



Stainless Steel High Vacuum Angle/In-line Valve

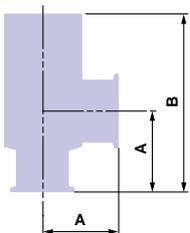


Angle type/
Series XM

In-line type/
Series XY

- **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

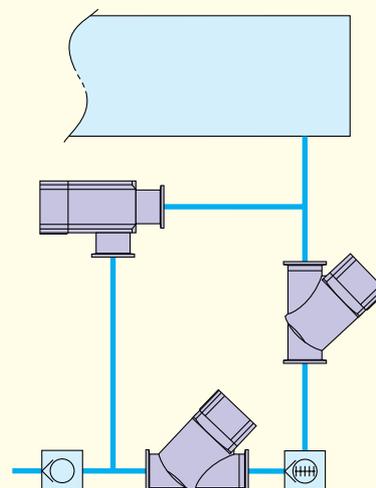


Series XMA with KF(NW) flange

Model	A* mm	B mm	Weight kg	Conductance ℓ/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

*: Common to all series.

Piping example



Combination of piping allows space saving.

Series Variations

Application	Shaft seal system	Models		Valve type	Operating pressure Pa	Flange size						Options'					
		Angle type	In-line type			16	25	40	50	63	80	Switch	Indicator	High temp. specification			
Air operated																	
Particulate free	Bellows seal	XMA 	XYA 	Single acting (N.C.)	Atmospheric pressure to 1 x 10 ⁻⁶	(Note)	●	●	●	●	●	●	●	●	●	●	●
		XMC 	XYC 	Double acting		(Note)	●	●	●	●	●	●	●	●	●	●	●
Reduces particulates Eliminates pump over loads	Bellows, O-ring seal	XMD 	XYD 	Single acting (N.C.)		●	●	●	●	●	●	●	●	Standard	●	●	
Manual																	
Particulate free	Bellows seal	XMH 	XYH 	Manual	Atmospheric pressure to 1 x 10 ⁻⁶	(Note)	●	●	●	●	●	●	●	Standard	Standard	Standard	Standard

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).
- Unrestricted 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

XMA — 16 — — — M9N A —

In-line type

XYA — 25 — — — M9N A —

1 2 3 4 5 6 7



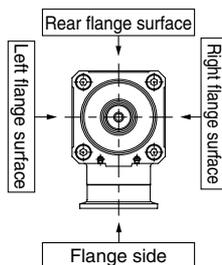
1. Flange size

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
A	With indicator	Flange side
F		Left flange surface
G		Rear flange surface
J		Right flange surface
K	Without indicator	Left flange surface
L	Without indicator	Rear flange surface
M	Without indicator	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	—
A	2 pcs.	Valve open/closed
B	1 pc.	Valve open
C	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 PERFLUORO®	70W
Q1	FFKM	4079
R1	CHEMRAZ®	SS592
R2		SS630
R3		SSE38
S1	VMQ	1232-70*
T1	FKM for Plasma	3310-75*
U1	ULTIC ARMOR®	UA4640

*: Produced by Mitsubishi Cable Industries, Ltd.

2. Flange type

XMA

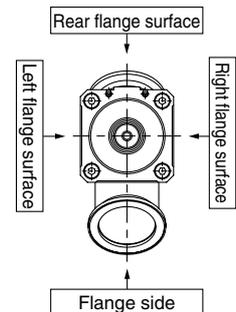
Symbol	Type	Applicable flange size
Nil	KF (NW)	16, 25, 40, 50, 63, 80
D	K (DN)	63, 80
C	CF	16 (034), 40 (070), 63 (114)

XYA

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
A	With indicator	Rear flange side
F		Left flange surface
J		Right flange surface
K	Without indicator	Left flange surface
M	Without indicator	Right flange surface



5. Auto switch type

Symbol	Auto switch	Remarks
Nil	—	Without auto switch (without built-in magnet)
M9N (L)	D-M9N (L)	Solid state switch
M9P (L)	D-M9P (L)	
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 ³ /s or less ^{Note 1)}	
		Internal	External
Nil	—	1.3 x 10 ⁻¹⁰ (FKM)	1.3 x 10 ⁻¹¹ (FKM)
A	2, 3	1.3 x 10 ⁻⁸	1.3 x 10 ⁻⁹
B	2	1.3 x 10 ⁻⁸	1.3 x 10 ⁻¹¹ (FKM)
C	3	1.3 x 10 ⁻¹⁰ (FKM)	1.3 x 10 ⁻⁹

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	Normally closed (Pressurize to open, spring seal)						
Fluid	Inactive gas under vacuum						
Operating temperature °C	5 to 60 (High temperature type: 5 to 150)						
Operating pressure Pa	Atmospheric pressure to 1×10^{-6}						
Conductance ℓ/s ^{Note 1)}	5	14	45	80	160	200	
Leakage $\text{Pa}\cdot\text{m}^3/\text{s}$	Internal	$1.3 \times 10^{-10}\{1 \times 10^{-10}\}$ at ambient temperature, excluding gas permeation					
	External	$1.3 \times 10^{-11}\{1 \times 10^{-11}\}$ 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 SUS316L Bellows holder: Stainless steel SUS304. FKM (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)						
Weight kg ^{Note 2)}	XMA	0.33(0.37)	0.61	1.40(1.76)	2.00	3.60(4.96)	6.20
	XYA	—	0.66	1.42	2.40	4.30	7.70

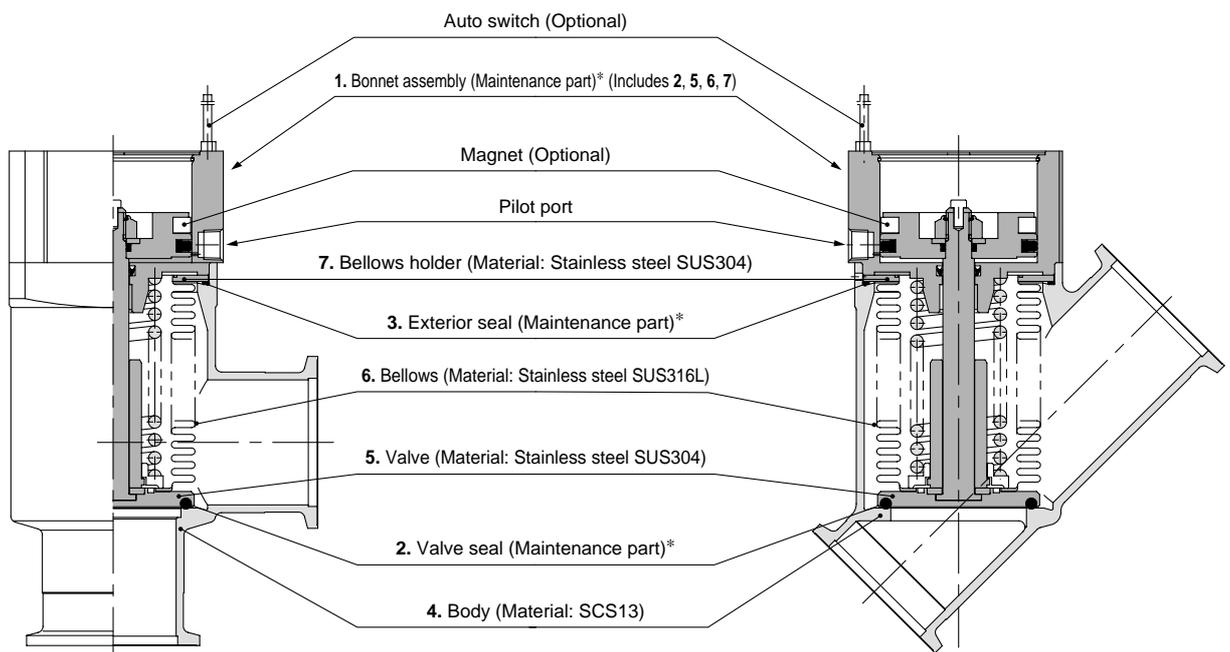
Note 1) Conductance is the value for the molecular flow of an elbow having the same dimensions.

Note 2) Figures in () indicates the weight of CF, conflate fittings.

Construction

XMA/Angle type

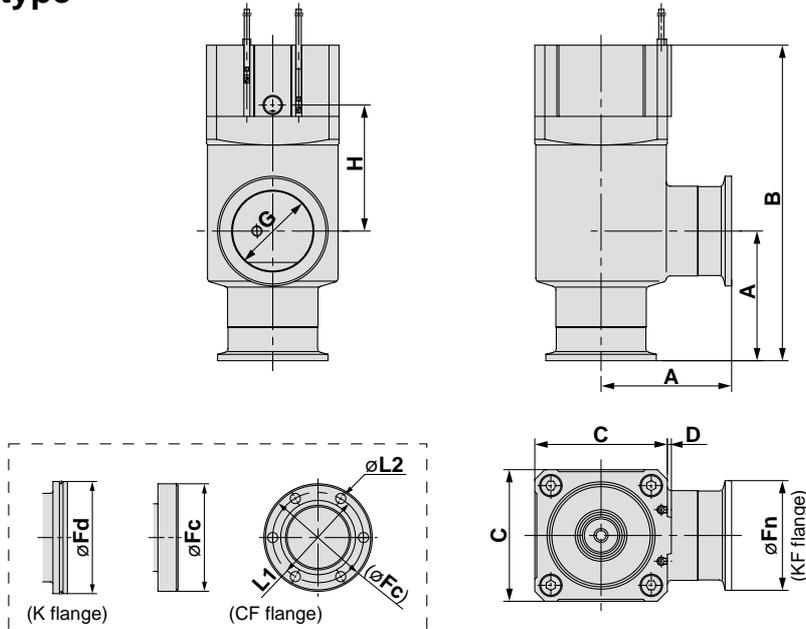
XYA/In-line type



* Refer to page 22 for the maintenance parts.

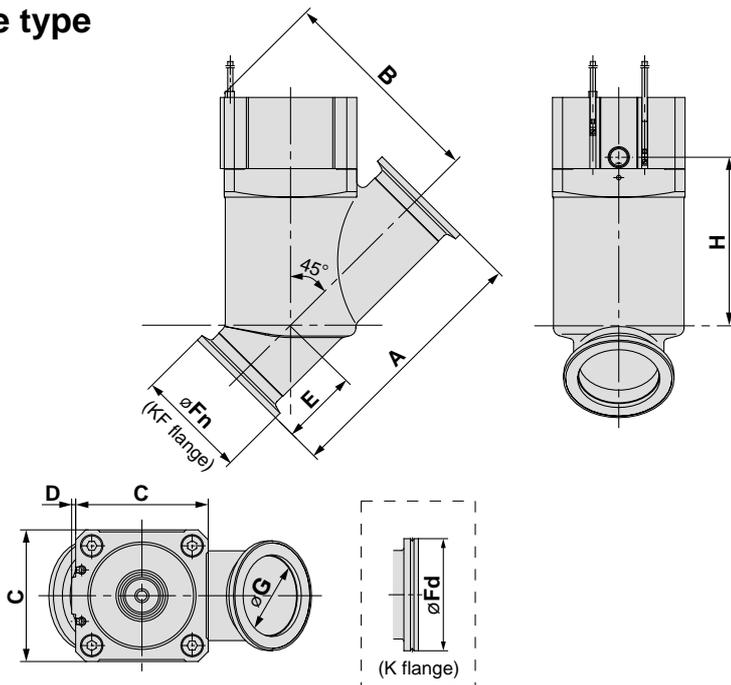
Dimensions

XMA/Angle type



Model	A	B	C	D	F _n	F _d	F _c	G	H	P.C.D L1	L2
XMA-16	40	103	38	1	30	—	34	17	40	P.C.D 27	6- ϕ 4.4
XMA-25	50	113	48	1	40	—	—	26	39	—	—
XMA-40	65	158	66	2	55	—	70	41	63	P.C.D 58.7	6- ϕ 6.6
XMA-50	70	170	79	2	75	—	—	52	68	—	—
XMA-63	88	196	100	3	87	95	114	70	69	P.C.D 92.1	8- ϕ 8.4
XMA-80	90	235	117	3	114	110	—	83	96	—	—

XYA/In-line type



Model	A	B	C	D	E	F _n	F _d	G	H
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

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 acting (Dual operation), pressurize to open/close						
Fluid	Inactive gas under vacuum						
Operating temperature °C	5 to 60 (High temperature type: 5 to 150)						
Operating pressure Pa	Atmospheric pressure to 1×10^{-6}						
Conductance ℓ/s <small>Note 1)</small>	5	14	45	80	160	200	
Leakage $\text{Pa}\cdot\text{m}^3/\text{s}$	Internal	$1.3 \times 10^{-10}\{1 \times 10^{-10}\}$ at ambient temperatures, excluding gas permeation					
	External	$1.3 \times 10^{-11}\{1 \times 10^{-11}\}$ 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 SUS316L Bellows holder: Stainless steel SUS304. FKM (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)						
Weight kg <small>Note 2)</small>	XMC	0.36 (0.40)	0.62	1.40 (1.76)	2.10	3.80 (5.16)	6.30
	XYC	—	0.67	1.42	2.50	4.50	7.80

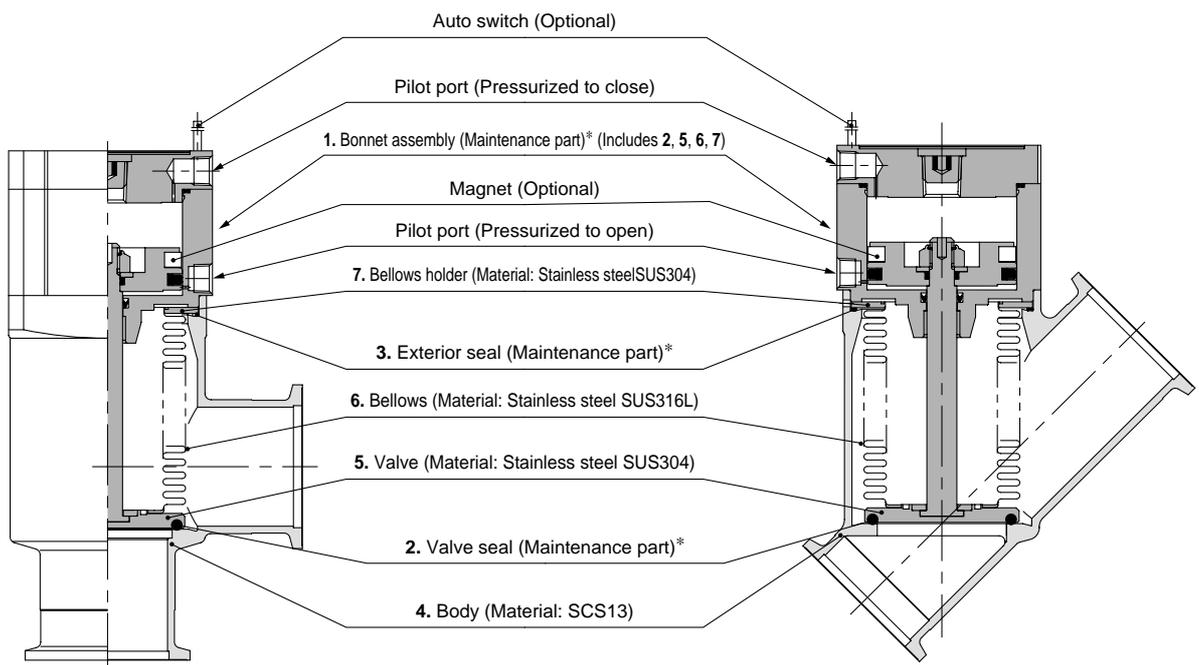
Note 1) Conductance is the value for the molecular flow of an elbow having the same dimensions.

Note 2) Figures in () indicates the weight of CF, conflate fittings.

Construction

XMC/Angle type

XYC/In-line type

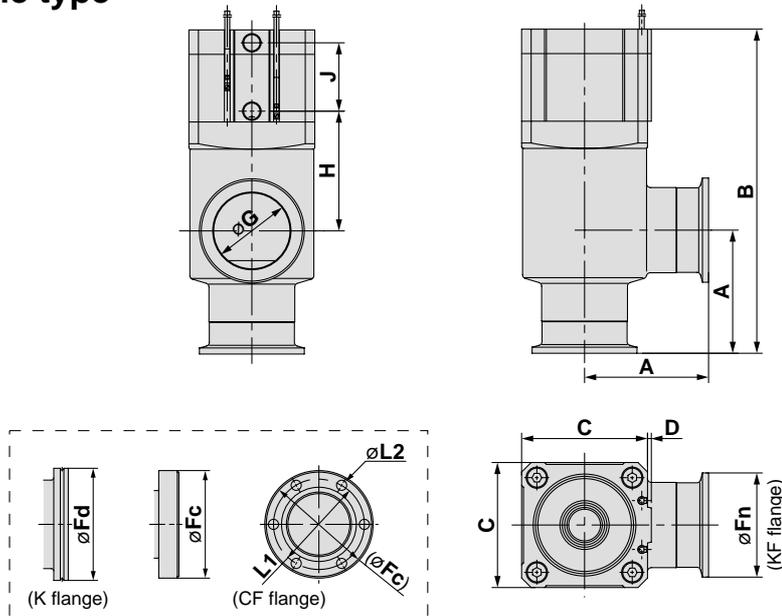


* Refer to page 22 for the maintenance parts.

Series XMC, XYC

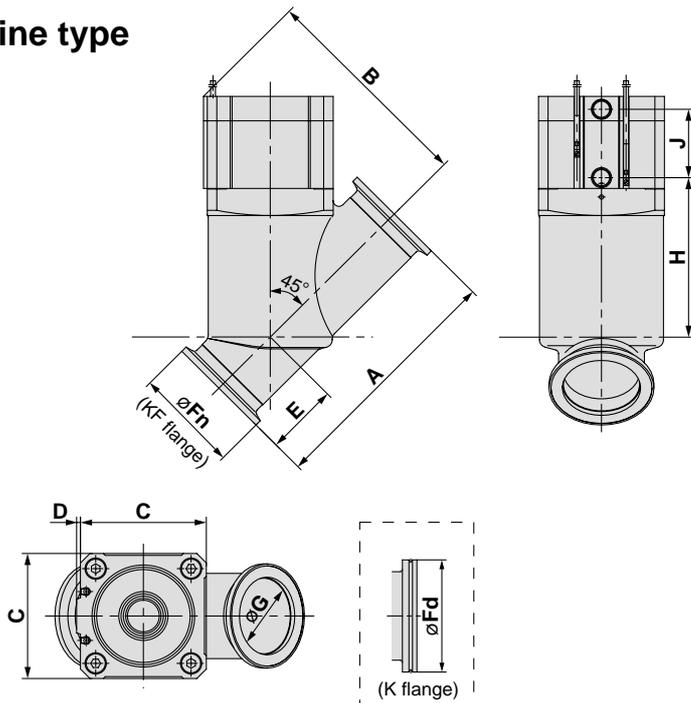
Dimensions

XMC/Angle type



Model	A	B	C	D	Fn	Fd	Fc	G	H	J	P.C.D L1	L2
XMC-16	40	110	38	1	30	—	34	17	40	26	P.C.D 27	6- ϕ 4.4
XMC-25	50	120	48	1	40	—	—	26	39	28	—	—
XMC-40	65	171	66	2	55	—	70	41	63	36	P.C.D 58.7	6- ϕ 6.6
XMC-50	70	183	79	2	75	—	—	52	68	38	—	—
XMC-63	88	209	100	3	87	95	114	70	69	45	P.C.D 92.1	8- ϕ 8.4
XMC-80	90	250	117	3	114	110	—	83	96	56	—	—

XYC/In-line type



Model	A	B	C	D	E	Fn	Fd	G	H	J
XYC-25	100.2	85	48	1	23.5	40	—	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

XMD — 25 □ □ □ — M9N A — □

In-line type

XYD — 25 □ □ □ — M9N A — □

1 2 3 4 5 6 7



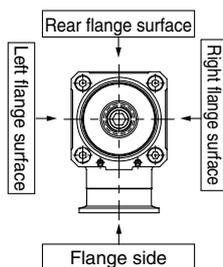
1. Flange size

Size	XMD	XYD
25	●	●
40	●	●
50	●	●
63	●	●
80	●	●

3. Pilot port direction

XMD

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	—
A	2 pcs.	Valve open/closed
B	1 pc.	Valve open
C	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 PERFLUORO®	70W
Q1	FFKM	4079
R1	CHEMRAZ®	SS592
R2		SS630
R3		SSE38
S1	VMQ	1232-70*
T1	FKM for Plasma	3310-75*
U1	ULTIC ARMOR®	UA4640

The material used in the sliding part of the S-valve is: FKM *: Produced by Mitsubishi Cable Industries, Ltd.

2. Flange type

XMD

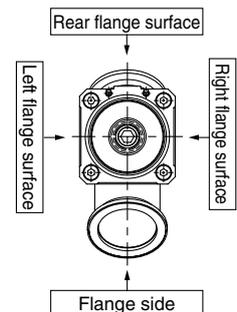
Symbol	Type	Applicable flange size
Nil	KF (NW)	25, 40, 50, 63, 80
D	K (DN)	63, 80
C	CF	40 (070), 63 (114)

XYD

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)	Solid state switch
M9P (L)	D-M9P (L)	
M9B (L)	D-M9B (L)	
A90 (L)	D-A90 (L)	Reed switch (Flange size 16 is not available.)
A93 (L)	D-A93 (L)	
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 ³ /s or less ^{Note 1)}	
		Internal	External
Nil	—	1.3 x 10 ⁻¹⁰ (FKM)	1.3 x 10 ⁻¹¹ (FKM)
A	2, 3, 4, 5	1.3 x 10 ⁻⁸	1.3 x 10 ⁻⁹
B	2, 4, 5	1.3 x 10 ⁻⁸	1.3 x 10 ⁻¹¹ (FKM)
C	3	1.3 x 10 ⁻¹⁰ (FKM)	1.3 x 10 ⁻⁹

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

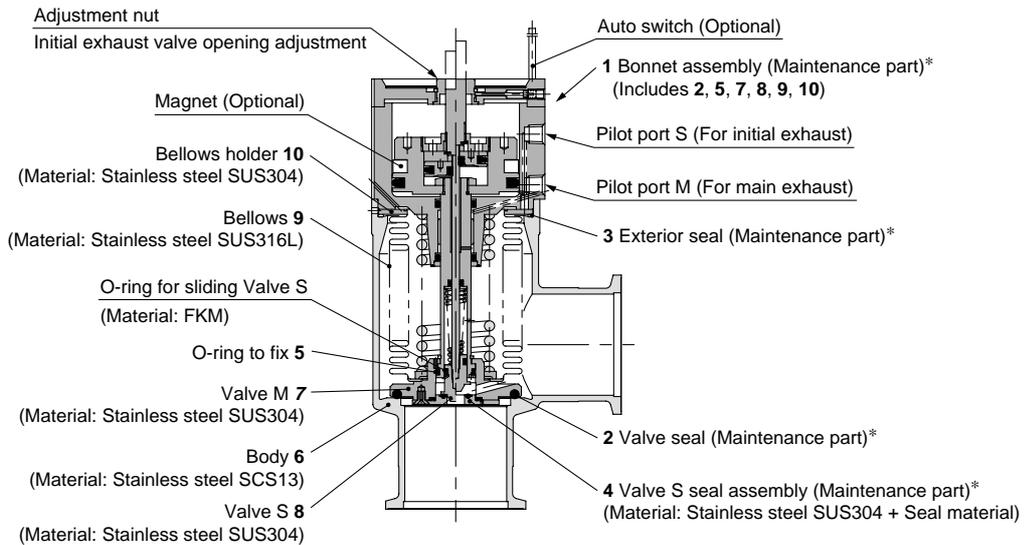
Model	XMD-25 XYD-25	XMD-40 XYD-40	XMD-50 XYD-50	XMD-63 XYD-63	XMD-80 XYD-80	
Flange (valve) size	25	40, CF070	50	63, CF114	80	
Valve type	Normally closed (Pressurize to open, spring seal) [both main & initial exhaust valves]					
Fluid	Inactive gas under vacuum					
Operating temperature °C	5 to 60 (High temperature type: 5 to 150)					
Operating pressure Pa	Atmospheric pressure to 1×10^{-6}					
Conductance ℓ/s <small>Note 1)</small>	Main exhaust valve	14	45	80	160	200
	Initial exhaust valve	0.5 to 3	2 to 8	2.5 to 11	4 to 18	4 to 18
Leakage $\text{Pa}\cdot\text{m}^3/\text{s}$	Internal	$1.3 \times 10^{-10}\{1 \times 10^{-10}\}$ at ambient temperatures, excluding gas permeation				
	External	$1.3 \times 10^{-11}\{1 \times 10^{-11}\}$ at ambient temperatures, excluding gas permeation				
Operating time s	Main exhaust valve	0.10	0.21	0.24	0.26	0.28
	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 cycles)	2 (FKM seal material)					
Weight kg <small>Note 2)</small>	XMD	0.65	1.50 (1.86)	2.20	4.10 (5.46)	6.80
	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.

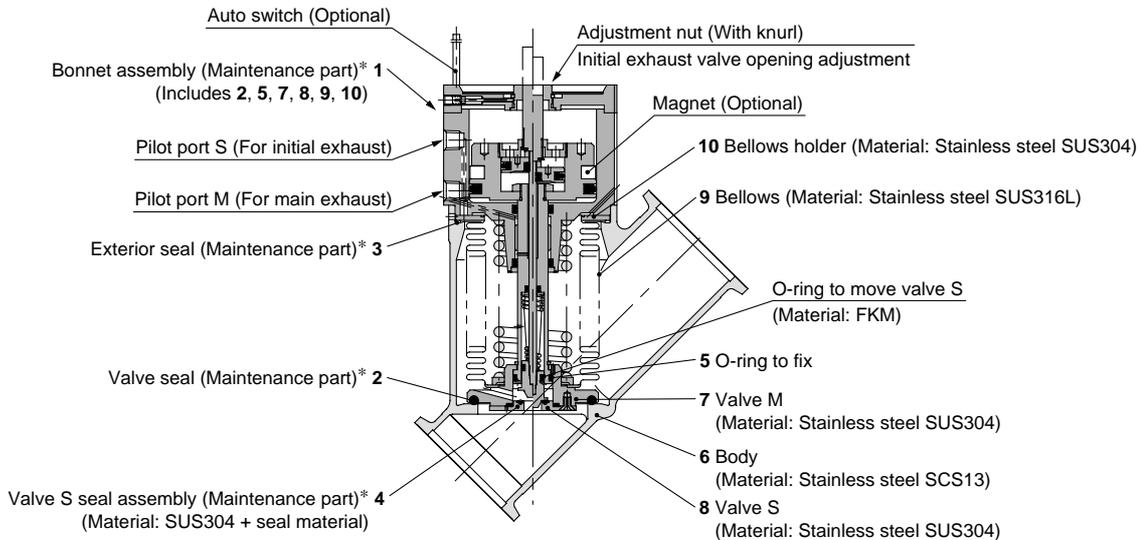
Note 2) Figures in () indicates the weight of CF, conflate fittings.

Construction

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)

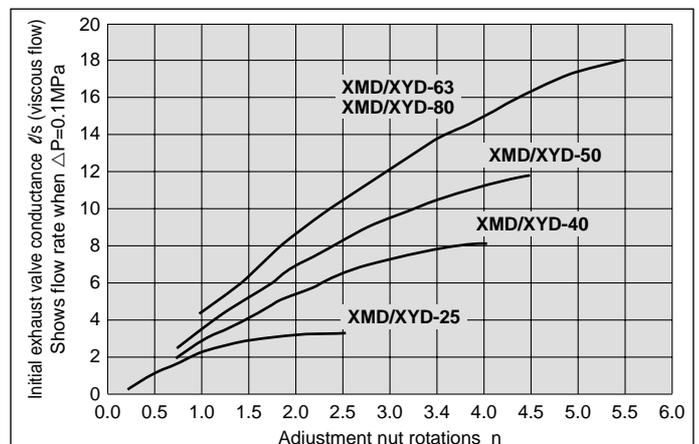
When pressure is applied to the pilot port S, the valve S is removed from the valve S assembly and opens until the adjusted opening setting.

[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

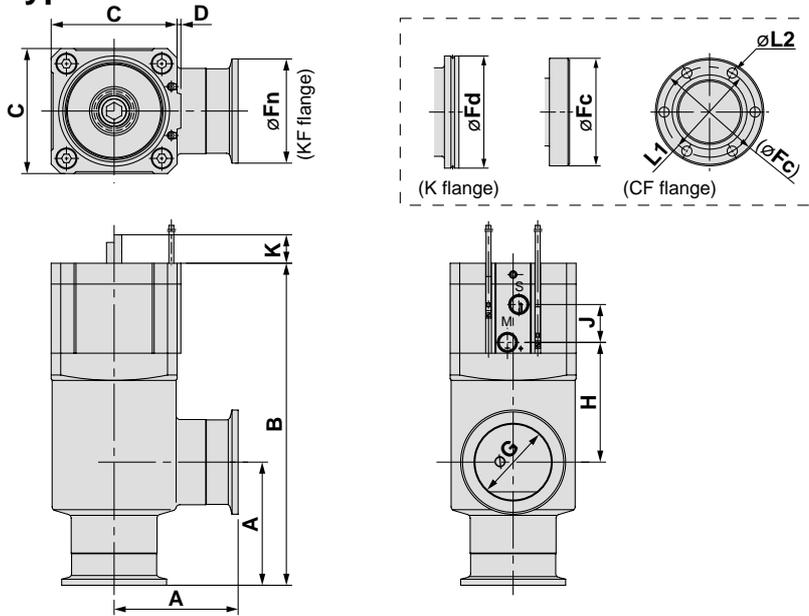
By removing the pressure from the pilot ports S and M, both valves return to their sealed position.



Series XMD, XYD

Dimensions

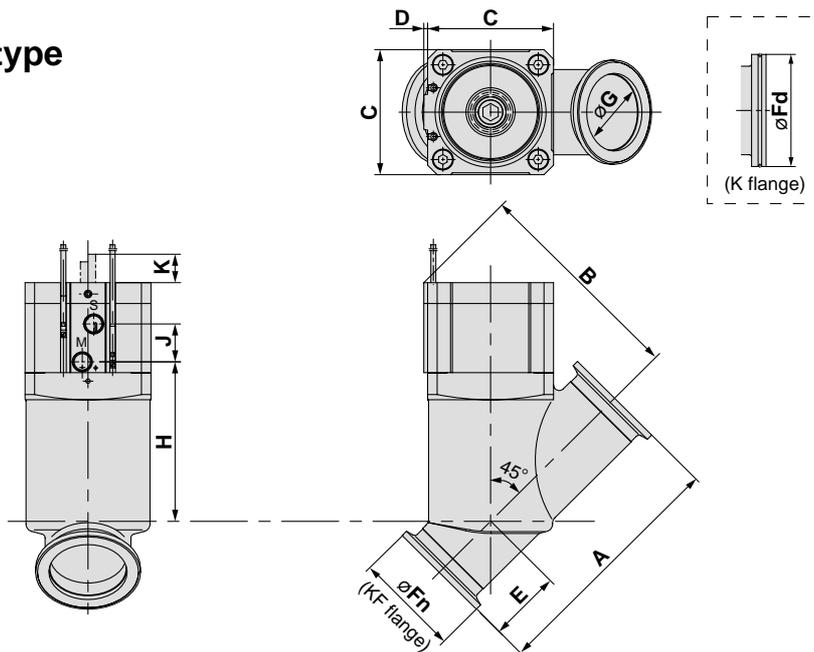
XMD/Angle type



Model	A	B	C	D	F _n	F _d	F _c	G	H	J	K	P.C.D L1	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- ϕ 6.6
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- ϕ 8.4
XMD-80	90	256	117	3	114	110	—	83	98	20	26.5	—	—

(mm)

XYD/In-line type



Model	A	B	C	D	E	F _n	F _d	G	H	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

(mm)

Stainless steel
High Vacuum Angle/In-line Valve

Series XMH, XYH

Manual Valve/Bellows Seal



How to Order

Angle type

XMH — **16** □ — □ — □

In-line type

XYH — **25** □ — □ — □

1 2 3



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
C	CF	16 (034), 40 (070)

XYH

Nil	KF (NW)	25, 40, 50
-----	---------	------------

3. Seal material and its changed part

• Seal material

Symbol	Seal material	Compound No.
Nil	FKM	1349-80*
N1	EPDM	2101-80*
P1	BARREL PERFLUORO®	70W
Q1	FFKM	4079
R1	CHEMRAZ®	SS592
R2		SS630
R3		SSE38
S1	VMQ	1232-70*
T1	FKM for Plasma	3310-75*
U1	ULTIC ARMOR®	UA4640

*: Produced by Mitsubishi Cable Industries, Ltd.

• Part numbers indicating changed seal material and leakage

Symbol	Changed part ^{Note 2)}	Leakage Pa m ³ /s or less ^{Note 1)}	
		Internal	External
Nil	—	1.3 x 10 ⁻¹⁰ (FKM)	1.3 x 10 ⁻¹¹ (FKM)
A	2, 3	1.3 x 10 ⁻⁸	1.3 x 10 ⁻⁹
B	2	1.3 x 10 ⁻⁸	1.3 x 10 ⁻¹¹ (FKM)
C	3	1.3 x 10 ⁻¹⁰ (FKM)	1.3 x 10 ⁻⁹

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		Manual type			
Fluid		Inactive gas under vacuum			
Operating temperature °C		5 to 150			
Operating pressure Pa		Atmospheric pressure to 1×10^{-6}			
Conductance ℓ/s <small>Note 1)</small>		5	14	45	80
Leakage $\text{Pa}\cdot\text{m}^3/\text{s}$	Internal	1.3×10^{-10} { 1×10^{-10} } at ambient temperature, excluding gas permeation			
	External	1.3×10^{-11} { 1×10^{-11} } 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 steel SUS304) Bellows: Stainless steel SUS316L Bellows holder: Stainless steel SUS304. FKM (Standard seal material)			
Pilot torque N·m		$0.1 \leq$	$0.15 \leq$	$0.35 \leq$	$0.5 \leq$
Handle revolutions		5	7	10	13
Service life (million cycles)		0.1			
Weight kg <small>Note 2)</small>	XMH	0.31 (0.35)	0.57	1.35 (1.71)	2.02
	XYH	—	0.62	1.37	2.42

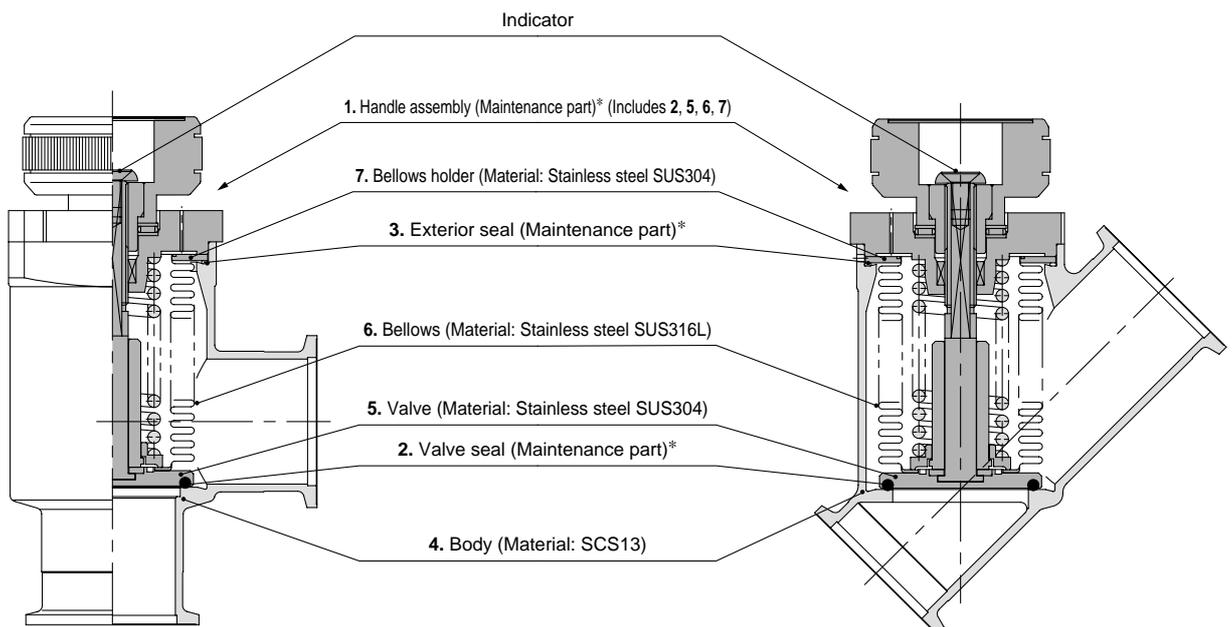
Note 1) Conductance is the value for the molecular flow of an elbow having the same dimensions.

Note 2) Figures in () indicates the weight of CF, conflate fittings.

Construction

XMH/Angle type

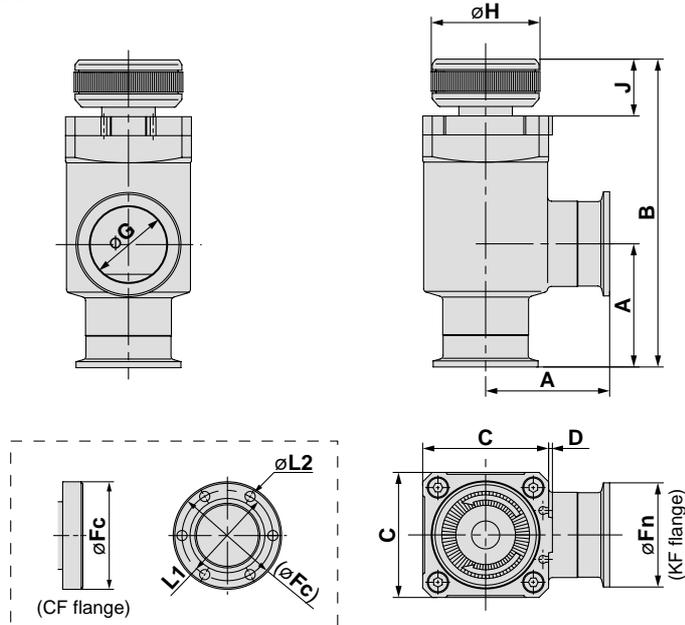
XYH/In-line type



* Refer to page 22 for the maintenance parts.

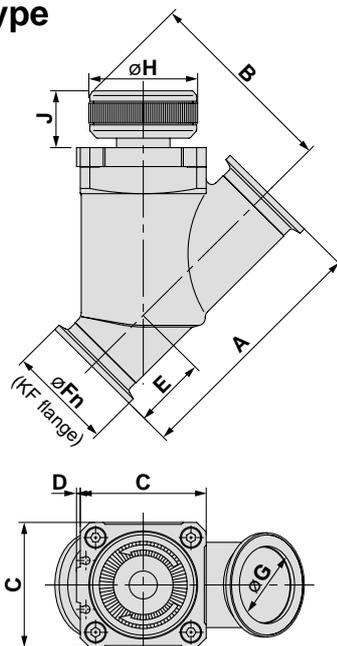
Dimensions

XMH/Angle type



Model	A	B	C	D	F _n	F _c	G	H	J	P.C.D L1	L2
XMH-16	40	100.5	38	1	30	34	17	35	18	P.C.D 27	6-ø4.4
XMH-25	50	114	48	1	40	—	26	40.5	21.5	—	—
XMH-40	65	162.5	66	2	55	70	41	57	30	P.C.D 58.7	6-ø6.6
XMH-50	70	179.5	79	2	75	—	52	70	35	—	—

XYH/In-line type



Model	A	B	C	D	E	F _n	G	H	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_2 , CF_4) 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® 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 $\varnothing A$ (cm^2) 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 $C=VA/4=(RT/2\pi M)^{0.5}A$, the conductance for $1cm^2$ is $C=11.6A$ l/sec , at an air temperature of $20^\circ C$.

Cylinder conductance

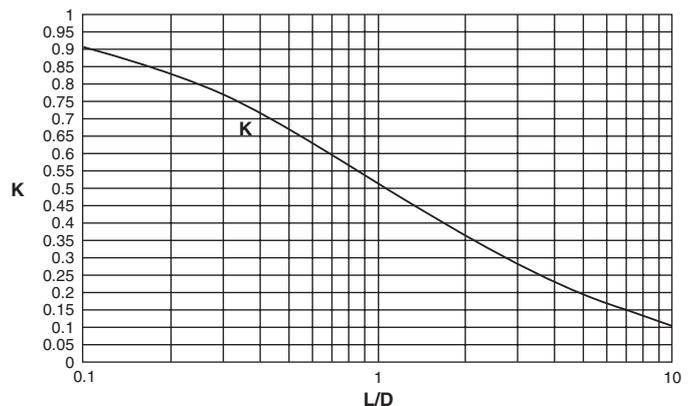
With length "L" (cm) and diameter "D" (cm) where $L \gg D$, from the formula $C=(2\pi RT/M)^{0.5}D^3/6L$, the conductance $C=12.1D^3/L$ l/sec , at an air temperature of $20^\circ C$.

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 $C_K=KC$.

Conductances combined

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



Graph 1. Clausing's factor

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 (Q_g) and leakage (Q_l) is Q (Pa·m³/s), and the exhaust speed is S (m³/s). The ultimate pressure is measured with Q_g , Q_l/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 (Δt) required to exhaust a chamber at low vacuum with volume V (l), from pressure P_1 to P_2 , using a pump with pumping speed S (l/sec) is $\Delta t=2.3(V/S)\log(P_1/P_2)$. 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 (τ), are evacuated quickly. However, in the case of water, which has a high activation energy, evacuation does not progress quickly unless the temperature (τ : 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 τ_0 =(approx.) 10^{-13} sec.

Residence time of water at 20°C is 5.5×10^{-6} sec, whereas at 150°C is 2.8×10^{-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 ²	1000m/s ²
Insulation resistance	50MΩ or more at 500V 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 60°C	
Enclosure	IEC529 standard IP67, JIS C 0920 watertight construction	

Lead Wire Length

How to Order

Ex.)

D-M9P **L**

Lead wire length

Nil	0.5m
L	3m

Contact Protection Box/CD-P11, CD-P12

<Applicable switch type>

Auto switch types,

D-A9□ and A9□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.
3. In the case the load voltage is 100 or 200V AC.

Be sure to use the contact protection box in any case mentioned above.
Otherwise, the contact life may be shortened. (Due to permanent energizing conditions.)

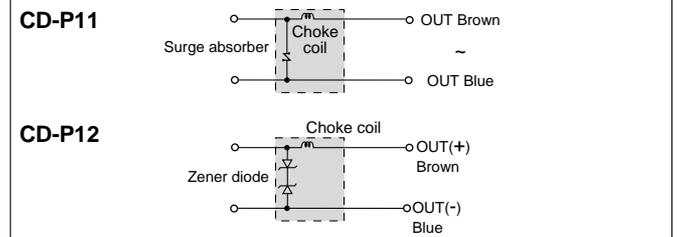
Specifications

Model number	CD-P11		CD-P12
Load voltage	100V AC	200V AC	24V DC
Max. load current	25mA	12.5mA	50mA

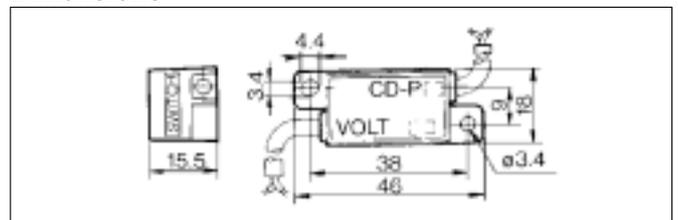
* Lead wire length — Switch connection side 0.5m
Load connecting side 0.5m



Internal circuit



Dimensions



Contact Protection Box/Connection Method

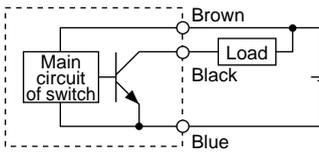
For connection of the switch body and the contact protection box, connect the lead wire in the side indicated as "SWITCH" on the contact protection box to the lead wire from the switch body. The length of lead wire between the switch body and the contact protection box should be within 1m and they should be set as close together as possible.

Prior to Use

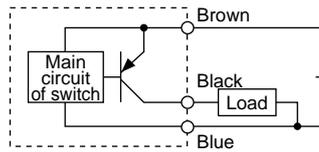
Auto Switches/Connections and Examples

Basic Wiring

Solid state 3-wire NPN

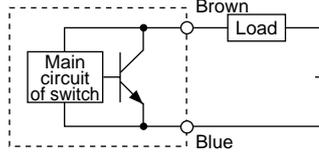


Solid state 3-wire PNP



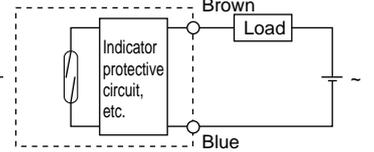
2-wire

<Solid state switch>

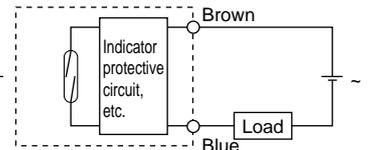
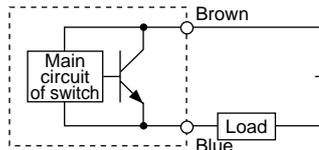
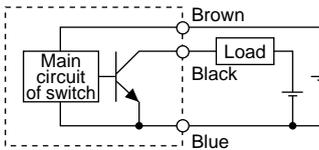


2-wire

<Reed switch>

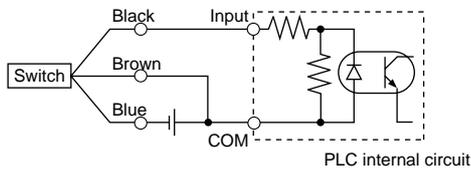


(Power supplies for switch and load separate.)

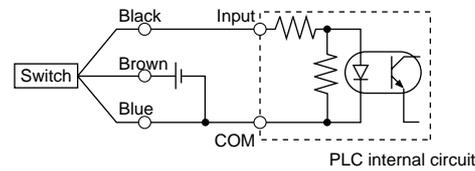


Examples of Connection to PLC (Programmable Logic Controller)

•Sink input 3-wire NPN

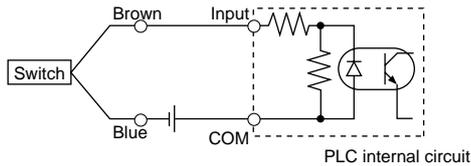


•Source input 3-wire PNP

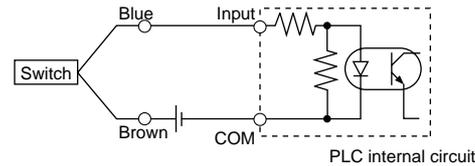


Connect according to the PLC input specifications. Please note, the connection method varies dependant on PLC specification.

2-wire



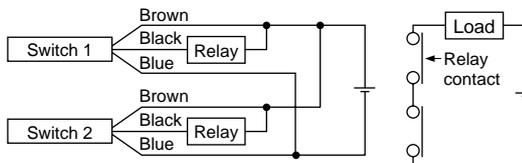
2-wire



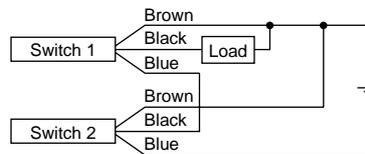
Connection Examples for AND (Series) and OR (Parallel)

•3-wire

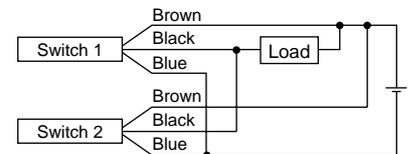
NPN/AND connection (with relay)



NPN/AND connection (with switch)

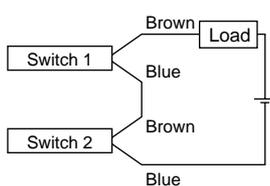


NPN/OR connection



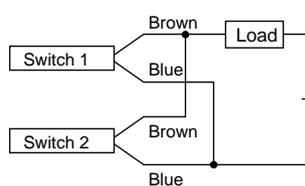
Indication lights up when both switches are ON.

•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.

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.

$$\begin{aligned} \text{Load voltage at ON} &= \text{Supply voltage} - \text{Residual voltage} \times 2 \text{ pcs.} \\ &= 24\text{V} - 4\text{V} \times 2 \text{ pcs.} \\ &= 16\text{V} \end{aligned}$$

Example) Supply voltage 24V DC, switch internal drop voltage 4V

$$\begin{aligned} \text{Load voltage at OFF} &= \text{Leakage current} \times 2 \text{ pcs.} \times \text{Load impedance} \\ &= 1\text{mA} \times 2 \text{ pcs.} \times 3\text{k}\Omega \\ &= 6\text{V} \end{aligned}$$

Example) Load impedance 3kΩ, switch leakage current 1mA

Solid State Switch/Direct Mounting D-M9N, D-M9P, D-M9B



Grommet

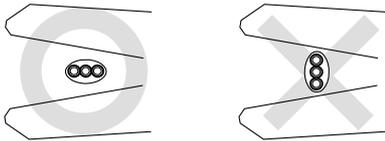
- Reduced load currents for 2-wire model (2.5 to 40 mA)
- Compliance with lead-free requirements
- Use of UL-approved lead wires (style 2844)



Caution

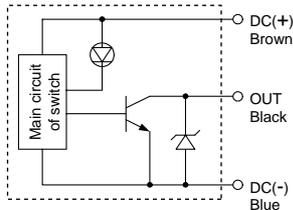
Precautions

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.

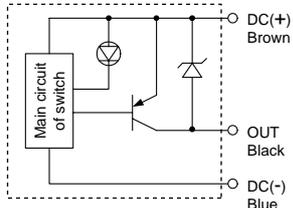


Auto Switch Internal Circuit

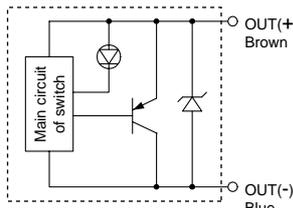
D-M9N



D-M9P



D-M9B



Auto Switch Specifications

PLC: Programmable Logic Controller

D-M9□ (With indicator light)			
Model number	D-M9N	D-M9P	D-M9B
Wiring	3-wire		2-wire
Output	NPN	PNP	—
Applicable load	IC circuit, Relay, PLC		24V DC relay, PLC
Power voltage	5, 12, 24V DC (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 or less		4V or less
Current leakage	≤ 100μA at 24V DC		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, 0.15mm², 2 cores (D-M9B), or 3 cores (D-M9N, D-M9P)

Note 1) Refer to common specifications on page 16.

Note 2) Refer to the page 16 for lead wire length.

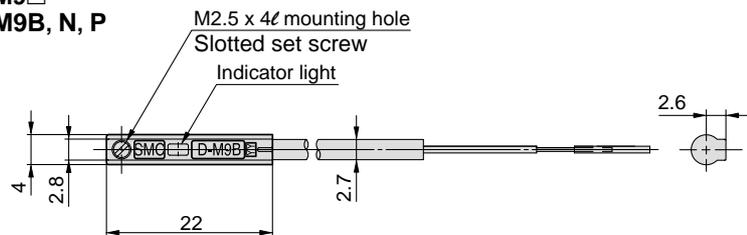
Auto Switch Weight

Unit: g

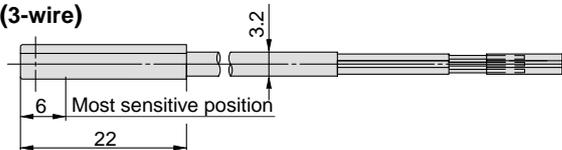
Model		D-M9N	D-M9P	D-M9B
Lead wire length m	0.5	8	8	7
	3	41	41	38

Auto Switch Dimensions

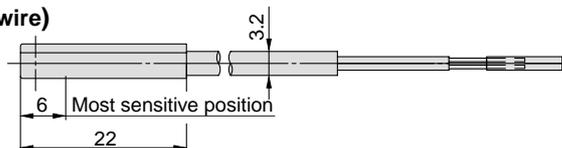
D-M9□ D-M9B, N, P



D-M9N, P (3-wire)



D-M9B (2-wire)



Reed Switch/Direct Mounting D-A90, D-A93



**Grommet
Electrical entry: In-line**

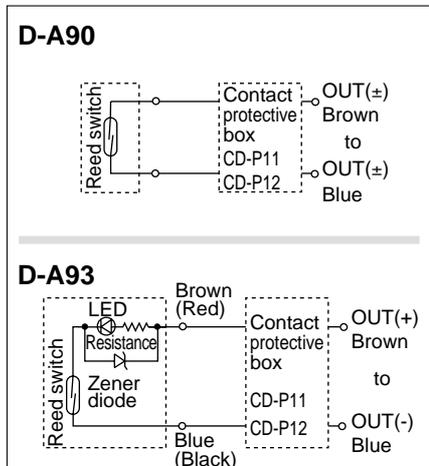


⚠ Caution

Precautions

1. 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 (Without indicator light)			
Model number	D-A90		
Applicable load	IC circuit, Relay, PLC		
Load voltage	24V $\frac{AC}{DC}$ or less	48V $\frac{AC}{DC}$ or less	100V $\frac{AC}{DC}$ or less
Max. load current	50mA	40mA	20mA
Contact protection circuit	—		
Internal resistance	1Ω or less (Including 3m lead wire)		
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 ON.		

• Lead wire

D-A90/D-A93 — Oil-proof heavy-duty vinyl cable, $\phi 2.7$, 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.

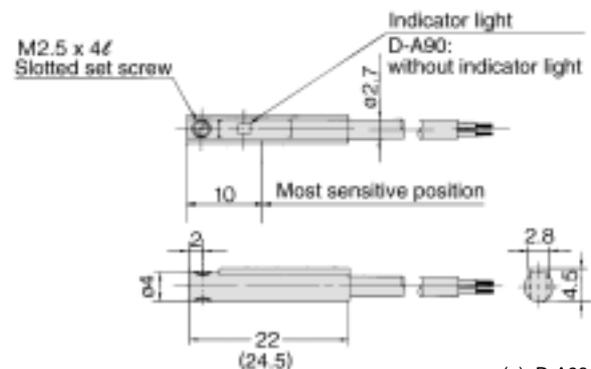
Auto Switch Weight

Model	D-A90	D-A93
Lead wire length 0.5m	6	6
Lead wire length 3m	30	30

(g)

Auto Switch Dimensions

D-A90, D-A93



(): 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

Warning

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

Warning

• 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.
2. Select materials for the actuation pressure piping, and heat resistance for fittings that are suitable for the applicable operating temperatures.

• Model with auto switch

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

Selection

Caution

• All models

1. When controlling valve responsiveness, take note of the size and length of piping, as well as the flow rate characteristics of the actuating solenoid valve.
2. Actuating pressure should be kept within the specified range. 0.4 to 0.5MPa is recommended.
3. Use within the limits of the operating pressure range.

• High temperature types

1. In the case of gases which cause a large amount of deposits, heat the valve body to prevent deposits in the valve.

Mounting

Caution

• All models

1. In high humidity environments keep valves packaged until the time of installation.
2. In case with switches, secure the lead wires so that they have sufficient slack, without any unreasonable force applied to them.
3. Perform piping so that excessive force is not applied to the flange sections. In case there is vibration of heavy objects or attachments, etc., secure them so that torque is not applied directly to the flanges.

• 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

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

Maintenance

Caution

1. When removing deposits from a valve, take care not to damage any of its parts.
2. Replace the bonnet assembly and the O-ring when the end of its service life is approached.
3. If damage is suspected prior to the end of the service life, perform early maintenance.
4. SMC specified parts should be used for service. Refer to the Construction/Maintenance parts table.
5. When removing 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

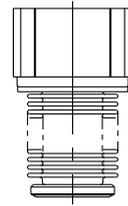
Be sure to read before handling.

Maintenance Parts

Caution

1. The bonnet or handle assembly should also be replaced when changing the seal material.

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 specifications	Indicator	Valve size					
			16	25	40	50	63	80
XMA XYA	General use	—	XLA16-30-1	XLA25-30-1	XLA40-30-1	XLA50-30-1	XLA63-30-1	XLA80-30-1
		○	XLA16A-30-1	XLA25A-30-1	XLA40A-30-1	XLA50A-30-1	XLA63A-30-1	XLA80A-30-1
XMC XYC	High temperature	—	XLA16-30-1H	XLA25-30-1H	XLA40-30-1H	XLA50-30-1H	XLA63-30-1H	XLA80-30-1H
		○	XLA16A-30-1H	XLA25A-30-1H	XLA40A-30-1H	XLA50A-30-1H	XLA63A-30-1H	XLA80A-30-1H
XMD XYD	General use	○	—	XLD25-30-1	XLD40-30-1	XLD50-30-1	XLD63-30-1	XLD80-30-1
		Standard	—	XLD25-30-1H	XLD40-30-1H	XLD50-30-1H	XLD63-30-1H	XLD80-30-1H
XMH XYH	High temperature as standard	○	XLH16-30-1	XLH25-30-1	XLH40-30-1	XLH50-30-1	—	—
		Standard	—	—	—	—	—	—

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

Model	Description Construction no.	Material	Valve size					
			16	25	40	50	63	80
XMA XMC XMH XMD	Exterior seal 3	Standard	AS568-025V	AS568-030V	AS568-035V	AS568-039V	AS568-043V	AS568-045V
		Special	AS568-025□	AS568-030□	AS568-035□	AS568-039□	AS568-043□	AS568-045□
XYA XYC XYH XYD	Valve seal 2	Standard	B2401-V15V	B2401-V24V	B2401-P42V	AS568-227V	AS568-233V	B2401-V85V
		Special	B2401-V15□	B2401-V24□	B2401-P42□	AS568-227□	AS568-233□	B2401-V85□
XMD XYD	S Valve seal assembly 4	Standard	—	AS568-009V	XLD40-2-9-1A	XLD50-2-9-1A	XLD80-2-9-3A	XLD80-2-9-3A
		Special	—	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.)

Note 3) Refer to the Construction of each series for the construction numbers.

Table 1

Optional seal material

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.

*: Produced by Mitsubishi Cable Industries, Ltd.

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