

Direct Operated 2 Port Solenoid Valve

VX21/22/23 Series



Air



Medium vacuum



Water



Oil



Steam

* Can be used with heated water.



Note) For air and water only

RoHS

VX2

VXK

VXD

VXZ

VXS

VXB

VXE

VXP

VXR

VXH

VXF

VX3

VXA

Large flow rate

Flow rate

20% More flow*

(Size 1)

* Comparison with SMC current model

Compact

Height

10% Smaller*

(Size 1)

Lightweight

Weight

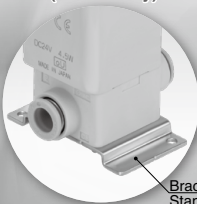
30% Lighter*

(Size 1, Aluminum body)

Body material

Air
Aluminum, Resin
Water/Oil/
Medium vacuum/Steam
C37 (Brass),
Stainless steel

With One-touch fittings
(Resin body)



Bracket
Standard
equipment



Enclosure

IP65*

* Electrical entry
Flat terminal type
terminal is IP40.

Power consumption

4.5 W (Size 1)

7 W (Size 2)

10.5 W (Size 3)

(DC/N.C. valve)

Manifold

Material • Body/PPS
• Base/Aluminum
• Seal/NBR, FKM



Solenoid coil type

• Insulation type Class B/H
• Fluid temperature
Class B/Max. 60°C
Class H/Max. 183°C



Valve type

N.C.

N.O.



Direct Operated 2 Port Solenoid Valve



Air



Medium vacuum



Water



Oil



Steam

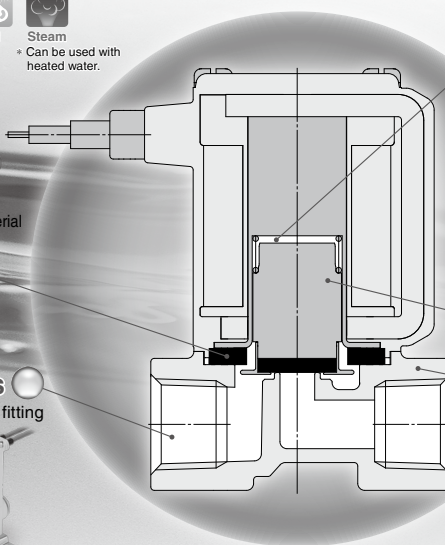
* Can be used with heated water.

Enclosure
IP65

Flame resistance
UL94V-0 conformed
Flame resistant mold coil material

Low-noise construction
Metal noise reduced by the rubber bumper

Piping variations
Thread piping, One-touch fitting



Clearance

By providing a bumper and clearance, we reduced the collision sound of the core when ON (when the valve is open). Because of the clearance, when using highly viscous fluids such as oil, the armature does not get stuck and the responsiveness when OFF (when the valve is closed) is improved.

Power consumption

* DC/Class B, N.C. valve

4.5 W (Size 1)

7 W (Size 2)

10.5 W (Size 3)

Improved armature durability

Body material

Air Aluminum, Resin

Water/Oil/Medium vacuum/Steam C37 (Brass),
Stainless steel

Full-wave rectifier type (AC specification: Insulation type Class B/H)

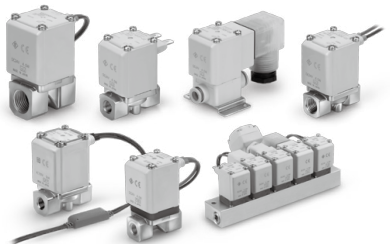
- Improved durability**
Service life is extended by the special construction. (compared with current shading coil)
- Reduced buzz noise**
Rectified to DC by the full-wave rectifier, resulting in a buzz noise reduction.
- Reduced apparent power** * Class B, N.C. valve
10 VA → **7 VA** (Size 1) 20 VA → **9.5 VA** (Size 2)
32 VA → **12 VA** (Size 3)
- Improved OFF response**
Specially constructed to improve the OFF response when operated with a higher viscosity fluid such as oil.
- Low-noise construction**
Specially constructed to reduce the metal noise during operation.

Variations

<Fluid>

Model	Applicable fluid *1					* Can be used with heated water.
	Air	Medium vacuum	Water	Oil	Steam	
For Air VX2□0 Page 33	●	—	—	—	—	—
For Medium vacuum VX2□4 Page 38	●*2	●	—	—	—	—
For Water VX2□2 Page 42	●*2	—	●	—	—	—
For Oil VX2□3 Page 44	●*2	—	●*2	●	—	—
For Steam VX2□5 Page 46	●*2	—	●*2	●*2	●	●

*1 For details, refer to pages 73 and 74. *2 Refer to the individual specifications for each fluid.



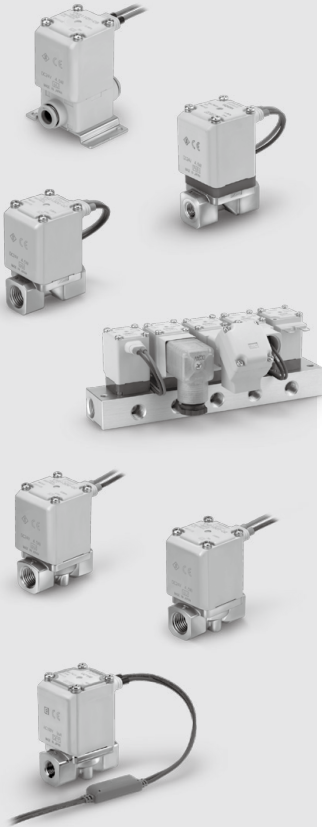
<Body Size>

Model	Body size	Orifice diameter						Port size
		2 mmφ	3 mmφ	4 mmφ	5 mmφ	7 mmφ	8 mmφ	
VX2₁	Size 1	●	●	—	●	—	—	1/8, 1/4 One-touch fitting: ø6, ø8
VX2₅	Size 2	—	—	●	—	●	—	1/4, 3/8 One-touch fitting: ø8, ø10
VX2₆	Size 3	—	—	—	●	—	●	1/4, 3/8, 1/2 One-touch fitting: ø10, ø12

Note) N.C. only

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For Steam * Can be used with heated water.

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VX2
VXK
VXD
VXZ
VXS
VXB
VXE
VXP
VXR
VXH
VXF
VX3
VXA

Direct Operated 2 Port Solenoid Valve

VX21/22/23 Series

For Air, Medium Vacuum, Water, Oil and Steam

Variations

Single Unit (For Air, Medium Vacuum, Water, Oil and Steam)



Valve type

Normally Closed (N.C.)
Normally Open (N.O.)

Solenoid coil type

Insulation type: Class B, Class H

Rated voltage

100 V/200 V/110 V/230 VAC
(220 V/240 V/48 V/24 VAC)
24 VDC (12 VDC)

Voltage in () indicates special voltage.

Material

Body — Aluminum, Resin, C37 (Brass),
Stainless steel

Seal — NBR, FKM*

* Refer to individual pages for details of each fluid.

Electrical entry

- Grommet
- Conduit
- DIN terminal
- Conduit terminal
- Flat terminal

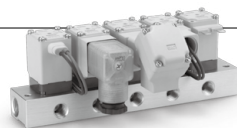
Normally Closed (N.C.)

Normally Open (N.O.)

Size		Size 1	Size 2	Size 3
Orifice diameter	2 mm \varnothing	●	—	—
	3 mm \varnothing	●	—	—
	4 mm \varnothing	—	●	—
	5 mm \varnothing	●	—	●
	7 mm \varnothing	—	●	—
	8 mm \varnothing	—	—	●
	10 mm \varnothing	—	—	●*
Port size		1/8, 1/4 $\varnothing 6, \varnothing 8$	1/4, 3/8 $\varnothing 8, \varnothing 10$	1/4, 3/8, 1/2 $\varnothing 10, \varnothing 12$

* N.C. only

Manifold (For Air, Medium Vacuum)



Valve type

Normally Closed (N.C.)
Normally Open (N.O.)

Manifold type

Common SUP type
Individual SUP type

Solenoid coil type

Insulation type: Class B

Rated voltage

100 V/200 V/110 V/230 VAC
(220 V/240 V/48 V/24 VAC)
24 VDC (12 VDC)

Voltage in () indicates special voltage.

Material

Body — Resin
Base — Aluminum
Seal — NBR, FKM

Electrical entry

- Grommet
- Conduit
- DIN terminal
- Conduit terminal
- Flat terminal

Manifold

Size		Size 1	Size 2	Size 3
Orifice diameter	2 mm \varnothing	●	—	—
	3 mm \varnothing	●	—	—
	4 mm \varnothing	—	●	—
	5 mm \varnothing	●	—	●
	7 mm \varnothing	—	●	●
Port size	Common SUP type (Air)	IN	3/8	
		OUT	1/8, 1/4	
	Individual SUP type (Medium vacuum)	IN	1/8, 1/4	
		OUT	3/8	

Common Specifications

Standard Specifications

Valve specifications	Valve construction		Direct operated poppet
	Withstand pressure		2.0 MPa (Resin body type 1.5 MPa)
	Body material		Aluminum, Resin, C37 (Brass), Stainless steel
	Seal material ^{Note 3)}		NBR, FKM
	Enclosure		Dust-tight, Water-jet-proof type (IP65) ^{Note 1,4)}
Environment		Location without the presence of corrosive gases, explosive gases, or constant fluid adhesion ^{Note 4)}	
Coil specifications	Rated voltage	AC	100 VAC, 200 VAC, 110 VAC, 230 VAC, (220 VAC, 240 VAC, 48 VAC, 24 VAC) ^{Note 2)}
		DC	24 VDC, (12 VDC) ^{Note 2)}
	Allowable voltage fluctuation		±10% of rated voltage
	Allowable leakage voltage	AC	5% or less of rated voltage
		DC	2% or less of rated voltage
Coil insulation type		Class B, Class H	

Note 1) Electrical entry flat terminal type terminal is IP40.

Note 2) Voltage in () indicates special voltage. (Refer to page 49.)

Note 3) For seal material/EPDM, refer to X332. (Refer to page 51.)

Note 4) For enclosure, refer to "Glossary of Terms" on page 65. When using the product in a place which requires water resistance, please contact SMC.

⚠ Be sure to read "Specific Product Precautions" before handling.

Solenoid Coil Specifications

Normally Closed (N.C.)

DC Specification

Class B

Size	Power consumption (W) ^{Note 1)}	Temperature rise (°C) ^{Note 2)}
Size 1	4.5	50
Size 2	7	55
Size 3	10.5	65

Class H

Size	Power consumption (W) ^{Note 1)}	Temperature rise (°C) ^{Note 2)}
Size 1	9	100
Size 2	12	100
Size 3	15	100

Note 1) Power consumption: The value at ambient temperature of 20°C and when the rated voltage is applied. (Variation: ±10%)

Note 2) The value at ambient temperature of 20°C and when the rated voltage is applied. The value depends on the ambient environment. This is for reference.

AC Specification (Built-in Full-wave Rectifier Type)

Class B

Size	Apparent power (VA) ^{Note 1) 2)}	Temperature rise (°C) ^{Note 3)}
Size 1	7	60
Size 2	9.5	70
Size 3	12	70

Class H

Size	Apparent power (VA) ^{Note 1) 2)}	Temperature rise (°C) ^{Note 3)}
Size 1	9	100
Size 2	12	100
Size 3	15	100

Note 1) Apparent power: The value at ambient temperature of 20°C and when the rated voltage is applied. (Variation: ±10%)

Note 2) There is no difference in the frequency and the inrush and energized apparent power, since a rectifying circuit is used in the AC.

Note 3) The value at ambient temperature of 20°C and when the rated voltage is applied. The value depends on the ambient environment. This is for reference.

Normally Open (N.O.)

DC Specification

Class B

Size	Power consumption (W) ^{Note 1)}	Temperature rise (°C) ^{Note 2)}
Size 1	7.5	60
Size 2	8.5	70
Size 3	12.5	70

Class H

Size	Power consumption (W) ^{Note 1)}	Temperature rise (°C) ^{Note 2)}
Size 1	9	100
Size 2	12	100
Size 3	15	100

Note 1) Power consumption: The value at ambient temperature of 20°C and when the rated voltage is applied. (Variation: ±10%)

Note 2) The value at ambient temperature of 20°C and when the rated voltage is applied. The value depends on the ambient environment. This is for reference.

AC Specification (Built-in Full-wave Rectifier Type)

Class B

Size	Apparent power (VA) ^{Note 1) 2)}	Temperature rise (°C) ^{Note 3)}
Size 1	9	60
Size 2	10	70
Size 3	14	70

Class H

Size	Apparent power (VA) ^{Note 1) 2)}	Temperature rise (°C) ^{Note 3)}
Size 1	9	100
Size 2	12	100
Size 3	15	100

Note 1) Apparent power: The value at ambient temperature of 20°C and when the rated voltage is applied. (Variation: ±10%)

Note 2) There is no difference in the frequency and the inrush and energized apparent power, since a rectifying circuit is used in the AC.

Note 3) The value at ambient temperature of 20°C and when the rated voltage is applied. The value depends on the ambient environment. This is for reference.

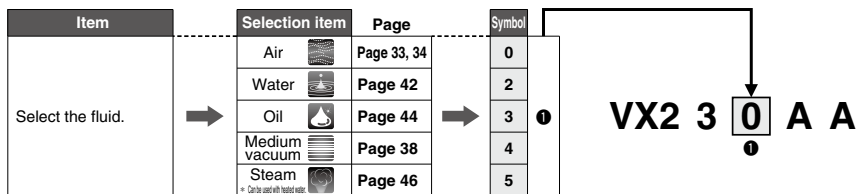
- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

VX21/22/23 Series

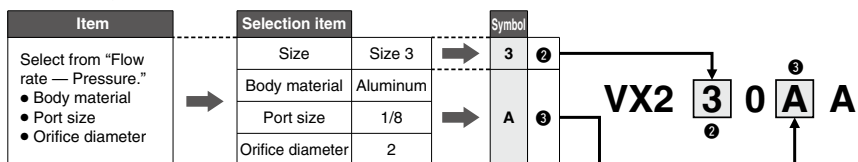
Selection Steps

Selection Steps

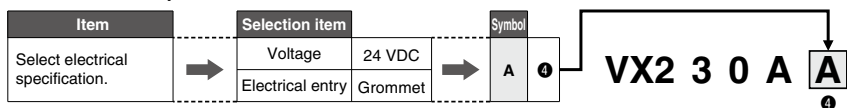
Step 1 Select the fluid.



Step 2 Select "Body material", "Port size" and "Orifice diameter" from "Flow rate — Pressure" of each fluid.



Step 3 Select electrical specification.



Step 4 For special options, refer to pages 49 to 51.

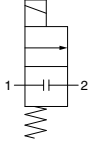


For Air Single Unit

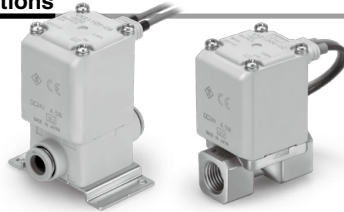
Model/Valve Specifications

N.C.

Symbol



When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.



Aluminum Body Type

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight (g) ^{Note 3)}	
				C [dm ³ /(s·bar)]	b	Cv				
1	1/8, 1/4	2	VX210	0.63	0.63	0.23	1.0	220		
		3		1.05	0.68	0.41			220	
		5		2.20	0.39	0.62			220	
2	1/4, 3/8	4	VX220	1.90	0.52	0.62	1.0	340		
		7		3.99	0.44	1.08			0.15	340
		5		1.96	0.55	0.75			1.0	450
3	1/4, 3/8	8	VX230	5.67	0.33	1.58	0.3	450		
		10		5.74	0.64	2.21			0.1	450
		10		8.42	0.39	2.21			0.1	470
		1/2		10	8.42	0.39			2.21	0.1

Resin Body Type (Built-in One-touch Fittings)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight (g) ^{Note 3)}	
				C [dm ³ /(s·bar)]	b	Cv				
1	ø6	2	VX210	0.82	0.44	0.23	1.0	220		
		3		1.25	0.34	0.35			0.6	220
		5		1.45	0.43	0.40			0.2	220
		2		0.82	0.44	0.23			1.0	220
		3		1.81	0.40	0.41			0.6	220
2	ø8	5	VX220	2.11	0.32	0.56	1.0	220		
		7		1.69	0.40	0.47			1.0	340
		4		3.14	0.34	0.84			0.15	340
		4		1.68	0.49	0.50			1.0	340
		7		3.54	0.36	0.90			0.15	340
3	ø10	5	VX230	2.50	0.44	0.70	1.0	460		
		8		2.77	0.82	1.22			0.3	460
		10		5.69	0.46	1.54			0.1	460
		5		2.50	0.44	0.70			1.0	460
		8		2.56	0.88	1.38			0.3	460
		10		5.69	0.64	1.76			0.1	460
		10		5.69	0.64	1.76			0.1	460

Note 1) The orifice size is just as a reference guide. Check the flow rate characteristics (conversion Cv).

Note 2) The flow rate characteristics of this product have variations.

When the highly precise flow control is required according to the system to be used, select an orifice diameter 1.3 times larger than that shown above and install a restrictor on the downstream side of the solenoid valve to make the adjustment.

Note 3) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.

Note 4) Refer to "Glossary of Terms" on page 65 for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
-10 ^{Note)} to 60	-20 to 60

Note) Dew point temperature: -10°C or less

Valve Leakage Rate

Internal Leakage

Seal material ^{Note 2)}	Leakage rate (Air) ^{Note 1)}
NBR (FKM)	1 cm ³ /min or less (Aluminum body type)
	15 cm ³ /min or less (Resin body type)

External Leakage

Seal material ^{Note 2)}	Leakage rate (Air) ^{Note 1)}
NBR (FKM)	1 cm ³ /min or less (Aluminum body type)
	15 cm ³ /min or less (Resin body type)

Note 1) Leakage is the value at ambient temperature 20°C.

Note 2) For seal material/FKM, refer to "Other Options" on page 49 for the selection.

Note 3) The amount of leakage is the value at a differential pressure of 0.01 MPa or more, and a temperature of 20°C. If the differential pressure is less than 0.01 MPa, please contact SMC.

VX21/22/23 Series

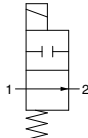


For Air Single Unit

Model/Valve Specifications

N.O.

Symbol



When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Aluminum Body Type

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight (g) ^{Note 3)}
				C [dm ³ /(s·bar)]	b	Cv			
1	1/8, 1/4	2	VX240	0.63	0.63	0.23	0.9	1.0	240
		3		1.05	0.68	0.41	0.45		240
		5		2.20	0.39	0.62	0.2		240
2	1/4, 3/8	4	VX250	1.90	0.52	0.62	0.8		370
		7		3.99	0.44	1.08	0.15		370
		5		1.96	0.55	0.75	0.8		490
3	1/4, 3/8	8	VX260	5.67	0.33	1.58	0.3		490

Resin Body Type (Built-in One-touch Fittings)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight (g) ^{Note 3)}
				C [dm ³ /(s·bar)]	b	Cv			
1	ø6	2	VX240	0.82	0.44	0.23	0.9	1.0	240
		3		1.25	0.34	0.35	0.45		240
		5		1.45	0.43	0.40	0.2		240
	ø8	2		0.82	0.44	0.23	0.9		240
		3		1.81	0.40	0.41	0.45		240
		5		2.11	0.32	0.56	0.2		240
2	ø8	4	VX250	1.69	0.40	0.47	0.8		370
		7		3.14	0.34	0.84	0.15		370
		4		1.68	0.49	0.50	0.8		370
	ø10	7		3.54	0.36	0.90	0.15		370
		5		2.50	0.44	0.70	0.8		500
		8		2.77	0.82	1.22	0.3		500
3	ø12	5	VX260	2.50	0.42	0.70	0.8	500	
		8		2.56	0.88	1.38	0.3	500	

Note 1) The orifice size is just as a reference guide. Check the flow rate characteristics (conversion Cv).

Note 2) The flow rate characteristics of this product have variations.

When the highly precise flow control is required according to the system to be used, select an orifice diameter 1.3 times larger than that shown above and install a restrictor on the downstream side of the solenoid valve to make the adjustment.

Note 3) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.

Note 4) Refer to "Glossary of Terms" on page 65 for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
-10 ^{Note)} to 60	-20 to 60

Note) Dew point temperature: -10°C or less

Valve Leakage Rate

Internal Leakage

Seal material ^{Note 2)}	Leakage rate (Air) ^{Note 1)}
NBR (FKM)	1 cm ³ /min or less (Aluminum body type) 15 cm ³ /min or less (Resin body type)

External Leakage

Seal material ^{Note 2)}	Leakage rate (Air) ^{Note 1)}
NBR (FKM)	1 cm ³ /min or less (Aluminum body type) 15 cm ³ /min or less (Resin body type)

Note 1) Leakage is the value at ambient temperature 20°C.

Note 2) For seal material/FKM, refer to "Other Options" on page 49 for the selection.

Note 3) The amount of leakage is the value at a differential pressure of 0.01 MPa or more, and a temperature of 20°C. If the differential pressure is less than 0.01 MPa, please contact SMC.

Direct Operated 2 Port Solenoid Valve **VX21/22/23 Series**



For Air Single Unit

How to Order (Single Unit)



Note) Refer to the table on page 52 for UL-compliant.



VX2 1 0 A A

Fluid

0 Air

Common Specifications

Seal material	NBR
Coil insulation type	Class B
Thread type	Rc*

* One-touch fittings are attached to the resin body type.



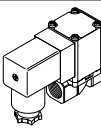
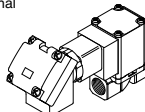
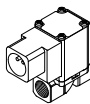
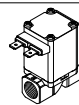
Coil size/Valve type

Size	Symbol	Valve type
Size 1	1	N.C.
	4	N.O.

Body material/Port size/Orifice diameter

Symbol	Body material	Port size	Orifice diameter
A	Aluminum	1/8	2
B			3
C			5
D			2
E	Resin (With bracket)	1/4	3
F			5
H			2
J			3
K	Resin (With bracket)	ø6	5
L			2
M			3
N	Resin (With bracket)	ø8	5

Voltage/Electrical entry

Symbol	Voltage	Electrical entry
A	24 VDC	Grommet 
B	100 VAC	Grommet (With surge voltage suppressor) 
C	110 VAC	
D	200 VAC	
E	230 VAC	
F	24 VDC	DIN terminal (With surge voltage suppressor) 
G	24 VDC	
H	100 VAC	
J	110 VAC	
K	200 VAC	Conduit terminal (With surge voltage suppressor) 
L	230 VAC	
M	24 VDC	
N	100 VAC	
P	110 VAC	Conduit (With surge voltage suppressor) 
Q	200 VAC	
R	230 VAC	
S	24 VDC	
T	100 VAC	Flat terminal 
U	110 VAC	
V	200 VAC	
W	230 VAC	
Y	24 VDC	
Z		Other voltages

Size	Symbol	Valve type
Size 2	2	N.C.
	5	N.O.

Symbol	Body material	Port size	Orifice diameter
A	Aluminum	1/4	4
B			7
D			3/8
E			4
H	Resin (With bracket)	ø8	4
J			7
L			4
M			7

Size	Symbol	Valve type
Size 3	3	N.C.
	6	N.O.

Symbol	Body material	Port size	Orifice diameter	
A	Aluminum	1/4	5	
B			8	
C			10 (N.C. only)	
D			5	
E		Resin (With bracket)	3/8	8
F				10 (N.C. only)
G				10 (N.C. only)
H				5
J	Resin (With bracket)	1/2	10 (N.C. only)	
K			5	
L			8	
M			10 (N.C. only)	
N	Resin (With bracket)	ø10	5	
J			8	
K			10 (N.C. only)	
L			5	
M	Resin (With bracket)	ø12	8	
N			10 (N.C. only)	

For special options, refer to pages 49 to 51.

Special voltage	24 VAC
	48 VAC
	220 VAC
	240 VAC
	12 VDC
DIN terminal with light	
Conduit terminal with light	
Without DIN connector	

Low concentration ozone resistant (Seal material: FKM)
Seal material: EPDM
Oil-free
G thread
NPT thread
With bracket (Aluminum body only)
Mounting holes on the bottom side of the body (Aluminum body only)
Special electrical entry direction

VX21/22/23 Series



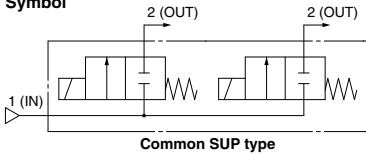
For Air Manifold

* For other fluids, please contact SMC.

Model/Valve Specifications

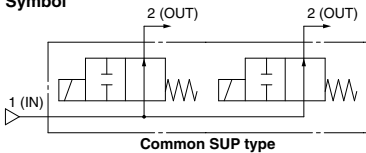
N.C.

Symbol



N.O.

Symbol



When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Normally Closed (N.C.)

Size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 3)}	Max. system pressure (MPa) ^{Note 3)}
			C [dm ³ /(s·bar)]	b	Cv		
1	2	VX2A0	0.63	0.63	0.23	1.0	1.0
	3		1.05	0.68	0.41	0.6	
	5		2.20	0.39	0.62	0.2	
2	4	VX2B0	1.90	0.52	0.62	1.0	
	7		3.99	0.44	1.08	0.15	
3	5	VX2C0	1.96	0.55	0.75	1.0	
	7		3.99	0.44	1.08	0.3	

Normally Open (N.O.)

Size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 3)}	Max. system pressure (MPa) ^{Note 3)}
			C [dm ³ /(s·bar)]	b	Cv		
1	2	VX2D0	0.63	0.63	0.23	0.9	1.0
	3		1.05	0.68	0.41	0.45	
	5		2.20	0.39	0.62	0.2	
2	4	VX2E0	1.90	0.52	0.62	0.8	
	7		3.99	0.44	1.08	0.15	
3	5	VX2F0	1.96	0.55	0.75	0.8	
	7		3.99	0.44	1.08	0.3	

Note 1) The orifice size is just as a reference guide. Check the flow rate characteristics (conversion Cv).

Note 2) The flow rate characteristics of this product have variations.

When the highly precise flow control is required according to the system to be used, select an orifice diameter 1.3 times larger than that shown above and install a restrictor on the downstream side of the solenoid valve to make the adjustment.

Note 3) Refer to "Glossary of Terms" on page 65 for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
-10 ^{Note)} to 60	-20 to 60

Note) Dew point temperature: -10°C or less

Valve Leakage Rate

Internal Leakage

Seal material ^{Note 2)}	Leakage rate ^{Note 1)}
NBR (FKM)	1 cm ³ /min or less

External Leakage

Seal material ^{Note 2)}	Leakage rate ^{Note 1)}
NBR (FKM)	1 cm ³ /min or less

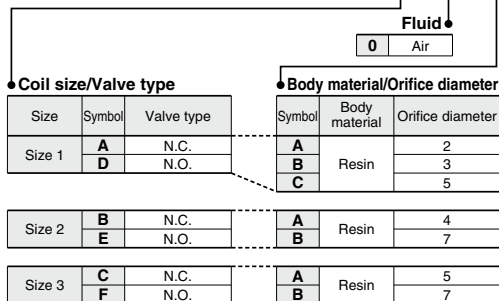
Note 1) Leakage is the value at ambient temperature 20°C.

Note 2) For seal material/FKM, refer to "Other Options" on page 49 for the selection.

Note 3) The amount of leakage is the value at a differential pressure of 0.01 MPa or more, and a temperature of 20°C. If the differential pressure is less than 0.01 MPa, please contact SMC.

How to Order (Solenoid Valve for Manifold)



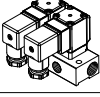
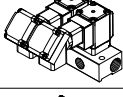

VX2 A 0 A A



Common Specifications

Seal material	NBR
Coil insulation type	Class B

• Voltage/Electrical entry

Symbol	Voltage	Electrical entry	
A	24 VDC	Grommet 	
	B	100 VAC	Grommet (With surge voltage suppressor) 
	C	110 VAC	
	D	200 VAC	
	E	230 VAC	
	F	24 VDC	
G	24 VDC	DIN terminal (With surge voltage suppressor) 	
H	100 VAC	Conduit terminal (With surge voltage suppressor) 	
J	110 VAC		
K	200 VAC		
L	230 VAC		
M	24 VDC		
N	100 VAC		
P	110 VAC	Flat terminal 	
Q	200 VAC		
R	230 VAC		
S	24 VDC		
T	100 VAC		
U	110 VAC		
V	200 VAC	Other voltages	
W	230 VAC		
Y	24 VDC		
Z			

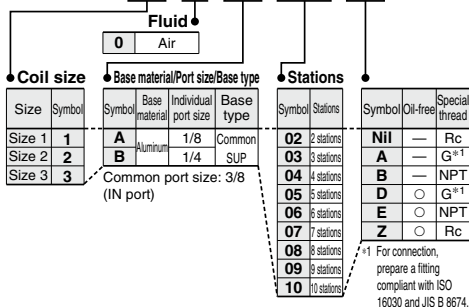
For special options, refer to pages 49 to 51.

Special voltage	24 VAC
	48 VAC
	220 VAC
	240 VAC
	12 VDC
DIN terminal with light	
Conduit terminal with light	
Without DIN connector	
Seal material: EPDM	
Low concentration ozone resistant (Seal material: FKM)	
Oil-free	
Special electrical entry direction	

⚠ Caution
Mounting orientation exists when mounting valves onto manifold base. Refer to page 76 for details.

Manifold Base/How to Order

VVX2 1 0 A 02



Blanking Plate Assembly Part No.

For size 1 **VVX021S-4A-N**

For size 2 **VVX022S-4A-N**

For size 3 **VVX023S-4A-N**

When mounting a blanking plate assembly, if the solenoid valve for the manifold is ozone resistant, (Seal material: FKM), please select FKM.

• **Seal material**

N	NBR
F	FKM

Dimensions → Page 63

How to Order Manifold Assembly (Example)

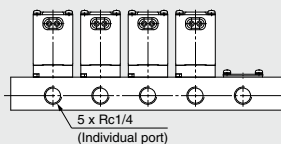
Enter the valve and blanking plate to be mounted under the manifold base part number.

<Example>

VVX210B05.....1
 *VX2A0AA4
 *VVX021S-4A-N1

↳ “*” is the symbol for mounting.
 Add an “*” in front of the part numbers for solenoid valves etc. to be mounted.

D side (Stations) ① ② ③ ④ ⑤ U side



Enter the product's part number in order, counting the 1st station from the D side (left in the manifold arrangement, when viewing the individual port in front).

VX21/22/23 Series



For Medium Vacuum (0.1 Pa-abs or more) Single Unit

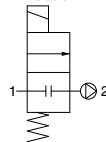
* This valve can also be used with air.
(Refer to the valve specifications for air.)

Model/Valve Specifications

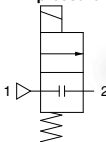
Symbol (Application example)

N.C.

① Used with vacuum



② Used with pressure

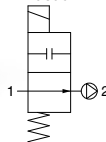


When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

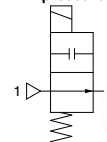
Symbol (Application example)

N.O.

① Used with vacuum



② Used with pressure



When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Normally Closed (N.C.)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa)	Weight (g) ^{Note 3)}
				C [dm ³ /(s·bar)]	b	Cv			
1	1/8, 1/4	2	VX214	0.63	0.63	0.23	1.0	300	
		3		1.05	0.68	0.41	0.6	300	
		5		2.20	0.39	0.62	0.2	300	
2	1/4, 3/8	4	VX224	1.90	0.52	0.62	1.0	460	
		7		3.99	0.44	1.08	0.15	460	
		5		1.96	0.55	0.75	1.0	580	
3	1/4, 3/8	8	VX234	5.67	0.33	1.58	0.3	580	
		10		5.74	0.64	2.21	0.1	580	
		1/2		8.42	0.39	2.21	0.1	630	
	10	8.42		0.39	2.21	0.1	630		

Normally Open (N.O.)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa)	Weight (g) ^{Note 3)}
				C [dm ³ /(s·bar)]	b	Cv			
1	1/8, 1/4	2	VX244	0.63	0.63	0.23	0.9	320	
		3		1.05	0.68	0.41	0.45	320	
		5		2.20	0.39	0.62	0.2	320	
2	1/4, 3/8	4	VX254	1.90	0.52	0.62	0.8	490	
		7		3.99	0.44	1.08	0.15	490	
		5		1.96	0.55	0.75	0.8	620	
3	1/4, 3/8	8	VX264	5.67	0.33	1.58	0.3	620	
		8		5.67	0.33	1.58	0.3	620	

Note 1) The orifice size is just as a reference guide. Check the flow rate characteristics (conversion Cv).

Note 2) The flow rate characteristics of this product have variations.

When the highly precise flow control is required according to the system to be used, select an orifice diameter 1.3 times larger than that shown above and install a restrictor on the downstream side of the solenoid valve to make the adjustment.

Note 3) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.

Note 4) Refer to "Glossary of Terms" on page 65 for details on the maximum operating pressure differential.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
1 to 60 ^{Note)}	-20 to 60

Note) With no freezing

Valve Leakage Rate

Internal Leakage

Seal material	Leakage rate ^{Note)}
FKM	10 ⁻⁶ Pa·m ³ /sec or less

External Leakage

Seal material	Leakage rate ^{Note)}
FKM	10 ⁻⁶ Pa·m ³ /sec or less

Note) Leakage (10⁻⁶ Pa·m³/sec) is the value at differential pressure 0.1 MPa and ambient temperature 20°C.

Direct Operated 2 Port Solenoid Valve **VX21/22/23 Series**

For Medium Vacuum Single Unit



How to Order (Single Unit)

VX2 1 4 A A

Fluid
4 Medium vacuum

Common Specifications

Seal material	FKM
Coil insulation type	Class B
Thread type	Rc
Oil-free	
Non-leak	



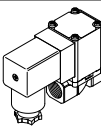
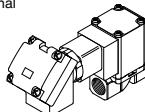
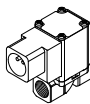
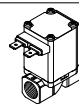
Coil size/Valve type

Size	Symbol	Valve type
Size 1	1	N.C.
	4	N.O.

Body material/Port size/Orifice diameter

Symbol	Body material	Port size	Orifice diameter
A	C37	1/8	2
B			3
C		1/4	5
D			2
E			3
F	5		
H	Stainless steel	1/8	2
J			3
K		1/4	5
L			2
M			3
N	5		

Voltage/Electrical entry

Symbol	Voltage	Electrical entry
A	24 VDC	Grommet 
B	100 VAC	Grommet (With surge voltage suppressor) 
C	110 VAC	
D	200 VAC	
E	230 VAC	
F	24 VDC	
G	24 VDC	DIN terminal (With surge voltage suppressor) 
H	100 VAC	
J	110 VAC	
K	200 VAC	
L	230 VAC	Conduit terminal (With surge voltage suppressor) 
M	24 VDC	
N	100 VAC	
P	110 VAC	
Q	200 VAC	Conduit (With surge voltage suppressor) 
R	230 VAC	
S	24 VDC	
T	100 VAC	
U	110 VAC	Flat terminal 
V	200 VAC	
W	230 VAC	
Y	24 VDC	
Z	Other voltages	

Size	Symbol	Valve type
Size 2	2	N.C.
	5	N.O.

Symbol	Body material	Port size	Orifice diameter
A	C37	1/4	4
B			7
D		3/8	4
E	7		
H	Stainless steel	1/4	4
J			7
L		3/8	4
M			7

Size	Symbol	Valve type
Size 3	3	N.C.
	6	N.O.

Symbol	Body material	Port size	Orifice diameter
A	C37	1/4	5
B			8
C		3/8	10 (N.C. only)
D			5
E			8
F	1/2	10 (N.C. only)	
G		10 (N.C. only)	
H	Stainless steel	1/4	5
J			8
K		3/8	10 (N.C. only)
L			5
M			8
N	1/2	10 (N.C. only)	
P		10 (N.C. only)	

For special options, refer to pages 49 to 51.

Special voltage	24 VAC	Without DIN connector
	48 VAC	Seal material: EPDM
	220 VAC	G thread
	240 VAC	NPT thread
	12 VDC	With bracket
DIN terminal with light	Mounting holes on the bottom side of the body	
Conduit terminal with light	Special electrical entry direction	

Dimensions → Pages 60, 61 (Single unit)

VX21/22/23 Series



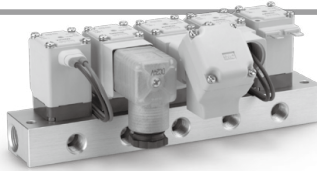
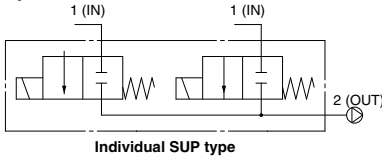
For Medium Vacuum (0.1 Pa-abs or more) Manifold

* For other fluids, please contact SMC.

Model/Valve Specifications

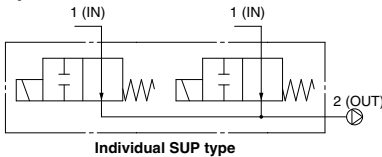
N.C.

Symbol



N.O.

Symbol



When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Normally Closed (N.C.)

Size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 3)}	Max. system pressure (MPa) ^{Note 3)}
			C [dm ³ /(s·bar)]	b	Cv		
1	2	VX2A4	0.63	0.63	0.23	1.0	1.0
	3		1.05	0.68	0.41	0.6	
	5		2.20	0.39	0.62	0.2	
2	4	VX2B4	1.90	0.52	0.62	1.0	
	7		3.99	0.44	1.08	0.15	
3	5	VX2C4	1.96	0.55	0.75	1.0	
	7		3.99	0.44	1.08	0.3	

Normally Open (N.O.)

Size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}			Maximum operating pressure differential (MPa) ^{Note 3)}	Max. system pressure (MPa) ^{Note 3)}
			C [dm ³ /(s·bar)]	b	Cv		
1	2	VX2D4	0.63	0.63	0.23	0.9	1.0
	3		1.05	0.68	0.41	0.45	
	5		2.20	0.39	0.62	0.2	
2	4	VX2E4	1.90	0.52	0.62	0.8	
	7		3.99	0.44	1.08	0.15	
3	5	VX2F4	1.96	0.55	0.75	0.8	
	7		3.99	0.44	1.08	0.3	

Note 1) The orifice size is just as a reference guide. Check the flow rate characteristics (conversion Cv).

Note 2) The flow rate characteristics of this product have variations.

When the highly precise flow control is required according to the system to be used, select an orifice diameter 1.3 times larger than that shown above and install a restrictor on the downstream side of the solenoid valve to make the adjustment.

Note 3) Refer to "Glossary of Terms" on page 65 for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
1 to 60 ^{Note)}	-20 to 60

Note) With no freezing

Valve Leakage Rate

Internal Leakage

Seal material	Leakage rate ^{Note)}
FKM	10 ⁻⁶ Pa·m ³ /sec or less

External Leakage

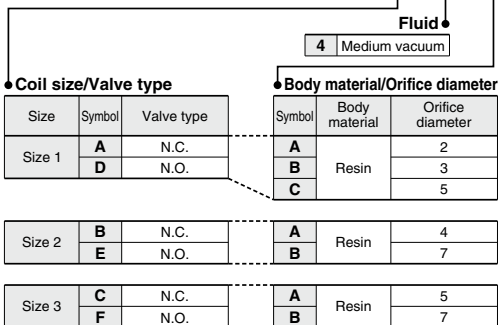
Seal material	Leakage rate ^{Note)}
FKM	10 ⁻⁶ Pa·m ³ /sec or less

Note) Leakage (10⁻⁶ Pa·m³/sec) is the value at 0.1 Pa-abs and ambient temperature 20°C.



How to Order (Solenoid Valve for Manifold)

VX2 A 4 A A



Common Specifications

Seal material	FKM
Coil insulation type	Class B
Oil-free	
Non-leak	

Symbol	Voltage	Electrical entry
A	24 VDC	Grommet
B	100 VAC	Grommet (With surge voltage suppressor)
C	110 VAC	
D	200 VAC	
E	230 VAC	
F	24 VDC	DIN terminal (With surge voltage suppressor)
G	24 VDC	
H	100 VAC	
J	110 VAC	
K	200 VAC	Conduit terminal (With surge voltage suppressor)
L	230 VAC	
M	24 VDC	
N	100 VAC	
P	110 VAC	Conduit terminal (With surge voltage suppressor)
Q	200 VAC	
R	230 VAC	
S	24 VDC	
T	100 VAC	Conduit terminal (With surge voltage suppressor)
U	110 VAC	
V	200 VAC	
W	230 VAC	
Y	24 VDC	Flat terminal
Z	Other voltages	

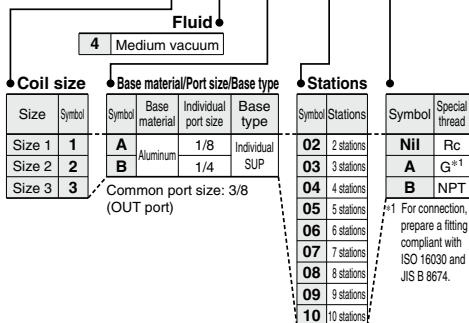
For special options, refer to pages 49 to 51.

Special voltage	24 VAC
	48 VAC
	220 VAC
	240 VAC
	12 VDC
DIN terminal with light	
Conduit terminal with light	
Without DIN connector	
Seal material: EPDM	
Special electrical entry direction	

Caution
Mounting orientation exists when mounting valves onto manifold base. Refer to page 76 for details.

Manifold Base/How to Order

VVX2 1 4 A 02



Blanking Plate Assembly Part No.

- For size 1 **VVX021S-4A-F**
- For size 2 **VVX022S-4A-F**
- For size 3 **VVX023S-4A-F**

Dimensions → Page 63

How to Order Manifold Assembly (Example)

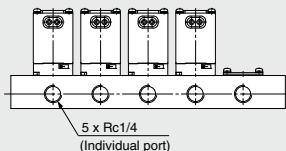
Enter the valve and blanking plate to be mounted under the manifold base part number.

<Example>

VVX214B05.....1
=VX2A4AA.....4
=VVX021S-4A-F.....1

“*” is the symbol for mounting.
Add an “*” in front of the part numbers for solenoid valves etc. to be mounted.

D side (Stations) ① ② ③ ④ ⑤ U side



Enter the product's part number in order, counting the 1st station from the D side (left in the manifold arrangement, when viewing the individual port in front).

VX21/22/23 Series



For Water Single Unit

* This valve can also be used with air.
(Refer to the valve specifications for air.)

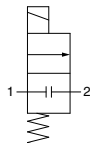
⚠ When water is used as the fluid

Use clear water equivalent to tap water. (When using underground water, if the water is to be treated, be sure to check the disinfectant or corrosion treatment's compatibility with the product before use.) Corrosive fluids or seawater cannot be used.

Model/Valve Specifications

Symbol

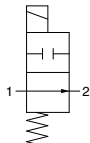
N.C.



When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Symbol

N.O.



When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Normally Closed (N.C.)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}		Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight ^{Note 3)} (g)
				Kv	Conversion Cv			
1	1/8, 1/4	2	VX212	0.20	0.23	1	1.0	300
		3		0.36	0.42	0.6		300
		5		0.54	0.63	0.2		300
2	1/4, 3/8	4	VX222	0.54	0.63	1		460
		7		0.93	1.08	0.15		460
3	1/4, 3/8	5	VX232	0.64	0.75	1		580
		8		1.36	1.58	0.3		580
		10		1.89	2.21	0.1		580
		10		1.89	2.21	0.1		630

Normally Open (N.O.)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}		Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight ^{Note 3)} (g)
				Kv	Conversion Cv			
1	1/8, 1/4	2	VX242	0.20	0.23	0.9	1.0	320
		3		0.36	0.42	0.45		320
		5		0.54	0.63	0.2		320
2	1/4, 3/8	4	VX252	0.54	0.63	0.8		490
		7		0.93	1.08	0.15		490
3	1/4, 3/8	5	VX262	0.64	0.75	0.8		620
		8		1.36	1.58	0.3		620

Note 1) The orifice size is just as a reference guide. Check the flow rate characteristics (conversion Cv).

Note 2) The flow rate characteristics of this product have variations.

When the highly precise flow control is required according to the system to be used, select an orifice diameter 1.3 times larger than that shown above and install a restrictor on the downstream side of the solenoid valve to make the adjustment.

Note 3) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.

Note 4) Refer to "Glossary of Terms" on page 65 for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
1 to 60 ^{Note)}	-20 to 60

Note) With no freezing

Valve Leakage Rate

Internal Leakage

Seal material ^{Note 2)}	Leakage rate (Water) ^{Note 1)}
NBR (FKM)	0.1 cm ³ /min or less

External Leakage

Seal material ^{Note 2)}	Leakage rate (Water) ^{Note 1)}
NBR (FKM)	0.1 cm ³ /min or less

Note 1) Leakage is the value at ambient temperature 20°C.

Note 2) For seal material/FKM, refer to "Other Options" on page 49 for the selection.

Direct Operated 2 Port Solenoid Valve **VX21/22/23 Series**



For Water Single Unit

How to Order (Single Unit)



Note) Refer to the table on page 53 for UL-compliant.



VX2 1 2 A A

Fluid
2 Water

Coil size/Valve type

Size	Symbol	Valve type
Size 1	1	N.C.
	4	N.O.

Size	Symbol	Valve type
Size 2	2	N.C.
	5	N.O.

Size	Symbol	Valve type
Size 3	3	N.C.
	6	N.O.

Body material/Port size/Orifice diameter

Symbol	Body material	Port size	Orifice diameter
A	C37	1/8	2
B			3
C			5
D			2
E			3
F	5	1/4	
H	2		
J	3		
K	5		
L	2		
M	Stainless steel	1/4	3
N			5

Symbol	Body material	Port size	Orifice diameter
A	C37	1/4	4
B			7
D			4
E	Stainless steel	3/8	7
H			4
J			7
L	3/8	3/8	4
M			7

Symbol	Body material	Port size	Orifice diameter	
A	C37	1/4	5	
B			8	
C			10 (N.C. only)	
D		3/8	3/8	5
E				8
F		10 (N.C. only)	1/2	10 (N.C. only)
G		5		
H	Stainless steel	1/4	8	
J			10 (N.C. only)	
K			5	
L		3/8	3/8	8
M				10 (N.C. only)
N		1/2	1/2	10 (N.C. only)
P				10 (N.C. only)

Common Specifications

Seal material	NBR
Coil insulation type	Class B
Thread type	Rc

Voltage/Electrical entry

Symbol	Voltage	Electrical entry
A	24 VDC	Grommet
B	100 VAC	Grommet (With surge voltage suppressor)
C	110 VAC	
D	200 VAC	
E	230 VAC	
F	24 VDC	
G	24 VDC	DIN terminal (With surge voltage suppressor)
H	100 VAC	
J	110 VAC	Conduit terminal (With surge voltage suppressor)
K	200 VAC	
L	230 VAC	
M	24 VDC	
N	100 VAC	Conduit (With surge voltage suppressor)
P	110 VAC	
Q	200 VAC	
R	230 VAC	
S	24 VDC	
T	100 VAC	Flat terminal
U	110 VAC	
V	200 VAC	
W	230 VAC	Other voltages
Y	24 VDC	
Z		

For special options, refer to pages 49 to 51.

Special voltage	24 VAC	Applicable to deionized water (Seal material: FKM)
	48 VAC	
	220 VAC	
	240 VAC	
	12 VDC	
DIN terminal with light		Seal material: EPDM
Conduit terminal with light		Oil-free
Without DIN connector		G thread
		NPT thread
		With bracket
		Mounting holes on the bottom side of the body
		Special electrical entry direction

VX21/22/23 Series



For Oil Single Unit

* This valve can also be used with air or water.
(Refer to the valve specifications for air or water.)

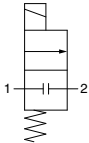
⚠ When the fluid is oil.

The kinematic viscosity must not exceed 50 mm²/s.
The special construction of the armature adopted in the built-in full-wave rectifier type gives an improvement in OFF response by providing clearance on the absorbed surface when it is switched ON.

Model/Valve Specifications

Symbol

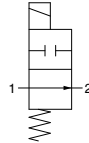
N.C.



When the valve is closed, flow is blocked from port 1 to port 2.
However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Symbol

N.O.



When the valve is closed, flow is blocked from port 1 to port 2.
However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Normally Closed (N.C.)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}		Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight (g) ^{Note 3)}
				Kv	Conversion Cv			
1	1/8, 1/4	2	VX213	0.20	0.23	1	1.0	300
		3		0.36	0.42			300
		5		0.54	0.63			300
2	1/4, 3/8	4	VX223	0.54	0.63	1	1.0	460
		7		0.93	1.08			460
		5		0.64	0.75			580
3	1/4, 3/8	8	VX233	1.36	1.58	0.3	1.0	580
		10		1.89	2.21			580
		10		1.89	2.21			580
		1/2		10	1.89			2.21

Normally Open (N.O.)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}		Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight (g) ^{Note 3)}
				Kv	Conversion Cv			
1	1/8, 1/4	2	VX243	0.20	0.23	0.9	1.0	320
		3		0.36	0.42			320
		5		0.54	0.63			320
2	1/4, 3/8	4	VX253	0.54	0.63	0.8	1.0	490
		7		0.93	1.08			490
		5		0.64	0.75			620
3	1/4, 3/8	8	VX263	1.36	1.58	0.3	1.0	620

Note 1) The orifice size is just as a reference guide. Check the flow rate characteristics (conversion Cv).

Note 2) The flow rate characteristics of this product have variations.

When the highly precise flow control is required according to the system to be used, select an orifice diameter 1.3 times larger than that shown above and install a restrictor on the downstream side of the solenoid valve to make the adjustment.

Note 3) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.

Note 4) Refer to "Glossary of Terms" on page 65 for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
-5 ^{Note)} to 60	-20 to 60

Note) Kinematic viscosity: 50 mm²/s or less

Valve Leakage Rate

Internal Leakage

Seal material	Leakage rate (Oil) ^{Note)}
FKM	0.1 cm ³ /min or less

External Leakage

Seal material	Leakage rate (Oil) ^{Note)}
FKM	0.1 cm ³ /min or less

Note) Leakage is the value at ambient temperature 20°C.

Direct Operated 2 Port Solenoid Valve **VX21/22/23 Series**

 **For Oil Single Unit**



How to Order

VX2 1 3 A A

Fluid
3 Oil

Common Specifications

Seal material	FKM
Coil insulation type	Class B
Thread type	Rc

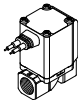

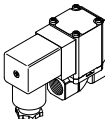
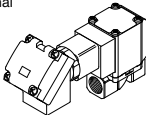
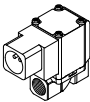
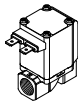
Coil size/Valve type

Size	Symbol	Valve type
Size 1	1	N.C.
	4	N.O.

Body material/Port size/Orifice diameter

Symbol	Body material	Port size	Orifice diameter	
A	C37	1/8	2	
B			3	
C			5	
D			1/4	2
E				3
F	5			
H	Stainless steel	1/8	2	
J			3	
K			5	
L			1/4	2
M				3
N	5			

Voltage/Electrical entry

Symbol	Voltage	Electrical entry
A	24 VDC	Grommet 
B	100 VAC	Grommet (With surge voltage suppressor) 
C	110 VAC	
D	200 VAC	
E	230 VAC	
F	24 VDC	
G	24 VDC	DIN terminal (With surge voltage suppressor) 
H	100 VAC	
J	110 VAC	
K	200 VAC	
L	230 VAC	Conduit terminal (With surge voltage suppressor) 
M	24 VDC	
N	100 VAC	
P	110 VAC	
Q	200 VAC	
R	230 VAC	Conduit (With surge voltage suppressor) 
S	24 VDC	
T	100 VAC	
U	110 VAC	
V	200 VAC	
W	230 VAC	
Y	24 VDC	Flat terminal 
Z		Other voltages

Size	Symbol	Valve type
Size 2	2	N.C.
	5	N.O.

Symbol	Body material	Port size	Orifice diameter	
A	C37	1/4	4	
B			7	
D			3/8	4
E	7			
H	Stainless steel	1/4	4	
J			7	
L			3/8	4
M				7

Size	Symbol	Valve type
Size 3	3	N.C.
	6	N.O.

Symbol	Body material	Port size	Orifice diameter	
A	C37	1/4	5	
B			8	
C			10 (N.C. only)	
D			3/8	5
E				8
F				10 (N.C. only)
G			1/2	10 (N.C. only)
H	Stainless steel	1/4	5	
J			8	
K			10 (N.C. only)	
L			3/8	5
M				8
N				10 (N.C. only)
P			1/2	10 (N.C. only)

For special options, refer to pages 49 to 51.

Special voltage	24 VAC	Without DIN connector
	48 VAC	Oil-free
	220 VAC	G thread
	240 VAC	NPT thread
	12 VDC	With bracket
DIN terminal with light		Mounting holes on the bottom side of the body
Conduit terminal with light		Special electrical entry direction

Dimensions → Pages 60, 61 (Single unit)

VX21/22/23 Series



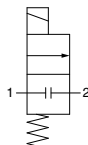
For Steam Single Unit

* This valve can also be used with air, water, oil or heated water.
(Refer to the valve specifications for air, water or oil.)

Model/Valve Specifications

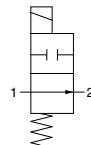
Symbol

N.C.



Symbol

N.O.



When the valve is closed, flow is blocked from port 1 to port 2.
However, if the pressure in port 2 is higher than port 1,
the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Normally Closed (N.C.)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}		Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight (g) ^{Note 3)}
				Kv	Conversion Cv			
1	1/8, 1/4	2	VX215	0.20	0.23	1	1.0	300
		3		0.36	0.42	0.6		300
		5		0.54	0.63	0.2		300
2	1/4, 3/8	4	VX225	0.54	0.63	1		460
		7		0.93	1.08	0.15		460
		5		0.64	0.75	1		580
3	1/4, 3/8	8	VX235	1.36	1.58	0.3		580
		10		1.89	2.21	0.1		580
		10		1.89	2.21	0.1		630
		1/2		10	1.89	2.21	0.1	630

Normally Open (N.O.)

Size	Port size	Orifice diameter (mm) ^{Note 1)}	Model	Flow rate characteristics ^{Note 2)}		Maximum operating pressure differential (MPa) ^{Note 4)}	Max. system pressure (MPa) ^{Note 4)}	Weight (g) ^{Note 3)}
				Kv	Conversion Cv			
1	1/8, 1/4	2	VX245	0.20	0.23	0.9	1.0	320
		3		0.36	0.42	0.45		320
		5		0.54	0.63	0.2		320
2	1/4, 3/8	4	VX255	0.54	0.63	0.8		490
		7		0.93	1.08	0.15		490
		5		0.64	0.75	0.8		620
3	1/4, 3/8	8	VX265	1.36	1.58	0.3		620
		8		1.36	1.58	0.3		620

Note 1) The orifice size is just as a reference guide. Check the flow rate characteristics (conversion Cv).

Note 2) The flow rate characteristics of this product have variations.

When the highly precise flow control is required according to the system to be used, select an orifice diameter 1.3 times larger than that shown above and install a restrictor on the downstream side of the solenoid valve to make the adjustment.

Note 3) Weight of grommet type. Add 10 g for conduit type, 60 g for conduit terminal type respectively.

Note 4) Refer to "Glossary of Terms" on page 65 for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
Steam: 183 or less	-20 to 60
Heated water: 99 or less	

Valve Leakage Rate

Internal Leakage

Fluid	Seal material	Leakage rate
Steam	FKM for high temperature	1.0 cm ³ /min or less
Heated water		0.1 cm ³ /min or less

External Leakage

Fluid	Seal material	Leakage rate
Steam	FKM for high temperature	1.0 cm ³ /min or less
Heated water		0.1 cm ³ /min or less

How to Order (Single Unit)

VX2 1 5 A B

Fluid

5 Steam

* Can be used with heated water.

● **Coil size/Valve type**

Size	Symbol	Valve type
Size 1	1	N.C.
	4	N.O.

● **Body material/Port size/Orifice diameter**

Symbol	Body material	Port size	Orifice diameter
A	C37	1/8	2
B			3
C			5
D			2
E			3
F	Stainless steel	1/4	5
H			2
J			3
K			5
L			2
M	1/4	3	3
N			5

Size 2	2	N.C.
	5	N.O.

Symbol	Body material	Port size	Orifice diameter
A	C37	1/4	4
B			7
D		3/8	4
E			7
H		1/4	4
J	7		
L	3/8	4	
M		7	


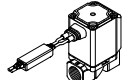
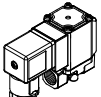
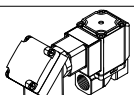
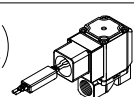
Size 3	3	N.C.
	6	N.O.

Symbol	Body material	Port size	Orifice diameter
A	C37	1/4	5
B			8
C		3/8	10 (Only N.C.)
D			5
E		1/2	8
F	10 (Only N.C.)		
G	1/2	10 (Only N.C.)	
H		1/4	5
J	8		
K	3/8	10 (Only N.C.)	
L		5	
M	1/2	8	
N		10 (Only N.C.)	
P	10 (Only N.C.)		

Common Specifications

Seal material	FKM for high temperature
Coil insulation type	Class H
Thread type	Rc

● **Voltage/Electrical entry**

Symbol	Voltage	Electrical entry
A	24 VDC	Grommet 
B	100 VAC	Grommet
C	110 VAC	(With surge voltage suppressor) 
D	200 VAC	
E	230 VAC	
G	24 VDC	DIN terminal (With surge voltage suppressor Note) 
H	100 VAC	
J	110 VAC	
K	200 VAC	
L	230 VAC	
N	100 VAC	Conduit terminal (With surge voltage suppressor) 
P	110 VAC	
Q	200 VAC	
R	230 VAC	
T	100 VAC	Conduit (With surge voltage suppressor) 
U	110 VAC	
V	200 VAC	
W	230 VAC	
Z	Other voltages	

Note) For the class H type DIN terminal, use it in combination with the connector provided.

For special options, refer to pages 49 to 51.

Special voltage	24 VAC
	48 VAC
	220 VAC
	240 VAC
DIN terminal with light	
Conduit terminal with light	
Seal material: EPDM (99°C or less)	
Oil-free	
G thread	
NPT thread	
With bracket	
Mounting holes on the bottom side of the body	
Special electrical entry direction	

VX2

VXK

VXD

VXZ

VXS

VXB

VXE

VXP

VXR

VXH

VXF

VX3

VXA

VX21/22/23 Series Special Options

Electrical Options (Special voltage, With light, Without DIN connector)

VX2 1 0 A Z 1A

Enter standard product number.

Electrical option

Electrical specification/Voltage/Electrical entry

Specification	Symbol	Class H*	Voltage	Electrical entry
Special voltage	1A	●	48 VAC	Grommet (With surge voltage suppressor)
	1B	●	220 VAC	
	1C	●	240 VAC	
	1U	●	24 VAC	
	1D	—	12 VDC	Grommet (With surge voltage suppressor)
	1E	—	12 VDC	
	1F	●	48 VAC	DIN terminal (With surge voltage suppressor)
	1G	●	220 VAC	
	1H	●	240 VAC	
	1V	●	24 VAC	
	1J	—	12 VDC	Conduit terminal (With surge voltage suppressor)
	1K	●	48 VAC	
	1L	●	220 VAC	
	1M	●	240 VAC	
	1W	●	24 VAC	
	1N	—	12 VDC	
	1P	●	48 VAC	Conduit (With surge voltage suppressor)
	1Q	●	220 VAC	
1R	●	240 VAC		
1Y	●	24 VAC		
1S	—	12 VDC	Flat terminal	
1T	—	12 VDC		

Specification	Symbol	Class H*	Voltage	Electrical entry
With light	2A	●	24 VDC	DIN terminal (With surge voltage suppressor)
	2B	●	100 VAC	
	2C	●	110 VAC	
	2D	●	200 VAC	
	2E	●	230 VAC	
	2F	●	48 VAC	
	2G	●	220 VAC	Conduit terminal (With surge voltage suppressor)
	2H	●	240 VAC	
	2V	●	24 VAC	
	2J	—	12 VDC	
	2K	—	24 VDC	
	2L	●	100 VAC	
	2M	●	110 VAC	
	2N	●	200 VAC	
	2P	●	230 VAC	
	2Q	●	48 VAC	
	2R	●	220 VAC	
	2S	●	240 VAC	
2W	●	24 VAC		
2T	—	12 VDC		

Specification	Symbol	Class H*	Voltage	Electrical entry
Without DIN connector	3A	—	24 VDC	DIN terminal (With surge voltage suppressor)
	3B	—	100 VAC	
	3C	—	110 VAC	
	3D	—	200 VAC	
	3E	—	230 VAC	
	3F	—	48 VAC	
	3G	—	220 VAC	
	3H	—	240 VAC	
	3V	—	24 VAC	
	3J	—	12 VDC	

* Options marked with ● are available for Class "H" coil.
Applicable for all when the coil insulation class is Class "B".

* Enter symbols in the order below when ordering a combination of electrical option, other option, etc.

Example) VX2 1 2 A Z 1A Z

Electrical option Other option

Other Options

Low concentration ozone resistant and applicable to deionized water

Oil-free

Port thread

VX2 1 0 A A Z

Enter standard product number.

Other option

Low concentration ozone resistant and applicable to deionized water/Oil-free/Port thread

Symbol	Low concentration ozone resistant and applicable to deionized water ^{*1, *2} (Seal material: FKM)	Oil-free	Port thread
Nil	—	—	Rc, One-touch fitting ^{*2}
A	—	—	G ^{*4}
B	—	—	NPT
C	○	—	Rc, One-touch fitting ^{*2}
D	—	—	G ^{*4}
E	—	○	NPT
F	—	—	G ^{*4}
G	○	—	NPT
H	—	—	Rc, One-touch fitting ^{*2}
K	○	○	G ^{*4}
L	—	—	NPT
Z	—	○	Rc, One-touch fitting ^{*2}

*1 Applicable to air (VX2□□0) and water (VX2□□2).

*2 When the body is resin, One-touch fittings are equipped.

*3 When using deionized water or any other fluid that may corrode C37 (brass), select a stainless steel body.

*4 For connection, prepare a fitting compliant with ISO 16030 and JIS B 8674.

Made to Order

<Special lead wire length>

Produced upon receipt of order. Please contact SMC for lead times.

VX2 □ □ □ □ XL □

Lead wire length

XL1	600 mm
XL2	1000 mm
XL3	1500 mm
XL4	3000 mm

<High pressure>

VX2 □ □ □ □ XH □

Correspondence table

Size	Symbol	Body material	Port size	Orifice dia.	Max. operating pressure differential		
1	N.C.	Q	C37	1/8	2 MPa		
		R		1/4			
		S	1/8				
		T	1/4				
N.O.		—	Not available				
2	N.C.	Q	C37	1/4	2 MPa		
		R		3/8			
		N.O.		—		Not available	
		N.O.		—		Not available	
3	N.C.	Q	C37	1/4	3 MPa		
		R		3/8			
		N.O.		—		Not available	
		N.O.		—		Not available	

* The aluminum and PBT bodies are not available.

Option

Symbol	Specifications
Nil	Electrical entry direction
A	Bracket
B	None
C	None
D	In side (Standard)
E	90°
F	180°
G	270°
H	In side (Standard)
J	90°
K	180°
L	270°

VX2

VXK

VXD

VXZ

VXS

VXB

VXE

VXP

VXR

VXH

VXF

VX3

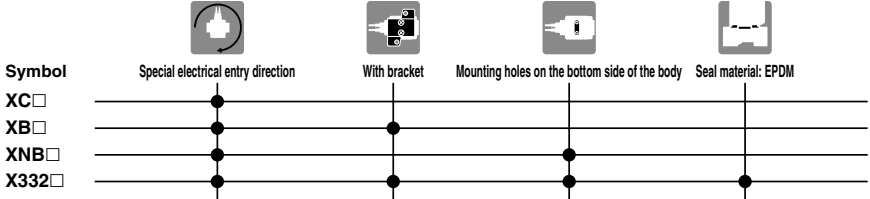
VXA

VX21/22/23 Series

Installation Options (Mounting Option/Special Electrical Entry Direction)

The following shows combinations that can be selected using installation options.

Combinations



Special Electrical Entry Direction

VX2 XC A

Enter standard product number.

Special electrical entry direction

Symbol	Electrical entry direction	
	Single unit	Manifold
A	90° 	90°
	180° 	180°
C	270° 	270°

* Enter symbols in the order below when ordering a combination of electrical option, other option and special electrical entry direction.

Example) VX2 A Z 1 A Z XC A

Electrical option
Other option
Special electrical entry direction

* Enter symbols in the order below when ordering a combination of electrical option, other option and with bracket.

Example) VX2 A Z 1 A Z XB A

Electrical option
Other option
With bracket/Special electrical entry direction

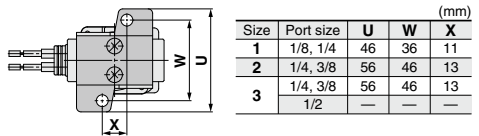
With Bracket/ Special Electrical Entry Direction

VX2 XB A

Enter standard product number.

With bracket/Special electrical entry direction

Symbol	Electrical entry direction		Symbol	Electrical entry direction	
	Standard				
A	Standard 		C	270° 	
	90° 				270°
B	180° 				





- *1 Bracket is attached as standard with the resin body, so there are no XB settings.
- *2 When the orifice is $\phi 8, \phi 10$, and the body port size is 1/4 or 3/8, use a foot type bracket. (The L-bracket of the old VX series is not compatible.) If the body port size is 1/2, there are no XB settings. (Refer to the following.)
- *3 On the bottom side of the standard body, there is no female thread for mounting a bracket. Please be careful because the bracket cannot be retrofit.
- *4 Bracket is packed in the same container as the main body.

Bracket Interchangeable with an Old Type

Size	Port size	Orifice diameter (mm)	Bracket interchangeable with an old type
1	1/8, 1/4	2	● (Interchangeable)
		3	● (Interchangeable)
		5	● (Interchangeable)
2	1/4, 3/8	4	● (Interchangeable)
		7	● (Interchangeable)
3	1/4, 3/8	5	● (Interchangeable)
		8	× (Not interchangeable) ^{*2}
		10	× (Not interchangeable) ^{*2}
		10	— (Not available) ^{*2}

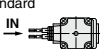
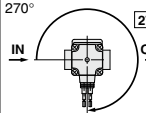
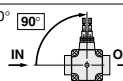
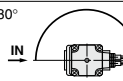
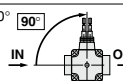
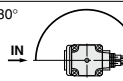
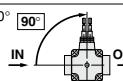
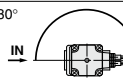
Installation Options (Mounting Option/Special Electrical Entry Direction)

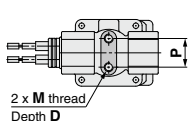
  **Mounting Holes on the Bottom Side of the Body/
Special Electrical Entry Direction**

VX2 **XNB A**

Enter standard product number.

Mounting holes on the bottom side of the body/
Special electrical entry direction

Symbol	Electrical entry direction	Symbol	Electrical entry direction
Nil	Standard 	C	
	A 		
B 			
A	90° 		
	180° 		
B	90° 		
	180° 		



(mm)					
Size	Port size	M	D	P	
1	1/8, 1/4	M4	6	12.8	
2	1/4, 3/8	M5	8	19	
3	1/4, 3/8	M5	8	19	
	1/2	M5	8	23	

Note) Resin body is not available.

* Enter symbols in the order below when ordering a combination of electrical option, other option and mounting holes on the bottom side of the body.

Example **VX2 1 2 A Z 1A Z XNB A**

Electrical option
Other option
Mounting holes on the bottom side of the body/
Special electrical entry direction

    **Seal Material: EPDM/With Bracket/
Mounting Holes on the Bottom Side of the Body/
Special Electrical Entry Direction**

VX2 **X332 A**

Enter standard product number. Seal material: EPDM

Fluid symbol

0	Air
2	Water
4	Medium vacuum
5	Heated water (99°C or less)

With bracket/Mounting holes on the bottom side of the body/
Special electrical entry direction

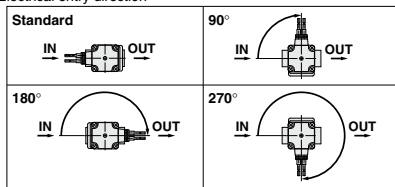
Symbol	Specifications	
	Electrical entry direction	Bracket
Nil	IN side (Standard)	None
A	90°	
B	180°	
C	270°	
D	IN side (Standard)	With bracket*1, 2
E	90°	
F	180°	
G	270°	Mounting holes on the bottom side of the body*1
H	IN side (Standard)	
J	90°	
K	180°	
L	270°	

*1 Resin body is not available.

*2 The model with bracket is not available for port size 1/2.

*3 "Other Options", which can be combined, are A, B, D, E, Z.

*4 Electrical entry direction



* Enter symbols in the order below when ordering a combination of electrical option, other option, seal material: EPDM, with bracket, mounting holes on the bottom side of the body and special electrical entry direction.

Example **VX2 1 2 A Z 1A Z X332 A**

Electrical option
Other option
Seal material: EPDM/
With bracket/Mounting holes on the bottom side of the body/
Special electrical entry direction

VX2

VXK

VXD

VXZ

VXS

VXB

VXE

VXP

VXR

VXH

VXF

VX3

VXA

VX21/22/23 Series

UL-compliant

* Refer to the table shown below for UL-compliant.

For Air

VX210 Valve type: N.C.

Size, Valve type, Fluid	Body material, Port size	Voltage, Electrical entry, Electrical options	Other options	With ^{Note)} bracket
VX210	A	A	Nil	Nil
	B	B	A	XC*
	C	C	B	XB*
	D	D	C	XNB*
	E	E	D	X332 ²⁾
	F	F	E	
	H ^{Note)}	M	F	
	J ^{Note)}	N	G	
	K ^{Note)}	P	H	
	L ^{Note)}	Q	K	
	M ^{Note)}	R	L	
	N ^{Note)}	S	Z	
	T			
	U			
	V			
	W			
	Y			
	Z1A			
	Z1B			
	Z1C			
	Z1U			
	Z1D			
	Z1E			
	Z1K			
	Z1L			
	Z1M			
	Z1W			
	Z1N			
	Z1P			
	Z1Q			
	Z1R			
	Z1Y			
	Z1S			
	Z1T			
	Z2K			
	Z2L			
	Z2M			
	Z2N			
	Z2P			
	Z2Q			
	Z2R			
	Z2S			
	Z2W			
	Z2T			
	Z3A			
	Z3B			
	Z3C			
	Z3D			
	Z3E			
	Z3F			
	Z3G			
	Z3H			
	Z3V			
	Z3J			

Note) Body material/
Port size: Since the bracket is attached to H, J, K, L, M and N, "XB" cannot be selected.

VX220 Valve type: N.C.

Size, Valve type, Fluid	Body material, Port size	Voltage, Electrical entry, Electrical options	Other options	With ^{Note)} bracket
VX220	A	A	Nil	Nil
	B	B	A	XC*
	D	C	B	XB*
	E	D	C	XNB*
	H ^{Note)}	E	D	X332 ²⁾
	J ^{Note)}	F	E	
	L ^{Note)}	M	F	
	M ^{Note)}	N	G	
		P	H	
		Q	K	
		R	L	
		S	Z	
	T			
	U			
	V			
	W			
	Y			
	Z1A			
	Z1B			
	Z1C			
	Z1U			
	Z1D			
	Z1E			
	Z1K			
	Z1L			
	Z1M			
	Z1W			
	Z1N			
	Z1P			
	Z1Q			
	Z1R			
	Z1Y			
	Z1S			
	Z1T			
	Z2K			
	Z2L			
	Z2M			
	Z2N			
	Z2P			
	Z2Q			
	Z2R			
	Z2S			
	Z2W			
	Z2T			
	Z3A			
	Z3B			
	Z3C			
	Z3D			
	Z3E			
	Z3F			
	Z3G			
	Z3H			
	Z3V			
	Z3J			

Note) Body material/
Port size: Since the bracket is attached to H, J, L and M, "XB" cannot be selected.

VX230 Valve type: N.C.

Size, Valve type, Fluid	Body material, Port size	Voltage, Electrical entry, Electrical options	Other options	With ^{Note)} bracket
VX230	A	A	Nil	Nil
	B	B	A	XC*
	C	C	B	XB*
	D	D	C	XNB*
	E	E	D	X332 ²⁾
	F	F	E	
	G ^{Note 1)}	M	F	
	H ^{Note 2)}	N	G	
	J ^{Note 2)}	P	H	
	K ^{Note 2)}	Q	K	
	L ^{Note 2)}	R	L	
	M ^{Note 2)}	S	Z	
	N ^{Note 2)}	T		
	U			
	V			
	W			
	Y			
	Z1A			
	Z1B			
	Z1C			
	Z1U			
	Z1D			
	Z1E			
	Z1K			
	Z1L			
	Z1M			
	Z1W			
	Z1N			
	Z1P			
	Z1Q			
	Z1R			
	Z1Y			
	Z1S			
	Z1T			
	Z2K			
	Z2L			
	Z2M			
	Z2N			
	Z2P			
	Z2Q			
	Z2R			
	Z2S			
	Z2W			
	Z2T			
	Z3A			
	Z3B			
	Z3C			
	Z3D			
	Z3E			
	Z3F			
	Z3G			
	Z3H			
	Z3V			
	Z3J			

Note 1) Body material/Port size: Since "with bracket" setting is not provided on G, "XB" cannot be selected.
Note 2) Body material/Port size: Since the bracket is attached to H, J, K, L, M and N, "XB" cannot be selected.

Refer to pages 49 to 51 for electrical options, other options, and bracket/electrical entry direction.

For Water

VX212 Valve type: N.C.

Size, Valve type, Fluid	Body material, Port size	Voltage, Electrical entry, Electrical options	Other options	With bracket
VX212	A	A	Nil	Nil
	B	B	A	XC*
	C	C	B	XB*
	D	D	C	XNB*
	E	E	D	X332 [†]
	F	F	E	
	H	M	F	
	J	N	G	
	K	P	H	
	L	Q	K	
	M	R	L	
	N	S	Z	
	T			
	U			
	V			
	W			
	Y			
	Z1A			
	Z1B			
	Z1C			
	Z1U			
	Z1D			
	Z1E			
	Z1K			
	Z1L			
	Z1M			
	Z1W			
	Z1N			
	Z1P			
	Z1Q			
	Z1R			
	Z1Y			
	Z1S			
	Z1T			
	Z2K			
	Z2L			
	Z2M			
	Z2N			
	Z2P			
	Z2Q			
	Z2R			
	Z2S			
	Z2W			
	Z2T			
	Z3A			
	Z3B			
	Z3C			
	Z3D			
	Z3E			
	Z3F			
	Z3G			
	Z3H			
	Z3V			
	Z3J			

VX222 Valve type: N.C.

Size, Valve type, Fluid	Body material, Port size	Voltage, Electrical entry, Electrical options	Other options	With bracket
VX222	A	A	Nil	Nil
	B	B	A	XC*
	D	C	B	XB*
	E	D	C	XNB*
	H	E	D	X332 [†]
	J	F	E	
	L	M	F	
	M	N	G	
		P	H	
		Q	K	
		R	L	
		S	Z	
		T		
		U		
		V		
		W		
		Y		
		Z1A		
		Z1B		
		Z1C		
		Z1U		
		Z1D		
		Z1E		
		Z1K		
		Z1L		
		Z1M		
		Z1W		
		Z1N		
		Z1P		
		Z1Q		
		Z1R		
		Z1Y		
		Z1S		
		Z1T		
		Z2K		
		Z2L		
		Z2M		
		Z2N		
		Z2P		
		Z2Q		
		Z2R		
		Z2S		
		Z2W		
		Z2T		
		Z3A		
		Z3B		
		Z3C		
		Z3D		
		Z3E		
		Z3F		
		Z3G		
		Z3H		
		Z3V		
		Z3J		

VX232 Valve type: N.C.

Size, Valve type, Fluid	Body material, Port size	Voltage, Electrical entry, Electrical options	Other options	With bracket
VX232	A	A	Nil	Nil
	B	B	A	XC*
	C	C	B	XB*
	D	D	C	XNB*
	E	E	D	X332 [†]
	F	F	E	
	G (Note)	M	F	
	H	N	G	
	J	P	H	
	K	Q	K	
	L	R	L	
	M	S	Z	
	N	T		
	P (Note)	U		
		V		
		W		
		Y		
		Z1A		
		Z1B		
		Z1C		
		Z1U		
		Z1D		
		Z1E		
		Z1K		
		Z1L		
		Z1M		
		Z1W		
		Z1N		
		Z1P		
		Z1Q		
		Z1R		
		Z1Y		
		Z1S		
		Z1T		
		Z2K		
		Z2L		
		Z2M		
		Z2N		
		Z2P		
		Z2Q		
		Z2R		
		Z2S		
		Z2W		
		Z2T		
		Z3A		
		Z3B		
		Z3C		
		Z3D		
		Z3E		
		Z3F		
		Z3G		
		Z3H		
		Z3V		
		Z3J		

(Note) Body material/
Port size: Since
"with bracket"
setting is not
provided on G
and P, "XB"
cannot be
selected.

Refer to pages 49 to 51 for electrical options, other options, and bracket/electrical entry direction.

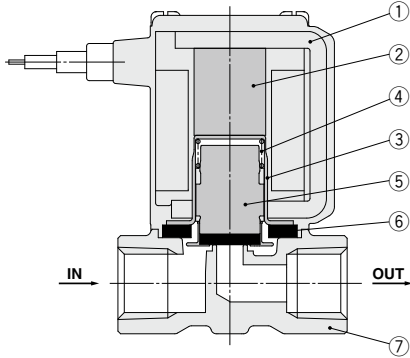
- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

VX21/22/23 Series

Construction/Single Unit

Normally Closed (N.C.)

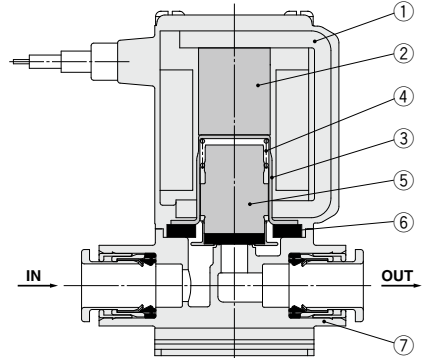
Body material: Aluminum, C37, Stainless steel



Component Parts

No.	Description	Material
1	Solenoid coil	Cu + Fe + Resin
2	Core	Fe
3	Tube	Stainless steel
4	Spring	Stainless steel
5	Armature assembly	NBR, FKM, Stainless steel, PPS
6	Seal	NBR, FKM
7	Body	Aluminum, C37, Stainless steel

Body material: Resin

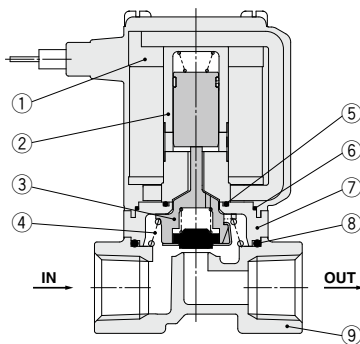


Component Parts

No.	Description	Material
1	Solenoid coil	Cu + Fe + Resin
2	Core	Fe
3	Tube	Stainless steel
4	Spring	Stainless steel
5	Armature assembly	NBR, FKM, Stainless steel, PPS
6	Seal	NBR, FKM
7	Body	Resin (PBT)

Normally Open (N.O.)

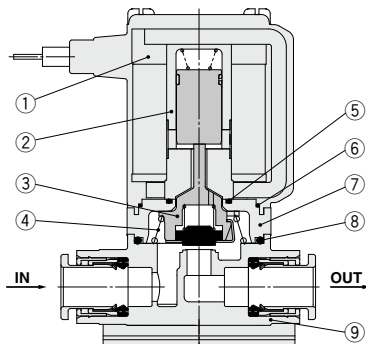
Body material: Aluminum, C37, Stainless steel



Component Parts

No.	Description	Material
1	Solenoid coil	Cu + Fe + Resin
2	Sleeve assembly	Stainless steel, Resin (PPS)
3	Push rod assembly	Resin (PPS), Stainless steel, NBR, FKM
4	Spring	Stainless steel
5	O-ring A	NBR, FKM
6	O-ring B	NBR, FKM
7	Adapter	Resin (PPS)
8	O-ring C	NBR, FKM
9	Body	Aluminum, C37, Stainless steel

Body material: Resin



Component Parts

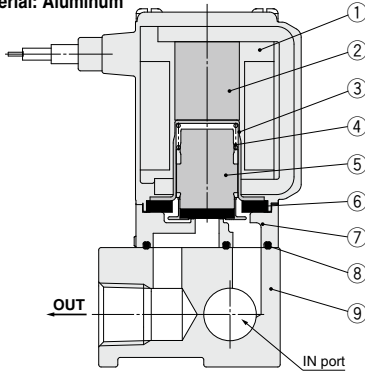
No.	Description	Material
1	Solenoid coil	Cu + Fe + Resin
2	Sleeve assembly	Stainless steel, Resin (PPS)
3	Push rod assembly	Resin (PPS), Stainless steel, NBR, FKM
4	Spring	Stainless steel
5	O-ring A	NBR, FKM
6	O-ring B	NBR, FKM
7	Adapter	Resin (PPS)
8	O-ring C	NBR, FKM
9	Body	Resin (PBT)

Construction/Manifold

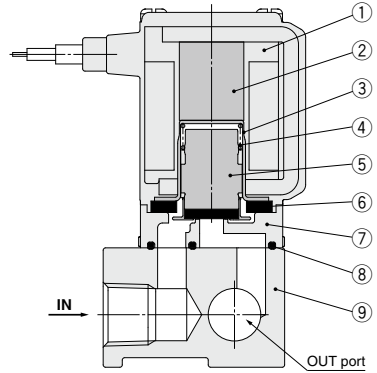
Normally Closed (N.C.)

Base material: Aluminum

Common SUP type (for air)



Individual SUP type (for medium vacuum)



Component Parts

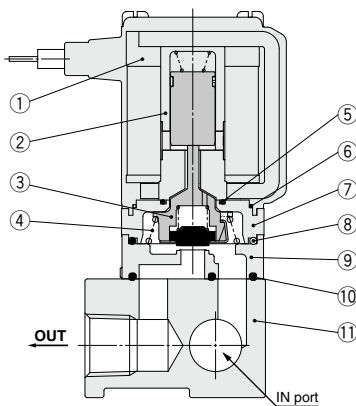
No.	Description	Material
1	Solenoid coil	Cu + Fe + Resin
2	Core	Fe
3	Tube	Stainless steel
4	Spring	Stainless steel
5	Armature assembly	NBR, FKM, Stainless steel, PPS
6	Seal	NBR, FKM
7	Body	Resin (PPS)
8	Gasket	NBR, FKM
9	Base	Aluminum

- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

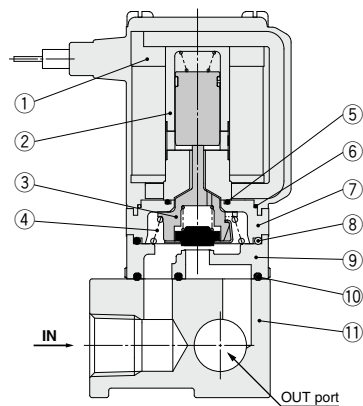
Normally Open (N.O.)

Base material: Aluminum

Common SUP type (for air)



Individual SUP type (for medium vacuum)



Component Parts

No.	Description	Material
1	Solenoid coil	Cu + Fe + Resin
2	Sleeve assembly	Stainless steel, Resin (PPS)
3	Push rod assembly	Resin (PPS), Stainless steel, NBR, FKM
4	Spring	Stainless steel
5	O-ring A	NBR, FKM
6	O-ring B	NBR, FKM

No.	Description	Material
7	Adapter	Resin (PPS)
8	O-ring C	NBR, FKM
9	Body	Resin (PPS)
10	Gasket	NBR, FKM
11	Base	Aluminum

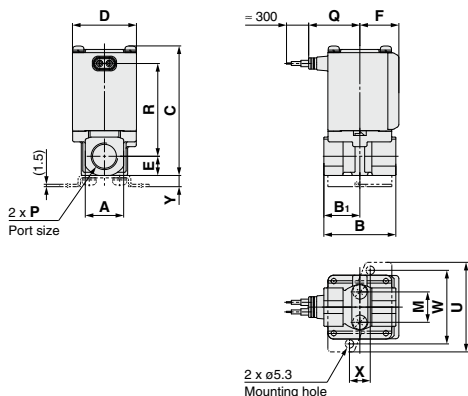
VX21/22/23 Series



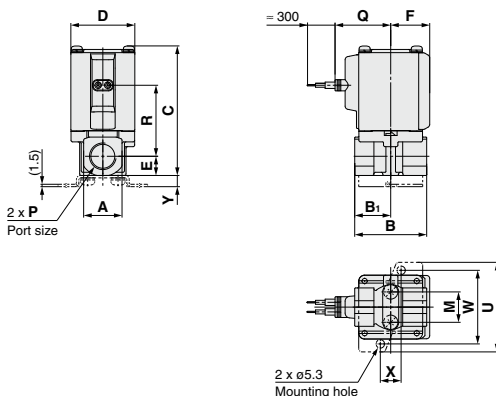
For Air

Dimensions/Body Material: Aluminum

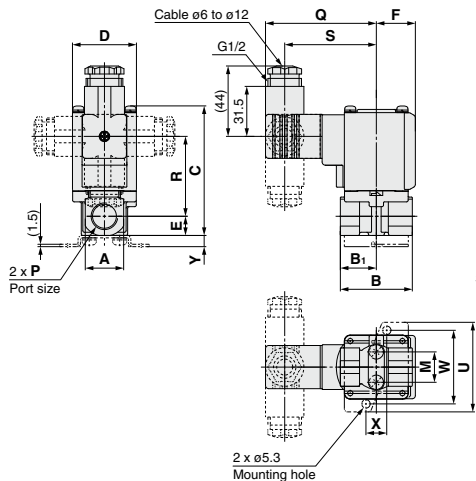
Grommet



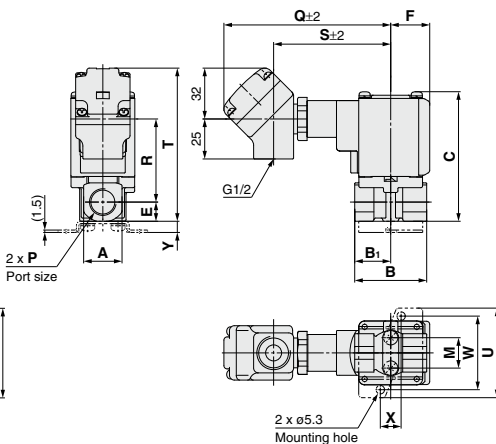
Grommet (with surge voltage suppressor)



DIN terminal



Conduit terminal



(mm)

Size	Port size P	A	B	B ₁	C	D	E	F	Mounting bracket dimensions				
									M	U	W	X	Y
1	1/8, 1/4	19	43	21	61 (67)	30	9.5	20	12.8	46	36	11	6
2	1/4, 3/8	24	45	22.5	76 (84)	35	12	22	19	56	46	13	7
3	1/4, 3/8	24	45	22.5	81 (89)	40	12	24.5	19	56	46	13	7
	1/2	30	50	25	86.5	40	15	24.5	—	—	—	—	—

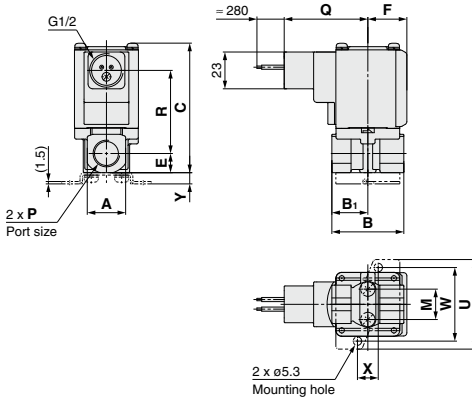
Size	Port size P	Electrical entry										
		Grommet		Grommet (with surge voltage suppressor)		DIN terminal			Conduit terminal			
		Q	R	Q	R	Q	R	S	Q	R	S	T
1	1/8, 1/4	27	42 (47.5)	30	28.5 (34)	64.5	34 (39.5)	52.5	99.5	36 (41.5)	68.5	77 (83)
2	1/4, 3/8	29.5	53.5 (61.5)	32.5	39.5 (47.5)	67	45 (53)	55	102	47 (55)	71	91 (99)
3	1/4, 3/8	32	58 (66)	35	44.5 (52.5)	69.5	50 (58)	57.5	104.5	52 (60)	73.5	96 (104)
	1/2	32	61	35	47.5	69.5	53	57.5	104.5	55	73.5	101.5

() : Denotes the Normally Open (N.O.) dimensions.

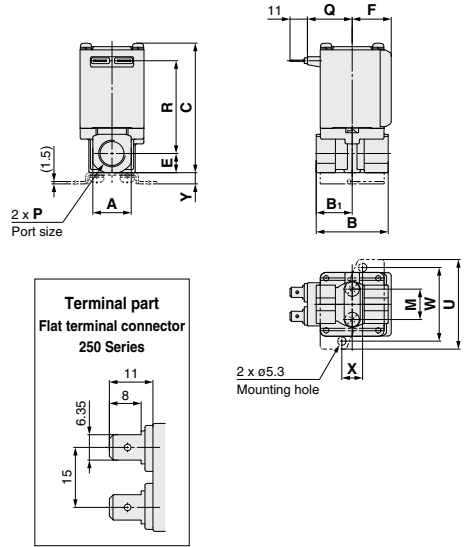


Dimensions/Body Material: Aluminum

Conduit



Flat terminal type



- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

Size	Port size P	A	B	B ₁	C	D	E	F	Mounting bracket dimensions (mm)				
									M	U	W	X	Y
1	1/8, 1/4	19	43	21	61 (67)	30	9.5	20	12.8	46	36	11	6
	1/4, 3/8	24	45	22.5	76 (84)	35	12	22	19	56	46	13	7
3	1/4, 3/8	24	45	22.5	81 (89)	40	12	24.5	19	56	46	13	7
	1/2	30	50	25	86.5	40	15	24.5	—	—	—	—	—

Size	Port size P	Electrical entry			
		Conduit		Flat terminal type	
		Q	R	Q	R
1	1/8, 1/4	47.5	36 (41.5)	23	42 (47.5)
2	1/4, 3/8	50	47 (55)	25.5	53.5 (61.5)
3	1/4, 3/8	52.5	52 (60)	28	58 (66)
	1/2	52.5	55	28	61

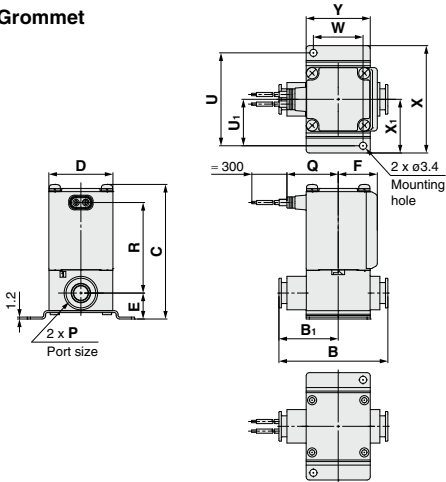
(): Denotes the Normally Open (N.O.) dimensions.

VX21/22/23 Series

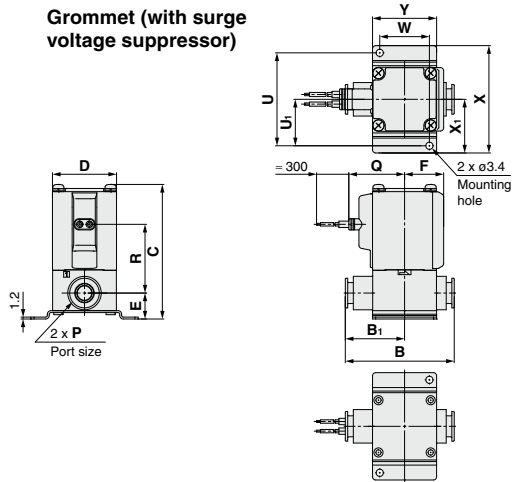


Dimensions/Body Material: Resin

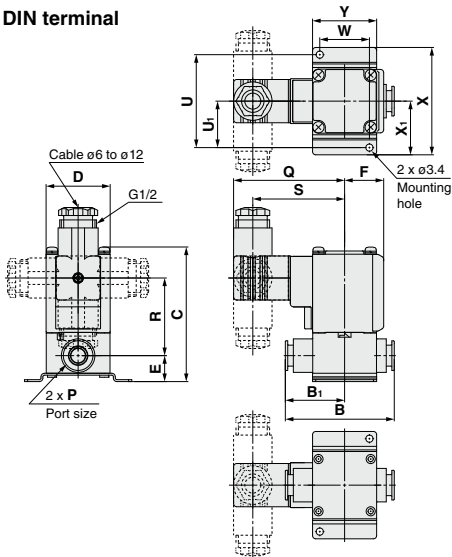
Grommet



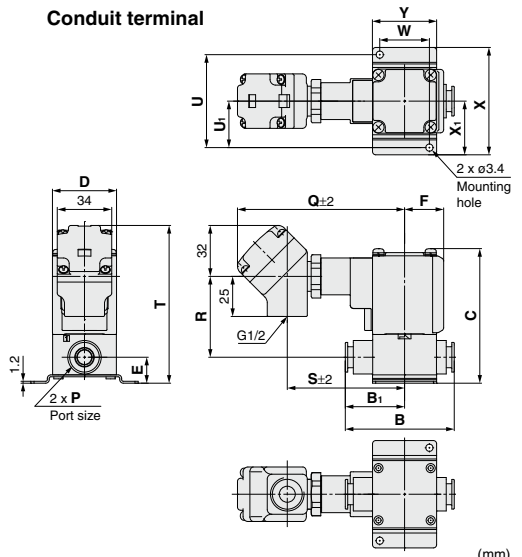
Grommet (with surge voltage suppressor)



DIN terminal



Conduit terminal



Size	One-touch fitting P	B	B ₁	C	D	E	F	Mounting bracket dimensions					
								U	U ₁	W	X	X ₁	Y
1	ø6, ø8	53.5	29	65.5 (71.5)	30	13.5	20	45	22.5	22	52	26	30
2	ø8, ø10	66	36	76.5 (84.5)	35	15	22	53	26.5	27	62	31	35
3	ø10, ø12	68	37	84 (92)	40	16.5	24.5	58	29	31	67	33.5	40

Size	One-touch fitting P	Electrical entry											
		Grommet				Grommet (with surge voltage suppressor)		DIN terminal			Conduit terminal		
		Q	R	Q	R	Q	R	S	Q	R	S	T	
1	ø6, ø8	27	42.5 (48)	30	29 (34.5)	64.5	34.5 (40)	52.5	99.5	36.5 (42)	68.5	81.5 (87)	
2	ø8, ø10	29.5	51 (59)	32.5	37 (45)	67	43 (50.5)	55	102	45 (52.5)	71	91.5 (99.5)	
3	ø10, ø12	32	56.5 (64.5)	35	43 (51)	69.5	48.5 (56.5)	57.5	104.5	50.5 (58.5)	73.5	98.5 (106.5)	

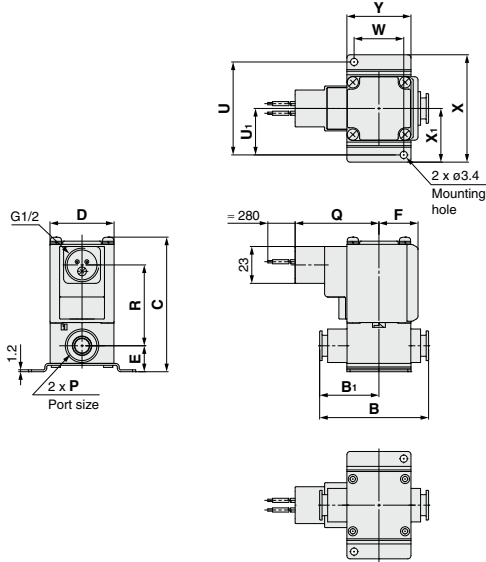
For information on handling One-touch fittings and on appropriate tubing, refer to page 76 and the Fittings & Tubing section of the "Handling Precautions for SMC Products" on the SMC website.

(): Denotes the Normally Open (N.O.) dimensions.

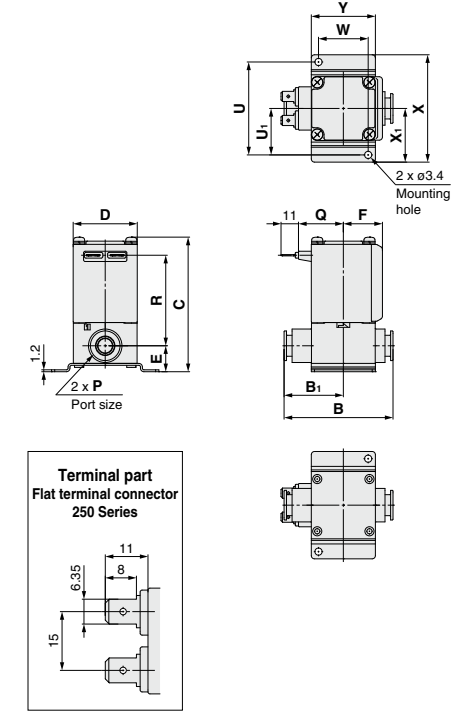


Dimensions/Body Material: Resin

Conduit



Flat terminal



- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

Size	One-touch fitting P	B	B ₁	C	D	E	F	Mounting bracket dimensions							Electrical entry (mm)			
															Conduit		Flat terminal	
								U	U ₁	W	X	X ₁	Y	Q	R	Q	R	
1	ø6, ø8	53.5	29	65.5 (71.5)	30	13.5	20	45	22.5	22	52	26	30	47.5	36.5 (42)	23	42.5 (48)	
2	ø8, ø10	66	36	76.5 (84.5)	35	15	22	53	26.5	27	62	31	35	50	45 (52.5)	25.5	51 (59)	
3	ø10, ø12	68	37	84 (92)	40	16.5	24.5	58	29	31	67	33.5	40	52.5	50.5 (58.5)	28	56.5 (64.5)	

(): Denotes the Normally Open (N.O.) dimensions.

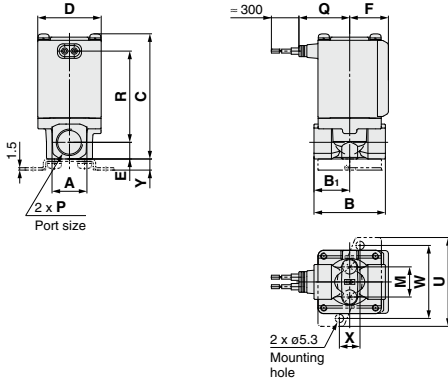
VX21/22/23 Series



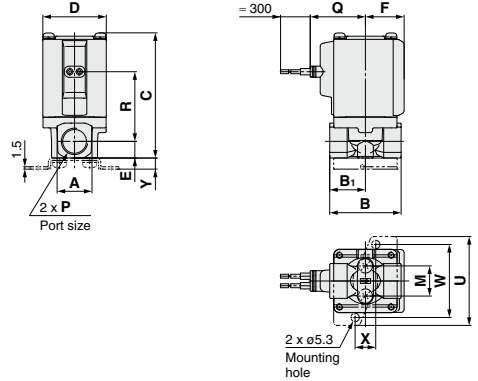
For Medium Vacuum, Water, Oil

Dimensions/Body Material: C37, Stainless Steel

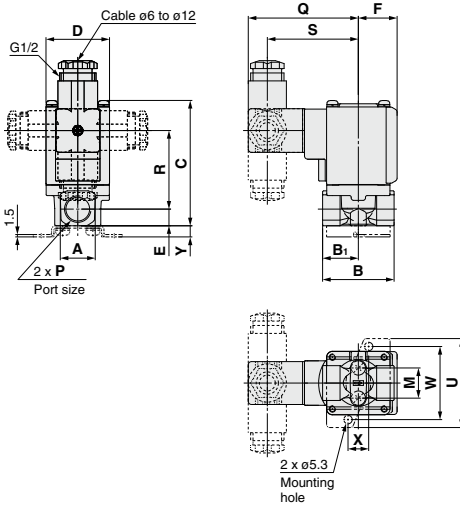
Grommet



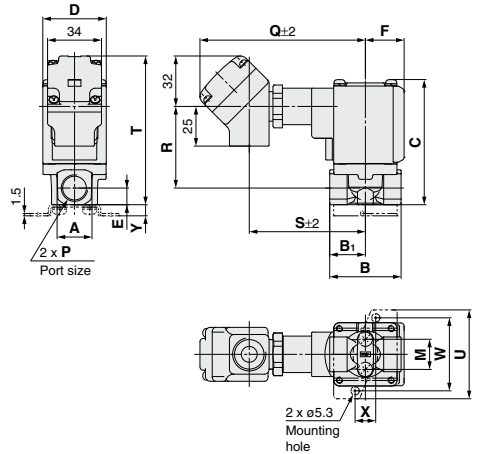
Grommet (with surge voltage suppressor)



DIN terminal



Conduit terminal

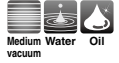


Size	Port size P	A	B	B ₁	C	D	E	F	Mounting bracket dimensions (mm)				
									M	U	W	X	Y
1	1/8, 1/4	19	43	21	61 (67)	30	9.5	20	12.8	46	36	11	6
	1/4, 3/8	22	45	22.5	74.5 (82.5)	35	10.5	22	19	56	46	13	7
3	1/4, 3/8	22	45	22.5	79 (87)	40	10.5	24.5	19	56	46	13	7
	1/2	29.5	50	25	85.5	40	14	24.5	—	—	—	—	—

Size	Port size P	Electrical entry											
		Grommet		Grommet (with surge voltage suppressor)		DIN terminal			Conduit terminal				
		Q	R	Q	R	Q	R	S	Q	R	S	T	
1	1/8, 1/4	27	42 (47.5)	30	28.5 (34)	64.5	34 (39.5)	52.5	99.5	36 (41.5)	68.5	77 (83)	
2	1/4, 3/8	29.5	53.5 (61.5)	32.5	39.5 (47.5)	67	45 (53)	55	102	47 (55)	71	89.5 (97.5)	
3	1/4, 3/8	32	57.5 (65.5)	35	44 (52)	69.5	49.5 (57.5)	57.5	104.5	51.5 (59.5)	73.5	94 (102)	
	1/2	32	61	35	47.5	69.5	53	57.5	104.5	55	73.5	100.5	

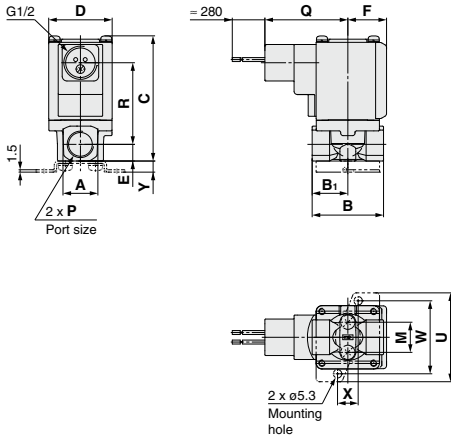
() : Denotes the Normally Open (N.O.) dimensions.

Direct Operated 2 Port Solenoid Valve **VX21/22/23 Series**

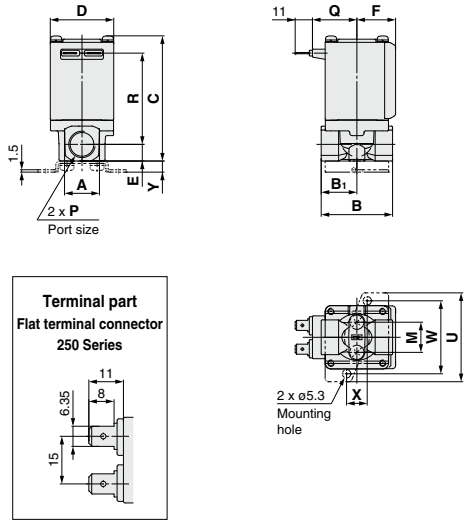


Dimensions/Body Material: C37, Stainless Steel

Conduit



Flat terminal



- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

Size	Port size P	A	B	B ₁	C	D	E	F	(mm)				
									Mounting bracket dimensions				
									M	U	W	X	Y
1	1/8, 1/4	19	43	21	61 (67)	30	9.5	20	12.8	46	36	11	6
	1/4, 3/8	22	45	22.5	74.5 (82.5)	35	10.5	22	19	56	46	13	7
3	1/4, 3/8	22	45	22.5	79 (87)	40	10.5	24.5	19	56	46	13	7
	1/2	29.5	50	25	85.5	40	14	24.5	—	—	—	—	—

Size	Port size P	Electrical entry			
		Conduit		Flat terminal	
		Q	R	Q	R
1	1/8, 1/4	47.5	36 (41.5)	23	42 (47.5)
2	1/4, 3/8	50	47 (55)	25.5	53.5 (61.5)
3	1/4, 3/8	52.5	51.5 (59.5)	28	57.5 (65.5)
	1/2	52.5	55	28	61

(): Denotes the Normally Open (N.O.) dimensions.

VX21/22/23 Series

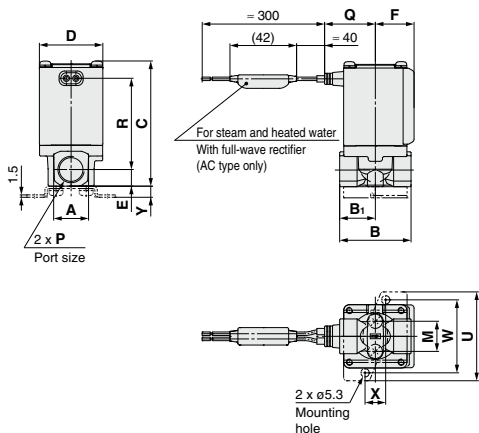


For Steam

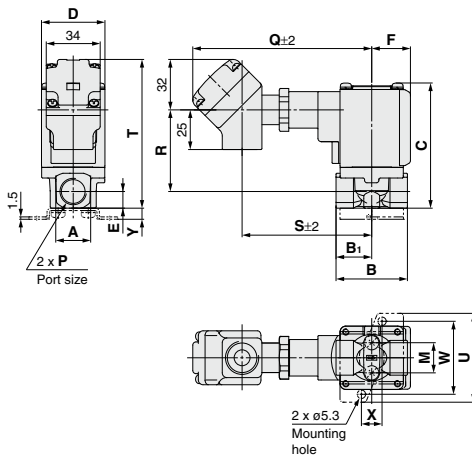
* Can be used with heated water.

Dimensions/Body Material: C37, Stainless Steel

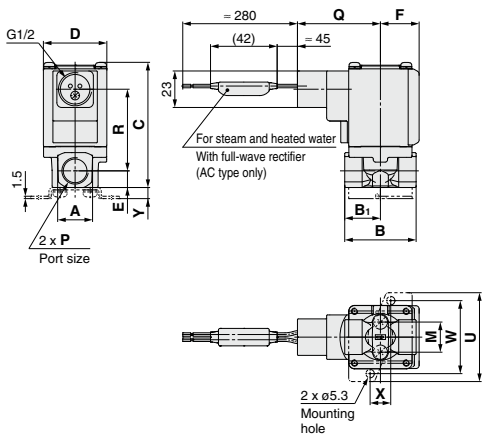
Grommet



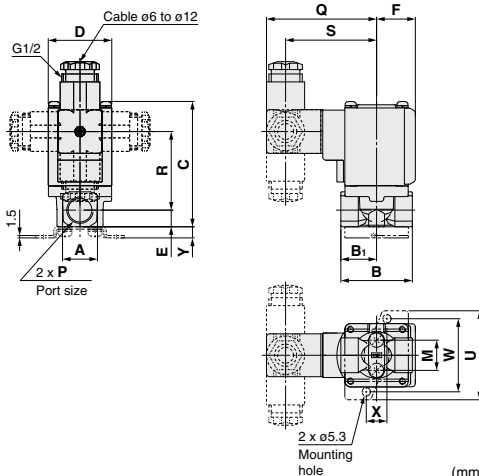
Conduit terminal



Conduit



DIN terminal



Size	Port size P	A	B	B ₁	C	D	E	F	Mounting bracket dimensions (mm)				
									M	U	W	X	Y
1	1/8, 1/4	19	43	21	61 (67)	30	9.5	20	12.8	46	36	11	6
2	1/4, 3/8	22	45	22.5	74.5 (82.5)	35	10.5	22	19	56	46	13	7
3	1/4, 3/8	22	45	22.5	79 (87)	40	10.5	24.5	19	56	46	13	7
	1/2	29.5	50	25	85.5	40	14	24.5	—	—	—	—	—

Size	Port size P	Electrical entry										
		Grommet		Conduit terminal				Conduit		DIN terminal		
		Q	R	Q	R	S	T	Q	R	Q	R	S
1	1/8, 1/4	27	42 (47.5)	108	36 (41.5)	77	77 (83)	47.5	36 (41.5)	64.5	34 (39.5)	52.5
2	1/4, 3/8	29.5	53.5 (61.5)	110.5	47 (55)	79.5	89.5 (97.5)	50	47 (55)	67	45 (53)	55
3	1/4, 3/8	32	57.5 (65.5)	113	51.5 (59.5)	82	94 (102)	52.5	51.5 (59.5)	69.5	49.5 (57.5)	57.5
	1/2	32	61	113	55	82	100.5	52.5	55	69.5	53	57.5

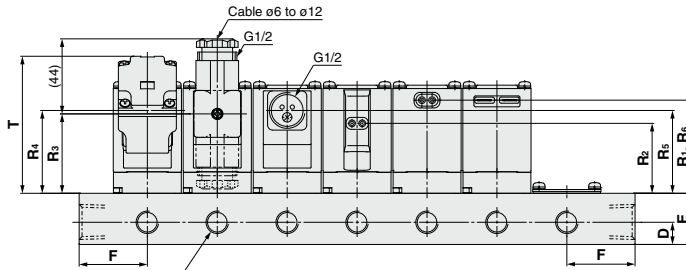
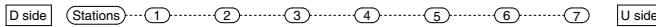
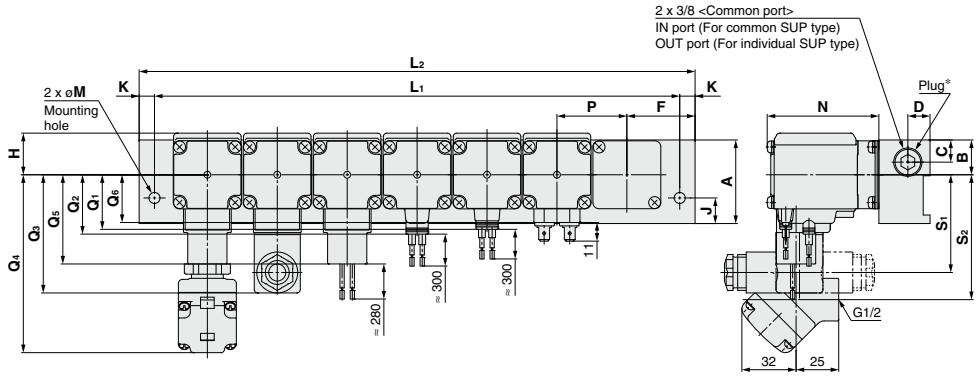
() : Denotes the Normally Open (N.O.) dimensions.

Flat terminal is not available for valves for steam and heated water.

Direct Operated 2 Port Solenoid Valve **VX21/22/23 Series**



Dimensions/Manifold/Base Material: Aluminum



n x 1/8, 1/4 <Individual port>
OUT port (For common SUP type)
IN port (For individual SUP type)

- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

Size	Dimensions	n (stations)									
		2	3	4	5	6	7	8	9	10	
1	L ₁	86	122	158	194	230	266	302	338	374	
	L ₂	100	136	172	208	244	280	316	352	388	
2	L ₁	90	126	162	198	234	270	306	342	378	
	L ₂	108	144	180	216	252	288	324	360	396	
3	L ₁	103	144	185	226	267	308	349	390	431	
	L ₂	121	162	203	244	285	326	367	408	449	

Size	A	B	C	D	E	F	H	J	K	M	N	P
1	38	15.5	10.5	11	25	32	20	12	7	6.5	50.5 (56.5)	36
2	49	18	13	13	30	36	22	15	9	8.5	60.5 (68.5)	36
3	49	20.5	13	13	30	40	24.5	15	9	8.5	65.5 (73.5)	41

Size	Grommet		Grommet (With surge voltage suppressor)		DIN terminal*			Conduit terminal				Conduit		Flat terminal	
	Q ₁	R ₁	Q ₂	R ₂	Q ₃	R ₃	S ₁	Q ₄	R ₄	S ₂	T	Q ₅	R ₅	Q ₆	R ₆
1	27	40.5 (46.5)	30	27 (33)	64.5	32.5 (38.5)	52.5	99.5	34.5 (40.5)	68.5	66.5 (72)	47.5	34.5 (40.5)	23	40.5 (46.5)
2	29.5	49.5 (57.5)	32.5	36 (44)	67	41.5 (49.5)	55	102	43.5 (51.5)	71	75.5 (83.5)	50	43.5 (51.5)	25.5	49.5 (57.5)
3	32	54.5 (63)	35	41 (49)	69.5	46.5 (54.5)	57.5	104.5	48.5 (56.5)	73.5	80.5 (89.5)	52.5	48.5 (56.5)	28	54.5 (63)

() : Denotes the Normally Open (N.O.) dimensions.

* When using a DIN terminal that faces downward, be careful of interference in the electrical wires and piping.

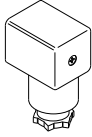
VX21/22/23 Series



For Air, Medium Vacuum, Water, Oil and Steam

Replacement Parts

• DIN Connector Part No.



<For Class B Coil>

Electrical option	Rated voltage	Connector part no.
None	24 VDC	C18312G6GCU
	12 VDC	
	100 VAC	
	110 VAC	
	200 VAC	
	220 VAC	
	230 VAC	
	240 VAC	
	24 VAC	
	48 VAC	
With light	24 VDC	GDM2A-L5
	12 VDC	GDM2A-L6
	100 VAC	GDM2A-L1
	110 VAC	GDM2A-L1
	200 VAC	GDM2A-L2
	220 VAC	GDM2A-L2
	230 VAC	GDM2A-L2
	240 VAC	GDM2A-L2
	24 VAC	GDM2A-L5
	48 VAC	GDM2A-L15

<For Class H Coil>

Electrical option	Rated voltage	Connector part no.
None	24 VDC	GDM2A-G-S5
	100 VAC	GDM2A-R
	110 VAC	
	200 VAC	
	220 VAC	
	230 VAC	
	240 VAC	
	24 VAC	
	48 VAC	
With light	24 VDC	
	100 VAC	GDM2A-R-L1
	110 VAC	GDM2A-R-L1
	200 VAC	GDM2A-R-L2
	220 VAC	GDM2A-R-L2
	230 VAC	GDM2A-R-L2
	240 VAC	GDM2A-R-L2
	24 VAC	GDM2A-R-L5
	48 VAC	GDM2A-R-L5

* Select an appropriate DIN connector suitable for the coil insulation type.

• Gasket Part No. for DIN Connector

VCW20-1-29-1 (For Class B Coil)

VCW20-1-29-1-F (For Class H Coil)

• Lead Wire Assembly for Flat Terminal (Set of 2 pcs.)

VX021S-1-16FB

• Bracket Assembly Part No. (for Metal Body)

VX02 N-12A

1	For VX2 ₁ <input type="checkbox"/>
2	For VX2 ₂ <input type="checkbox"/>
	For VX2 ₃ <input type="checkbox"/>

* 2 mounting screws are shipped together with the bracket assembly.

* On the bottom side of the standard body, there is no female thread for mounting a bracket.
Please select XNB.

VX21/22/23 Series

Glossary of Terms

Pressure Terminology

1. Maximum operating pressure differential

The maximum pressure differential (the difference between the inlet and outlet pressure) which is allowed for operation. When the outlet pressure is 0 MPa, this becomes the maximum operating pressure.

2. Minimum operating pressure differential

The minimum pressure differential (the difference between the inlet pressure and outlet pressure) required to keep the main valve fully open.

3. Maximum system pressure

The maximum pressure that can be applied inside the pipelines (line pressure).

[The pressure differential of the solenoid valve portion must not exceed the maximum operating pressure differential.]

4. Withstand pressure

The pressure in which the valve must be withstood without a drop in performance after holding for one minute under prescribed pressure and returning to the operating pressure range. [value under the prescribed conditions]

Electrical Terminology

1. Apparent power (VA)

Volt-ampere is the product of voltage (V) and current (A). Power consumption (W): For AC, $W = V \cdot A \cdot \cos \theta$. For DC, $W = V \cdot A$.

Note) $\cos \theta$ shows power factor. $\cos \theta = 0.9$

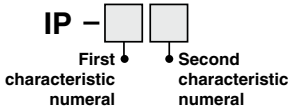
2. Surge voltage

A high voltage which is momentarily generated by shutting off the power in the shut-off area.

3. Degree of protection

A degree defined in the "JIS C 0920: Waterproof test of electric machinery/appliance and the degree of protection against the intrusion of solid foreign objects."

Verify the degree of protection for each product.



●First Characteristics:

Degrees of protection against solid foreign objects

0	Non-protected
1	Protected against solid foreign objects of 50 mmø and greater
2	Protected against solid foreign objects of 12 mmø and greater
3	Protected against solid foreign objects of 2.5 mmø and greater
4	Protected against solid foreign objects of 1.0 mmø and greater
5	Dust-protected
6	Dust-tight

Electrical Terminology

●Second Characteristics:

Degrees of protection against water

0	Non-protected	—
1	Protected against vertically falling water drops	Driproof type 1
2	Protected against vertically falling water drops when enclosure tilted up to 15°	Driproof type 2
3	Protected against rainfall when enclosure tilted up to 60°	Rainproof type
4	Protected against splashing water	Splashproof type
5	Protected against water jets	Water-jet-proof type
6	Protected against powerful water jets	Powerful water-jet-proof type
7	Protected against the effects of temporary immersion in water	Immersion type
8	Protected against the effects of continuous immersion in water	Submersible type

Example) IP65: Dust-tight, Water-jet-proof type

"Water-jet-proof type" means that no water intrudes inside an equipment that could hinder from operating normally by means of applying water for 3 minutes in the prescribed manner. Take appropriate protection measures, since a device is not usable in an environment where a droplet of water is splashed constantly.

Others

1. Material

NBR: Nitrile rubber

FKM: Fluororubber

EPDM: Ethylene propylene rubber

2. Oil-free treatment

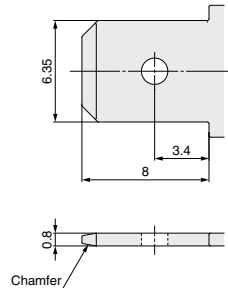
The degreasing and washing of wetted parts

3. Symbol

In the symbol $\left(\begin{array}{c} \square \\ \square \end{array} \right)_{(M)}$, when the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

Flat Terminal

Flat terminal/Electrical connection size of molded coil



VX2

VXK

VXD

VXZ

VXS

VXB

VXE

VXP

VXR

VXH

VXF

VX3

VXA

Solenoid Valve Flow Rate Characteristics

(How to indicate flow rate characteristics)

1. Indication of flow rate characteristics

The flow rate characteristics in equipment such as a solenoid valve, etc. are indicated in their specifications as shown in Table (1).

Table (1) Indication of Flow Rate Characteristics

Corresponding equipment	Indication by international standard	Other indications	Conformed standard
Pneumatic equipment	<i>C, b</i>	—	ISO 6358: 1989 JIS B 8390: 2000
	—	<i>S</i>	JIS B 8390: 2000 Equipment: JIS B 8379, 8381-1, 8381-2
		<i>Cv</i>	ANSI/(NFPA)T3.21.3 R1-2008
Process fluid control equipment	<i>Kv</i>	—	IEC60534-1: 2005 IEC60534-2-3: 1997 JIS B 2005-1: 2012
	—	<i>Cv</i>	JIS B 2005-2-3: 2004 Equipment: JIS B 8471, 8472, 8473

2. Pneumatic equipment

2.1 Indication according to the international standards

(1) Conformed standard

ISO 6358: 1989 : Pneumatic fluid power—Components using compressible fluids—
Determination of flow rate characteristics

JIS B 8390: 2000 : Pneumatic fluid power—Components using compressible fluids—
How to test flow rate characteristics

(2) Definition of flow rate characteristics

The flow rate characteristics are indicated as a result of a comparison between sonic conductance **C** and critical pressure ratio **b**.

Sonic conductance **C** : Value which divides the passing mass flow rate of an equipment in a choked flow condition by the product of the upstream absolute pressure and the density in a standard condition.

Critical pressure ratio **b** : Pressure ratio (downstream pressure/upstream pressure) which will turn to a choked flow when the value is smaller than this ratio.

Choked flow : The flow in which the upstream pressure is higher than the downstream pressure and where sonic speed in a certain part of an equipment is reached.

Gaseous mass flow rate is in proportion to the upstream pressure and not dependent on the downstream pressure.

Subsonic flow : Flow greater than the critical pressure ratio

Standard condition : Air in a temperature state of 20°C, absolute pressure 0.1 MPa (= 100 kPa = 1 bar), relative humidity 65%.

It is stipulated by adding the “(ANR)” after the unit depicting air volume. (standard reference atmosphere)

Conformed standard: ISO 8778: 1990 Pneumatic fluid power—Standard reference atmosphere, JIS B 8393: 2000: Pneumatic fluid power—Standard reference atmosphere

(3) Formula for flow rate

It is described by the practical units as following.

When

$$\frac{P_2 + 0.1}{P_1 + 0.1} \leq b, \text{ choked flow}$$

$$Q = 600 \times C (P_1 + 0.1) \sqrt{\frac{293}{273 + T}} \dots\dots\dots(1)$$

When

$$\frac{P_2 + 0.1}{P_1 + 0.1} > b, \text{ subsonic flow}$$

$$Q = 600 \times C (P_1 + 0.1) \sqrt{1 - \left[\frac{P_2 + 0.1}{P_1 + 0.1} - b \right]^2} \sqrt{\frac{293}{273 + T}} \dots\dots\dots(2)$$

- Q** : Air flow rate [L/min (ANR)]
- C** : Sonic conductance [$\text{dm}^3/(\text{s}\cdot\text{bar})$], dm^3 (Cubic decimeter) of SI = L (liter).
- b** : Critical pressure ratio [—]
- P₁** : Upstream pressure [MPa]
- P₂** : Downstream pressure [MPa]
- T** : Temperature [°C]

Note) Formula of subsonic flow is the elliptic analogous curve.

Flow rate characteristics are shown in Graph (1) For details, please use the calculation software available from SMC website.

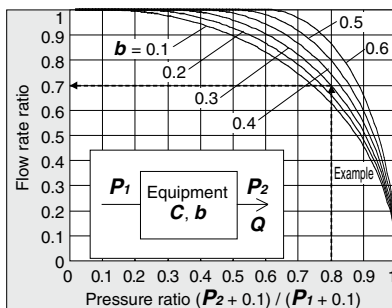
Example)

Obtain the air flow rate for **P₁** = 0.4 [MPa], **P₂** = 0.3 [MPa], **T** = 20 [°C] when a solenoid valve is performed in **C** = 2 [$\text{dm}^3/(\text{s}\cdot\text{bar})$] and **b** = 0.3.

According to formula 1, the maximum flow rate = $600 \times 2 \times (0.4 + 0.1) \times \sqrt{\frac{293}{273 + 20}} = 600$ [L/min (ANR)]

$$\text{Pressure ratio} = \frac{0.3 + 0.1}{0.4 + 0.1} = 0.8$$

Based on Graph (1), it is going to be 0.7 if it is read by the pressure ratio as 0.8 and the flow ratio to be **b** = 0.3. Hence, flow rate = Max. flow x flow ratio = 600 x 0.7 = 420 [L/min (ANR)]



Graph (1) Flow rate characteristics

(4) Test method

Attach a test equipment with the test circuit shown in Fig. (1) while maintaining the upstream pressure to a certain level which does not go below 0.3 MPa. Next, measure the maximum flow to be saturated in the first place, then measure this flow rate at 80%, 60%, 40%, 20% and the upstream and downstream pressure. And then, obtain the sonic conductance **C** from this maximum flow rate. In addition, calculate **b** using each data of others and the subsonic flow formula, and then obtain the critical pressure ratio **b** from that average.

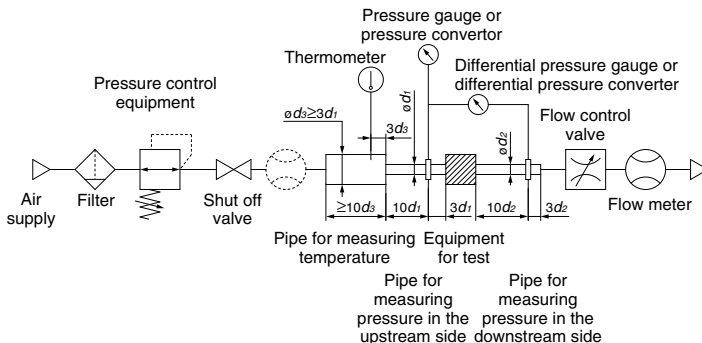


Fig. (1) Test circuit based on ISO 6358: 1989, JIS B 8390: 2000

- VX2**
- VXK**
- VXD**
- VXZ**
- VXS**
- VXB**
- VXE**
- VXP**
- VXR**
- VXH**
- VXF**
- VX3**
- VXA**

2.2 Effective area **S**

(1) Conformed standard

JIS B 8390: 2000: Pneumatic fluid power—Components using compressible fluids—Determination of flow rate characteristics

Equipment standards: JIS B 8373: Solenoid valve for pneumatics

JIS B 8379: Silencer for pneumatics

JIS B 8381-1: Fittings for pneumatics—Part 1: Push-in fittings for thermoplastic resin tubing

JIS B 8381-2: Fittings for pneumatics—Part 2: Compression fittings for thermoplastic resin tubing

(2) Definition of flow rate characteristics

Effective area **S**: The cross-sectional area having an ideal throttle without friction deduced from the calculation of the pressure changes inside an air tank or without reduced flow when discharging the compressed air in a choked flow, from an equipment attached to the air tank. This is the same concept representing the “easy to run through” as sonic conductance **C**.

(3) Formula for flow rate

When

$$\frac{P_2 + 0.1}{P_1 + 0.1} \leq 0.5, \text{ choked flow}$$

$$Q = 120 \times S (P_1 + 0.1) \sqrt{\frac{293}{273 + T}} \dots\dots\dots(3)$$

When

$$\frac{P_2 + 0.1}{P_1 + 0.1} > 0.5, \text{ subsonic flow}$$

$$Q = 240 \times S \sqrt{(P_2 + 0.1) (P_1 - P_2)} \sqrt{\frac{293}{273 + T}} \dots\dots\dots(4)$$

Conversion with sonic conductance **C**:

$$S = 5.0 \times C \dots\dots\dots(5)$$

Q : Air flow rate[L/min(ANR)]

S : Effective area [mm²]

P₁ : Upstream pressure [MPa]

P₂ : Downstream pressure [MPa]

T : Temperature [°C]

Note) Formula for subsonic flow (4) is only applicable when the critical pressure ratio **b** is the unknown equipment. In the formula (2) by the sonic conductance **C**, it is the same formula as when **b** = 0.5.

(4) Test method

Attach a test equipment with the test circuit shown in Fig. (2) in order to discharge air into the atmosphere until the pressure inside the air tank goes down to 0.25 MPa (0.2 MPa) from an air tank filled with the compressed air at a certain pressure level (0.5 MPa) which does not go below 0.6 MPa. At this time, measure the discharging time and the residual pressure inside the air tank which had been left until it turned to be the normal values to determine the effective area **S**, using the following formula. The volume of an air tank should be selected within the specified range by corresponding to the effective area of an equipment for test. In the case of JIS B 8379, the pressure values are in parentheses and the coefficient of the formula is 12.9.

$$S = 12.1 \frac{V}{t} \log_{10} \left(\frac{P_s + 0.1}{P + 0.1} \right) \sqrt{\frac{293}{T}} \dots\dots\dots(6)$$

S : Effective area [mm²]

V : Air tank capacity [L]

t : Discharging time [s]

P_s: Pressure inside air tank

before discharging [MPa]

P : Residual pressure inside air tank

after discharging [MPa]

T : Temperature inside air tank

before discharging [K]

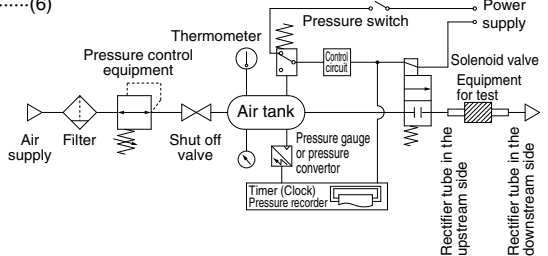


Fig. (2) Test circuit based on JIS B 8390: 2000

2.3 Flow coefficient Cv factor

The United States Standard ANSI/(NFPA)T3.21.3: R1-2008R: Pneumatic fluid power—Flow rating test procedure and reporting method for fixed orifice components

This standard defines the **Cv** factor of the flow coefficient by the following formula that is based on the test conducted by the test circuit analogous to ISO 6358.

$$Cv = \frac{Q}{114.5 \sqrt{\frac{\Delta P (P_2 + P_a)}{T_1}}} \dots\dots\dots(7)$$

ΔP : Pressure drop between the static pressure tapping ports [bar]

P_1 : Pressure of the upstream tapping port [bar gauge]

P_2 : Pressure of the downstream tapping port [bar gauge]; $P_2 = P_1 - \Delta P$

Q : Flow rate [L/s standard condition]

P_a : Atmospheric pressure [bar absolute]

T_1 : Upstream absolute temperature [K]

Test conditions are $< P_1 + P_a = 6.5 \pm 0.2$ bar absolute, $T_1 = 297 \pm 5K$, $0.07 \text{ bar} \leq \Delta P \leq 0.14$ bar.

This is the same concept as effective area **A** which ISO 6358 stipulates as being applicable only when the pressure drop is smaller than the upstream pressure and the compression of air does not become a problem.

3. Process fluid control equipment

(1) Conformed standard

IEC60534-1: 2005: Industrial-process control valves. Part 1: control valve terminology and general considerations

IEC60534-2-3: 1997: Industrial-process control valves. Part 2: Flow capacity, Section Three- Test procedures

JIS B 2005-1: 2012: Industrial-process control valves – Part 1: Control valve terminology and general considerations

JIS B 2005-2-3: 2004: Industrial-process control valves – Part 2: Flow capacity – Section 3: Test procedures

Equipment standards: JIS B 8471: Solenoid valve for water

JIS B 8472: Solenoid valve for steam

JIS B 8473: Solenoid valve for fuel oil

(2) Definition of flow rate characteristics

Kv factor: Value of the clean water flow rate represented by m³/h that runs through the valve (equipment for test) at 5 to 40°C, when the pressure difference is 1 x 10⁵ Pa (1 bar). It is calculated using the following formula:

$$Kv = Q \sqrt{\frac{1 \times 10^5}{\Delta P} \cdot \frac{\rho}{1000}} \dots\dots\dots(8)$$

Kv : Flow coefficient [m³/h]

Q : Flow rate [m³/h]

ΔP : Pressure difference [Pa]

ρ : Density of fluid [kg/m³]

(3) Formula of flow rate

It is described by the practical units. Also, the flow rate characteristics are shown in Graph (2).

In the case of liquid:

$$Q = 53 Kv \sqrt{\frac{\Delta P}{G}} \dots\dots\dots(9)$$

Q : Flow rate [L/min]

Kv : Flow coefficient [m³/h]

ΔP : Pressure difference [MPa]

G : Relative density [water = 1]

In the case of saturated aqueous vapor:

$$Q = 232 Kv \sqrt{\Delta P (P_2 + 0.1)} \dots\dots\dots(10)$$

Q : Flow rate [kg/h]

Kv : Flow coefficient [m³/h]

ΔP : Pressure difference [MPa]

P₁ : Upstream pressure [MPa]; $\Delta P = P_1 - P_2$

P₂ : Downstream pressure [MPa]

VX2
VXK
VXD
VXZ
VXS
VXB
VXE
VXP
VXR
VXH
VXF
VX3
VXA

VX21/22/23 Series

Conversion of flow coefficient:

$$Kv = 0.865 Cv \dots\dots\dots(11)$$

Here,

Cv factor: Value of the clean water flow rate represented by US gal/min that runs through the valve at 40 to 100°F, when the pressure difference is 1 lbf/in² (psi)

Value is different from **Kv** and **Cv** factors for pneumatic purpose due to different test method.

(4) Test method

Connect the equipment for the test to the test circuit shown in Fig. (3), and run water at 5 to 40°C. Then, measure the flow rate with a pressure difference where vaporization does not occur in a turbulent flow (pressure difference of 0.035 MPa to 0.075 MPa when the inlet pressure is within 0.15 MPa to 0.6 MPa). However, as the turbulent flow is definitely caused, the pressure difference needs to be set with a large enough difference so that the Reynolds number does not fall below 1 x 10⁵, and the inlet pressure needs to be set slightly higher to prevent vaporization of the liquid. Substitute the measurement results in formula (8) to calculate **Kv**.

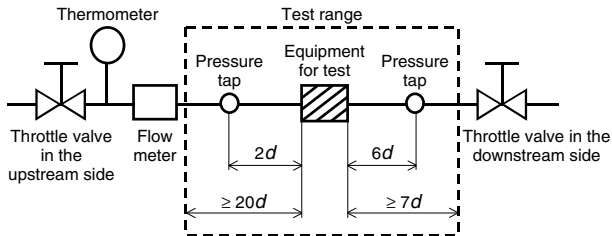
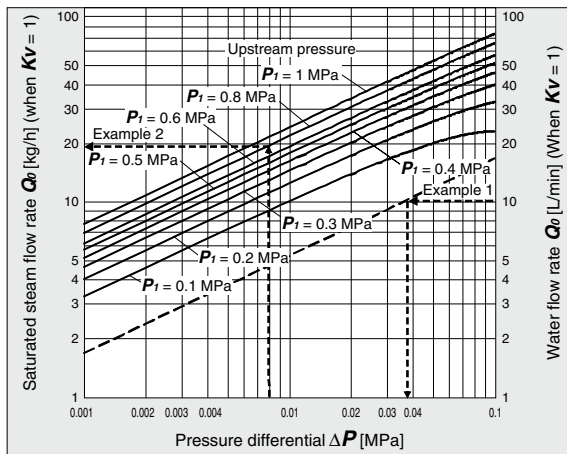


Fig. (3) Test circuit based on IEC60534-2-3, JIS B 2005-2-3



Graph (2) Flow rate characteristics

Example 1)

Obtain the pressure difference when water [15 L/min] runs through the solenoid valve with a **Kv** = 1.5 m³/h. As the flow rate when **Kv** = 1 is calculated as the formula: $Q_0 = 15 \times 1/1.5 = 10$ [L/min], read off ΔP when Q_0 is 10 [L/min] in Graph (2). The reading is 0.036 [MPa].

Example 2)

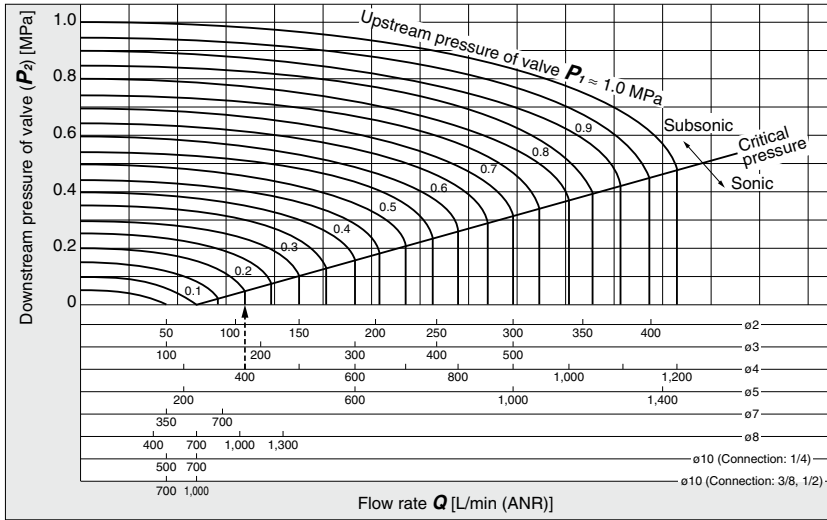
Obtain the saturated steam flow rate when $P_t = 0.8$ [MPa] and $\Delta P = 0.008$ [MPa] with a solenoid valve with a **Kv** = 0.05 [m³/h]. Read off Q_0 when P_t is 0.8 and ΔP is 0.008 in Graph (2), the reading is 20 kg/h. Therefore, the flow rate is calculated as the formula: $Q = 0.05/1 \times 20 = 1$ [kg/h].

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Flow Rate Characteristics 1

Note) Use this graph as a guide. In the case of obtaining an accurate flow rate, refer to pages 66 through to 70.

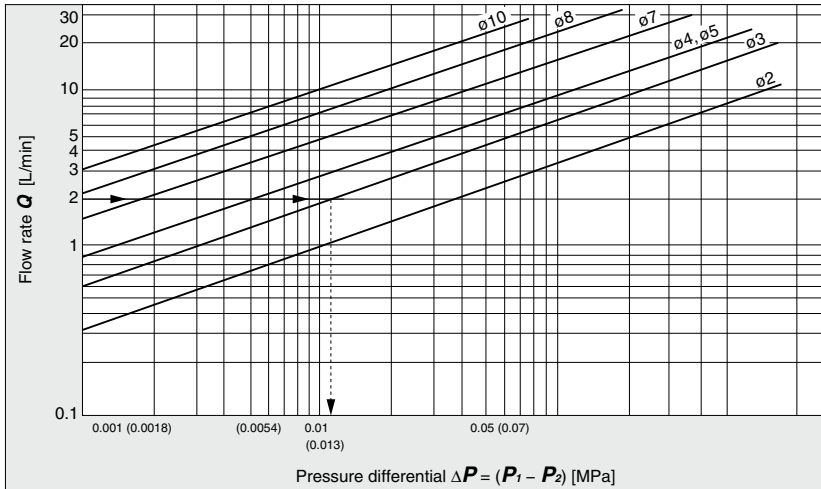
For Air



How to read the graph

The sonic range pressure to generate a flow rate of 400 L/min (ANR) is $P_1 = 0.2$ MPa for a ø4 orifice and $P_1 = 0.58$ MPa for a ø3 orifice.

For Water



How to read the graph

When a water flow of 2 L/min is generated, $\Delta P = 0.013$ MPa for a valve with ø3 orifice.

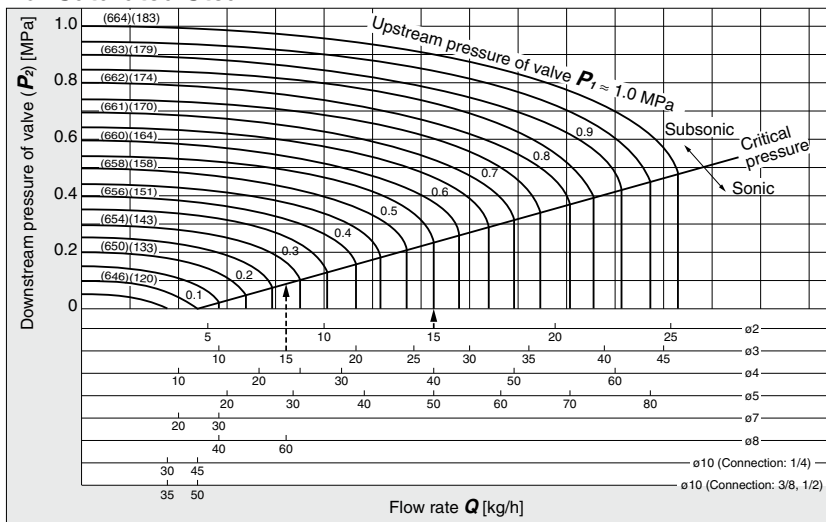
- VX2
- VXK
- VXD
- VXZ
- VXS
- VXB
- VXE
- VXP
- VXR
- VXH
- VXF
- VX3
- VXA

VX21/22/23 Series

Flow Rate Characteristics 2

Note) Use this graph as a guide. In the case of obtaining an accurate flow rate, refer to pages 66 through to 70.

For Saturated Steam



How to read the graph

The sonic range pressure to generate a flow rate of 15 kg/h is $P_1 = 0.55$ MPa for a $\phi 2$ orifice and $P_1 = 0.28$ MPa for a $\phi 3$ orifice.



VX21/22/23 Series Specific Product Precautions 1

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 17 to 19 for 2 Port Solenoid Valve for Fluid Control Precautions.

Design

⚠ Warning

- 1. Cannot be used as an emergency shutoff valve etc.**
The valves presented in this catalog are not designed for safety applications such as an emergency shutoff valve. If the valves are used in this type of system, other reliable safety assurance measures should also be adopted.
- 2. Extended periods of continuous energization**
If the product is to be in a continuously energized state, please consult SMC beforehand.
The solenoid coil will generate heat when continuously energized. Avoid using in a tightly shut container. Install it in a well ventilated area. Furthermore, do not touch it while it is being energized or right after it is energized.
- 3. Closed liquid circuit**
In a closed circuit, when liquid is static, pressure could rise due to changes in temperature. This pressure rise could cause malfunction and damage to components such as valves. To prevent this, install a relief valve in the system.
- 4. Actuator drive**
When an actuator, such as a cylinder, is to be driven using a valve, take appropriate measures to prevent potential danger caused by actuator operation.
- 5. Pressure (including vacuum) holding**
It is not usable for an application such as holding the pressure (including vacuum) inside of a pressure vessel because air leakage is entailed in a valve.
- 6. When the conduit type is used as equivalent to an IP65 enclosure, install a wiring conduit etc.**
- 7. When an impact, such as water hammer etc., caused by the rapid pressure fluctuation is applied, the solenoid valve may be damaged. Give an attention to it.**

Selection

⚠ Warning

- 1. Fluid**
 - 1) Type of fluid**
Before using a fluid, check whether it is compatible with the materials of each model by referring to the fluids listed in this catalog. Use a fluid with a kinematic viscosity of 50 mm²/s or less. If there is something you do not know, please contact SMC.
 - 2) Flammable oil, Gas**
Do not use the product with combustion-supporting or flammable fluids.
 - 3) Corrosive gas**
Cannot be used since it will lead to cracks by stress corrosion or result in other incidents.
 - 4) When a brass body is used, then depending on water quality, corrosion and internal leakage may occur. If such abnormalities occur, exchange the product for a stainless steel body.**
 - 5) Use an oil-free specification when any oily particle must not enter the passage.**
 - 6) Applicable fluid on the list may not be used depending on the operating condition. Give adequate confirmation, and then determine a model, just because the compatibility list shows the general case.**

Selection

⚠ Warning

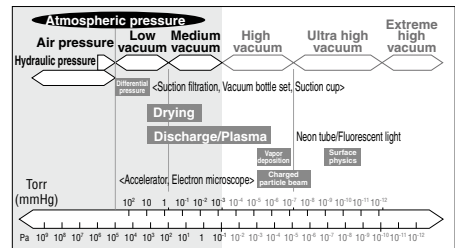
- 2. Fluid quality**

<Air>

 - 1) Use clean air.**
Do not use compressed air that contains chemicals, synthetic oils including organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.
 - 2) Install an air filter.**
Install air filters close to the valves on the upstream side. A filtration degree of 5 μm or less should be selected.
 - 3) Install an aftercooler or air dryer, etc.**
Compressed air that contains excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an aftercooler or air dryer, etc.
 - 4) If excessive carbon powder is generated, eliminate it by installing mist separators at the upstream side of valves.**
If excessive carbon powder is generated by the compressor, it may adhere to the inside of the valves and cause a malfunction.
Refer to Best Pneumatics No.5 for further details on compressed air quality.

<Vacuum>

Please be aware that there is a range of pressure that can be used.



Vacuum piping direction: if the system uses a vacuum pump, we ask that you install the vacuum pump on the secondary side.

Also, install a filter on the primary side, and be careful that no foreign object is picked up.

Please replace the valve after operating the device approximately 300,000 times.



VX21/22/23 Series Specific Product Precautions 2

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 17 to 19 for 2 Port Solenoid Valve for Fluid Control Precautions.

Selection

Warning

<Water>

Be aware that rust stains, chloride separation, etc., from the piping may cause malfunction, leakage, or, in worse case scenarios, damage due to corrosion. Also, such damage may result in the spraying of fluids or scattering of parts. Please be sure to have protective measures in place in case such incidents should occur.

The use of a fluid that contains foreign objects can cause problems such as malfunction and seal failure by promoting wear of the valve seat and armature and by sticking to the sliding parts of the armature etc. Install a suitable filter (strainer) immediately upstream from the valve. As a general rule, use 100 mesh.

The supply water includes materials that create a hard sediment or sludge such as calcium and magnesium. Since this scale and sludge can cause the valve to malfunction, install water softening equipment, and a filter (strainer) directly upstream from the valve to remove these substances.

Tap water pressure:

The water pressure for tap water is normally 0.4 MPa or less. However, in places like a high-rise building, the pressure may be 1.0 MPa.

When selecting tap water, be careful of the maximum operating pressure differential.

When using water or heated water, poor operation or leaks may be caused by dezincification, erosion, corrosion, etc. The brass (C37) body of this product uses dezincification resistant material as a standard. We also offer a stainless steel body type with improved corrosion resistance. Please use the one that fits your needs.

<Oil>

Generally, FKM is used as seal material, as it is resistant to oil. The resistance of the seal material may deteriorate depending on the type of oil, manufacturer or additives. Check the resistance before using. The kinematic viscosity must not exceed 50 mm²/s.

<Steam>

The use of a steam that contains foreign objects can cause problems such as malfunction and seal failure by promoting wear of the valve seat and armature, and by sticking to the sliding parts of the armature etc. Install a suitable filter (strainer) immediately upstream from the valve.

As a standard, the mesh count for the strainer is 100 mesh. However, the size and shape of foreign objects that occur depends on the operating environment. Check the fluid status and choose an appropriate mesh count.

The supply water to a boiler includes materials that create a hard sediment or sludge such as calcium and magnesium.

Sediment and sludge from steam can cause the valve to not operate properly. Install a water softening device, which removes these materials. Do not use operation steam which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as these can cause damage or deterioration.

The seal material (special FKM) used for wetted parts of the product can withstand steam in standard conditions.

However, the resistance of the sealing material can deteriorate depending on the types of additives such as boiler compounds and water conditioners within the boiler steam. Please only utilize the product after determining the sealing material resistance within the actual usage conditions.

3. Ambient environment

Use within the operable ambient temperature range. Check the compatibility between the product's composition materials and the ambient atmosphere. Be certain that the fluid used does not touch the external surface of the product.

4. Countermeasures against static electricity

Take measures to prevent static electricity since some fluids can cause static electricity.

Selection

Warning

5. Low temperature operation

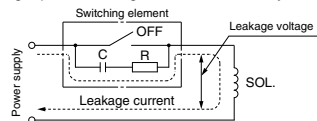
1) The valve can be used in an ambient temperature of between -20 to -10°C. However, take measures to prevent freezing or solidification of impurities, etc.

2) When using valves for water application in cold climates, take appropriate countermeasures to prevent the water from freezing in tubing after cutting the water supply from the pump, by draining the water etc. When warming by a heater etc., be careful not to expose the coil portion to a heater. Installation of a dryer, heat retaining of the body is recommended to prevent a freezing condition in which the dew point temperature is high and the ambient temperature is low, and the high flow runs.

Caution

1. Leakage voltage

When the solenoid valve is operated using the controller, etc., the leakage voltage should be the product allowable leakage voltage or less. Particularly when using a resistor in parallel with a switching element and using a C-R element (surge voltage suppressor) to protect the switching element, take note that leakage current will flow through the resistor, C-R element, etc., creating a possible danger that the valve may not turn off.



AC coil: 5% or less of rated voltage
DC coil: 2% or less of rated voltage

2. Selecting model

Material depends on fluid. Select optimal models for the fluid.

3. When the fluid is oil.

The kinematic viscosity must not exceed 50 mm²/s.

Mounting

Warning

1. If air leakage increases or equipment does not operate properly, stop operation.

After mounting is completed, confirm that it has been done correctly by performing a suitable function test.

2. Do not apply external force to the coil section.

When tightening is performed, apply a wrench or other tool to the outside of the piping connection parts.

3. Mount a valve with its coil position upward, not downward.

When mounting a valve with its coil positioned downward, foreign objects in the fluid will adhere to the iron core leading to a malfunction. Especially for strict leakage control, such as with vacuum applications and non-leak specifications, the coil must be positioned upward.

4. Do not warm the coil assembly with a heat insulator etc.

Use tape, heaters, etc., for freeze prevention on the piping and body only. They can cause the coil to burn out.



VX21/22/23 Series Specific Product Precautions 3

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 17 to 19 for 2 Port Solenoid Valve for Fluid Control Precautions.

Mounting

Warning

- Secure with brackets, except in the case of steel piping and copper fittings.
- Avoid sources of vibration, or adjust the arm from the body to the minimum length so that resonance will not occur.
- Painting and coating

Warnings or specifications printed or labeled on the product should not be erased, removed or covered up.

Disassembly/Assembly Procedures

Caution

- Before starting the disassembly work, be sure to shut off the power supply and pressure supply, and then release the residual pressure.

Disassembly

<N.C.>

- Loosen the mounting screws.
The coil assembly, seal, return spring, armature assembly and body can be removed.

<N.O.>

- Loosen the mounting screws.
The coil assembly, push rod assembly, O-rings, adapter and body can be removed.

Assembly

<Common to N.C. and N.O.>

- Mount the components on the body in the reverse order of disassembly.
- When changing the electrical entry direction, turn the coil assembly in a desired direction to mount it.
- Push the coil assembly against the body and tighten the screws two or more rounds diagonally (Fig. 2) in the status that there are no gaps between the coil assembly and body (Fig. 1).
Tighten the screws in the order of "1→2→3→4→1→2→3→4".

Proper Tightening Torque (N.m)

VX21	0.5
VX22	0.7
VX23	

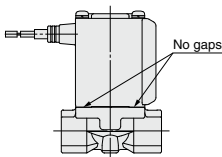


Fig.1

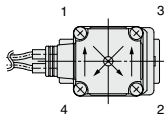


Fig.2

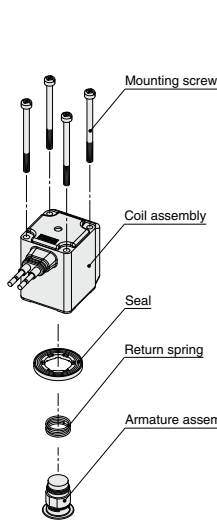
* After tightening the screws, make sure that there are no gaps between the coil and body (Fig. 1).

* After the disassembly and assembly have been completed, make sure that no leak occurs from the seal. Additionally, when restarting the valve, make sure that the valve operates correctly after checking the safety.

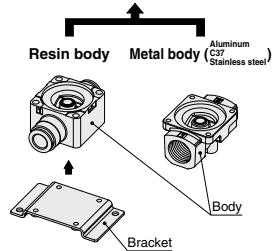
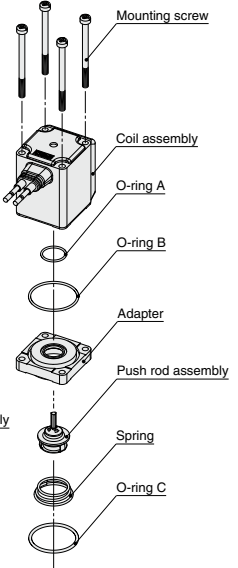
Disassembly/Assembly Procedures

Caution

<N.C.>



<N.O.>



VX2

VXK

VXD

VXZ

VXS

VXB

VXE

VXP

VXR

VXH

VXF

VX3

VXA



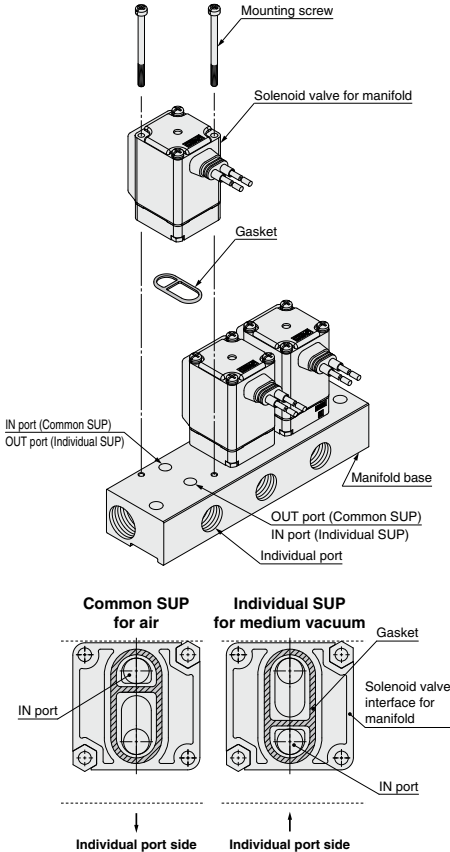
VX21/22/23 Series Specific Product Precautions 4

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 17 to 19 for 2 Port Solenoid Valve for Fluid Control Precautions.

Disassembly/Assembly Procedures

⚠ Caution

Manifold Exploded View



- * Mounting orientation exists when mounting valves onto manifold base. Mount it as shown above.
- * Take great care when special electrical entry direction (XC) is used.

Piping

⚠ Warning

1. During use, deterioration of the tube or damage to the fittings could cause tubes to come loose from their fittings and thrash about.

To prevent uncontrolled tube movement, install protective covers or fasten tubes securely in place.

2. For piping the tube, fix the product securely using the mounting holes so that the product is not in the air.

⚠ Caution

1. Preparation before piping

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe. Avoid pulling, compressing, or bending the valve body when piping.

2. Avoid connecting ground lines to piping, as this may cause electric corrosion of the system.

3. Always tighten threads with the proper tightening torque.

When using steel piping, tighten with the proper tightening torque shown below.

Lower tightening torque will lead into fluid leakage.

Tightening Torque for Piping

Thread size	Proper tightening torque (N·m)
Rc1/8	7 to 9
Rc1/4	12 to 14
Rc3/8	22 to 24
Rc1/2	28 to 30

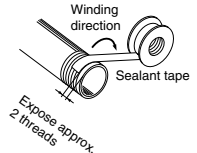
4. Connection of piping to products

When connecting piping to a product, avoid mistakes regarding the supply port etc.

5. Winding of sealant tape

When connecting pipes, fittings, etc., be sure that chips from the pipe threads and sealing material do not enter the valve.

Furthermore, when sealant tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.



6. In applications such as vacuum and non-leak specifications, use caution specifically against the contamination of foreign objects or airtightness of the fittings.



VX21/22/23 Series Specific Product Precautions 5

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 17 to 19 for 2 Port Solenoid Valve for Fluid Control Precautions.

Recommended Piping Conditions

- When connecting tubes using One-touch fittings, provide some spare tube length shown in Fig. 1, recommended piping configuration.

Also, do not apply external force to the fittings when binding tubes with bands etc. (see Fig. 2.)

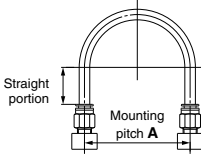
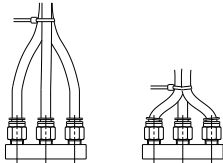


Fig. 1 Recommended piping configuration

Unit: mm

Tube size	Mounting pitch A			Straight portion length
	Nylon tubing	Soft nylon tubing	Polyurethane tubing	
ø1/8"	44 or more	29 or more	25 or more	16 or more
ø6	84 or more	39 or more	39 or more	30 or more
ø1/4"	89 or more	56 or more	57 or more	32 or more
ø8	112 or more	58 or more	52 or more	40 or more
ø10	140 or more	70 or more	69 or more	50 or more
ø12	168 or more	82 or more	88 or more	60 or more



Recommended Unacceptable

Fig. 2 Binding tubes with bands

Wiring

Warning

- The solenoid valve is an electrical product. For safety, install an appropriate fuse and circuit breaker before use.

When using multiple solenoid valves, it is not sufficient to merely install one fuse on the inlet side. In order to ensure the safety of the devices, select and install a fuse for each circuit.

- Do not apply AC voltage to Class "H" coil AC type unless it is built in full-wave rectifier, or the coil will be damaged.

Caution

- As a rule, use electrical wire with a cross sectional area of 0.5 to 1.25 mm² for wiring. Furthermore, do not allow excessive force to be applied to the lines.
- Use electrical circuits which do not generate chattering in their contacts.
- Use voltage which is within ±10% of the rated voltage. In cases with a DC power supply where importance is placed on responsiveness, stay within ±5% of the rated value. The voltage drop is the value in the lead wire section connecting the coil.
- When a surge from the solenoid affects the electrical circuitry, install a surge voltage suppressor etc., in parallel with the solenoid. Or, adopt an option that comes with the surge voltage protection circuit. (However, a surge voltage occurs even if the surge voltage protection circuit is used. For details, please consult with SMC.)

VX2
VXK
VXD
VXZ
VXS
VXB
VXE
VXP
VXR
VXH
VXF
VX3
VXA



VX21/22/23 Series Specific Product Precautions 6

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 17 to 19 for 2 Port Solenoid Valve for Fluid Control Precautions.

Operating Environment

Warning

1. Be sure to have appropriate protective measures in place when installed in environments where there is the constant presence of water, such as water spray, condensation, high humidity, etc. This product has an IP65 protective construction; however, when used in the above-mentioned environments, liquid may find its way inside the enclosure through microscopic gaps, possibly resulting in the burning out, short-circuiting, or ignition of coils.
2. Do not use in an atmosphere having corrosive gases, chemicals, sea water, or where there is direct contact with any of these.
3. Do not use in explosive atmospheres.
4. Do not use in locations subject to vibration or impact.
5. Do not use in locations where radiated heat will be received from nearby heat sources.
6. Employ suitable protective in locations where there is contact with oil or welding spatter, etc.

Maintenance

Warning

1. **Removing the product**
The valve will reach a high temperature when used with high temperature fluids. Confirm that the valve temperature has dropped sufficiently before performing work. If touched inadvertently, there is a danger of being burned.
 - 1) Shut off the fluid supply and release the fluid pressure in the system.
 - 2) Shut off the power supply.
 - 3) Dismount the product.
2. **Low frequency operation**
Switch valves at least once every 30 days to prevent malfunction. Also, in order to use it under the optimum state, conduct a regular inspection once a half year.

Caution

1. **Filters and strainers**
 - 1) Be careful regarding clogging of filters and strainers.
 - 2) Replace filter elements after one year of use, or earlier if the pressure drop reaches 0.1 MPa.
 - 3) Clean strainers when the pressure drop reaches 0.1 MPa.
2. **Lubrication**
When using after lubricating, never forget to lubricate continuously.
3. **Storage**
In case of long term storage after use, thoroughly remove all moisture to prevent rust and deterioration of rubber materials etc.
4. **Exhaust the drainage from an air filter periodically.**

Operating Precautions

Warning

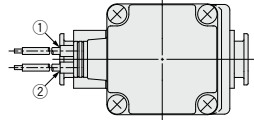
1. If there is a possibility of reverse pressure being applied to the valve, take countermeasures such as mounting a check valve on the downstream side of the valve.
2. When problems are caused by a water hammer, install water hammer relief equipment (accumulator etc.), or use an SMC water hammer relief valve (VXR series). For details, please consult with SMC.

Electrical Connections

Caution

Grommet

Class B coil: AWG20 Insulator O.D. 2.6 mm
Class H coil: AWG18 Insulator O.D. 2.1 mm



Rated voltage	Lead wire color	
	①	②
DC	Black	Red
100 VAC	Blue	Blue
200 VAC	Red	Red
Other AC	Gray	Gray

* There is no polarity.

DIN terminal

Disassembly

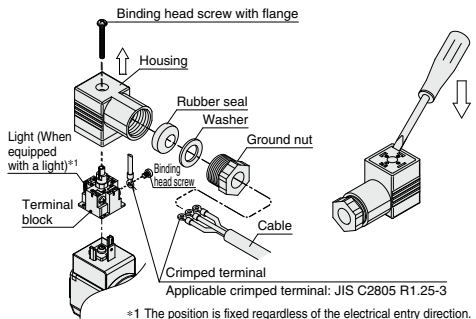
1. After loosening the binding head screw with flange, then if the housing is pulled in the direction of the arrow, the connector will be removed from the solenoid valve.
2. Pull out the binding head screw with flange from the housing.
3. There is a cutout on the bottom of the terminal block. Insert a small flat head screwdriver, etc. into this cutout, and remove the terminal block from the housing. (See figure below.)
4. Remove the ground nut, and pull out the washer and the rubber seal.

Wiring

1. Pass the cable through the ground nut, washer and rubber seal in this order, and insert these parts into the housing.
2. Loosen the binding head screw of the terminal block, then insert the core wire or the crimped terminal of the lead wire into the terminal, and securely fix it with the binding head screw. The binding head screw of the terminal block is M3.
Note 1) Tighten the screw to a torque of between 0.5 and 0.6 N·m.
Note 2) Cable O.D.: $\phi 6$ to $\phi 12$ mm
Note 3) For an outside cable diameter of $\phi 9$ to 12 mm, remove the internal parts of the rubber seal before using.

Assembly

1. Pass the cable through the ground nut, washer, rubber seal and the housing in this order, and connect to the terminal block. Then, set the terminal block inside the housing. (Push in the terminal block until it snaps into position.)
2. Insert the rubber seal and the washer in this order into the cable entry of the housing, and then tighten the ground nut securely.
3. Insert the gasket between the bottom part of the terminal block and the plug attached to the equipment, and then insert the binding head screw with flange from the top of the housing, and tighten it.
Note 1) Tighten the screw to a torque of between 0.5 and 0.6 N·m.
Note 2) The orientation of the connector can be changed in steps of 90° by changing the method of assembling the housing and the terminal block.





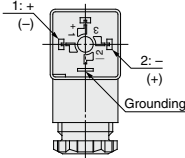
VX21/22/23 Series Specific Product Precautions 7

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 17 to 19 for 2 Port Solenoid Valve for Fluid Control Precautions.

Electrical Connections

⚠ Caution

Internal connections are as shown below. Make connections to the power supply accordingly.

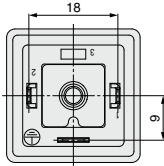


Terminal no.	1	2
DIN terminal	+(-)	-(+)

* There is no polarity.

DIN (EN175301-803) Terminal

This DIN terminal corresponds to the Form A DIN connector with an 18 mm terminal pitch, which complies with EN175301-803B.



■ Conduit terminal

Disassembly

- Loosen the mounting screw, and remove the terminal cover from the conduit terminal.

Wiring

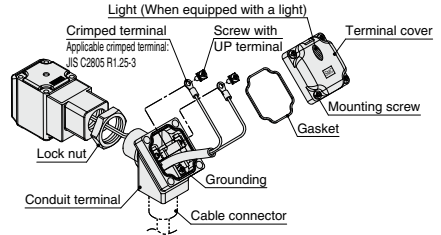
- Insert the cable into the conduit terminal.
- Loosen the screw with UP terminal of the conduit terminal, then insert the core wire or the crimped terminal of the lead wire into the terminal, and securely fix it with the screw with UP terminal.
Note 1) Tighten the screw to a torque of between 0.5 and 0.6 N·m.

⚠ Caution

■ Conduit terminal

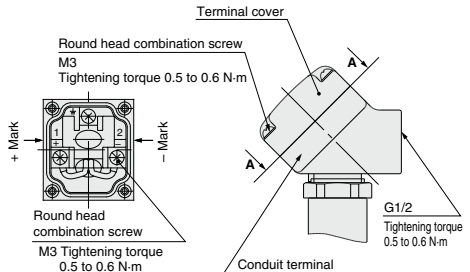
Assembly

- Insert the gasket into the conduit terminal, and then clamp the terminal cover with the mounting screw.
Note 1) Tighten the screw to a torque of between 0.5 and 0.6 N·m.
Note 2) When changing the orientation of the conduit terminal, carry out the following procedure.
 - Apply a tool (monkey wrench, spanner, etc.) to the width across flats of the conduit terminal, and turn the terminal in the counterclockwise direction.
 - Loosen the lock nut.
 - Turn the conduit terminal in the clamping direction (clockwise direction) to about 15° ahead of the desired position.
 - Turn the lock nut by hand to the coil side until it is lightly tightened.
 - Apply a tool to the width across flats of the conduit terminal, and turn it to the desired position (through an angle of about 15°) so as to clamp the conduit terminal.
- Note) When changing the orientation by applying additional tightening force to the conduit terminal from the factory-set position, turn no more than one half a turn.



Make connections according to the marks shown below.

- Use the tightening torques below for each section.
- Properly seal the terminal connection (G1/2) with the special wiring conduit etc.



View A-A
(Internal connection diagram)

VX2

VXK

VXD

VXZ

VXS

VXB

VXE

VXP

VXR

VXH

VXF

VX3

VXA



VX21/22/23 Series Specific Product Precautions 8

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 17 to 19 for 2 Port Solenoid Valve for Fluid Control Precautions.

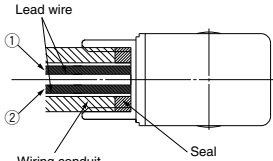
Electrical Connections

⚠ Caution

■ Conduit

When used as an IP65 equivalent, use seal to install the wiring conduit. Also, use the tightening torque below for the conduit.

Class B coil: AWG20 Insulator O.D. 2.5 mm
Class H coil: AWG18 Insulator O.D. 2.1 mm



(Bore size G1/2 Tightening torque 0.5 to 0.6 N·m)

Rated voltage	Lead wire color	
	①	②
DC	Black	Red
100 VAC	Blue	Blue
200 VAC	Red	Red
Other AC	Gray	Gray

* There is no polarity.

Description	Part no.
Seal	VCW20-15-6

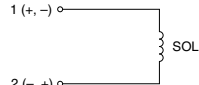
Note) Please order separately.

Electrical Circuits

⚠ Caution

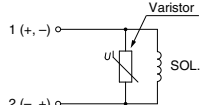
[DC circuit]

Grommet, Flat terminal



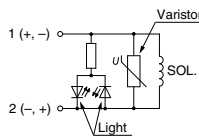
Without electrical option

Grommet, DIN terminal, Conduit terminal, Conduit



With surge voltage suppressor

DIN terminal, Conduit terminal

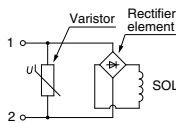


With light/surge voltage suppressor

[AC circuit]

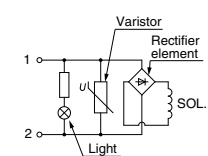
* For AC (Class B), the standard product is equipped with surge voltage suppressor.

Grommet, DIN terminal, Conduit terminal, Conduit



Without electrical option

DIN terminal, Conduit terminal



With light/surge voltage suppressor

One-touch Fitting

⚠ Caution

For information on handling One-touch fittings and on appropriate tubing, refer to page 77 and the Fittings & Tubing section of the "Handling Precautions for SMC Products" on the SMC website.