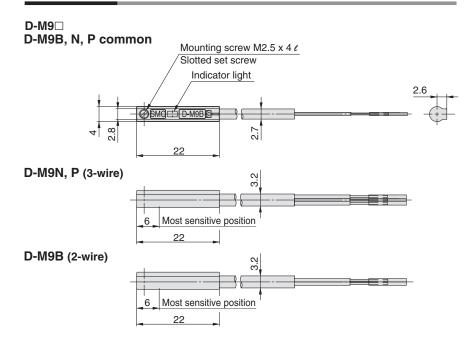
Note 1) Refer to page 9 for solid state switch common specifications.

Note 2) Refer to page 9 for lead wire lengths.

#### Weight

Auto switch part no.		D-M9N	D-M9P	D-M9B
Lead wire length	0.5	8	8	7
(m)	3	41	41	38

#### **Dimensions**



Unit: g

# Reed Switch: Direct Mounting Style D-A90/D-A93

 $\epsilon$ 

#### Grommet Electrical entry direction: In-line

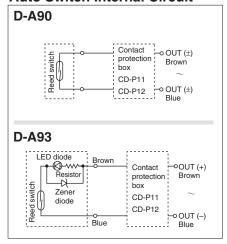


#### **∧**Caution

#### **Operating Precautions**

Fix the switch with the existing screw installed on the switch body. The switch may be damaged if a screw other than the one supplied, is used.

#### **Auto Switch Internal Circuit**



- Note) ① In a case where the operation load is an inductive load.
  - ② In a case where the wiring load is greater than 5 m.
  - ③ In a case where the load voltage is 100 VAC.

Use the auto switch with a contact protection box in any of the above mentioned cases.

(For details about the contact protection box, refer to page 9.)

### **Auto Switch Specifications**



PLC: Programmable Logic Controller

D-A90 (Without indicator light)					
Auto switch part no.		D-A	<b>1</b> 90		
Applicable load		IC circuit, F	Relay, PLC		
Load voltage	24 V AC/DC or less	48 V AC/[	OC or less	100 V AC/DC or less	
Maximum load current	50 mA	40	mA	20 mA	
Contact protection circuit		No	ne		
Internal resistance	1 Ω or les	s (including l	ead wire leng	th of 3 m)	
D-A93 (With in	D-A93 (With indicator light)				
Auto switch part no.		D-A93			
Applicable load		Relay	, PLC		
Load voltage	24 VDC			100 VAC	
Load current range and max. load current	5 to 40 mA 5 to 20 mA		5 to 20 mA		
Contact protection circuit	None				
Internal voltage drop	D-A93 — 2.4 V or less (to 20 mA)/3 V or less (to 40 mA)				
Indicator light	Re	d LED illumir	nates when C	N.	

Lead wires

D-A90/D-A93 — Oilproof heavy-duty vinyl cable: ø2.7, 0.18 mm² x 2 cores (Brown, Blue), 0.5 m Note 1) Refer to page 9 for reed switch common specifications. Note 2) Refer to page 9 for lead wire lengths.

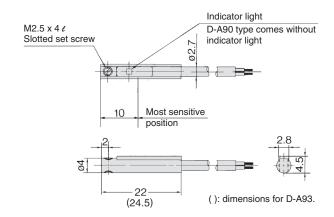
#### Weight

Unit: g

Auto switch part no	. D-A90	D-A93
Lead wire length: 0.5 r	m 6	6
Lead wire length: 3 m	30	30

#### **Dimensions**

#### D-A90/D-A93





# Series XLAQ/XLDQ Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by labels of **"Caution"**, **"Warning"** or **"Danger"**. To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

**Caution**: Operator error could result in injury or equipment damage.

**Warning:** Operator error could result in serious injury or loss of life.

**Danger**: In extreme conditions, there is a possible result of serious injury or loss of life.

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

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

## **Warning**

1. The compatibility of the pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or post analysis and/or tests to meet the specific requirements. The expected performance and safety assurance are the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

- 3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.
  - 1. Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driven objects have been confirmed.
  - 2. When equipment is removed, confirm that safety process as mentioned above. Turn off the supply pressure for this equipment and exhaust all residual compressed air in the system.
  - 3. Before machinery/equipment is restarted, take measures to prevent quick extension of a cylinder piston rod, etc.
- 4. Contact SMC if the product will be used in any of the following conditions:
  - 1. Conditions and environments beyond the given specifications, or if product is used outdoors.
  - 2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
  - 3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.





# Series XLAQ/XLDQ Specific Product Precautions 1

Be sure to read this before handling.

#### **Caution on Design**

## **⚠** Warning

#### All models

- The body material is alluminum alloy 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.
- Select materials for the actuation pressure piping, and heat resistance for fittings that are suitable for the applicable operating temperatures.

#### Model with auto switch

 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

#### Selection

## **⚠** Caution

#### All models

- 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.
- 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.

#### 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.
- When using with auto switches, secure the lead wires so that they have sufficient slack, without any unreasonable force applied to them.
- 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.

#### Mounting

## **∧** Caution

## High-temperature type (Temperature specifications/H0, H2, H3)

- 1. In models with heater (thermistor), take care not to damage the insulation components of the lead wires and connector section.
- 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.
- 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.
- 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

- Before mounting, clean the surface of the flange seal and the Oring 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. When using an outer ring, be sure that the O-ring is compressed sufficiently. (There is basically no problem with the outer ring.)

#### **Maintenance**

## **⚠** Caution

- 1. Observe the caution plate during maintenance.
- 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."
- 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 instruction manual for replacement instructions.







# Series XLAQ/XLDQ Specific Product Precautions 2

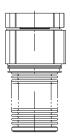
Be sure to read this before handling.

#### **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					
Model			16	16 25 40		50			
	General	_	XLAQ16-30-1	XLAQ25-30-1	XLAQ40-30-1	XLAQ50-30-1			
XLAQ	use	0	XLAQ16A-30-1	XLAQ25A-30-1	XLAQ40A-30-1	XLAQ50A-30-1			
ALAG	High	_	XLAQ16-30-1H	XLAQ25-30-1H	XLAQ40-30-1H	XLAQ50-30-1H			
	temperature	0	XLAQ16A-30-1H	XLAQ25A-30-1H	XLAQ40A-30-1H	XLAQ50A-30-1H			
XLDQ	General use	0:	<del></del>	_	XLDQ40-30-1	XLDQ50-30-1			
ALDQ	High temperature	Standard	<u> </u>	_	XLDQ40-30-1H	XLDQ50-30-1H			

Note) 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.

#### External Seal/Valve Seal/S Valve Seal Assembly

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

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.

#### Table 1

#### **Optional Seal Material**

- p									
Symbol	-XN1	-XP1	-XQ1	-XR1	-XR2	-XR3	-XS1	-XT1	-XU1
Seal material	EPDM	Barrel Perfluoro <sup>®</sup>	FFKM	Chemraz <sup>®</sup>		VMQ	FKM for PLASMA	ULTIC ARMOR®	
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.

Note 2) Refer to "Construction" of each series for the construction numbers.

<sup>\*</sup> Produced by Mitsubishi Cable Industries, Ltd.



## **⚠** Safety Instructions

**⚠** Warning:

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.

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

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

------

Danger indicates a hazard with a high level of risk Danger: which, if not avoided, will result in death or serious injury. \*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 10218-1: Manipulating industrial robots - Safety.

#### **⚠** 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 catalogue 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.

- not service or attempt to remove product 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
  - 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 catalogue.
  - 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.

## 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 the product is delivered, wichever 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 catalogue for the particular
  - \*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

#### 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 regulations 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.

#### **∕**∴Caution

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

The product herein described is basically provided for peaceful use in manufacturing

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.

#### **∕**∴Caution

SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

#### /!\ Safety Instructions |

Be sure to read "Handling Precautions for SMC Products" (M-E03-3) before using.

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₹ +44 (0)845 121 5122 www.smc.uk

## **Normal Close High Vacuum Solenoid Valve**

Minimum operating pressure

# $1 \times 10^{-6^{*1}}$ Pa(abs)

## Leakage

Internal

1.3 x 10<sup>-9</sup> Pa·m<sup>3</sup>/s

**External** 

1.3 x 10<sup>-11</sup> Pa·m<sup>3</sup>/s



## **■ Power consumption**

25 % reduction

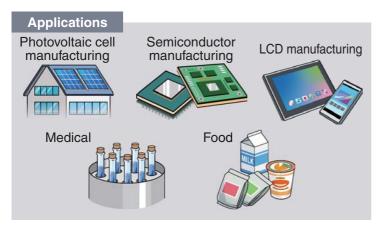
Size	XSA [W]	Previous model [W]
XSA1	4.5	6
XSA2	7	8
XSA3	10.5	11.5

**Weight** 

\*1 XSA2-22

**7**0 lighter





## Fluid temperature

5 to 60 °c

Reverse pressure potential

**0.5** MPa(G)\*<sup>1</sup>

1 XSA1-12 (Refer to the Specifications on page 3.)

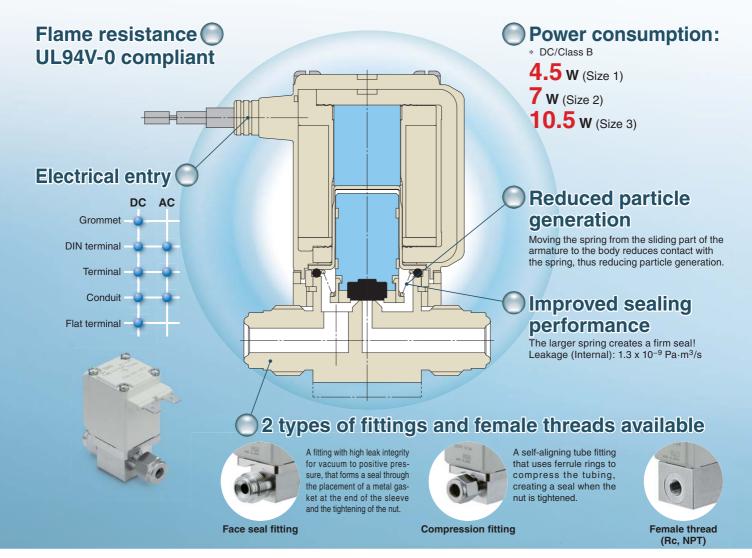
#### Rated voltage

AC	100 V, 200 V, 110 V, 220 V, 240 V, 48 V, 24 V, 230 V
DC	24 V, 12 V



XSA Series





#### **Variations**

	Model		Orifice o	diameter		Fitting	/Port size	(inch)	Minimum operating pressure	Leakage Pa⋅m³/s				
Face seal fitting	Model	Ø 2	Ø 3	Ø 4.5	Ø 6	1/4		3/8	Pa(abs)	Internal	External			
Compression fitting	XSA1	•	•	_	_	•		_						
	XSA2	_	•	•	•	• •		•	1 x 10 <sup>-6</sup>	1.3 x 10 <sup>-9</sup>	1.3 x 10 <sup>-11</sup>			
·······································	XSA3	_	_	•	•	•		•	]					
	Madal		Orifice o	diameter		Female	thread (F	Rc, NPT)	Minimum operating pressure	Leakage	1.3 x 10 <sup>-9</sup> 1.3 x 10 <sup>-11</sup> Leakage Pa⋅m³/s  Internal External			
	Model	Ø 2	Ø 3	Ø 4.5	Ø 6	1/8	1/4	3/8	Pa(abs)	Internal	External			
Female thread (Rc, NPT)	XSA1	•	•	_	_	•	_	_						
(no, Nr 1)	XSA2	_	•	•	_	_	•	_	1 x 10 <sup>-6</sup>	1.3 x 10 <sup>-9</sup>	1.3 x 10 <sup>-11</sup>			
	XSA3								1					



## Normal Close High Vacuum Solenoid Valve

XSA Series



\*1 Excluding grommet/AC

#### **How to Order** Face seal fitting XSA 1 S-5G2-**Compression fitting** Face seal fitting Female thread type Female thread type **Orifice diameter** Fitting size Valve size Spacer Face seal fitting/Compression fitting None 1/4 With spacer 2 ØЗ The spacer is used to raise the body when fastening it onto a flat 2 Size 2 2 ØЗ 2 1/4 area. Refer to the table below if 3 Ø 4.5 3 3/8 spacers are required separately. 4 Ø 6 3 Size 3 3 Ø 4.5 2 1/4 Ø6 3 3/8 Female thread type Ø2 1/8 Size 1 1 2 ØЗ 2 2 Size 2 Øз 2 1/4 3 Ø 4.5 3 Size 3 3 Ø 4.5 3/8

## Fitting type Face seal fitting/Compression fitting

٧	Face seal fitting
S	Compression fitting

#### Female thread type

Р	Rc female thread
N	NPT female thread

#### **Voltage**

1	100 V AC
2	200 V AC
3	110 V AC
4	220 V AC
5	24 V DC
6	12 V DC
7	240 V AC
8	48 V AC
В	24 V AC
J	230 V AC

## Table: Spacer Part No. (Applicable to the face seal fitting/compression fitting)

Ø6

Model	Part no.
XSA1	XSA1R-8-1
XSA2	XSA2R-8-1
XSA3	7072N-0-1

• Ele	ectrical entry		DC	AC
G	Grommet		•	ı
GS	Grommet (With surge voltage suppressor)		•	*1
D	DIN terminal (With surge voltage suppressor)		•	•
DL	DIN terminal with light (With surge voltage suppressor)		•	•
DO	DIN terminal without connector (With surge voltage suppressor)		•	•
т	Terminal (With surge voltage suppressor)		•	•
TL	Terminal with light (With surge voltage suppressor)		•	•
С	Conduit (With surge voltage suppressor)		•	•
F	Flat terminal		•	_
		*1 Not CE-		ا مرداد

\*1 Not CE-compliant

For the special option below, refer to page 7.

Special	electrical	entry	direction

2

## XSA Series

#### **Specifications**

Model		XSA1-1 <sup>1</sup> <sub>2</sub>	XSA1-2 <sup>1</sup>	XSA2-22	XSA2-32	XSA2-43*3	XSA3-3 <sup>2</sup>	XSA3-43					
Action					Normally closed	t							
Fluid		Air, Inert gas											
Orifice diameter mmØ		2 3 4.5				6	4.5	6					
Withstand pressure MPa	a(G)	1.5											
Minimum operating pressure	Pa(abs)/OUT side	1 x 10 <sup>-6</sup>											
Maximum operating pressure		1.0											
Maximum operating pressure	8.0	0.3	1.0	0.3	0.1	0.8	0.3						
Reverse pressure potent	0.5	0.25	0.4	0.2	0.05	0.2	0.15						
Leakage Pa·m³/s *4	1.3 x 10 <sup>-9</sup>												
Leakage Pailins	External	1.3 x 10 <sup>-11</sup>											
Piping connection syster	n	Face seal fitting/Compression fitting/(Rc, NPT) Female thread											
Connection size	Face seal fitting (inch) Compression fitting (inch)		1.	/4		3/8	1/4	3/8					
	(Rc, NPT) Female thread	1,	/8	1.	1/4 —			/8					
Ambient and fluid temper	rature °C	5 to 60											
Rated voltage *5		100/110/200/220/230/240/24/48 V AC 12/24 V DC											
Power consumption W *6	DC	4	.5		7		10.5						
Apparent power VA *6	AC	-	7		9.5	12							
Coil temperature rise °C *7	DC	5	0		55		6	5					
Con temperature rise C	AC	6	0		70		7	0					
Allowable voltage fluctua	ition			±10 % or	less of the rate	d voltage							
Allowable leakage voltage	DC			2 % or I	ess of the rated	l voltage							
Allowable leakage voltage	AC			5 % or I	ess of the rated	voltage							
Coil insulation type					Class B	·							
	Face seal fitting	0.	28	0.	41	0.42	0.53	0.62					
Weight kg *8	Compression fitting	0.	28	0.	41	0.42	0.53	0.55					
	(Rc, NPT) Female thread	0.	33	0.	33	_	0.74	0.74					

<sup>\*1</sup> The operating pressure differential indicates the difference between Port 1 (high pressure side) and Port 2 (low pressure side). Example) In the case of 0.3 MPa, Port 2 is a vacuum (1 Torr or less), while Port 1 can be pressurised to 0.2 MPa(G).

- \*2 The reverse pressure potential indicates the pressure which can be applied from Port 2 when Port 1 is at atmospheric pressure.
- \*3 Face seal fitting/compression fitting only
- \*4 Leakage when the ambient temperature is at 20  $^{\circ}$ C and there is 0.1 MPa of differential pressure. Gas permeation is not included.
- \*5 AC type is equipped with full-wave rectifier.
- \*6 Power consumption/Apparent power: The value when there is an ambient temperature of 20 °C and when the rated voltage is applied. (Variation: ±10 %)
- \*7 The value when there is an ambient temperature of 20 °C and when the rated voltage is applied. The value depends on the ambient environment. This is for reference.
- \*8 Indicates case of grommet type

#### Flow Rate Characteristics

#### Face seal fitting/Compression fitting

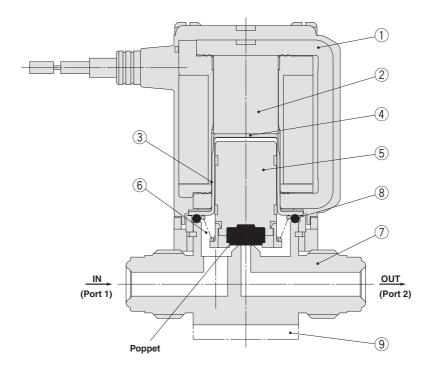
		XSA1-12	XSA1-22	XSA2-22	XSA2-32	XSA2-43	XSA3-32	XSA3-43
Flow rate characteristics	C[dm <sup>3</sup> /(s·bar)]	0.55	1.07	1.07	1.51	2.78	1.54	2.89
1 low rate characteristics	b	0.41	0.36	0.34	0.24	0.21	0.24	0.21

#### (Rc, NPT) Female thread

· / /							
		XSA1-11	XSA1-21	XSA2-22	XSA2-32	XSA3-33	XSA3-43
Flow rate characteristics	C[dm <sup>3</sup> /(s·bar)]	0.54	1.14	1.14	2.23	2.37	3.50
	b	0.36	0.39	0.42	0.38	0.40	0.15



## **Construction/Operation**



#### **Component Parts**

No.	Description	Material
1	Solenoid coil	Cu + Fe + Resin
2	Core	Fe
3	Tube	Stainless steel
4	Seat (PET seat to shut the residual magnetism)	PET
5	Armature assembly	FKM, Stainless steel, Resin (PPS)
6	Spring	Stainless steel
7	Body	Stainless steel
8	O-ring	FKM
9	Spacer	Al

#### : Parts in contact with gas

#### <Option>

9 Spacer (Face seal fitting/compression fitting only): The spacer is used to raise the body when fastening it onto a flat area.

#### <Operating principle>

By energising the solenoid coil ①, the armature assembly ⑤ overcomes the composite force, which consists of the force acting on the poppet due to differential pressure and the reactive force of the spring ⑥, and is adsorbed to the core ② side, thus opening the poppet.

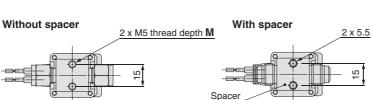
When the energising of the solenoid coil ① is canceled, the armature assembly ⑤ is separated from the core ② side by the reactive force of the spring ⑥, thus closing the poppet.



## XSA Series

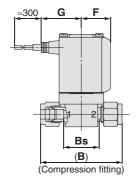
## **Dimensions: Face Seal Fitting, Compression Fitting**

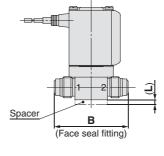
#### **Grommet: G**

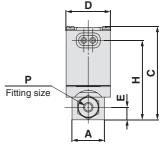




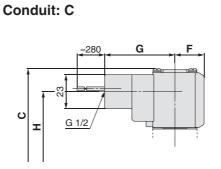
Fitting size

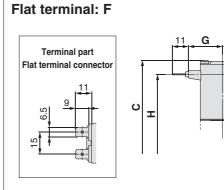


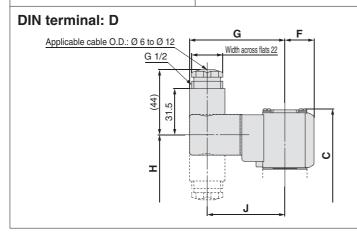


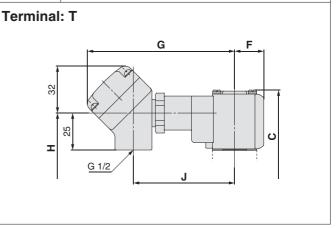


**Grommet: GS** 

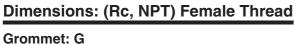




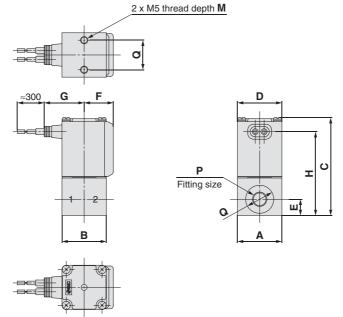


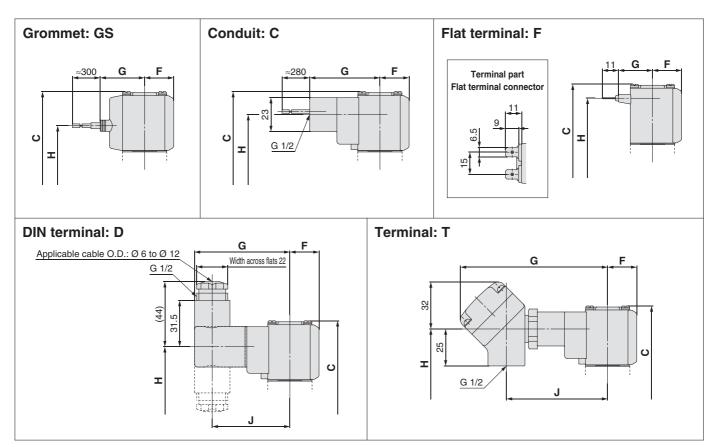


Dimensi	ons																							[mm]
Model	Α	В	Bs	С	D	D E F L M		Р	Grom	met: G	Gromn	net: GS	Cond	uit: C	Flat ter	minal: F	DIN terminal: D			Terminal: T		: T		
Model	4	В	D5		ט		Г	_	IVI	[inch]	G	Н	G	Н	G	Ι	G	Н	G	Н	J	G	Ι	J
XSA1-□2S	22	55	24	63	30	8.5	20	3	8		27	53.5	30	40	47.5	47.5	23	53.5	64.5	45.5	52.5	00.5	47.5	68.5
XSA1-□2V	22	50	_	03	30	0.5	20	3	0	1/4	21	33.3	30	40	47.5	47.5	23	33.3	04.5	45.5	32.3	99.5	47.5	00.5
XSA2-□2S		63	31.5							1/4														
XSA2-□2V		56	_	73.5	35		22				29.5	63	32.5	49.5	50	57	25.5	63	67	55	55	102	57	71
XSA2-43S		64.5	31		35		22			3/8	50		20.0		07		33	102		/ 1				
XSA2-43V	25	67	_			11.5		5	10	3/0					1						1			
XSA3-32S	25	63	31.5	78		11.5		5	10	1/4		67.5		54		61.5		67.5		E0 E			61.5	
XSA3-32V		56	_	/0	40		24.5			1/4	00	67.5	35	54		61.5	28	67.5	CO F	59.5	F7 F	104 5	61.5	70.5
XSA3-43S		64.5	31		40		24.5			0/0	32		35		52.5		28		69.5		57.5	104.5		73.5
XSA3-43V		67	_	82.5						3/8		72	[	58.5	[	66		72		64	1		66	
5	5 SMC																							









<b>Dimensions</b> [mm]																							
Model	Λ	В	2	ם	_	_	B/I	Р	0	Gromi	net: G	Gromm	et: GS	Cond	luit: C	Flat teri	minal: F	DIN :	termin	al: D	Te	rminal	: T
Model	Α	D	C	ט	_	Г	IVI	P	Q	G	Н	G	Н	G	Н	G	Н	G	Н	J	G	Н	J
XSA1-□1P(N)	30	30	66	30	11	20	8	1/8	Ø 19	27	56.5	30	43	47.5	50.5	23	56.5	64.5	48.5	52.5	99.5	50.5	68.5
XSA2-□2P(N)	36	36	79	35	14	22	10	1/4	Ø 24	29.5	68.5	32.5	55	50	62.5	25.5	68.5	67	60.5	55	102	62.5	71
XSA3-□3P(N)	40	40	88	40	16.5	24.5	10	3/8	Ø 29	32	77.5	35	64	52.5	71.5	28	77.5	69.5	69.5	57.5	104.5	71.5	73.5

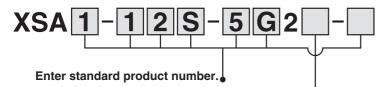
## XSA Series

# **Special Option/Replacement Parts**

#### **Special Option**



## **Special Electrical Entry Direction**



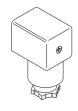
#### Special electrical entry direction

Opoon	ai electricai entry un ection •
Symbol	Electrical entry direction
A	90° 90° OUT
В	180° 180° OUT
С	270° OUT

#### **Replacement Parts**

• DIN Connector Part No.

## <For Class B Coil>



Electrical option	Rated voltage	Connector part no.
Liectrical option	24 V DC	Confidence part no.
	12 V DC	
	100 V AC	
	110 V AC	
None	200 V AC	C18312G6GCU
None	220 V AC	C16312G6GC0
	230 V AC	
	240 V AC	
	24 V AC	
	48 V AC	
	24 V DC	GDM2A-L5
	12 V DC	GDM2A-L6
	100 V AC	GDM2A-L1
	110 V AC	GDM2A-L1
Mith light	200 V AC	GDM2A-L2
With light	220 V AC	GDM2A-L2
	230 V AC	GDM2A-L2
	240 V AC	GDM2A-L2
	24 V AC	GDM2A-L5
	48 V AC	GDM2A-L15

 Select an appropriate DIN connector suitable for the coil insulation type.

- Gasket Part No. for DIN Connector
   VCW20-1-29-1 (For Class B Coil)
- Lead Wire Assembly for Flat Terminal (Set of 2 pcs.)

VX021S-1-16FB





# XSA Series Specific Product Precautions 1

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For common precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website: http://www.smcworld.com

#### Design

## **Marning**

1. Cannot be used as an emergency shutoff valve, etc.

The valve presented in this catalogue is not designed for safety applications such as an emergency shutoff valve. If valves are used in this type of system, other reliable safety assurance measures should also be adopted.

2. Extended periods of continuous energisation

The solenoid coil will generate heat when continuously energised. Avoid using in a tightly shut container. Install the valve in a well ventilated area. Furthermore, do not touch it while it is being energised or right after it has been energised.

#### Selection

## **Marning**

#### 1. Fluid

1) Type of fluid

Before using a fluid, check whether it is compatible with the materials of each model by referring to the fluids listed in this catalogue. (Refer to the Component Parts on page 4.)

#### 2. Fluid quality

#### <Air>

1) Use clean air.

Do not use compressed air that contains chemicals, synthetic oils that include organic solvents, salt, corrosive gases, etc., as it can cause damage or malfunction.

2) Install an air filter, if necessary.

Install an air filter close to the valve on the upstream side. A filtration size of 5  $\mu m$  or smaller should be selected.

3) Install an aftercooler or air dryer, if necessary.

Compressed air that contains excessive drainage may cause the malfunction of the valve or other pneumatic equipment. To prevent this, install an aftercooler, air dryer, etc.

 If excessive carbon powder is generated, eliminate it by installing a mist separator on the upstream side of the valve.

If excessive carbon powder is generated by the compressor, it may adhere to the inside of the valve and cause a malfunction

Refer to "SMC Air Preparation System" for further details on compressed air quality.

#### <Vacuum>

Vacuum piping direction: Connect the piping so that the pressure in the secondary side is lower.

Avoid the entry of foreign matter.

#### 3. Ambient environment

Use within the operable ambient temperature range. Check the compatibility between the product's composition materials and the ambient atmosphere. Be certain that the fluid used does not touch the external surface of the product.

#### Selection

## **Marning**

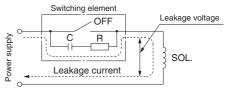
4. Countermeasures against static electricity

Take measures to prevent static electricity since some fluids can cause static electricity.

## **⚠** Caution

1. Leakage voltage

Particularly when using a resistor in parallel with a switching element and when using a C-R element (surge voltage suppressor) to protect the switching element, take note that leakage current will flow through the resistor, C-R element, etc., which may prevent the valve from turning off.



AC coil: 5 % or less of the rated voltage DC coil: 2 % or less of the rated voltage

#### Mounting

## **△** Warning

1. If air leakage increases or equipment does not operate properly, stop operation.

After mounting is completed, confirm that it has been done correctly by performing a suitable function test.

2. Do not apply external force to the coil section.

When tightening is performed, apply a wrench or other tool to the outside of the piping connection ports.

The solenoid valve can be mounted in any direction, but the recommended mounting direction of the coil is upward.

When mounting a valve with its coil positioned downward, foreign matter in the fluid will adhere to the iron core, leading to a malfunction. Especially for strict leakage control, the coil must be positioned upward.

- **4.** Do not warm the coil assembly with a heat insulator, etc. Use tape, heaters, etc., for freeze prevention on the piping and body only. Warming the coil can cause it to burn out.
- Avoid sources of vibration, or adjust the arm from the body to the minimum length so that resonance will not occur.
- 6. Painting and coating

Warnings or specifications printed or labelled on the product should not be erased, removed, or covered up.





# XSA Series Specific Product Precautions 2

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For common precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website: http://www.smcworld.com

#### **Piping**

## **⚠** Caution

#### 1. Preparation before piping

Before mounting, clean the sealing surface with ethanol, etc.

2. Avoid connecting ground lines to piping, as this may cause the electric corrosion of the system.

#### 3. Tightening

Tighten the fitting or female thread as follows.

After tightening, confirm that there is no leakage from the fitting.

#### **Tightening of Fitting**

Face seal fitting	1/8 turn after tightening by hand
Compression fitting	1 1/4 turns after tightening by hand

#### **Tightening of Female Thread**

NPT, Rc 1/8	7 to 9 N⋅m
NPT, Rc 1/4	12 to 14 N·m
NPT, Rc 3/8	22 to 24 N·m

#### 4. Connection of piping to products

When connecting piping to a product, avoid mistakes regarding the supply port, etc.

#### Wiring

## **⚠** Caution

- 1. As a rule, use electrical wire with a cross sectional area of 0.5 to 1.25 mm<sup>2</sup> for wiring.
  - Furthermore, do not allow excessive force to be applied to the lines.
- 2. Use electrical circuits which do not generate chattering in their contacts.
- 3. Use a voltage which is within  $\pm 10$  % of the rated voltage. In cases with a DC power supply where importance is placed on responsiveness, stay within  $\pm 5$  % of the rated value. The voltage drop is the value in the lead wire section connecting the coil.
- 4. When a surge from the solenoid affects the electrical circuitry, install a surge voltage suppressor, etc., in parallel with the solenoid. Or, select an option that comes with a surge voltage protection circuit. (However, a surge voltage occurs even if the surge voltage protection circuit is used. For details, please consult with SMC.)

### **Operating Environment**

## ⚠ Warning

- 1. Do not use in an atmosphere containing corrosive gases, chemicals, sea water, water, water vapour, or where there is direct contact with any of these.
- 2. Do not use in explosive atmospheres.
- 3. Do not use in locations subject to vibration or impact.
- 4. Do not use in locations where radiated heat will be received from nearby heat sources.
- Employ suitable protective measures in locations where there is contact with water droplets, oil, welding spatter, etc.

#### **Maintenance**

## **⚠** Warning

#### 1. Removing the product

Confirm that the valve temperature has dropped sufficiently before performing work. If touched inadvertently, there is a danger of being burned.

- Shut off the fluid supply and release the fluid pressure in the system.
- 2) Shut off the power supply.
- 3) Dismount the product.

#### 2. Low frequency operation

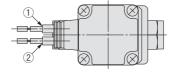
Switch valves at least once every 30 days to prevent a malfunction. Also, in order to use them under the optimum state, conduct a regular inspection biannually.

#### **Electrical Connections**

## **∧** Caution

#### **■** Grommet

Class B coil: AWG20 Insulator O.D. 2.5 mm

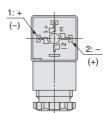


Rated voltage	Lead wire colour			
hateu voitage	1	2		
DC	Black	Red		
100 V AC	Blue	Blue		
200 V AC	Red	Red		
Other AC	Grey	Grey		

<sup>\*</sup> There is no polarity.

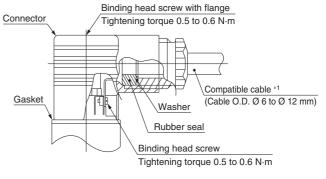
#### **■** DIN terminal

Internal connections for the DIN terminal are shown below. Please make connections to the power supply accordingly.



Terminal no.	1	2
DIN terminal	+ (-)	- (+)

- \* There is no polarity.
- Use a heavy-duty cord with a cable O.D. of Ø 6 to Ø 12 mm.
- Use the tightening torques below for each section.



<sup>\*1</sup> For cables with an O.D. of Ø 9 to Ø 12 mm, remove the internal parts of the rubber seal before using.



# XSA Series Specific Product Precautions 3

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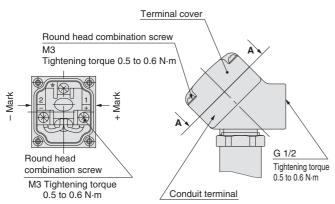
#### **Electrical Connections**

## **∧** Caution

#### ■ Conduit terminal

In the case of the conduit terminal, make connections according to the marks shown below.

- Use the tightening torques below for each section.
- Properly seal the terminal connection (G 1/2) with the special wiring conduit, etc.



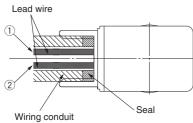
View A-A

(Internal connection diagram)

#### **■** Conduit

Use the tightening torque below for the conduit.

Class B coil: AWG20 Insulator O.D. 2.5 mm



(Bore size G 1/2 Tightening torque 0.5 to 0.6 N·m)

Rated voltage	Lead wire colour			
nateu voitage	1)	2		
DC	Black	Red		
100 V AC	Blue	Blue		
200 V AC	Red	Red		
Other AC	Grey	Grey		

<sup>\*</sup> There is no polarity.

Description	Part no.
Seal	VCW20-15-6

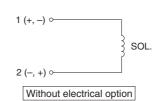
<sup>\*</sup> Please order separately.

#### **Electrical Circuits**

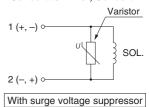
## **⚠** Caution

[DC circuit]

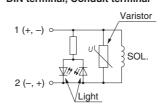
Grommet, Flat terminal



Grommet, DIN terminal, Conduit terminal, Conduit



DIN terminal, Conduit terminal

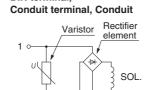


With light/surge voltage suppressor

#### [AC circuit]

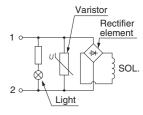
DIN terminal

For AC, the standard product is equipped with a surge voltage suppressor.



Without electrical option

## DIN terminal, Conduit terminal



With light/surge voltage suppressor

## **⚠** 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.

Caution indicates a hazard with a low level of risk which if not avoided could result in minor or mode

which, if not avoided, could result in minor or moderate injury

njury.

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.

\*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 10218-1: Manipulating industrial robots - Safety.

#### ⚠ Warning

 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 catalogue 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.
  - 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.
  - 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.
  - Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.
  - 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 catalogue.
  - 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.

## 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, wichever 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.
- Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue 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**

- 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 regulations 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.

#### **A** 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.

#### **∧** Caution

 $\ensuremath{\mathsf{SMC}}$  products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country. Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

#### Safety Instructions

Be sure to read "Handling Precautions for SMC Products" (M-E03-3) before using.

#### SMC Corporation (Europe)

Austria Belgium Bulgaria Croatia Czech Republic Denmark Estonia Finland France Germany Greece Hungary	☎ +43 (0)2262622800 ☎ +32 (0)33551464 ☎ +359 (0)2807670 ☎ +385 (0)13707288 ☎ +420 541424611 ☎ +45 70252900 ☎ +372 6510370 ☎ +358 207513513 ☎ +33 (0)164761000 ☎ +49 (0)61034020 ☎ +30 210 2717265 ☎ +36 23511390	www.smc.at www.smcpneumatics.be www.smc.bg www.smc.hr www.smc.cz www.smcdk.com www.smcpneumatics.ee www.smc.fi www.smc-france.fr www.smc.de www.smc.hu	office@smc.at info@smcpneumatics.be office@smc.bg office@smc.hr office@smc.cz smc@smcdk.com smc@smcpneumatics.ee smcfi@smc.fi info@smc.farance.fr info@smc.de sales@smchellas.gr office@smc.hu	Lithuania Netherlands Norway Poland Portugal Romania Russia Slovakia Slovenia Spain Sweden Switzerland	### 370 5 2308118    34 370 5 2308118   43 6 (0)205318888   44 7 67129020   448 222119600   43 1 226166570   440 213205111   47 8127185445   421 (0)413213212   4386 (0)73885412   434 902184100   446 (0)86031200   441 (0)523963131	www.smclt.lt www.smcpneumatics.nl www.smc-norge.no www.smc.pl www.smc.eu www.smcromania.ro www.smc-pneumatik.ru www.smc.si www.smc.si www.smc.eu www.smc.nu www.smc.ch	info@smclt.lt info@smcpneumatics.nl post@smc-norge.no office@smc.pl postpt@smc.smces.es smcromania@smcromania.ro info@smc-pneumatik.ru office@smc.sk office@smc.si post@smc.smces.es post@smc.nu info@smc.nu
		•	•		\ /		1
Ireland	<b>2</b> +353 (0)14039000	www.smcpneumatics.ie	sales@smcpneumatics.ie	Turkey	<b>2</b> +90 212 489 0 440	www.smcpnomatik.com.tr	info@smcpnomatik.com.tr
Italy	<b>2</b> +39 0292711	www.smcitalia.it	mailbox@smcitalia.it	UK	<b>*</b> +44 (0)845 121 5122	www.smcpneumatics.co.uk	sales@smcpneumatics.co.uk
Latvia	<b>2</b> +371 67817700	www.smclv.lv	info@smclv.lv		` '	'	·

## **Process Gas**

# Diaphragm Valve



# For wide variety of applications from semiconductor to general.

Multiple port available in various configurations Compression, Rc, R, NPT

Cleaned for O<sub>2</sub> service

## **Air Operated Type** Series AK3542/4542

- Compact and lightweight by making the actuator shorter
- M5 actuation port

280 g 1 57 mm

## **Manually Operated Type** Series AK3652/4652

- Compact and lightweight by modifying the knob design
- The knob is a unique design that combines a scalloped round knob with a raised rectangular section to provide two choices of gripping.

Actuation is 90 degrees open to closed with a cutout window, on both sides of raised rectangular section, providing visual status of open or closed state.





Direction of a raised rectangular section indicate open/close status





Series AK





## **Air Operated Type**

Series AK3542/AK4542



## **Manually Operated Type**

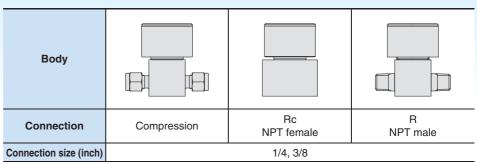
Series AK3652/AK4652



## Body material

316 SS Passivation internals

## ■ Various configurations available



## Air Operated Type

		Series	Status	Body material	Max. operating pressure	Cv Note)	Connections	Page
		Series	Status	body material	psig (MPa)	CV No.c.)	Fitting	Page
>	日面田	AK3542	N.C	216.00	105 (0.0)	0.29	Compression	P.1
Female thread type	Compression	AK4542	N.C.	316 SS	125 (0.9)	0.5	Rc, R, NPT	P.1

## Manually Operated Type

		Series	Knob	Body material	Max. operating pressure	Cv Note)	Connections	Dogo
The same of		Series	KIIOD	Body material	psig (MPa)	CV No.co	Fitting	Page
亩!	日童時	AK3652	Knob with a raised	316 SS	250 (1.7)	0.29	Compression	P.3
Female thread type	Compression	AK4652	section on top (indication window)		250 (1.7)	0.5	Rc, R, NPT	P.3

Note) Cv calculation based on SEMI Standard

## Series AZ

- SEMI standard
- Body material: 316L SS
- Face sealTube weld



Air Operated



Manually Operated Type

For details, refer to the product catalog available on SMC website.



http://www.smcworld.com

#### Precautions for selection

The proper regulator and valve selection can be significantly affected by parameters such as system design, flow duration, frequency of use, ambient conditions and outlet pressure. It is important to understand that one may follow this guide's recommendation, yet have a failure due to a parameter specific to the given application, as noted.

#### **Applicable Fluid**

Process Gas	Molecular Formula	
Argon	Ar	
Halocarbon 114	C <sub>2</sub> Cl <sub>2</sub> F <sub>4</sub>	
Halocarbon 115	C <sub>2</sub> CIF <sub>5</sub>	
Halocarbon 116	C <sub>2</sub> F <sub>6</sub>	
Acetylene	C <sub>2</sub> H <sub>2</sub>	
Halocarbon 134A	C <sub>2</sub> H <sub>2</sub> F <sub>4</sub>	
Halocarbon 125	C₂HF₅	
Halocarbon R218	C <sub>3</sub> F <sub>8</sub>	
Propene	C <sub>3</sub> H <sub>6</sub>	
Propane	C <sub>3</sub> H <sub>8</sub>	
Halocarbon C318	C <sub>4</sub> F <sub>8</sub>	
Butene-1	C <sub>4</sub> H <sub>8</sub>	
Halocarbon 13B1	CBrF <sub>3</sub>	
Halocarbon 12	CCl <sub>2</sub> F <sub>2</sub>	

Process Gas	Molecular Formula
Halocarbon 13	CCIF <sub>3</sub>
Halocarbon 14	CF <sub>4</sub>
Halocarbon 32	CH <sub>2</sub> F <sub>2</sub>
Methane	CH <sub>4</sub>
Halocarbon 23	CHF <sub>3</sub>
Carbon Dioxide	CO <sub>2</sub>
Hydrogen	H <sub>2</sub>
Helium	Не
Krypton	Kr
Nitrogen	N <sub>2</sub>
Neon	Ne
Oxygen	O <sub>2</sub>
Xenon	Xe

· Following \* symbols indicate toxic gas (allowable concentration 200 ppm or less). In Japan, according to METI, pipe thread (Rc, R, NPT etc) should not be used as connections of piping, fittings, and valves installed in gas systems.

Process Gas	Molecular Formula		
Boron 11 Trifluoride*	11BF3		
Arsine*	AsH₃		
Boron Trichloride*	BCl <sub>3</sub>		
Boron Trifluoride*	BF <sub>3</sub>		
Ethylene*	C <sub>2</sub> H <sub>4</sub>		
Dimethylsilane*	C <sub>2</sub> SiH <sub>8</sub>		
Perfluoro-butadiene*	C <sub>4</sub> F <sub>6</sub>		
Octafluorocyclopentene*	C <sub>5</sub> F <sub>8</sub>		
Halocarbon 12B2*	CBr <sub>2</sub> F <sub>2</sub>		
Trimethylsilane*	(CH₃)₃SiH		
Methyl Chloride*	CH₃CI		
Methyl Fluoride*	CH₃F		
Methanol*	CH₃OH		
Methylsilane*	CH₃SiH₃		
Halocarbon 21*	CHCl <sub>2</sub> F		
Chlorine*	Cl <sub>2</sub>		
Chlorine Trifluoride*	CIF <sub>3</sub>		
Carbon Monoxide*	СО		
Germane*	GeH <sub>4</sub>		
Hydrogen Sulfide*	H <sub>2</sub> S		
Hydrogen Selenide*	H <sub>2</sub> Se		
· This applicable fluid is a reference guide and does not apply to product gua			

Process Gas	Molecular Formula
Hydrogen Bromide*	HBr
Hydrogen Chloride*	HCI
Hydrogen Fluoride*	HF
Nitrogen Oxide*	N <sub>2</sub> O
Nitrogen Trifluoride*	NF <sub>3</sub>
Ammonia*	NH <sub>3</sub>
Nitric Oxide*	NO
Phosphorous Pentafluoride*	PF₅
Phosphine*	PH₃
Sulfur Tetrafluoride*	SF <sub>4</sub>
Sulfur Hexafluoride*	SF <sub>6</sub>
Disilane*	Si <sub>2</sub> H <sub>6</sub>
Silicon Tetrachloride*	SiCl <sub>4</sub>
Silicon Tetrafluoride*	SiF <sub>4</sub>
Dichlorosilane*	SiH <sub>2</sub> Cl <sub>2</sub>
Silane*	SiH <sub>4</sub>
Trichlorosilane*	SiHCl₃
Sulfur Dioxide*	SO <sub>2</sub>
Diethyltelluride*	Te(C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub>
Tungsten Hexafluoride*	WF <sub>6</sub>

- · This applicable fluid is a reference guide and does not apply to product guarantee.
- · Please consult SMC for a specific recommendation beyond the scope of this document.



Since the product specified here is used under various operating conditions, its compatibility with fluid and specific equipment must be decided by the person who designs the equipment or decided 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 regardless of any recommendation. Proper installation, operation and maintenance are also required to assure safe, trouble free performance.



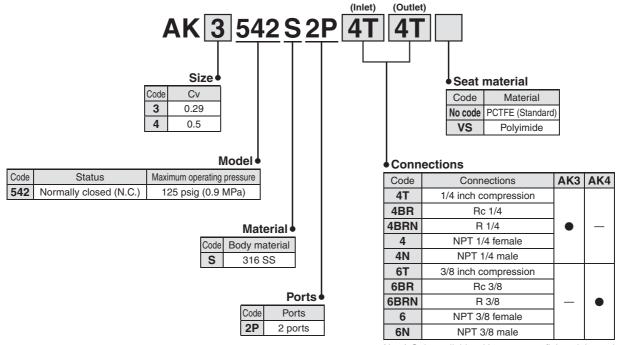
## Series AK3542 & 4542

- Body material: 316 SS
- Normally closed



**How to Order** 

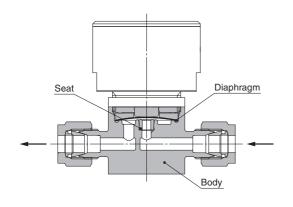
RoHS



Note) Only available with same type fittings inlet and outlet.

#### Construction

#### **AK3542**



#### **Wetted Parts Material**

Wetted Parts	S	
Body	316 SS	
Diaphragm	Ni-Co Alloy	
Seat	PCTFE (Option: Polyimide)	

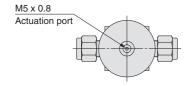
## **Specifications**

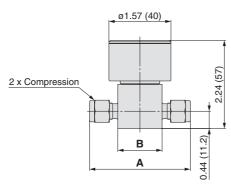
Operating Parameters	AK3542	AK4542		
Status	Normally closed (N.C.)			
Gas	Select compatible materials of construction for the gas			
Operating pressure	Vacuum to 125	Vacuum to 125 psig (0.9 MPa)		
Proof pressure	200 psig (1.4 MPa)			
Ambient and operating temperature	–10 to 71°C	-10 to 71°C (No freezing)		
Cv	0.29	0.5		
Leak rate	1 x 10 <sup>-10</sup> Pa·m³/sec			
Connections	Compression, Rc, R, NPT			
Actuation pressure	60 to 110 psig (0.4 to 0.76 MPa)			
Actuation port connection	M5 x 0.8			
Actuation port location	Тор			
Installation	Bottom mount			
Internal volume	0.06 in <sup>3</sup> (1.07 cm <sup>3</sup> )			
Weight	0.28 kg <sup>Note)</sup>			

Note) Weight for AK3542S2P4T4T including individual boxed weight. It may vary depending on connections or options.

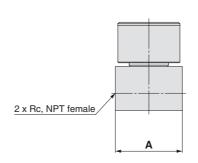
**Dimensions** inch (mm)

#### AK3542 & 4542

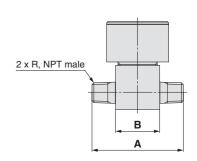




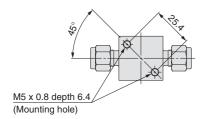




Connections: 4, 6, <sup>4</sup><sub>6</sub>BR



Connections: <sup>4</sup><sub>6</sub>N, <sup>4</sup><sub>6</sub>BRN



Ports	Α		В		Connections
POILS	inch	(mm)	inch	(mm)	Connections
4T	2.56	(65.0)	1.12 sq.	(28.4)	1/4 inch compression
4BR	1.70	(43.2)	_	_	Rc 1/4
4BRN	2.32	(58.9)	1.12 sq.	(28.4)	R 1/4
4	1.70	(43.2)	_	_	NPT 1/4 female
4N	2.32	(58.9)	1.12 sq.	(28.4)	NPT 1/4 male
6T	2.68	(68.1)	1.12 sq.	(28.4)	3/8 inch compression
6BR	2.32	(58.9)	_	_	Rc 3/8
6BRN	2.32	(58.9)	1.12 sq.	(28.4)	R 3/8
6	2.32	(58.9)	_	_	NPT 3/8 female
6N	2.32	(58.9)	1.12 sq.	(28.4)	NPT 3/8 male



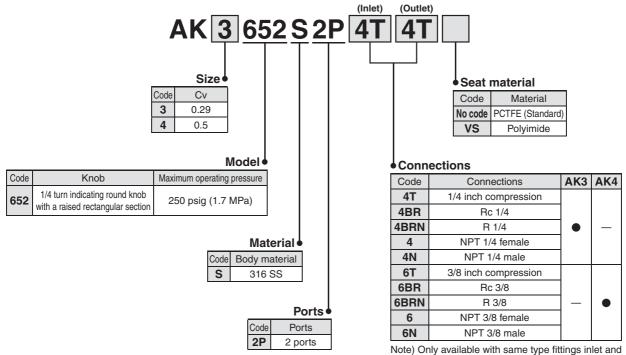
Series AK3652 & 4652

Body material: 316 SS



#### **How to Order**

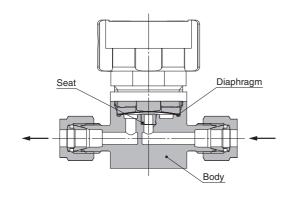
RoHS



## outlet.

#### Construction

#### AK3652



#### **Wetted Parts Material**

Wetted Parts	S
Body	316 SS
Diaphragm	Ni-Co Alloy
Seat	PCTFE (Option: Polyimide)

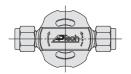
## **Specifications**

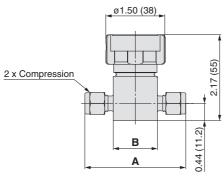
Operating Parameters	AK3652	AK4652	
Gas	Select compatible materials of construction for the gas		
Operating pressure	Vacuum to 250 psig (1.7 MPa)		
Proof pressure	375 psig (2.6 MPa)		
Ambient and operating temperature	-40 to 71°C (No freezing)		
Cv	0.29	0.5	
Leak rate	1 x 10 <sup>-10</sup> Pa·m³/sec		
Connections	Compression, Rc, R, NPT		
Installation	Bottom mount		
Internal volume	0.06 in <sup>3</sup> (1.07 cm <sup>3</sup> )		
Weight	0.26 kg <sup>Note)</sup>		
Knob	1/4 turn indicating round knob with a raised rectangular section		

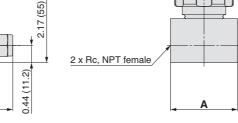
Note) Weight for AK3652S2P4T4T including individual boxed weight. It may vary depending on connections.

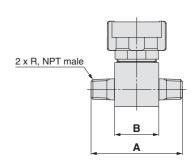
**Dimensions** inch (mm)

#### AK3652 & 4652





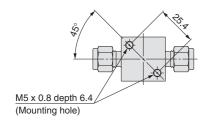




Connections: 4T, 6T

Connections: 4, 6, <sup>4</sup><sub>6</sub>BR

Connections: <sup>4</sup><sub>6</sub>N, <sup>4</sup><sub>6</sub>BRN



Ports	-	4	В		Connections
FOILS	inch	(mm)	inch	(mm)	Connections
4T	2.56	(65.0)	1.12 sq.	(28.4)	1/4 inch compression
4BR	1.70	(43.2)	_	_	Rc 1/4
4BRN	2.32	(58.9)	1.12 sq.	(28.4)	R 1/4
4	1.70	(43.2)	_	_	NPT 1/4 female
4N	2.32	(58.9)	1.12 sq.	(28.4)	NPT 1/4 male
6T	2.68	(68.1)	1.12 sq.	(28.4)	3/8 inch compression
6BR	2.32	(58.9)	_	_	Rc 3/8
6BRN	2.32	(58.9)	1.12 sq.	(28.4)	R 3/8
6	2.32	(58.9)	_	_	NPT 3/8 female
6N	2.32	(58.9)	1.12 sq.	(28.4)	NPT 3/8 male





# **Process Gas Equipment Common Precautions 1**

Be sure to read before handling.

#### Design

## **⚠** Warning

#### 1. Confirm the specifications.

The compatibility of the product with specific equipment must be decided by the person who designs the equipment or decided 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.

#### Selection

## **Marning**

#### 1. Confirm the specifications.

When selecting the product, confirm the operating conditions, such as type of gas, operating pressure (inlet and outlet), flow rate, operating temperature etc., and use within the operating range specified in the catalog. The product may not be suitable for use with specific gases and applications/environments. Check the compatibility of the product materials with the process gas.

Design the equipment and select the product by understanding the characteristics of gas.

#### Follow the regulations and laws, defined by the country or local government, or organization standards.

Reference: High Pressure Gas Safety Act, Labor Safety and Sanitation Law etc.

#### Mounting

## **⚠** Warning

#### 1. Operation Manual

Mount and operate the product after reading the manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

## **⚠** Caution

## 1. Flush the piping thoroughly with inert gas before installing the products.

Remove any dust or scales thoroughly as they could cause malfunction or failure of the product. Do not flush with gas other than inert gas, as this could cause dangerous situations.

- 2. Do not touch the fitting or the wetted parts of the products by hand. Do not apply grease or oil to the products.
- 3. Ensure sufficient space for maintenance activities.

Ensure sufficient space for maintenance activities.

#### 4. Connect compression fittings.

Typically 1-1/4 turn past finger tight of the nut after inserting the tube into the fitting. Please use stainless steel material for piping. After installation, perform a leak test.

#### Mounting

## **⚠** Caution

#### 5. Connect pipe thread fittings.

Thread fitting or piping into body and tighten it at recommended torque. When holding the product, hold its body section. Apply PTFE tape or sealant on the thread of the piping, fitting, etc. When using the sealant, other than the PTFE, it will be difficult to fully remove the sealant and this could cause malfunction or failure of the product.

#### 6. After installation, perform a leak test.

Perform a leak test, such as helium leak test, pressure decay test, bubble leak test, etc., depending on the application. It is recommended to perform a helium leak test on all face seal connections and tube welds per the industry standards (refer to SEMI F1).

#### **Storage and Operating Environment**

## **Marning**

- 1. Do not use in an area having chemicals, sea water or water, or where there is direct contact with any of these.
- 2. Do not use in a place subject to heavy vibration and/or shock.
- 3. Keep ambient temperature and use gas within the specified operating temperature. Remove any sources of excessive heat.
- 4. Do not keep the products in stock in an area, where any dust or water coming in, and keep in dry conditions, where there is no contact with humidity.





# **Process Gas Equipment Common Precautions 2**

Be sure to read before handling.

#### **Maintenance**

#### **⚠** Warning

1. Perform a routine maintenance.

Perform a routine maintenance at customer's responsibility by taking into consideration the operating conditions of the equipment. It is recommended to perform a routine maintenance for the following:

External leakage, Internal leakage (Across the seat leak), Performance etc.

2. Shut down system before removing the product from system for repair or replacement.

Follow the proper procedures to shut off the process gas supply and vent the system.

- 3. Purge hazardous gases from system before removing the product from system.
- 4. Do not disassemble products under warranty.

The warranty may be voided if product is disassembled.

#### **Operation**

## **⚠** Warning

- 1. Do not put the heavy objects on the products. Do not use the products as scaffold.
- 2. Do not use the products in conditions that do not meet the product specifications.

#### **Product Returns**

When returning the product to SMC, make sure to properly purge to remove all hazardous materials and return the product complying with SMC specified procedures. For details, please contact SMC.

#### **Export**

#### **Marning**

The products fall within the United States Export Administration Regulations (EAR) regarding sale, export and re-exports. It is the exporter's responsibility to assure that these regulations are followed when the products are exported. Export Control Classification Number (ECCN) related to the products is as follows.

Regulations (including ECCN) are subject to change with amendment of law.

Latest information regarding these regulations should be checked by customer.

Reference: Bureau of Industry and Security (USA)

http://www.bis.doc.gov/

- 1) 2B999.g < Applicable conditions>
  - (1) Product name: Diaphragm valve
  - (2) Body material: 316 SS





# Process Gas Equipment / Diaphragm Valve Specific Product Precautions

Be sure to read before handling. Refer to back cover for Safety Instructions and page 5 and 6 and the Operation Manual for common precautions. Operation manual is available from the SMC website. http://www.smcworld.com

Selection

#### **⚠** Warning

1. Confirm the specifications.

This product is used in gas delivery systems to shutoff gas flow. When selecting the product, confirm the operating conditions, such as type of gas, operating pressure (inlet and outlet), flow rate, actuating pressure, operating temperature etc., and use within the operating range specified in the catalog. The product may not be suitable for use with specific gases and applications/environments. Check the compatibility of the product materials with the process gas.

Design the equipment and select the product by understanding the characteristics of gas.

#### Mounting

#### **Marning**

1. Confirm the mounting direction of the product.

Direction of gas flow from inlet to outlet is indicated by an arrow on each label.

Orient the valve as specified by the system designer.

2. Connect actuation pressure to the valve actuator connection. (Air operated type)

Use nitrogen or clean dry air for actuation pressure. The connection M5 thread. Tighten thread to recommended torque value.

3. After installation, check internal leakage (leakage across seat) with inert gases.

Perform a helium leak test depending on applications.

#### **Maintenance**

#### **⚠** Warning

1. If a valve requires repair, contact SMC or sales representative.

#### Operation (Air operate type)

#### **Marning**

- 1. Use nitrogen or clean dry air as actuation pressure.
- 2. Confirm the valve type (N.C.).

In the case of N.C. (Normally Closed), valve will open when applying actuation pressure to the valve actuator connection and valve will close when actuation pressure is vented to atmospheric pressure.

3. Apply actuation pressure within the range of specifications.

#### Operation (Manually operated type)

#### **⚠** Warning

1. When closing the valve, rotate the handle clockwise until it completely stops.

There is the internal stop in the handle or in the valve body. Rotate the handle clockwise until the internal stop is reached and it completely stops.

2. When opening the valve, rotate the handle counterclockwise until it completely stops.

There is the internal stop in the handle. Rotate the handle counterclockwise until the internal stop is reached and it completely stops.

3. Do not use a tool when rotating the handle.

When the handle is rotated with a tool, it may apply excessive torque to the handle or inside the valve body and it may cause damage. Rotate the handle by hand.

## **⚠** 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)\*1, Japan Industrial Standards (JIS)\*2) and other safety regulations\*3).

Caution indicates a hazard with a low level of risk !\ Caution: which, if not avoided, could result in minor or

moderate injury.

**⚠** Danger :

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

serious injury.

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious

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

\*2) JIS B 8370: General rules for pneumatic equipment.

\*3) High Pressure Gas Safety Act, Labor Safety and Sanitation Law etc.

#### **⚠** 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

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
  - 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.

#### 

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 after the product is delivered to customer from SMC.
- 2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will

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 the products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

#### 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 regulations 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.

Safety Instructions Be sure to read "Handling Precautions for SMC Products" (M-E03-3) before using.

## **SMC** Corporation

Akihabara UDX 15F

4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, JAPAN

Phone: 03-5207-8249 Fax: 03-5298-5362

http://www.smcworld.com

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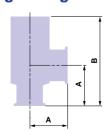


# Stainless Steel High Vacuum **Angle/In-line Valve**



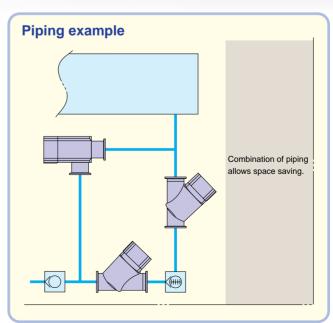
- Body material: SCS13 (conforms to SUS304)
- A precision casting, unified composition prevents accumulation of gas.
- Service life: more than 2 million (air operated valve)
- •Series XM is Interchangeable with the series XL, aluminium high vacuum angle valve.

#### Light weight & compact-

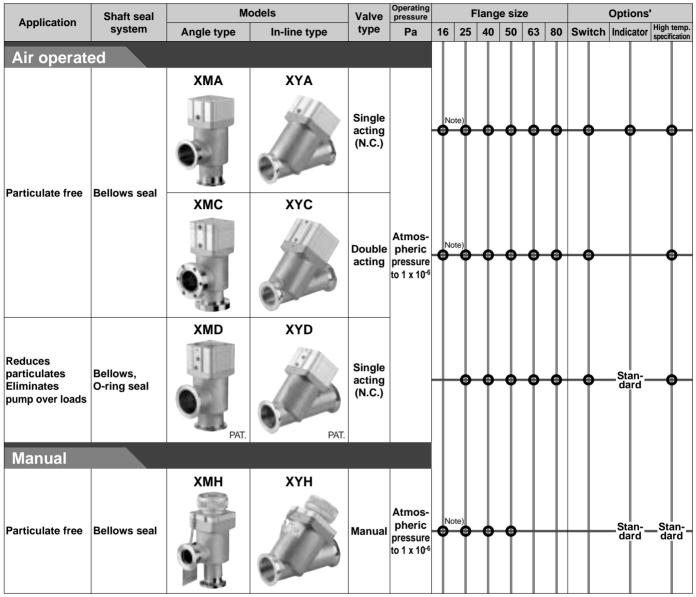


Series	XMA	with	KF(	(NW	) flange

Model	A* mm	B mm	Weight kg	Conductance $\ell$ /s
XMA-16	40	103	0.33	5
XMA-25	50	113	0.61	14
XMA-40	65	158	1.40	45
XMA-50	70	170	2.00	80
XMA-63	88	196	3.60	160
XMA-80	90	235	6.20	200



#### **Series Variations**



Note) The in-line valve is not available in flange size 16.

Bellows seal, Single acting: XMA, XYA Bellows seal, Double acting: XMC, XYC

- Bellows type is particulate free and completely cleaned.
- Pressure balance mechanism allows unrestricted exhaust direction.

2 stage control, Single acting: XMD, XYD

- Initial exhaust valve and main exhaust valve have been integrated (2 stage flow control valve).
- Unrestrected exhaust direction.
- Makes compact system design and reduced piping possible.
- Minimizes particulates by eliminating turbulence during exhaust.
- Prevents pump overload.
- Initial exhaust valve flow is adjustable and adjustment can be locked.

Bellows seal, Manual operation: XMH, XYH

- Bellows type is particulate free and completely cleaned.
- Pressure balance mechanism allows unrestricted exhaust direction.
- Low actuation torque (0.5N·m or less).
- · Spring provides standard sealing load.
- Handle height is the same when valve is open or closed.
- Indicator to confirm opening and closing of valve is standard equipment.



# Stainless steel High Vacuum Angle/In-line Valve

# Series XMA, XYA

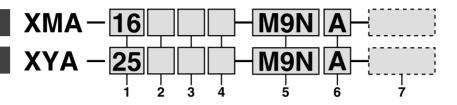
# Normally Closed/Bellows Seal



#### **How to Order**

**Angle type** 

In-line type



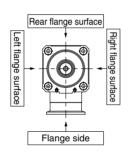


#### 1. Flange size

Size	XMA	XYA
16	•	_
25	•	•
40	•	•
50	•	•
63	•	•
80	•	•

## 3. Indicator/Pilot port direction XMA

Symbol	Indicator	Pilot port direction
Nil	Without indicator	Flange side
Α		Flange side
F	Mith indicator	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



#### 4. Temperature specifications

Symbol	Temperature range
Nil	5 to 60°C
H0	5 to 150°C

#### 6. No. of auto switches/Detecting position

Symbol	Quantity	Detecting position
Nil	Without auto switch	_
Α	2 pcs.	Valve open/closed
В	1 pc.	Valve open
С	1 pc.	Valve closed

#### 7. Seal material and its changed part

· Seal material				
Symbol	Seal material	Compound No.		
Nil	FKM	1349-80*		
N1	EPDM	2101-80*		
P1	BARREL 70W			
Q1	FFKM	4079		
R1		SS592		
R2	CHEMRAZ <sup>®</sup>	SS630		
R3		SSE38		
S1	VMQ	1232-70*		
T1	FKM for Plasma	3310-75*		
ULTIC ARMOR®		UA4640		
*: Produced by Mitsubishi Cable Industries, Ltd.				

## 2. Flange type XMA

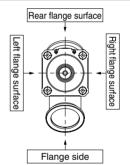
Symbol	Type	Applicable flange size
Nil	KF (NW)	16, 25, 40, 50, 63, 80
D	K (DN)	63, 80
С	CF	16 (034), 40 (070), 63 (114)

#### **XYA**

71.71		
Nil	KF (NW)	25, 40, 50, 63, 80
D	K (DN)	63, 80

#### XYA

Symbol	Indicator	Pilot port direction
Nil	Without indicator	Rear flange side
Α		Rear flange side
F	With indicator	Left flange surface
J		Right flange surface
K	Mithaut indicator	Left flange surface
M	Williout indicator	Left flange surface Right flange surface



#### 5. Auto switch type

Symbol	Auto switch	Remarks
Nil	_	Without auto switch (without built-in magnet)
M9N (L)	D-M9N (L)	
M9P (L)	D-M9P (L)	Solid state switch
M9B (L)	D-M9B (L)	
A90 (L)	D-A90 (L)	Reed switch
A93 (L)	D-A93 (L)	(Flange size 16 is not available.)
M9//	_	Without auto switch (with built-in magnet)

Auto switches cannot be mounted in the case of high temperature types (temperature specifications H0). The standard lead wire length is 0.5m. For 3m, "L" is added at the end of the part number. Ex.) -M9NL

#### $\boldsymbol{\cdot}$ Part numbers indicating changed seal material and leakage

Cl	Changed		<sup>3</sup> /s or less Note 1)
Symbol	part Note 2)	Internal	External
Nil —		1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)
Α	2, 3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-9</sup>
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>

Note 1) Values at ambient temperatures, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on the page 2 for changed part.

Number indicates parts number of "Construction" accordingly.

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

Ex.) XMA-16-M9NA-XN1A



# Series XMA, XYA

#### **Specifications**

Model	XMA-16	XMA-25 XYA-25	XMA-40 XYA-40	XMA-50 XYA-50	XMA-63 XYA-63	XMA-80 XYA-80		
Flange (valve) size	16, CF034	25	40, CF070	50	63, CF114	80		
Valve type			Norm	ally closed (Pres	surize to open, s	pring seal)		
Fluid				Inactive ga	s under vacuum			
Operating temperature °C			5	to 60 (High temp	perature type: 5 t	o 150)		
Operating pressure Pa				Atmospheric p	ospheric pressure to 1 x 10 <sup>-6</sup>			
Conductance Us Note 1)		5	14	45	80	160	200	
Laskaga Da m³/s	Internal	1.3 x 10 <sup>-10</sup> {1 x 10 <sup>-10</sup> } at ambient temperature, excluding gas permeation						
Leakage Pa-m³/s	External	1.3	1.3 x 10 <sup>-11</sup> {1 x 10 <sup>-11</sup> } at ambient temperature, excluding gas permeation					
Operating time s		0.05	0.1	0.21	0.24	0.26	0.28	
Flange type		KF (NW), CF	KF (NW)	KF (NW), CF	KF (NW)	KF (NW), K (DN), CF	KF (NW), K (DN)	
Principle materials		Body: SCS13 (Conforms	to Stainless steel SUS304)	Bellows: Stainless steel S	US316L Bellows holder: S	Stainless steel SUS304. FKI	(Standard seal material)	
Pilot pressure MPa		0.4 to 0.7						
Pilot port size		M5 Rc 1/8						
Service life (million cycles)			2 (FKM seal	material)				
Mainht Ira Note 2)	XMA	0.33(0.37)	0.61	1.40(1.76)	2.00	3.60(4.96)	6.20	
Weight kg Note 2)	XYA		0.66	1.42	2.40	4.30	7.70	

Note 1) Conductance is the value for the molecular flow of an elbow having the same dimensions.

#### Construction

# Auto switch (Optional) 1. Bonnet assembly (Maintenance part)\* (Includes 2, 5, 6, 7) Magnet (Optional) Pilot port 7. Bellows holder (Material: Stainless steel SUS304) 3. Exterior seal (Maintenance part)\* 6. Bellows (Material: Stainless steel SUS316L) 5. Valve (Material: Stainless steel SUS304) 2. Valve seal (Maintenance part)\* 4. Body (Material: SCS13)

<sup>\*</sup> Refer to page 22 for the maintenance parts.

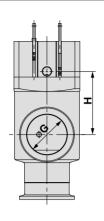


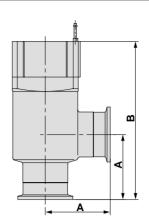
Note 2) Figures in ( ) indicates the weight of CF, conflate fittings.

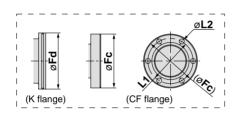
# Stainless steel High Vacuum Angle/In-line Valve Series XMA, XYA

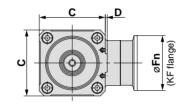
#### **Dimensions**

#### XMA/Angle type

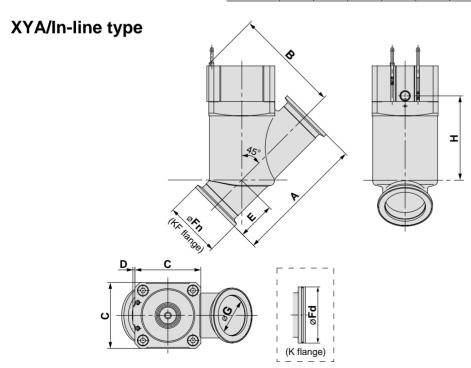








(mm) Model Α В С D Fn Fd Fc G Н P.C.D **L1** L2 XMA-16 P.C.D 27 6-ø4.4 XMA-25 XMA-40 P.C.D 58.7 6-ø6.6 XMA-50 XMA-63 P.C.D 92.1 8-ø8.4 XMA-80 



									(mm)
Model	Α	В	С	ם	Е	Fn	Fd	G	Н
XYA-25	100.2	79.5	48	1	23.5	40	_	26	64
XYA-40	130	106	66	2	38	55	_	41	84
XYA-50	178	119	79	2	53	75	_	52	95
XYA-63	209	149	100	3	61	87	95	70	118
XYA-80	268	178	117	3	80	114	110	83	142

#### Stainless steel **High Vacuum Angle/In-line Valve**

# Series XMC, XYC

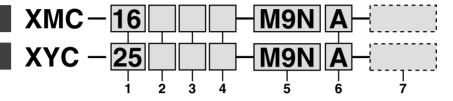
Double Acting/Bellows Seal



#### **How to Order**

Angle type

In-line type





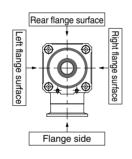
#### 1. Flange size

Size	XMC	XYC
16	•	<del></del>
25	•	•
40	•	•
40 50	•	•
63	•	•
80	•	•

#### 3. Pilot port direction

#### **XMC**

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



Compound No.

SSE38

1232-70\*

3310-75\*

**UA4640** 

#### 4. Temperature specifications

Symbol	Temperature range
Nil	5 to 60°C
H0	5 to 150°C

#### 6. No. of auto switches/Detecting position

Symbol	Quantity	Detecting position			
Nil	Without auto switch	_			
Α	2 pcs.	Valve open/closed			
В	1 pc.	Valve open			
С	1 pc.	Valve closed			

#### 7. Seal material and its changed part

· Seal material

Symbol

R3

**S1** 

T1

U1

1	0,	Ocai matema	oopoua.
İ	Nil	FKM	1349-80*
İ	N1	EPDM	2101-80*
	P1	BARREL PERFLUORO <sup>®</sup>	70W
	Q1	FFKM	4079
ı	R1		SS592
ı	R2	CHEMRAZ®	SS630

VMQ

FKM for Plasma

ULTIC

Spal material

#### ARMOR® \*: Produced by Mitsubishi Cable Industries, Ltd.

#### 2. Flange type **XMC**

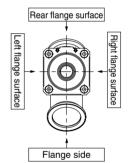
Symbol	Type	Applicable flange size
Nil	KF (NW)	16, 25, 40, 50, 63, 80
D	K (DN)	63, 80
С	CF	16 (034), 40 (070), 63 (114)

#### XYC

X10					
Nil	KF (NW)	25, 40, 50, 63, 80			
D	K (DN)	63, 80			

#### **XYC**

Symbol	Pilot port direction
Nil	Rear flange surface
K	Left flange surface
M	Right flange surface



#### 5. Auto switch type

Symbol	Auto switch	Remarks
Nil	_	Without auto switch (without built-in magnet)
M9N (L)	D-M9N (L)	
M9P (L)	D-M9P (L)	Solid state switch
M9B (L)	D-M9B (L)	
A90 (L)	D-A90 (L)	Reed switch
A93 (L)	D-A93 (L)	(Flange size 16 is not available.)
M9//	_	Without auto switch (with built-in magnet)

Auto switches cannot be mounted in the case of high temperature types (temperature specifications H0). The standard lead wire length is 0.5m. For 3m, "L" is added at the end of the part number. Ex.) -M9NL

#### · Part numbers indicating changed seal material and leakage

Symbol Changed part Note 2)		Leakage Pa m <sup>3</sup> /s or less Note 1)		
		Internal	External	
Nil	_	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)	
Α	2, 3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-9</sup>	
B 2		1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)	
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>	

Note 1) Values at ambient temperatures, excluding gas permeation. Note 2) Refer to parts number of "Construction" on the page 5 for changed part. Number indicates parts number of "Construction" accordingly.

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

Ex.) XMC-16-M9NA-XN1A

#### **Specifications**

Model		XMC-16	XMC-25 XYC-25	XMC-40 XYC-40	XMC-50 XYC-50	XMC-63 XYC-63	XMC-80 XYC-80
Flange (valve) size	16, CF034	25	40, CF070	50	63, CF114	80	
Valve type			Double a	cting (Dual opera	ation), pressurize	to open/close	
Fluid				Inactive ga	s under vacuum		
Operating temperature °C			5	to 60 (High temp	perature type: 5 to	o 150)	
Operating pressure Pa				Atmospheric p	ressure to 1 x 10	)-6	
Conductance (s Note 1)		5	14	45	80	160	200
Laskana Da m³/a	Internal	1.3 x 10 <sup>-10</sup> {1 x 10 <sup>-10</sup> } at ambient temperatures, excluding gas permeation					
Leakage Pa-m³/s	External	1.3 x 10 <sup>-11</sup> {1 x 10 <sup>-11</sup> } at ambient temperatures, excluding gas permeation					
Operating time s		0.08	0.15	0.35	0.4	0.54	0.7
Flange type		KF (NW), CF	KF (NW)	KF (NW), CF	KF (NW)	KF (NW), K (DN), CF	KF (NW), K (DN)
Principle materials		Body: SCS13 (Conforms	to Stainless steel SUS304)	Bellows: Stainless steel S	US316L Bellows holder: S	Stainless steel SUS304. FKN	(Standard seal material)
Pilot pressure MPa		0.3 to 0.6					
Pilot port size	M5 Rc 1/8						
Service life (million cycles)			2 (FKM seal	material)			
Maint In Note 2)	ХМС	0.36 (0.40)	0.62	1.40 (1.76)	2.10	3.80 (5.16)	6.30
Weight kg Note 2)	XYC	_	0.67	1.42	2.50	4.50	7.80

Note 1) Conductance is the value for the molecular flow of an elbow having the same dimensions.

#### Construction

# Auto switch (Optional) Pilot port (Pressurized to close) 1. Bonnet assembly (Maintenance part)\* (Includes 2, 5, 6, 7) Magnet (Optional) Pilot port (Pressurized to open) 7. Bellows holder (Material: Stainless steelSUS304) 3. Exterior seal (Maintenance part)\* 6. Bellows (Material: Stainless steel SUS316L) 5. Valve (Material: Stainless steel SUS304) 2. Valve seal (Maintenance part)\* 4. Body (Material: SCS13)

 $\ast$  Refer to page 22 for the maintenance parts.

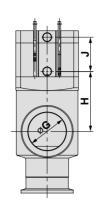


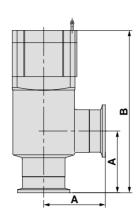
Note 2) Figures in ( ) indicates the weight of CF, conflate fittings.

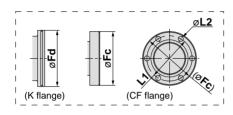
# Series XMC, XYC

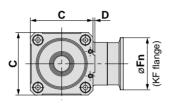
#### **Dimensions**

#### XMC/Angle type



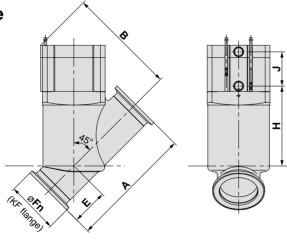


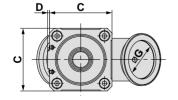


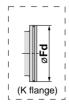


(mm) Model В С D Fn Fd Fc G Н J P.C.D **L1** L2 XMC-16 P.C.D 27 6-ø4.4 XMC-25 XMC-40 P.C.D 58.7 6-ø6.6 XMC-50 XMC-63 P.C.D 92.1 8-ø8.4 XMC-80 

XYC/In-line type







										(mm)
Model	Α	В	С	D	Е	Fn	Fd	G	Н	J
XYC-25	100.2	85	48	1	23.5	40	l	26	64	28
XYC-40	130	115	66	2	38	55		41	84	36
XYC-50	178	129	79	2	53	75		52	95	38
XYC-63	209	158	100	3	61	87	95	70	118	45
XYC-80	268	189	117	3	80	114	110	83	142	56



# Stainless steel High Vacuum Angle/In-line Valve

# Series XMD, XYD

2 Stage Control, Single Acting/Bellows, O-ring Seal

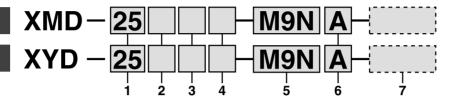
PAT.



#### **How to Order**

Angle type

In-line type



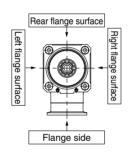


#### 1. Flange size

Size	XMD	XYD
25	•	•
40	•	•
50	•	•
63	•	•
80	•	•

## 3. Pilot port direction XMD

711112	
Symbol	Pilot port direction
Nil	Flange side
K	Left flange surface
L	Rear flange surface
M	Right flange surface



#### 4. Temperature specifications

Symbol	Temperature range
Nil	5 to 60°C
H0	5 to 150°C

#### 6. No. of auto switches/Detecting position

Symbol	Quantity	Detecting position
Nil Without auto switch		_
Α	2 pcs.	Valve open/closed
<b>B</b> 1 pc.		Valve open
С	1 pc.	Valve closed

#### 7. Seal material and its changed part

Symbol	Seal material	Compound No.
Nil	FKM	1349-80*
N1	EPDM	2101-80*
P1	BARREL PERFLUORO®	70W
Q1	FFKM	4079
R1		SS592
R2	CHEMRAZ <sup>®</sup>	SS630
R3	] [	SSE38
S1	VMQ	1232-70*
T1 FKM for Plasma		3310-75*
U1	ULTIC ARMOR®	UA4640

# 2. Flange type XMD

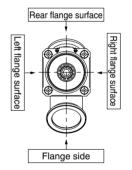
Symbol	Type	Applicable flange size
Nil	KF (NW)	25, 40, 50, 63, 80
D	K (DN)	63, 80
С	CF	40 (070), 63 (114)

#### XYD

XID					
Nil	KF (NW)	25, 40, 50, 63, 80			
D	K (DN)	63, 80			

#### **XYD**

Symbol	Pilot port direction
Nil	Rear flange surface
K	Left flange surface
M	Right flange surface



#### 5. Auto switch type

Symbol	Auto switch	Remarks
Nil	_	Without auto switch (without built-in magnet)
M9N (L)	D-M9N (L)	
M9P (L)	D-M9P (L)	Solid state switch
M9B (L)	D-M9B (L)	
A90 (L)	D-A90 (L)	Reed switch
A93 (L)	D-A93 (L)	(Flange size 16 is not available.)
M9//	_	Without auto switch (with built-in magnet)

Auto switches cannot be mounted in the case of high temperature types (temperature specifications H0). The standard lead wire length is 0.5m. For 3m, "L" is added at the end of the part number. Ex.) -M9NL

#### · Part numbers indicating changed seal material and leakage

Cumbal	Changed		<sup>3</sup> /s or less <sup>Note 1)</sup>		
Symbol part Note 2)		Internal	External		
Nil	_	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)		
Α	2, 3, 4, 5	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-9</sup>		
В	2, 4, 5	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)		
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>		

Note 1) Values at ambient temperatures, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on the page 9 for changed part.

Number indicates parts number of "Construction" accordingly.

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

Ex.) XMD-25-M9NA-XN1A



# Series XMD, XYD

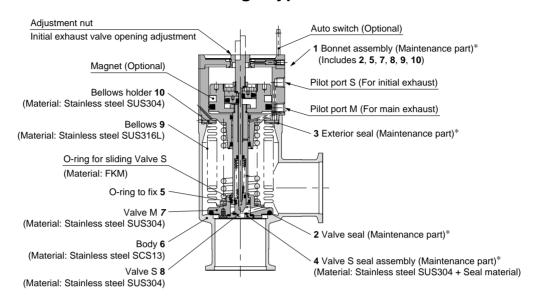
#### **Specifications**

Model		XMD-25 XYD-25	XMD-40 XYD-40	XMD-50 XYD-50	XMD-63 XYD-63	XMD-80 XYD-80		
Flange (valve) size		25	40, CF070	50	63, CF114	80		
Valve type		Normally	closed (Pressurize to	o open, spring seal)	[both main & initial e	exhaust valves]		
Fluid			lı	nactive gas under va	cuum			
Operating temperature	°C		5 to 60	(High temperature ty	pe: 5 to 150)			
Operating pressure Pa	ı		Atm	ospheric pressure to	1 x 10 <sup>-6</sup>			
Conductance (/s Note 1)	Main exhaust valve	14	45	80	160	200		
Conductance as Note 1)	Initial exhaust valve	0.5 to 3	2 to 8	2.5 to 11	4 to 18	4 to 18		
	Internal	1.3 x 10 <sup>-10</sup> {1 x 10 <sup>-10</sup> } at ambient temperatures, excluding gas permeation						
Leakage Pa·m³/s	External	1.3 x 10 <sup>-11</sup> {1 x 10 <sup>-11</sup> } at ambient temperatures, excluding gas permeation						
Operating time s	Main exhaust valve	0.10	0.21	0.24	0.26	0.28		
Operating time s	Initial exhaust valve	0.07	0.08	0.09	0.23	0.27		
Flange type		KF (NW)	KF (NW), CF	KF (NW)	KF (NW), K (DN), CF	KF (NW), K (DN)		
Principle materials		Body: SCS13 (Conforms to Stainless steel SUS304) Bellows: Stainless steel SUS316L Bellows holder: Stainless steel SUS304. FKM (Standard seal material)						
Pilot pressure MPa		0.4 to 0.7 [both main and initial exhaust valves]						
Pilot port size		M5 Rc 1/8						
Service life (million cyc	cles)		2	(FKM seal material)	·			
Weight kg Note 2)	XMD	0.65	1.50 (1.86)	2.20	4.10 (5.46)	6.80		
Weight ky 1000 27	XYD	0.71	1.52	2.60	4.80	8.30		

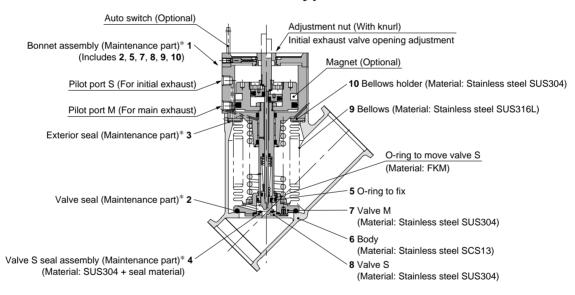
Note 1) Main exhaust valve conductance is the value for the molecular flow of an elbow having the same dimensions. The initial exhaust valve is the value for the viscous flow. Note 2) Figures in () indicates the weight of CF, conflate fittings.



#### XMD/Angle type



#### XYD/In-line type



\* Refer to page 22 for maintenance parts.

#### <Operating principle> Series XMD, XYD

#### [1] Initial exhaust valve opening adjustment

The initial exhaust rate should be adjusted before operation (with pilot port S in an unpressurized state).

The initial exhaust rate is set to zero by turning the adjustment nut clockwise until it just stops. (Do not use a tool.)

The initial exhaust rate is adjusted by turning the nut anti-clockwise. The number of adjustment nut (its pitch is 1mm) rotations and initial exhaust conductance should be confirmed referring to the figure on the right.

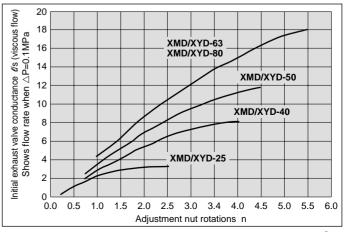
#### [2] Opening of the initial exhaust valve (valve S)

When pressure is applied to the pilot port S, the valve S is removed from the valve S assembly and opens until the adjusted opening setting.

#### [3] Opening of the main exhaust valve (valve M)

When pressure is applied to the pilot port M, the valve M is removed from the body seat surface and fully opens.

# [4] Closing of the initial exhaust valve, the main exhaust valve By removing the pressure from the pilot ports S and M, both valves return to their sealed position.



# Series XMD, XYD

#### **Dimensions**

XMD/Angle type

C

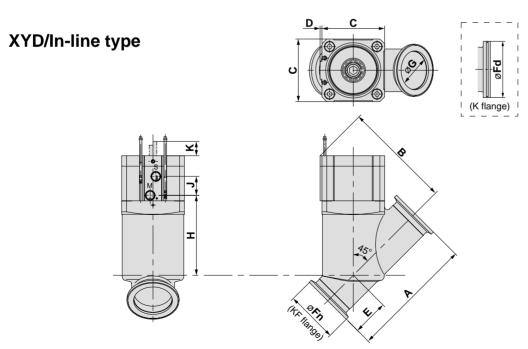
O

O

(K flange)

(CF flange)

													(mm)
Model	Α	В	С	D	Fn	Fd	Fc	G	Н	J	K	P.C.D <b>L1</b>	L2
XMD-25	50	123	48	1	40	_	_	26	41	16	7.5	_	_
XMD-40	65	170	66	2	55	_	70	41	63	20	15	P.C.D 58.7	6-ø6.6
XMD-50	70	183	79	2	75	_	_	52	68	20	17.5	_	_
XMD-63	88	217	100	3	87	95	114	70	72	20	19.5	P.C.D 92.1	8-ø8.4
XMD-80	90	256	117	3	114	110	_	83	98	20	26.5	_	_



											(mm)
Model	Α	В	С	D	Е	Fn	Fd	G	Н	J	K
XYD-25	100.2	86.7	48	1	23.5	40	_	26	66	16	7.5
XYD-40	130	114	66	2	38	55	_	41	84	20	15
XYD-50	178	128	79	2	53	75	_	52	95	20	17.5
XYD-63	209	163	100	3	61	87	95	70	121	20	19.5
XYD-80	268	193	117	3	80	114	110	83	144	20	26.5



# Stainless steel High Vacuum Angle/In-line Valve

# Series XMH, XYH

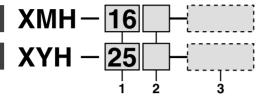
# Manual Valve/Bellows Seal



#### **How to Order**

**Angle type** 

In-line type





#### 1. Flange size

Size	XMH	XYH
16	•	_
25	•	•
40	•	•
50	•	•

## 2. Flange type XMH

Symbol	Type	Applicable flange size		
Nil	KF (NW)	16, 25, 40, 50		
С	CF	16 (034), 40 (070)		
XYH				
Nil	KF (NW)	25, 40, 50		

#### 3. Seal material and its changed part

· Seal materia	· Seal material									
Symbol	Seal material	Compound No.								
Nil	FKM	1349-80*								
N1	EPDM	2101-80*								
P1	BARREL PERFLUORO®	70W								
Q1	FFKM	4079								
R1		SS592								
R2	CHEMRAZ®	SS630								
R3		SSE38								
S1	VMQ	1232-70*								
T1	FKM for Plasma	3310-75*								
U1	ULTIC ARMOR <sup>®</sup>	UA4640								

<sup>\*:</sup> Produced by Mitsubishi Cable Industries, Ltd.

#### · Part numbers indicating changed seal material and leakage

Cumbal	Changed	Leakage Pa m <sup>3</sup> /s or less Note 1)				
Symbol part Note 2)		Internal	External			
Nil	_	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-11</sup> (FKM)			
Α	2, 3	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-9</sup>			
В	2	1.3 x 10 <sup>-8</sup>	1.3 x 10 <sup>-11</sup> (FKM)			
С	3	1.3 x 10 <sup>-10</sup> (FKM)	1.3 x 10 <sup>-9</sup>			

Note 1) Values at ambient temperatures, excluding gas permeation.

Note 2) Refer to parts number of "Construction" on the page 12 for changed part.

Number indicates parts number of "Construction" accordingly.

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

Ex.) XMH-16-XN1A

# Series XMH, XYH

#### **Specifications**

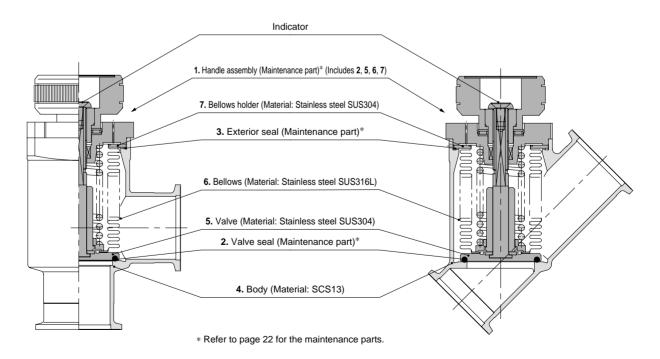
Model		XMH-16	XMH-25 XYH-25	XMH-40 XYH-40	XMH-50 XYH-50		
Flange (valve) size		16, CF034	25	40, CF070	50		
Valve type			Mar	nual type			
Fluid			Inactive ga	s under vacuum			
Operating temperature °C			5	to 150			
Operating pressure Pa			Atmospheric p	pressure to 1 x 10 <sup>-6</sup>			
Conductance (/s Note 1)		5	5 14 45				
,	Internal	1.3 x 10 <sup>-10</sup> {1 x 10 <sup>-10</sup> } at ambient temperature, excluding gas permeation					
Leakage Pa·m³/s	External	1.3 x 10 <sup>-11</sup> {1 x 10 <sup>-11</sup> } at ambient temperature, excluding gas permeation					
Flange type		KF (NW), CF	KF (NW)	KF (NW), CF	KF (NW)		
Principle materials		Body: SCS13 (Conforms to Stainless s	Body: SCS13 (Conforms to Stainless steel SUS304) Bellows: Stainless steel SUS316L Bellows holder: Stainless steel SUS304. FKM (Standard seal material)				
Pilot torque N·m		0.1 ≦	0.15 ≦	0.35 ≦	0.5 ≦		
Handle revolutions		5 7 10 13			13		
Service life (million cycles)		0.1					
Weight kg Note 2)	XMH		0.57	1.35 (1.71)	2.02		
vveigiit kg 11516 27	XYH	_	0.62	1.37	2.42		

Note 1) Conductance is the value for the molecular flow of an elbow having the same dimensions.

#### Construction

#### XMH/Angle type

#### XYH/In-line type

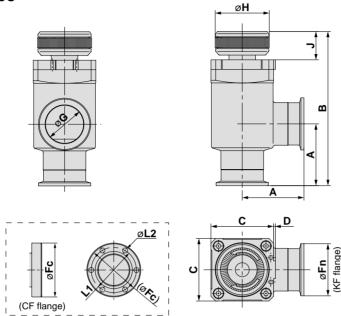




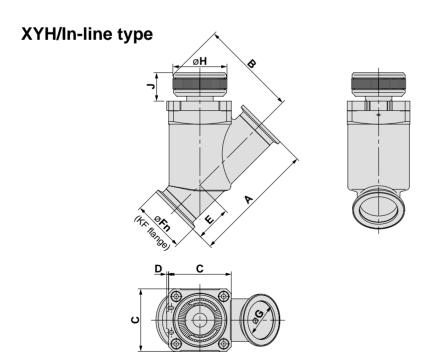
Note 2) Figures in ( ) indicates the weight of CF, conflate fittings.

#### **Dimensions**

#### XMH/Angle type



(mm) Model В С D Fn Fc G Н P.C.D **L1** L2 XMH-16 100.5 38 30 17 18 P.C.D 27 40 1 34 35 6-ø4.4 XMH-25 114 40 21.5 50 48 26 40.5 XMH-40 162.5 2 55 70 57 30 P.C.D 58.7 65 66 41 6-ø6.6 XMH-50 179.5 75 52 70 35



									(111111)
Model	Α	В	С	D	E	Fn	G	Н	J
XYH-25	100.2	75.8	48	1	23.5	40	26	40.5	21.5
XYH-40	130	102.5	66	2	38	55	41	57	30
XYH-50	178	119	79	2	53	75	52	70	35



# **Technical Data**

#### 1 Seal Materials Available

#### FKM (fluoro rubber)

With low outgassing, low permanent-set and low gas permeation rate, this is the most popular seal material for high vacuum. SMC's seal material has undergone a high vacuum degassing process.

#### **FFKM**

This is an elastomer with the most outstanding resistance to heat and chemicals, but its permanent-set is large, and special caution is required when used in other than static applications. Variations are available with improved plasma (O<sub>2</sub>, CF<sub>4</sub>) and particulate resistance. Therefore, it is advisable to select types based upon the application.

#### **Chemraz®**

This material has excellent chemical and plasma resistance and has slightly higher heat resistance than FKM. Several variations of Chemraz<sup>®</sup> are available and it is advisable to make a selection based upon the particular plasma being used and other conditions, etc.

\* Chemraz® is a registered trade mark of Greene, Tweed & Co.

#### Silicone

This material is relatively inexpensive, has good plasma resistance and can be used at high temperatures, but its gas permeation rate is large.

#### 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.

#### 4 Molecular flow conductance

#### **Orifice conductance**

In the case of a ØA (cm²) hole in an ultra-thin plate, the conductance "C" results from "V" the average velocity of the gas, "R" the gas constant, "M" the molecular weight and "T" the absolute temperature. From the formula C=VA/4=(RT/2 $\pi$ M)<sup>0.5</sup>A, the conductance for 1cm² is C=11.6A  $\ell$ /sec, at an air temperature of 20°C.

#### Cylinder conductance

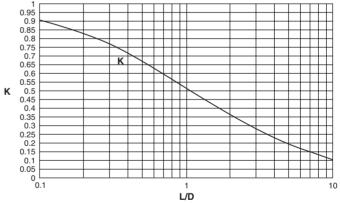
With length "L" (cm) and diameter "D" (cm) where L>>D, from the formula  $C=(2\pi RT/M)^{0.5}D^3/6L$ , the conductance  $C=12.1D^3/L$   $\ell$ /sec, at an air temperature of  $20^{\circ}C$ .

#### Short pipe conductance

From the Clausing's factor "K" and the hole conductance "C" in the Drawing 1. (Clausing's factor drawing), the short pipe conductance  $C_K$  is easily found as  $C_K$ = $K_C$ .

#### Conductances combined

When each of the separate conductances are given as  $C_1$ ,  $C_2$  and  $C_1$ , the composite conductance  $\Sigma C$  is expressed as:  $\Sigma C=1/(1/C_1+1/C_2+...1/C_1)$  when in series, and  $\Sigma C=C_1+C_2+...C_1$ , when in parallel.



Graph 1. Clausing's factor

#### **Technical Data**

#### 5 He leakage

#### Surface leakage

This leakage occurs between surfaces of the sealing and the seal material. In the case of elastic body seal (elastomer), leakage values are confirmed within minutes of operation. Leakage rate is measured at room temperature (20 to 30°C).

#### Gas permeation

This is leakage caused by diffusion through the elastic body seal material. As temperature increases, the diffusion rate increases, and in many cases, becomes greater than surface leakage. The diffusion rate is proportional to the cross-sectional area (cm²) of the seal, and inversely proportional to the seal width (distance between the atmosphere and the vacuum side). In the case of metal gaskets, only hydrogen diffusion should be considered.

#### 6 Outgassing

This is a phenomenon where gases adhered or adsorbed to the metallic surface or its inside parts are released from the surface and drawn into the vacuum according to the pressure decrease. The smoothness of the surface and closeness of the oxidize layer can effect (increase/decrease) this.

#### 7 Ultimate pressure

Ultimate pressure is P=Q/S, where the sum of mass flow rates for outgassing (Qg) and leakage ( $Q\ell$ ) is Q(Pa·m³/s), and the exhaust speed is S(m³/s). The ultimate pressure is measured with Qg, Q $\ell$ S shown as above, and the ultimate pressure of the pump itself. In the case of very low pressure, the exhaust characteristics of the actual pump can be the limiting factor. In particular, a deterioration of exhaust characteristics due to an unclean pump and invasion of the atmospheric moisture can be the major factor.

#### 8 Exhaust time (low/medium vacuum)

The time ( $\triangle$ t) required to exhaust a chamber at low vacuum with volume V ( $\ell$ ), from pressure P1 to P2, using a pump with pumping speed S ( $\ell$ /sec) is  $\triangle$ t=2.3(V/S)log(P1/P2). In high vacuum, this is subject to the ultimate pressure limit imposed by outgassing and leakage as characterised above.

#### 9 Baking

Gases such as oxygen and nitrogen, which have a small adsorption activation energy (E) and a short adsorption residence time ( $\tau$ ), are evacuated quickly. However, in the case of water, which has a high activation energy, evacuation does not progress quickly unless the temperature ( $\tau$ : absolute temperature) is raised to shorten residence time. This time is characterized as  $\tau$ = $\tau$ 0 exp(E/RT) where R is the ideal gas constant and  $\tau$ 0=(approx.)  $10^{-13}$ sec.

Residence time of water at  $20^{\circ}$ C is  $5.5 \times 10^{-6}$ sec, whereas at  $150^{\circ}$ C is  $2.8 \times 10^{-8}$  sec, or 200 times shorter. Objective of baking is to make water of long adsorption residence time to exhaust in a shorter time.



# Series XM, XY Auto Switch Specifications

#### **Auto Switches Common Specifications**

Auto switch type	Reed switch	Solid state switch					
Leakage current	_	3-wire: 100μA or less, 2-wire: 0.8mA or less					
Operating time	1.2ms	1ms or less					
Impact resistance	300m/s <sup>2</sup>	1000m/s <sup>2</sup>					
Insulation resistance	$50 M\Omega$ or more at $500 V$ DC (	between lead wire and case)					
Withstand voltage	1500V AC/min. (between lead wire and the case)	1000V AC/min. (between lead wire and the case)					
Ambient temperature	-10 to	−10 to 60°C					
Enclosure	IEC529 standard IP67, JIS C 0920 watertight construction						

#### **Lead Wire Length**



#### Contact Protection Box/CD-P11, CD-P12

#### <Applicable switch type>

Auto switch types,

D-A9 $\square$  and A9 $\square$ V are not incorporated with the contact protection circuit.

- 1. In the case operation load is an inductive load.
- 2. In the case the wiring length to load is more than 5m.
- In the case the load voltage is 100 or 200V AC.Be sure to use the contact protection box in any case mentioned above.

#### **Specifications**

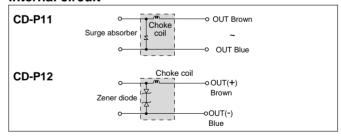
Model number	CD-	CD-P12	
Load voltage	100V AC	24V DC	
Max. load current	25mA	12.5mA	50mA

Otherwise, the contact life may be shortened. (Due to permanent energizing conditions.)

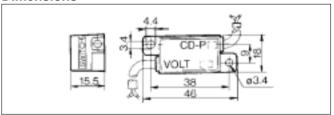
\* Lead wire length —— Switch connection side 0.5m



#### Internal circuit



#### **Dimensions**



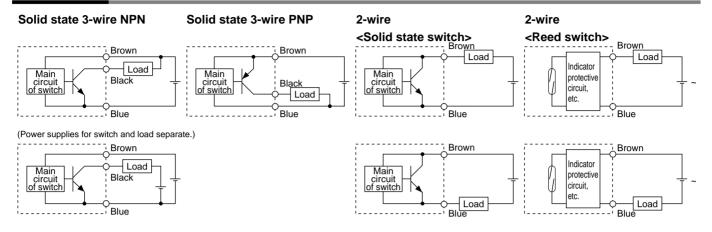
#### **Contact Protection Box/Connection Method**

For connection of the switch body and the contact protection box, connect the lead wire in the side indicated as "SWITCH" on the contact protection box to the lead wire from the switch body. The length of lead wire between the switch body and the contact protection box should be within 1m and they should be set as close together as possible.

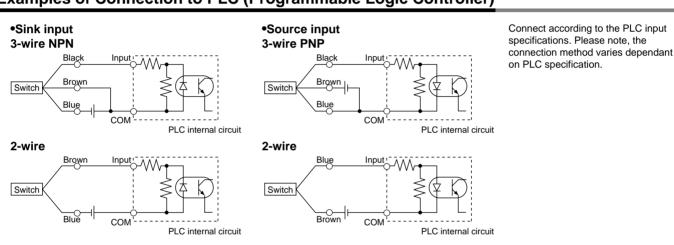


# **Prior to Use**Auto Switches/Connections and Examples

#### **Basic Wiring**

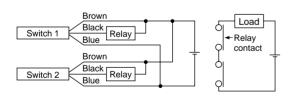


#### **Examples of Connection to PLC (Programmable Logic Controller)**

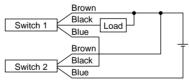


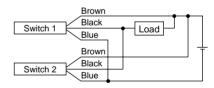
#### Connection Examples for AND (Series) and OR (Parallel)

## •3-wire NPN/AND connection (with relay)



#### NPN/AND connection (with switch)

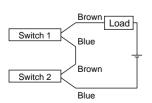




**NPN/OR** connection

Indication lights up when both switches are ON

#### •2-wire (2 pcs.)



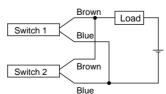
When 2 switches are connected by AND, load voltage will decrease at ON and these connections may cause malfunction of load.

Indication lights up when both switches are ON.

Load voltage at ON=Supply voltage – Residual voltage x 2 pcs. =24V – 4V x 2 pcs. =16V

Example) Supply voltage 24V DC, switch internal drop voltage 4V

#### **OR** connection



[Solid state switch]
When 2 switches
are connected by
OR, load voltage
will increase at
OFF and these
connections may
cause malfunction.

[Reed switch]

There is no current leakage so that load voltage does not increase at OFF.

The flowing current is broken up into the ON state switches, so indicator light becomes dark or may not turn ON due to the lack of the current

Load voltage at OFF=Leakage current x 2 pcs. x Load impedance =1mA x 2 pcs. x  $3k\Omega$ 

Example) Load impedance  $3k\Omega$ , switch leakage current 1mA



# **Solid State Switch/Direct Mounting** D-M9N, D-M9P, D-M9B

#### **Grommet**

- Reduced load currents for 2wire model (2.5 to 40 mA)
- Compliance with lead-free requirements
- Use of UL-approved lead wires (style 2844)



#### **∆**Caution

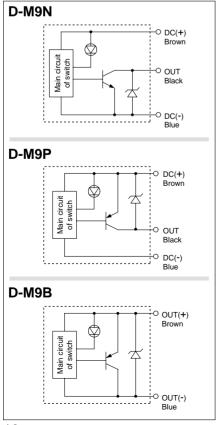
#### **Precautions**

Care should be taken when stripping the outer cable covering as the insulator may be accidentally torn or damaged if incorrectly stripped, as shown below.





#### **Auto Switch Internal Circuit**



#### **Auto Switch Specifications**

PLC: Programmable Logic Controller

D-M9□ (With indicator light)							
Model number	D-M9N	D-M9P	D-M9B				
Wiring	3-v	vire	2-wire				
Output	NPN	PNP	_				
Applicable load	IC circuit, F	Relay, PLC	24V DC releay, PLC				
Power voltage	5, 12, 24V DO	C (4.5 to 28V)	_				
Current consumption	10mA	or less	_				
Load voltage	28V DC or less		24V DC (10 to 28V DC)				
Load current	40mA	or less	2.5 to 40mA				
Internal voltage drop	0.8V d	4V or less					
Current leakage	≤ 100μA a	0.8mA or less					
Indicator light		Red LED lights when ON.					

• Lead wire — Oil-proof heavy-duty vinyl cable

2.7 x 3.2 with elliptic cross-section, 0.15mm<sup>2</sup>, 2 cores (D-M9B),

or 3 cores (D-M9N, D-M9P)

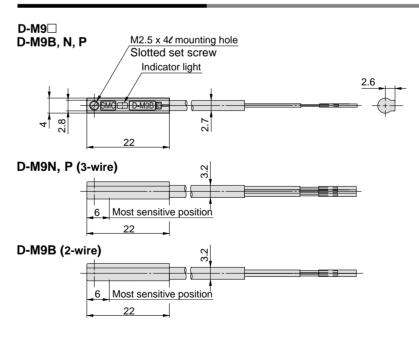
Note 1) Refer to common specifications on page16. Note 2) Refer to the page 16 for lead wire length.

#### **Auto Switch Weight**

Unit: g

Model		D-M9N	D-M9P	D-M9B
Lead wire length	0.5	8	8	7
m	3	41	41	38

#### **Auto Switch Dimensions**





# Reed Switch/Direct Mounting D-A90, D-A93

 $\epsilon$ 

## Grommet Electrical entry: In-line

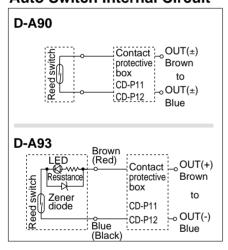


#### **∧**Caution

#### **Precautions**

 Fix the switch with appropriate screw installed on the auto switch body. If using other screws, switch may be damaged.

#### **Auto Switch Internal Circuit**



- Note) 1. In the case operation load is an inductive load.
  - 2. In the case the wiring length to load is more than 5m.
- 3. In the case the load voltage is 100V AC. Be sure to use the contact protection box in any case mentioned above not to shorten the contact life. Refer to the page 16 for details of the contact protection box.

#### **Auto Switch Specifications**

	PLC: Programmable Logic Controller						
D-A90 (Witho	D-A90 (Without indicator light)						
Model number		D-A90					
Applicable load		IC circuit, Relay, PLC					
Load voltage	24V AC or less	48V AC or less	100V AC or less				
Max. load current	50mA	40mA	20mA				
Contact protection circuit		_					
Internal resistance	$1\Omega$ or less (Including 3m lead wire)						
D-A93 (With i	D-A93 (With indicator light)						
Model number		D-A93					
Applicable load		Relay, PLC					
Load voltage	24V DC		100V AC				
Max. load current and load current range	5 to 40mA		5 to 20mA				
Contact protection circuit	_						
Internal voltage drop	D-A93 2.4V or less (up to 20mA)/3V or less (up to 40mA)						
Indicator light		Red LED lights when O	N.				

Lead wire

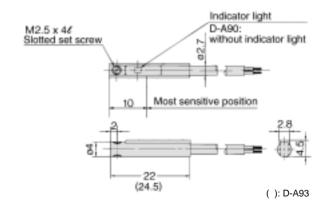
D-A90/D-A93 — Oil-proof heavy-duty vinyl cable, ø2.7, 0.18mm² x 2 cores (Brown, Blue), 0.5m Note 1) Refer to common specifications on page16. Note 2) Refer to page 16 for lead wire length.

#### **Auto Switch Weight**

Model	D-A90	D-A93
Lead wire length 0.5m	6	6
Lead wire length 3m	30	30

#### **Auto Switch Dimensions**

D-A90, D-A93





# Series XM, XY Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

**Caution**: Operator error could result in injury or equipment damage.

**Warning:** Operator error could result in serious injury or loss of life.

**Danger**: In extreme conditions, there is a possible result of serious injury or loss of life.

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

Note 2) JIS B 8370: Pneumatic system axiom

#### **Marning**

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or maintenance of pneumatic systems should be performed by trained and experienced operators.

- 3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.
  - 1. Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driven object have been confirmed.
  - 2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
  - 3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc.
- 4. Contact SMC if the product is to be used in any of the following conditions:
  - 1. Conditions and environments beyond the given specifications, or if product is used outdoors.
  - 2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuit in press applications, or safety equipment.
  - 3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.





# Series XM, XY Specific Product Precaution 1

Be sure to read before handling.

#### **Precautions on Design**

#### <u> Marning</u>

#### All models

- 1. The body material is SCS13 (conforms to Stainless steel SUS304), the bellows is Stainless steel 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.
- Select materials for the actuation pressure piping, and heat resistance for fittings that are suitable for the applicable operating temperatures.

#### · Model with auto switch

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

#### Selection

#### **⚠** Caution

#### All models

- 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.
- Actuating pressure should be kept within the specified range. 0.4 to 0.5MPa is recommended.
- 3. Use within the limits of the operating pressure range.

#### · High temperature types

 In the case of gases which cause a large amount of deposits, heat the valve body to prevent deposits in the valve.

#### Mounting

#### 

#### All models

- In high humidity environments keep valves packaged until the time of installation.
- In case with switches, secure the lead wires so that they have sufficient slack, without any unreasonable force applied to them
- 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.

#### High temperature types (Models/XMH, XYH; Temperature specifications/H0)

1. When a valve is to be heated, only the body section should be heated, excluding the bonnet (handle) section.

#### **Piping**

#### **⚠** Caution

- Before mounting, clean the surface of the flange seal and the O-ring with ethanol, etc.
- 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**

#### 

- When removing deposits from a valve, take care not to damage any of its parts.
- Replace the bonnet assembly and the O-ring when the end of its service life is approached.
- If damage is suspected prior to the end of the service life, perform early maintenance.
- SMC specified parts should be used for service. Refer to the Construction/Maintenance parts table.
- When removing seal material (such as valve, exterior seals), take care not to damage the sealing surfaces. When installing the valve and exterior seals, be sure that the O-ring is not twisted.





## Series XM, XY **Specific Product Precautions 2**

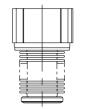
Be sure to read before handling.

#### **Maintenance Parts**

#### **⚠** Caution

1. The bonnet or handle assembly should also be replaced when changing

Due to the different materials used, changing only the seal may prove inadequate.





#### **Bonnet assembly**

Handle assembly

#### Bonnet & Handle assembly/Construction part number: 1

Model	Temperature	perature Indicator Valve siz					size		
iviodei	specifications	indicator	16	25	40	50	63	80	
	0	_	XLA16-30-1	XLA25-30-1	XLA40-30-1	XLA50-30-1	XLA63-30-1	XLA80-30-1	
XMA	General use	0	XLA16A-30-1	XLA25A-30-1	XLA40A-30-1	XLA50A-30-1	XLA63A-30-1	XLA80A-30-1	
XYA	High	_	XLA16-30-1H	XLA25-30-1H	XLA40-30-1H	XLA50-30-1H	XLA63-30-1H	XLA80-30-1H	
	temperature	0	XLA16A-30-1H	XLA25A-30-1H	XLA40A-30-1H	XLA50A-30-1H	XLA63A-30-1H	XLA80A-30-1H	
XMC	General use		XLC16-30-1	XLC25-30-1	XLC40-30-1	XLC50-30-1	XLC63-30-1	XLC80-30-1	
XYC	High temperature	_	XLC16-30-1H	XLC25-30-1H	XLC40-30-1H	XLC50-30-1H	XLC63-30-1H	XLC80-30-1H	
XMD	General use		_	XLD25-30-1	XLD40-30-1	XLD50-30-1	XLD63-30-1	XLD80-30-1	
XYD	High temperature	Standard	_	XLD25-30-1H	XLD40-30-1H	XLD50-30-1H	XLD63-30-1H	XLD80-30-1H	
XMH XYH	High temperature as standard	O: Standard	XLH16-30-1	XLH25-30-1	XLH40-30-1	XLH50-30-1	_	_	

Note 1) List the optional seal material symbol (refer to Table 1 below) after the model number, except for the standard seal material (FKM: compound no. 1349-80, produced by Mitsubishi Cable industries, Ltd.)

#### Exterior seal, (M) Valve seal, S Valve seal assemblies

	Description Construction	n			Valve	e size		
Mod	Construction	no. Materia	16	25	40	50	63	80
XMA :	(YA Exterior s	Standard	AS568-025V	AS568-030V	AS568-035V	AS568-039V	AS568-043V	AS568-045V
XMC :	(YC 3	Specia	AS568-025□	AS568-030□	AS568-035□	AS568-039□	AS568-043□	AS568-045□
XMH :	Valve Se	Standard	B2401-V15V	B2401-V24V	B2401-P42V	AS568-227V	AS568-233V	B2401-V85V
XMD :	CYD 2	Specia	B2401-V15□	B2401-V24□	B2401-P42□	AS568-227□	AS568-233□	B2401-V85□
VMD 3	S Valve s	Standard	<b>.</b>	AS568-009V	XLD40-2-9-1A	XLD50-2-9-1A	XLD80-2-9-3A	XLD80-2-9-3A
ZIVID A	AD XYD assembly 4	Specia	_	AS568-009□	XLD40-2-9-1A□	XLD50-2-9-1A□	_	_

Note 2) List the optional seal material symbol (refer to Table 1 below) after the model number, except for the standard seal material (FKM: compound no. 1349-80, produced by Mitsubishi Cable industries, Ltd.)

#### Table 1

#### Optional seal material

Optional o	oui materiai								
Symbol	-XN1	-XP1	-XQ1	-XR1	-XR2	-XR3	-XS1	XT1	-XU1
Seal material	EPDM	BARREL® PERFLUORO	FFKM	CHEMRAZ®			VMQ	FKM for PLASMA	ULTIC ARMOR®
Compound No.	2101-80*	70W	4079	SS592	SS630	SSE38	1232-70*	3310-75*	UA4640

Note 4) Due to the different materials used, changing only the seal may prove inadequate.

#### SMC CORPORATION (Europe)

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Italy Latvia	<b>≅</b> +39 0292711 <b>≅</b> +37 7779474	www.smcitalia.it www.smclv.lv	mailbox@smcitalia.it info@smclv.lv	UK	<b>2</b> +44 8001382930	www.smcpneumatics.co.uk	sales@smcpneumatics.co.uk

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Note 3) Refer to the Construction of each series for the construction numbers.

<sup>\*:</sup> Produced by Mitsubishi Cable Industries, Ltd

# **SMC** Information

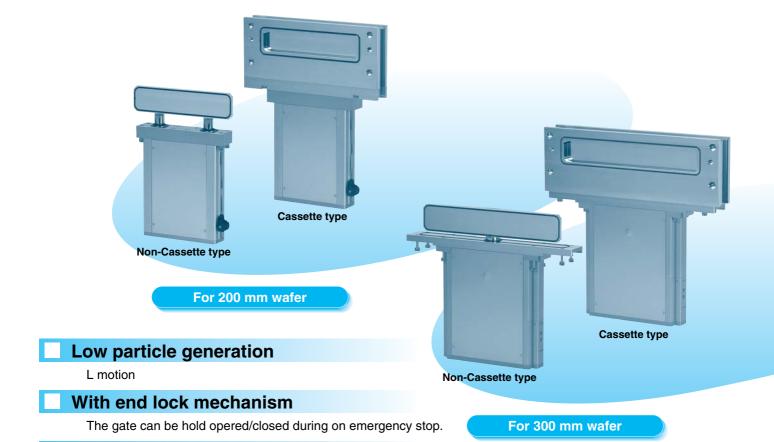
## **Slit Valve**

## **XGT Series**

SMC Corporation

1-16-4 Shimbashi, Minato-ku, Tokyo 105-8659, Japan URL: http://www.smcworld.com ©2005 SMC Corporation All rights reserved.

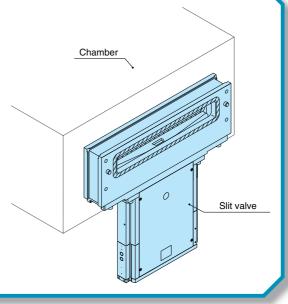
'04-EU516-UK Issued: June, 2005 D-KS P-120(KS)



\* With SMC's life conditions.

This product is suitable for the partition valve between the load lock chamber and the transfer chamber or between the transfer chamber and the process chamber in semiconductor equipment or other equipment.

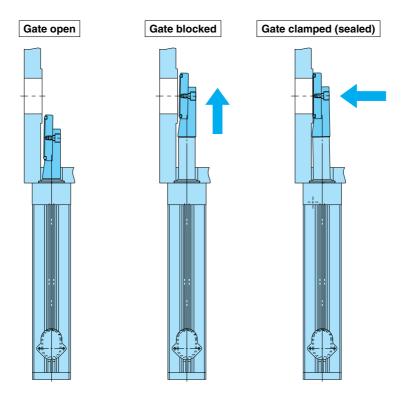
Service life of two million cycles.



## Series XGT

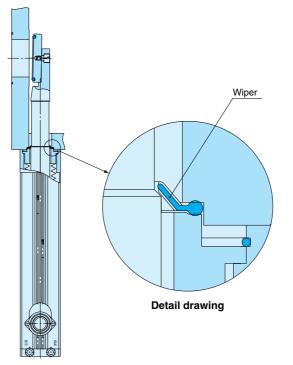
L motion structure

A gate construction with a two-stage operation which consists of a direct up and down movement and a clamp operation to seal the gate.



**Bellows protection structure** 

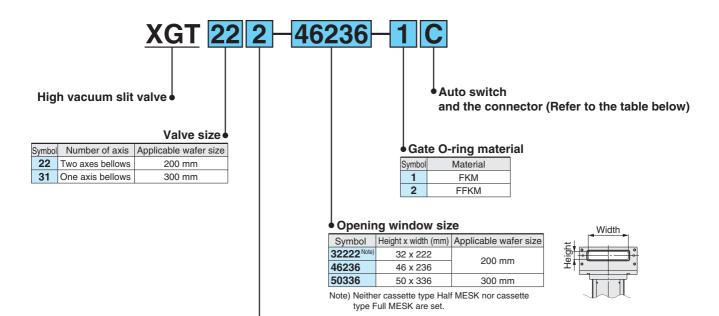
The adoption of a wiper decreases the intrusion of foreign objects, resulting from wafer damage and or other sources.



## Slit valve

# Series XGT

#### **How to Order**



Valve type

valve type •					
Symbol		1	2	3	4
		Non-Cassette type	Cassette type standard	Cassette type Half MESK	Cassette type Full MESK
Valve type	•				
Applicable	200 mm	•	•	•	•
wafer size	300 mm	•	•	•	_

#### Non-Cassette type







Cassette type



For 300 mm wafer

#### Auto switch and connector

Symbo	Auto switch	Connector			
-	None	_	_		
Α		Lead wire: 0.5 m (	without connector)		
С	D-A93 (With 2 pcs.	With multiple connector Note 1) (T3106 000: Made by AMP)			
F	for opening and closing)	With D-sub connector Note 2) (CDE-9PF05: Made by HIROSE ELECTRIC CO., LTD.)	Santa Santa Santa Santa Santa Santa Santa Santa Santa Santa Santa Santa Santa Santa Santa Santa Santa Santa Sa		

Note 1) T3105000 made by AMP is recommended for the connector (female type). Note 2) CDE-9SF05 made by HIROSE ELECTRIC CO., LTD. is recommended for the connector (female type).



## Series XGT

#### **Specifications**

Mod	lel	XGT22□-32222	XGT22□-46236	XGT31□-50336		
Wafer size mm		20	300			
Opening window size (Height x V	Vidth) mm	32 x 222	46 x 236	50 x 336		
Number of axes		2		1		
Operating environmental pressu	re <sup>Note 1)</sup> Pa (abs)		Atmospheric pressure to10 <sup>-6</sup>	i 		
Operating pressure differential k	Pa		4 or less			
Operating pressure range MPa (	G)		0.45 to 0.6			
Internal leak Note 2) Pa·m³/s	O-ring: FKM		6.5 x 10 <sup>-10</sup>			
	O-ring: Kalrez <sup>®</sup>		6.5 x 10 <sup>-9</sup>			
Internal leak Note 2) Pa·m³/s at reversed pressure	O-ring: FKM		6.5 x 10 <sup>-8</sup>			
[Reversed pressure: 0.1 MPa (abs) or less]	O-ring: Kalrez <sup>®</sup>		6.5 x 10 <sup>-7</sup>			
External leak Note 2) Pa·m³/s			6.5 x 10 <sup>-11</sup>			
Operation temperature Note 3) °C	Gate part		5 to 150			
Operation temperature **** C	Actuator part	5 to 60				
Fluid		Inert gas				
Operating time Note 4) s		0.6 to 1				
	Seal material	FKM, FFKM (Option)				
	Bellows	AM350				
Main material of vacuum part	Gate					
Main material of vacuum part	Body		A5052			
	Bonnet		A5052			
	Others		Stainless steel 304			
Exhaust direction			Free			
Mounting direction			Vertical			
Port size		M	15	Rc 1/8		
End-lock mechanism		With lock me	chanism at opening/closing p	position Note 5)		
Cylinder volume ℓ		0	0.2			
	Non-Cassette type	8	3	14		
Weight kg	Cassette type: Standard	1:	2	20		
weight kg	Cassette type: Half MESK	_	12	20		
	Cassette type: Full MESK —		11	_		

Note 1) Absolute pressure Note 2) Value at normal temperature: Not including gas permeation.

Note 3) If the temperature at the gate exceeds 60°C, the operating temperature at actuator may go beyond the range. In this case, cool the actuator part.

Note 4) This shows the time after the switching valve activates and causes the gate to open and close.

Note 5) The holding function of the seal is not guaranteed when the gate is clamped.

#### Auto switch specifications

Auto switch type	D-A93						
Applicable load	Relay, PLC						
Load voltage	24 V DC	100 V AC					
Load current range and maximum load current	5 to 40 mA	5 to 20 mA					
Contact protection circuit	None						
Internal voltage drop	2.4 V or less (to 20 mA) / 3 V or less (40 mA)						
Indicator light	Red light emitting diode (LED) lights up when ON.						

#### **D-sub connector specifications**

	<u> </u>		
Description		Slit valve body side	Counter side
	Contacting division	Pin (male type)	Socket (female type)
D-sub connector	Shell size	E	
	Poles	9	)

Prepare the socket contacting (female type) because the slit valve body is a pin contacting (male type).

#### **Connector wiring diagram**

#### C: Multiple connector (6P)



Terminal item no.	Lead wire color	Auto switch	
1	Blue	OPEN (-)	
2	Brown	OPEN (+)	
3	_	_	
4	_	_	
5	Brown	CLOSE (+)	
6	Blue	CLOSE (-)	

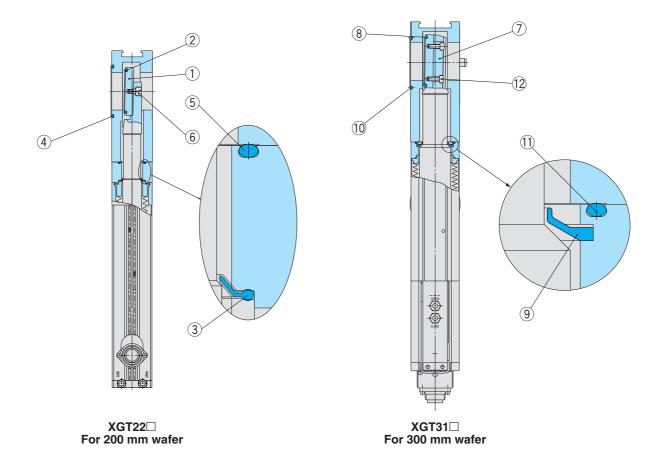
#### F: D-sub connector (9P)



` '			
Terminal item no.	Lead wire color	Auto switch	
1	Brown	OPEN (+)	
2	Brown	CLOSE (+)	
3	_	_	
4	_	_	
5	_	_	
6	_	_	
7	Blue	OPEN (-)	
8	Blue	CLOSE (-)	
9	_	_	



#### Construction



#### **Component Parts**

#### XGT22□ (200 mm wafer type)

AGIZ	M122 (200 mm water type)					
No.	Description	Material	Part number	Corresponding model		
	Gate A6063		XGT0101-2-1S	XGT22□-32222-□□		
	Gate	A0003	XGT0402-2-1S	XGT22□-46236-□□		
		FKM	XGT200-9-13S	XGT22□-32222-□□		
2	O-ring (Gate)	FFKM	XGT200-9-14S	AG122LI-32222-LILI		
2		FKM	XGT200-9-7S	XGT22□-46236-□□		
		FFKM	XGT200-9-9S	AG122L-40230-LLL		
3	Wiper		XGT0402-4-9S	XGT22□- □ - □ □		
4	O-ring (Body opening side)	FKM	XGT200-9-12S	VOTOOD D		
5	O-ring (Bonnet assembly)		XGT300-9-11S	XGT22□- □ □ - □ □		
6	Holding bolt	Stainless steel 304	XGT200-2-5S	XGT22□- □ -□□		

#### XGT31□ (300 mm wafer type)

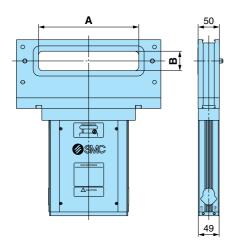
	(			
No.	Description	Material	Part number	Corresponding model
7	Gate	A6063	XGT300-2-1S	
8	O-ring (Gate)	FKM	XGT300-9-9S	XGT31□-50336-□□
0	O-ring (Gate)	FFKM	XGT300-9-11S	XG131L-30330-LL
9	Wiper		XGT300-4-9S	
10	O-ring (body opening side)	FKM	XGT300-9-10S	XGT31□-50336-□□
11	O-ring (Bonnet assembly)		XGT300-9-7S	XGT31□-50336-□□
12	Holding bolt	Stainless steel 316	XGT300-2-5S	X4131L-30330-LL



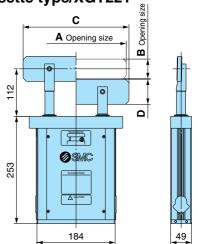
## Series XGT

#### **Dimensions**

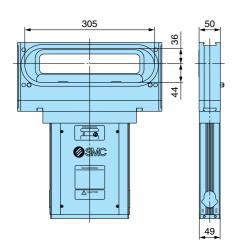
#### **Cassette type Standard/XGT222**

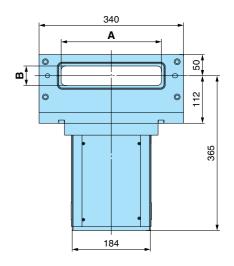


#### Non-Cassette type/XGT221



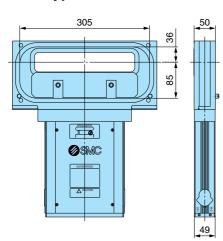
#### **Cassette type Half MESK/XGT223**





Valve seat side (XGT222, 223, and 224 commons)

#### Cassette type Full MESK/XGT224

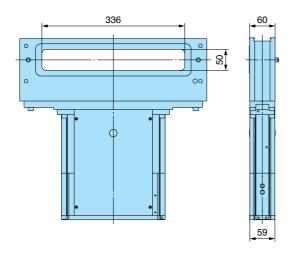


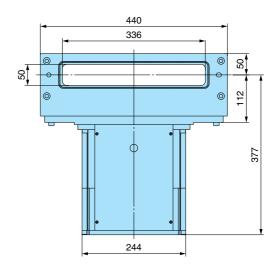
					(mm)
Model	Valve type	Α	В	С	D
XGT221-32222	Non-Cassette type	222	32	235	45
XGT221-46236	Non-Cassette type	236	46	249	59
XGT222-32222	Cassette type standard	222	32	_	_
XGT222-46236	Casselle type standard	236	46	_	_
XGT223-46236	Cassette type Half MESK	236	46	_	_
XGT224-46236	Cassette type Full MESK	236	46	_	_



#### **Dimensions**

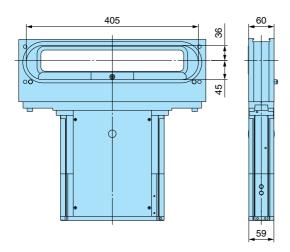
#### **Cassette type Standard/XGT312**



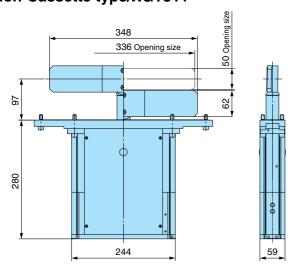


Valve seat side (XGT312, 313, and 311 commons)

#### **Cassette type Half MESK/XGT313**



#### Non-Cassette type/XGT311



## Series XGT **Made to Order**

Contact SMC for further detail.



#### **Anodized parts**

The parts which come in contact with gas (oxalic acid aluminum alloy, stainless steel etc.) are changed.

#### Replaceable bellows

Customer can replace the bellows.

#### High temperature type (150°C)

O-ring, guide etc. which is the part of actuator are changed to heat resistance.

#### Holding function of the seal (when operating pressure is stopped)

Sealing is maintained when operating pressure is stopped.

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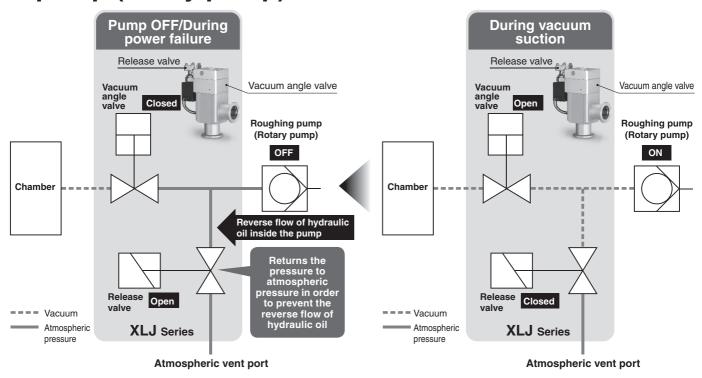
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UK

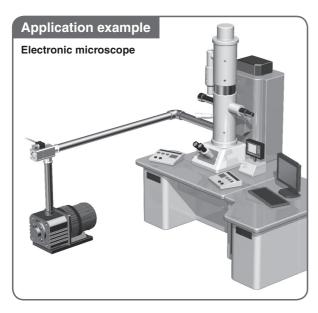
# Vacuum Angle Valve with Release Valve

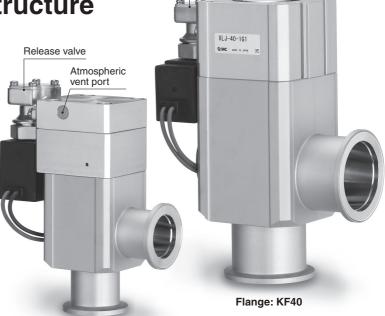
 $\epsilon$ 

■ Prevents the reverse flow of oil through the roughing pump (rotary pump) into the chamber



■ Reduced piping labour due to the built-in release valve structure





Release valve

Flange: KF25



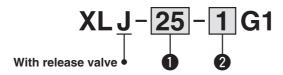


# Vacuum Angle Valve with Release Valve

# **XLJ** Series



#### **How to Order**



#### 1 Flange size

	_
Symbol	Flange type/Size
25	KF25
40	KF40

#### 2 Rated voltage

Symbol	Rated voltage	XLJ-25	XLJ-40
1	100 VAC	•	•
2	200 VAC	•	•
3	110 VAC	•	•
4	220 VAC	•	•
5	24 VDC	•	•
6	12 VDC	•	•
7	240 VAC	•	•
J	230 VAC	•	•

#### **Specifications**

Model	XLJ-25	XLJ-40	
Valve type	Normally closed/Vacuum pilot		
Shaft seal type	O-rin	g seal	
Operating pressure range	Atmospheric press	sure to 1 x 10 <sup>-2</sup> Pa	
Fluid	Inert	gas	
Piping direction	Fix	red	
Internal leakage	1.3 x 10 <sup>-8</sup> Pa·	m <sup>3</sup> /s or less*1	
External leakage	1.3 x 10 <sup>-6</sup> Pa⋅m³/s or less*1		
Operating temperature	5 to 40°C		
Conductance	12 L/s* <sup>2</sup>	45 L/s *2	
Starting voltage	100 VAC, 200 VAC, 110 VAC, 230 VAC, 220 VAC, 240 VAC, 12 VDC, 24 VDC		
Electrical entry	Gron	nmet	
Flange type	KF25	KF40	
Weight	0.95 kg	1.5 kg	
ON operation (Operating simultaneously with pump)	The valve opens after approx. 2 seconds.*3		
OFF operation (Operating simultaneously with pump)	The valve closes instantaneously. The pump side releases the air immediately afterwards.		
Standards	CE marking		

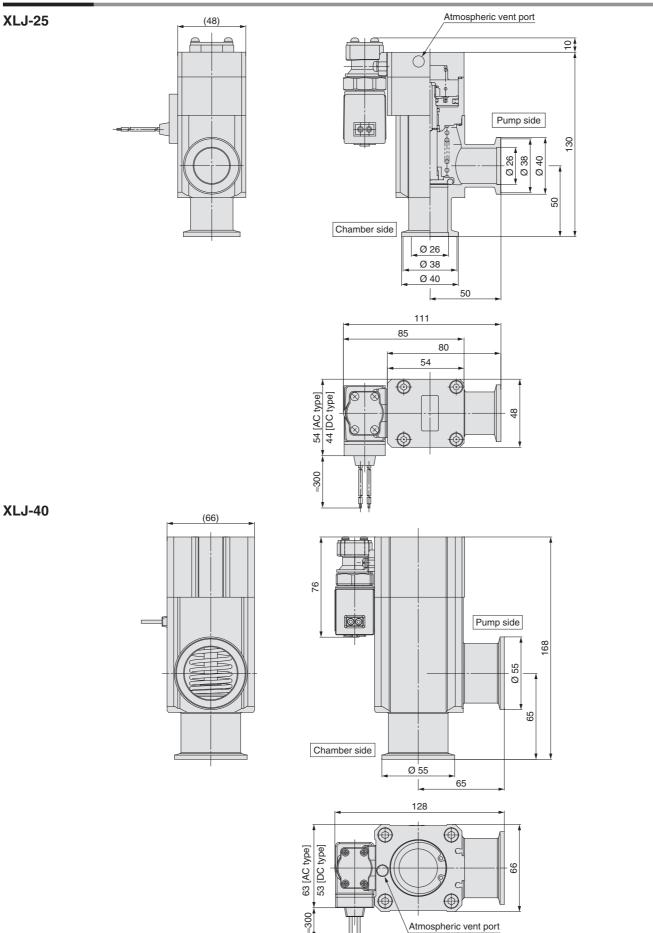
<sup>\*1</sup> The amount of leakage is the value when the ambient temperature is 20°C and the differential pressure is 0.1 MPa. Excludes gas permeation



st2 The conductance is the value calculated using an elbow of the same dimensions.

 $<sup>\</sup>ast 3\,$  The value when using a pump that has an exhaust speed of 75 L/min

#### **Dimensions**



**SMC** 



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