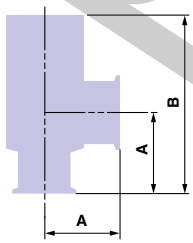
Stainless Steel High Vacuum Angle/In-line Valve

- **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, aluminum high vacuum angle valve.

Light weight & compact

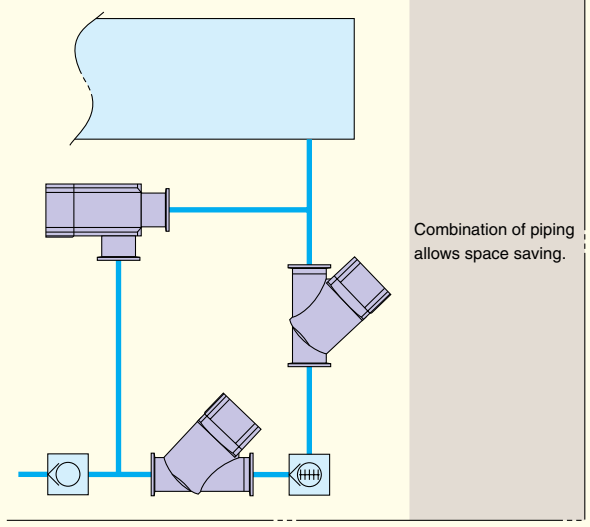


Series XMA with KF(NW) flange

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



Preliminary

ORDER ONLINE

Series Variations

Application	Shaft seal system	Models: Angle type	Models: In-line type	Valve type	Operating pressure: Pa	Flange size: 16	25	40	50	63	80	Options': 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  PAT.	XYD  PAT.	Single acting (N.C.)									Standard	
Manual														
Particulate free	Bellows seal	XMH 	XYH 	Manual	Atmospheric pressure to 1 x 10^{-6}	Note)							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.

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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	V	—
25	V	V
40	V	V
50	V	V
63	V	V
80	V	V

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)

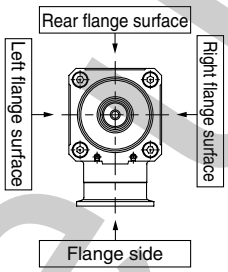
XYA

Nil	KF (NW)	25, 40, 50, 63, 80
D	K (DN)	63, 80

3. Indicator/Pilot port direction

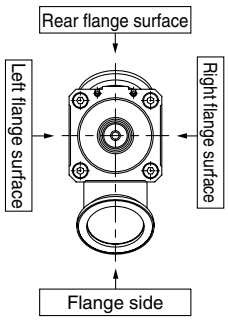
XMA

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		Rear flange surface
M		Right flange surface



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		Right flange surface



4. Temperature specifications

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

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

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	Kalrez®	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 m³/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

Preliminary

POWER AIRE
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Series XMA, XYA

Specifications

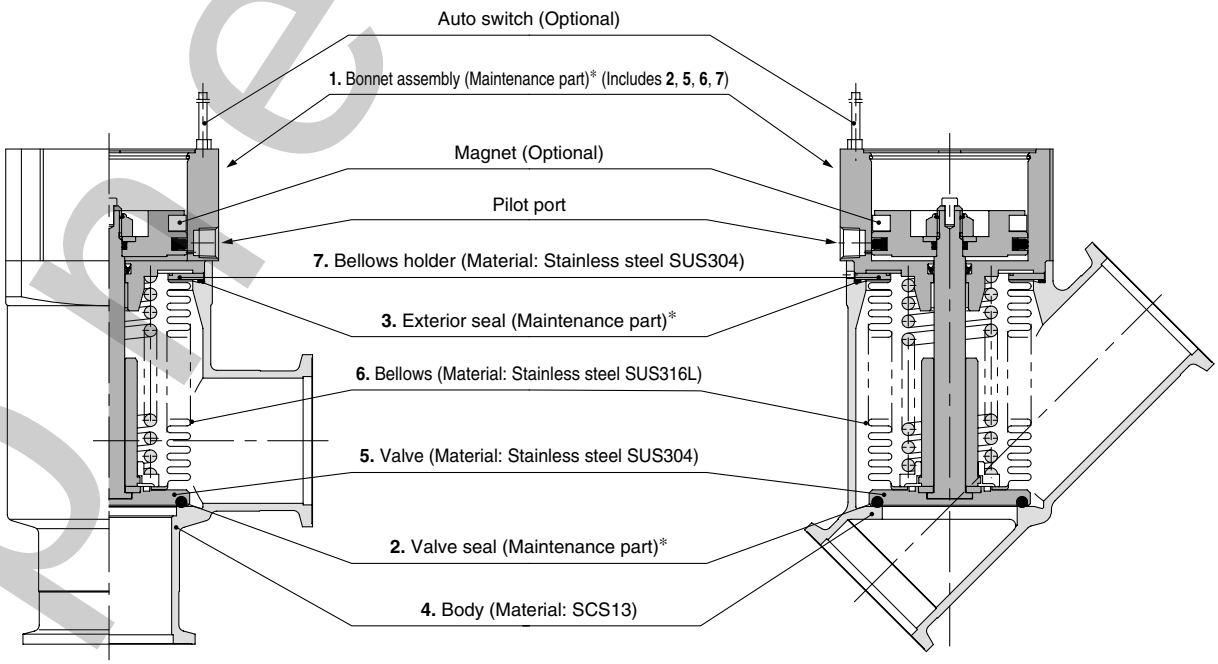
Model		XMA-16	XMA-25 XYA-25	XMA-40 XYA-40	XMA-50 XYA-50	XMA-63 XYA-63	XMA-80 XYA-80
Flange (valve) size		16, CF034	25	40, CF070	50	63, CF114	80
Valve type		Normally closed (Pressurize to open, spring seal)					
Fluid		Inactive gas under vacuum					
Operating temperature °C		5 to 60 (High temperature type: 5 to 150)					
Operating pressure Pa		Atmospheric pressure to 1 x 10^{-6}					
Conductance ℓ/s Note 1)		5	14	45	80	160	200
Leakage Pa·m³/s	**Internal**	1.3 x 10^{-10}{1 x 10^{-10}} at ambient temperature, excluding gas permeation					
	External	1.3 x 10^{-11}{1 x 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)		200 (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 the page 22 for the maintenance parts.

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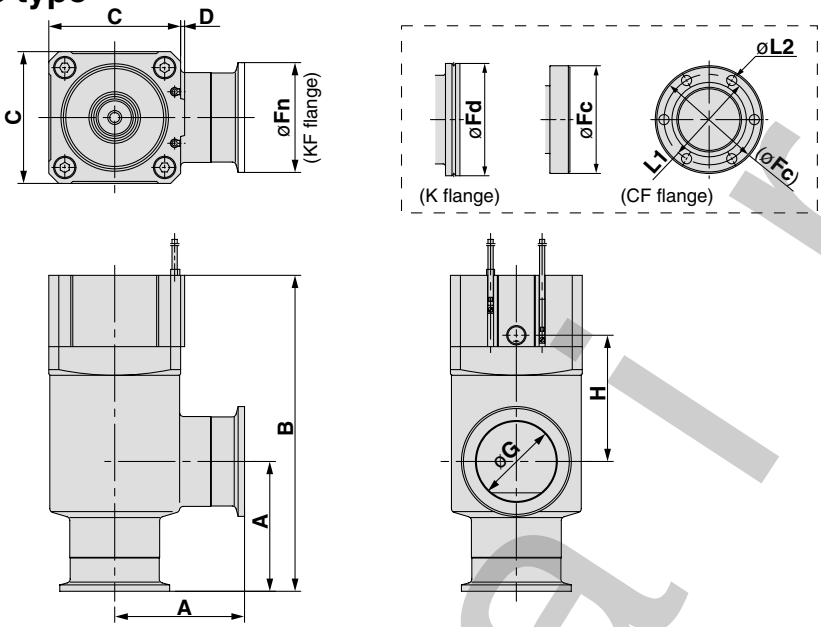
Dimensions

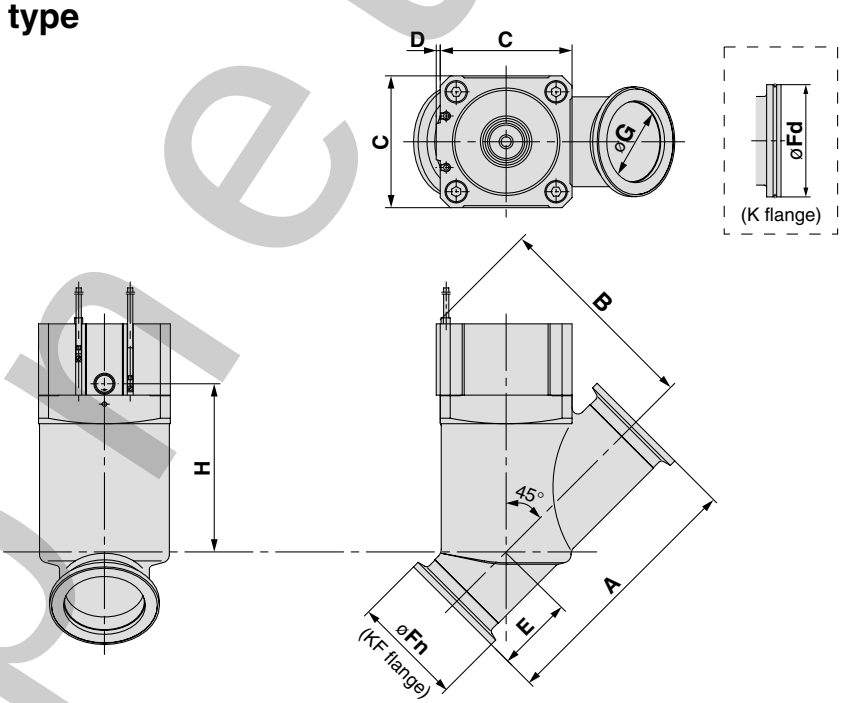
XMA/Angle type



(mm)

Model	A	B	C	D	Fn	Fd	Fc	G	H	P.C.D L1	L2
XMA-16	40	103	38	1	30	—	34	17	40	P.C.D 27	6-ø4.4
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-ø6.6
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-ø8.4
XMA-80	90	235	117	3	114	110	—	83	96	—	—

XYA/In-line type



(mm)

Model	A	B	C	D	E	Fn	Fd	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

preliminary

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Stainless steel
High Vacuum Angle/In-line Valve
Series XMC, XYC
Double Acting/Bellows Seal

How to Order

Angle type XMC — 16 □ □ □ — M9N A — □

In-line type XYC — 25 □ □ □ — M9N A — □

1 2 3 4 5 6 7

1. Flange size

Size	XMC	XYC
16	V	—
25	V	V
40	V	V
50	V	V
63	V	V
80	V	V

2. Flange type

XMC

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)

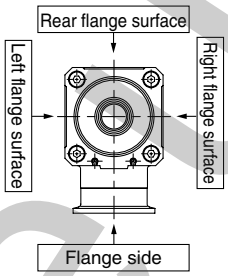
XYC

Nil	KF (NW)	25, 40, 50, 63, 80
D	K (DN)	63, 80

3. Pilot port direction

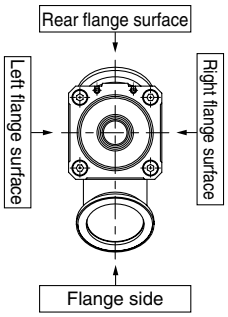
XMC

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



XYC

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



4. Temperature specifications

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

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

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	Kalrez®	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 m³/s or less Note 1)	
		Internal	External
Nil	—	1.3×10^{-10} (FKM)	1.3×10^{-11} (FKM)
A	**2, 3**	1.3×10^{-8}	1.3×10^{-9}
B	**2**	1.3×10^{-8}	1.3×10^{-11} (FKM)
C	**3**	1.3×10^{-10} (FKM)	1.3×10^{-9}

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

Preliminary

POWER AIRE
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Specifications

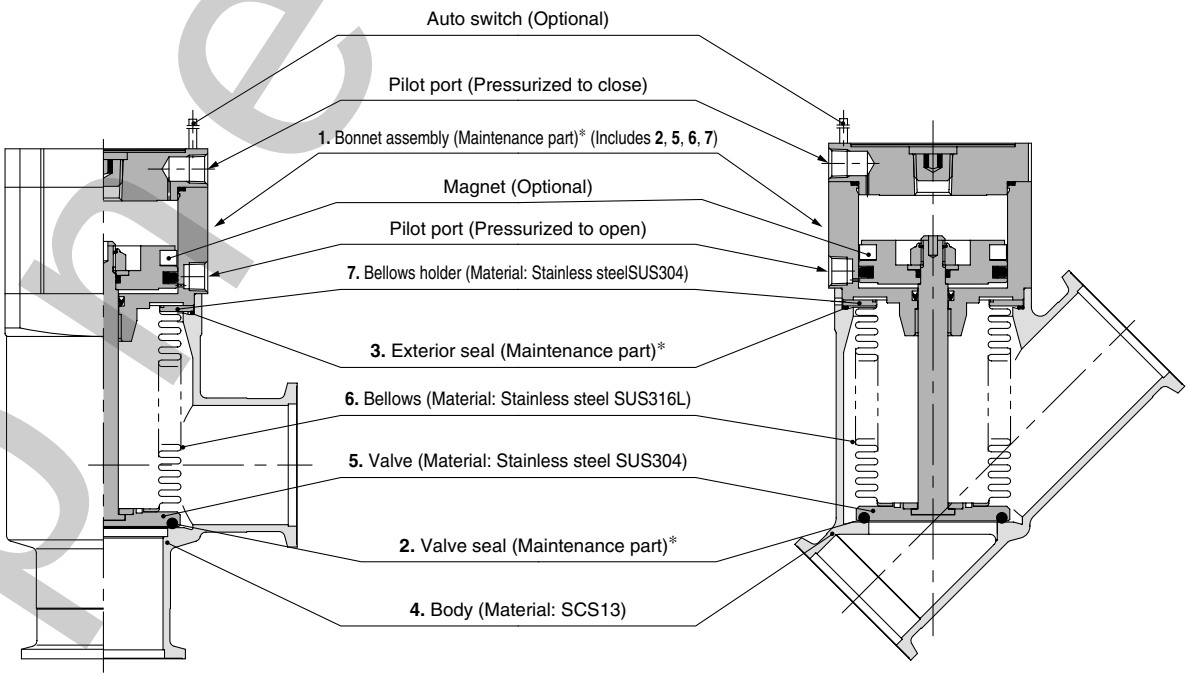
Model		XMC-16	XMC-25 XYC-25	XMC-40 XYC-40	XMC-50 XYC-50	XMC-63 XYC-63	XMC-80 XYC-80
Flange (valve) size		16, CF034	25	40, CF070	50	63, CF114	80
Valve type		Double acting (Dual operation), pressurize to open/close					
Fluid		Inactive gas under vacuum					
Operating temperature °C		5 to 60 (High temperature type: 5 to 150)					
Operating pressure Pa		Atmospheric pressure to 1 x 10^{-6}					
Conductance ℓ/s Note 1)		5	14	45	80	160	200
Leakage Pa·m³/s	**Internal**	1.3 x 10^{-10}{1 x 10^{-10}} at ambient temperatures, excluding gas permeation					
	External	1.3 x 10^{-11}{1 x 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)		200 (FKM seal material)					
Weight kg Note 2)	**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

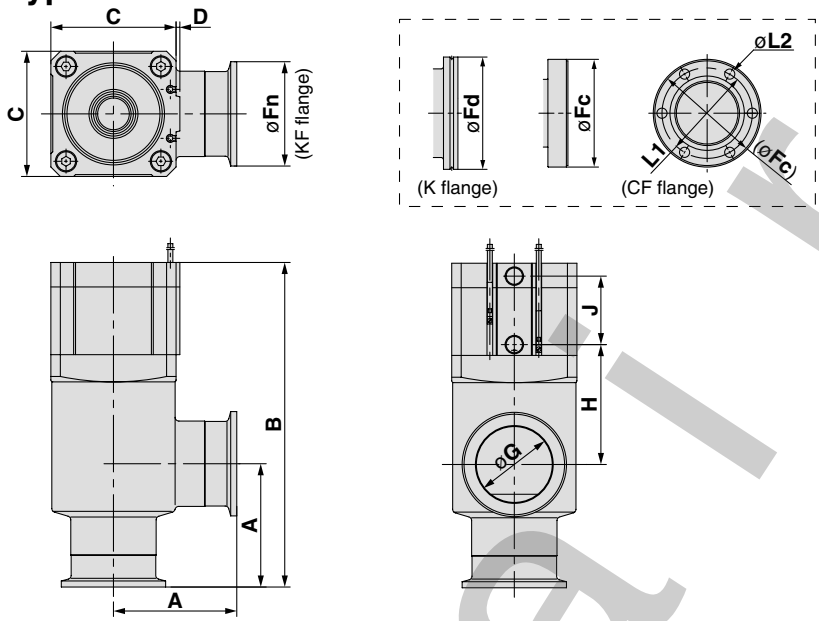
XYC/In-line type



* Refer to the page 22 for the maintenance parts.

Dimensions

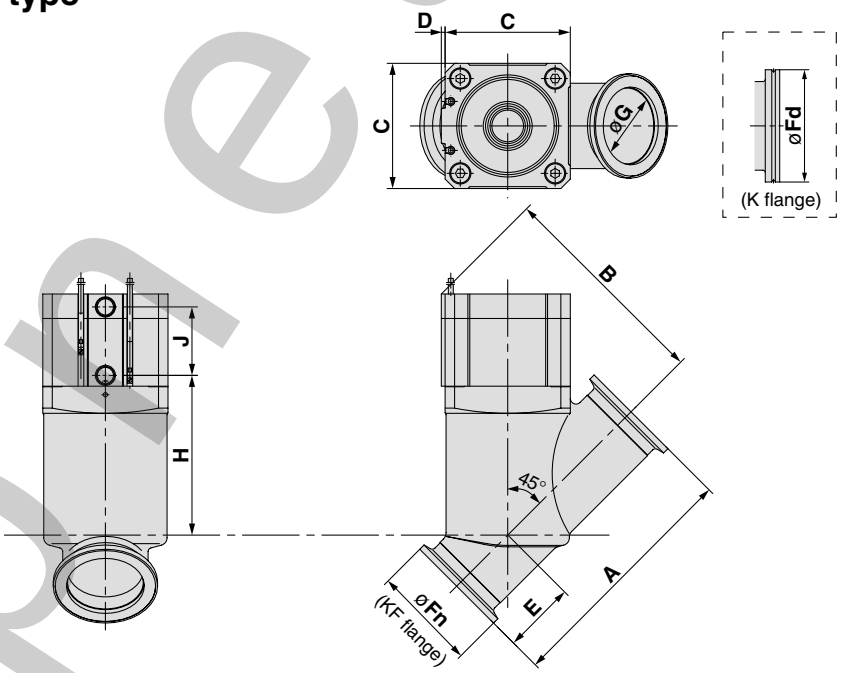
XMC/Angle type



(mm)

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-ø4.4
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-ø6.6
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-ø8.4
XMC-80	90	250	117	3	114	110	—	83	96	56	—	—

XYC/In-line type



(mm)

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

POWER AIRE
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POWER AIRE

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	V	V
40	V	V
50	V	V
63	V	V
80	V	V

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)

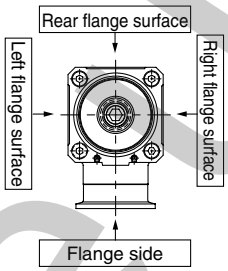
XYD

Nil	KF (NW)	25, 40, 50, 63, 80
D	K (DN)	63, 80

3. Pilot port direction

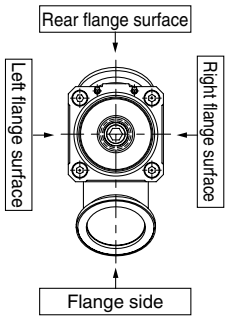
XMD

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



XYD

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



4. Temperature specifications

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

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

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	Kalrez®	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.

· Part numbers indicating changed seal material and leakage

Symbol	Changed part Note 2)	Leakage Pa m³/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

Preliminary

POWER AIRE
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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 x 10^{-6}				
Conductance ℓ/s Note 1)	**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 Pa·m³/s	**Internal**	1.3 x 10^{-10}{1 x 10^{-10}} at ambient temperatures, excluding gas permeation				
	External	1.3 x 10^{-11}{1 x 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)		200 (FKM seal material)				
Weight kg Note 2)	**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.

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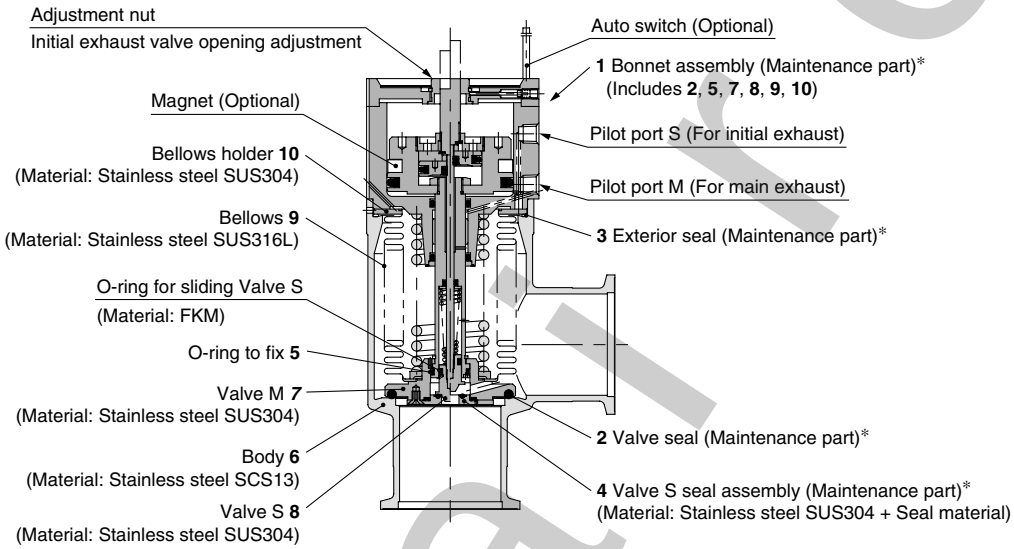
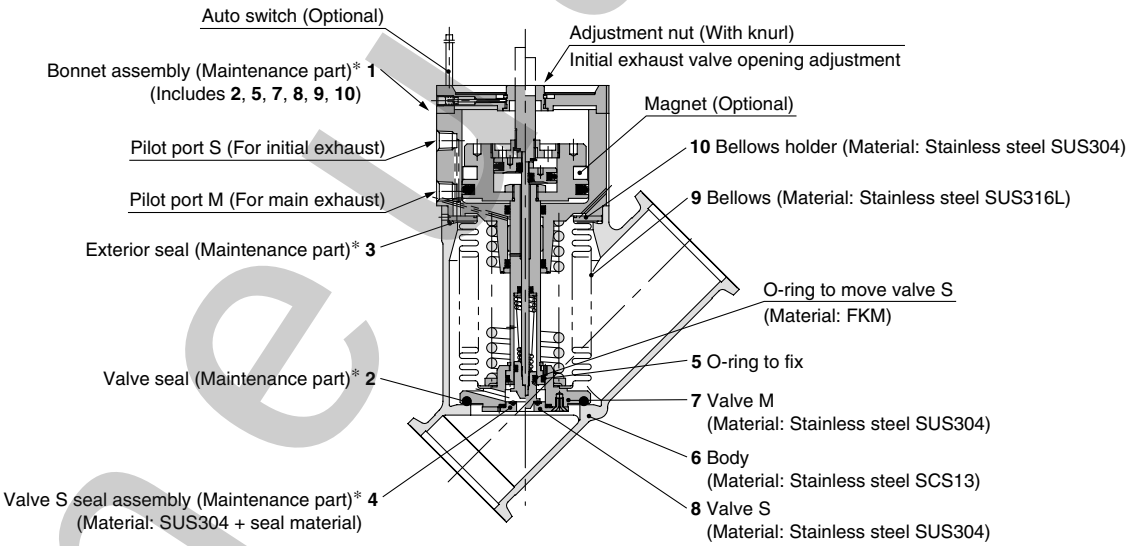
Construction

XMD/Angle type



XYD/In-line type



∗ Refer to the 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)

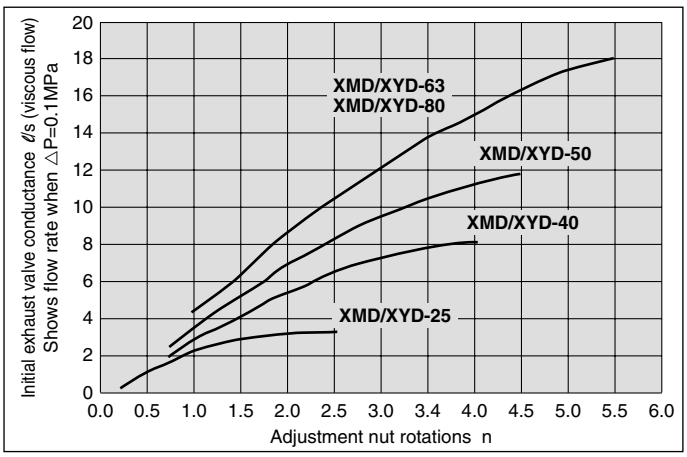
When pressure is applied to the pilot port S, the valve S is removed from the valve S assembly and opens until the adjusted opening setting.

[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.



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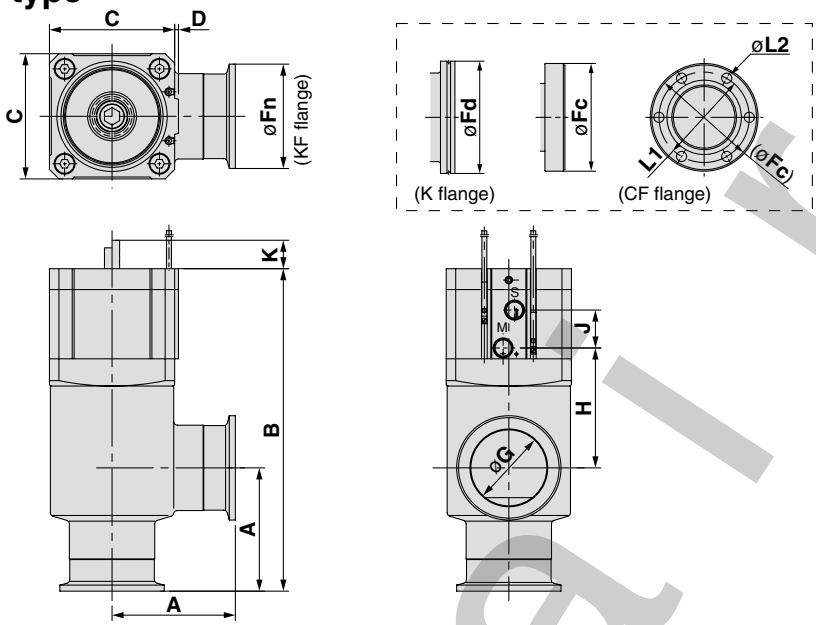
Dimensions

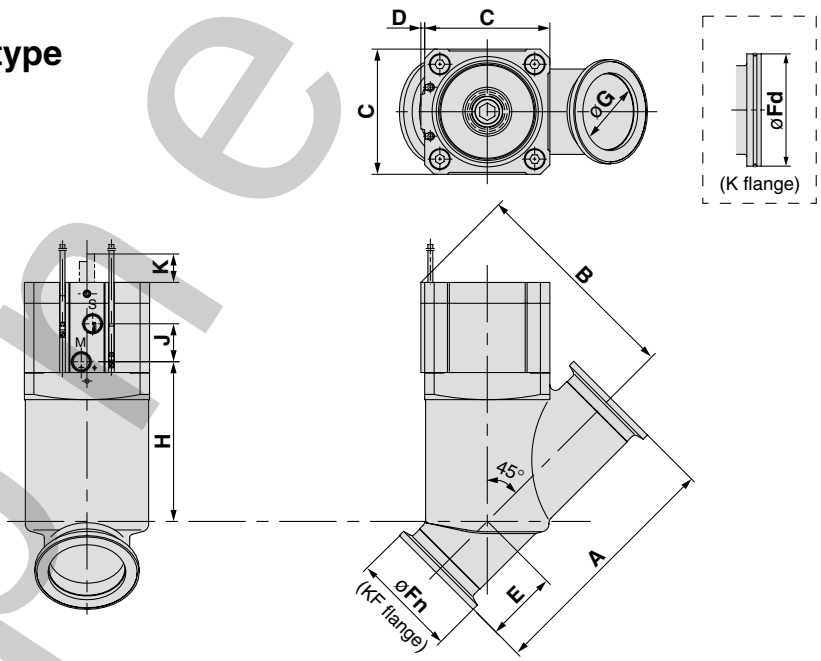
XMD/Angle type



(mm)

Model	A	B	C	D	Fn	Fd	Fc	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-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	—	—

XYD/In-line type



(mm)

Model	A	B	C	D	E	Fn	Fd	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

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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	V	—
25	V	V
40	V	V
50	V	V

2. Flange type

XMH

Symbol	Type	Applicable flange size
Nil	KF (NW)	16, 25, 40, 50
C	CF	16 (034), 40 (070)

XYH

Symbol	Type	Applicable flange size
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	Kalrez®	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 m³/s or less Note 1)	
		Internal	External
Nil	—	1.3×10^{-10} (FKM)	1.3×10^{-11} (FKM)
A	**2**, **3**	1.3×10^{-8}	1.3×10^{-9}
B	**2**	1.3×10^{-8}	1.3×10^{-11} (FKM)
C	**3**	1.3×10^{-10} (FKM)	1.3×10^{-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

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Specifications

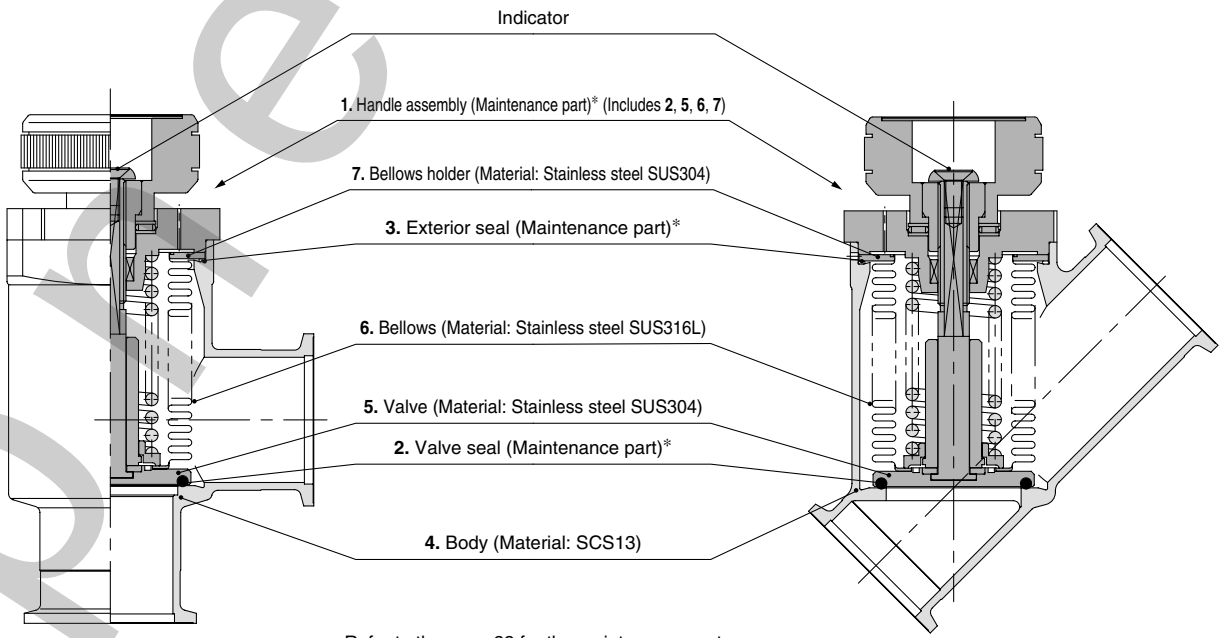
Model		XMH-16	XMH-25 XYH-25	XMH-40 XYH-40	XMH-50 XYH-50
Flange (valve) size		16, CF034	25	40, CF070	50
Valve type		Manual type			
Fluid		Inactive gas under vacuum			
Operating temperature °C		5 to 150			
Operating pressure Pa		Atmospheric pressure to 1×10^{-6}			
Conductance ℓ/s Note 1)		5	14	45	80
Leakage Pa·m³/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			
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 %	0.15 %	0.35 %	0.5 %
Handle revolutions		5	7	10	13
Service life (million cycles)		10			
Weight kg Note 2)	**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 the page 22 for the maintenance parts.

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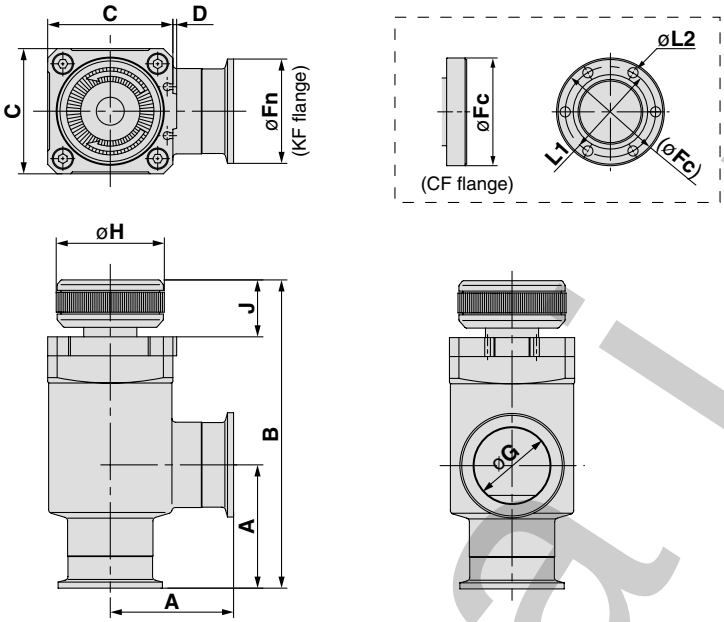
Dimensions

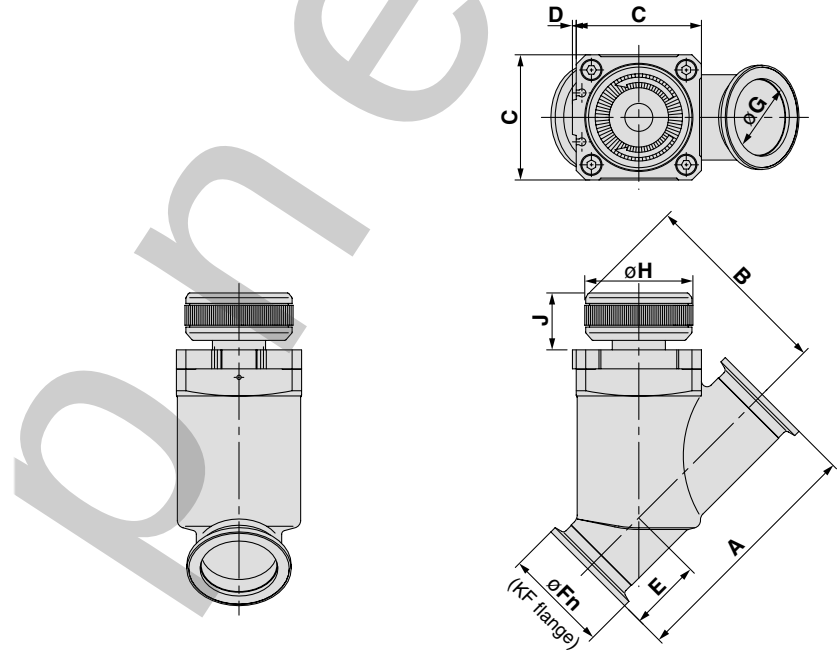
XMH/Angle type



(mm)

Model	A	B	C	D	Fn	Fc	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



(mm)

Model	A	B	C	D	E	Fn	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

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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. P/A's seal material has undergone a high vacuum degassing process.

Kalrez®
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.

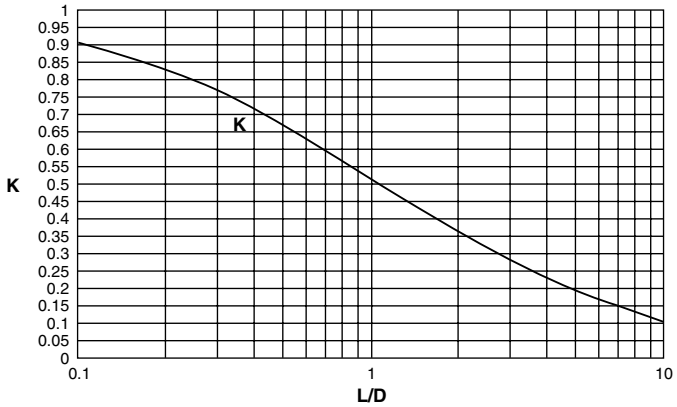
4 Molecular flow conductance

Orifice conductance
In the case of a øA (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°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 $C=12.1D^3/L$ ℓ/sec, at an air temperature of 20°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 Cn, the composite conductance $\sum C$ is expressed as:
$\sum C=1/(1/C_1+1/C_2+...1/Cn)$ when in series, and $\sum C=C_1+C_2+...Cn$, when in parallel.



Graph 1. Clausing's factor

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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 (cm^2) 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 (Qℓ) is Q($Pa \cdot m^3/s$), and the exhaust speed is S(m^3/s). The ultimate pressure is measured with Qg, QℓS 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 (ℓ), from pressure P1 to P2, using a pump with pumping speed S (ℓ/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 (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 $\tau 0$=(approx.) 10^{-13}sec.
Residence time of water at 20°C is 5.5 x 10^{-6}sec, whereas at 150°C is 2.8 x 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.

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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.

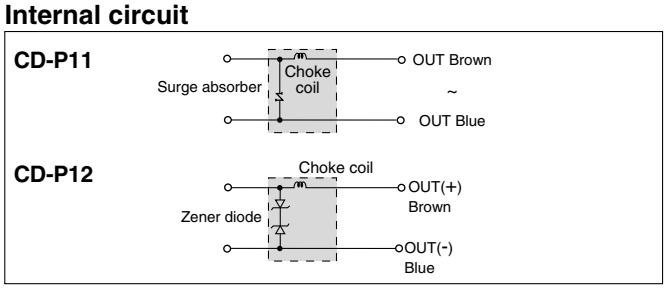
Otherwise, the contact life may be shortened. (Due to permanent energizing conditions.)

Specifications

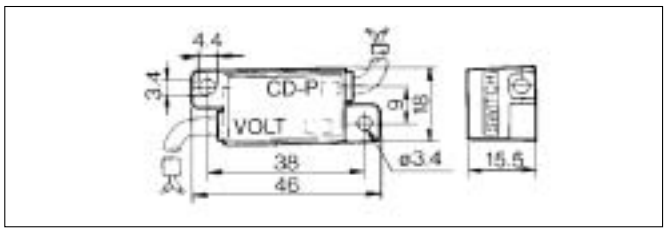
Model number	CD-P11		CD-P12
Load voltage	100V AC	200V AC	24V DC
Max. load current	25mA	12.5mA	50mA

∗ 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.

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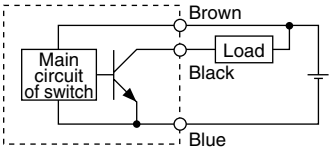
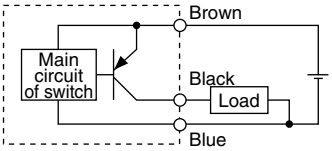
Prior to Use
Auto Switches/Connections and Examples

Basic Wiring

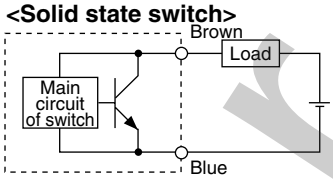
Solid state 3-wire NPN



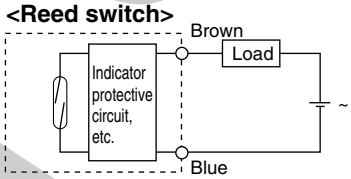
Solid state 3-wire PNP



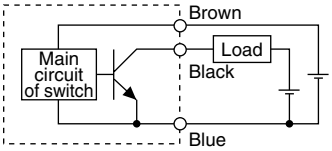
2-wire
<Solid state switch>

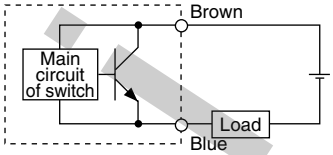


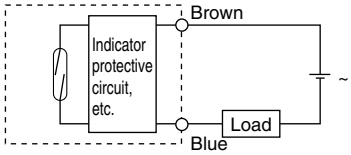
2-wire
<Reed switch>



(Power supplies for switch and load separate.)

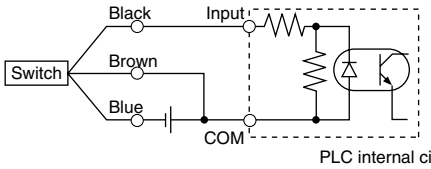




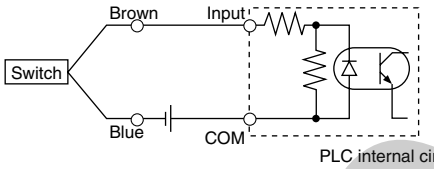


Examples of Connection to PLC (Programmable Logic Controller)

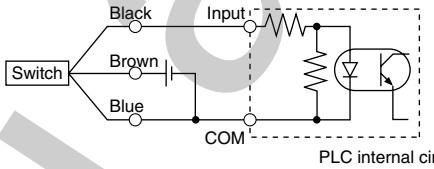
•Sink input
3-wire NPN



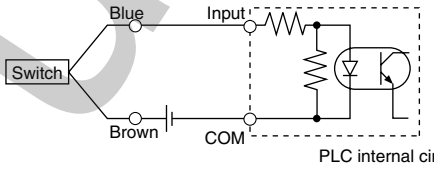
2-wire



•Source input
3-wire PNP



2-wire

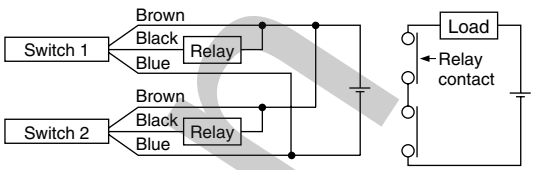


Connect according to the PLC input specifications. Please note, the connection method varies dependant on PLC specification.

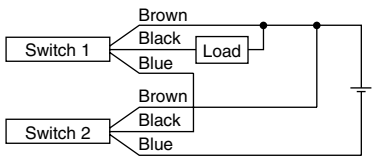
Connection Examples for AND (Series) and OR (Parallel)

•3-wire

NPN/AND connection (with relay)

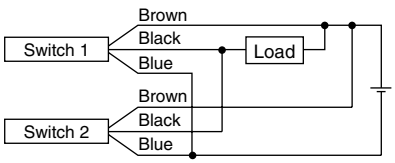


NPN/AND connection (with switch)

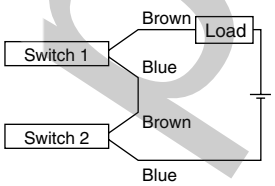


Indication lights up when both switches are ON.

NPN/OR connection



•2-wire (2 pcs.)

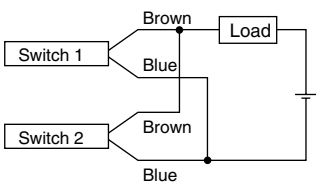


When 2 switches are connected by AND, load voltage will decrease at ON and these connections may cause malfunction of load.
Indication lights up when both switches are ON.

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 3kΩ
=6V

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

Preliminary

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

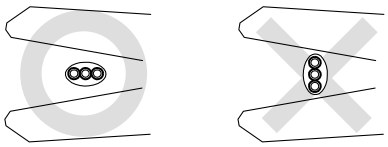
Grommet

- **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)**

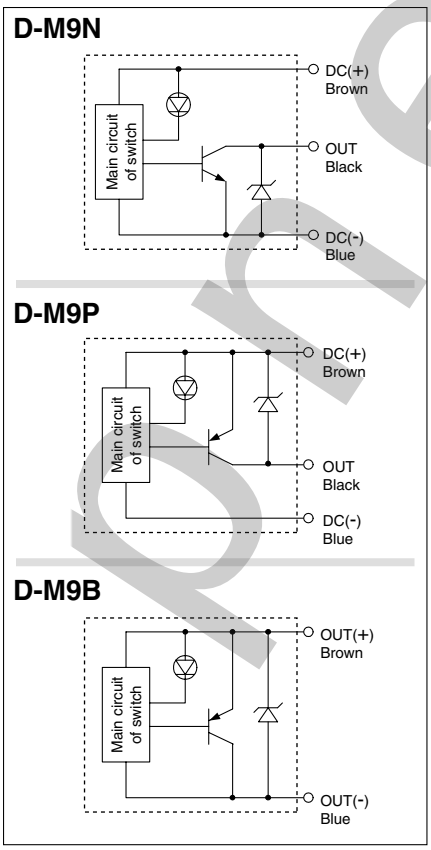
⚠Caution

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



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 releay, 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, 0.15mm^2, 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.

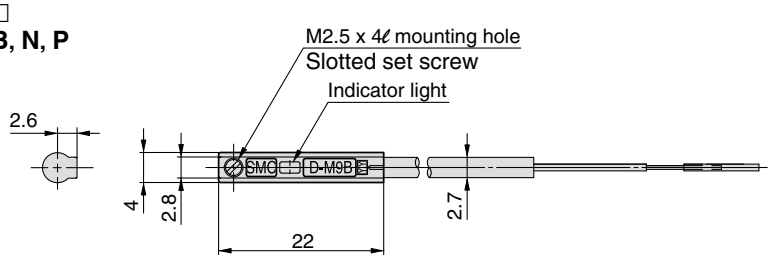
Auto Switch Weight

Unit: g

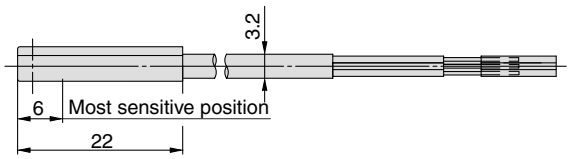
Model		D-M9N	D-M9P	D-M9B
Lead wire length m	0.5	8	8	7
	3	41	41	38

Auto Switch Dimensions

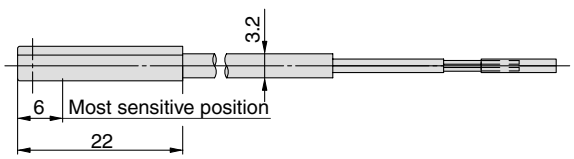
D-M9□
D-M9B, N, P



D-M9N, P (3-wire)



D-M9B (2-wire)



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