Pilot Operated 2 Port Solenoid Valve

Series VXD21/22/23

For Air, Water, Oil

■ Valve

Normally closed (N.C.)
Normally open (N.O.) Note)

Note) Except VXD2130

■ Solenoid Coil

Coil: Class B, Class H

■ Rated Voltage

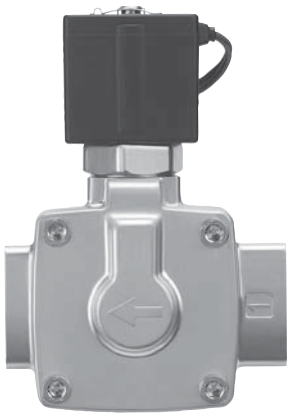
100 VAC, 200 VAC, 110 VAC,
220 VAC, 240 VAC, 230 VAC,
48 VAC, 24 VDC, 12 VDC

■ Material

Body	Brass (C37)/CAC407, Stainless steel
Seal	NBR, FKM, EPDM

■ Electrical Entry

- Grommet
- Conduit
- DIN terminal
- Conduit terminal



Model		VXD2130	VXD214$^{2}_{0}$	VXD215$^{2}_{0}$	VXD226$^{2}_{0}$
Orifice size	10 mmø	●	—	—	—
	15 mmø	—	●	—	—
	20 mmø	—	—	●	—
	25 mmø	—	—	—	●
Port size (Thread)		1/4 3/8 1/2	3/8 1/2	3/4	1

Model		VXD227$^{2}_{0}$	VXD238$^{2}_{0}$	VXD239$^{2}_{0}$
Orifice size	35 mmø	●	—	—
	40 mmø	—	●	—
	50 mmø	—	—	●
Port size (Flange)		32A	40A	50A

Common Specifications

Standard Specifications

Valve specifications	**Valve construction**		Pilot operated 2 port diaphragm type
	Withstand pressure (MPa)		8A to 25A: 5.0, 32A to 50A: 2.0
	Body material		Brass (C37), Stainless steel, CAC407
	Seal material		NBR, FKM, EPDM
	Enclosure		Dusttight, Low jetproof (equivalent to IP65) Note 1)
	Environment		Location without corrosive or explosive gases
Coil specifications	**Rated voltage**	**AC (Class B coil, Built-in full-wave rectifier type)**	100 VAC, 200 VAC, 110 VAC, 220 VAC, 230 VAC, 240 VAC, 48 VAC
		AC (Class B coil/H coil) Note 2)	
		DC (Class B coil only)	24 VDC, 12 VDC
	Allowable voltage fluctuation		±10% of rated voltage
	Allowable leakage voltage	**AC (Class B coil, Built-in full-wave rectifier type)**	10% or less of rated voltage
		AC (Class B coil/H coil) Note 2)	20% or less of rated voltage
		DC (Class B coil only)	2% or less of rated voltage
	Coil insulation type		Class B, Class H

Note 1) Electrical entry: Grommet with surge voltage suppressor (GS) has a rating of IP40.
Note 2) For the AC (Class B coil) of the VXD2130, built-in full-wave rectifier type is only applicable.

Solenoid Coil Specifications

Normally Closed (N.C.)

DC Specification

Model	Power consumption (W)	Temperature rise (C°) Note)
VXD2130	5.5	50
VXD2140/2150	4.5	45
VXD2260/2270	7	45
VXD2380/2390	10.5	60

Note) The values at ambient temperature of 20°C and when the rated voltage is applied.

AC Specification (Class B coil, Built-in full-wave rectifier type)

Model	Apparent power (VA)*	Temperature rise (C°) Note)
VXD21	7	55
VXD22	9.5	60
VXD23	12	65

* There is no difference in apparent power due to the inrush, energization, or frequency of the power, since the AC (Class B coil, Built-in full-wave rectifier type) uses a rectifying circuit.
Note) The values at ambient temperature of 20°C and when the rated voltage is applied.

AC Specification

Model	Frequency (Hz)	Apparent power (VA) Inrush	Apparent power (VA) Energized	Temperature rise (C°) Note)
VXD21	50	19	10	50
	60	16	8	45
VXD22	50	43	20	65
	60	35	17	60
VXD23	50	62	32	65
	60	52	27	60

Note) The values at ambient temperature of 20°C and when the rated voltage is applied.

Normally Open (N.O.)

DC Specification

Model	Power consumption (W)	Temperature rise (C°) Note)
VXD2142/2152	4.5	45
VXD2262/2272	7	45
VXD2382/2392	10.5	60

Note) The values at ambient temperature of 20°C and when the rated voltage is applied.

AC Specification (Class B coil, Built-in full-wave rectifier type)

Model	Apparent power (VA)*	Temperature rise (C°) Note)
VXD21	7	55
VXD22	9.5	60
VXD23	12	65

* There is no difference in apparent power due to the inrush, energization, or frequency of the power, since the AC (Class B coil, Built-in full-wave rectifier type) uses a rectifying circuit.
Note) The values at ambient temperature of 20°C and when the rated voltage is applied.

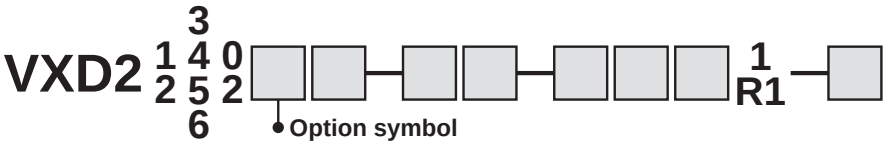
AC Specification

Model	Frequency (Hz)	Apparent power (VA) Inrush	Apparent power (VA) Energized	Temperature rise (C°) Note)
VXD21	50	22	11	55
	60	18	8	50
VXD22	50	46	20	65
	60	38	18	60
VXD23	50	64	32	65
	60	54	27	60

Note) The values at ambient temperature of 20°C and when the rated voltage is applied.

Applicable Fluid Check List

All Options (8A to 25A)

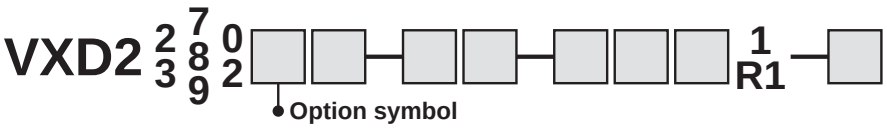


Fluid and application	Option symbol	Seal material	Body/Shading coil material Note 6)	Push rod (N.O. only) material Note 5)	Coil insulation type Note 3)	Note
Air	**Nil**	NBR	Brass (C37)/–	PPS	B	Select the built-in full-wave rectifier type for the AC spec.
	G		Stainless steel/–			
Water	**Nil**	NBR	Brass (C37)/Cu		B	
	G		Stainless steel/Ag			
Heated water	**E**	EPDM	Brass (C37)/Cu		H	
	P		Stainless steel/Ag			
Oil Note 2)	**A**	FKM	Brass (C37)/Cu		B	
	H		Stainless steel/Ag			
	D		Brass (C37)/Cu		H	
	N		Stainless steel/Ag			
High corrosive spec., Oil-free	**L** Note 1)	FKM	Stainless steel/Ag		B	
Copper-free, Fluoro-free Note 4)	**J**	EPDM	Stainless steel/Ag		B	
	P		Stainless steel/Ag		H	
Other combinations	**B**	EPDM	Brass (C37)/Cu		B	

Note 1) "L" option is for non-lube treatment.
Note 2) The dynamic viscosity of the fluid must not exceed 50 mm^2/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.
Select the DC spec. or AC spec. built-in full-wave rectifier type when the dynamic viscosity is higher than water or when the OFF response is prioritized.
Note 3) Coil insulation type Class H: AC spec. only
Note 4) The nuts (non-wetted parts) are nickel-plated on the C37 material.
Note 5) N.O. for VXD2130 is not available.
Note 6) There is no shading coil attached to the DC spec. or AC spec built-in full-wave rectifier type.

∗ Please contact SMC when fluids other than above are used.

All Options (32A to 50A)



Fluid and application	Option symbol	Seal material	Body/Shading coil material Note 6)	Push rod (N.O. only) material	Coil insulation type Note 4)	Note
Air	**Nil**	NBR	Brass (C37)/–	PPS	B	Select the built-in full-wave rectifier type for the AC spec.
Water	**Nil**	NBR	Brass (C37)/Cu		B	
Heated water Note 4)	**E**	EPDM	Brass (C37)/Cu		H	
Oil Note 3)	**A**	FKM	Brass (C37)/Cu		B	
	D		Brass (C37)/Cu		H	
Other combination	**B**	EPDM	Brass (C37)/Cu		B	

Note 1) "L" option is for non-lube treatment.
Note 2) The highest operating temperature of 32A to 50A is 80°C.
Note 3) The dynamic viscosity of the fluid must not exceed 50 mm^2/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.
Select the DC spec. or AC spec built-in full-wave rectifier type when the dynamic viscosity is higher than water or when the OFF response is prioritized.
Note 5) Coil insulation type Class H: AC spec. only
Note 6) There is no shading coil attached to the DC spec. or AC spec built-in full-wave rectifier type.

∗ Please contact SMC when fluids other than above are used.

For Air

(Inert gas)

⚠ When the fluid is air.

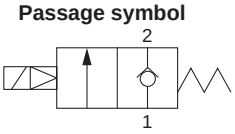
Please select the built-in full wave rectifier type when the fluid is air.

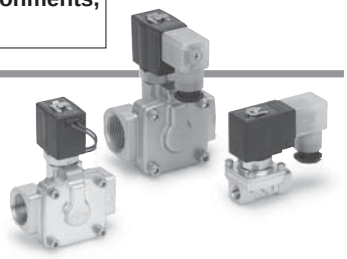
- **The special construction of the armature reduces abrasion, resulting in a longer service life.**
- **Reduced buzz noise**
  Best suited for medical equipment, low-noise environments, etc.

Model/Valve Specifications

Normally closed (N.C.)

Passage symbol





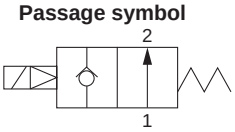
Port size		Orifice size (mmø)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)		Flow characteristics			Max. system pressure (MPa)	Weight Note) (g)
					AC	DC	C	b	Cv		
Thread (Nominal size)	1/4 (8A)	10	**VXD2130-02**	0.02	0.9	0.7	8.5	0.35	2.0	1.5	420
	3/8 (10A)	10	**VXD2130-03**				9.2		2.4		
		15	**VXD2140-03**		1.0	1.0	18.0		5.0		670
	1/2 (15A)	10	**VXD2130-04**		0.9	0.7	9.2		2.4		500
		15	**VXD2140-04**		1.0	1.0	20.0		5.5		670
	3/4 (20A)	20	**VXD2150-06**				38.0	0.30	9.5		1150

Port size		Orifice size (mmø)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)	Flow characteristics	Max. system pressure (MPa)	Weight Note) (g)
					AC, DC	Effective area (mm^2)		
Thread (Nominal size)	1 (25A)	25	**VXD2260-10**	0.02	1.0	225	1.5	1650
Flange	32A	35	**VXD2270-32**	0.03		415		5400
	40A	40	**VXD2380-40**			560		6800
	50A	50	**VXD2390-50**			880		8400

Note) Weight of grommet type. Add 10 g for conduit, 30 g for DIN terminal, and 60 g for conduit terminal type respectively.
- Refer to "Glossary of Terms" for details on the max. operating pressure differential and the max. system pressure.

Normally open (N.O.)

Passage symbol



Port size		Orifice size (mmø)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)	Flow characteristics			Max. system pressure (MPa)	Weight Note) (g)
					AC, DC	C	b	Cv		
Thread (Nominal size)	3/8 (10A)	15	**VXD2142-03**	0.02	0.7	18.0	0.35	5.0	1.5	690
	1/2 (15A)		**VXD2142-04**			20.0		5.5		
	3/4 (20A)	20	**VXD2152-06**			38.0	0.30	9.5		1170

Port size		Orifice size (mmø)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)	Flow characteristics	Max. system pressure (MPa)	Weight Note) (g)
					AC, DC	Effective area (mm^2)		
Thread (Nominal size)	1 (25A)	25	**VXD2262-10**	0.02	0.7	225	1.5	1690
Flange	32A	35	**VXD2272-32**	0.03		415		5400
	40A	40	**VXD2382-40**			560		6800
	50A	50	**VXD2392-50**			880		8400

Note) Weight of grommet type. Add 10 g for conduit, 30 g for DIN terminal, and 60 g for conduit terminal type respectively.
- Refer to "Glossary of Terms" for details on the max. operating pressure differential and the max. system pressure.

Ambient and Fluid Temperature

Power source	Fluid temperature (°C)	Ambient temperature (°C)
	Solenoid valve option symbol	
	Nil, G	
AC	–10 Note) to 60	–10 to 60
DC	–10 to 60	

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

Valve Leakage Rate

Internal Leakage

Seal material	Leakage rate (Air)	
	1/4 to 1	32A to 50A
NBR, FKM	2 cm^3/min or less	10 cm^3/min or less

External Leakage

Seal material	Leakage rate (Air)	
	1/4 to 1	32A to 50A
NBR, FKM	1 cm^3/min or less	1 cm^3/min or less

How to Order

DC VXD 21 3 0 □ □ — 02 □ — 5 G 1 — □

AC/Class B coil (Built-in full-wave rectifier type) VXD 21 3 0 □ □ — 02 □ — 1 G R1 — □

Model
Refer to the table (1) shown below for availability.

Orifice size
Refer to the table (1) shown below for availability.

Valve/Body configuration

0	N.C. / Single unit
2	N.O. / Single unit

∗ N.O. for VXD2130 is not available.

Solenoid valve option
Refer to the table (2) shown below for availability.

Port size
Refer to the table (1) shown below for availability.

Thread type

Nil	Rc
T	NPTF
F	G
N	NPT

Suffix

Nil	—
Z	Oil-free spec.

Rated voltage

1	100 VAC 50/60 Hz	6	12 VDC
2	200 VAC 50/60 Hz	7	240 VAC 50/60 Hz
3	110 VAC 50/60 Hz	8	48 VAC 50/60 Hz
4	220 VAC 50/60 Hz	J	230 VAC 50/60 Hz
5	24 VDC		

∗ Refer to the table (3) shown below for availability.

Refer to page 15 for ordering coil only.

Built-in full-wave rectifier type

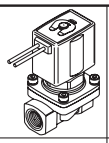
Bracket

Nil	None
B	With bracket

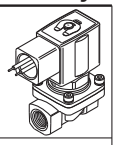
∗ Bracket is not removable.

Electrical entry

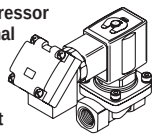
G - Grommet
GS - With grommet surge voltage suppressor



C - Conduit

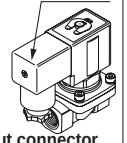


T - With conduit terminal
TS - With conduit terminal and surge voltage suppressor
TL - With conduit terminal and light
TZ - With conduit terminal, surge voltage suppressor and light



D - DIN termnal
DS - DIN terminal with surge voltage suppressor
DL - DIN terminal with light
DZ - DIN terminal with surge voltage suppressor and light
DO - For DIN terminal (without connector, gasket is included.)

Connector



∗ DIN type is available with class B only.

∗ Refer to the table (3) for the available combinations between each electrical option (S, L, Z) and rated voltage.
∗ Option "S", "Z" are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.

Table (1) Port/Orifice Size

Normally closed (N.C.)

Solenoid valve (Port size)					Orifice symbol (Diameter)							Material	
Model		VXD21	VXD22	VXD23	3 (10 mmø)	4 (15 mmø)	5 (20 mmø)	6 (25 mmø)	7 (35 mmø)	8 (40 mmø)	9 (50 mmø)	Body	Seal
Port no. (Port size)	Thread	**02** (1/4)	—	—	●	—	—	—	—	—	—	Brass (C37), Stainless steel	NBR
		03 (3/8)	—	—	●	●	—	—	—	—	—		
		04 (1/2)	—	—	●	●	—	—	—	—	—		
		06 (3/4)	—	—	—	—	●	—	—	—	—		
		—	**10** (1)	—	—	—	—	●	—	—	—		
	Flange	—	**32** (32A)	—	—	—	—	—	●	—	—	CAC407	
		—	—	**40** (40A)	—	—	—	—	—	●	—		
		—	—	**50** (50A)	—	—	—	—	—	—	●		

Normally open (N.O.)

Solenoid valve (Port size)					Orifice symbol (Diameter)						Material	
Model		VXD21	VXD22	VXD23	4 (15 mmø)	5 (20 mmø)	6 (25 mmø)	7 (35 mmø)	8 (40 mmø)	9 (50 mmø)	Body	Seal
Port no. (Port size)	Thread	**03** (3/8)	—	—	●	—	—	—	—	—	Brass (C37), Stainless steel	NBR
		04 (1/2)	—	—	●	—	—	—	—	—		
		06 (3/4)	—	—	—	●	—	—	—	—		
		—	**10** (1)	—	—	—	●	—	—	—		
	Flange	—	**32** (32A)	—	—	—	—	●	—	—	CAC407	
		—	—	**40** (40A)	—	—	—	—	●	—		
		—	—	**50** (50A)	—	—	—	—	—	●		

Table (2) Solenoid Valve Option

Option symbol	Seal material	Body/ Shading coil material	Coil insulation type	Note
Nil	NBR	Brass (C37)/Cu	B	—
G		Stainless steel/Ag		

Table (3) Rated Voltage – Electrical Option

Rated voltage			Class B			Class H		
			S	L	Z	S	L	Z
AC/ DC	Voltage symbol	Voltage	With surge voltage suppressor	With light	With light and surge voltage suppressor	With surge voltage suppressor	With light	With light and surge voltage suppressor
AC	**1**	100 V	●	●	●	●	●	●
	2	200 V	●	●	●	●	●	●
	3	110 V	●	●	●	●	●	●
	4	220 V	●	●	●	●	●	●
	7	240 V	●	—	—	●	—	—
	8	48 V	●	—	—	●	—	—
	J	230 V	●	—	—	●	—	—
DC	**5**	24 V	●	●	●	DC spec. is not available.		
	6	12 V	●	—	—			

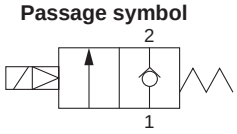
Note) Option "S", "Z" are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.

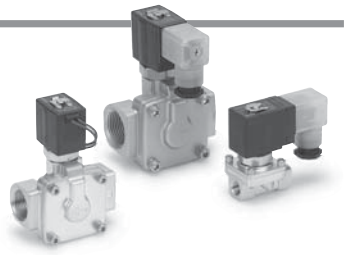
For Water

Model/Valve Specifications

Normally closed (N.C.)

Passage symbol



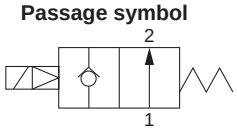


Port size		Orifice size (mmø)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)		Flow characteristics		Max. system pressure (MPa)	Note) Weight (g)
					AC	DC	Av x $10^{-6}m^2$	Cv converted		
Thread (Nominal size)	1/4 (8A)	10	**VXD2130-02**	0.02	0.7	0.5	46	1.9	1.5	420
	3/8 (10A)	10	**VXD2130-03**				58	2.4		
		15	**VXD2140-03**		1.0	1.0	110	4.5		670
	1/2 (15A)	10	**VXD2130-04**		0.7	0.5	58	2.4		500
		15	**VXD2140-04**		1.0	1.0	130	5.5		670
	3/4 (20A)	20	**VXD2150-06**				230	9.5		1150
	1 (25A)	25	**VXD2260-10**				310	13		1650
Flange	32A	35	**VXD2270-32**	0.03			550	23		5400
	40A	40	**VXD2380-40**				740	31		6800
	50A	50	**VXD2390-50**				1200	49		8400

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

Normally open (N.O.)

Passage symbol



Port size		Orifice size (mmø)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)	Flow characteristics		Max. system pressure (MPa)	Note) Weight (g)
					AC, DC	Av x $10^{-6}m^2$	Cv converted		
Thread (Nominal size)	3/8 (10A)	15	**VXD2142-03**	0.02	0.7	110	4.5	1.5	690
	1/2 (15A)		**VXD2142-04**			130	5.5		
	3/4 (20A)	20	**VXD2152-06**			230	9.5		1170
	1 (25A)	25	**VXD2262-10**			310	13		1690
Flange	32A	35	**VXD2272-32**	0.03		550	23		5400
	40A	40	**VXD2382-40**			740	31		6800
	50A	50	**VXD2392-50**			1200	49		8400

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

Ambient and Fluid Temperature

Power source	Fluid temperature (°C)		Ambient temperature (°C)
	Solenoid valve option symbol		
	Nil, G, L	**E, P**	
AC	1 to 60	1 to 99	–10 to 60
DC		—	

Note) With no freezing

Valve Leakage Rate

Internal Leakage

Seal material	Leakage rate (Water)	
	1/4 to 1	32A to 50A
NBR, FKM, EPDM	0.2 cm^3/min or less	1 cm^3/min or less

External Leakage

Seal material	Leakage rate (Water)	
	1/4 to 1	32A to 50A
NBR, FKM, EPDM	0.1 cm^3/min or less	0.1 cm^3/min or less

How to Order

DC/AC (Except VXD2130 AC/Class B) VXD 21 3 0 □ □ — 02 □ — 5 G 1 — □

AC/Class B coil (Built-in full-wave rectifier type) VXD 21 3 0 □ □ — 02 □ — 1 G R1 — □

∗ For the AC (Class B coil) of the VXD2130, built-in full-wave rectifier type is only applicable.

Model
Refer to the table (1) shown below for availability.

Orifice size
Refer to the table (1) shown below for availability.

Valve/Body configuration

0	N.C. / Single unit
2	N.O. / Single unit

∗ N.O. for VXD2130 is not available.

Solenoid valve option
Refer to the table (2) shown below for availability.

Suffix

Nil	—
Z	Oil-free spec.

Port size
Refer to the table (1) shown below for availability.

Thread type

Nil	Rc
T	NPTF
F	G
N	NPT

Rated voltage

1	100 VAC 50/60 Hz	**6**	12 VDC
2	200 VAC 50/60 Hz	**7**	240 VAC 50/60 Hz
3	110 VAC 50/60 Hz	**8**	48 VAC 50/60 Hz
4	220 VAC 50/60 Hz	**J**	230 VAC 50/60 Hz
5	24 VDC		

∗ Refer to the table (3) shown below for availability.

Refer to page 15 for ordering coil only.

Built-in full-wave rectifier type

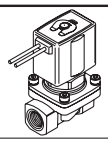
Bracket

Nil	None
B	With bracket

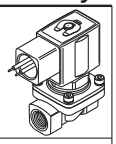
∗ Bracket is not removable.

Electrical entry

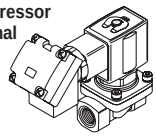
G - **Grommet**
GS - **With grommet surge voltage suppressor**



C - **Conduit**

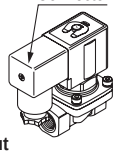


T - **With conduit terminal**
TS - **With conduit terminal and surge voltage suppressor**
TL - **With conduit terminal and light**
TZ - **With conduit terminal, surge voltage suppressor and light**



D - **DIN terminal**
DS - **DIN terminal with surge voltage suppressor**
DL - **DIN terminal with light**
DZ - **DIN terminal with surge voltage suppressor and light**
DO - **For DIN terminal (without connector, gasket is included.)**

Connector



∗ DIN type is available with class B only.

∗ Refer to the table (3) for the available combinations between each electrical option (S, L, Z) and rated voltage.
∗ Option "S", "Z" are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.

Table (1) Port/Orifice Size

Normally closed (N.C.)

Solenoid valve (Port size)					Orifice symbol (Diameter)							Material	
Model		VXD21	VXD22	VXD23	3 (10 mmø)	4 (15 mmø)	5 (20 mmø)	6 (25 mmø)	7 (35 mmø)	8 (40 mmø)	9 (50 mmø)	Body	Seal
Port no. (Port size)	Thread	**02** (1/4)	—	—	●	—	—	—	—	—	—	Brass (C37), Stainless steel	NBR FKM EPDM
		03 (3/8)	—	—	●	●	—	—	—	—	—		
		04 (1/2)	—	—	●	●	—	—	—	—	—		
		06 (3/4)	—	—	—	—	●	—	—	—	—		
		—	**10** (1)	—	—	—	—	●	—	—	—		
	Flange	—	**32** (32A)	—	—	—	—	—	●	—	—	CAC407	
		—	—	**40** (40A)	—	—	—	—	—	●	—		
		—	—	**50** (50A)	—	—	—	—	—	—	●		

Normally open (N.O.)

Solenoid valve (Port size)					Orifice symbol (Diameter)						Material	
Model		VXD21	VXD22	VXD23	4 (15 mmø)	5 (20 mmø)	6 (25 mmø)	7 (35 mmø)	8 (40 mmø)	9 (50 mmø)	Body	Seal
Port no. (Port size)	Thread	**03** (3/8)	—	—	●	—	—	—	—	—	Brass (C37), Stainless steel	NBR FKM EPDM
		04 (1/2)	—	—	●	—	—	—	—	—		
		06 (3/4)	—	—	—	●	—	—	—	—		
		—	**10** (1)	—	—	—	●	—	—	—		
	Flange	—	**32** (32A)	—	—	—	—	●	—	—	CAC407	
		—	—	**40** (40A)	—	—	—	—	●	—		
		—	—	**50** (50A)	—	—	—	—	—	●		

Table (2) Solenoid Valve Option

Option symbol	Seal material	Body/ Shading coil material	Coil insulation type	Note
Nil	NBR	Brass (C37)/Cu	B	—
G		Stainless steel/Ag		
E	EPDM	Brass (C37)/Cu	H	Heated water (AC only)
P		Stainless steel/Ag		
L	FKM	Stainless steel/Ag	B	High corrosive, Oil-free

Table (3) Rated Voltage – Electrical Option

Rated voltage			Class B			Class H		
			S	**L**	**Z**	**S**	**L**	**Z**
AC/ DC	Voltage symbol	Voltage	With surge voltage suppressor	With light	With light and surge voltage suppressor	With surge voltage suppressor	With light	With light and surge voltage suppressor
AC	**1**	100V	●	●	●	●	●	●
	2	200V	●	●	●	●	●	●
	3	110V	●	●	●	●	●	●
	4	220V	●	●	●	●	●	●
	7	240V	●	—	—	●	—	—
	8	48V	●	—	—	●	—	—
	J	230V	●	—	—	●	—	—
DC	**5**	24V	●	●	●	DC spec. is not available.		
	6	12V	●	—	—			

Note) Option "S", "Z" are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.

⚠ When the fluid is oil.

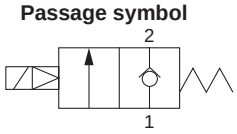
The dynamic viscosity of the fluid must not exceed 50 mm²/s.
The special construction of the armature adopted in the built-in full-wave rectifier type gives an improvement in OFF response by providing clearance on the absorbed surface when it is switched ON.
Select the DC spec. or AC spec. built-in full-wave rectifier type when the dynamic viscosity is higher than water or when the OFF response is prioritized.

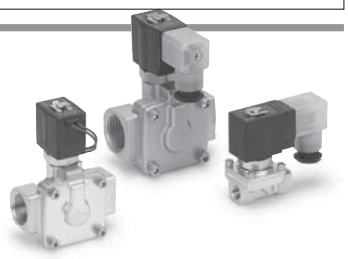
For Oil

Model/Valve Specifications

Normally closed (N.C.)

Passage symbol



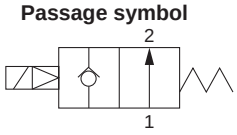


Port size		Orifice size (mmø)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)		Flow characteristics		Max. system pressure (MPa)	Note) Weight (g)
					AC	DC	Av x $10^{-6}m^2$	Cv converted		
Thread (Nominal size)	1/4 (8A)	10	**VXD2130-02**	0.02	0.5	0.4	46	1.9	1.5	420
	3/8 (10A)	10	**VXD2130-03**				58	2.4		
		15	**VXD2140-03**		0.7	0.7	110	4.5		670
	1/2 (15A)	10	**VXD2130-04**		0.5	0.4	58	2.4		500
		15	**VXD2140-04**		0.7	0.7	130	5.5		670
	3/4 (20A)	20	**VXD2150-06**				230	9.5		1150
	1 (25A)	25	**VXD2260-10**				310	13		1650
Flange	32A	35	**VXD2270-32**	0.03			550	23		5400
	40A	40	**VXD2380-40**				740	31		6800
	50A	50	**VXD2390-50**				1200	49		8400

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

Normally open (N.O.)

Passage symbol



Port size		Orifice size (mmø)	Model	Min. operating pressure differential (MPa)	Max. operating pressure differential (MPa)	Flow characteristics		Max. system pressure (MPa)	Note) Weight (g)
					AC, DC	Av x $10^{-6}m^2$	Cv converted		
Thread (Nominal size)	3/8 (10A)	15	**VXD2142-03**	0.02	0.6	110	4.5	1.5	690
	1/2 (15A)		**VXD2142-04**			130	5.5		
	3/4 (20A)	20	**VXD2152-06**			230	9.5		1170
	1 (25A)	25	**VXD2262-10**			310	13		1690
Flange	32A	35	**VXD2272-32**	0.03		550	23		5400
	40A	40	**VXD2382-40**			740	31		6800
	50A	50	**VXD2392-50**			1200	49		8400

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

Ambient and Fluid Temperature

Power source	Fluid temperature (°C)		Ambient temperature (°C)
	Solenoid valve option symbol		
	A, H	**D, N**	
AC	–5 to 60	–5 to 100	–10 to 60
DC		—	

Note) Dynamic viscosity: 50 mm²/s or less

Valve Leakage Rate

Internal Leakage

Seal material	Leakage rate (Oil)	
	1/4 to 1	32A to 50A
FKM	0.2 cm^3/min or less	1 cm^3/min or less

External Leakage

Seal material	Leakage rate (Oil)	
	1/4 to 1	32A to 50A
FKM	0.1 cm^3/min or less	0.1 cm^3/min or less

How to Order

DC/AC (Except VXD2130 AC/Class B) VXD 21 3 0 □ □ — 02 □ — 5 G 1 — □

AC/Class B coil (Built-in full-wave rectifier type) VXD 21 3 0 □ □ — 02 □ — 1 G R1 — □

∗ For the AC (Class B coil) of the VXD2130, built-in full-wave rectifier type is only applicable.

Model
Refer to the table (1) shown below for availability.

Orifice size
Refer to the table (1) shown below for availability.

Valve/Body configuration

0	N.C. / Single unit
2	N.O. / Single unit

∗ N.O. for VXD2130 is not available.

Solenoid valve option
Refer to the table (2) shown below for availability.

Suffix

Nil	—
Z	Oil-free spec.

Thread type

Nil	Rc
T	NPTF
F	G
N	NPT

Rated voltage

1	100 VAC 50/60 Hz	**6**	12 VDC
2	200 VAC 50/60 Hz	**7**	240 VAC 50/60 Hz
3	110 VAC 50/60 Hz	**8**	48 VAC 50/60 Hz
4	220 VAC 50/60 Hz	**J**	230 VAC 50/60 Hz
5	24 VDC		

∗ Refer to the table (3) shown below for availability.

Refer to page 15 for ordering coil only.

Port size
Refer to the table (1) shown below for availability.

Built-in full-wave rectifier type

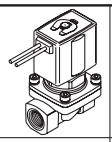
Bracket

Nil	None
B	With bracket

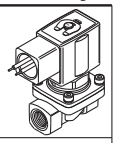
∗ Bracket is not removable.

Electrical entry

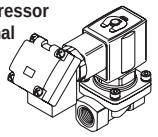
G - Grommet
GS - With grommet surge voltage suppressor



C - Conduit

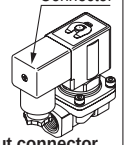


T - With conduit terminal
TS - With conduit terminal and surge voltage suppressor
TL - With conduit terminal and light
TZ - With conduit terminal, surge voltage suppressor and light



D - DIN terminal
DS - DIN terminal with surge voltage suppressor
DL - DIN terminal with light
DZ - DIN terminal with surge voltage suppressor and light
DO - For DIN terminal (without connector, gasket is included.)

Connector



∗ DIN type is available with class B only.

∗ Refer to the table (3) for the available combinations between each electrical option (S, L, Z) and rated voltage.
∗ Option "S", "Z" are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.

Table (1) Port/Orifice Size

Normally closed (N.C.)

Solenoid valve (Port size)					Orifice symbol (Diameter)							Material	
Model		VXD21	VXD22	VXD23	3 (10 mmø)	4 (15 mmø)	5 (20 mmø)	6 (25 mmø)	7 (35 mmø)	8 (40 mmø)	9 (50 mmø)	Body	Seal
Port no. (Port size)	Thread	**02** (1/4)	—	—	●	—	—	—	—	—	—	Brass (C37), Stainless steel	FKM
		03 (3/8)	—	—	●	●	—	—	—	—	—		
		04 (1/2)	—	—	●	●	—	—	—	—	—		
		06 (3/4)	—	—	—	—	●	—	—	—	—		
		—	**10** (1)	—	—	—	—	●	—	—	—		
	Flange	—	**32** (32A)	—	—	—	—	—	●	—	—	CAC407	
		—	—	**40** (40A)	—	—	—	—	—	●	—		
		—	—	**50** (50A)	—	—	—	—	—	—	●		

Normally open (N.O.)

Solenoid valve (Port size)					Orifice symbol (Diameter)						Material	
Model		VXD21	VXD22	VXD23	4 (15 mmø)	5 (20 mmø)	6 (25 mmø)	7 (35 mmø)	8 (40 mmø)	9 (50 mmø)	Body	Seal
Port no. (Port size)	Thread	**03** (3/8)	—	—	●	—	—	—	—	—	Brass (C37), Stainless steel	FKM
		04 (1/2)	—	—	●	—	—	—	—	—		
		06 (3/4)	—	—	—	●	—	—	—	—		
		—	**10** (1)	—	—	—	●	—	—	—		
	Flange	—	**32** (32A)	—	—	—	—	●	—	—	CAC407	
		—	—	**40** (40A)	—	—	—	—	●	—		
		—	—	**50** (50A)	—	—	—	—	—	●		

Table (2) Solenoid Valve Option

Option symbol	Seal material	Body/ Shading coil material	Coil insulation type
A	FKM	Brass (C37)/Cu	B
H		Stainless steel/Ag	
D		Brass (C37)/Cu	H
N		Stainless steel/Ag	

Table (3) Rated Voltage – Electrical Option

Rated voltage			Class B			Class H		
			S	**L**	**Z**	**S**	**L**	**Z**
AC/ DC	Voltage symbol	Voltage	With surge voltage suppressor	With light	With light and surge voltage suppressor	With surge voltage suppressor	With light	With light and surge voltage suppressor
AC	**1**	100V	●	●	●	●	●	●
	2	200V	●	●	●	●	●	●
	3	110V	●	●	●	●	●	●
	4	220V	●	●	●	●	●	●
	7	240V	●	—	—	●	—	—
	8	48V	●	—	—	●	—	—
	J	230V	●	—	—	●	—	—
DC	**5**	24V	●	●	●	DC spec. is not available.		
	6	12V	●	—	—			

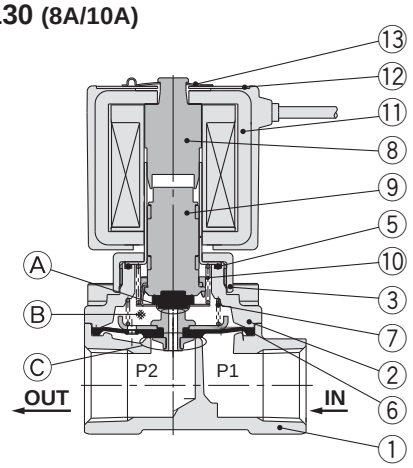
Note) Option "S", "Z" are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.

Construction

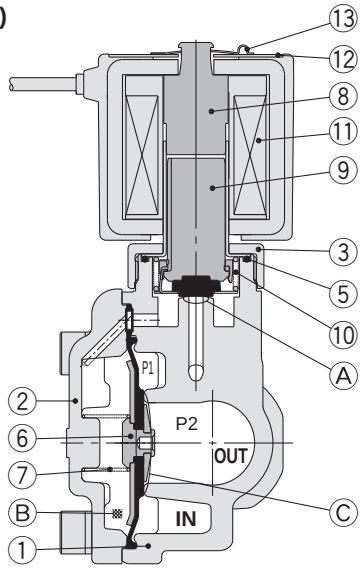
Normally closed (N.C.)

Body material: Brass (C37) (32A or larger: CAC407), Stainless steel (32A or larger: not available)

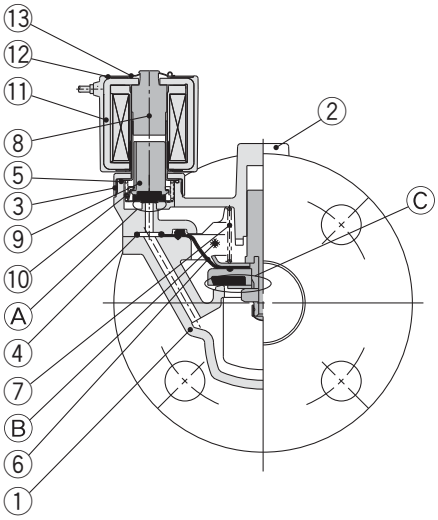
VXD2130 (8A/10A)



VXD2140, 2150, 2260 (10A to 25A)



VXD2270, 2380, 2390 (32A to 50A)



Operation

<Valve opened> When the coil ⑪ is energized, the armature assembly ⑨ is attracted into the core of the tube assembly ⑧ and the pilot valve Ⓐ opens. Then the pressure in the pressure action chamber Ⓑ falls to open the main valve Ⓒ.

<Valve closed> When the coil ⑪ is not energized, the pilot valve Ⓐ is closed and the pressure in the pressure action chamber Ⓑ rises and the main valve Ⓒ closes.

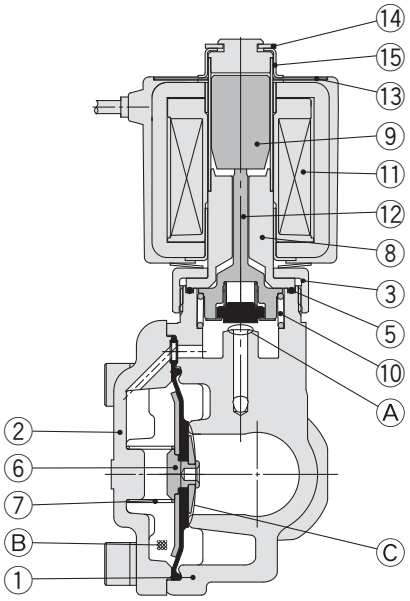
Component Parts

No.	Description	Size	Material	
			Standard	Option
1	Body	8A to 25A	Brass (C37)	Stainless steel
		32A to 50A	CAC407	
2	Bonnet	8A to 25A	Brass (C37)	Stainless steel
		32A to 50A	CAC407	
3	Nut	8A to 50A	Brass (C37)	Brass (C37), Ni plated
4	O-ring	32A to 50A	NBR	FKM, EPDM
5	O-ring	8A to 50A	NBR	FKM, EPDM
6	Diaphragm assembly	8A to 25A	Stainless steel, NBR	Stainless steel, FKM / Stainless steel, EPDM
		32A to 50A	Stainless steel, Brass (C37), NBR	Stainless steel, FKM, EPDM
7	Valve spring	8A to 50A	Stainless steel	
8	Tube assembly	8A to 25A	Stainless steel, Cu	Stainless steel, Ag
		32A to 50A		—
9	Armature assembly	8A to 50A	Stainless steel, PPS, NBR	Stainless steel, PPS, FKM Stainless steel, EPDM
10	Return spring	8A to 50A	Stainless steel	
11	Solenoid coil	8A to 50A	Class B molded	Class H molded
12	Name plate	8A to 50A	Aluminum	
13	Clip	8A to 50A	SK	

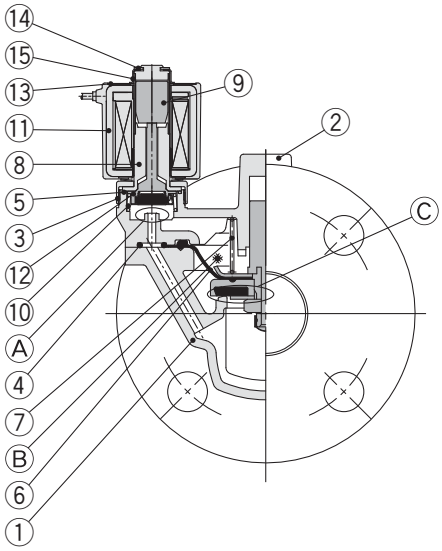
Normally open (N.O.)

Body material: Brass (C37) (32A or larger: CAC407), Stainless steel (32A or larger: not available)

VXD2142, 2152, 2262 (10A to 25A)



VXD2272, 2382, 2392 (32A to 50A)



Operation
<Valve opened> When the coil ⑪ is energized, the opened pilot Ⓐ closes, the pressure in pressure action chamber Ⓑ rises and the main valve Ⓒ closes.
<Valve closed> When the coil ⑪ is not energized, the closed pilot valve Ⓐ opens, the pressure in pressure action chamber Ⓑ drops and the main valve Ⓒ opens.

Component Parts

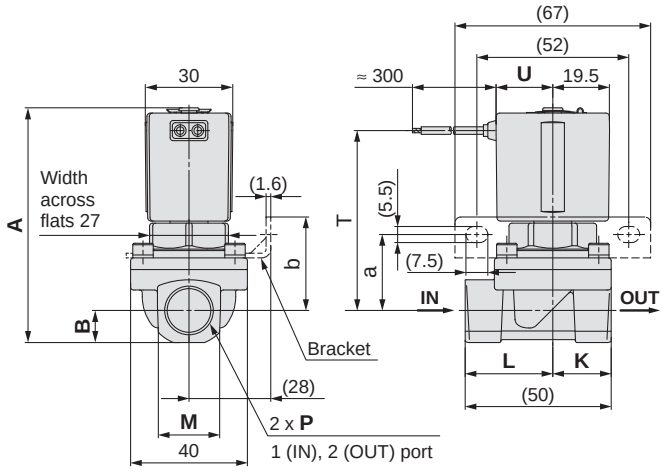
No.	Description	Size	Material	
			Standard	Option
1	**Body**	10A to 25A	Brass (C37)	Stainless steel
		32A to 50A	CAC407	
2	**Bonnet**	10A to 25A	Brass (C37)	Stainless steel
		32A to 50A	CAC407	
3	**Nut**	10A to 25A	Brass (C37)	Brass (C37), Ni plated
4	**O-ring**	32A to 50A	NBR	FKM, EPDM
5	**O-ring**	10A to 50A	NBR	FKM, EPDM
6	**Diaphragm assembly**	10A to 25A	Stainless steel, NBR	Stainless steel, FKM / Stainless steel, EPDM
		32A to 50A	Stainless steel, NBR	Stainless steel, FKM, EPDM
7	**Valve spring**	10A to 25A	Stainless steel	
8	**Tube assembl**	10A to 25A	Stainless steel, Cu	Stainless steel, Ag
		32A to 50A		—
9	**Armature assembly**	10A to 50A	Stainless steel	
10	**Return spring**	10A to 50A	Stainless steel	
11	**Solenoid coil**	10A to 50A	Class B molded	Class H molded
12	**Push rod assembly**	10A to 50A	NBR, PPS, Stainless steel	FKM, EPDM, Stainless steel
13	**Name plate**	10A to 50A	Aluminum	
14	**Clip**	10A to 50A	SK	
15	**Cover**	10A to 50A	Stainless steel	

The materials in parentheses are the seal materials.

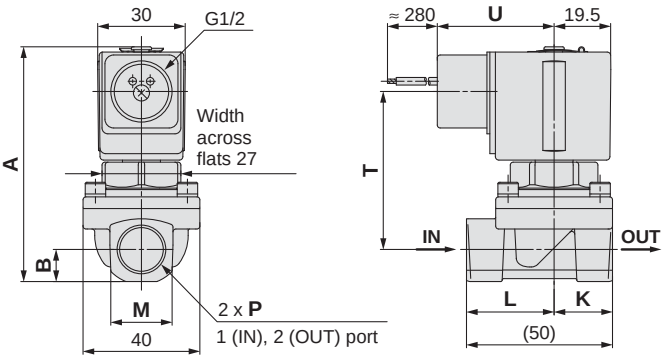
Dimensions: Single Unit/Body Material: Brass (C37), Stainless Steel

Normally closed (N.C.): VXD2130

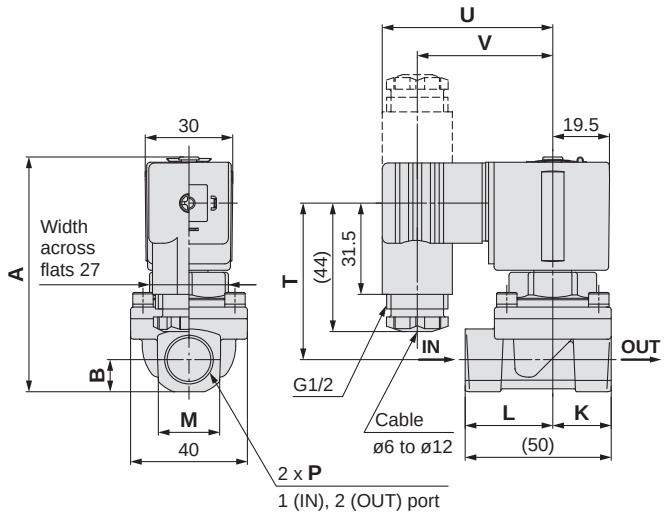
Grommet: G



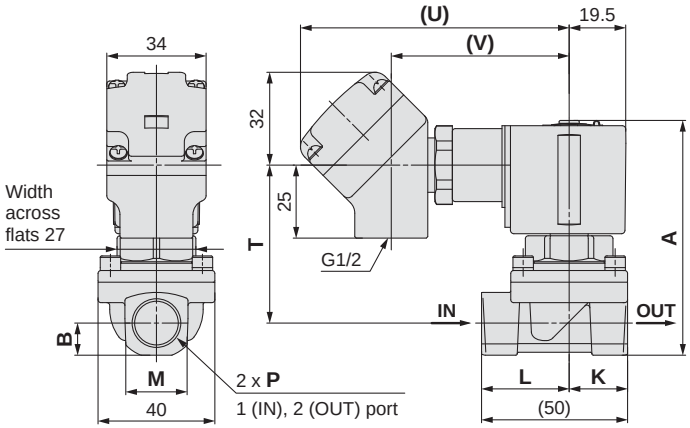
Conduit: C



DIN terminal: D

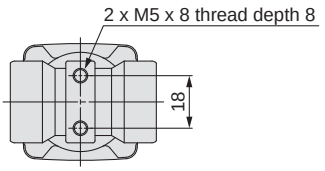


Conduit terminal: T



VXD2130□□-04□-□□□□

Note) A thread is drilled on the bottom of the body of the VXD2130 with port size 04 (1/2).



(mm)

Model	Port size P	A	B	K	L	M	Electrical entry									
							Grommet		Conduit		DIN terminal			Conduit terminal		
N.C.							T	U	T	U	T	U	V	T	U	V
VXD2130	1/4, 3/8	80.5	11	20	30	22	62	19.5	54.5	40	54	58.5	46.5	54.5	92	61
	1/2	86	14.5	24	26	28	64	19.5	56.5	40	56	58.5	46.5	56.5	92	61

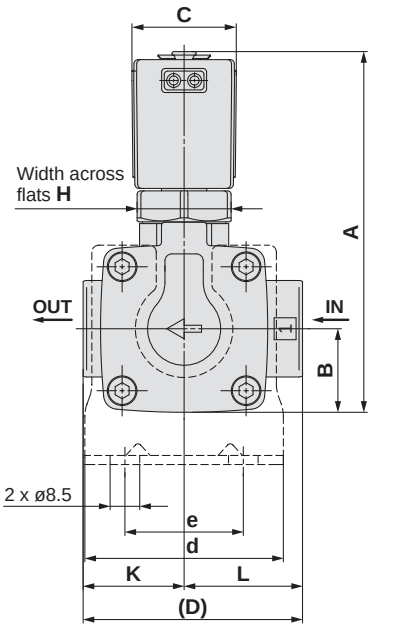
(mm)

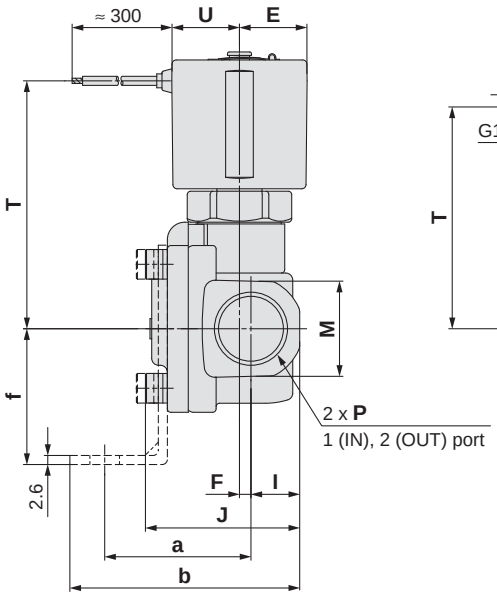
Model	Port size P	Electrical entry (Built-in full-wave rectifier type)										Bracket mounting	
		Grommet		Conduit		DIN terminal			Conduit terminal				
N.C.		T	U	T	U	T	U	V	T	U	V	a	b
VXD2130	1/4, 3/8	58	30	53	48.5	54	65.5	53.5	53	100.5	69.5	26	32
	1/2	60	30	55	48.5	56	65.5	53.5	55	100.5	69.5	28	34

Dimensions: Single Unit/Body Material: Brass (C37), Stainless Steel

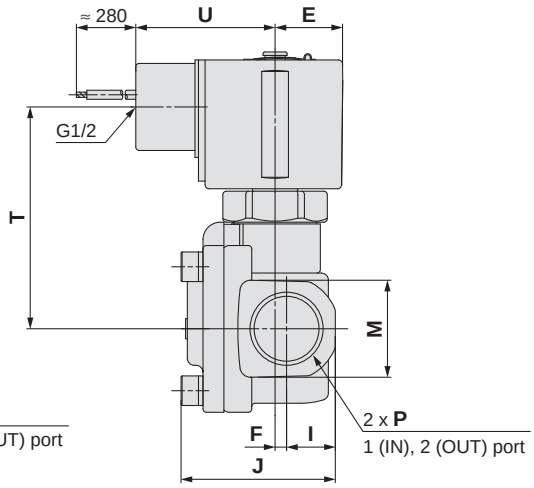
Normally closed (N.C.): VXD2140/VXD2150/VXD2260
Normally open (N.O.): VXD2142/VXD2152/VXD2262

Grommet: G

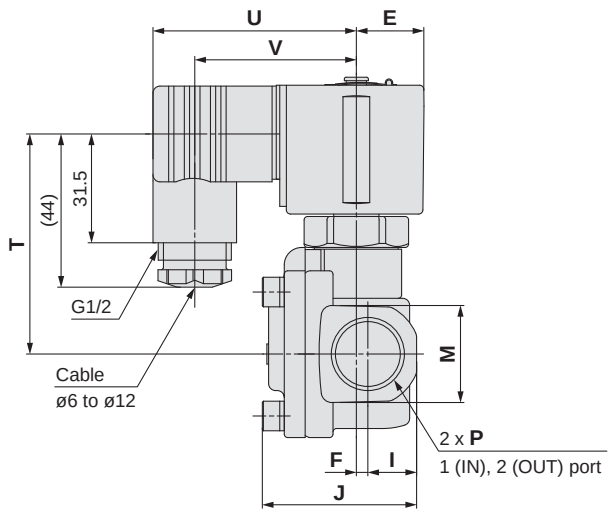




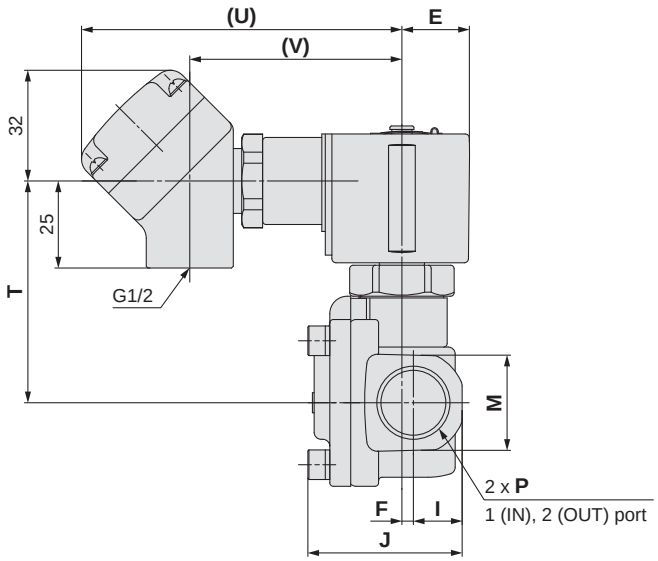
Conduit: C



DIN terminal: D



Conduit terminal: T



(mm)

Model		Port size P	A	B	C	D	E	F	H	I	J	K	L	M	Electrical entry									
															Grommet		Conduit		DIN terminal			Conduit terminal		
N.C.	N.O.														T	U	T	U	T	U	V	T	U	V
VXD2140	**VXD2142**	3/8, 1/2	103.5 (110.5)	24	30	63	19.5	3.5	27	14	44.5	29	34	28	71.5 (73)	19.5	64 (65.5)	40	63.5 (65)	58.5	46.5	64 (65.5)	92	61
VXD2150	**VXD2152**	3/4	115 (122)	29	30	80	19.5	4.5	27	17	51.5	37	43	35	78 (79.5)	19.5	70.5 (72)	40	70 (71.5)	58.5	46.5	70.5 (72)	92	61
VXD2260	**VXD2262**	1	133 (140.5)	33	35	90	22.5	4.5	32	20	60	43	47	42	92 (93.5)	22.5	84.5 (86)	43	84 (85.5)	61.5	49.5	84.5 (86)	95	64

( ) denotes the value for N.O.

(mm)

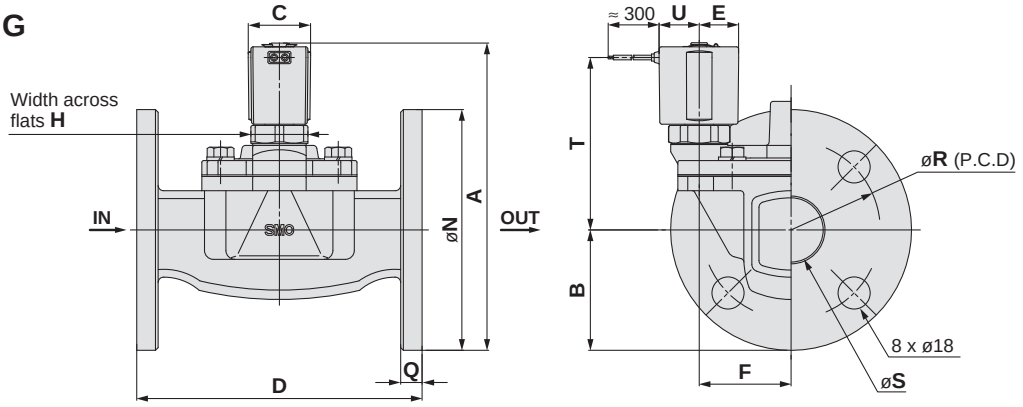
Model		Port size P	Electrical entry (Built-in full-wave rectifier type)									Bracket mounting				
			Grommet		Conduit		DIN terminal			Conduit terminal							
N.C.	N.O.		T	U	T	U	T	U	V	T	U	V	a	b	d	e	f
VXD2140	**VXD2142**	3/8, 1/2	67.5 (69)	30	62.5 (64)	48.5	63.5 (65)	65.5	53.5	62.5 (64)	100.5	69.5	42	66	57	34	39
VXD2150	**VXD2152**	3/4	74 (75.5)	30	69 (70.5)	48.5	70 (71.5)	65.5	53.5	69 (70.5)	100.5	69.5	51	78	74	51	45.5
VXD2260	**VXD2262**	1	88 (89.5)	33	83 (84.5)	51.5	84 (85.5)	68.5	56.5	83 (84.5)	103.5	72.5	56	86	81	58	49.5

( ) denotes the value for N.O.

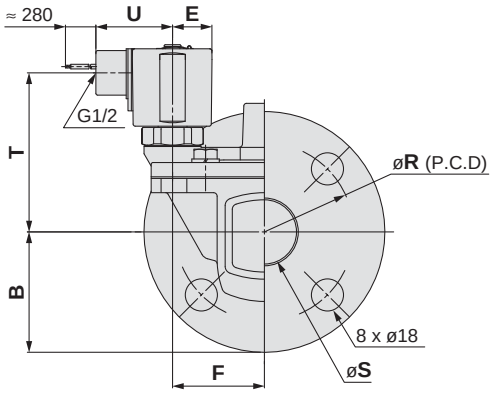
Dimensions: Single Unit/Body Material: Brass (C37), Stainless Steel

Normally closed (N.C.): VXD2270/VXD2380/VXD2390
Normally open (N.O.): VXD2272/VXD2382/VXD2392

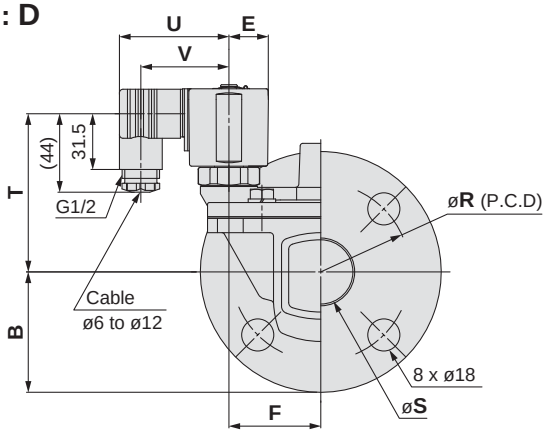
Grommet: G



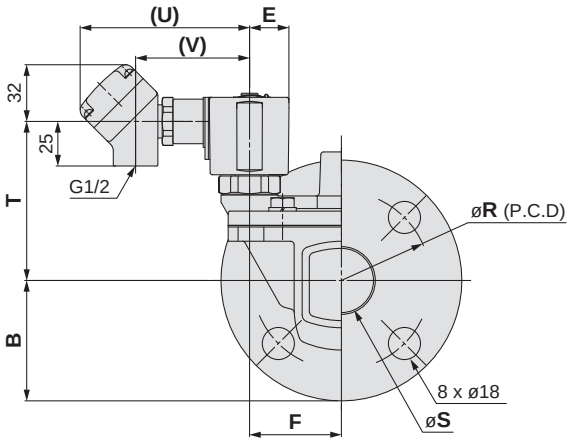
Conduit: C



DIN terminal: D



Conduit terminal: T



(mm)

Model		Applicable flange	A	B	C	D	E	F	H	N	Q	R	S	Electrical entry								
														Grommet		Conduit		DIN terminal			Conduit terminal		
N.C.	N.O.													T	U	T	U	T	U	V	T	U	V
VXD2270	**VXD2272**	32A	172.5 (180)	67.5	35	160	22.5	51.5	32	135	12	100	36	97 (98.5)	22.5	89.5 (91)	43	89 (90.5)	61.5	49.5	89.5 (91)	95	64
VXD2380	**VXD2382**	40A	185 (192.5)	70	40	170	25	54.5	36	140	14	105	42	107 (108.5)	25.5	99.5 (101)	46	99 (100.5)	64	52	99.5 (101)	98	67
VXD2390	**VXD2392**	50A	198 (205.5)	77.5	40	180	25	59	36	155	14	120	52	112.5 (114)	25.5	105 (106.5)	46	104.5 (106)	64	52	105 (106.5)	98	67

( ) denotes the value for N.O.

(mm)

Model		Applicable flange	Electrical entry (Built-in full-wave rectifier type)									
			Grommet		Conduit		DIN terminal			Conduit terminal		
N.C.	N.O.		T	U	T	U	T	U	V	T	U	V
VXD2270	**VXD2272**	32A	93 (94.5)	33	88 (89.5)	51.5	89 (90.5)	68.5	56.5	88 (89.5)	103.5	72.5
VXD2380	**VXD2382**	40A	103 (104.5)	36	98 (99.5)	54	99 (100.5)	71	59	98 (99.5)	106	75
VXD2390	**VXD2392**	50A	108.5 (110)	36	103.5 (105)	54	104.5 (106)	71	59	103.5 (105)	106	75

( ) denotes the value for N.O.

Replacement Parts

● Solenoid coil assembly part no.

Table (1) Model and Solenoid Coil Type

Select the coil type from Ⓐ to Ⓒ, and refer to "How to Order" below.

Voltage type		AC		AC (Built-in full-wave rectifier type)	DC
Coil insulation type		Class B	Class H	Class B	Class H
(Solenoid valve option)		(Nil, A, B, G, H, J, L)	(D, E, N, P)	(Nil, A, B, G, H, J, L)	(Nil, A, B, G, H, J, L)
Model	VXD2130	— Note)	Ⓐ	Ⓒ	Ⓑ
	VXD21$^{4}_{5}$□	Ⓐ	Ⓐ	Ⓒ	Ⓐ
	VXD22$^{6}_{7}$□	Ⓐ	Ⓐ	Ⓒ	Ⓐ
	VXD23$^{8}_{9}$□	Ⓐ	Ⓐ	Ⓒ	Ⓐ

DC, AC (Except VXD2130 AC/Class B) Note 1)

Ⓐ**VX02 1 N — 5 G — □ — □**

Series

1	VXD21□□
2	VXD22□□
3	VXD23□□

Rated voltage Note 2)

1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3	110 VAC 50/60 Hz
4	220 VAC 50/60 Hz
5	24 VDC
6	12 VDC
7	240 VAC 50/60 Hz
8	48 VAC 50/60 Hz
J	230 VAC 50/60 Hz

Coil insulation type

Nil	Class B
H	Class H Note)

Note) DIN terminal and DC spec. are not available.

Valve

Symbol	Valve
Nil	N.C.
2	N.O.

Note 1) For the AC (Class B coil) of the VXD2130, built-in full-wave rectifier type is only applicable.
Note 2) Refer to the table (2) for the available combinations.

Electrical entry

G - Grommet **GS** - With grommet surge voltage suppressor	**C** - Conduit
T - With conduit terminal **TS** - With conduit terminal and surge voltage suppressor **TL** - With conduit terminal and light **TZ** - With conduit terminal, surge voltage suppressor and light	**D** - DIN terminal **DS** - DIN terminal with surge voltage suppressor **DL** - DIN terminal with light **DZ** - DIN terminal with surge voltage suppressor and light **DO** - For DIN terminal (without connector, gasket is included.)

Connector

∗ Refer to the table (2) for the available combinations between each electrical option and rated voltage.

For VXD2130 DC

Ⓑ**VX021N — 5 G — Z**

Rated voltage

5	24 VDC
6	12 VDC

Table (2) Rated Voltage – Electrical Option

Rated voltage			Class B			Class H		
			S	L	Z	S	L	Z
AC/DC	Voltage symbol	Voltage	With surge voltage suppressor	With light	With light and surge voltage suppressor	With surge voltage suppressor	With light	With light and surge voltage suppressor
AC	1	100 V	●	●	●	●	●	●
	2	200 V	●	●	●	●	●	●
	3	110 V	●	●	●	●	●	●
	4	220 V	●	●	●	●	●	●
	7	240 V	●	—	—	●	—	—
	8	48 V	●	—	—	●	—	—
	J	230 V	●	—	—	●	—	—
DC	5	24 V	●	●	●	DC spec. is not available.		
	6	12 V	●	—	—			

∗ Option "S", "Z" are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.
∗ Replacement of solenoid coils:
- DC and AC coils cannot be interchanged in order to change the voltage.
- DC and AC (built-in full-wave rectifier type) coils can be interchanged in order to change the voltage.
- All DC coil voltages are interchangeable. • All AC coil voltages are interchangeable.

AC/Class B (Built-in full-wave rectifier type)

Ⓒ**VX02 1 N — 1 G R — □**

Series

1	VXD21□□
2	VXD22□□
3	VXD23□□

Rated voltage Note)

1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3	110 VAC 50/60 Hz
4	220 VAC 50/60 Hz
7	240 VAC 50/60 Hz
8	48 VAC 50/60 Hz
J	230 VAC 50/60 Hz

Valve

Symbol	Valve
Nil	N.C.
2	N.O.

Note) Refer to the table (2) for the available combinations.

Electrical entry

G - Grommet	**C** - Conduit
T - With conduit terminal **TL** - With conduit terminal and light	**D** - DIN terminal **DL** - DIN terminal with light **DO** - For DIN terminal (without connector, gasket is included.)

Connector

∗ Refer to the table (2) for the available combinations between each electrical option and rated voltage.
∗ A surge voltage suppressor is inegrated into the AC/Class B coil, as a standard.

● DIN connector part no.

Without electrical option **GDM2A**

With electrical option **GDM2A — □ □**

Electrical option

S	With surge voltage suppressor
L	With light
Z	With light/surge voltage suppressor

∗ Refer to the table (1) for the available combinations between each electrical option (S, L, Z) and rated voltage.

Rated voltage

1	100 VAC, 110 VAC
2	200 VAC, 220 VAC, 230 VAC, 240 VAC
5	24 VDC
6	12 VDC
15	48 VAC

● Gasket part no. for DIN connector **VCW20-1-29-1**

Replacement Parts

● **Name plate part no.**

AZ-T-VX **Valve model**

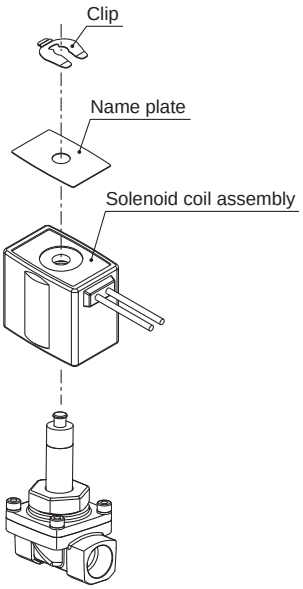
Enter by referring to
"How to Order".

● **Clip part no. (For N.C.)**

For VXD21: VX021N-10
For VXD22: VX022N-10
For VXD23: VX023N-10

● **Clip part no. (For N.O.)**

For VXD21: ETW-7
For VXD22: ETW-8
For VXD23: ETW-9



Solenoid Valve Flow Characteristics
(How to indicate flow characteristics)

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

Table (1) Indication of Flow 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 8373, 8374, 8375, 8379, 8381**
		Cv	**ANSI/(NFPA)T3.21.3: 1990**
Process fluid control equipment	*Av*	—	**IEC60534-2-3: 1997** **JIS B 2005: 1995** **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 characteristics

The flow 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 [dm³/min (ANR)], dm³ (Cubic decimeter) of SI unit are also allowed to be described by ℓ (liter). 1 dm³ = 1 ℓ

Solenoid Valve Flow Characteristics

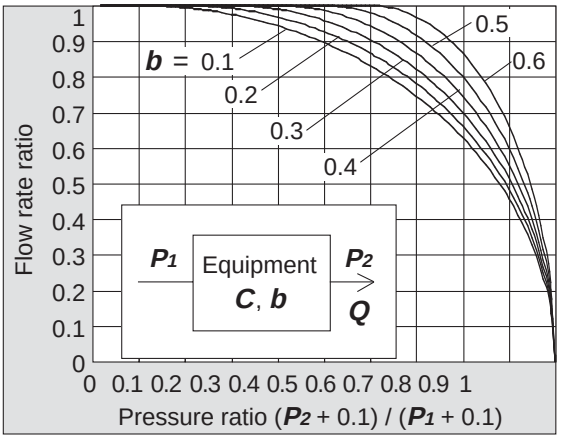
C : Sonic conductance [dm³/(s·bar)]
b : Critical pressure ratio [—]
P₁ : Upstream pressure [MPa]
P₂ : Downstream pressure [MPa]
t : Temperature [°C]
Note) Formula of subsonic flow is the elliptic analogous curve.
Flow characteristics are shown in Graph (1) For details, please make use of SMC's "Energy Saving Program".

Example)
Obtain the air flow rate for ***P₁*** = 0.4 [MPa], ***P₂*** = 0.3 [MPa], ***t*** = 20 [°C] when a solenoid valve is performed in ***C*** = 2 [dm³/(s·bar)] and ***b*** = 0.3.

According to formula 1, the maximum flow rate $= 600 \times 2 \times (0.4 + 0.1) \times \sqrt{\frac{293}{273 + 20}} = 600$ [dm³/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 [dm³/min (ANR)]



Graph (1) Flow 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.

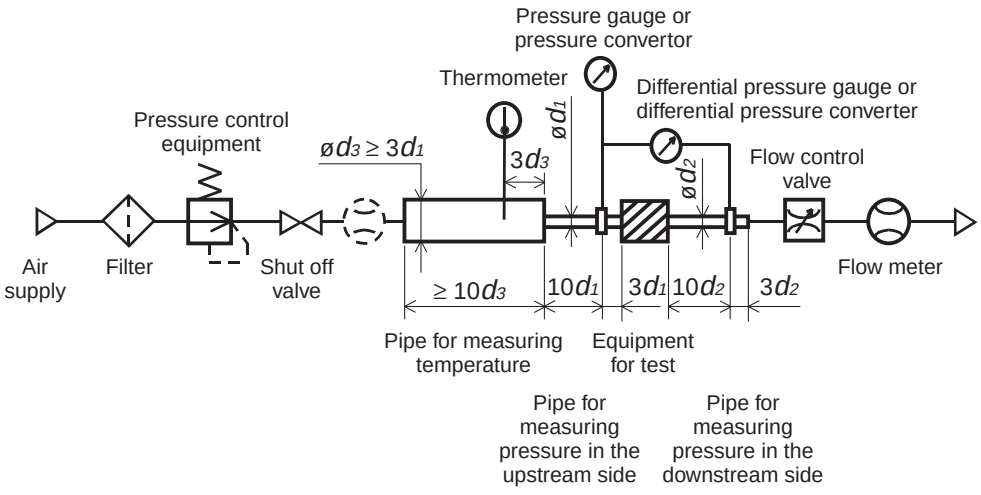


Fig. (1) Test circuit based on ISO 6358, JIS B 8390

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 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[dm³/min(ANR)], dm³ (cubic decimeter) of SI unit are also allowed to be described by ℓ (liter) 1 dm³ = 1 ℓ
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 8373, 8374, 8375, 8379, 8381, the pressure values are in parentheses and the coefficient of the formula is 12.9.

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

S : Effective area [mm²]
V : Air tank capacity [dm³]
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]

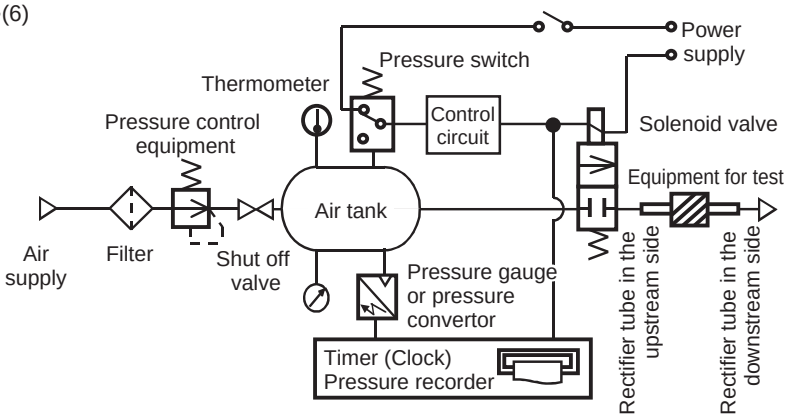


Fig. (2) Test circuit based on JIS B 8390

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.

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

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 [dm³/s standard condition]
Pa : Atmospheric pressure [bar absolute]
T_1 : Test conditions of the upstream absolute temperature [K]
is < $P_1 + P_a =$ 6.5 ± 0.2 bar absolute, T_1 = 297 ± 5K, 0.07 bar ≤ ΔP ≤ 0.14 bar.
This is the same concept as effective area A which ISO6358 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 characteristics

Av factor: Value of the clean water flow rate represented by m³/s which runs through a valve (equipment for test) when the pressure difference is 1 Pa. It is calculated using the following formula.

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

Av : Flow coefficient [m²]
Q : Flow rate [m³/s]
ΔP : Pressure difference [Pa]
ρ : Density of fluid [kg/m³]

(3) Formula of flow rate

It is described by the practical units. Also, the flow characteristics are shown in Graph (2).
In the case of liquid:

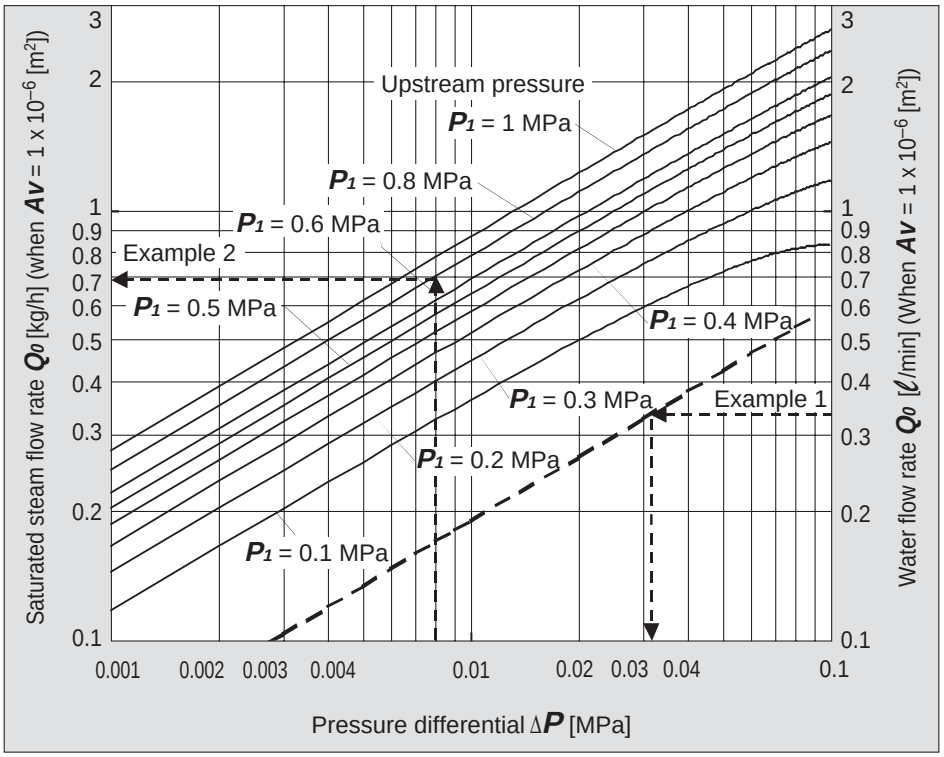
$$Q = 1.9 \times 10^6 Av\sqrt{\frac{\Delta P}{G}} \quad \cdots\cdots(9)$$

Q : Flow rate [ℓ/min]
Av : Flow coefficient [m²]
ΔP : Pressure difference [MPa]
G : Relative density [water = 1]
In the case of saturated aqueous vapor:

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

Q : Flow rate [kg/h]
Av : Flow coefficient [m²]
ΔP : Pressure difference [MPa]
P_1 : Relative density [MPa]: $\Delta P = P_1 - P_2$
P_2 : Relative density [MPa]

Conversion of flow coefficient:
$Av = 28 \times 10^{-6}\ Kv = 24 \times 10^{-6} Cv$ ·····(11)
Here,
Kv factor: Value of the clean water flow rate represented by m^3/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^2 (psi).
Value is different from ***Kv*** and ***Cv*** factors for pneumatic purpose due to different test method.



Graph (2) Flow characteristics

Example 1)
Obtain the pressure difference when water 15 [ℓ/min] runs through a solenoid valve with an $Av = 45 \times 10^{-6}$ [m^2].
Since $Q_0 = 15/45 = 0.33$ [ℓ/min], according to Graph (2), if reading ΔP when Q_0 is 0.33, it will be 0.031 [MPa].

Example 2)
Obtain the saturated steam flow rate when $P_1 = 0.8$ [MPa], $\Delta P = 0.008$ [MPa] with a solenoid valve with an $Av = 1.5 \times 10^{-6}$ [m^2].
According to Graph (2), if reading Q_0 when P_1 is 0.8 and ΔP is 0.008, it is 0.7 [kg/h]. Hence, the flow rate $Q = 0.7 \times 1.5 = 1.05$ [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 4×10^4.

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

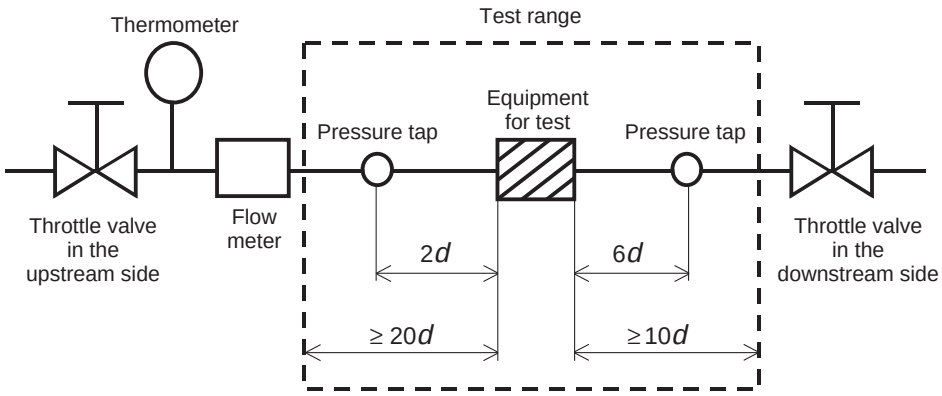
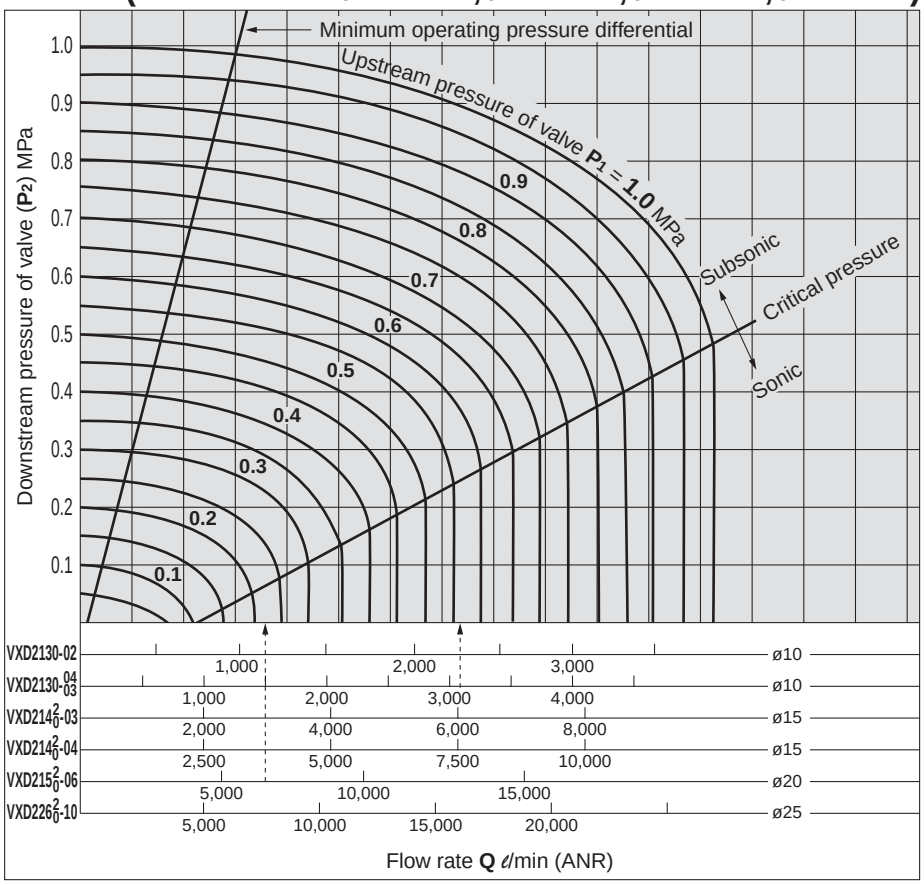


Fig. (3) Test circuit based on IEC60534-2-3, JIS B 2005

Flow Characteristics

Note) Use this graph as a guide. In the case of obtaining an accurate flow rate, refer to pages 17 through to 22.

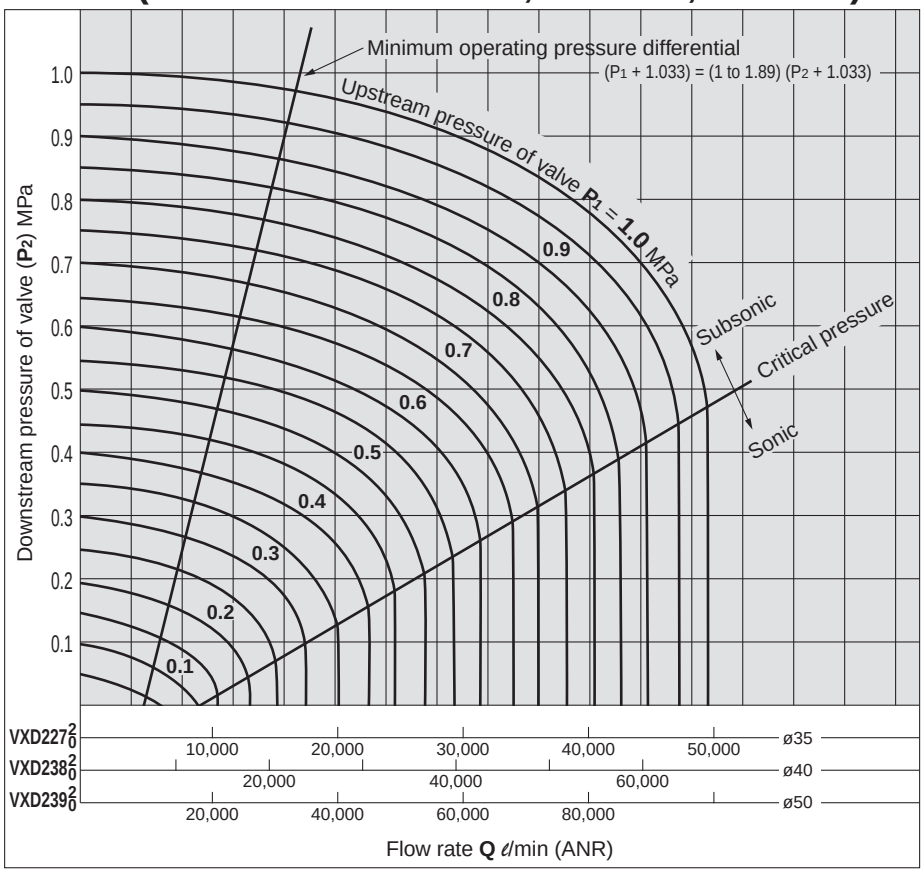
For Air (Orifice size: ø10 mm, ø15 mm, ø20 mm, ø25 mm)



How to read the graph

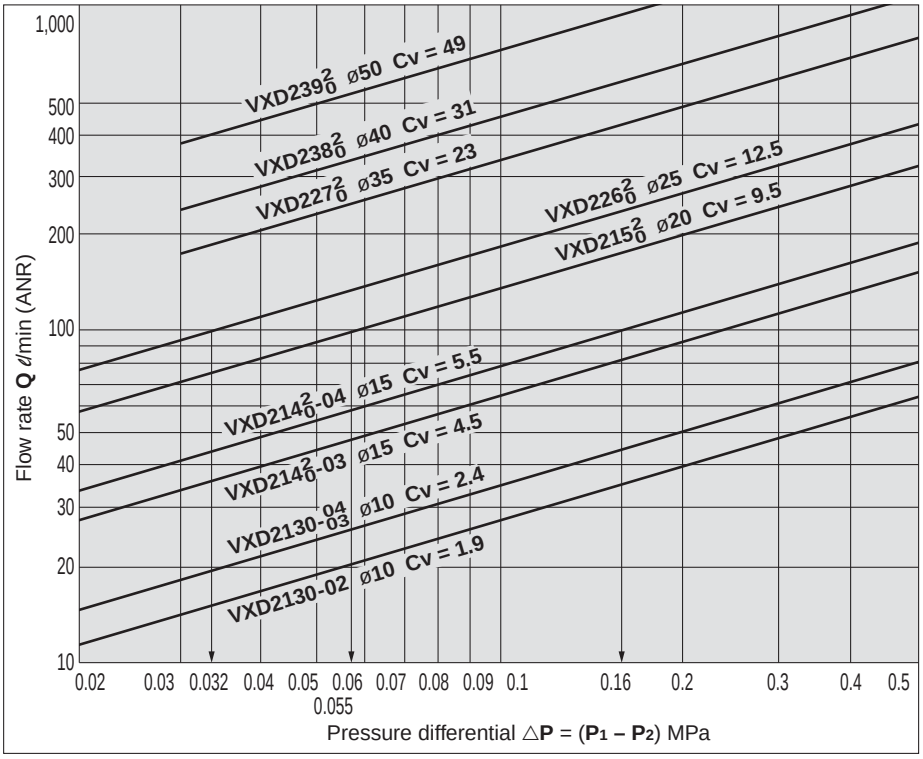
The sonic range pressure to generate a flow rate of 6000 ℓ/min (ANR) is
$P_1 \approx 0.57$ MPa for a ø15 orifice (VXD214$^{2}_{0}$-03) and
$P_1 \approx 0.22$ MPa for a ø20 orifice (VXD215$^{2}_{0}$-06).

For Air (Orifice size: ø35 mm, ø40 mm, ø50 mm)



Flow Characteristics

For Water



How to read the graph

When a water flow of 100 ℓ/min is generated,
△P ≈ 0.16 MPa for a ø15 orifice (VXD214$^{2}_{0}$-04),
△P ≈ 0.055 MPa for a ø20 orifice (VXD215$^{2}_{0}$), and
△P ≈ 0.032 MPa for a ø25 orifice (VXD226$^{2}_{0}$).

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, with the valve closed. 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. Proof pressure

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

Electrical Terminology

1. Apparent power (VA)

Volt-ampere is the product of voltage (V) and current (A). Power consumption (W): For AC, $W = V \cdot A \cdot \cos\theta$. For DC, $W = V \cdot A$.
(Note) $\cos\theta$ shows power factor. $\cos\theta = 0.6$

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”.

IP65: Dusttight, Low jetproof type

“Low jetproof 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.

Others

1. Material

NBR: Nitrile rubber

FKM: Fluoro rubber – Trade names: Viton®, Dai-el®, etc.

EPDM: Ethylene propylene rubber

PTFE: Polytetrafluoroethylene resin – Trade names: Teflon®, Polyflon®, etc.

FFKM: Perfluoroelastomer
Trade names: Kalrez®, Chemraz®, etc.

2. Oil-free treatment

The degreasing and washing of wetted parts.

3. Passage symbol

In the JIS symbol () IN and OUT are in a blocked condition (⫩), but actually in the case of reverse pressure (OUT>IN), there is a limit to the blocking.
(⫪) is used to indicate that blocking of reverse pressure is not possible.