Doc. no.VXZS***-OMZ0009

Operation Manual

PRODUCT NAME

PILOT OPERATED 2 PORT SOLENOID VALVE

MODEL / Series / Product Number

２５Ａ－ＶＸＺ＊＊＊＊＊

SMC Corporation

Contents

VXZ Series
Common Specifications

Standard Specifications

Valve specifications	**Valve construction**		Zero differential pressure type pilot operated 2 port diaphragm type
	Withstand pressure		2.0 MPa (Resin body type 1.5 MPa)
	Body material		Aluminum, Stainless steel Note 1)
	Seal material		NBR, FKM
	Enclosure		Dust-tight, Water-jet-proof type (equivalent to IP65) Note 2) 4)
	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) Note 3)
		DC	24 VDC, (12 VDC) Note 3)
	Allowable voltage fluctuation		±10% of rated voltage
	Allowable leakage voltage	**AC (Built-in full-wave rectifier type)**	5% or less of rated voltage
		DC	2% or less of rated voltage
	Coil insulation type		Class B (for air, water, oil), Class H (for heated water, high temperature oil)

Note 1) Body material is aluminum body is available only for the VXZ2$^{3}_{A}$.
Note 2) Electrical entry flat terminal type terminal is IP40.
Note 3) Voltage in ( ) indicates special voltage.
Note 4) For enclosure, refer to “Glossary of Terms”. When using the product in a place which requires water resistance, please contact SMC.

⚠ Be sure to read “Specific Product Precautions” before handling.
⚠ When pressure differential is less than 0.01 MPa, operation may become unstable. Please contact SMC in case of low flow operation.

Solenoid Coil Specifications

Normally Closed (N.C.)
DC Specification
Class B

Model	Power consumption (W) Note 1)	Temperature rise (°C) Note 2)
VXZ23, 24	7	55
VXZ25, 26	10.5	65

Class H

Model	Power consumption (W) Note 1)	Temperature rise (°C) Note 2)
VXZ23, 24	12	100
VXZ25, 26	15	100

Normally Open (N.O.)
DC Specification
Class B

Model	Power consumption (W) Note 1)	Temperature rise (°C) Note 2)
VXZ2A, 2B	8.5	70
VXZ2C, 2D	12.5	70

Class H

Model	Power consumption (W) Note 1)	Temperature rise (°C) Note 2)
VXZ2A, 2B	12	100
VXZ2C, 2D	15	100

Note 1) Power consumption, Apparent power: 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.

Normally Closed (N.C.)
AC Specification (Built-in Full-wave Rectifier Type)
Class B

Model	Apparent power (VA) Note 1) 2)	Temperature rise (°C) Note 3)
VXZ23, 24	9.5	70
VXZ25, 26	12	70

Class H

Model	Apparent power (VA) Note 1) 2)	Temperature rise (°C) Note 3)
VXZ23, 24	12	100
VXZ25, 26	15	100

Normally Open (N.O.)
AC Specification (Built-in Full-wave Rectifier Type)
Class B

Model	Apparent power (VA) Note 1) 2)	Temperature rise (°C) Note 3)
VXZ2A, 2B	10	70
VXZ2C, 2D	14	70

Class H

Model	Apparent power (VA) Note 1) 2)	Temperature rise (°C) Note 3)
VXZ2A, 2B	12	100
VXZ2C, 2D	15	100

Note 1) Power consumption, 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 (Built-in full-wave rectifier type).
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.

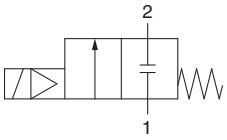
For Air

∗ Can be used with low vacuum (up to 133 Pa.abs).

Flow Rate Characteristics

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.

Normally Closed (N.C.)

Body material	Port size (Nominal diameter)	Orifice diameter (mmø)	Model	Min. operating pressure differential Note 1) (MPa)	Max. operating pressure differential Note 3) (MPa)		Flow rate characteristics				Max. system pressure Note 3) (MPa)	Weight Note 2) (g)
					AC	DC	C [dm³/(s·bar)]	b	Cv	Effective area (mm²)		
Aluminum	1/4 (8A)	10	**VXZ230**	0	1.0	0.7	8.5	0.44	2.4	—	1.5	600
	3/8 (10A)						9.3	0.43	2.6			
Stainless steel	1/2 (15A)	15	**VXZ240**				23.0	0.34	6.0			720
	3/4 (20A)	20	**VXZ250**			1.0	36.0	0.26	9.4			1100
	1 (25A)	25	**VXZ260**				—			185		1300

Note 1) The operation of the valve may be unstable due to the capacity of the pressure supply source such as pumps and compressors or the pressure loss by the orifice of piping. Please contact SMC to check if the required valve size can be used in the application. Please contact SMC for the compatibility of the circuit flow and valve size.

Note 2) Weight of grommet type. Add 10 g for conduit, 30 g for DIN terminal, and 60 g for conduit terminal type respectively.

Note 3) Refer to “Glossary of Terms” for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
−10 Note) to 60	−20 to 60

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

Valve Leakage Rate

Internal Leakage

Seal material	Leakage rate (Air) Note 1) 2)
NBR (FKM) Note 3)	15 cm³/min or less (Aluminum body type)
	1 cm³/min or less (Metal body type)

External Leakage

Seal material	Leakage rate (Air) Note 1)
NBR (FKM) Note 3)	15 cm³/min or less (Aluminum body type)
	1 cm³/min or less (Metal body type)

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

Note 2) Leakage is the value when the pressure differential ranges from 0.01 MPa to the maximum operating pressure differential.

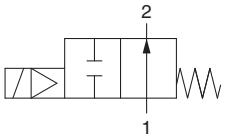
Note 3) For seal material/FKM, refer to “Other options” for the selection.

Note 4) When the product is used with low vacuum (to 133 Pa.abs), give caution to the external leakage outlined above.

Flow Rate Characteristics

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 Open (N.O.)

Body material	Port size (Nominal diameter)	Orifice diameter (mmø)	Model	Min. operating pressure differential Note 1) (MPa)	Max. operating pressure differential Note 3) (MPa)		Flow rate characteristics				Max. system pressure Note 3) (MPa)	Weight Note 2) (g)
					AC	DC	C [dm³/(s·bar)]	b	Cv	Effective area (mm²)		
Aluminum	1/4 (8A)	10	**VXZ2A0**	0	0.7	0.6	8.5	0.44	2.4	—	1.5	630
	3/8 (10A)						9.3	0.43	2.6			
Stainless steel	1/2 (15A)	15	**VXZ2B0**				23.0	0.34	6.0			750
	3/4 (20A)	20	**VXZ2C0**				36.0	0.26	9.4			1150
	1 (25A)	25	**VXZ2D0**				—			185		1350

Note 1) The operation of the valve may be unstable due to the capacity of the pressure supply source such as pumps and compressors or the pressure loss by the orifice of piping. Please contact SMC to check if the required valve size can be used in the application. Please contact SMC for the compatibility of the circuit flow and valve size.
Note 2) Weight of grommet type. Add 10 g for conduit, 30 g for DIN terminal, and 60 g for conduit terminal type respectively.
Note 3) Refer to “Glossary of Terms” for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
–10 Note) to 60	–20 to 60

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

Valve Leakage Rate

Internal Leakage

Seal material	Leakage rate (Air) Note 1) 2)
NBR (FKM) Note 3)	15 cm³/min or less (Aluminum body type)
	1 cm³/min or less (Metal body type)

External Leakage

Seal material	Leakage rate (Air) Note 1)
NBR (FKM) Note 3)	15 cm³/min or less (Aluminum body type)
	1 cm³/min or less (Metal body type)

Note 1) Leakage is the value at ambient temperature 20°C.
Note 2) Leakage is the value when the pressure differential ranges from 0.01 MPa to the maximum operating pressure differential.
Note 3) For seal material/FKM, refer to “Other options” for the selection.
Note 4) When the product is used with low vacuum (to 133 Pa.abs), give caution to the external leakage outlined above.

Zero Differential Pressure Type
Pilot Operated 2-Port Solenoid Valve/For Air
25A-VXZ Series

CE RoHS

How to Order (Single Unit)

25A – VXZ2 [3] [0] [A] [A]

- **25A**: Series compatible with secondary batteries
- **VXZ2**: Series compatible with secondary batteries
- **[3]**: Size/Valve type
- **[0]**: Fluid
- **[A]**: Body material/Port size/Orifice diameter
- **[A]**: Voltage/Electrical entry

Fluid

0	For Air

Size/Valve type

Symbol	Body size	Valve type
3	10A	N.C.
A		N.O.
4	15A	N.C.
B		N.O.
5	20A	N.C.
C		N.O.
6	25A	N.C.
D		N.O.

Body material/Port size/Orifice diameter

Symbol	Body material	Port size	Orifice diameter
A	Aluminum	1/4	10
B		3/8	
G	Stainless steel	1/2	15
J	Stainless steel	3/4	20
L	Stainless steel	1	25

Common Specifications

Seal material	NBR
Coil insulation type	Class B
Thread type	Rc

Voltage/Electrical entry

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

All other special options are the same as those of the standard model.

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 (Standard for resin body)	
Special electrical entry direction	

* The 25A- series specifications and dimensions are the same as those of the standard model.

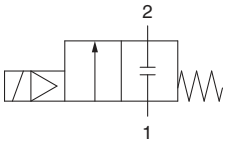
For Water

∗ Can be used with air (Up to 133 Pa.abs for vacuum).
Note that the maximum operating pressure differential and flow rate characteristics should be within the specifications for air.

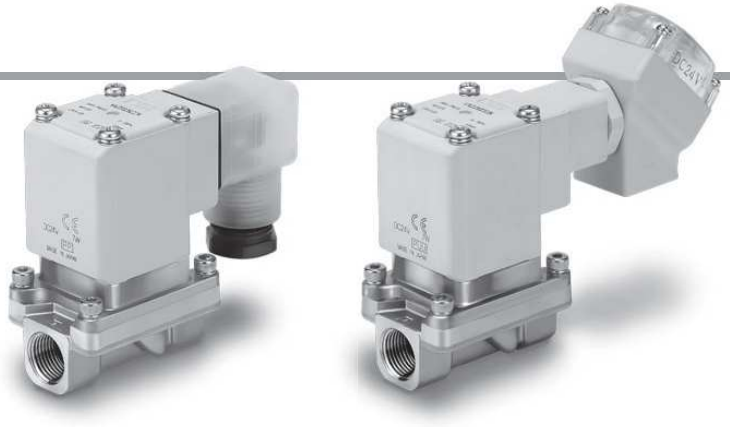
Flow Rate Characteristics

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.



Normally Closed (N.C.)

Body material	Port size (Nominal diameter)	Orifice diameter (mmø)	Model	Min. operating pressure differential Note 1) (MPa)	Max. operating pressure differential (MPa) Note 3)		Flow rate characteristics		Max. system pressure Note 3) (MPa)	Weight Note 2) (g)
					AC	DC	Kv	Cv		
Stainless steel	1/4 (8A)	10	**VXZ232**	0	1.0	0.7	1.6	1.9	1.5	600
	3/8 (10A)						2.0	2.4		
	1/2 (15A)	15	**VXZ242**				4.6	5.3		720
	3/4 (20A)	20	**VXZ252**			1.0	7.8	9.2		1100
	1 (25A)	25	**VXZ262**				8.7	10.2		1300

Note 1) The operation of the valve may be unstable due to the capacity of the pressure supply source such as pumps and compressors or the pressure loss by the orifice of piping. Please contact SMC to check if the required valve size can be used in the application. Please contact SMC for the compatibility of the circuit flow and valve size.
Note 2) Weight of grommet type. Add 10 g for conduit, 30 g for DIN terminal, and 60 g for conduit terminal type respectively.
Note 3) Refer to “Glossary of Terms” for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
1 to 60	–20 to 60

Note) With no freezing

Valve Leakage Rate

Internal Leakage

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

External Leakage

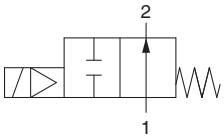
Seal material	Leakage rate (Water) Note 1)
NBR (FKM) Note 3)	0.1 cm^3/min or less

Note 1) Leakage is the value at ambient temperature 20°C.
Note 2) Leakage is the value when the pressure differential ranges from 0.01 MPa to the maximum operating pressure differential.
Note 3) For seal material/FKM, refer to “Other options” for the selection.

Flow Rate Characteristics

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 Open (N.O.)

Body material	Port size (Nominal diameter)	Orifice diameter (mmø)	Model	Min. operating pressure differential Note 1) (MPa)	Max. operating pressure differential Note 3) (MPa)		Flow rate characteristics		Max. system pressure Note 3) (MPa)	Weight Note 2) (g)
					AC	DC	Kv	Cv		
Stainless steel	1/4 (8A)	10	**VXZ2A2**	0	0.7	0.6	1.6	1.9	1.5	630
	3/8 (10A)						2.0	2.4		
	1/2 (15A)	15	**VXZ2B2**				4.6	5.3		750
	3/4 (20A)	20	**VXZ2C2**				7.8	9.2		1150
	1 (25A)	25	**VXZ2D2**				8.7	10.2		1350

Note 1) The operation of the valve may be unstable due to the capacity of the pressure supply source such as pumps and compressors or the pressure loss by the orifice of piping. Please contact SMC to check if the required valve size can be used in the application. Please contact SMC for the compatibility of the circuit flow and valve size.
Note 2) Weight of grommet type. Add 10 g for conduit, 30 g for DIN terminal, and 60 g for conduit terminal type respectively.
Note 3) Refer to “Glossary of Terms” for details on the maximum operating pressure differential and the maximum system pressure.

Fluid and Ambient Temperature

Fluid temperature (°C)	Ambient temperature (°C)
1 to 60	–20 to 60

Note) With no freezing

Valve Leakage Rate

Internal Leakage

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

External Leakage

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

Note 1) Leakage is the value at ambient temperature 20°C.
Note 2) Leakage is the value when the pressure differential ranges from 0.01 MPa to the maximum operating pressure differential.
Note 3) For seal material/FKM, refer to “Other options” for the selection.

Zero Differential Pressure Type
Pilot Operated 2-Port Solenoid Valve/For Water
25A-VXZ Series

How to Order (Single Unit)

25A – VXZ2 [3] [2] [C] [A]

- **25A**: Series compatible with secondary batteries
- **3**: Size/Valve type
- **2**: Fluid
- **C**: Body material/Port size/Orifice diameter
- **A**: Voltage/Electrical entry

Fluid

2	For Water

Common Specifications

Seal material	NBR
Coil insulation type	Class B
Thread type	Rc

Size/Valve type

Symbol	Body size	Valve type
3	10A	N.C.
A		N.O.
4	15A	N.C.
B		N.O.
5	20A	N.C.
C		N.O.
6	25A	N.C.
D		N.O.

Body material/Port size/Orifice diameter

Symbol	Body material	Port size	Orifice diameter
C	Stainless steel	1/4	10
D		3/8	
G	Stainless steel	1/2	15
J	Stainless steel	3/4	20
L	Stainless steel	1	25

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

All other special options are the same as those of the standard model.

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

* The 25A- series specifications and dimensions are the same as those of the standard model.

VXZ Series
Other Special Options

Electrical Options

VXZ2 3 0 A Z 1A

- **Enter standard product number.**
- **Electrical option**
- **Special voltage/Electrical entry/Electrical option**

Specification	Symbol	Class H*	Voltage	Electrical entry
Special voltage	1A	●	48 VAC	Grommet (With surge voltage suppressor)
	1B	●	220 VAC	
	1C	●	240 VAC	
	1U	●	24 VAC	
	1D	—	12 VDC	Grommet
	1E	—	12 VDC	Grommet (With surge voltage suppressor)
	1F	●	48 VAC	DIN terminal (With surge voltage suppressor)
	1G	●	220 VAC	
	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	Conduit (With surge voltage suppressor)
	1Q	●	220 VAC	
	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	
	2V	●	24 VAC	
	2J	—	12 VDC	
	2K	—	24 VDC	Conduit terminal (With surge voltage suppressor)
	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	

●: Also applicable to Class "H" coil.
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

VXZ2 3 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
A	—	—	G*2
B			NPT
C	○	—	Rc, One-touch fitting
D	—	○	G*2
E			NPT
F	○	—	G*2
G			NPT
H	○	○	Rc, One-touch fitting
K			G*2
L			NPT
Z	—	○	Rc, One-touch fitting

*1 Applicable to air (VXZ2□0) and water (VXZ2□2).
*2 For connection, prepare a fitting compliant with ISO 16030 and JIS B 8674.

Made to Order

<Special lead wire length>

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

VXZ □ □ □ □ XL □

- **Lead wire length**

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

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

Example) **VXZ2 3 2 A Z 1A Z XB A**

- **Electrical option**
- **Other option**
- **Special electrical entry direction**
- **With bracket**

Installation Options
(Mounting Option/Special Electrical Entry Direction)

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

Combinations

Symbol	Special electrical entry direction	With bracket
XC□	●	●
XB□	●	●

Special Electrical Entry Direction

VXZ2 □□□□ XC A

Enter standard product number.

Symbol	Rotation angle
A	90° / 90° / IN / OUT
B	180° / 180° / IN / OUT
C	270° / 270° / IN / OUT

∗ Available for the VXZ2$^{3}_{A}$ to 2$^{6}_{D}$.

With Bracket/Special Electrical Entry Direction

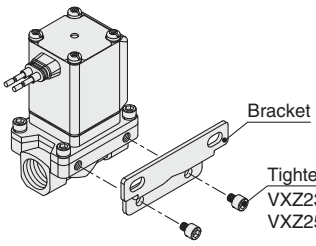
VXZ2 □□□□ XB A

Enter standard product number.

Symbol	Rotation angle
Nil	Standard / IN / OUT
A	90° / 90° / IN / OUT
B	180° / 180° / IN / OUT
C	270° / 270° / IN / OUT

∗1 Available for the VXZ2$^{3}_{A}$ to 2$^{6}_{D}$.
∗2 Bracket is attached as standard with the resin body type (VXZ2$^{3}_{A}$0$^{C}_{D}_{E}$□), so it is no necessary to add XB to the part number.
∗3 Bracket is packed in the same container as the main body.

VXZ Bracket mounting dimensions



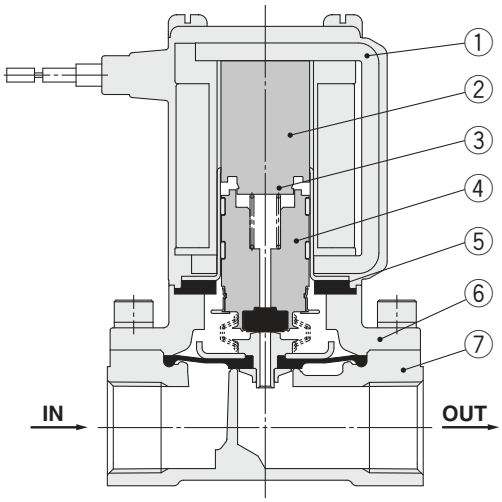
∗ Enter symbols in the order below when ordering a combination of electrical option, other option, etc.

Example) **VXZ2 3 2 A Z 1A Z XB A**

- **Electrical option**
- **Special electrical entry direction**
- **Other option**
- **With bracket**

Construction

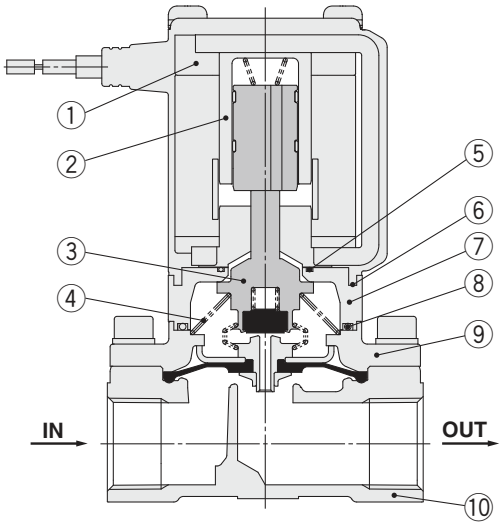
Normally Closed (N.C.)



Component Parts

No.	Description	Material
1	**Solenoid coil**	Cu + Fe + Resin
2	**Tube assembly**	Stainless steel
3	**Return spring**	Stainless steel
4	**Armature/Diaphragm assembly**	Stainless steel, NBR, FKM
5	**Stopper**	NBR, FKM
6	**Bonnet**	Stainless steel, Aluminum
7	**Body**	Stainless steel, Aluminum

Normally Open (N.O.)



Component Parts

No.	Description	Material
1	**Solenoid coil**	Cu + Fe + Resin
2	**Sleeve assembly**	Stainless steel, Resin (PPS)
3	**Push rod/Diaphragm assembly**	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	**Bonnet**	Aluminum,Stainless steel
10	**Body**	Aluminum,Stainless steel

Working Principle

De-energized

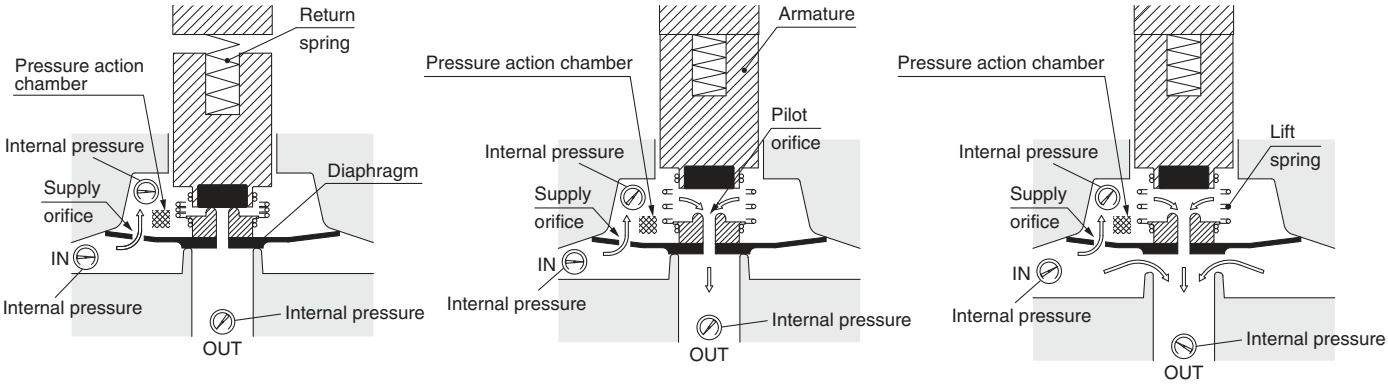
The fluid enters from the IN goes through the supply orifice to fill the pressure action chamber. Main valve is closed by the pressure in the pressure action chamber and the reaction force of the return spring.

Energized (Pilot valve open)

When the coil is energized, the armature is attracted causing the pilot orifice to opening. The fluid filling the pressure action chamber flows to the OUT side through the pilot orifice.

Energized (Main valve open)

The pressure in the pressure action chamber decreases by discharging fluid through the pilot orifice. Because the force which pushes down the valve is reduced by the discharge of the fluid, the force that pushes up the main valve overcomes the push down force and opens the main valve. The main valve opens by the lift spring reaction force even if pressure on the IN side is 0 MPa or very low pressure.

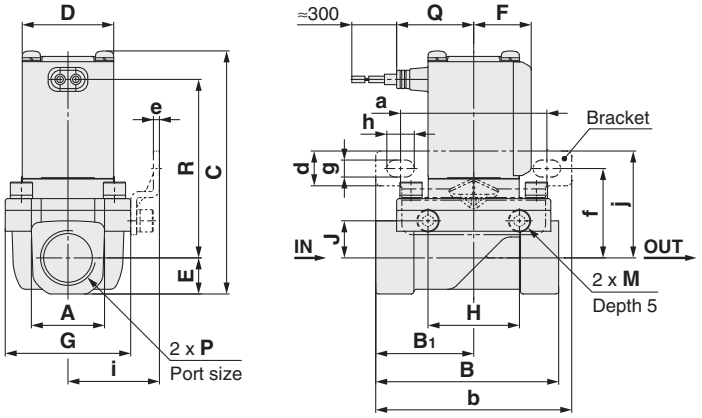


⚠Warning

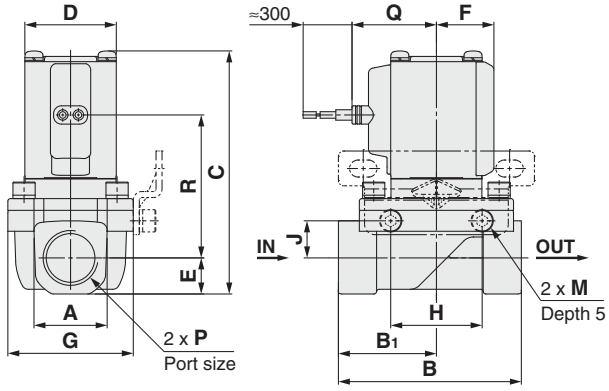
Unstable flow may occur with the product under the following conditions: • low flow from the pump or compressor, etc. • use of several elbows or tees in the circuit, or • thin nozzles installed at the end of the piping etc. This can cause valve opening/closing failure, or oscillation, and cause a valve malfunction. If products are used with vacuum, then the vacuum level can be unstable due to these conditions. Please contact SMC to check if the valve can be used in the application by providing the relevant fluid circuit.

Dimensions/Body Material:Aluminum,Stainless Steel

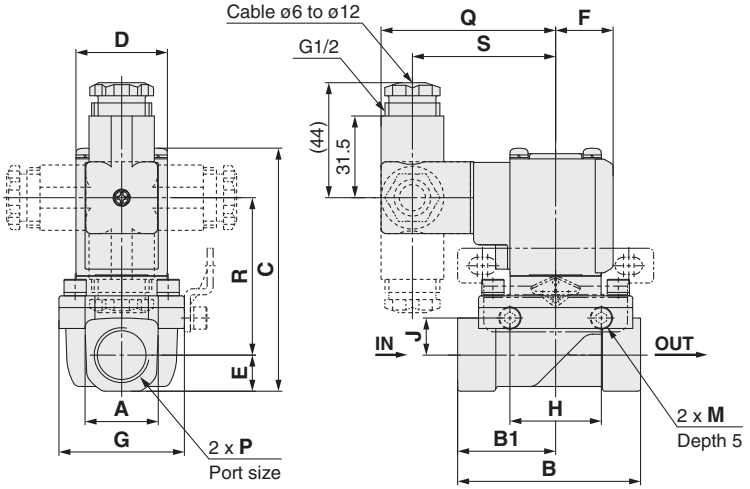
Grommet

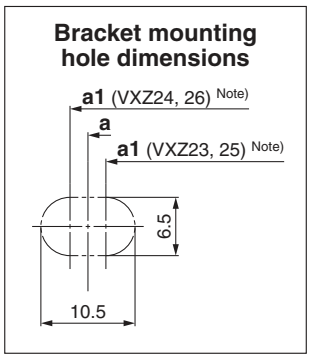


Grommet (with surge voltage suppressor)



DIN terminal





(mm)

Model	Port size P	A	B	B_1	C	D	E	F	G	H	J	M
VXZ2$^{3}_{A}$	1/4, 3/8	21 <22>	57	28.5	85 (91.5)	35	10.5	22	40	35	10	M5
VXZ2$^{4}_{B}$	1/2	28	70	37.5	93 (99.5)	35	14	22	48	35	14.2	M5
VXZ2$^{5}_{C}$	3/4	33.5	71	38.5	104 (110.5)	40	17	24.5	62	33	15.2	M6
VXZ2$^{6}_{D}$	1	42	95	49.5	110 (116)	40	20	24.5	66	37	17.2	M6

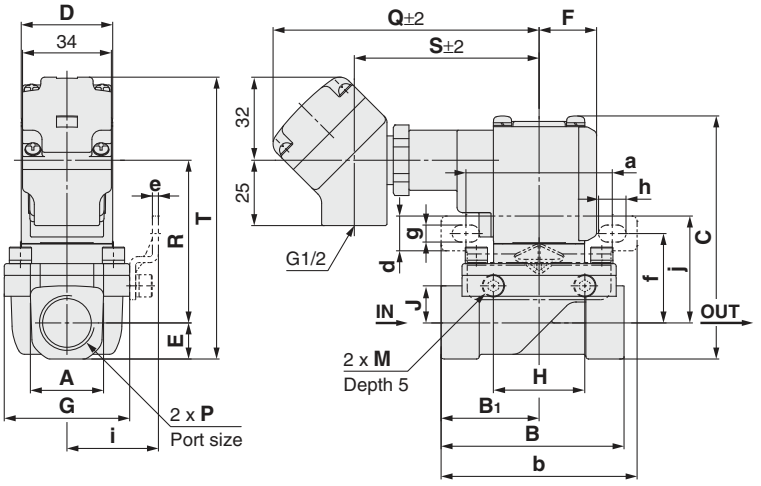
Model	Port size P	Bracket mounting									
		a	a1 Note)	b	d	e	f	g	h	i	j
VXZ2$^{3}_{A}$	1/4, 3/8	56	52	75	13.5	2.3	30	6.5	10.5	31	37
VXZ2$^{4}_{B}$	1/2	56	60	75		2.3	34.5	6.5	10.5	35	41
VXZ2$^{5}_{C}$	3/4	70.5	68	92		2.3	39	6.5	10.5	43	46
VXZ2$^{6}_{D}$	1	70.5	73	92		2.3	41	6.5	10.5	45	48

Model	Port size P	Electrical entry						
		Grommet		Grommet (with surge voltage suppressor)		DIN terminal		
		Q	R	Q	R	Q	R	S
VXZ2$^{3}_{A}$	1/4, 3/8	29.5	63.5 (70)	32.5	50 (56.5)	67	55.5 (62)	55
VXZ2$^{4}_{B}$	1/2	29.5	68.5 (74.5)	32.5	55 (61)	67	60.5 (66.5)	55
VXZ2$^{5}_{C}$	3/4	32	76.5 (83)	35	63 (69.5)	69.5	68.5 (75)	57.5
VXZ2$^{6}_{D}$	1	32	79.5 (85)	35	66 (71.5)	69.5	71.5 (77)	57.5

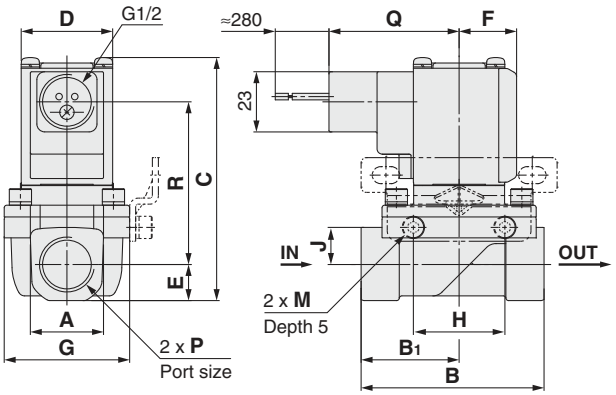
( ) are the dimensions of Normally Open (N.O.). < > are the dimensions of aluminum body.
Note) Old VXZ bracket mounting hole center position

Dimensions/Body Material:Aluminum,Stainless Steel

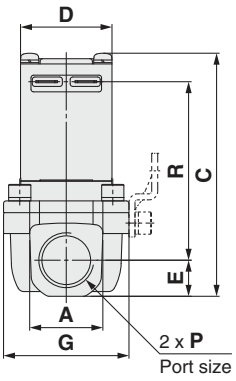
Conduit terminal

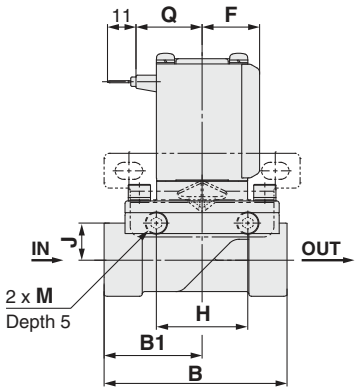


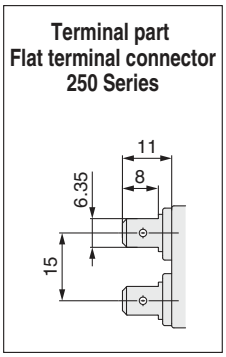
Conduit

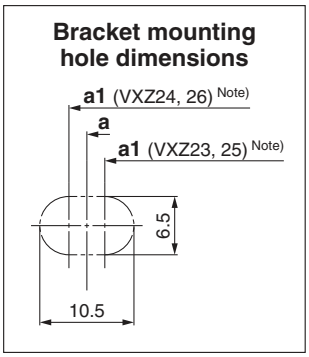


Flat terminal type









(mm)

Model	Port size P	A	B	B_1	C	D	E	F	G	H	J	M
VXZ2$^{3}_{A}$	1/4, 3/8	21 <22>	57	28.5	85 (91.5)	35	10.5	22	40	35	10	M5
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Model	Port size P	Bracket mounting									
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VXZ2$^{5}_{C}$	3/4	70.5	68	92		2.3	39	6.5	10.5	43	46
VXZ2$^{6}_{D}$	1	70.5	73	92		2.3	41	6.5	10.5	45	48

Model	Port size P	Electrical entry							
		Conduit terminal				Conduit		Flat terminal	
		Q	R	S	T	Q	R	Q	R
VXZ2$^{3}_{A}$	1/4, 3/8	102	57.5 (64)	71	100 (106.5)	50	57.5 (64)	25.5	63.5 (70)
VXZ2$^{4}_{B}$	1/2	102	62.5 (68.5)	71	108 (114.5)	50	62.5 (68.5)	25.5	68.5 (74.5)
VXZ2$^{5}_{C}$	3/4	104.5	70.5 (77)	73.5	119 (126)	52.5	70.5 (77)	28	76.5 (82.5)
VXZ2$^{6}_{D}$	1	104.5	73.5 (79)	73.5	125 (131)	52.5	73.5 (79)	28	79.5 (85)

( ) are the dimensions of Normally Open (N.O.). < > are the dimensions of aluminum body.
Note) Old VXZ bracket mounting hole center position

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 opened.

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 be less than 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

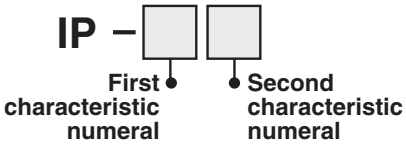
1. Surge voltage

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

2. Degree of protection

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

Verify the degree of protection for each product.



●**First Characteristics:**
Degrees of protection against solid foreign objects

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

Electrical Terminology

●**Second Characteristics:**
Degrees of protection against water

0	Non-protected	—
1	Protected against vertically falling water drops	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: Fluoro rubber

2. Oil-free treatment

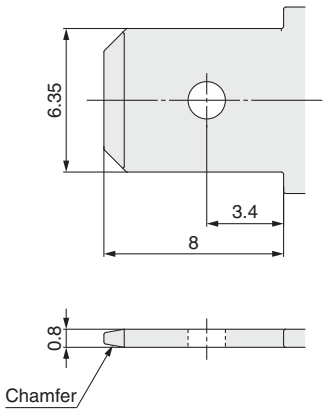
The degreasing and washing of wetted parts

3. 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.

Flat Terminal

1. 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	*C*, *b*	—	ISO 6358: 1989 JIS B 8390: 2000
	—	*S*	JIS B 8390: 2000 Equipment: JIS B 8379, 8381-1, 8381-2
		Cv	ANSI/(NFPA)T3.21.3 R1-2008
Process fluid control equipment	*Kv*	—	IEC60534-1: 2005 IEC60534-2-3: 1997 JIS B 2005-1: 2012 JIS B 2005-2-3: 2004 Equipment: JIS B 8471, 8472, 8473
	—	*Cv*	

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**

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

When

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

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

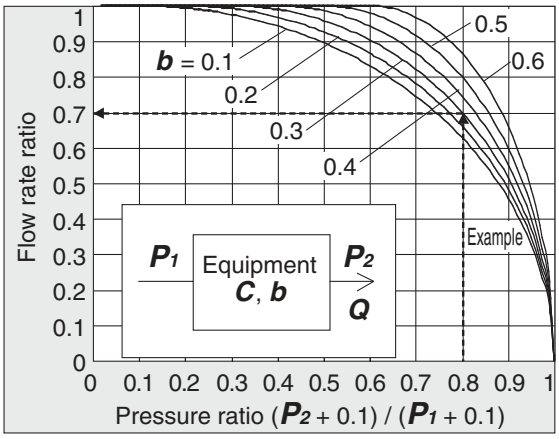
Q : Air flow rate [L/min (ANR)]
C : Sonic conductance [dm³/(s·bar)], dm³ (Cubic decimeter) of SI = L (liter).
b : Critical pressure ratio [—]
P₁ : Upstream pressure [MPa]
P₂ : Downstream pressure [MPa]
T : Temperature [°C]
Note) Formula of subsonic flow is the elliptic analogous curve.
Flow rate characteristics are shown in Graph (1) For details, please use the calculation software available from SMC website.

Example)
Obtain the air flow rate for P_1 = 0.4 [MPa], P_2 = 0.3 [MPa], T = 20 [°C] when a solenoid valve is performed in C = 2 [dm³/(s·bar)] and b = 0.3.

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

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

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



Graph (1) Flow rate characteristics

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

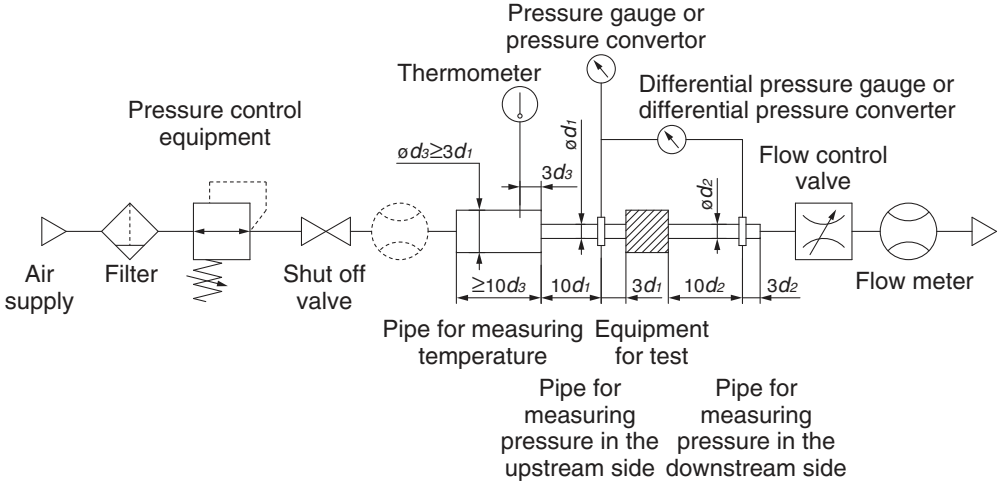


Fig. (1) Test circuit based on ISO 6358: 1989, JIS B 8390: 2000

2.2 Effective area *S*

(1) Conformed standard

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

Equipment standards: **JIS B 8373: Solenoid valve for pneumatics**
JIS B 8379: Silencer for pneumatics
JIS B 8381-1: Fittings for pneumatics—Part 1: Push-in fittings for thermoplastic resin tubing
JIS B 8381-2: Fittings for pneumatics—Part 2: Compression fittings for thermoplastic resin tubing

(2) Definition of flow rate characteristics

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

(3) Formula for flow rate

When

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

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

When

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

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

Conversion with sonic conductance ***C***:

$$S = 5.0 \times C \quad \cdots\cdots(5)$$

Q : Air flow rate[L/min(ANR)]
S : Effective area [mm²]
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 8379, the pressure values are in parentheses and the coefficient of the formula is 12.9.

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

S : Effective area [mm²]
V : Air tank capacity [L]
t : Discharging time [s]
P_s : Pressure inside air tank before discharging [MPa]
P : Residual pressure inside air tank after discharging [MPa]
T : Temperature inside air tank before discharging [K]

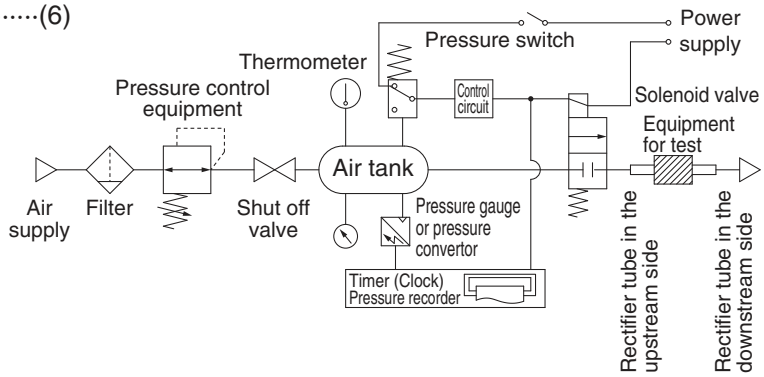


Fig. (2) Test circuit based on JIS B 8390: 2000

2.3 Flow coefficient *Cv* factor

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

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

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

ΔP : Pressure drop between the static pressure tapping ports [bar]
P_1 : Pressure of the upstream tapping port [bar gauge]
P_2 : Pressure of the downstream tapping port [bar gauge]: $P_2 = P_1 - \Delta P$
Q : Flow rate [L/s standard condition]
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 bar $\leq \Delta P$ 0.14 bar.
This is the same concept as effective area ***A*** which ISO 6358 stipulates as being applicable only when the pressure drop is smaller than the upstream pressure and the compression of air does not become a problem.

3. Process fluid control equipment

(1) Conformed standard

IEC60534-1: 2005: Industrial-process control valves. Part 1: control valve terminology and general considerations
IEC60534-2-3: 1997: Industrial-process control valves. Part 2: Flow capacity, Section Three- Test procedures
JIS B 2005-1: 2012: Industrial-process control valves – Part 1: Control valve terminology and general considerations
JIS B 2005-2-3: 2004: Industrial-process control valves – Part 2: Flow capacity – Section 3: Test procedures
Equipment standards: JIS B 8471: Solenoid valve for water
JIS B 8472: Solenoid valve for steam
JIS B 8473: Solenoid valve for fuel oil

(2) Definition of flow rate characteristics

Kv factor: Value of the clean water flow rate represented by m^3/h that runs through the valve (equipment for test) at 5 to 40°C, when the pressure difference is 1 x 105 Pa (1 bar). It is calculated using the following formula:

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

Kv : Flow coefficient [m^3/h]
Q : Flow rate [m^3/h]
ΔP : Pressure difference [Pa]
ρ : Density of fluid [kg/m^3]

(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:

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

Q : Flow rate [L/min]
Kv : Flow coefficient [m^3/h]
ΔP : Pressure difference [MPa]
G : Relative density [water = 1]
In the case of saturated aqueous vapor:

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

Q : Flow rate [kg/h]
Kv : Flow coefficient [m^3/h]
ΔP : Pressure difference [MPa]
P_1 : Upstream pressure [MPa]: $\Delta P = P_1 - P_2$
P_2 : Downstream pressure [MPa]

Conversion of flow coefficient:

$Kv = 0.865\ Cv$ ·····(11)

Here,

Cv factor: Value of the clean water flow rate represented by US gal/min that runs through the valve at 40 to 100°F, when the pressure difference is 1 lbf/in^2 (psi)

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

(4) Test method

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

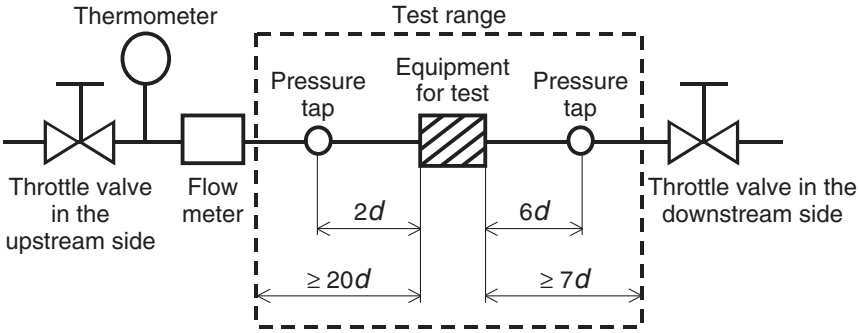
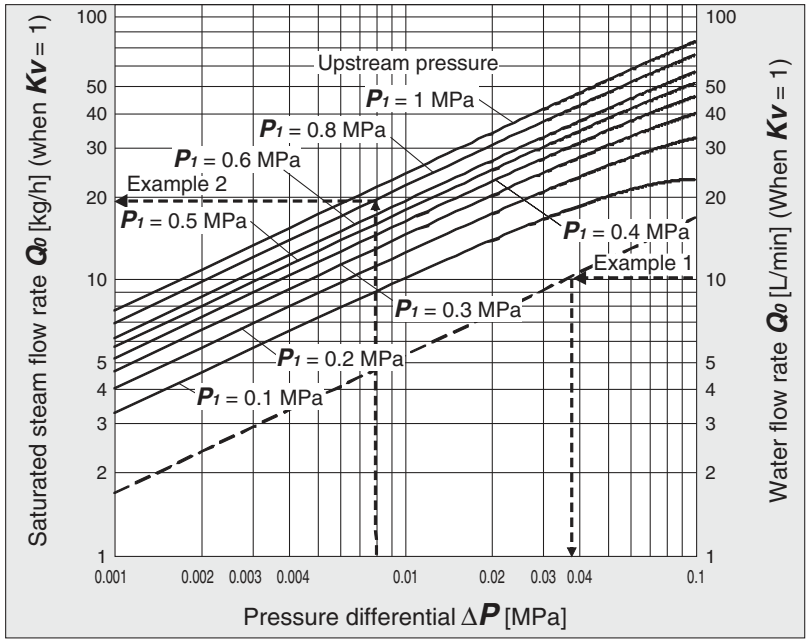


Fig. (3) Test circuit based on IEC60534-2-3, JIS B 2005-2-3



Graph (2) Flow rate characteristics

Example 1)

Obtain the pressure difference when water [15 L/min] runs through the solenoid valve with a ***Kv*** = 1.5 m^3/h.

As the flow rate when ***Kv*** = 1 is calculated as the formula: $Q_0 = 15 \times 1/1.5 = 10$ [L/min], read off ΔP when Q_0 is 10 [L/min] in Graph (2). The reading is 0.036 [MPa].

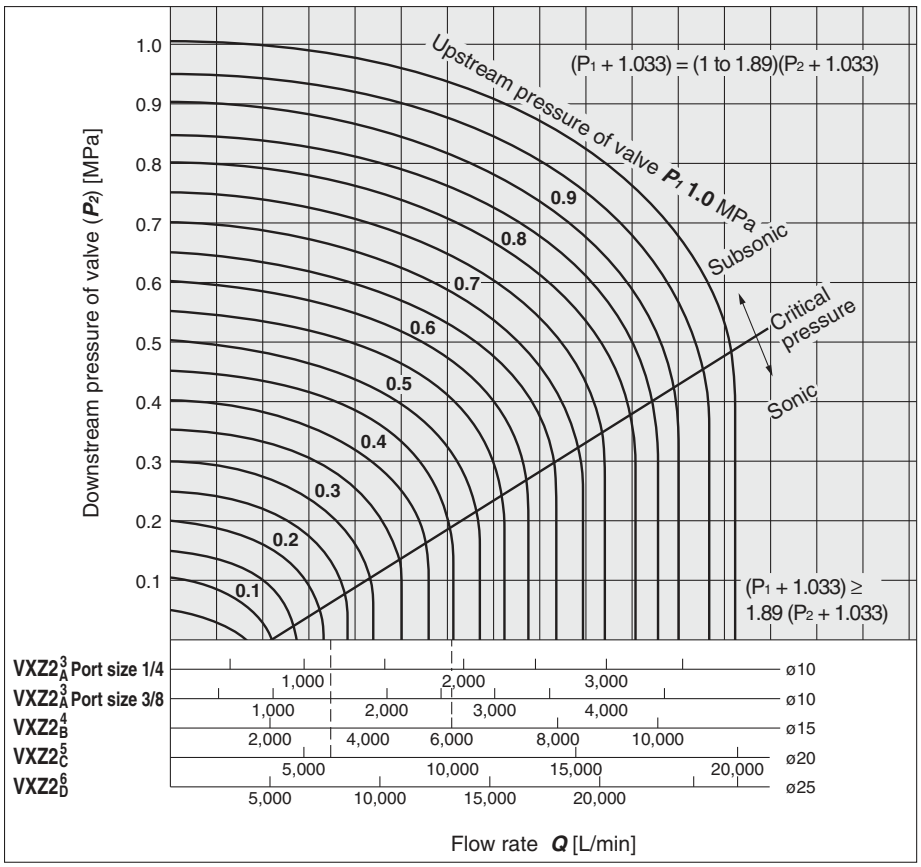
Example 2)

Obtain the saturated steam flow rate when $P_1 = 0.8$ [MPa] and $\Delta P = 0.008$ [MPa] with a solenoid valve with a ***Kv*** = 0.05 [m^3/h]. Read off Q_0 when P_1 is 0.8 and ΔP is 0.008 in Graph (2), the reading is 20 kg/h. Therefore, the flow rate is calculated as the formula: $Q = 0.05/1 \times 20 = 1$ [kg/h].

VXZ Series
Flow Rate Characteristics

Note) Use this graph as a guide. In the case of obtaining an accurate flow rate, refer to pages 16 through to 20.

For Air

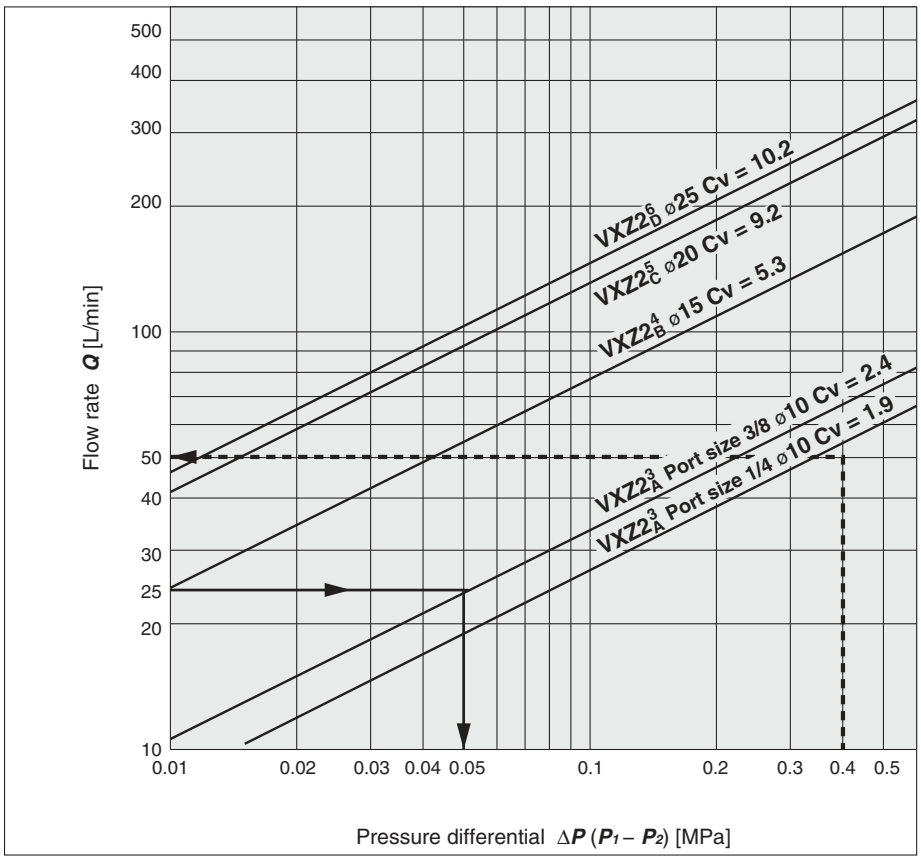


How to read the graph

The sonic range pressure to generate a flow of 6,000 L/min (ANR) is $P_1 \approx 0.47$ MPa for a ø15 orifice ($VXZ2^4_B$) and $P_1 \approx 0.23$ MPa for a ø20 orifice ($VXZ2^5_C$).

The optimum size for an upstream pressure $P_1 = 0.45$ MPa and a flow of 6,000 L/min will be the $VXZ2^4_B$ (ø15 orifice, port size 1/2).

For Water



How to read the graph

The pressure differential for a ø10 orifice to supply a flow of 25 L/min ($VXZ2^3_A$, port size 3/8) will be $\Delta P \approx 0.05$ MPa.

The optimum size for a pressure differential of $\Delta P \approx 0.4$ MPa and a flow of 50 L/min will be the $VXZ2^3_A$ (ø10 orifice, port size 1/4).

VXZ Series
Specific Product Precautions 1

Please be sure to read before use.

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. Closed liquid circuit

In a closed circuit, when liquid is static, pressure could rise due to changes in temperature. This pressure rise could cause malfunction and damage to components such as valves. To prevent this, install a relief valve in the system.

4. Actuator drive

When an actuator, such as a cylinder, is to be driven using a valve, take appropriate measures to prevent potential danger caused by actuator operation.

5. Pressure (including vacuum) holding

It is not usable for an application such as holding the pressure (including vacuum) inside of a pressure vessel because air leakage is entailed in a valve.

6. When the conduit type is used as equivalent to an IP65 enclosure, install a wiring conduit etc.

7. When an impact, such as water hammer etc., caused by the rapid pressure fluctuation is applied, the solenoid valve may be damaged. Give an attention to it.

Selection

⚠Warning

1. Usage with low flow

Unstable flow may occur with the product under the following conditions: • low flow from the pump or compressor, etc. • use of several elbows or tees in the circuit, or • thin nozzles installed at the end of the piping etc. This can cause valve opening/closing failure, or oscillation, and cause a valve malfunction.

Please check the pressure differential and flow to select the appropriate size of the valve referring to the Flow rate Characteristics on page 21. Ensure that pressure differential does not become lower than 0.01 MPa during ON (N.C.: Valve open).

Selection

⚠Warning

2. Fluid

1) Type of fluid

Select an appropriate valve with reference to the table below for the general 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^2/s or less.

If there is something you do not know, please contact SMC.

Applicable Fluid

For Air	Air
For Water	Air, Water
For Oil	Air, Water, Oil
For Heated water	Air(up to 99°C), Water, Heated water
For High temperature oil	Air(up to 99°C), Water, Oil, High temperature oil

2) Flammable oil, Gas

Do not use the product with combustion-supporting or flammable fluids.

3) Corrosive gas

Cannot be used since it will lead to cracks by stress corrosion or result in other incidents.

4) When a brass body is used, then depending on water quality, corrosion and internal leakage may occur. If such abnormalities occur, exchange the product for a stainless steel body.

5) Use an oil-free specification when any oily particle must not enter the passage.

6) Applicable fluid on the list may not be used depending on the operating condition. Give adequate confirmation, and then determine a model, just because the compatibility list shows the general case.

3. Air 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 valves at their upstream side. 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.

VXZ Series
Specific Product Precautions 2

Please be sure to read before use.

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.

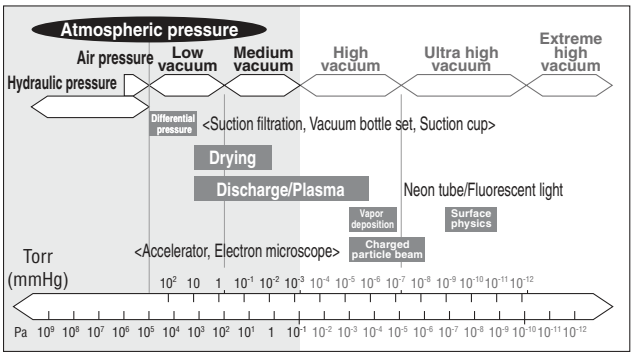
<Oil>

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.

<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.

⚠Warning

4. 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.

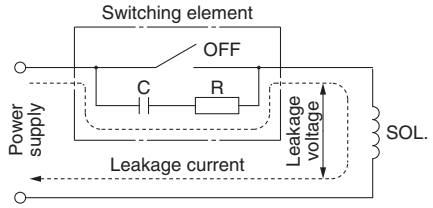
5. Countermeasures against static electricity

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

⚠Caution

1. Leakage voltage

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



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

2. Selecting model

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

3. When the fluid is oil.

The kinematic viscosity must not exceed 50 mm^2/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.

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.

5. Secure with brackets, except in the case of steel piping and copper fittings.

VXZ Series
Specific Product Precautions 3

Please be sure to read before use.

Mounting

⚠Warning

6. Avoid sources of vibration, or adjust the arm from the body to the minimum length so that resonance will not occur.

7. Painting and coating

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

Disassembly/Assembly Procedures

⚠Caution

1. 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.>

1) Loosen the mounting screws.
The coil assembly, stopper, return spring and body assembly can be removed.

<N.O.>

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

Assembly

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

1) Mount the components on the body in the reverse order of disassembly.
2) When changing the electrical entry direction, turn the coil assembly in a desired direction to mount it.
3) 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).
Proper tightening torque: 0.7 N·m
Tighten the screws in the order of "1 → 2 → 3 → 4 → 1 → 2 → 3 → 4".

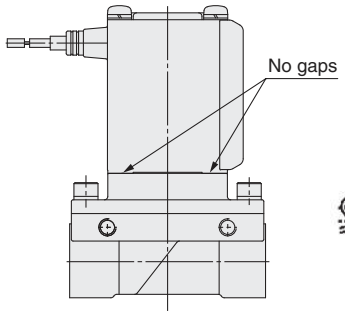


Fig.1

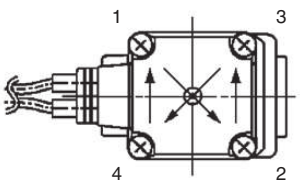


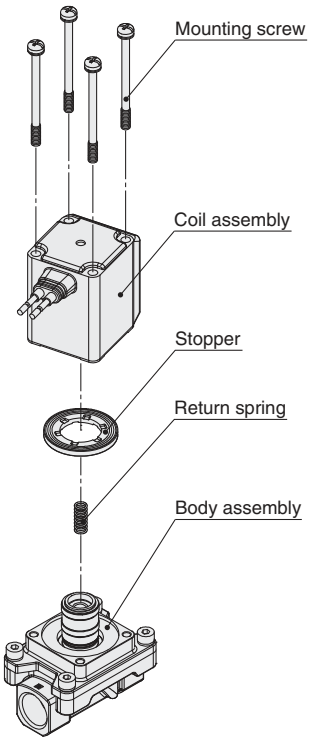
Fig.2

* 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.

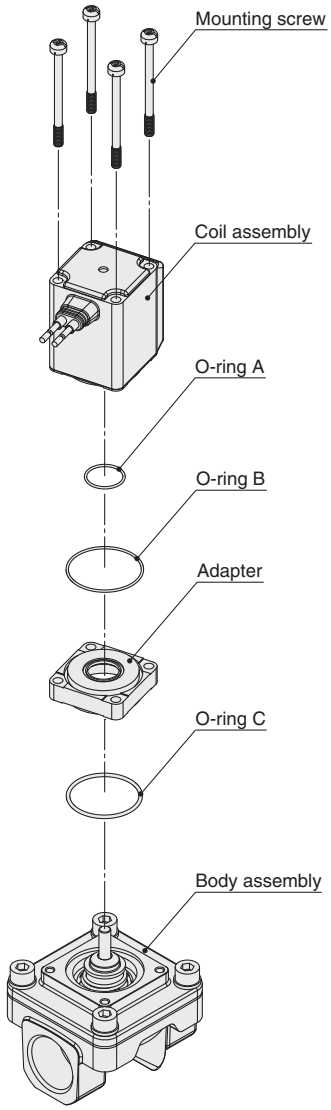
Disassembly/Assembly Procedures

⚠Caution

<N.C.>



<N.O.>



Specific Product Precautions 3-1

Please be sure to read before use.

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 attaching fittings to valves, tighten with the proper tightening torque shown below.

Lower tightening torque will lead into fluid leakage.

Tightening Torque for Piping

Connection threads	Proper tightening torque N·m
Rc1/8	7 to 9
Rc1/4	12 to 14
Rc3/8	22 to 24
Rc1/2	28 to 32
Rc3/4	
Rc1	36 to 38

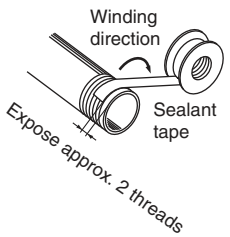
4. Connection of piping to products

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

5. Winding of sealant tape

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

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



6. If a regulator and valve are connected directly, they may vibrate together and cause chattering. Do not connect directly.

7. If the cross-sectional area of piping for the fluid supply side is restricted, operation will become unstable due to inadequate pressure differential during valve operation. Use piping size for the fluid supply side that is suited to the port size.

Recommended Piping Conditions

1. 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.)

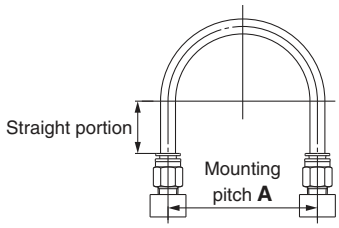


Fig. 1 Recommended piping configuration

Unit: mm

Tubing 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

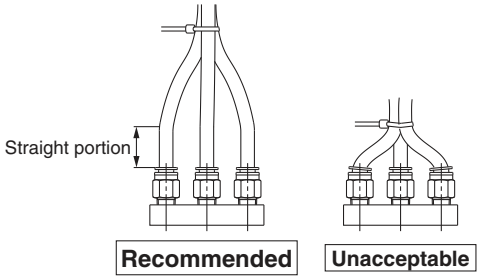


Fig. 2 Binding tubes with bands

VXZ Series
Specific Product Precautions 4

Please be sure to read before use.

Wiring

⚠Warning

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

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

2. 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

1. As a rule, use electrical wire with a cross sectional area of 0.5 to 1.25 mm^2 for wiring.
Furthermore, do not allow excessive force to be applied to the lines.

2. Use electrical circuits which do not generate chattering in their contacts.

3. Use 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.

4. 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.)

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 drain from an air filter periodically.

Operating Precautions

⚠Warning

1. If there is a possibility of reverse pressure being applied to the valve, take countermeasures such as mounting a check valve on the downstream side of the valve.

2. When problems are caused by a water hammer, install water hammer relief equipment (accumulator etc.), or use an SMC water hammer relief valve (VXR series). Please consult with SMC for details.

3. For pilot type 2-port solenoid valves, when the valve is closed, sudden pressure resulting from the startup of the fluid supply source (pump, compressor, etc.) may cause the valve momentarily to open and leakage to occur, so please exercise caution.

4. If the product is used in the conditions in which rapid decrease in the inlet pressure of the valve and rapid increase in the outlet pressure of the valve are repeated, excessive stress will be applied to the diaphragm, which causes the diaphragm to be damaged and dropped, leading to the operation failure of the valve. Check the operating conditions before use.

Specific Product Precautions 5

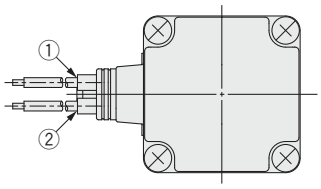
Please be sure to read before use.

Electrical Connections

⚠Caution

■ Grommet

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



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

∗ There is no polarity.

■ DIN terminal

Disassembly

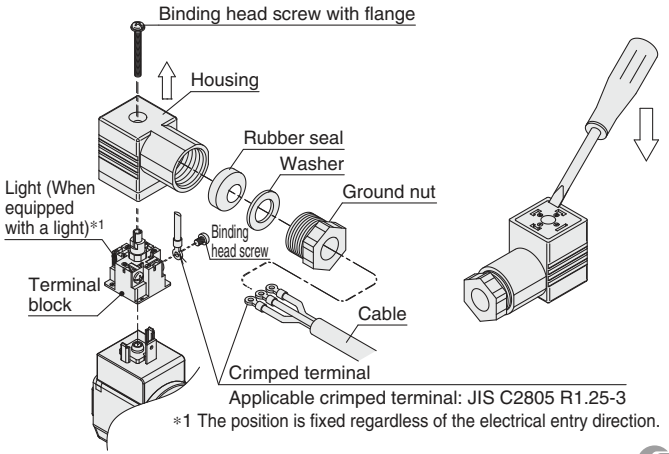
1. After loosening the binding head screw with flange, then if the housing is pulled in the direction of the arrow, the connector will be removed from the solenoid valve.
2. Pull out the binding head screw with flange from the housing.
3. There is a cutout on the bottom of the terminal block. Insert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

Wiring

1. Pass the cable through the ground nut, washer and rubber seal in this order, and insert these parts into the housing.
2. Loosen the binding head screw of the terminal block, then insert the core wire or the crimped terminal of the lead wire into the terminal, and securely fix it with the binding head screw. The binding head screw of the terminal block is M3.
   Note 1) Tighten the screw to a torque of between 0.5 and 0.6 N·m.
   Note 2) Cable O.D.: ø6 to ø12 mm
   Note 3) For an outside cable diameter of ø9 to 12 mm, remove the internal parts of the rubber seal before using.

Assembly

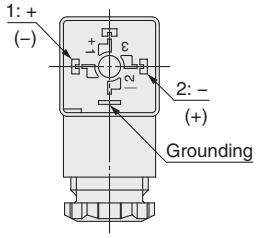
1. Pass the cable through the ground nut, washer, rubber seal and the housing in this order, and connect to the terminal block. Then, set the terminal block inside the housing. (Push in the terminal block until it snaps into position.)
2. Insert the rubber seal and the washer in this order into the cable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



∗1 The position is fixed regardless of the electrical entry direction.

⚠Caution

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

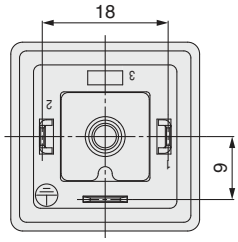


Terminal no.	1	2
DIN terminal	+ (–)	– (+)

∗ There is no polarity.

DIN (EN175301-803) Terminal

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



■ Conduit terminal

Disassembly

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

Wiring

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

Specific Product Precautions 6

Please be sure to read before use.

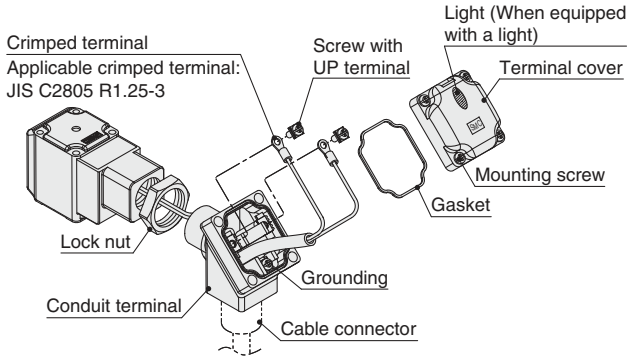
Electrical Connections

⚠Caution

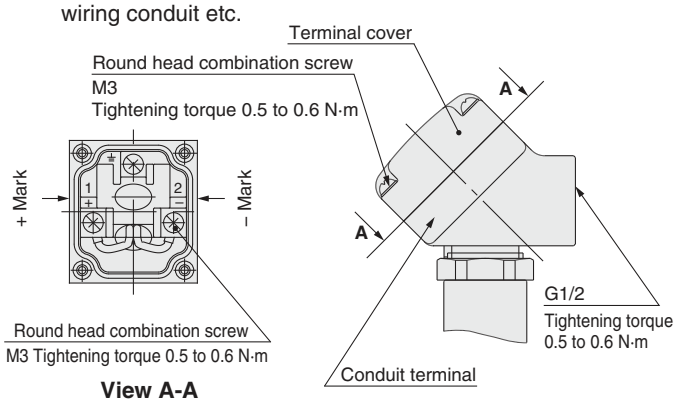
■ Conduit terminal

Assembly

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



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



View A-A
(Internal connection diagram)

■ Conduit

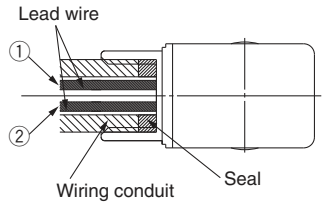
When used as an IP65 equivalent, use seal to install the wiring conduit. Also, use the tightening torque below for the conduit.

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

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

Electrical Connections

⚠Caution



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

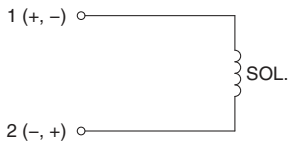
Note) Please order separately.

Electrical Circuits

⚠Caution

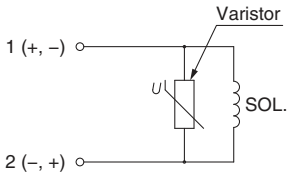
[DC circuit]

Grommet, Flat terminal



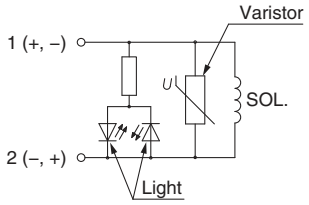
Without electrical option

Grommet, DIN terminal, Conduit terminal, Conduit



With surge voltage suppressor

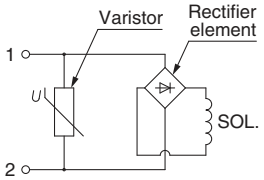
DIN terminal, Conduit terminal



With light/surge voltage suppressor

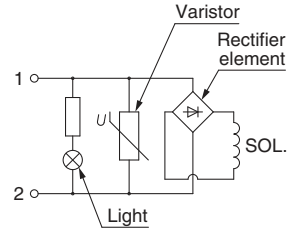
[AC circuit]

Grommet, DIN terminal, Conduit terminal, Conduit



Without electrical option

DIN terminal, Conduit terminal



With light/surge voltage suppressor

One-touch Fitting

⚠Caution

For information on handling One-touch fittings and on appropriate tubing, refer to page 211 and the Fittings & Tubing section of the "Handling Precautions for SMC Products" on the SMC website.

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.

*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: Manipulating industrial robots -Safety.
etc.

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.

⚠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.

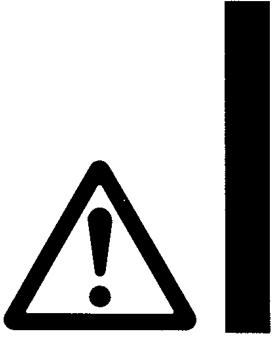
4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

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.



Safety Instructions

⚠ Caution

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 regulation 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.

Trouble shooting

If abnormal operations occur while in use,

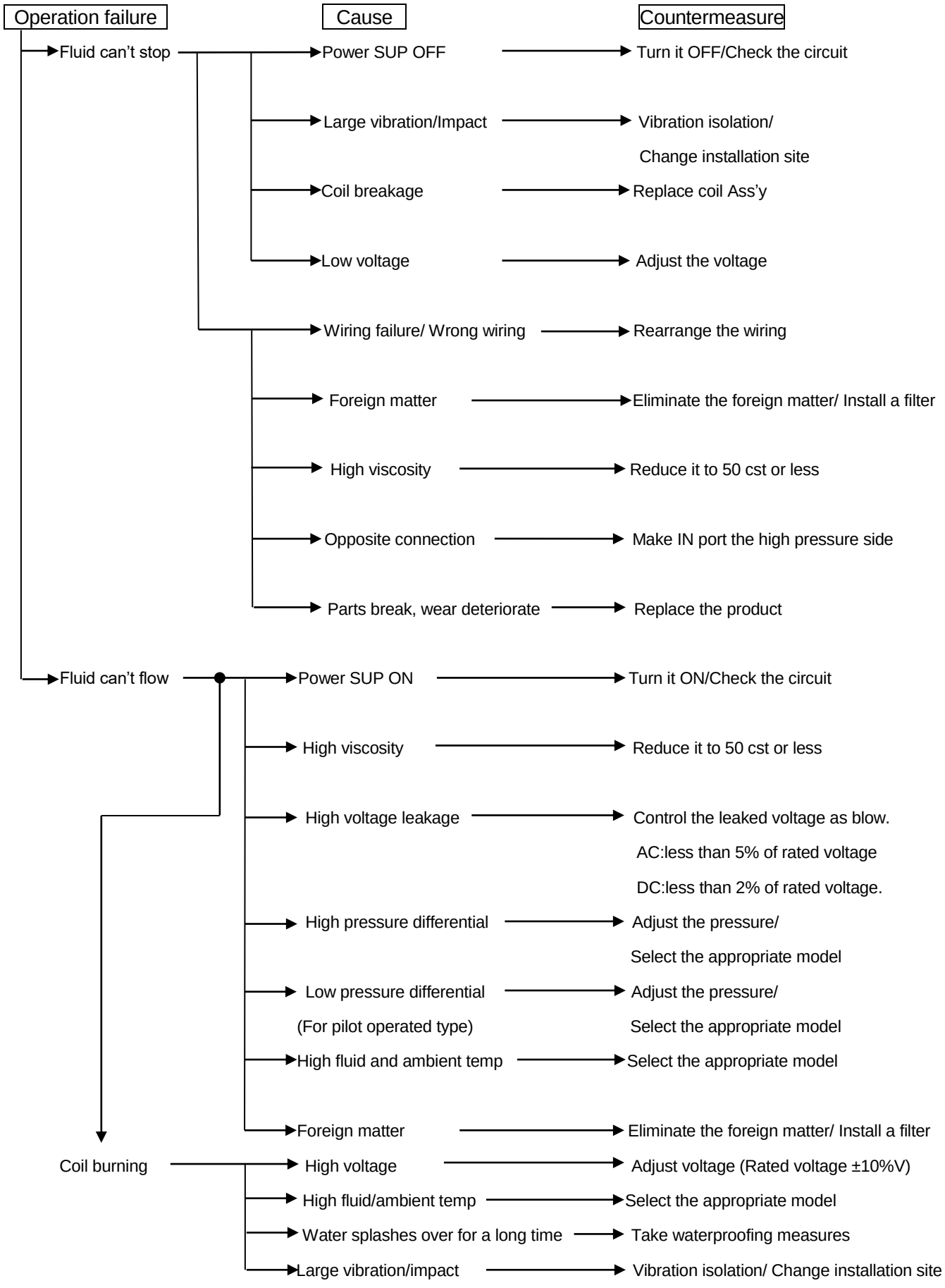
please check the following flowchart and take the appropriate measures.

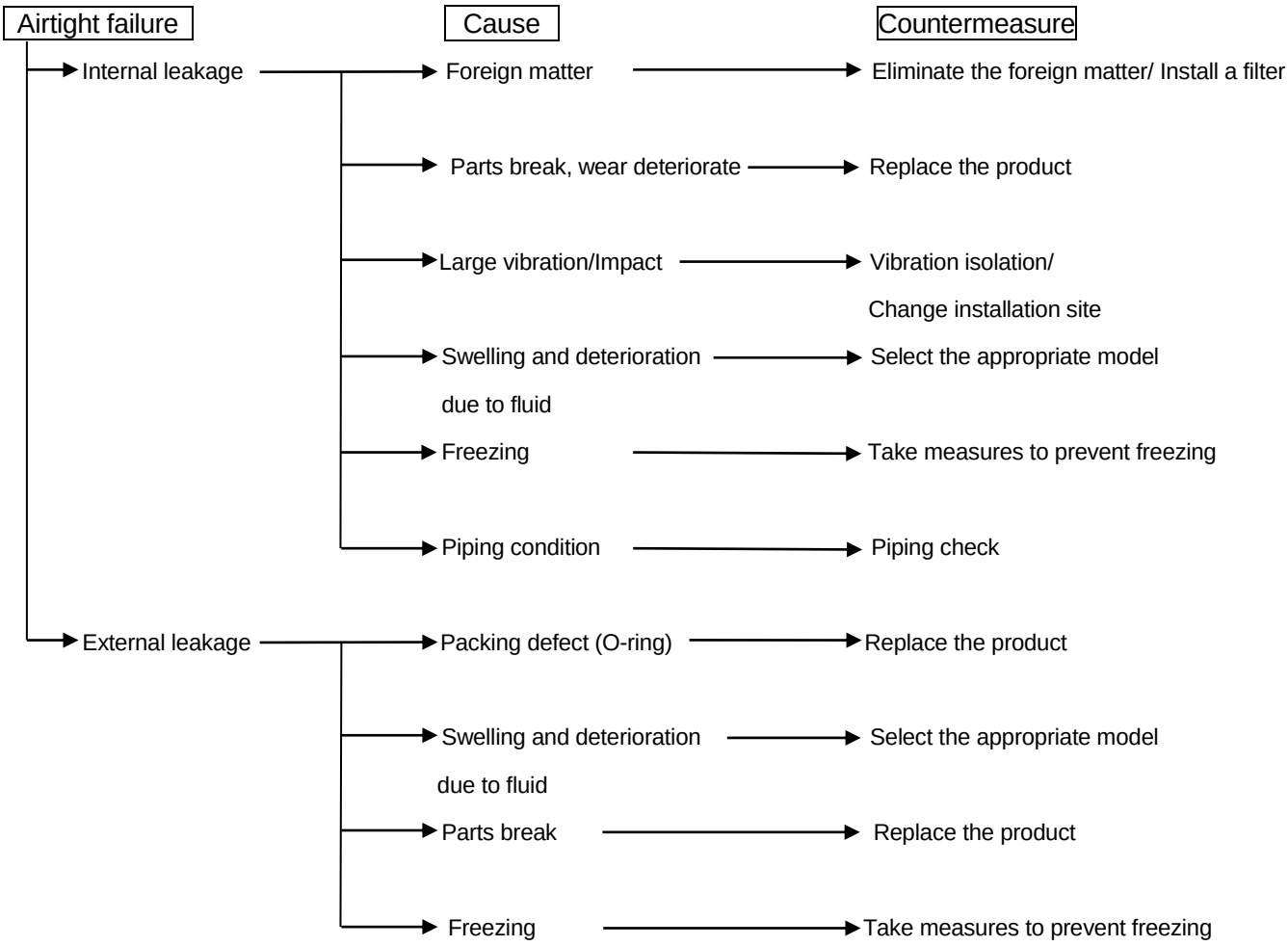
<For Normal Close(N.C.)>

If abnormal operations occur while in use,

please check the following flowchart and take the appropriate measures.

<For Normal Open(N.O.)>




Airtight failure
Cause
Countermeasure
Internal leakage
Foreign matter
Eliminate the foreign matter/ Install a filter
Parts break, wear deteriorate
Replace the product
Large vibration/Impact
Vibration isolation/
Change installation site
Swelling and deterioration
due to fluid
Select the appropriate model
Freezing
Take measures to prevent freezing
Piping condition
Piping check
External leakage
Packing defect (O-ring)
Replace the product
Swelling and deterioration
due to fluid
Select the appropriate model
Parts break
Replace the product
Freezing
Take measures to prevent freezing

Revision history

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