



# Operation Manual

PRODUCT NAME

DIRECTIONAL 2WAY SOLENOID VALVE

MODEL / Series / Product Number

VX21/22/23 Series

**SMC Corporation**

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# Direct Operated 2 Port Solenoid Valve New



Air



Medium vacuum



Water



Oil



Steam



\* Can be used with heated water.

**Large flow rate**  
Flow rate  
**20% More flow\***  
(Size 1)

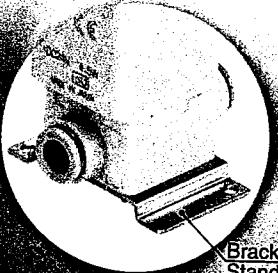
**Compact**  
Height  
**10% Smaller\***  
(Size 1)

**Lightweight**  
Weight  
**30% Lighter\***  
(Size 1, Aluminum body)

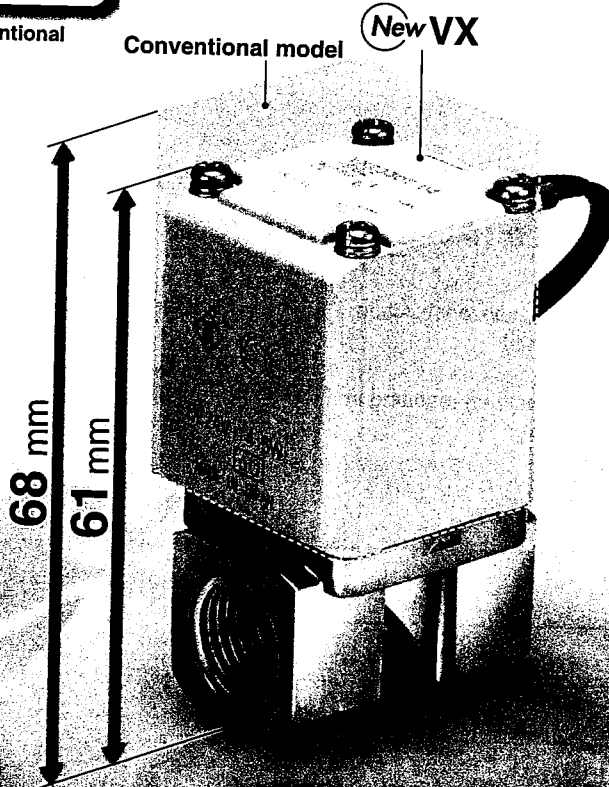
\* Comparison with SMC conventional model

**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.

Series **VX21/22/23**

# Direct Operated 2 Port Solenoid Valve



Air Medium vacuum Water Oil Steam  
\* Can be used with heated water.

Enclosure IP65

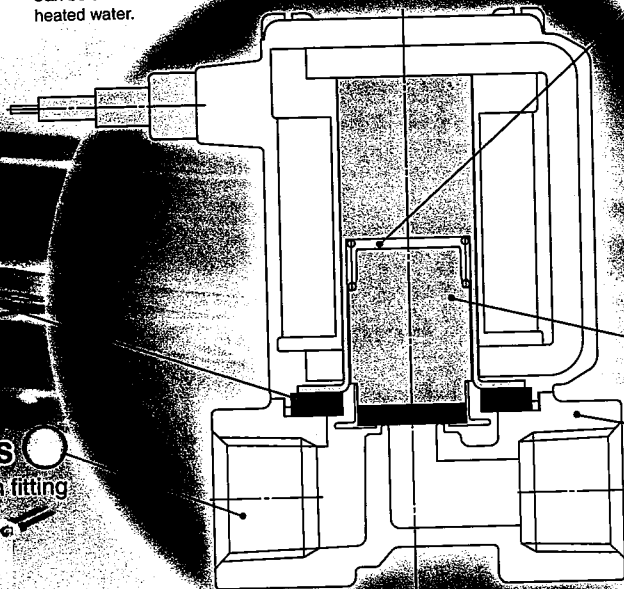
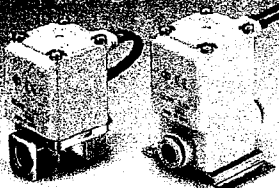
Flame resistance UL94V-0 conformed

Flame resistance

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)

W (Size 2)

0.5 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)

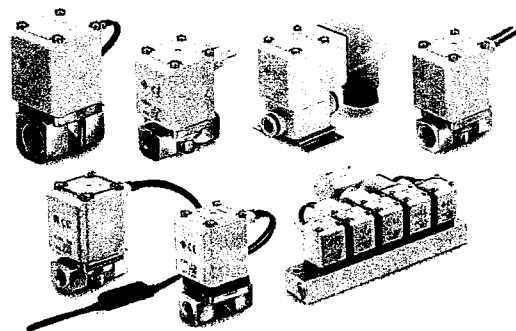
- Improved durability**  
Service life is extended by the special construction. (compared with current shading coil)
- Reduced buzz noise**  
Rectified to DC by the full-wave rectifier, resulting in a buzz noise reduction.
- Reduced apparent power** \* Class B, N.C. valve  
10 VA → 7 VA (Size 1) 20 VA → 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 5	●	—	—	—	—	—
For Medium vacuum VX2□4 Page 10	● *2	●	—	—	—	—
For Water VX2□2 Page 14	● *2	—	●	—	—	—
For Oil VX2□3 Page 16	● *2	—	● *2	●	—	—
For Steam VX2□5 Page 18	● *2	—	● *2	● *2	●	—

\*1 For details, refer to pages 45 and 46. \*2 Refer to the individual specifications for each fluid.



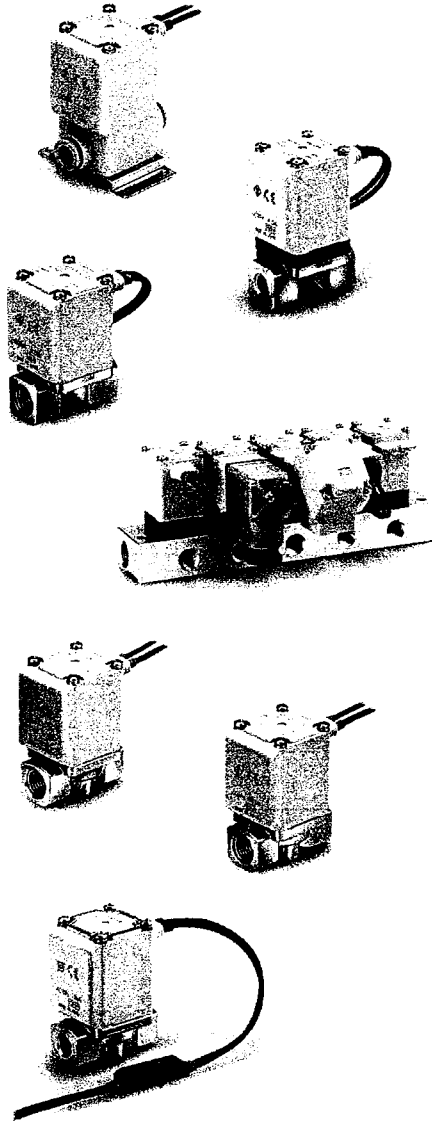
### <Body Size>






Model	Body size	Orifice diameter							Port size
		2 mmø	3 mmø	4 mmø	5 mmø	7 mmø	8 mmø	10 mmø (Note)	
VX2 <sub>1</sub>	Size 1	●	●	—	●	—	—	—	1/8, 1/4 One-touch fitting: ø6, ø8
VX2 <sub>5</sub>	Size 2	—	—	●	—	●	—	—	1/4, 3/8 One-touch fitting: ø8, ø10
VX2 <sub>6</sub>	Size 3	—	—	—	●	—	●	●	1/4, 3/8, 1/2 One-touch fitting: ø10, ø12

Note) N.C. only

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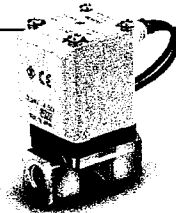
# Direct Operated 2 Port Solenoid Valve

## Series VX21/22/23

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 mmø	●	—	—
	3 mmø	●	—	—
	4 mmø	—	●	—
	5 mmø	●	—	●
	7 mmø	—	●	—
	8 mmø	—	—	●
	10 mmø	—	—	●*
Port size		1/8, 1/4 ø6, ø8	1/4, 3/8 ø8, ø10	1/4, 3/8, 1/2 ø10, ø12

\* 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)

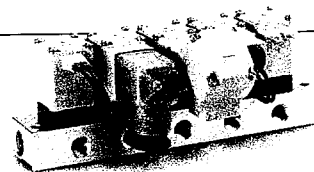
Voltage in ( ) indicates special voltage.

##### 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 mmø	●	—	—
	3 mmø	●	—	—
	4 mmø	—	●	—
	5 mmø	●	—	●
	7 mmø	—	●	●
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 <sup>Note 3)</sup>		NBR, FKM
	Enclosure		Dust-tight, Water-jet-proof type (IP65) <sup>Note 1)</sup>
Environment		Location without corrosive or explosive gases	
Coil specifications	Rated voltage	AC	100 VAC, 200 VAC, 110 VAC, 230 VAC, (220 VAC, 240 VAC, 48 VAC, 24 VAC) <sup>Note 2)</sup>
		DC	24 VDC, (12 VDC) <sup>Note 2)</sup>
	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 21.)

Note 3) For seal material/EPDM, refer to X332. (Refer to page 23.)

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

## Solenoid Coil Specifications

### Normally Closed (N.C.)

#### DC Specification

##### Class B

Size	Power consumption (W) <sup>Note 1)</sup>	Temperature rise (°C) <sup>Note 2)</sup>
Size 1	4.5	50
Size 2	7	55
Size 3	10.5	65

##### Class H

Size	Power consumption (W) <sup>Note 1)</sup>	Temperature rise (°C) <sup>Note 2)</sup>
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) <sup>Note 1) 2)</sup>	Temperature rise (°C) <sup>Note 3)</sup>
Size 1	7	60
Size 2	9.5	70
Size 3	12	70

#### Class H

Size	Apparent power (VA) <sup>Note 1) 2)</sup>	Temperature rise (°C) <sup>Note 3)</sup>
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) <sup>Note 1)</sup>	Temperature rise (°C) <sup>Note 2)</sup>
Size 1	7.5	60
Size 2	8.5	70
Size 3	12.5	70

##### Class H

Size	Power consumption (W) <sup>Note 1)</sup>	Temperature rise (°C) <sup>Note 2)</sup>
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) <sup>Note 1) 2)</sup>	Temperature rise (°C) <sup>Note 3)</sup>
Size 1	9	60
Size 2	10	70
Size 3	14	70

#### Class H

Size	Apparent power (VA) <sup>Note 1) 2)</sup>	Temperature rise (°C) <sup>Note 3)</sup>
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.

Specifications

For Air

For Medium Vacuum

For Water

For Oil

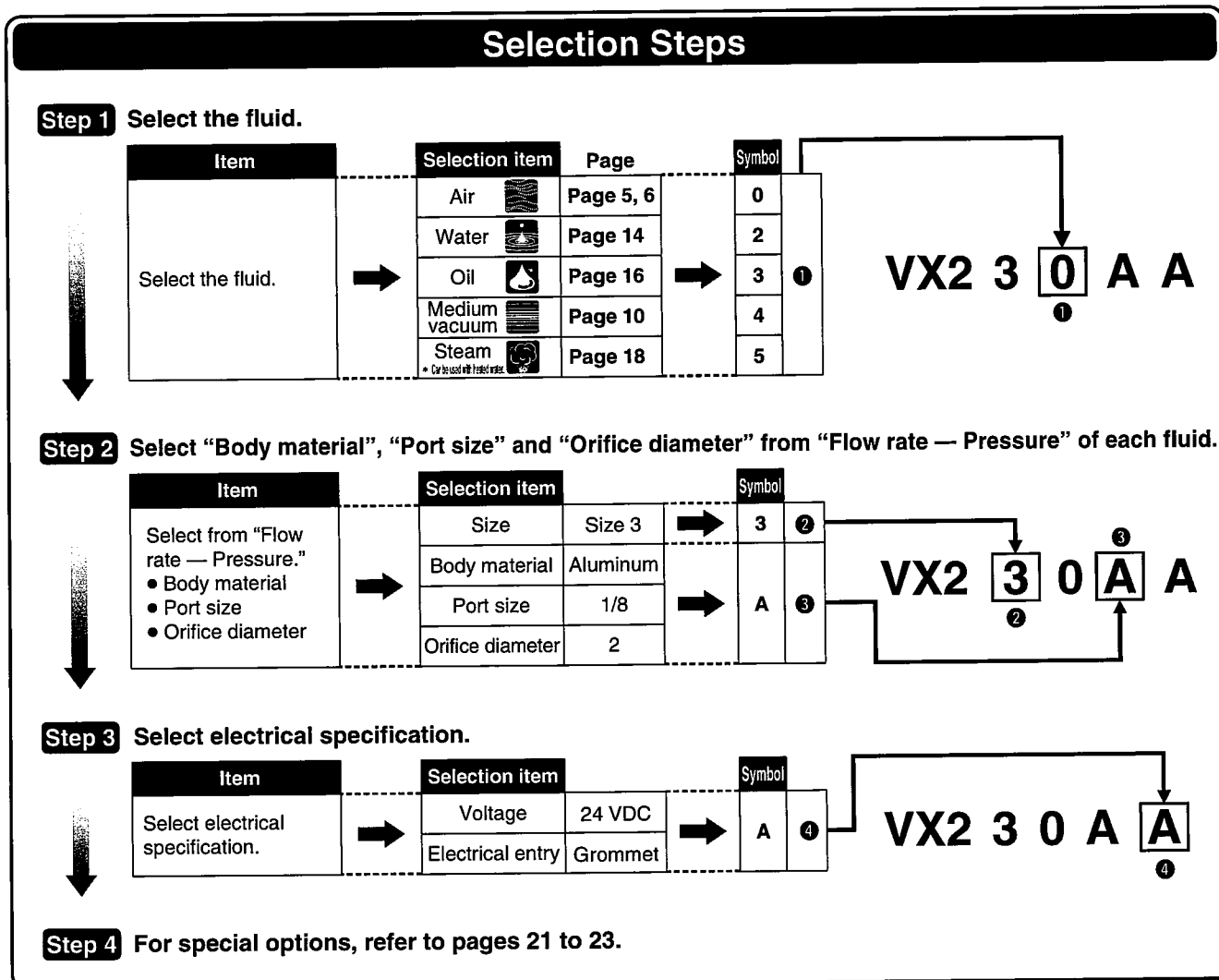
For Steam

Special Options

Construction

Dimensions

# Series VX21/22/23 Selection Steps







# For Air Single Unit

Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

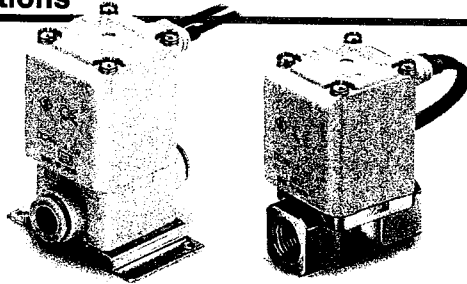
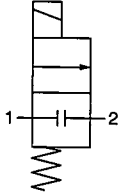
Construction

Dimensions

## 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 (mmø)	Model	Flow-rate characteristics			Maximum operating pressure differential (MPa)	Max. system pressure (MPa)	Weight (g) <sup>Note)</sup>
				C [dm <sup>3</sup> /(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			0.6
		5		2.20	0.39	0.62			0.2
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
		5		1.96	0.55	0.75			1.0
3	1/4, 3/8	8	VX230	5.67	0.33	1.58	1.0	450	
		10		5.74	0.64	2.21			0.1
	1/2	8		8.42	0.39	2.21			0.1
		10		8.42	0.39	2.21			0.1

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

Size	Port size	Orifice diameter (mmø)	Model	Flow-rate characteristics			Maximum operating pressure differential (MPa)	Max. system pressure (MPa)	Weight (g) <sup>Note)</sup>
				C [dm <sup>3</sup> /(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
		5		1.45	0.43	0.40			0.2
	ø8	2		0.82	0.44	0.23			1.0
		3		1.81	0.40	0.41			0.6
		5		2.11	0.32	0.56			0.2
2	ø8	4	VX220	1.69	0.40	0.47	1.0	340	
		7		3.14	0.34	0.84			0.15
		4		1.68	0.49	0.50			1.0
	ø10	7		3.54	0.36	0.90			0.15
		5		2.50	0.44	0.70			1.0
		8		2.77	0.82	1.22			0.3
3	ø10	10	VX230	5.69	0.46	1.54	1.0	460	
		5		2.50	0.44	0.70			1.0
		8		2.56	0.88	1.38			0.3
	ø12	5		5.69	0.64	1.76			0.1
		8		5.69	0.64	1.76			0.1
		10		5.69	0.64	1.76			0.1

Note) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.  
 • Refer to "Glossary of Terms" on page 37 for details on the maximum operating pressure differential.

### Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
-10 <sup>Note)</sup> to 60	-20 to 60

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

### Valve Leakage Rate

#### Internal Leakage

Seal material <sup>Note 2)</sup>	Leakage rate (Air) <sup>Note 1)</sup>
NBR (FKM)	1 cm <sup>3</sup> /min or less (Aluminum body type) 15 cm <sup>3</sup> /min or less (Resin body type)

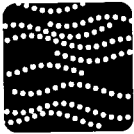
#### External Leakage

Seal material <sup>Note 2)</sup>	Leakage rate (Air) <sup>Note 1)</sup>
NBR (FKM)	1 cm <sup>3</sup> /min or less (Aluminum body type) 15 cm <sup>3</sup> /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 21 for the selection.

# Series VX21/22/23

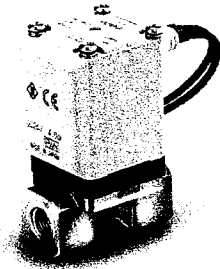
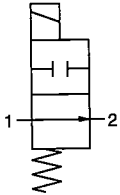


## For Air Single Unit

### 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 (mmø)	Model	Flow-rate characteristics			Maximum operating pressure differential (MPa)	Max. system pressure (MPa)	Weight (g) <sup>Note)</sup>
				C [dm <sup>3</sup> /(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			240
		5		2.20	0.39	0.62			240
2	1/4, 3/8	4	VX250	1.90	0.52	0.62	0.8	1.0	370
		7		3.99	0.44	1.08			370
3	1/4, 3/8	5	VX260	1.96	0.55	0.75	0.8	1.0	490
		8		5.67	0.33	1.58			490

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

Size	Port size	Orifice diameter (mmø)	Model	Flow-rate characteristics			Maximum operating pressure differential (MPa)	Max. system pressure (MPa)	Weight (g) <sup>Note)</sup>	
				C [dm <sup>3</sup> /(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			240	
		5		1.45	0.43	0.40			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	1.0	370	
		7		3.14	0.34	0.84			0.15	370
	ø10	4		1.68	0.49	0.50			0.8	370
		7		3.54	0.36	0.90			0.15	370
3	ø10	5	VX260	2.50	0.44	0.70	0.8	1.0	500	
		8		2.77	0.82	1.22			0.3	500
	ø12	5		2.50	0.42	0.70			0.8	500
		8		2.56	0.88	1.38			0.3	500

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

• Refer to "Glossary of Terms" on page 37 for details on the maximum operating pressure differential.

### Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
-10 <sup>Note)</sup> to 60	-20 to 60

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

### Valve Leakage Rate

#### Internal Leakage

Seal material <sup>Note 2)</sup>	Leakage rate (Air) <sup>Note 1)</sup>
NBR (FKM)	1 cm <sup>3</sup> /min or less (Aluminum body type)
	15 cm <sup>3</sup> /min or less (Resin body type)

#### External Leakage

Seal material <sup>Note 2)</sup>	Leakage rate (Air) <sup>Note 1)</sup>
NBR (FKM)	1 cm <sup>3</sup> /min or less (Aluminum body type)
	15 cm <sup>3</sup> /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 21 for the selection.

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

**For Air Single Unit**

## How to Order (Single Unit)



Note) Refer to the table on page 24 for UL-compliant.

**RoHS**

**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			1/4	2
E				3
F	5			
H	Resin (With bracket)	ø6		2
J				3
K			5	
L			ø8	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	DIN terminal (With surge voltage suppressor)
G	24 VDC	
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	
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	Aluminum	1/4	4	
B			7	
D			3/8	4
E				7
H	Resin (With bracket)	ø8		4
J			7	
L			ø10	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		3/8	5	
E			8	
F			10 (N.C. only)	
G			1/2	10 (N.C. only)
H	Resin (With bracket)	ø10	5	
J			8	
K			10 (N.C. only)	
L			ø12	5
M				8
N				10 (N.C. only)

For special options, refer to pages 21 to 23.

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

Dimensions → Pages 28 to 31 (Single unit)



Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

Construction

Dimensions

# Series VX21/22/23



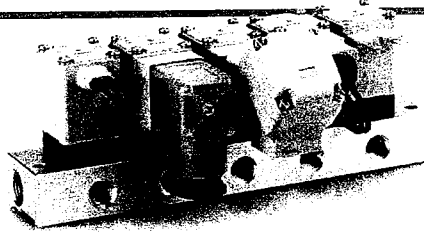
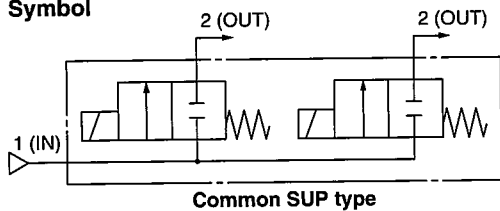
## For Air Manifold

\* For other fluids, please contact SMC.

### Model/Valve Specifications

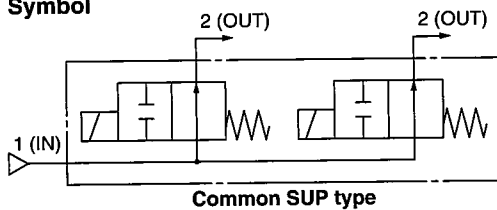
#### N.C.

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 (mmø)	Model	Flow-rate characteristics			Maximum operating pressure differential (MPa)	Max. system pressure (MPa)
			C [dm <sup>3</sup> /(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 (mmø)	Model	Flow-rate characteristics			Maximum operating pressure differential (MPa)	Max. system pressure (MPa)
			C [dm <sup>3</sup> /(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	

### 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 <sup>3</sup> /min or less

#### External Leakage

Seal material (Note 2)	Leakage rate (Note 1)
NBR (FKM)	1 cm <sup>3</sup> /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 21 for the selection.

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

**For Air Manifold**



## How to Order (Solenoid Valve for Manifold)

**VX2 A 0 A A**

### Common Specifications

Seal material	NBR
Coil insulation type	Class B

Specifications

Coil size/Valve type			Body material/Orifice diameter		
Size	Symbol	Valve type	Symbol	Body material	Orifice diameter
Size 1	A	N.C.	A	Resin	2
	D	N.O.	B		3
			C		5
Size 2	B	N.C.	A	Resin	4
	E	N.O.	B		7
Size 3	C	N.C.	A	Resin	5
	F	N.O.	B		7

For special options, refer to pages 21 to 23.

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 48 for details.

### Voltage/Electrical entry

Symbol	Voltage	Electrical entry		
A	24 VDC	Grommet		
		Grommet (With surge voltage suppressor)		
			B	100 VAC
			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	
		M	24 VDC	
N	100 VAC	Conduit terminal (With surge voltage suppressor)		
		P	110 VAC	
		Q	200 VAC	
		R	230 VAC	
		S	24 VDC	
		T	100 VAC	
U	110 VAC	Conduit (With surge voltage suppressor)		
			V	200 VAC
			W	230 VAC
Y	24 VDC	Flat terminal		
			Z	Other voltages

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

Construction

Dimensions

## Manifold Base/How to Order

**VVX2 1 0 A 02**

Coil size		Base material/Port size/Base type			Stations		Special thread			
Size	Symbol	Symbol	Base material	Individual port size	Base type	Symbol	Stations	Symbol	Oil-free	Special thread
Size 1	1	A	Aluminum	1/8	Common	02	2 stations	Nil	—	Rc
Size 2	2	B		1/4	SUP	03	3 stations	A	—	G
Size 3	3	Common port size: 3/8 (1N port)				04	4 stations	B	—	NPT
						05	5 stations	D	○	G
						06	6 stations	E	○	NPT
						07	7 stations	Z	○	Rc
						08	8 stations			
						09	9 stations			
						10	10 stations			

## 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

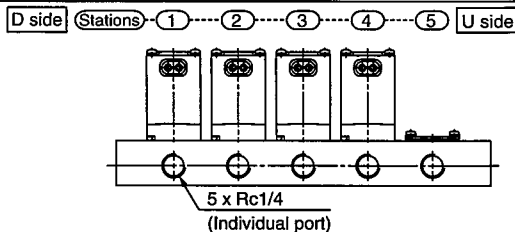
Dimensions → Page 35

## How to Order Manifold Assembly (Example)

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

<Example>

VVX210B05.....1  
 \*VX2A0AA .....4  
 \*VVX021S-4A-N .....1  
 ↳ "\*" is the symbol for mounting.  
 Add an "\*" in front of the part numbers for solenoid valves etc. to be mounted.



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).

# Series VX21/22/23



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

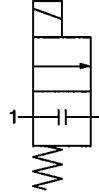
\* This valve can also be used with air.  
(Refer to the valve specifications for air.)

### Model/Valve Specifications

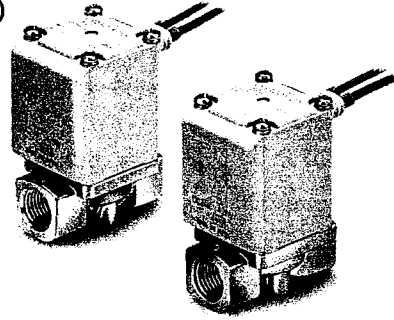
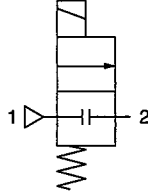
#### Symbol (Application example)

**N.C.**

① Used with vacuum



② Used with pressure

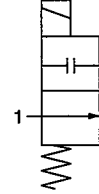


When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

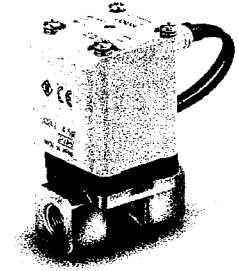
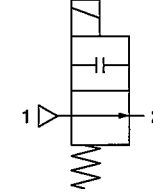
#### Symbol (Application example)

**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 (mmø)	Model	Flow-rate characteristics			Operating pressure range		Weight	
				C [dm³/(s·bar)]	b	Cv	①	②		
1	1/8, 1/4	2	VX214	0.63	0.63	0.23	0.1 to atmospheric pressure	0 to 1.0	1.0	300
		3		1.05	0.68	0.41		0 to 0.6		300
		5		2.20	0.39	0.62		0 to 0.2		300
2	1/4, 3/8	4	VX224	1.90	0.52	0.62		0 to 1.0		460
		7		3.99	0.44	1.08		0 to 0.15		460
3	1/4, 3/8	5	VX234	1.96	0.55	0.75		0 to 1.0		580
		8		5.67	0.33	1.58		0 to 0.3		580
		10		5.74	0.64	2.21		0 to 0.1		580
		10		8.42	0.39	2.21		0 to 0.1		630

#### Normally Open (N.O.)

Size	Port size	Orifice diameter (mmø)	Model	Flow-rate characteristics			Operating pressure range		Weight	
				C [dm³/(s·bar)]	b	Cv	①	②		
1	1/8, 1/4	2	VX244	0.63	0.63	0.23	0.1 to atmospheric pressure	0 to 0.9	1.0	320
		3		1.05	0.68	0.41		0 to 0.45		320
		5		2.20	0.39	0.62		0 to 0.2		320
2	1/4, 3/8	4	VX254	1.90	0.52	0.62		0 to 0.8		490
		7		3.99	0.44	1.08		0 to 0.15		490
3	1/4, 3/8	5	VX264	1.96	0.55	0.75		0 to 0.8		620
		8		5.67	0.33	1.58		0 to 0.3		620

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

#### Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
1 to 60 <small>Note)</small>	-20 to 60

Note) With no freezing

#### Valve Leakage Rate

##### Internal Leakage

Seal material	Leakage rate <small>Note)</small>
FKM	10 <sup>-6</sup> Pa·m³/sec or less

##### External Leakage

Seal material	Leakage rate <small>Note)</small>
FKM	10 <sup>-6</sup> Pa·m³/sec or less

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

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

**For Medium Vacuum Single Unit**

## How to Order (Single Unit)



**VX2 1 4 A A**

### Common Specifications

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

Specifications



### 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	DIN terminal (With surge voltage suppressor)
G	24 VDC	
H	100 VAC	
J	110 VAC	
K	200 VAC	
L	230 VAC	
M	24 VDC	Conduit terminal (With surge voltage suppressor)
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	

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

Construction

Dimensions

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			4
M		3/8	4
			7
			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 21 to 23.

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

Dimensions → Pages 32, 33 (Single unit)



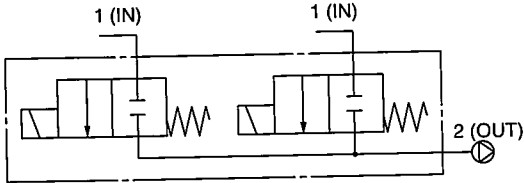
## For Medium Vacuum (0.1 Pa-abs or more) Manifold

\* For other fluids, please contact SMC.

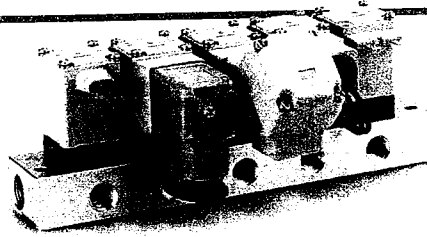
### Model/Valve Specifications

**N.C.**

Symbol

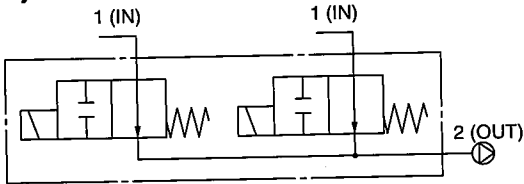


Individual SUP type



**N.O.**

Symbol



Individual SUP type

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 (mmø)	Model	Flow-rate characteristics			Maximum operating pressure differential (MPa)	Max. system pressure (MPa)
			C [dm <sup>3</sup> /(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 (mmø)	Model	Flow-rate characteristics			Maximum operating pressure differential (MPa)	Max. system pressure (MPa)
			C [dm <sup>3</sup> /(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	

#### Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
1 to 60 <sup>Note)</sup>	-20 to 60

Note) With no freezing

#### Valve Leakage Rate

##### Internal Leakage

Seal material	Leakage rate <sup>Note)</sup>
FKM	10 <sup>-6</sup> Pa·m <sup>3</sup> /sec or less

##### External Leakage

Seal material	Leakage rate <sup>Note)</sup>
FKM	10 <sup>-6</sup> Pa·m <sup>3</sup> /sec or less

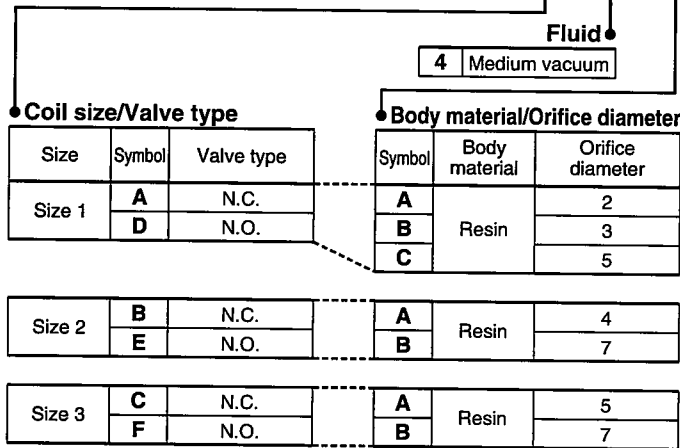
Note) Leakage (10<sup>-6</sup> Pa·m<sup>3</sup>/sec) is the value at differential pressure 0.1 MPa and ambient temperature 20°C.



**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	

**Coil size/Valve type**

Size	Symbol	Valve type
Size 1	A	N.C.
	D	N.O.
Size 2	B	N.C.
	E	N.O.
Size 3	C	N.C.
	F	N.O.

**Body material/Orifice diameter**

Symbol	Body material	Orifice diameter
A	Resin	2
B		3
C		5
A	Resin	4
B		7
A	Resin	5
B		7

**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	Flat terminal
Z		Other voltages

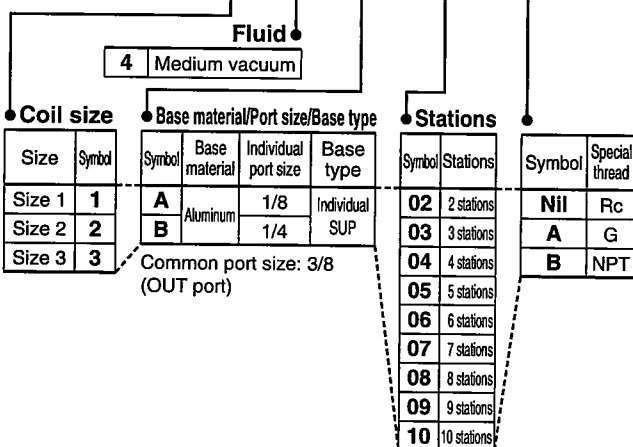
For special options, refer to pages 21 to 23.

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 48 for details.

**Manifold Base/How to Order**

**VVX2 1 4 A 02**



**Coil size**

Size	Symbol
Size 1	1
Size 2	2
Size 3	3

**Base material/Port size/Base type**

Symbol	Base material	Individual port size	Base type
A	Aluminum	1/8	Individual
B		1/4	SUP

**Stations**

Symbol	Stations	Symbol	Special thread
02	2 stations	Nil	Rc
03	3 stations	A	G
04	4 stations	B	NPT
05	5 stations		
06	6 stations		
07	7 stations		
08	8 stations		
09	9 stations		
10	10 stations		

Common port size: 3/8 (OUT port)

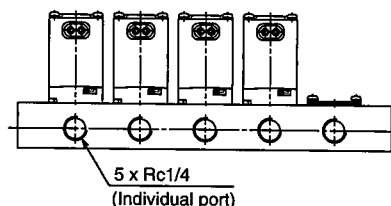
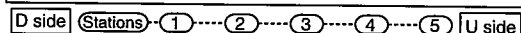
**How to Order Manifold Assembly (Example)**

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.



**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 35

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).

Specifications  
 For Air  
 For Medium Vacuum  
 For Water  
 For Oil  
 For Steam  
 Special Options  
 Construction  
 Dimensions

# Series VX21/22/23



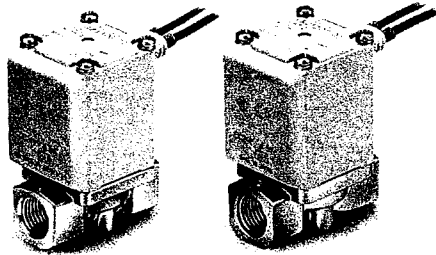
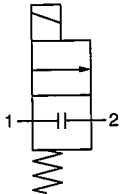
## For Water Single Unit

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

### Model/Valve Specifications

#### Symbol

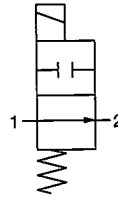
**N.C.**



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 (mmø)	Model	Flow-rate characteristics		Maximum operating pressure differential (MPa)	Weight (g)	
				AV (x 10 <sup>-6</sup> m <sup>2</sup> )	Conversion Cv			
1	1/8, 1/4	2	VX212	5.5	0.23	1	1.0	
		3		10.0	0.42			0.6
		5		15.0	0.63			0.2
2	1/4, 3/8	4	VX222	15.0	0.63	1		
		7		26.0	1.08	0.15		
3	1/4, 3/8	5	VX232	18.0	0.75	1		
		8		38.0	1.58	0.3		
		10		53.0	2.21	0.1		
	1/2	10		53.0	2.21	0.1		

#### Normally Open (N.O.)

Size	Port size	Orifice diameter (mmø)	Model	Flow-rate characteristics		Maximum operating pressure differential (MPa)	Weight (g)	
				AV (x 10 <sup>-6</sup> m <sup>2</sup> )	Conversion Cv			
1	1/8, 1/4	2	VX242	5.5	0.23	0.9	1.0	
		3		10.0	0.42			0.45
		5		15.0	0.63			0.2
2	1/4, 3/8	4	VX252	15.0	0.63	0.8		
		7		26.0	1.08	0.15		
3	1/4, 3/8	5	VX262	18.0	0.75	0.8		
		8		38.0	1.58	0.3		

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

• Refer to "Glossary of Terms" on page 37 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 Note 2)	Leakage rate (Water) Note 1)
NBR (FKM)	0.1 cm <sup>3</sup> /min or less

#### External Leakage

Seal material Note 2)	Leakage rate (Water) Note 1)
NBR (FKM)	0.1 cm <sup>3</sup> /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 21 for the selection.

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

 **For Water Single Unit**



Note) Refer to the table on page 25 for UL-compliant.

**RoHS**

## How to Order (Single Unit)

**VX2 1 2 A A**

Fluid  
2 Water

### Common Specifications

Seal material	NBR
Coil insulation type	Class B
Thread type	Rc

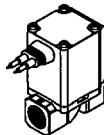
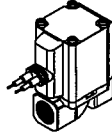
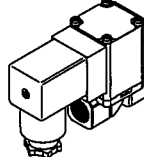
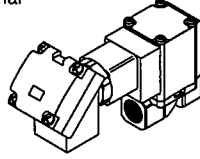
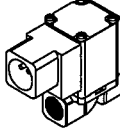
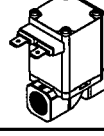
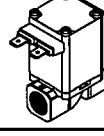
### Coil size/Valve type

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	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	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			4
M		3/8	4
L			7
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 21 to 23.

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

Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

Construction

Dimensions

# Series VX21/22/23



## For Oil Single Unit

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

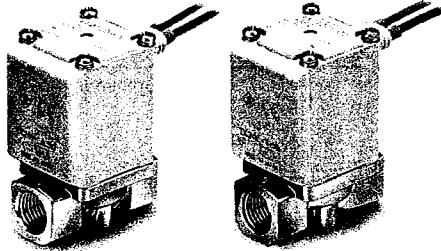
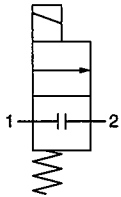
**⚠ When the fluid is oil.**

The kinematic viscosity must not exceed 50 mm<sup>2</sup>/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

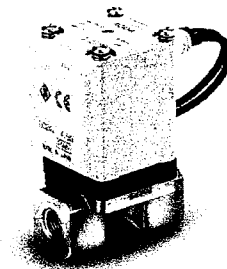
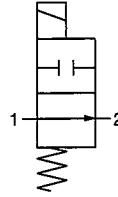
**N.C.**



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 (mmø)	Model	Flow-rate characteristics		Maximum operating pressure differential (MPa)	Max. system pressure (MPa)	Weight (g) <sup>Note)</sup>
				AV (x 10 <sup>-6</sup> m <sup>2</sup> )	Conversion Cv			
1	1/8, 1/4	2	VX213	5.5	0.23	1	1.0	300
		3		10.0	0.42	0.6		300
		5		15.0	0.63	0.2		300
2	1/4, 3/8	4	VX223	15.0	0.63	1		460
		7		26.0	1.08	0.15		460
3	1/4, 3/8	5	VX233	18.0	0.75	1		580
		8		38.0	1.58	0.3		580
		10		53.0	2.21	0.1		580
	1/2	10		53.0	2.21	0.1		630

#### Normally Open (N.O.)

Size	Port size	Orifice diameter (mmø)	Model	Flow-rate characteristics		Maximum operating pressure differential (MPa)	Max. system pressure (MPa)	Weight (g) <sup>Note)</sup>
				AV (x 10 <sup>-6</sup> m <sup>2</sup> )	Conversion Cv			
1	1/8, 1/4	2	VX243	5.5	0.23	0.9	1.0	320
		3		10.0	0.42	0.45		320
		5		15.0	0.63	0.2		320
2	1/4, 3/8	4	VX253	15.0	0.63	0.8		490
		7		26.0	1.08	0.15		490
3	1/4, 3/8	5	VX263	18.0	0.75	0.8		620
		8		38.0	1.58	0.3		620

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

• Refer to "Glossary of Terms" on page 37 for details on the maximum operating pressure differential.

### Fluid and Ambient Temperature

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

Note) Kinematic viscosity: 50 mm<sup>2</sup>/s or less

### Valve Leakage Rate

#### Internal Leakage

Seal material	Leakage rate (Oil) <sup>Note)</sup>
FKM	0.1 cm <sup>3</sup> /min or less

#### External Leakage

Seal material	Leakage rate (Oil) <sup>Note)</sup>
FKM	0.1 cm <sup>3</sup> /min or less

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

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

 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

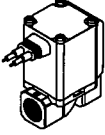
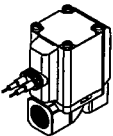
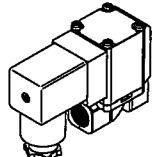
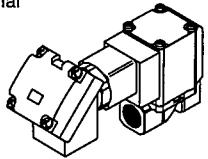
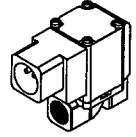
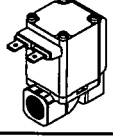
### Coil size/Valve type

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	DIN terminal (With surge voltage suppressor) 
G	24 VDC	
H	100 VAC	
J	110 VAC	
K	200 VAC	
L	230 VAC	
M	24 VDC	Conduit terminal (With surge voltage suppressor) 
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 21 to 23.

Special voltage	24 VAC
	48 VAC
	220 VAC
	240 VAC
	12 VDC
DIN terminal with light	
Conduit terminal with light	

Without DIN connector
Oil-free
G thread
NPT thread
With bracket
Mounting holes on the bottom side of the body
Special electrical entry direction

Dimensions → Pages 32, 33 (Single unit)

Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

Construction

Dimensions

# Series VX21/22/23



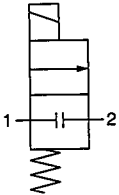
## For Steam Single Unit

\* 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

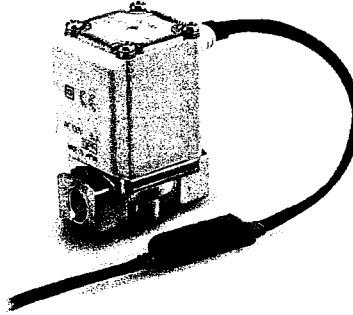
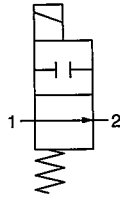
Symbol

**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 (mmø)	Model	Flow-rate characteristics		Maximum operating pressure differential (MPa)	Max. system pressure (MPa)	Weight (g) <sup>Note)</sup>
				AV (x 10 <sup>-6</sup> m <sup>2</sup> )	Conversion Cv			
1	1/8, 1/4	2	VX215	5.5	0.23	1	1.0	300
		3		10.0	0.42	0.6		300
		5		15.0	0.63	0.2		300
2	1/4, 3/8	4	VX225	15.0	0.63	1		460
		7		26.0	1.08	0.15		460
		5		18.0	0.75	1		580
3	1/4, 3/8	8	VX235	38.0	1.58	0.3		580
		10		53.0	2.21	0.1		580
		10		53.0	2.21	0.1		580
	1/2	10		53.0	2.21	0.1	630	

#### Normally Open (N.O.)

Size	Port size	Orifice diameter (mmø)	Model	Flow-rate characteristics		Maximum operating pressure differential (MPa)	Max. system pressure (MPa)	Weight (g) <sup>Note)</sup>
				AV (x 10 <sup>-6</sup> m <sup>2</sup> )	Conversion Cv			
1	1/8, 1/4	2	VX245	5.5	0.23	0.9	1.0	320
		3		10.0	0.42	0.45		320
		5		15.0	0.63	0.2		320
2	1/4, 3/8	4	VX255	15.0	0.63	0.8		490
		7		26.0	1.08	0.15		490
3	1/4, 3/8	5	VX265	18.0	0.75	0.8		620
		8		38.0	1.58	0.3		620

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

### 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 <sup>3</sup> /min or less
Heated water		0.1 cm <sup>3</sup> /min or less

#### External Leakage

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

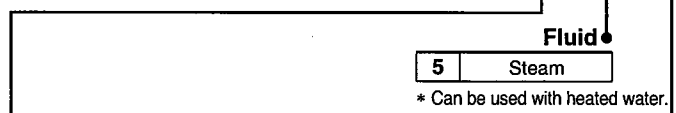
# Direct Operated 2 Port Solenoid Valve Series VX21/22/23

 For Steam Single Unit



## How to Order (Single Unit)

VX2 **1** **5** **A** **B**



### Common Specifications

Seal material	FKM for high temperature
Coil insulation type	Class H
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	Stainless steel	1/8	5
H			2
J			3
K		5	
L		1/4	2
M			3
N			5

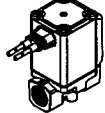
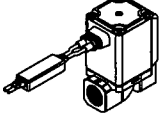
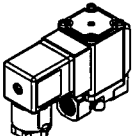
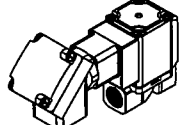
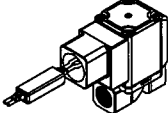
Size	Symbol	Valve type
Size 2	2	N.C.
	5	N.O.

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 (Only N.C.)
D			5
E		3/8	8
F			10 (Only N.C.)
G		1/2	10 (Only N.C.)
H		Stainless steel	1/4
J	8		
K	10 (Only N.C.)		
L	3/8		5
M			8
N			10 (Only N.C.)
P			1/2

### Voltage/Electrical entry

Symbol	Voltage	Electrical entry <sup>Note 3)</sup>
A	24 VDC	Grommet 
B	100 VAC	Grommet (With surge voltage suppressor) 
C	110 VAC	
D	200 VAC	
E	230 VAC	
G	24 VDC	DIN terminal (With surge voltage suppressor <sup>Note 1) 2)</sup> 
H	100 VAC	
J	110 VAC	
K	200 VAC	Conduit terminal (With surge voltage suppressor) 
L	230 VAC	
N	100 VAC	Conduit (With surge voltage suppressor) 
P	110 VAC	
Q	200 VAC	
R	230 VAC	
T	100 VAC	
U	110 VAC	Other voltages
V	200 VAC	
W	230 VAC	
Z		

Note 1) AC voltage coil for "H" of DIN terminal type does not have full-wave rectifier. Full-wave rectifier is built on the DIN connector side. Refer to page 36 to order it as an accessory.

Note 2) DIN connector insulation class is Class "B".

Note 3) Flat terminal is not available.

### For special options, refer to pages 21 to 23.

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

Dimensions → Page 34 (Single unit)

Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

Construction

Dimensions





# Series VX21/22/23 Special Options

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

VX2 1 0 A Z 1 A

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	Grommet
	1D	—	12 VDC	
	1E	—	12 VDC	Grommet (With surge voltage suppressor)
	1F	●	48 VAC	
	1G	●	220 VAC	DIN terminal (With surge voltage suppressor)
	1H	●	240 VAC	
	1V	●	24 VAC	
	1J	—	12 VDC	
	1K	●	48 VAC	Conduit terminal (With surge voltage suppressor)
	1L	●	220 VAC	
	1M	●	240 VAC	
	1W	●	24 VAC	
	1N	—	12 VDC	
	1P	●	48 VAC	
	1Q	●	220 VAC	Conduit (With surge voltage suppressor)
	1R	●	240 VAC	
1Y	●	24 VAC		
1S	—	12 VDC		
1T	—	12 VDC	Flat terminal	

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	
	2H	●	240 VAC	Conduit terminal (With surge voltage suppressor)
	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		

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".

## 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 (Seal material: FKM)	Oil-free	Port thread
Nil	—	—	Rc, One-touch fitting*2
A	—	—	G
B	—	—	NPT
C	○	—	Rc, One-touch fitting*2
D	—	—	G
E	—	○	NPT
F	—	—	G
G	○	—	NPT
H	—	—	Rc, One-touch fitting*2
K	○	○	G
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.

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

Example) VX2 1 2 A Z 1 A Z

Electrical option

Other option

Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

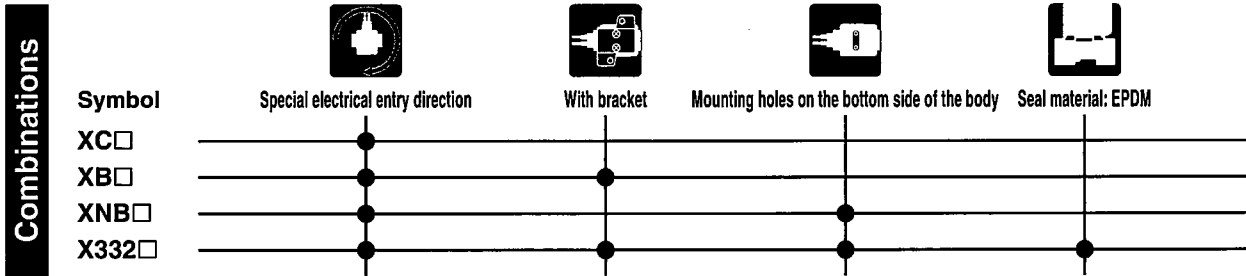
Construction

Dimensions

# Series VX21/22/23

## Installation Options (Mounting Option/Special Electrical Entry Direction)

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



### 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° 
B	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 **1** **2** **A** **Z** **1A** **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 **1** **2** **A** **Z** **1A** **Z** XB **A**

Electrical option      With bracket/Special electrical entry direction

Other option

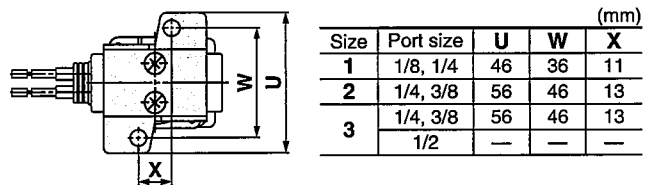
### With Bracket/ Special Electrical Entry Direction

VX2 □ □ □ □ XB A

Enter standard product number.

With bracket/Special electrical entry direction

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



- \*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 $\phi$ )	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
	1/2	10	— (Not available)*2

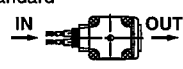
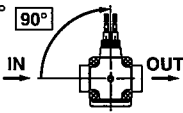
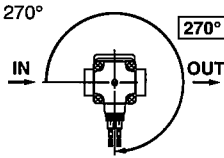
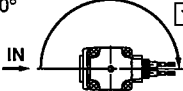
**Installation Options**  
(Mounting Option/Special Electrical Entry Direction)

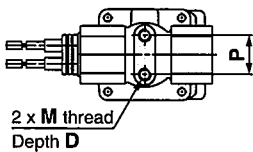
 **Mounting Holes on the Bottom Side of the Body/  
Special Electrical Entry Direction**

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 		
A	90° 	C	270° 
B	180° 		



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

When the fluid is oil, enter the part number for water (VX2□2).

\* VX2  3   → VX2  2

Refer to page 15 for model selection.

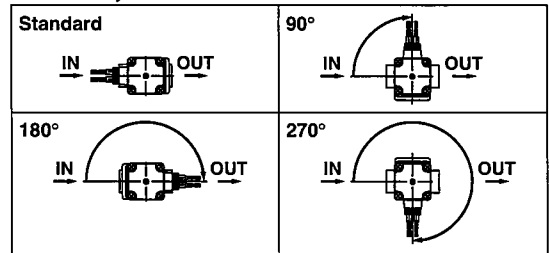
With bracket/Mounting holes on the bottom side of the body/  
Special electrical entry direction

Symbol	Specifications	
	Electrical entry direction	Bracket
Nil	IN side (Standard)	None
A	90°	
B	180°	
C	270°	
D	IN side (Standard)	With bracket*1
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 "Other Options", which can be combined, are A, B, D, E, Z.

\*3 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

Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

Construction

Dimensions

# Series VX21/22/23

## 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 <sup>Note)</sup> bracket
VX210	A	A	Nil	Nil
	B	B	A	XB
	C	C	B	
	D	D	C	
	E	E	D	
	F	F	E	
	H <sup>Note)</sup>	M	F	
	J <sup>Note)</sup>	N	G	
	K <sup>Note)</sup>	P	H	
	L <sup>Note)</sup>	Q	K	
	M <sup>Note)</sup>	R	L	
	N <sup>Note)</sup>	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 <sup>Note)</sup> bracket
VX220	A	A	Nil	Nil
	B	B	A	XB
	D	C	B	
	E	D	C	
	H <sup>Note)</sup>	E	D	
	J <sup>Note)</sup>	F	E	
	L <sup>Note)</sup>	M	F	
	M <sup>Note)</sup>	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 <sup>Note)</sup> bracket
VX230	A	A	Nil	Nil
	B	B	A	XB
	C	C	B	
	D	D	C	
	E	E	D	
	F	F	E	
	G <sup>Note 1)</sup>	M	F	
	H <sup>Note 2)</sup>	N	G	
	J <sup>Note 2)</sup>	P	H	
	K <sup>Note 2)</sup>	Q	K	
	L <sup>Note 2)</sup>	R	L	
	M <sup>Note 2)</sup>	S	Z	
	N <sup>Note 2)</sup>	T		
		U		
		V		
		W		
	Y			
	Z1A			
	Z1B			
	Z1C			
	Z1U			
	Z1D			
	Z1E			
	Z1K			
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	Z1N			
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	Z2M			
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	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 21 to 23 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	XB
	C	C	B	
	D	D	C	
	E	E	D	
	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	XB
	D	C	B	
	E	D	C	
	H	E	D	
	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		
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		Z1Q		
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		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	XB
	C	C	B	
	D	D	C	
	E	E	D	
	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		
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		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 21 to 23 for electrical options, other options, and bracket/electrical entry direction.

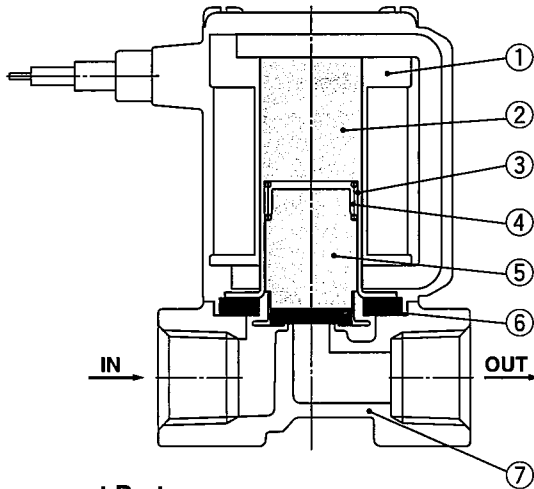
**Specifications**  
**For Air**  
**For Medium Vacuum**  
**For Water**  
**For Oil**  
**For Steam**  
**Special Options**  
**Construction**  
**Dimensions**

# Series VX21/22/23

## Construction/Single Unit

### Normally Closed (N.C.)

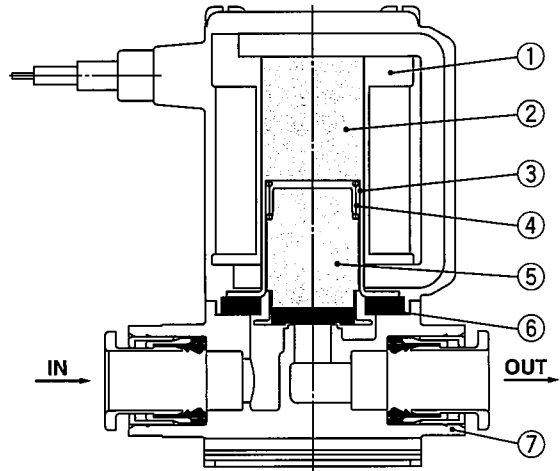
Body material: Aluminum, C37, Stainless steel



#### 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
6	Seal	NBR, FKM
7	Body	Aluminum, C37, Stainless steel

Body material: Resin

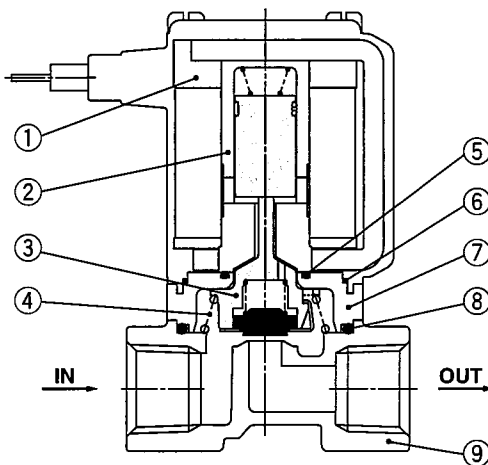


#### Component Parts

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
6	Seal	NBR, FKM
7	Body	Resin (PBT)

### Normally Open (N.O.)

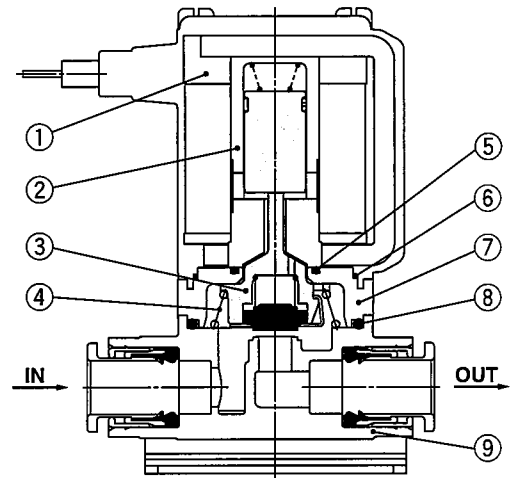
Body material: Aluminum, C37, Stainless steel



#### 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



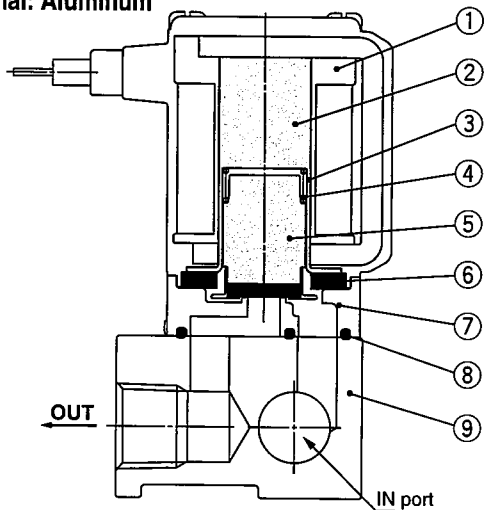
#### Component Parts

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)

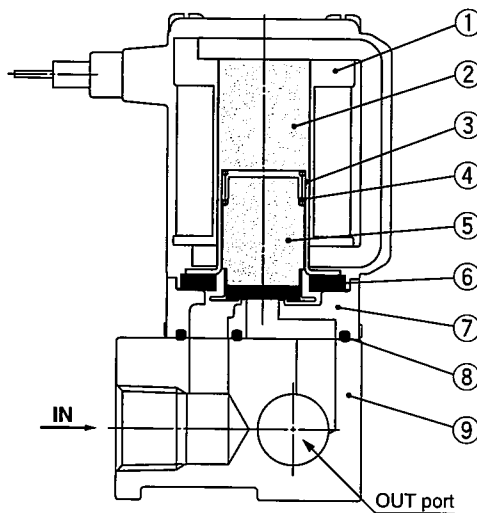
**Construction/Manifold**

**Normally Closed (N.C.)**  
Base material: Aluminum

Common SUP type (for air)



Individual SUP type (for medium vacuum)



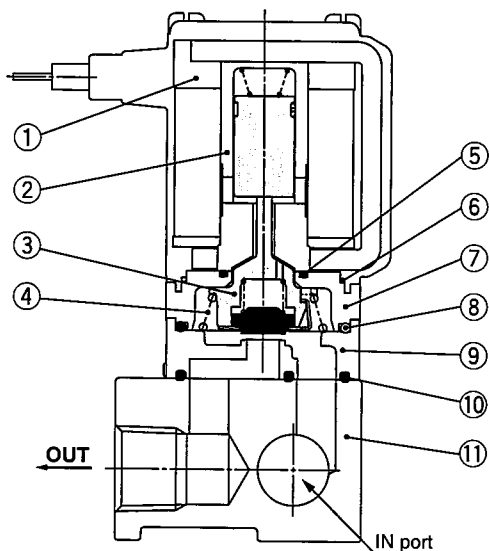
**Component Parts**

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
6	Seal	NBR, FKM
7	Body	Resin (PPS)
8	Gasket	NBR, FKM
9	Base	Aluminum

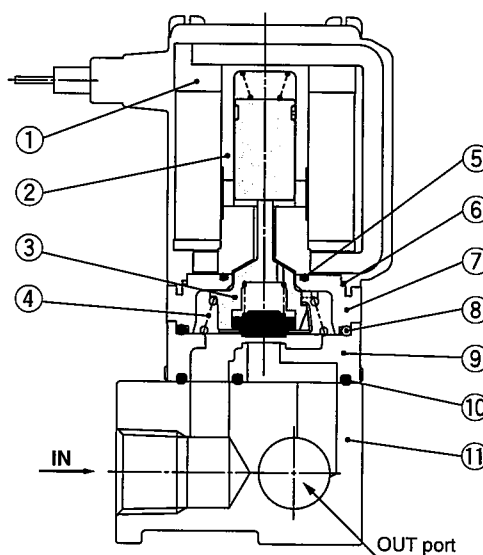
**Normally Open (N.O.)**

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

Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

Construction

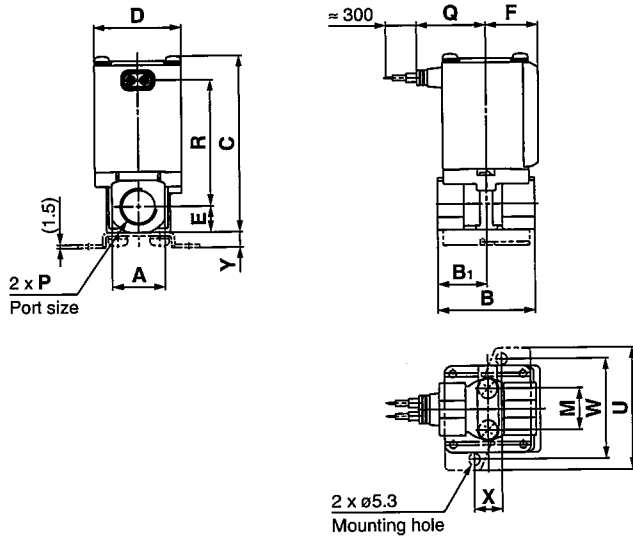
Dimensions

# Series VX21/22/23

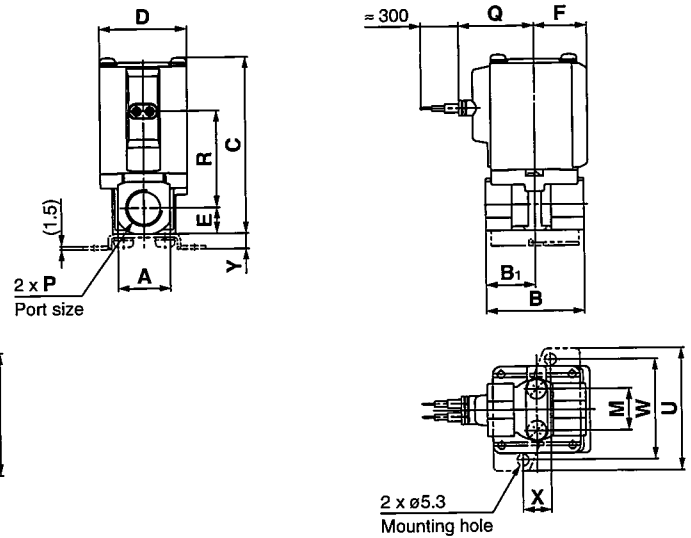


## Dimensions/Body Material: Aluminum

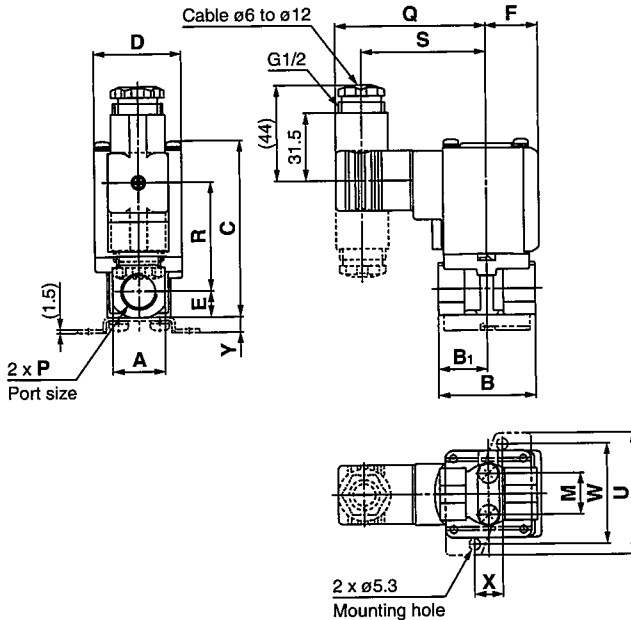
### Grommet



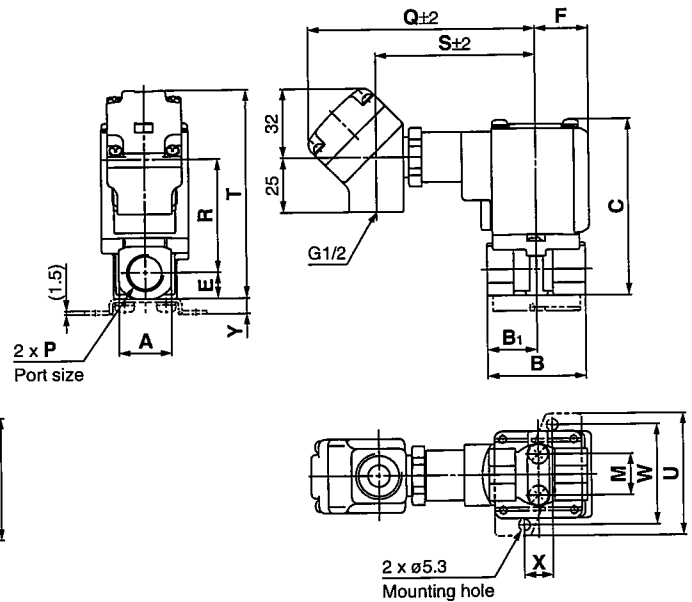
### Grommet (with surge voltage suppressor)



### DIN terminal



### Conduit terminal



(mm)

Size	Port size P	A	B	B <sub>1</sub>	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.

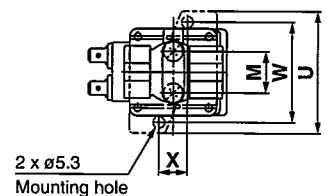
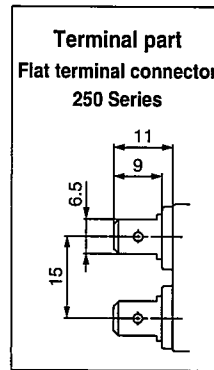
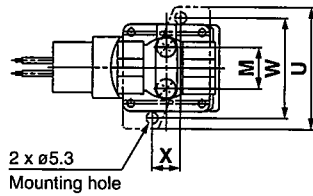
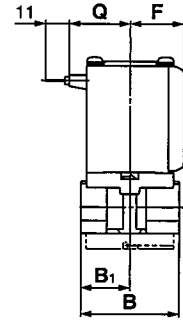
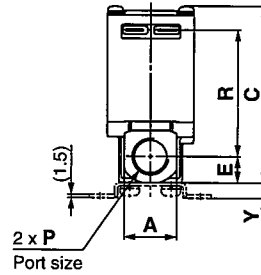
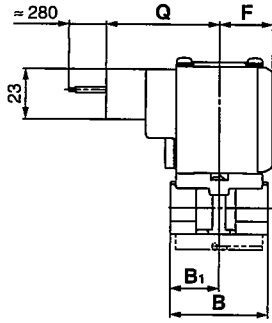
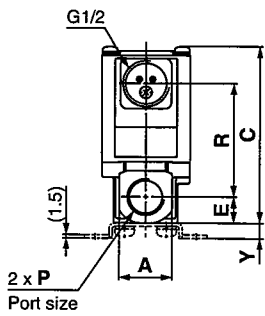




**Dimensions/Body Material: Aluminum**

**Conduit**

**Flat terminal type**



- Specifications
- For Air
- For Medium Vacuum
- For Water
- For Oil
- For Steam

Special Options

Construction

Dimensions

Size	Port size P	A	B	B <sub>1</sub>	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
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			
		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.

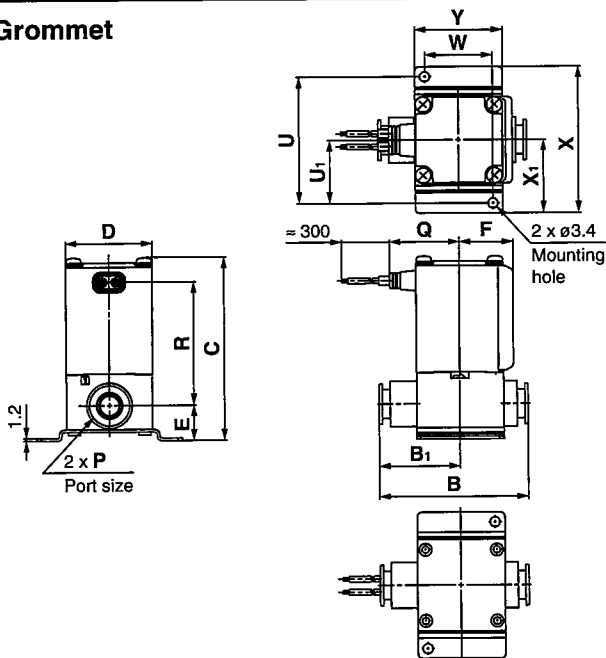
# Series VX21/22/23



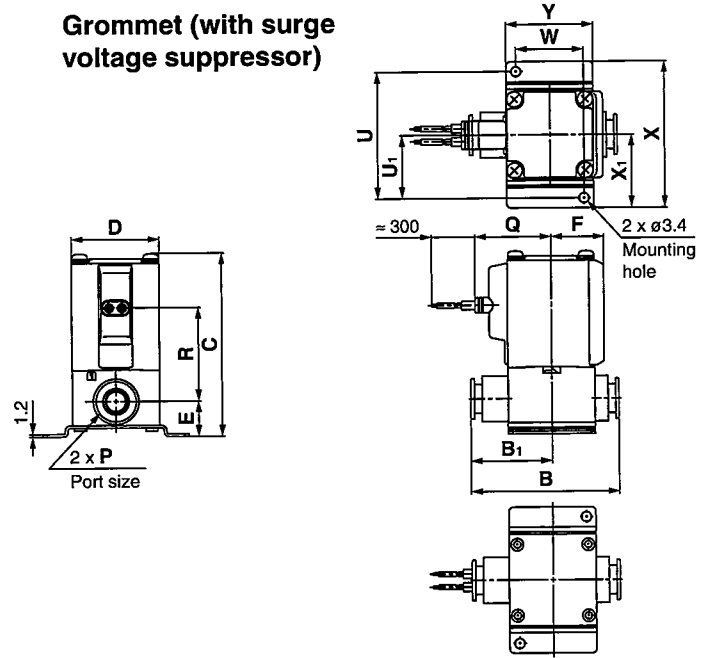
For Air

## Dimensions/Body Material: Resin

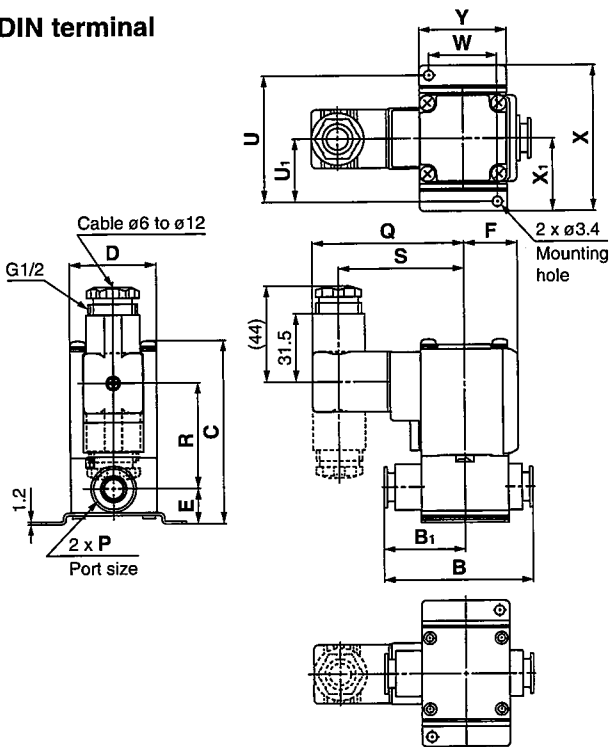
### Grommet



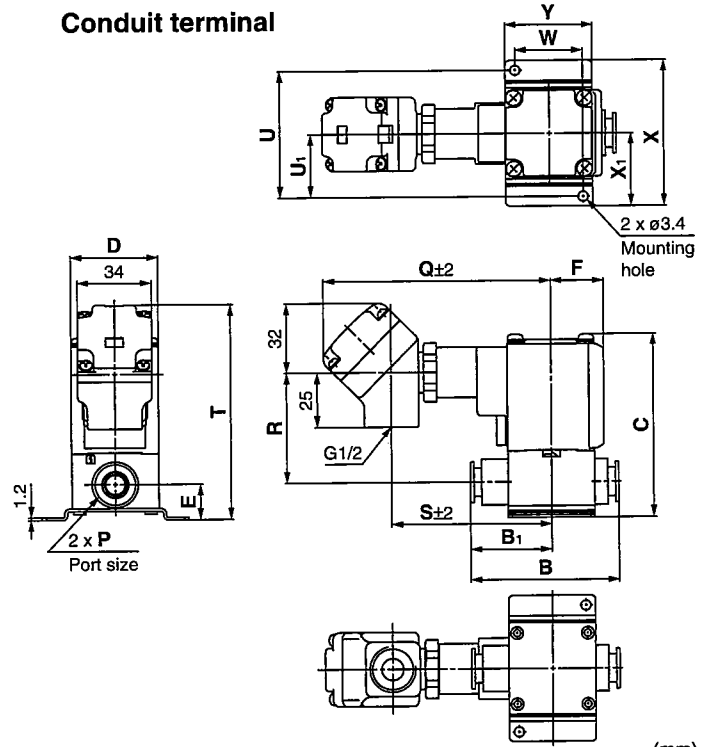
### Grommet (with surge voltage suppressor)



### DIN terminal



### Conduit terminal



(mm)

Size	One-touch fitting P	B	B <sub>1</sub>	C	D	E	F	Mounting bracket dimensions					
								U	U <sub>1</sub>	W	X	X <sub>1</sub>	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)	

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

For information on handling One-touch fittings and appropriate tubing, refer to page 48 and KQ2 series One-touch fittings in Best Pneumatics No. 6. The KQ2 series information can be downloaded from the following SMC website, <http://www.smcworld.com>

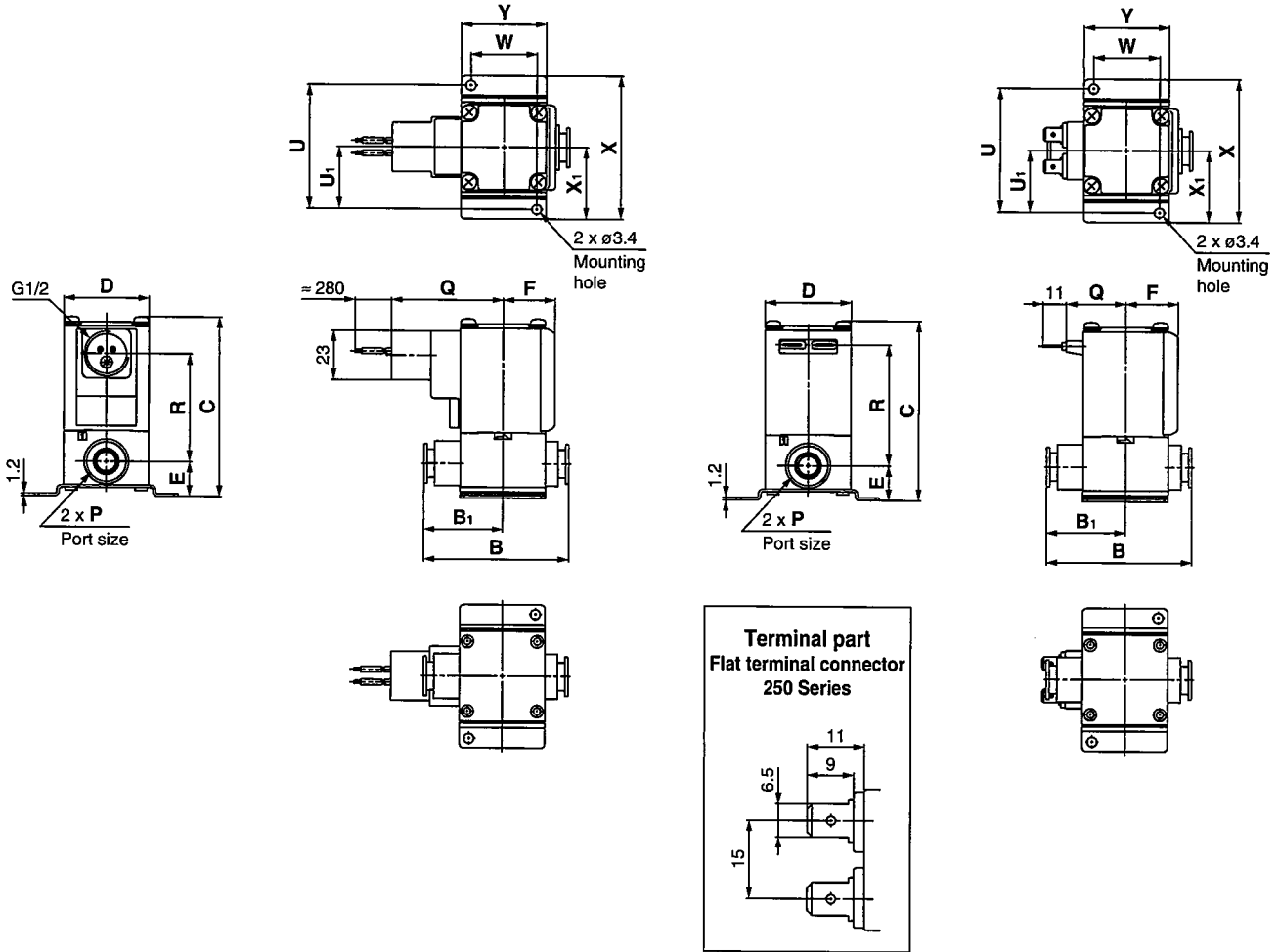
# Direct Operated 2 Port Solenoid Valve Series VX21/22/23



## Dimensions/Body Material: Resin

### Conduit

### Flat terminal



Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Size	One-touch fitting P	B	B <sub>1</sub>	C	D	E	F	Mounting bracket dimensions						Electrical entry			
														Conduit		Flat terminal	
								U	U <sub>1</sub>	W	X	X <sub>1</sub>	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.

Special Options

Construction

Dimensions

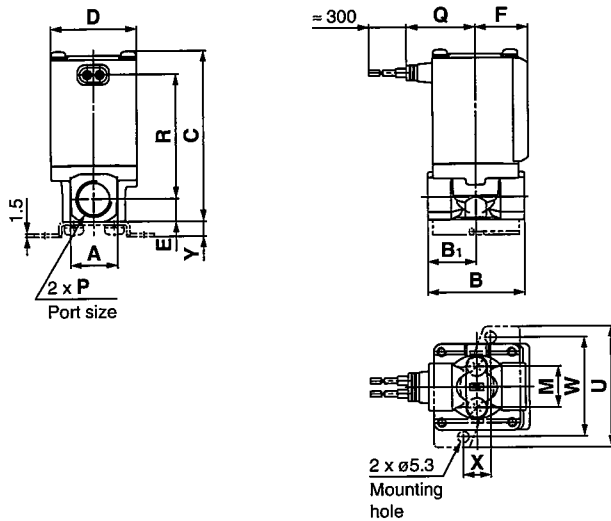
# Series VX21/22/23



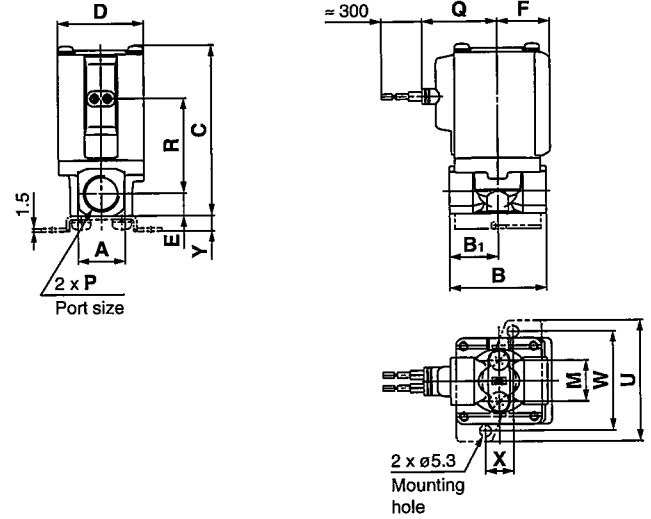
For Medium Vacuum, Water, Oil

## Dimensions/Body Material: C37, Stainless Steel

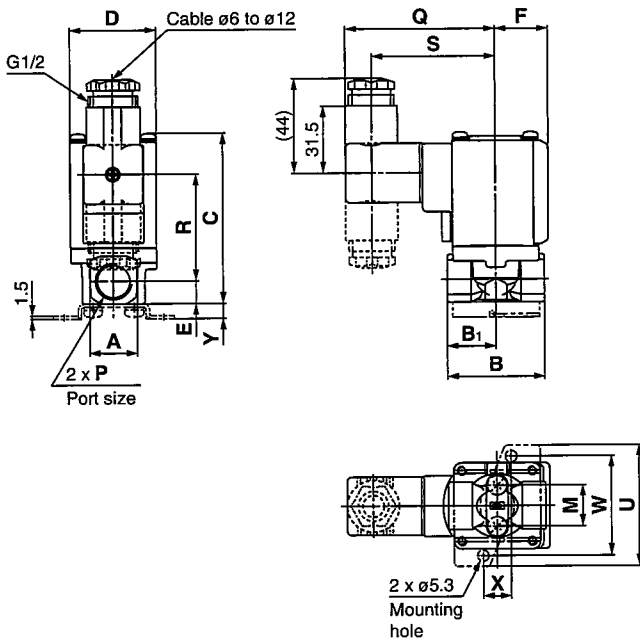
### Grommet



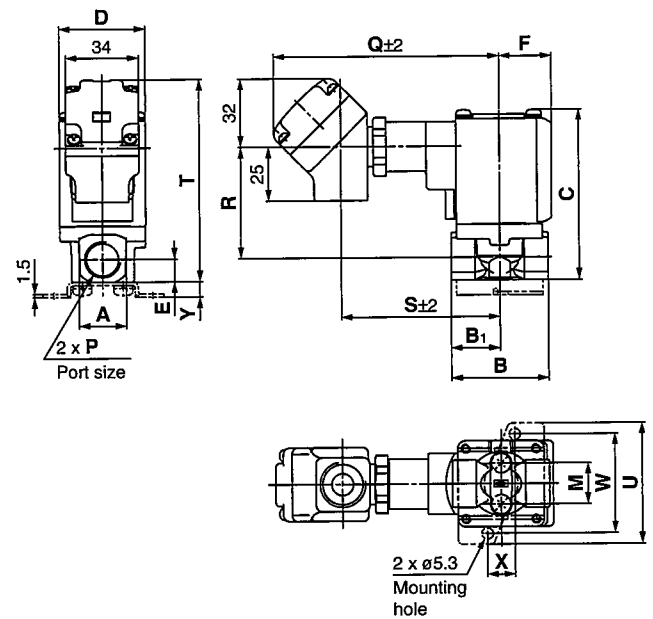
### Grommet (with surge voltage suppressor)



### DIN terminal



### Conduit terminal



(mm)

Size	Port size P	A	B	B <sub>1</sub>	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	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	

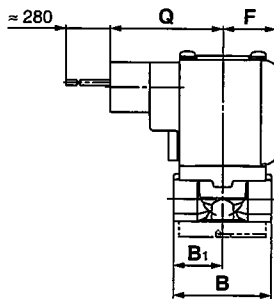
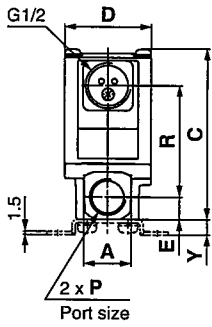
( ): Denotes the Normally Open (N.O.) dimensions.

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

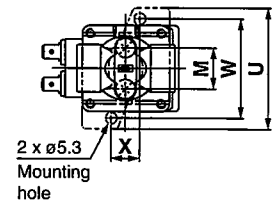
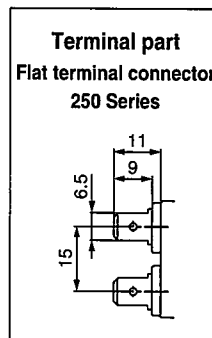
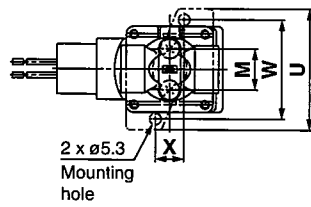
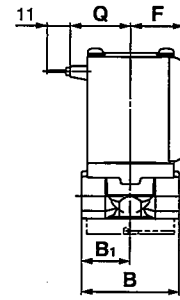
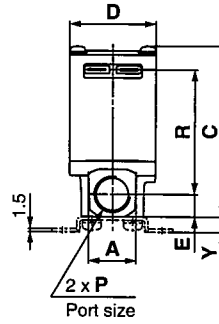


## Dimensions/Body Material: C37, Stainless Steel

### Conduit



### Flat terminal



- Specifications
- For Air
- For Medium Vacuum
- For Water
- For Oil
- For Steam

Size	Port size P	A	B	B <sub>1</sub>	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	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.

- Special Options
- Construction
- Dimensions

# Series VX21/22/23

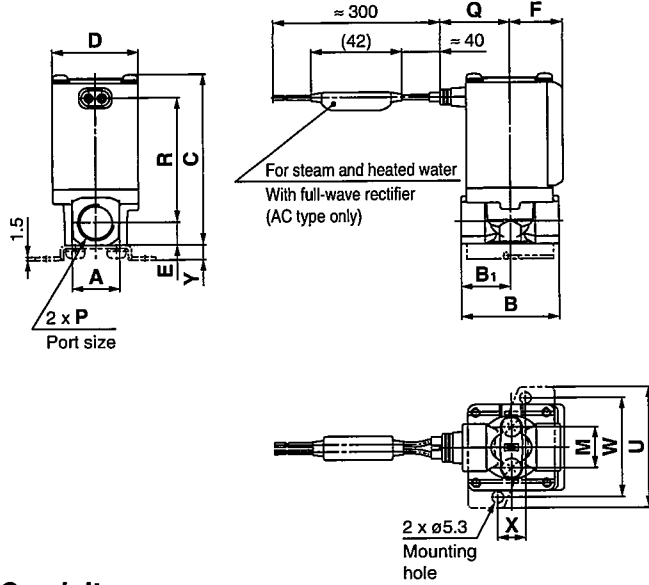


**For Steam**

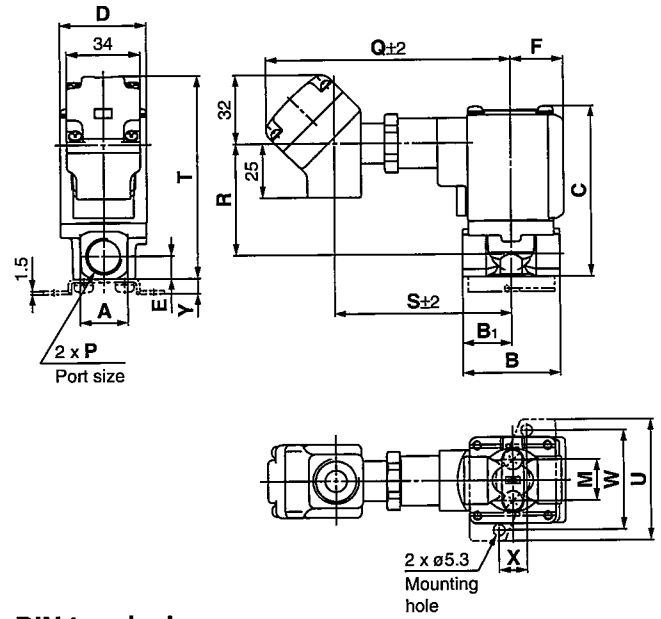
\* Can be used with heated water.

## Dimensions/Body Material: C37, Stainless Steel

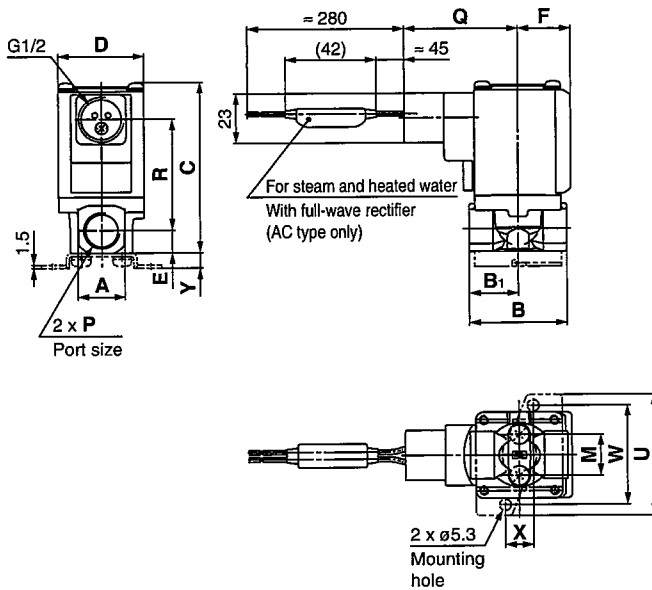
### Grommet



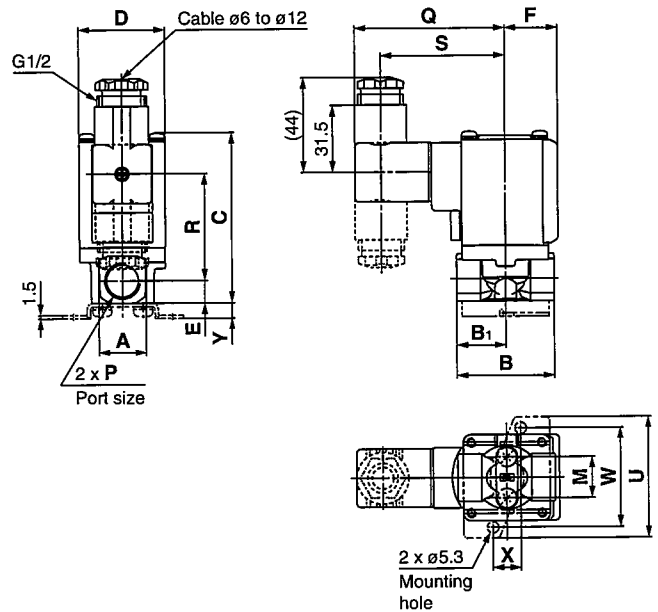
### Conduit terminal



### Conduit



### DIN terminal



(mm)

Size	Port size P	A	B	B <sub>1</sub>	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	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	—	—	—	—	—

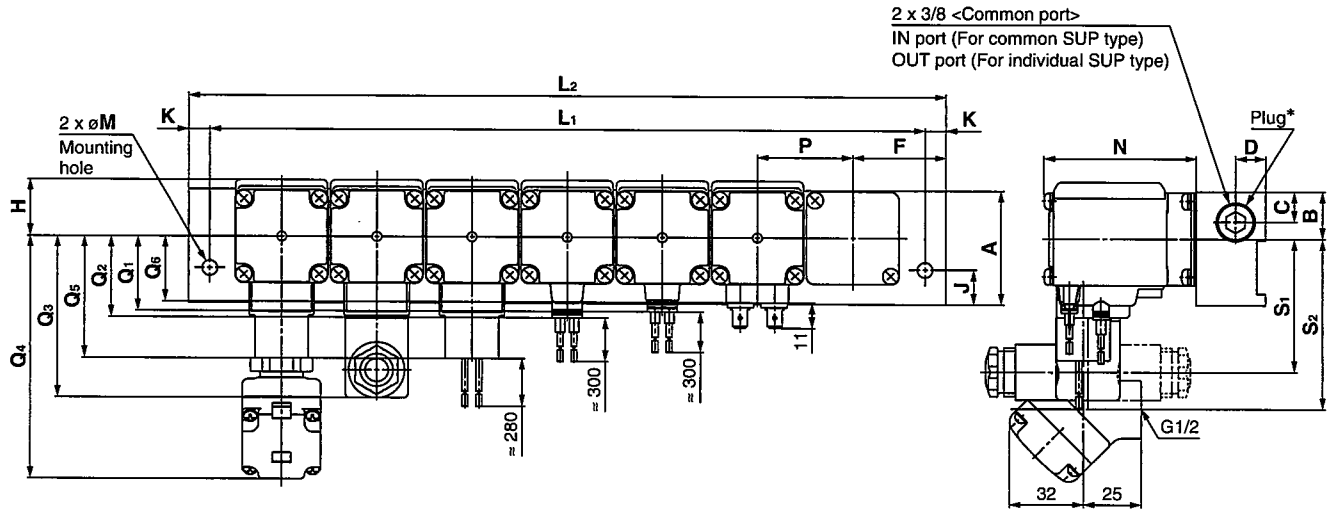
Size	Port size P	Electrical entry										
		Grommet		Conduit terminal				Conduit		DIN terminal		
		Q	R	Q	R	S	T	Q	R	Q	R	S
1	1/8, 1/4	27	42 (47.5)	108	36 (41.5)	77	77 (83)	47.5	36 (41.5)	64.5	34 (39.5)	52.5
2	1/4, 3/8	29.5	53.5 (61.5)	110.5	47 (55)	79.5	89.5 (97.5)	50	47 (55)	67	45 (53)	55
3	1/4, 3/8	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.

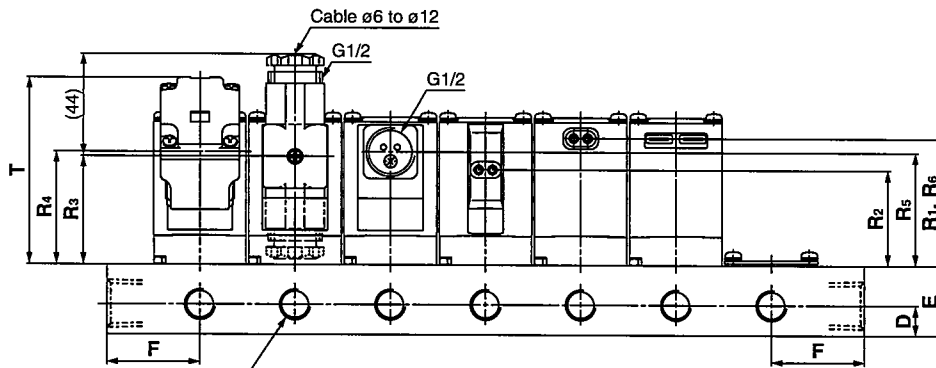
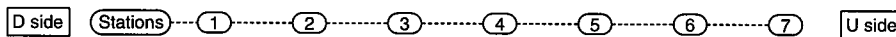
# Direct Operated 2 Port Solenoid Valve Series VX21/22/23



## Dimensions/Manifold/Base Material: Aluminum



\* D side port does not have a plug.



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

(mm)

Size	Dimensions	n (stations)								
		2	3	4	5	6	7	8	9	10
1	L <sub>1</sub>	86	122	158	194	230	266	302	338	374
	L <sub>2</sub>	100	136	172	208	244	280	316	352	388
2	L <sub>1</sub>	90	126	162	198	234	270	306	342	378
	L <sub>2</sub>	108	144	180	216	252	288	324	360	396
3	L <sub>1</sub>	103	144	185	226	267	308	349	390	431
	L <sub>2</sub>	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 <sub>1</sub>	R <sub>1</sub>	Q <sub>2</sub>	R <sub>2</sub>	Q <sub>3</sub>	R <sub>3</sub>	S <sub>1</sub>	Q <sub>4</sub>	R <sub>4</sub>	S <sub>2</sub>	T	Q <sub>5</sub>	R <sub>5</sub>	Q <sub>6</sub>	R <sub>6</sub>
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.

Specifications

For Air

For Medium Vacuum

For Water

For Oil

For Steam

Special Options

Construction

Dimensions

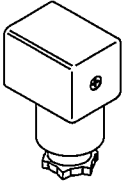
# Series VX21/22/23



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	GDM2A-G-Z5
	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 <sub>4</sub> □□
2	For VX2 <sub>6</sub> □□
	For VX2 <sub>8</sub> □□

\* 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□.



# 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.  $\cos \theta \approx 0.9$

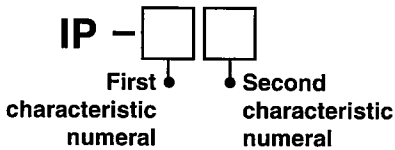
### 2. Surge voltage

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 mm $\phi$ and greater
2	Protected against solid foreign objects of 12 mm $\phi$ and greater
3	Protected against solid foreign objects of 2.5 mm $\phi$ and greater
4	Protected against solid foreign objects of 1.0 mm $\phi$ 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	Dripproof type 1
2	Protected against vertically falling water drops when enclosure tilted up to 15°	Dripproof 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	Immersible 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

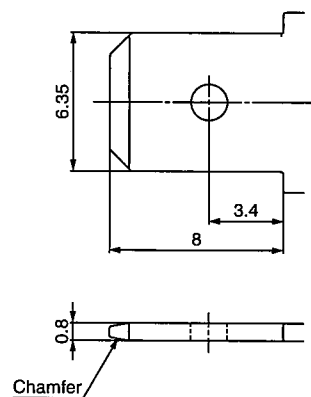
The degreasing and washing of wetted parts

### 3. Symbol

In the symbol ()<sub>W</sub>, 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



# 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	<b>C, b</b>	—	ISO 6358: 1989 JIS B 8390: 2000
	—	<b>S</b>	JIS B 8390: 2000 Equipment: JIS B 8373, 8374, 8375, 8379, 8381
	—	<b>Cv</b>	ANSI/(NFPA)T3.21.3: 1990
Process fluid control equipment	<b>Av</b>	—	IEC60534-2-3: 1997 JIS B 2005: 1995
	—	<b>Cv</b>	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  $\frac{P_2 + 0.1}{P_1 + 0.1} \leq b$ , choked flow

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

When  $\frac{P_2 + 0.1}{P_1 + 0.1} > b$ , 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 [dm<sup>3</sup>/min (ANR)], dm<sup>3</sup> (Cubic decimeter) of SI unit are also allowed to be described by L (liter).  
1 dm<sup>3</sup> = 1 L

- C** : Sonic conductance [dm<sup>3</sup>/(s·bar)]
- b** : Critical pressure ratio [—]
- P<sub>1</sub>** : Upstream pressure [MPa]
- P<sub>2</sub>** : 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 make use of SMC's "Energy Saving Program."

Example)

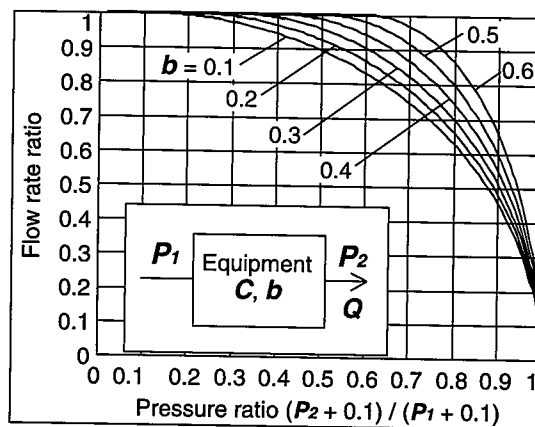
Obtain the air flow rate for **P<sub>1</sub>** = 0.4 [MPa], **P<sub>2</sub>** = 0.3 [MPa], **t** = 20 [°C] when a solenoid valve is performed in **C** = 2 [dm<sup>3</sup>/(s·bar)] and **b** = 0.3.

According to formula 1, the maximum flow rate = 600 x 2 x (0.4 + 0.1) x  $\sqrt{\frac{293}{273 + 20}} = 600$  [dm<sup>3</sup>/min (ANR)]

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

Based on Graph (1), the flow rate will be 0.7 when the pressure ratio is 0.8 and **b** = 0.3.

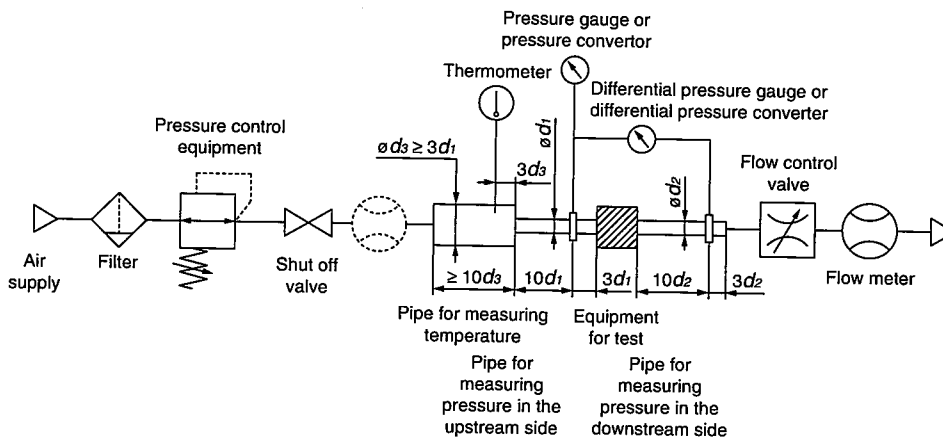
Hence, flow rate = Maximum flow rate x flow rate ratio = 600 x 0.7 = 420 [dm<sup>3</sup>/min (ANR)]



**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. Besides that, substitute each data of others for the subsonic flow formula to find **b**, then obtain the critical pressure ratio **b** from that average.



**Fig. (1) Test circuit based on ISO 6358, JIS B 8390**

## 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: 2 port solenoid valve for pneumatics**

**JIS B 8374: 3 port solenoid valve for pneumatics**

**JIS B 8375: 4 port, 5 port solenoid valve for pneumatics**

**JIS B 8379: Silencer for pneumatics**

**JIS B 8381: Fittings of flexible joint for pneumatics**

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

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

When  $\frac{P_2 + 0.1}{P_1 + 0.1} > 0.5$ , **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[dm<sup>3</sup>/min(ANR)], dm<sup>3</sup> (cubic decimeter) of SI unit are also allowed to be described by L (liter)  
1 dm<sup>3</sup> = 1 L

$S$  : Effective area [mm<sup>2</sup>]

$P_1$  : Upstream pressure [MPa]

$P_2$  : 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 8373, 8374, 8375, 8379, 8381, 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 [mm<sup>2</sup>]

$V$  : Air tank capacity [dm<sup>3</sup>]

$t$  : 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]

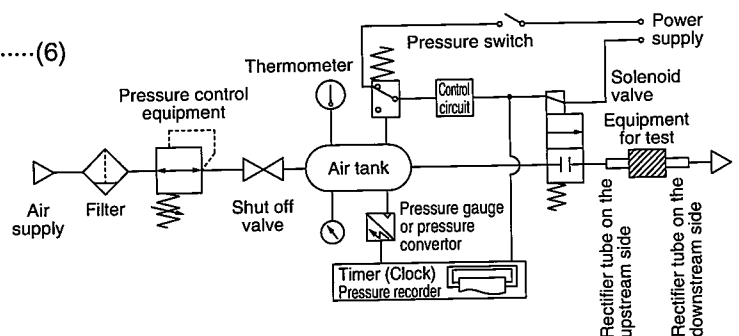


Fig. (2) Test circuit based on JIS B 8390

**2.3 Flow coefficient CV factor**

The United States Standard ANSI/(NFPA)T3.21.3: 1990: Pneumatic fluid power—Flow rating test procedure and reporting method for fixed orifice components

Defines the CV factor of flow coefficient by the following formula which is based on the test conducted by the test circuit analogous to ISO 6358.

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

$\Delta P$  : 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 [dm<sup>3</sup>/s standard condition]

$Pa$  : Atmospheric pressure [bar absolute]

$T_1$  : Upstream absolute temperature [K]

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

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

**JIS B 2005: 1995: Test method for the flow coefficient of a valve**

**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

**Av** factor: Value of the clean water flow rate represented by m<sup>3</sup>/s which runs through a valve (equipment for test) when the pressure difference is 1 Pa. It is calculated using the following formula.

$$Av = Q \sqrt{\frac{\rho}{\Delta P}} \dots\dots\dots(8)$$

**Av** : Flow coefficient [m<sup>2</sup>]

**Q** : Flow rate [m<sup>3</sup>/s]

$\Delta P$  : Pressure difference [Pa]

$\rho$  : Fluid density [kg/m<sup>3</sup>]

(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:

$$Q = 1.9 \times 10^6 Av \sqrt{\frac{\Delta P}{G}} \dots\dots\dots(9)$$

**Q** : Flow rate [L/min]

**Av** : Flow coefficient [m<sup>2</sup>]

$\Delta P$  : Pressure difference [MPa]

**G** : Relative density [water = 1]

In the case of saturated aqueous vapor:

$$Q = 8.3 \times 10^6 Av \sqrt{\Delta P (P_2 + 0.1)} \dots\dots\dots(10)$$

**Q** : Flow rate [kg/h]

**Av** : Flow coefficient [m<sup>2</sup>]

$\Delta P$  : Pressure difference [MPa]

**P<sub>1</sub>** : Upstream pressure [MPa]:  $\Delta P = P_1 - P_2$

**P<sub>2</sub>** : Downstream pressure [MPa]

# Series VX21/22/23

Conversion of flow coefficient:

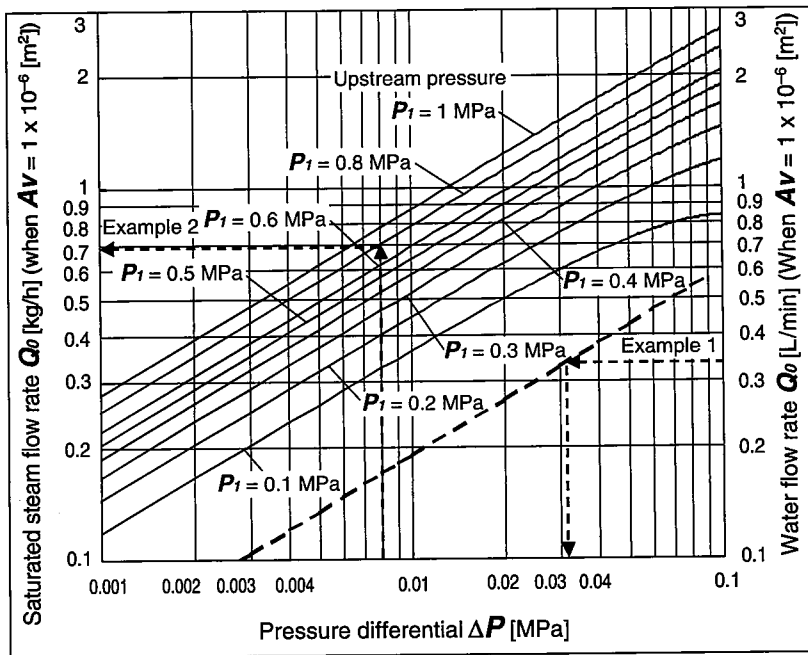
$$Av = 28 \times 10^{-6} Kv = 24 \times 10^{-6} Cv \dots\dots\dots(11)$$

Here,

**Kv** factor : Value of the clean water flow rate represented by m<sup>3</sup>/h which runs through a valve at 5 to 40°C, when the pressure difference is 1 bar.

**Cv** factor (Reference values): Figures representing the flow rate of clean water by US gal/min which runs through a valve at 60°F, when the pressure difference is 1 lbf/in<sup>2</sup> (psi).

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



**Graph (2) Flow-rate characteristics**

Example 1)

Obtain the pressure difference when water 15 [L/min] runs through a solenoid valve with an **Av** = 45 x 10<sup>-6</sup> [m<sup>2</sup>]. Since **Qo** = 15/45 = 0.33 [L/min], according to Graph (2), if reading **ΔP** when **Qo** is 0.33, it will be 0.031 [MPa].

Example 2)

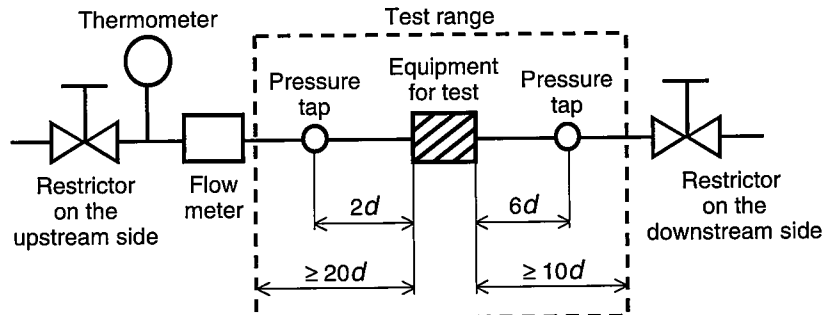
Obtain the saturated steam flow rate when **P1** = 0.8 [MPa], **ΔP** = 0.008 [MPa] with a solenoid valve with an **Av** = 1.5 x 10<sup>-6</sup> [m<sup>2</sup>].

According to Graph (2), if reading **Qo** when **P1** is 0.8 and **ΔP** is 0.008, it is 0.7 [kg/h]. Hence, the flow rate **Q** = 0.7 x 1.5 = 1.05 [kg/h].

(4) Test method

Attach a test equipment with the test circuit shown in Fig. (3). Next, pour water at 5 to 40°C, then measure the flow rate with a pressure difference of 0.075 MPa. However, the pressure difference needs to be set with a large enough difference so that the Reynolds number does not go below a range of 4 x 10<sup>4</sup>.

By substituting the measurement results for formula (8) to figure out **Av**.



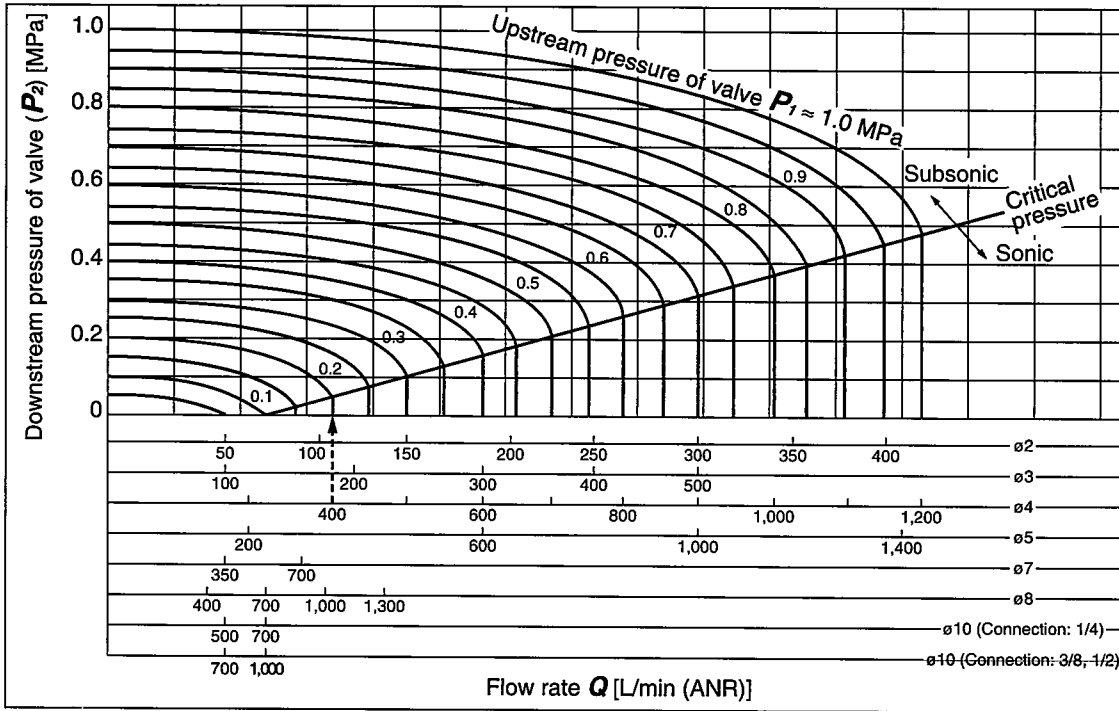
**Fig. (3) Test circuit based on IEC60534-2-3, JIS B 2005**

# Series VX21/22/23

# Flow-rate Characteristics 1

Note) Use this graph as a guide. In the case of obtaining an accurate flow rate, refer to pages 38 through to 42.

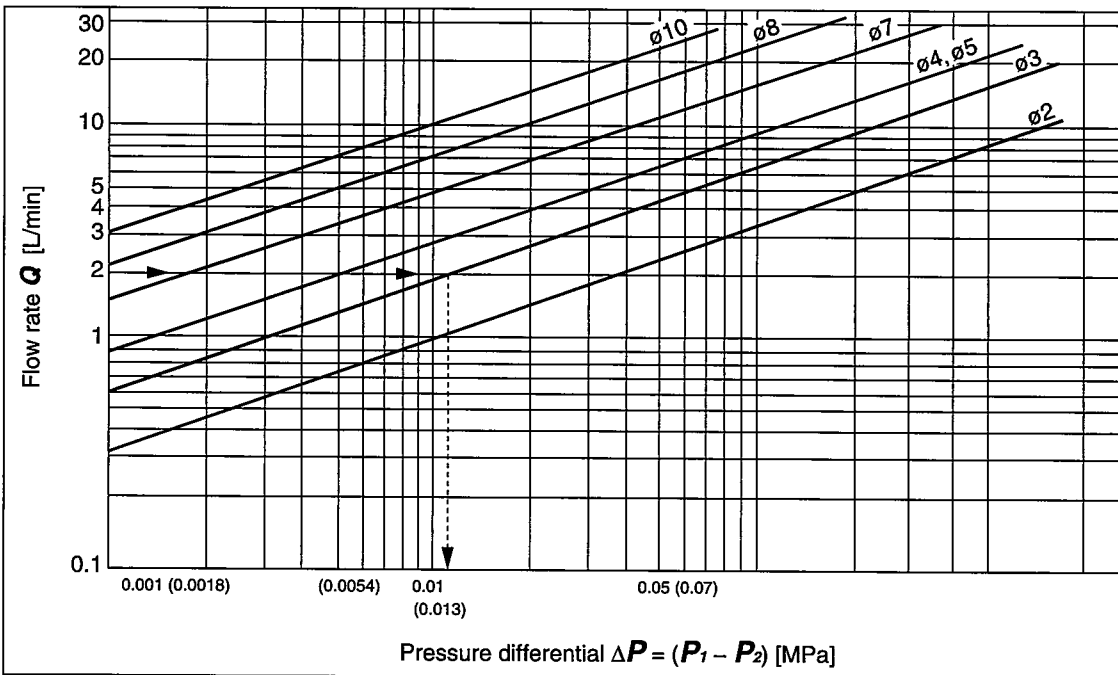
## For Air



### 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  $\phi 4$  orifice and  $P_1 = 0.58$  MPa for a  $\phi 3$  orifice.

## For Water



### How to read the graph

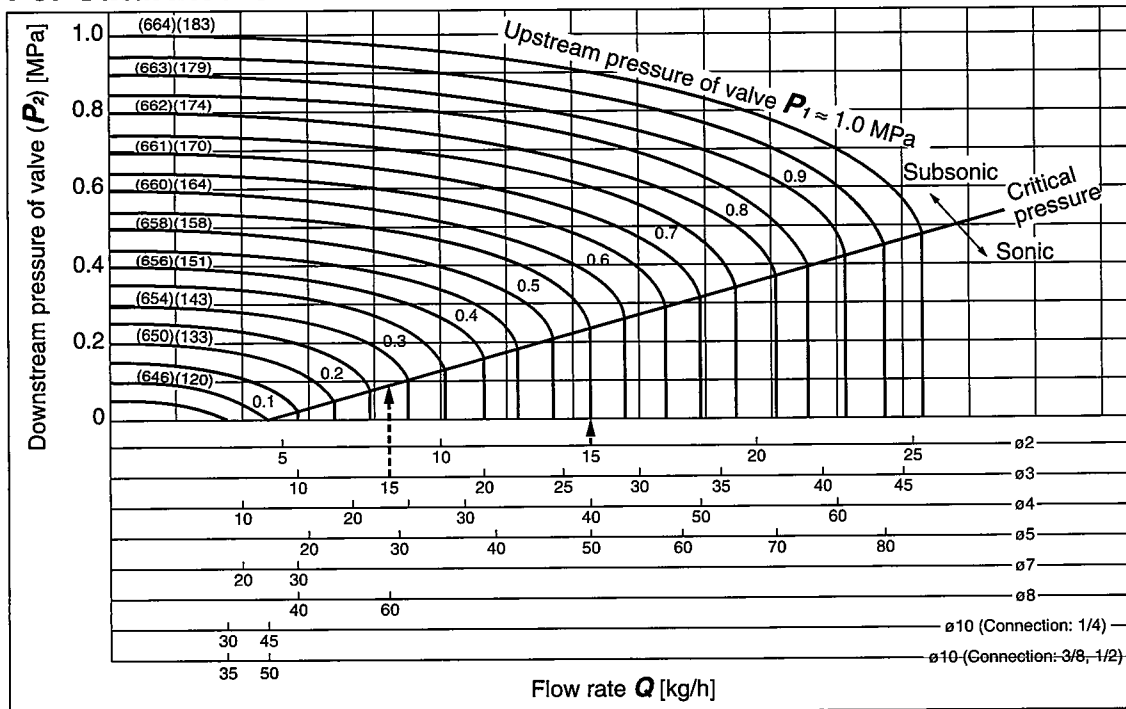
When a water flow of 2 L/min is generated,  $\Delta P = 0.013$  MPa for a valve with  $\phi 3$  orifice.

# Series VX21/22/23

## Flow-rate Characteristics 2

Note) Use this graph as a guide. In the case of obtaining an accurate flow rate, refer to pages 38 through to 42.

### For Saturated Steam



#### How to read the graph

The sonic range pressure to generate a flow rate of 15 kg/h is  $P_1 \approx 0.55$  MPa for a ø2 orifice and  $P_1 \approx 0.28$  MPa for a ø3 orifice. The amount of potential heat varies somewhat based on the pressure  $P_1$ . At 15 kg/h, there will be approximately 9700 kcal/h of heat.





# Series VX21/22/23 Specific Product Precautions 1

Be sure to read this before handling.

Refer to the back cover for Safety Instructions. For 2 Port Solenoid Valves for Fluid Control Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, <http://www.smcworld.com>

## 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**  
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. Liquid rings**  
In cases with a flowing liquid, provide a bypass valve in the system to prevent the liquid from entering the liquid seal circuit.
- 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 mm<sup>2</sup>/s or less. If there is something you do not know, please contact SMC.
  - 2) Flammable oil, Gas**  
Check the specifications for leakage in the interior and/or exterior area.
  - 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.

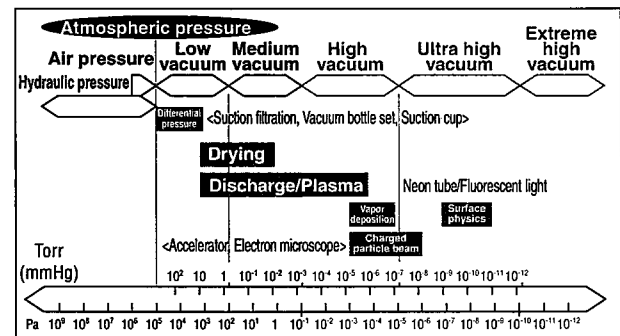
##### 4) If excessive carbon powder is generated, eliminate it by installing mist separators at the upstream side of valves.

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.



# Series VX21/22/23 Specific Product Precautions 2

Be sure to read this before handling.

Refer to the back cover for Safety Instructions. For 2 Port Solenoid Valves for Fluid Control Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, <http://www.smcworld.com>

## Selection

### ⚠ Warning

#### <Water>

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 mm<sup>2</sup>/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.

#### 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

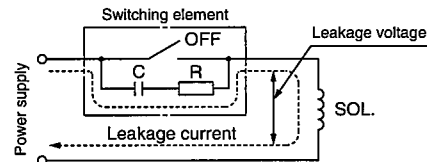
#### 5. Low temperature operation

- 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

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 mm<sup>2</sup>/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.



# Series VX21/22/23 Specific Product Precautions 3

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## 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	

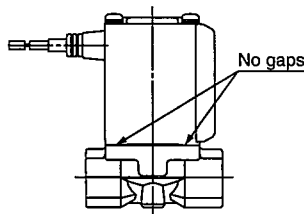


Fig.1

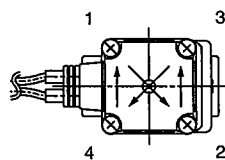


Fig.2

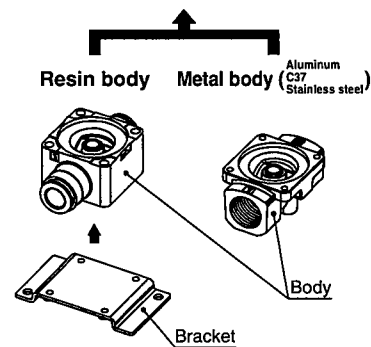
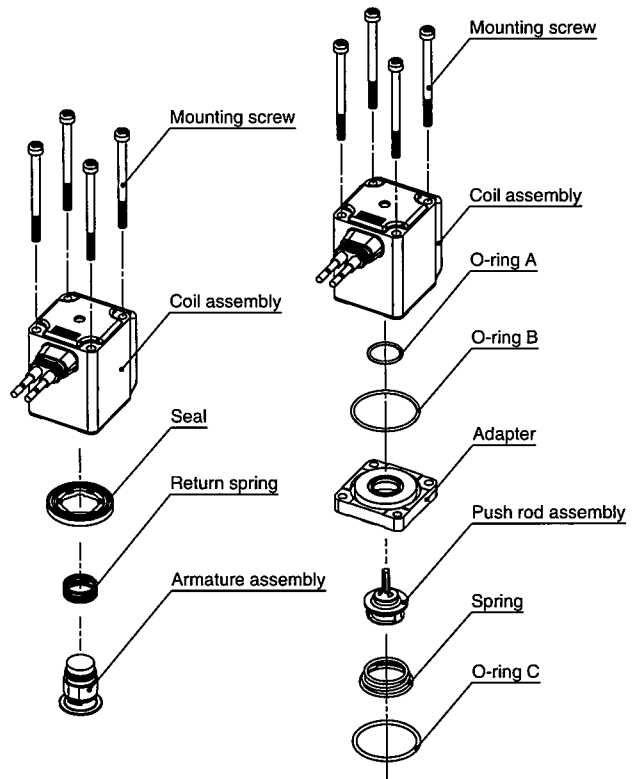
- \* After tightening the screws, make sure that there are no gaps between the coil and body (Fig. 1).
- \* After the disassembly and assembly have been completed, make sure that no leak occurs from the seal. Additionally, when restarting the valve, make sure that the valve operates correctly after checking the safety.

## Disassembly/Assembly Procedures

### Caution

<N.C.>

<N.O.>





# Series VX21/22/23 Specific Product Precautions 4

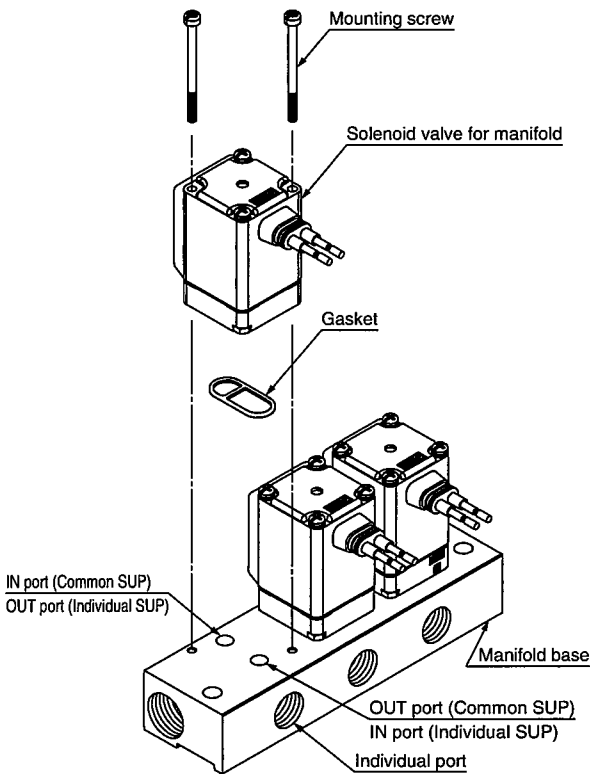
Be sure to read this before handling.

Refer to the back cover for Safety Instructions. For 2 Port Solenoid Valves for Fluid Control Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, <http://www.smcworld.com>

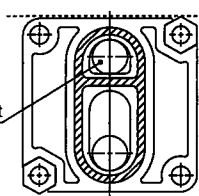
## Disassembly/Assembly Procedures

### ⚠ Caution

#### Manifold Exploded View

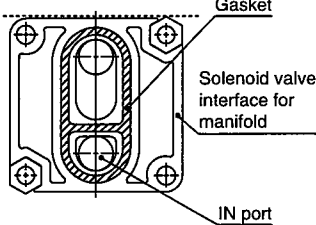


#### Common SUP for air



Individual port side

#### Individual SUP for medium vacuum



Individual port side

- \* 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

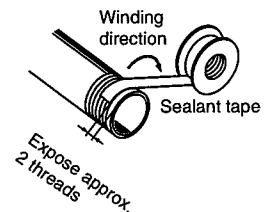
#### 4. Connection of piping to products

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

#### 5. Wrapping 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.



# Series VX21/22/23 Specific Product Precautions 5

Be sure to read this before handling.

Refer to the back cover for Safety Instructions. For 2 Port Solenoid Valves for Fluid Control Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, <http://www.smcworld.com>

## 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.)

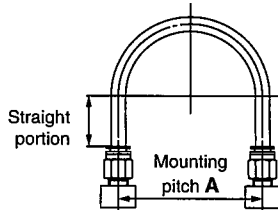


Fig. 1 Recommended piping configuration

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

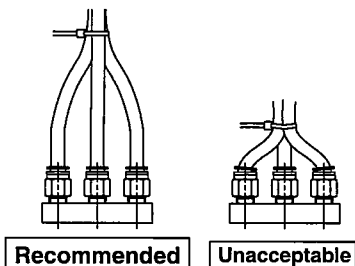


Fig. 2 Binding tubes with bands

## Wiring

### Warning

- 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 mm<sup>2</sup> 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.)



# Series VX21/22/23 Specific Product Precautions 6

Be sure to read this before handling.

Refer to the back cover for Safety Instructions. For 2 Port Solenoid Valves for Fluid Control Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, <http://www.smcworld.com>

## Operating Environment

### Warning

1. Do not use in an atmosphere having corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these.
2. Do not use in explosive atmospheres.
3. Do not use in locations subject to vibration or impact.
4. Do not use in locations where radiated heat will be received from nearby heat sources.
5. Employ suitable protective measures in locations where there is contact with water droplets, 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 (Series VXR). For details, please consult with SMC.

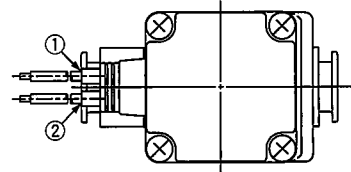
## Electrical Connections

### Caution

#### Grommet

Class B coil: AWG20 Insulator O.D. 2.5 mm

Class H coil: AWG18 Insulator O.D. 2.1 mm

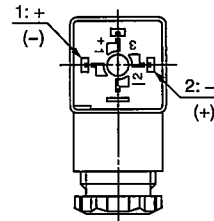


Rated voltage	Lead wire color	
	①	②
DC	Black	Red
100 VAC	Blue	Blue
200 VAC	Red	Red
Other AC	Gray	Gray

\* There is no polarity.

#### DIN terminal

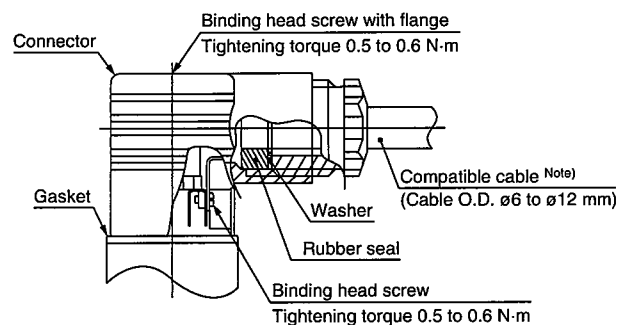
Since internal connections are shown below for the DIN terminal, make connections to the power supply accordingly.



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

\* There is no polarity.

- Use compatible heavy duty cords with cable O.D.  $\phi 6$  to  $\phi 12$  mm.
- Use the tightening torques below for each section.



Note) For an outside cable O.D.  $\phi 9$  to  $\phi 12$  mm, remove the internal parts of the rubber seal before using.



# Series VX21/22/23 Specific Product Precautions 7

Be sure to read this before handling.

Refer to the back cover for Safety Instructions. For 2 Port Solenoid Valves for Fluid Control Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, <http://www.smcworld.com>

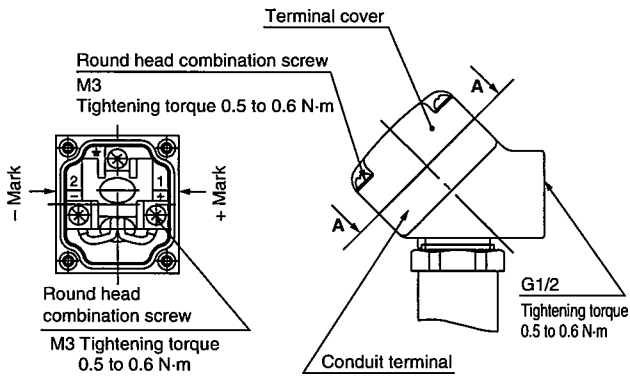
## Electrical Connections

### ⚠ Caution

#### ■ Conduit terminal

In the case of the conduit terminal, make connections according to the marks shown below.

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



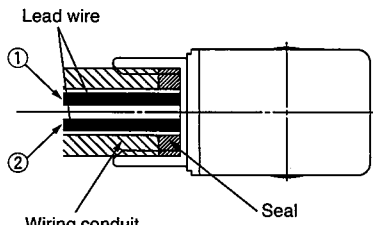
View A-A

(Internal connection diagram)

#### ■ 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

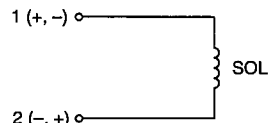
Note) Please order separately.

## Electrical Circuits

### ⚠ Caution

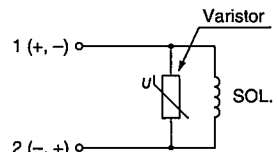
#### [DC circuit]

##### Grommet, Flat terminal



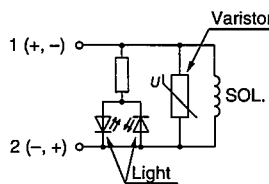
Without electrical option

##### Grommet, DIN terminal, Conduit terminal, Conduit



With surge voltage suppressor

##### DIN terminal, Conduit terminal

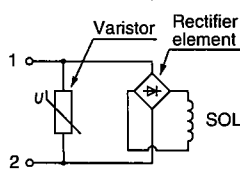


With light/surge voltage suppressor

#### [AC circuit]

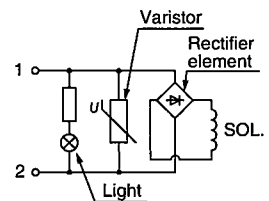
\* For AC (Class B), the standard product is equipped with surge voltage suppressor.

##### 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 appropriate tubing, refer to page 48 and the KQ2 series One-touch fittings in Best Pneumatics No. 6.

The KQ2 series information can be downloaded from the following SMC website, <http://www.smcworld.com>

## Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)\*1), and other safety regulations.

-  **Caution:** Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
-  **Warning:** Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
-  **Danger:** Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

- \*1) ISO 4414: Pneumatic fluid power – General rules relating to systems.  
 ISO 4413: Hydraulic fluid power – General rules relating to systems.  
 IEC 60204-1: Safety of machinery – Electrical equipment of machines.  
 (Part 1: General requirements)  
 ISO 10218-1: Manipulating industrial robots – Safety.  
 etc.

### Warning

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

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

#### 2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

#### 3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

#### 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

### Caution

#### 1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.  
 If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.  
 If anything is unclear, contact your nearest sales branch.

### Limited warranty and Disclaimer/ Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

#### Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)  
 Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.  
 This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

\*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.  
 Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

#### Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.


### Caution

#### SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country. Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

#### Revision history

<p><b>Edition B</b></p> <ul style="list-style-type: none"> <li>* Added N.O. valve.</li> <li>* Added steam as a fluid (Insulation type Class H).</li> <li>* Added manifold.</li> <li>* Increased pages from 32 to 48.</li> </ul> <p style="text-align: right;">QV</p>	<p><b>Edition D</b></p> <ul style="list-style-type: none"> <li>* Faston terminal is changed to flat terminal.</li> <li>* Added UL-compliant (For Air/Water).</li> <li>* Increased pages from 52 to 56.</li> </ul> <p style="text-align: right;">SZ</p>
<p><b>Edition C</b></p> <ul style="list-style-type: none"> <li>* Added installation options.</li> <li>* Added disassembly/assembly procedures.</li> <li>* Leakage voltage (AC coil) was corrected from 10% or less to 5% or less.</li> <li>* Increased pages from 48 to 52.</li> </ul> <p style="text-align: right;">RX</p>	

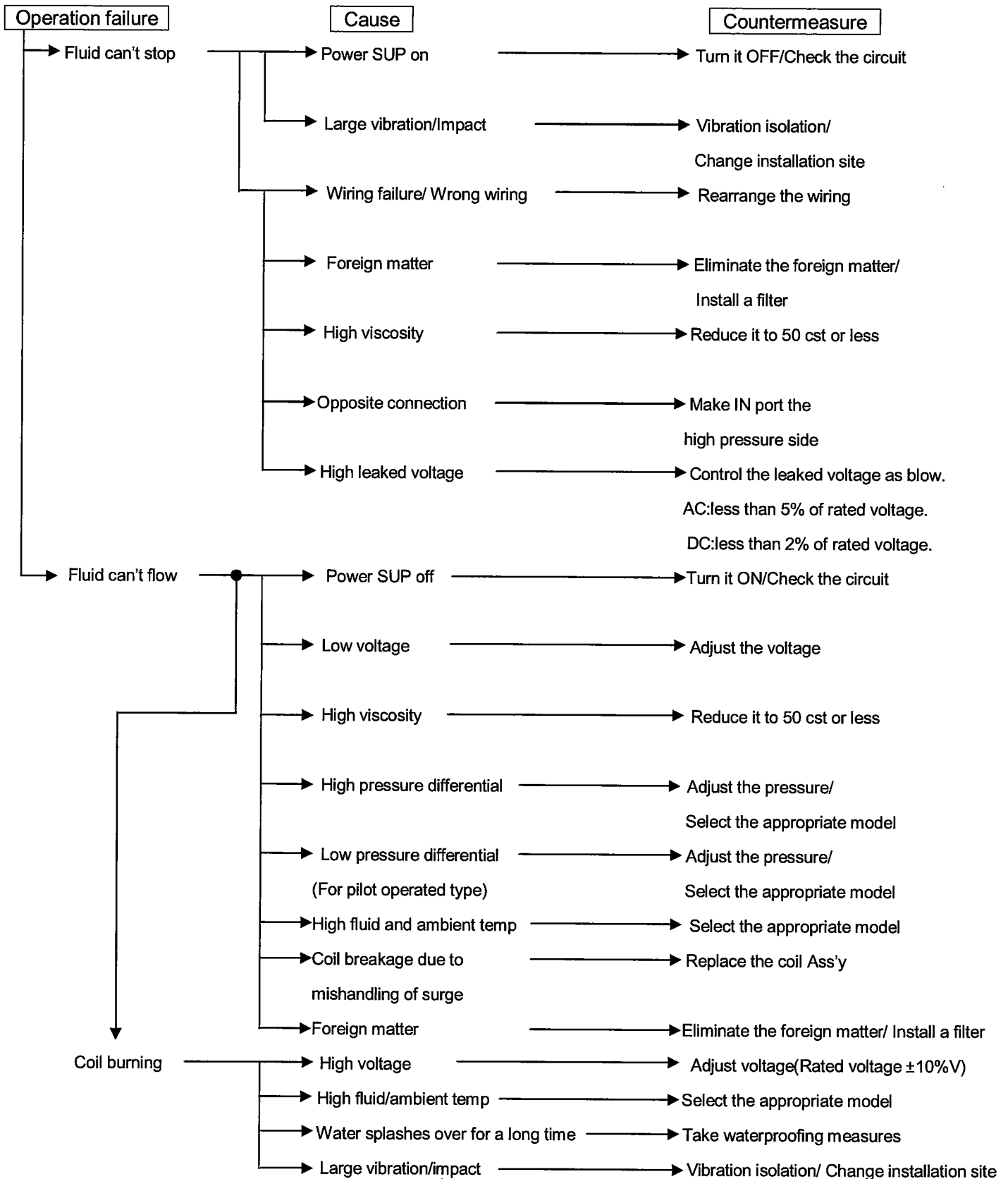
 **Safety Instructions** Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.



# Trouble shooting

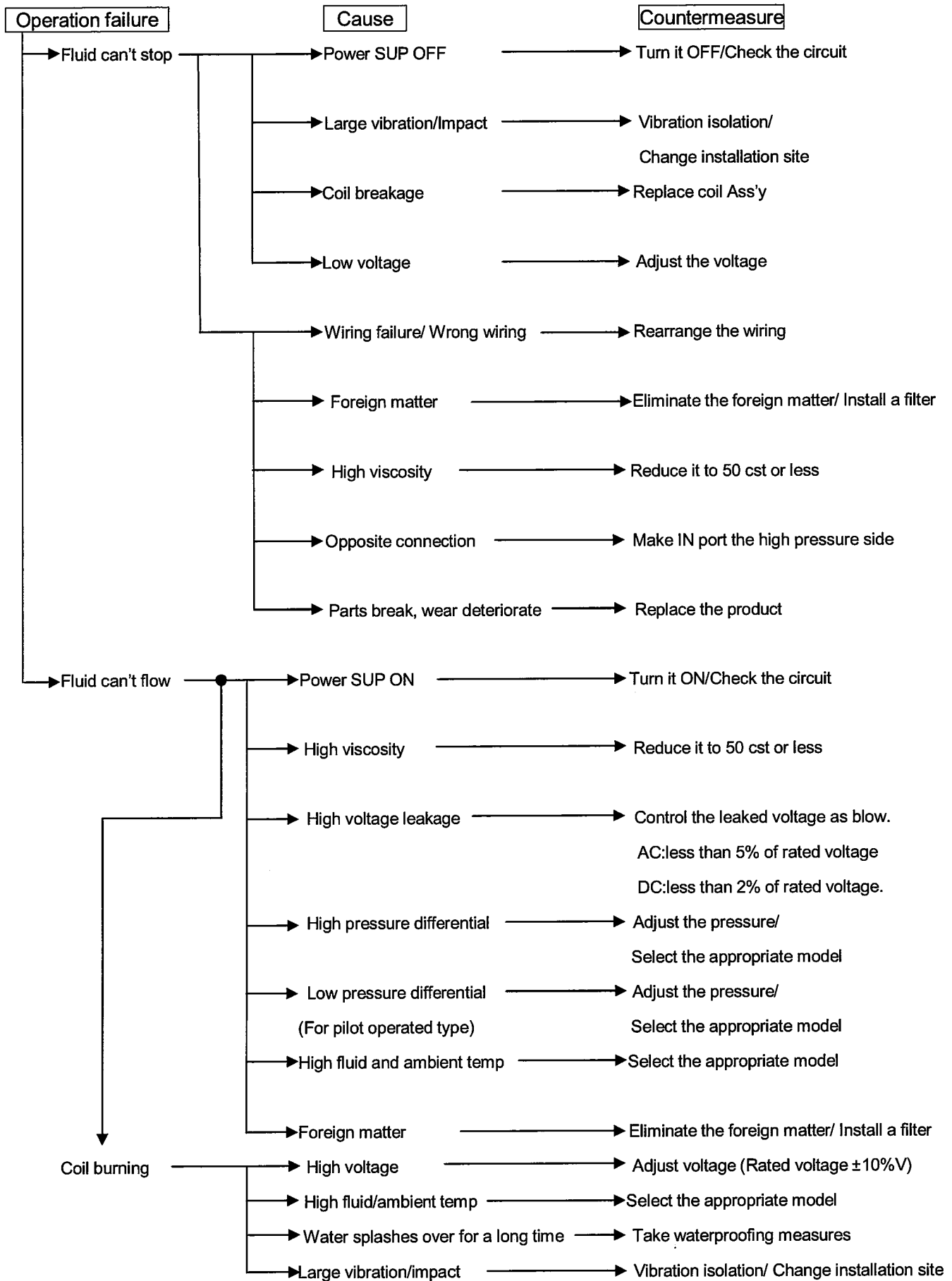
If abnormal operations occur while in use,  
please check the following flowchart and take the appropriate measures.

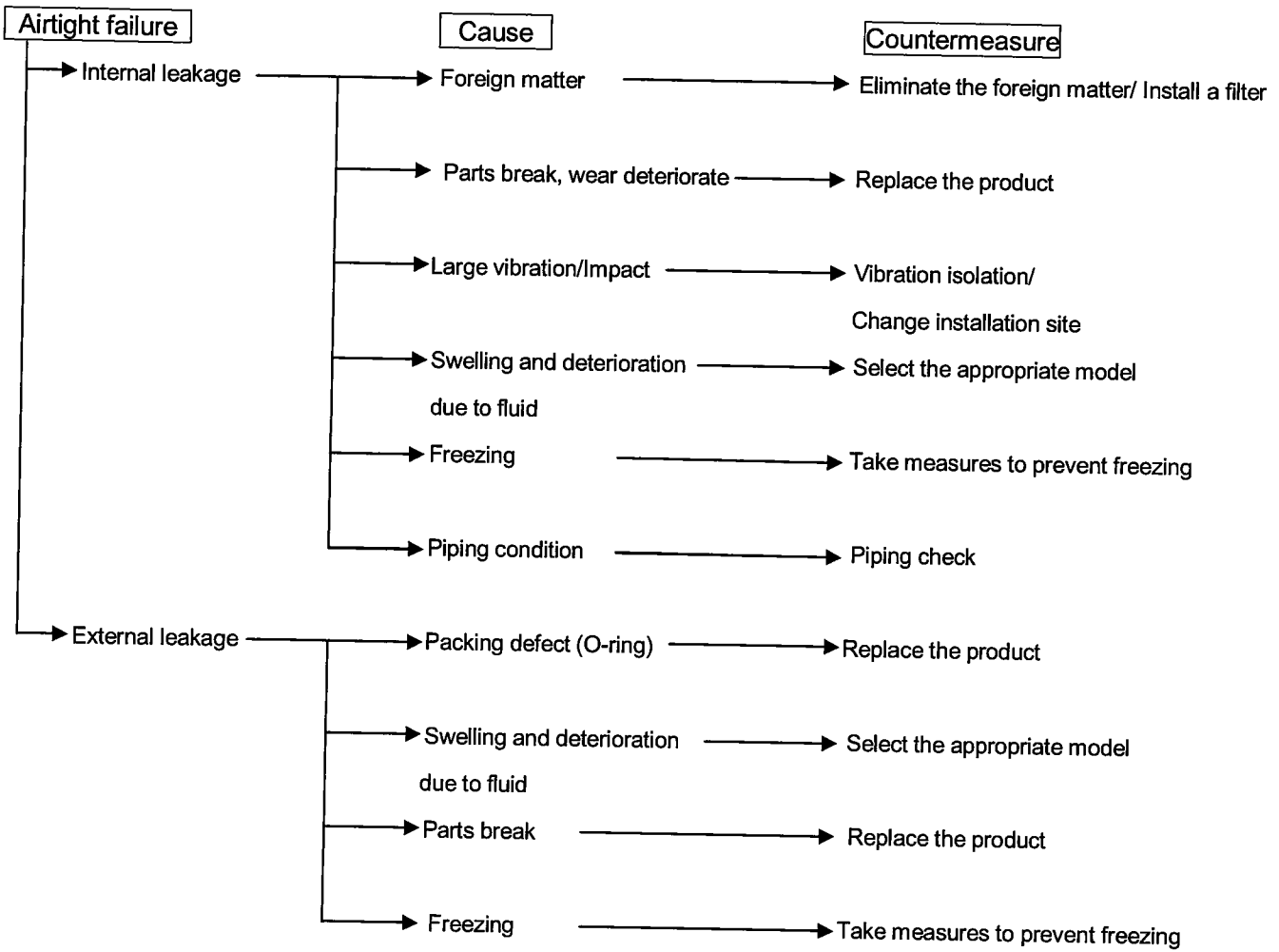
<For Normal Close(N.C.)>

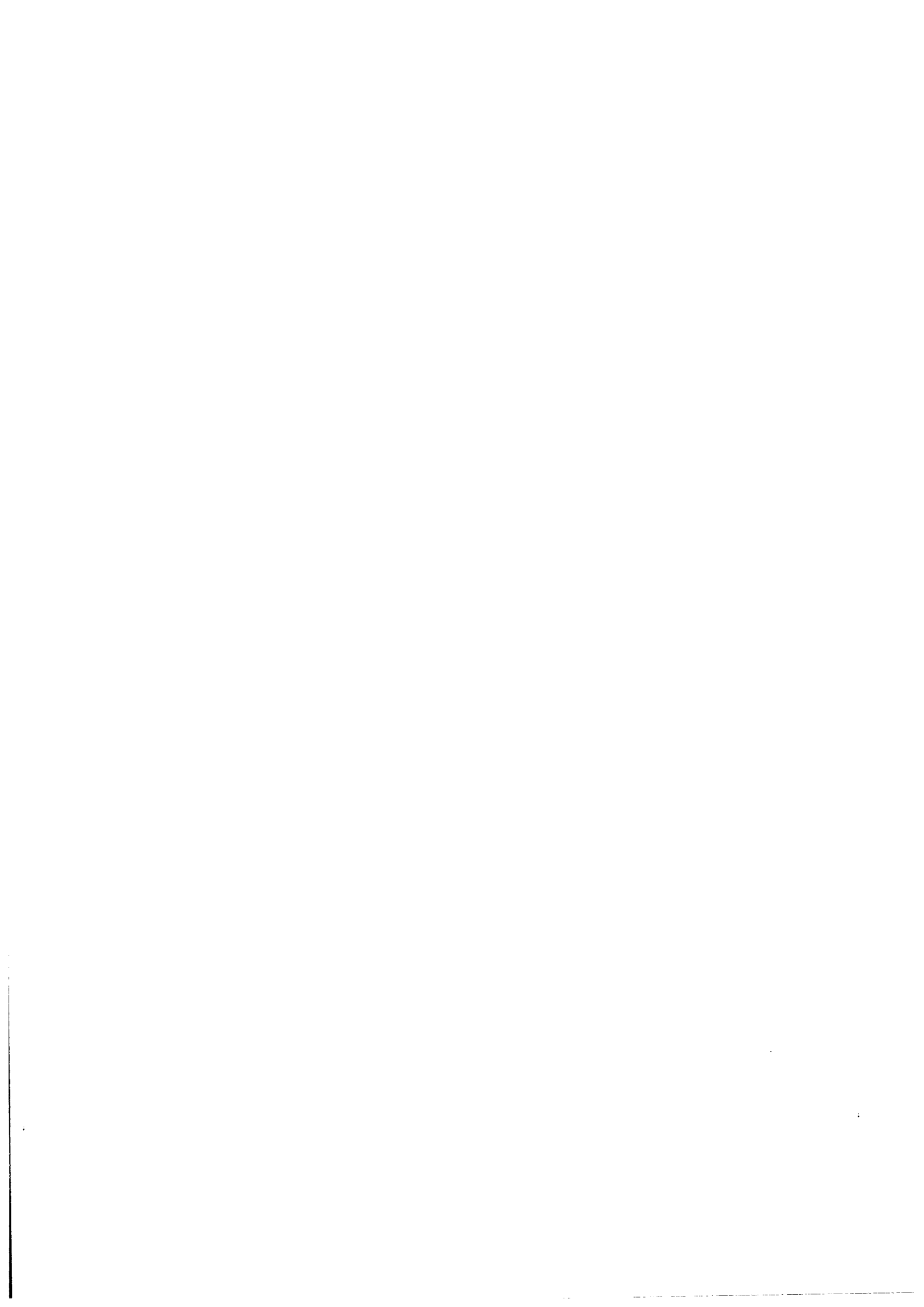


If abnormal operations occur while in use,  
 please check the following flowchart and take the appropriate measures.

<For Normal Close(N.O.)>









Revision history

A: Add to specification

B: Add to troubleshooting

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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