

2 Port Solenoid Valve with Built-in Y-strainer

For Air, Water, Oil, Steam

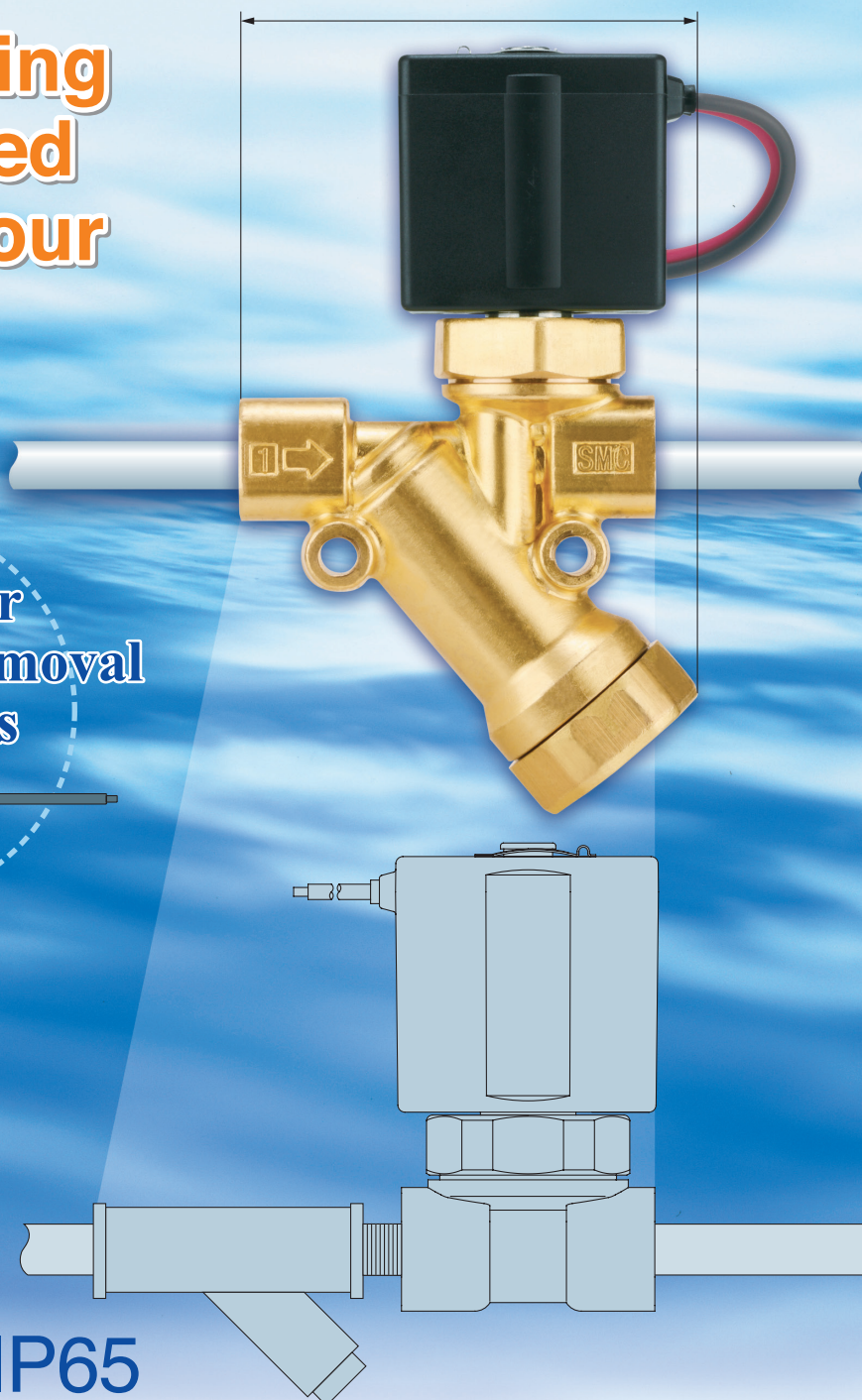
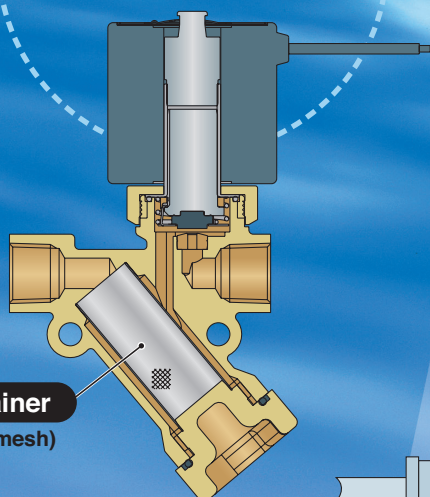


IP65

60 mm (VXK21)
63.5 mm (VXK22/23)

**Space saving
and reduced
piping labour**

**Built-in strainer
enabling the removal
of contaminants**



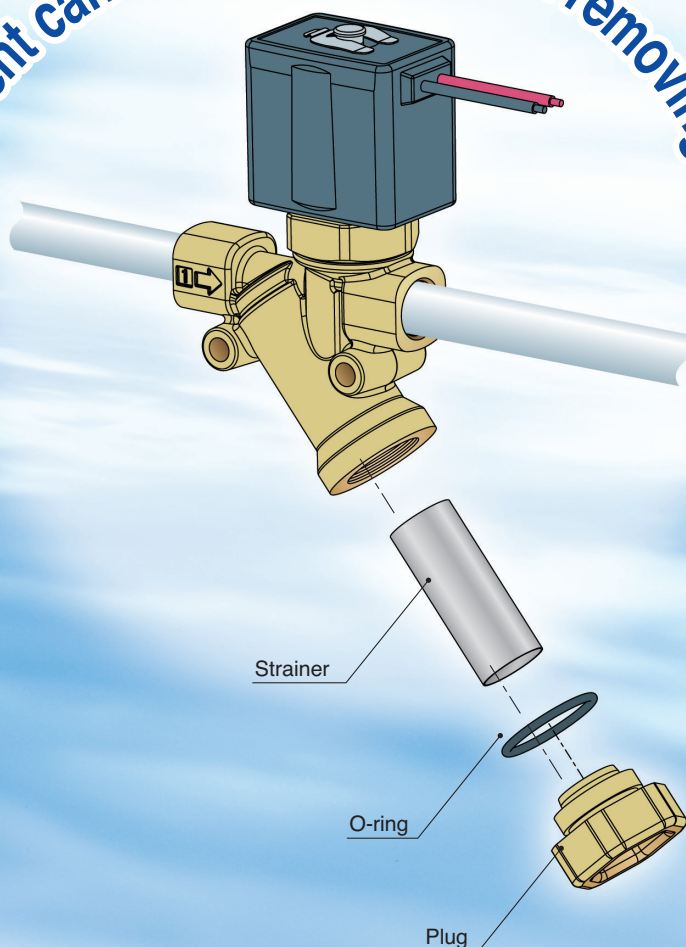
● Restriction of environmentally hazardous substances. **RoHS** compliant

Series VXK



CAT.EUS70-34A-UK

The element can be replaced without removing piping.



Variations

Direct Operated: Series VVK21/22/23

Valve

Normally closed (N.C.)

Normally open (N.O.)

Solenoid Coil

Coil: Class B, Class H

Rated Voltage

AC: 100 V, 200 V, 110 V, 220 V, 240 V
230 V, 48 V

DC: 24 V, 12 V

Material

Body: Brass (C37)

Seal: NBR, FKM, EPDM, PTFE

Electrical Entry

Grommet

Conduit

DIN terminal

Conduit terminal



Normally Closed (N.C.)

Model	VVK21	VVK22	VVK23
Orifice size	2 mm Ø	—	—
	3 mm Ø	●	●
	4.5 mm Ø	●	●
	6 mm Ø	—	●
	8 mm Ø	—	●
Port size	1/8, 1/4	1/4, 3/8	1/4, 3/8

Normally Open (N.O.)

Model	VVK21	VVK22	VVK23
Orifice size	2 mm Ø	—	—
	3 mm Ø	●	●
	4.5 mm Ø	●	●
	6 mm Ø	—	●
Port size	1/8, 1/4	1/4, 3/8	1/4, 3/8

* Basic specifications are the same as those of the VX21/22/23 series.

Direct Operated 2 Port Solenoid Valve with Built-in Y-strainer



Series **VXK21/22/23**

For Air, Water, Oil, Steam

Specifications



Single Unit

■ Valve

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

■ 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)
Seal — NBR, FKM, EPDM, PTFE

■ Electrical Entry

- Grommet
- Conduit
- DIN terminal
- Conduit terminal



Normally Closed (N.C.)

Model	VXK21	VXK22	VXK23
Orifice size			
2 mm Ø	●	—	—
3 mm Ø	●	●	●
4.5 mm Ø	●	●	●
6 mm Ø	—	●	●
8 mm Ø	—	●	●
Port size	1/8 1/4	1/4 3/8	1/4 3/8

Normally Open (N.O.)

Model	VXK21	VXK22	VXK23
Orifice size			
2 mm Ø	●	—	—
3 mm Ø	●	●	●
4.5 mm Ø	●	●	●
6 mm Ø	—	●	●
Port size	1/8 1/4	1/4 3/8	1/4 3/8

For Air

For Water

For Oil

For Steam

Construction

Dimensions

Common Specifications

Standard Specifications

Valve specifications	Valve construction		Direct operated poppet
	Withstand pressure	MPa	5.0
	Body material		Brass (C37)
	Seal material		NBR, FKM, EPDM, PTFE
	Enclosure		Dust-tight, Water-jet-proof type (IP65) ^{Note)}
	Environment		Location without the presence of corrosive gases, explosive gases, or constant water adhesion
Strainer specifications	Mesh		100
	Material		Stainless steel
Coil specifications	Rated voltage	AC	100 VAC, 200 VAC, 110 VAC, 220 VAC, 230 VAC, 240 VAC, 48 VAC
		DC	24 VDC, 12 VDC
	Allowable voltage fluctuation		10 % of rated voltage
	Allowable leakage voltage	AC (Class B, Built-in full-wave rectifier type)	10 % or less of rated voltage
		AC (Class B/H)	20 % or less of rated voltage
		DC (Class B only)	2 % or less of rated voltage
	Coil insulation type		Class B, Class H

* Electrical entry: Grommet with surge voltage suppressor (GS) has a rating of IP40.

Solenoid Coil Specifications

Normally Closed (N.C.)

DC Specification

Model	Power consumption (W)	Temperature rise (°C) ^{Note)}
VXK21	4.5	45
VXK22	7	45
VXK23	10.5	60

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

Model	Apparent power (VA)*	Temperature rise (°C) ^{Note)}
VXK21	7	55
VXK22	9.5	60
VXK23	12	65

* There is no difference in frequency for the inrush and energised apparent power because a rectifying circuit is used for AC (Class B, Built-in full-wave rectifier type).

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

AC Specification

Model	Frequency (Hz)	Apparent power (VA)		Temperature rise (°C) ^{Note)}
		Inrush	Energised	
VXK21	50	19	10	50
	60	16	8	45
VXK22	50	43	20	65
	60	35	17	60
VXK23	50	62	32	65
	60	52	27	60

Note) Value 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)}
VXK21	4.5	45
VXK22	7	45
VXK23	10.5	60

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

Model	Apparent power (VA)*	Temperature rise (°C) ^{Note)}
VXK21	7	55
VXK22	9.5	60
VXK23	12	65

* There is no difference in frequency for the inrush and energised apparent power because a rectifying circuit is used for AC (Class B, Built-in full-wave rectifier type).

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

AC Specification

Model	Frequency (Hz)	Apparent power (VA)		Temperature rise (°C) ^{Note)}
		Inrush	Energised	
VXK21	50	22	11	55
	60	18	8	50
VXK22	50	46	20	65
	60	38	18	60
VXK23	50	64	32	65
	60	54	27	60

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

Applicable Fluid Check List

All Options (Single Unit)

VXK2 0 2 - - 1

● Option symbol

Fluid and application	Option symbol	Seal material	Body/Shading coil material Note 5)	Coil insulation type Note 4)	Remarks
Air	—	NBR	Brass (C37)/—	B	Select the built-in full-wave rectifier type for AC spec.
Medium vacuum, Non-leak, Oil-free Note 1)	V Note 2)	FKM	Brass (C37)/—	B	Select the built-in full-wave rectifier type for AC spec.
Water	—	NBR	Brass (C37)/Cu	B	
Heated water	E	EPDM	Brass (C37)/Cu	H	
Oil Note 3)	A	FKM	Brass (C37)/Cu	B	
	D			H	
Steam	S	PTFE	Brass (C37)/Cu	H	
Other combinations	B	EPDM	Brass (C37)/Cu	B	
	C	PTFE			

Note 1) The leakage amount (10^{-6} Pa·m³/s) of option "V" is the value when the differential pressure is 0.1 MPa.

Note 2) Option "V" is the oil-free treatment.

Note 3) 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 to the 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 that of water or when the OFF response is prioritised.

Note 4) Coil insulation type Class H: AC spec. only

Note 5) There is no shading coil attached to the DC spec. or AC spec. built-in full-wave rectifier type.

Specifications

For Air

For Water

For Oil

For Steam

Construction

Dimensions

Series VVK21/22/23

⚠ Fluid: Air

For Air/Single Unit

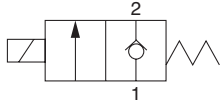
(Inert gas, Non-leak, Medium vacuum)

Model/Valve Specifications

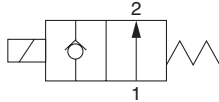
N.C.

N.O.

Passage symbol



Passage symbol



Normally Closed (N.C.)

Port size	Orifice size (mm Ø)	Model	Max. operating pressure differential (MPa)	Flow characteristics			Max. system pressure (MPa)	Note) Weight (g)
				C[dm ³ /(s·bar)]	b	Cv		
1/8 (6A)	2	VVK2110-01	1.5	0.59	0.48	0.18	3.0	480
	3	VVK2120-01	0.6	1.2	0.45	0.33		
	4.5	VVK2130-01	0.2	2.3	0.46	0.61		
1/4 (8A)	2	VVK2110-02	1.5	0.59	0.48	0.18	3.0	640
		VVK2120-02	0.6					
		VVK2130-02	0.2					
	3	VVK2220-02	1.5	1.2	0.45	0.33	3.0	790
		VVK2320-02	3.0					
		VVK2130-02	0.2					
	4.5	VVK2230-02	0.35	2.3	0.46	0.61	3.0	640
		VVK2330-02	0.9					
		VVK2240-02	0.15					
	6	VVK2340-02	0.35	4.0	0.30	1.10	1.0	790
		VVK2250-02	0.08					
	8	VVK2350-02	0.2	4.9	0.29	1.20		
3/8 (10A)	3	VVK2220-03	1.5	1.2	0.45	0.33	3.0	640
		VVK2320-03	3.0					
		VVK2230-03	0.35	2.3	0.46	0.61		
	4.5	VVK2330-03	0.9				3.0	790
		VVK2240-03	0.15					
		VVK2340-03	0.35	4.0	0.30	1.10		
	6	VVK2250-03	0.08				1.0	640
		VVK2350-03	0.2	4.9	0.29	1.20		
	8							790

Note) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.
• Refer to "Glossary of Terms" on page 23 for details on the max. operating pressure differential and the max. system pressure.

Normally Open (N.O.)

Port size	Orifice size (mm Ø)	Model	Max. operating pressure differential (MPa)	Flow characteristics			Max. system pressure (MPa)	Note) Weight (g)
				C[dm ³ /(s·bar)]	b	Cv		
1/8 (6A)	2	VVK2112-01	1.5	0.59	0.48	0.18	3.0	500
	3	VVK2122-01	0.7	1.2	0.45	0.33		
	4.5	VVK2132-01	0.3	2.3	0.46	0.61		
1/4 (8A)	2	VVK2112-02	1.5	0.59	0.48	0.18	3.0	670
		VVK2122-02	0.7					
		VVK2132-02	0.3					
	3	VVK2222-02	1.0	1.2	0.45	0.33	3.0	830
		VVK2322-02	1.6					
		VVK2132-02	0.3					
	4.5	VVK2232-02	0.45	2.3	0.46	0.61	3.0	670
		VVK2332-02	0.8					
		VVK2242-02	0.25					
	6	VVK2342-02	0.45	4.0	0.30	1.10	1.0	830
		VVK2222-03	1.0					
		VVK2322-03	1.6					
3/8 (10A)	3	VVK2232-03	0.45	2.3	0.46	0.61	3.0	670
		VVK2332-03	0.8					
		VVK2242-03	0.25					
	4.5	VVK2342-03	0.45	4.0	0.30	1.10	1.0	830
	6							

Note) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, 60 g for conduit terminal type respectively.
• Refer to "Glossary of Terms" on page 23 for details on the max. operating pressure differential and the max. system pressure.

Ambient and Fluid Temperature

Fluid temperature (C)		Ambient temperature (C)
Solenoid valve option symbol		
—	V	
-10 ^{Note)} to 60	-10 ^{Note)} to 60	-20 to 60

Note) Dew point temperature: -10C or less

Valve Leakage

Internal Leakage

Seal material	Leakage rate	
	Air	Non-leak, Medium vacuum Note)
NBR, FKM	1 cm ³ /min or less	10 ⁻⁶ Pa·m ³ /sec or less

External Leakage

Seal material	Leakage rate	
	Air	Non-leak, Medium vacuum Note)
NBR, FKM	1 cm ³ /min or less	10 ⁻⁶ Pa·m ³ /sec or less

Note) Value for option "V" (Non-leak, Medium vacuum)

How to Order (Single Unit)

AC VXK **21** **2** **0** **01** **1** **G** **R** **1** **-**

DC VXK **21** **2** **0** **01** **5** **G** **1** **-**

Model Refer to Table (1) shown below for availability.

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

Valve/Body configuration

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

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

Suffix

—	—
Z	Oil-free

Do not select suffix "Z" because the solenoid valve option "V" is the oil-free treatment.

Thread type Refer to Table (1) shown below for availability.

—	Rc
T	NPTF
F	G*1
N	NPT

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

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 Table (3) shown below for availability.

Refer to page 14 for ordering a coil only.

Bracket

—	None
B	With bracket

* Packed in the same container as the main body.
* Refer to Table (4) when a bracket is ordered separately.

Built-in full-wave rectifier type

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.

Table (1) Model/Orifice Size/Port Size
Normally Closed (N.C.)

Solenoid valve (Port size)				Orifice symbol (Diameter)				
Model	VXK21	VXK22	VXK23	1 (2 mm Ø)	2 (3 mm Ø)	3 (4.5 mm Ø)	4 (6 mm Ø)	5 (8 mm Ø)
Port symbol (Port size)	01 (1/8)	—	—	●	●	●	—	—
	02 (1/4)	—	—	●	●	●	—	—
	—	02 (1/4)	02 (1/4)	—	●	●	●	●
	—	03 (3/8)	03 (3/8)	—	●	●	●	●

Normally Open (N.O.)

Solenoid valve (Port size)				Orifice symbol (Diameter)			
Model	VXK21	VXK22	VXK23	1 (2 mm Ø)	2 (3 mm Ø)	3 (4.5 mm Ø)	4 (6 mm Ø)
Port symbol (Port size)	01 (1/8)	—	—	●	●	●	—
	02 (1/4)	—	—	●	●	●	—
	—	02 (1/4)	02 (1/4)	—	●	●	●
	—	03 (3/8)	03 (3/8)	—	●	●	●

Table (2) Solenoid Valve Option

Option symbol	Seal material	Body material	Coil insulation type	Remarks
—	NBR	Brass (C37)	B	—
V	FKM			Non-leak (10 ⁻⁶ Pa·m ³ /sec), Oil-free, Medium vacuum (0.1 Pa.abs)

* When using with vacuum, consider the max. differential pressure. (0.1 MPa or more is recommended.)

⚠ Fluid: Air

When **VX series (AC spec.)** are operated with air, the built-in full-wave rectifier type should be chosen.

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

Table (3) Rated Voltage/Electrical Option

Rated voltage			Class B		
AC/DC	Voltage symbol	Voltage	S With surge voltage suppressor	L With light	Z With light and surge voltage suppressor
AC	1	100 V	—	●	—
	2	200 V	—	●	—
	3	110 V	—	●	—
	4	220 V	—	●	—
	7	240 V	—	—	—
	J	48 V	—	—	—
DC	8	230 V	—	—	—
	5	24 V	●	●	●
	6	12 V	●	—	—

* Options "S", "Z" are not available because a surge voltage suppressor is integrated into the AC/Class B, built-in full-wave rectifier type as standard.

Table (4) Bracket Part No.

Model	Part no.
VXK21	VXK021N-5A
VXK22	
VXK23	

Dimensions → page 13 (Single unit)

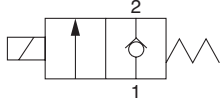
For Water /Single Unit

Model/Valve Specifications

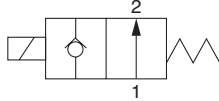
N.C.

N.O.

Passage symbol



Passage symbol



Normally Closed (N.C.)

Port size	Orifice size (mm Ø)	Model	Max. operating pressure differential (MPa)		Flow characteristics		Max. system pressure (MPa)	Note) Weight (g)
			AC	DC AC (Built-in full-wave rectifier type)	Flow characteristics			
					Av x 10 ⁻⁶ m ²	Cv converted		
1/8 (6A)	2	VXK2110-01	2.0	1.5	4.1	0.17	3.0	480
	3	VXK2120-01	0.9	0.5	7.9	0.33		
	4.5	VXK2130-01	0.4	0.2	15.0	0.61		
1/4 (8A)	2	VXK2110-02	2.0	1.5	4.1	0.17	3.0	640 790 480 640 790 640 790
	3	VXK2120-02	0.9	0.5	7.9	0.33		
		VXK2220-02	1.7	1.5				
		VXK2320-02	2.5	3.0				
	4.5	VXK2130-02	0.4	0.2	15.0	0.61		
		VXK2230-02	0.6	0.35				
		VXK2330-02	0.85	0.9				
	6	VXK2240-02	0.35	0.15	23.0	0.95		
		VXK2340-02	0.55	0.3				
	8	VXK2250-02	0.13	0.08	26.0	1.10		
		VXK2350-02	0.17	0.2				
3/8 (10A)	3	VXK2220-03	1.7	1.5	7.9	0.33	3.0	640 790
		VXK2320-03	2.5	3.0				
	4.5	VXK2230-03	0.6	0.35	15.0	0.61		
		VXK2330-03	0.85	0.9				
	6	VXK2240-03	0.35	0.15	23.0	0.95		
		VXK2340-03	0.55	0.3				
	8	VXK2250-03	0.13	0.08	26.0	1.10	1.0	640 790
		VXK2350-03	0.17	0.2				

Note) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, and 60 g for conduit terminal type respectively.
• Refer to "Glossary of Terms" on page 23 for details on the max. operating pressure differential and the max. system pressure.

Normally Open (N.O.)

Port size	Orifice size (mm Ø)	Model	Max. operating pressure differential (MPa)	Flow characteristics		Max. system pressure (MPa)	Weight (g) (Note)			
				Av x 10 ⁻⁶ m ²	Cv converted					
1/8 (6A)	2	VXK2112-01	0.9	4.1	0.17	3.0	500			
	3	VXK2122-01	0.45	7.9	0.33					
	4.5	VXK2132-01	0.2	15.0	0.61					
1/4 (8A)	2	VXK2112-02	0.9	4.1	0.17		3.0	670		
	3	VXK2122-02	0.45	7.9	0.33					
		VXK2222-02	0.8							
		VXK2322-02	1.2							
	4.5	VXK2132-02	0.2	15.0	0.61				3.0	500
		VXK2232-02	0.3							
		VXK2332-02	0.6							
	6	VXK2242-02	0.15	23.0	0.95				3.0	670
		VXK2342-02	0.35							
3/8 (10A)	3	VXK2222-03	0.8	7.9	0.33		3.0	670		
		VXK2322-03	1.2						830	
	4.5	VXK2232-03	0.3	15.0	0.61			670		
		VXK2332-03	0.6			830				
	6	VXK2242-03	0.15	23.0	0.95			670		
		VXK2342-03	0.35			830				

Note) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, and 60 g for conduit terminal type respectively.
• Refer to "Glossary of Terms" on page 23 for details on the max. operating pressure differential and the max. system pressure.

Ambient and Fluid Temperature

Fluid temperature (°C)		Ambient temperature (°C)
Solenoid valve option symbol		
—	E	
1 to 60	1 to 99	−20 to 60

Note) With no freezing

Valve Leakage

Internal Leakage

Seal material	Leakage rate (Water)
NBR, EPDM	0.1 cm ³ /min or less

External Leakage

Seal material	Leakage rate (Water)
NBR, EPDM	0.1 cm ³ /min or less

How to Order (Single Unit)

AC VXK 21 2 0 - 01 - 1 G R 1 -

DC VXK 21 2 0 - 01 - 5 G 1 -

Model Refer to Table (1) shown below for availability.

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

Valve/Body configuration

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

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

Suffix

—	—
Z	Oil-free

Oil-free, AC/Class B: Built-in full-wave rectifier type only. Select the built-in full-wave rectifier type.

Thread type

—	Rc
T	NPTF
F	G*1
N	NPT

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

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 Table (3) shown below for availability.

Bracket

—	None
B	With bracket

* Packed in the same container as the main body.
* Refer to Table (4) when a bracket is ordered separately.

Full-wave rectifier

—	None
R	Built-in full-wave rectifier type (Class B only)

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.)

* DIN type is available with class B only.

Refer to page 14 for ordering a coil only.

Table (1) Model/Orifice Size/Port Size
Normally Closed (N.C.)

Solenoid valve (Port size)				Orifice symbol (Diameter)				
Model	VXK21	VXK22	VXK23	1 (2 mm Ø)	2 (3 mm Ø)	3 (4.5 mm Ø)	4 (6 mm Ø)	5 (8 mm Ø)
Port symbol (Port size)	01 (1/8)	—	—	●	●	●	—	—
	02 (1/4)	—	—	●	●	●	—	—
	—	02 (1/4)	02 (1/4)	—	●	●	●	●
	—	03 (3/8)	03 (3/8)	—	●	●	●	●

Normally Open (N.O.)

Solenoid valve (Port size)				Orifice symbol (Diameter)			
Model	VXK21	VXK22	VXK23	1 (2 mm Ø)	2 (3 mm Ø)	3 (4.5 mm Ø)	4 (6 mm Ø)
Port symbol (Port size)	01 (1/8)	—	—	●	●	●	—
	02 (1/4)	—	—	●	●	●	—
	—	02 (1/4)	02 (1/4)	—	●	●	●
	—	03 (3/8)	03 (3/8)	—	●	●	●

Table (3) Rated Voltage/Electrical Option

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

* Options "S", "Z" are not available because a surge voltage suppressor is integrated into the AC/Class B, built-in full-wave rectifier type as standard.

Table (2) Solenoid Valve Option

Option symbol	Seal material	Body/Shading coil material	Coil insulation type	Remarks
—	NBR	Brass (C37)/Cu	B	—
E	EPDM		H	Heated water (AC only)

Table (4) Bracket Part No.

Model	Part no.
VXK21	VXK021N-5A
VXK22	
VXK23	

Dimensions → page 13 (Single unit)

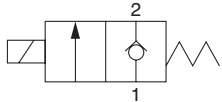
For Oil/Single Unit

Model/Valve Specifications

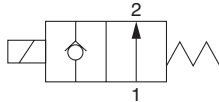
N.C.

N.O.

Passage symbol



Passage symbol



Normally Closed (N.C.)

Port size	Orifice size (mm Ø)	Model	Max. operating pressure differential (MPa)		Flow characteristics		Max. system pressure (MPa)	Note) Weight (g)
			AC	DC AC (Built-in full-wave rectifier type)				
					Av x 10 ⁻⁶ m ²	Cv converted		
1/8 (6A)	2	VXK2110-01	1.5	1.5	4.1	0.17	3.0	480
	3	VXK2120-01	0.5	0.5	7.9	0.33		
	4.5	VXK2130-01	0.2	0.15	15.0	0.61		
1/4 (8A)	2	VXK2110-02	1.5	1.5	4.1	0.17	3.0	640 790 480 640 790 640 790
	3	VXK2120-02	0.5	0.5	7.9	0.33		
		VXK2220-02	1.2	1.2				
		VXK2320-02	1.7	2.0				
	4.5	VXK2130-02	0.2	0.15	15.0	0.61		
		VXK2230-02	0.35	0.3				
	6	VXK2330-02	0.55	0.85	23.0	0.95		
		VXK2240-02	0.2	0.1				
	8	VXK2340-02	0.35	0.3	26.0	1.10		
		VXK2250-02	0.1	0.08				
3/8 (10A)	3	VXK2350-02	0.14	0.2	7.9	0.33	3.0	640 790
		VXK2220-03	1.2	1.2				
	4.5	VXK2320-03	1.7	2.0	15.0	0.61		
		VXK2230-03	0.35	0.3				
	6	VXK2330-03	0.55	0.85	23.0	0.95		
		VXK2240-03	0.2	0.1				
	8	VXK2340-03	0.35	0.3	26.0	1.10		
		VXK2250-03	0.1	0.08				
			VXK2350-03	0.14	0.2			1.0

Note) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, and 60 g for conduit terminal type respectively.
• Refer to "Glossary of Terms" on page 23 for details on the max. operating pressure differential and the max. system pressure.

Normally Open (N.O.)

Port size	Orifice size (mm Ø)	Model	Max. operating pressure differential (MPa)	Flow characteristics		Max. system pressure (MPa)	Weight ^(Note) (g)
			AC, DC	Av x 10 ⁻⁶ m ²	Cv converted		
1/8 (6A)	2	VXK2112-01	0.8	4.1	0.17	3.0	500
	3	VXK2122-01	0.45	7.9	0.33		
	4.5	VXK2132-01	0.2	15	0.61		
1/4 (8A)	2	VXK2112-02	0.8	4.1	0.17		
	3	VXK2122-02	0.45	7.9	0.33		
		VXK2222-02	0.7				
		VXK2322-02	1.0				
	4.5	VXK2132-02	0.2	15	0.61		
		VXK2232-02	0.3				
		VXK2332-02	0.6				
	6	VXK2242-02	0.15	23.0	0.95		
		VXK2342-02	0.35				
	3/8 (10A)	3	VXK2222-03	0.7	7.9		0.33
VXK2322-03			1.0	830			
4.5		VXK2232-03	0.3	15	0.61		670
		VXK2332-03	0.6			830	
6		VXK2242-03	0.15	23.0	0.95	670	
		VXK2342-03	0.35			830	

Note) Weight of grommet type. Add 10 g for conduit type, 30 g for DIN terminal type, and 60 g for conduit terminal type respectively.
• Refer to "Glossary of Terms" on page 23 for details on the max. operating pressure differential and the max. system pressure.

Ambient and Fluid Temperature

Fluid temperature (°C)		Ambient temperature (°C)
Solenoid valve option symbol		
A	D	
-5 ^{Note)} to 60	-5 ^{Note)} to 120	-20 to 60

Note) Dynamic viscosity: 50 mm²/s or less

Valve Leakage

Internal Leakage

Seal material	Leakage rate (Oil)
FKM	0.1 cm ³ /min or less

External Leakage

Seal material	Leakage rate (Oil)
FKM	0.1 cm ³ /min or less

How to Order (Single Unit)

AC VXK **21** **2** **0** **A** - **01** - **1** **G** **R** **1** -

DC VXK **21** **2** **0** **A** - **01** - **5** **G** **1** -

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

Solenoid valve option • Refer to Table (2) shown below for availability.

Suffix

—	—
Z	Oil-free

Oil-free, AC/Class B: Built-in full-wave rectifier type only. Select the built-in full-wave rectifier type.

Thread type

—	Rc
T	NPTF
F	G*1
N	NPT

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

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 Table (3) shown below for availability.

Refer to page 14 for ordering a coil only.

Bracket

—	None
B	With bracket

Full-wave rectifier

—	None
R	Built-in full-wave rectifier type (Class B only)

* Packed in the same container as the main body.
* Refer to Table (4) when a bracket is ordered separately.

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.

Table (1) Model/Orifice Size/Port Size

Normally Closed (N.C.)

Solenoid valve (Port size)				Orifice symbol (Diameter)				
Model	VXK21	VXK22	VXK23	1 (2 mm Ø)	2 (3 mm Ø)	3 (4.5 mm Ø)	4 (6 mm Ø)	5 (8 mm Ø)
Port symbol (Port size)	01 (1/8)	—	—	●	●	●	—	—
	02 (1/4)	—	—	●	●	●	—	—
	—	02 (1/4)	02 (1/4)	—	●	●	●	●
	—	03 (3/8)	03 (3/8)	—	●	●	●	●

Normally Open (N.O.)

Solenoid valve (Port size)				Orifice symbol (Diameter)			
Model	VXK21	VXK22	VXK23	1 (2 mm Ø)	2 (3 mm Ø)	3 (4.5 mm Ø)	4 (6 mm Ø)
Port symbol (Port size)	01 (1/8)	—	—	●	●	●	—
	02 (1/4)	—	—	●	●	●	—
	—	02 (1/4)	02 (1/4)	—	●	●	●
	—	03 (3/8)	03 (3/8)	—	●	●	●

Table (3) Rated Voltage/Electrical Option

Rated voltage			Class B			Class H		
AC/DC	Voltage symbol	Voltage	S With surge voltage suppressor	L With light	Z With light/surge voltage suppressor	S With surge voltage suppressor	L With light	Z With light/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	●	—	—			

* Options "S", "Z" are not available because a surge voltage suppressor is integrated into the AC/Class B, built-in full-wave rectifier type as standard.

Table (2) Solenoid Valve Option

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

Table (4) Bracket Part No.

Model	Part no.
VXK21	VXK021N-5A
VXK22	
VXK23	

Dimensions → page 13 (Single unit)

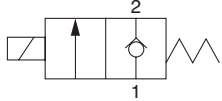
For Steam/Single Unit

Model/Valve Specifications

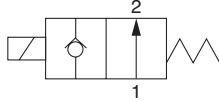
N.C.

N.O.

Passage symbol



Passage symbol



Normally Closed (N.C.)

Port size	Orifice size (mm Ø)	Model	Max. operating pressure differential (MPa)	Flow characteristics		Max. system pressure (MPa)	Note) Weight (g)
			AC	Av x 10 ⁻⁶ m ²	Cv converted		
1/8 (6A)	2	VVK2110-01	1.0	4.1	0.17	1.0	480
	3	VVK2120-01	1.0	7.9	0.33		
	4.5	VVK2130-01	0.45	15.0	0.61		
1/4 (8A)	2	VVK2110-02	1.0	4.1	0.17		
	3	VVK2120-02	1.0	7.9	0.33		
		VVK2130-02	0.45				
	4.5	VVK2230-02	0.75	15.0	0.61		640
		VVK2330-02	1.0				790
	6	VVK2240-02	0.4	23.0	0.95		640
		VVK2340-02	0.5				790
	8	VVK2250-02	0.15	26.0	1.10		640
3/8 (10A)		VVK2350-02	0.2			0.5	790
	3	VVK2220-03	1.0	7.9	0.33		1.0
		VVK2230-03	0.75	15.0	0.61		
	4.5	VVK2330-03	1.0				
		VVK2240-03	0.4	23.0	0.95		
		VVK2340-03	0.5				
	6	VVK2250-03	0.15	26.0	1.10		640
		VVK2350-03	0.2				790



Note) Weight of grommet type. Add 60 g for conduit terminal type.
• Refer to "Glossary of Terms" on page 23 for details on the max. operating pressure differential and the max. system pressure.

Normally Open (N.O.)

Port size	Orifice size (mm Ø)	Model	Max. operating pressure differential (MPa)	Flow characteristics		Max. system pressure (MPa)	Note) Weight (g)
			AC	Av x 10 ⁻⁶ m ²	Cv converted		
1/8 (6A)	2	VVK2112-01	1.0	4.1	0.17	1.0	500
	3	VVK2122-01	0.7	7.9	0.33		
	4.5	VVK2132-01	0.3	15	0.61		
1/4 (8A)	2	VVK2112-02	1.0	4.1	0.17		
	3	VVK2122-02	0.7	7.9	0.33		
		VVK2222-02	1.0				670
	4.5	VVK2132-02	0.3	15	0.61		500
		VVK2232-02	0.45				670
		VVK2332-02	0.8				830
	6	VVK2242-02	0.25	23.0	0.95		670
		VVK2342-02	0.45				830
3/8 (10A)	3	VVK2222-03	1.0	7.9	0.33	1.0	670
	4.5	VVK2232-03	0.45	15	0.61		830
		VVK2332-03	0.8				
	6	VVK2242-03	0.25	23.0	0.95		
		VVK2342-03	0.45				670
							830



Note) Weight of grommet type. Add 60 g for conduit terminal type.
• Refer to "Glossary of Terms" on page 23 for details on the max. operating pressure differential and the max. system pressure.

Ambient and Fluid Temperature

Max. fluid temperature (°C)	Ambient temperature (°C)
Solenoid valve option symbol	
S	
183	-20 to 60

Valve Leakage

Internal Leakage

Seal material	Leakage rate (Air)
PTFE	300 cm ³ /min or less

External Leakage

Seal material	Leakage rate (Air)
PTFE	1 cm ³ /min or less

How to Order (Single Unit)

AC VXK2120S-01-1G1-

Model
Refer to Table (1) shown below for availability.

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

Valve/Body configuration

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

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

Suffix

-	-
Z	Oil-free

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

Thread type

-	Rc
T	NPTF
F	G*1
N	NPT

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

Rated voltage

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

* Refer to Table (3) shown below for availability.

Bracket

-	None
B	With bracket

* Packed in the same container as the main body.
* Refer to the Table (4) when a bracket is ordered separately.

Electrical entry

C-Conduit

G - Grommet
GS- With grommet surge voltage suppressor

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

* Refer to Table (3) for the available combinations between each electrical option (S, L, Z) and rated voltage.

Refer to page 14 for ordering a coil only.

Table (1) Model/Orifice Size/Port Size

Normally Closed (N.C.)

Solenoid valve (Port size)				Orifice symbol (Diameter)				
Model	VXK21	VXK22	VXK23	1 (2 mm Ø)	2 (3 mm Ø)	3 (4.5 mm Ø)	4 (6 mm Ø)	5 (8 mm Ø)
Port symbol (Port size)	01 (1/8)	—	—	●	●	●	—	—
	02 (1/4)	—	—	●	●	●	—	—
	—	02 (1/4)	02 (1/4)	—	—	●	●	●
	—	03 (3/8)	03 (3/8)	—	● (VXK22)	●	●	●

Normally Open (N.O.)

Solenoid valve (Port size)				Orifice symbol (Diameter)			
Model	VXK21	VXK22	VXK23	1 (2 mm Ø)	2 (3 mm Ø)	3 (4.5 mm Ø)	4 (6 mm Ø)
Port symbol (Port size)	01 (1/8)	—	—	●	●	●	—
	02 (1/4)	—	—	●	●	●	—
	—	02 (1/4)	02 (1/4)	—	● (VXK22)	●	●
	—	03 (3/8)	03 (3/8)	—	● (VXK22)	●	●

Table (2) Solenoid Valve Option

Option symbol	Seal material	Body/Shading coil material	Coil insulation type
S	PTFE	Brass (C37)/Cu	H

Solenoid coil: AC/Class H only

Table (3) Rated Voltage/Electrical Option

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

Table (4) Bracket Part No.

Model	Part no.
VXK21	VXK021N-5A
VXK22	
VXK23	

Dimensions → page 13 (Single unit)

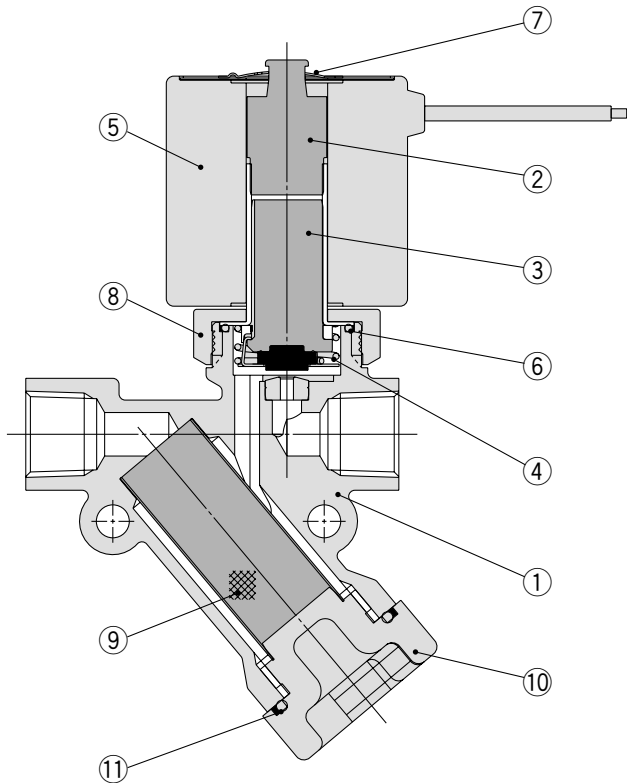
Series VVK21/22/23

For Air, Water, Oil, Steam

Construction: Single Unit

Normally closed (N.C.)

Body material: Brass (C37)



Component Parts

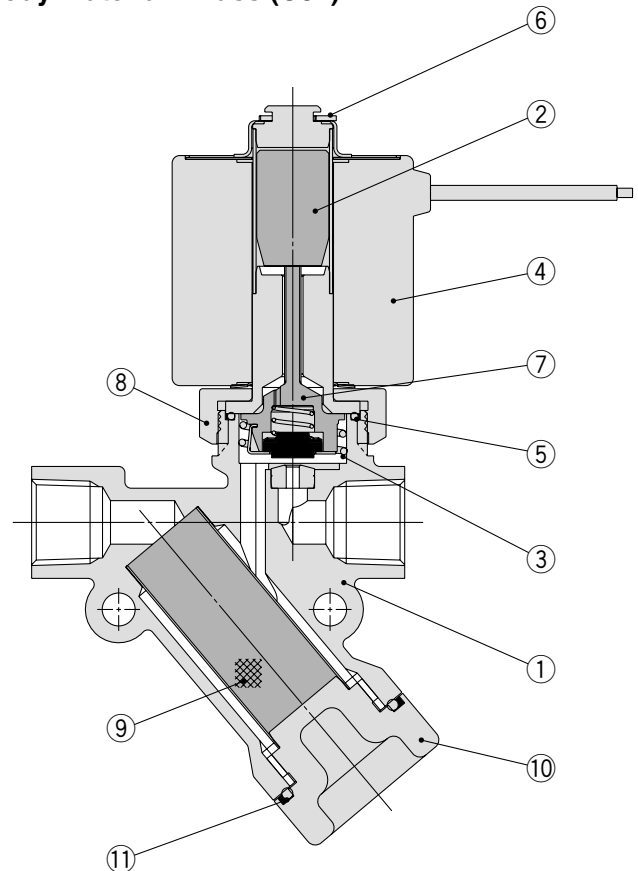
No.	Description	Material
1	Body	Brass (C37)
2	Tube assembly Note 2)	Stainless steel, Cu
3	Armature assembly	Stainless steel, PPS, NBR (FKM, EPDM, PTFE)
4	Return spring	Stainless steel
5	Solenoid coil	—
6	O-ring	NBR (FKM, EPDM, PTFE)
7	Clip	SK
8	Nut	Brass (C37)
9	Strainer	Stainless steel
10	Plug	Brass (C37)
11	O-ring	NBR (FKM, EPDM, PTFE)

Note 1) The seal materials shown in () are available depending on the option selected.

Note 2) "Cu" is not available with the DC spec. and AC spec. built-in full-wave rectifier type.

Normally open (N.O.)

Body material: Brass (C37)



Component Parts

No.	Description	Material
1	Body	Brass (C37)
2	Tube assembly Note 2)	Stainless steel, Cu
3	Return spring	Stainless steel
4	Solenoid coil	—
5	O-ring	NBR (FKM, EPDM, PTFE)
6	E stop ring	Stainless steel
7	Push rod assembly	Stainless steel, PPS, NBR (FKM, EPDM, PTFE)
8	Nut	Brass (C37)
9	Strainer	Stainless steel
10	Plug	Brass (C37)
11	O-ring	NBR (FKM, EPDM, PTFE)

Note 1) The seal materials shown in () are available depending on the option selected.

Note 2) "Cu" is not available with the DC spec. and AC spec. built-in full-wave rectifier type.

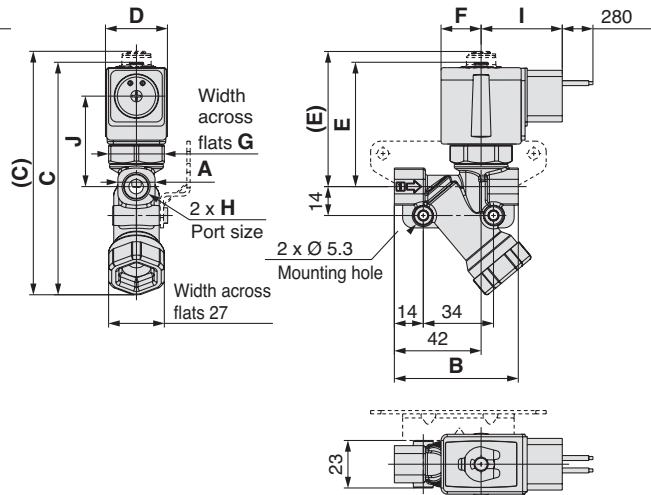
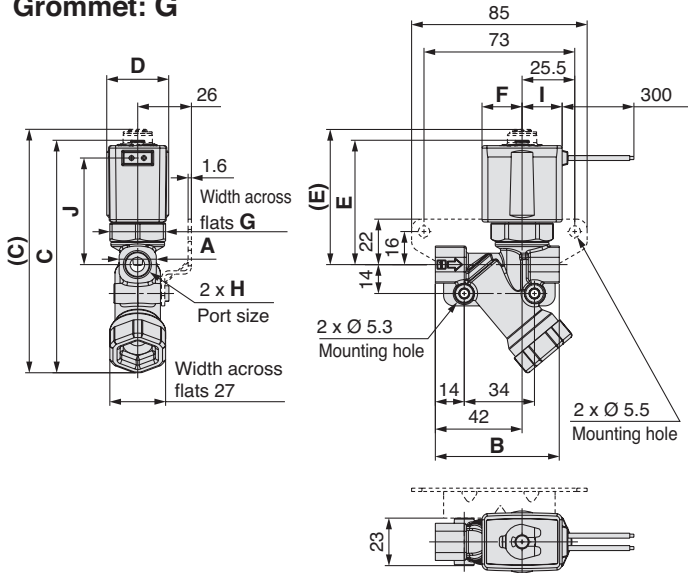
Dimensions

Normally closed (N.C.): VXK21□0/VXK22□0/VXK23□0

Normally open (N.O.): VXK21□2/VXK22□2/VXK23□2

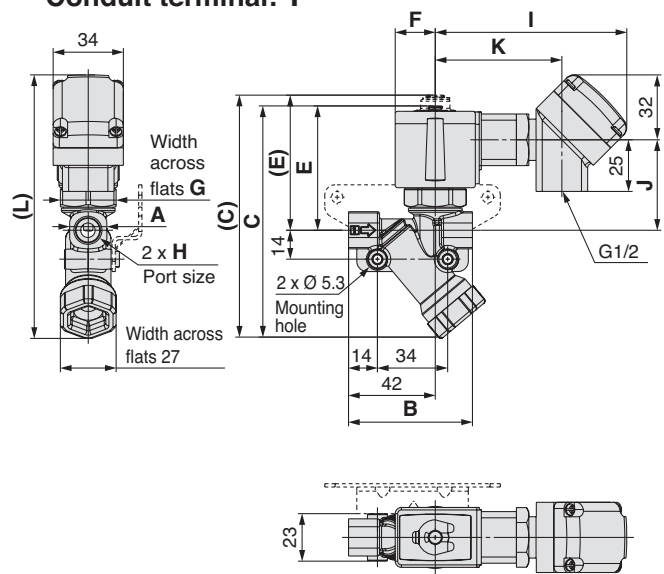
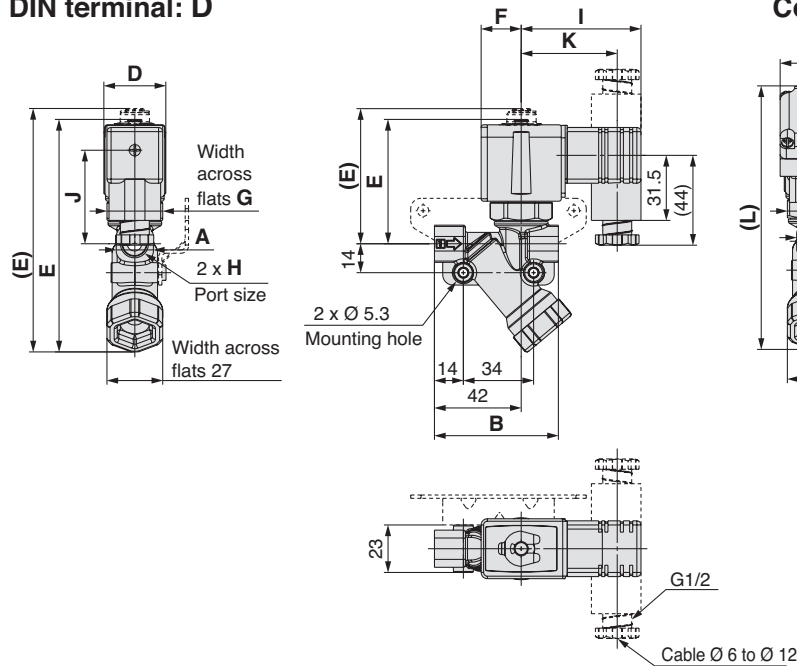
Grommet: G

Conduit: C



DIN terminal: D

Conduit terminal: T



(mm)

Model		Orifice size	Port size H	A	B	C	(C)	D	E	(E)	F	G
Normally closed (N.C.)	Normally open (N.O.)											
VXK21□0	VXK21□2	Ø 2, Ø 3, Ø 4.5	1/8, 1/4	18	60	(112)	(119)	30	60	67	19.5	27
VXK22□0	VXK22□2	Ø 3, Ø 4.5, Ø 6, Ø 8 ^{Note 1)}	1/4, 3/8	22	63.5	(121.5)	(128.5)	35	69	76.5	22.5	32
VXK23□0	VXK23□2	Ø 3, Ø 4.5, Ø 6, Ø 8 ^{Note 1)}	1/4, 3/8	22	63.5	(127.5)	(135)	40	75.5	83.5	25	36

(mm)

Model		Orifice size	Port size H	Electrical entry ^{Note 3)}								Built-in full-wave rectifier type Electrical entry ^{Note 3)}							
Normally closed (N.C.)	Normally open (N.O.)			Grommet				Conduit				DIN terminal				Conduit terminal			
I	J	I	J	I	J	I	J	I	J	I	J	I	J	I	J	I	J	I	J
VXK21□0	VXK21□2	Ø 2, Ø 3, Ø 4.5	1/8, 1/4	19.5	52	40	44.5	58.5	44	46.5	(92)	44.5	(61)	(129)	30	48	48.5	43	65.5
VXK22□0	VXK22□2	Ø 3, Ø 4.5, Ø 6, Ø 8 ^{Note 1)}	1/4, 3/8	22.5	61	43	53.5	61.5	53	49.5	(95)	53.5	(64)	(138)	33	57	51.5	52	68.5
VXK23□0	VXK23□2	Ø 3, Ø 4.5, Ø 6, Ø 8 ^{Note 1)}	1/4, 3/8	25.5	67.5	46	60	64	59.5	52	(98)	60	(66.5)	(143.5)	36	63.5	54	58.5	71

Note 1) An orifice size of Ø 8 is only available with the N.C. spec.

Note 2) (C)(E): N.O. spec. dimensions

Note 3) Add 1.5 mm to "J" and "L" dimensions for the N.O. spec.

Series VXK21/22/23

For Air, Water, Oil, Steam

Replacement Parts

• Solenoid Coil Assembly Part No.

VX02 **1**N-**1**G- -

Model

1	VXK21□□
2	VXK22□□
3	VXK23□□

Valve

—	N.C.
2	N.O.

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
5	24 VDC
6	12 VDC
7	240 VAC 50/60 Hz
8	48 VAC 50/60 Hz
J	230 VAC 50/60 Hz

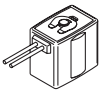
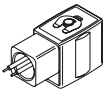
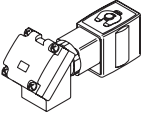
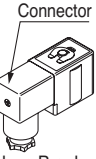
Note) Refer to Table (1) for the available combinations.

Coil insulation type Note)

—	Class B
H*	Class H

* DIN terminal and DC spec. are not available.

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)  * DIN type is available with class B only.

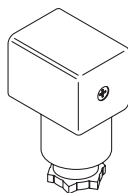
* Refer to Table (1) for the available combinations between each electrical option (S, L, Z) and rated voltage.

• DIN Connector Part No.

Without electrical option **3G-GDM2A**

With electrical option **GDM2A- -**

Electrical option



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

* Refer to 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

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

VX02 **1**N-**1**G**R**-

Model

1	VXK21□□
2	VXK22□□
3	VXK23□□

Valve

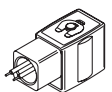
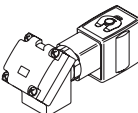
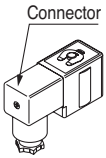
—	N.C.
2	N.O.

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

Note) Refer to Table (1) 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.) 

* Refer to Table (1) for the available combinations between each electrical option and the rated voltage.

* Surge voltage suppressor is integrated into the AC/Class B, built-in full-wave rectifier type as standard.

Table (1) 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/surge voltage suppressor	With surge voltage suppressor	With light	With light/surge voltage suppressor
	1	100 V	●	●	●	●	●	●
	2	200 V	●	●	●	●	●	●
	3	110 V	●	●	●	●	●	●
	4	220 V	●	●	●	●	●	●
	7	240 V	●	—	—	●	—	—
	8	48 V	●	—	—	●	—	—
DC	J	230 V	●	—	—	●	—	—
	5	24 V	●	●	●	DC spec. is not available.		
	6	12 V	●	—	—			

* Options "S", "Z" are not available because a surge voltage suppressor is integrated into the AC/Class B, built-in full-wave rectifier type as standard.

* Replacement of solenoid coil

- Cannot be changed between DC and AC.
- Can be changed between DC and AC (built-in full-wave rectifier type).
- Can be changed from DC to DC.
- Can be changed from AC to AC.

• Gasket Part No. for DIN Connector

VCW20-1-29-1

● Name Plate Part No.

AZ-T- Valve model

↑ Enter by referring to
"How to Order"
(Single Unit).

● Clip Part No. (For N.C.)

For VX21: **VX021N-10**

For VX22: **VX022N-10**

For VX23: **VX023N-10**

● Clip Part No. (For N.O.)

For VX21: **ETW-7**

For VX22: **ETW-8**

For VX23: **ETW-9**

● Strainer Part No.

Strainer: **VVK021N-4-1**

Plug assembly (Plug+O-ring):

VVK021N-3CA (NBR)

VVK021N-3CA-F (FKM)

VVK021N-3CA-E (EPDM)

VVK021N-3CA-P (PTFE)

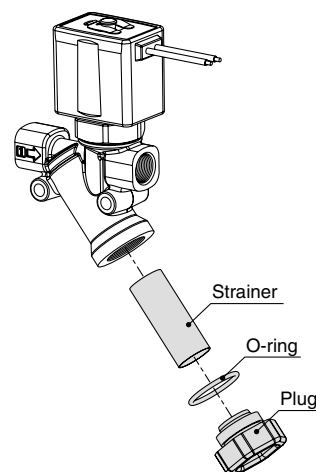
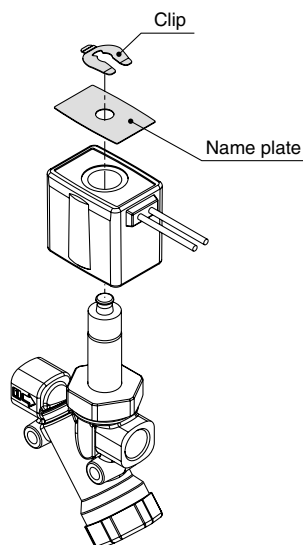
O-ring (10 pcs):

VVK-OR (NBR)

VVK-OR-F (FKM)

VVK-OR-E (EPDM)

VVK-OR-P (PTFE)



Specifications

For Air

For Water

For Oil

For Steam

Construction

Dimensions

Solenoid Valve Flow Characteristics

(How to indicate flow characteristics)

1. Indication of the flow characteristics

The flow characteristics in equipments such as a solenoid valves, 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
		C_v	ANSI/(NFPA)T3.21.3: 1990
Process fluid control equipment	A_v	—	IEC60534-2-3: 1997 JIS B 2005: 1995
	—	C_v	Equipment: JIS B 8471, 8472, 8473

2. Pneumatic equipment

2.1 Indication according to the international standards

(1) Conformed standard

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

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

(2) Definition of the 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

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

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

When

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

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

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 [$\text{dm}^3/(\text{s}\cdot\text{bar})$]

b : Critical pressure ratio [—]

P₁ : Upstream pressure [MPa]

P₂ : Downstream pressure [MPa]

t : Temperature [$^{\circ}\text{C}$]

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".

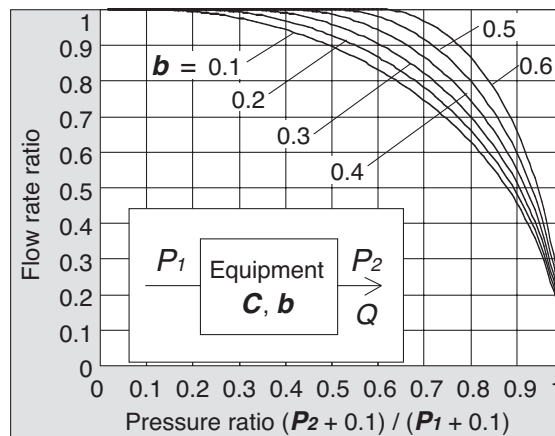
Example)

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

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

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 rate ratio to be **b** = 0.3.
Hence, flow rate = maximum flow rate x flow rate ratio = $600 \times 0.7 = 420 [\text{dm}^3/\text{min (ANR)}]$



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 by the subsonic flow formula to find **b**, then obtain the critical pressure ratio **b** from that average.

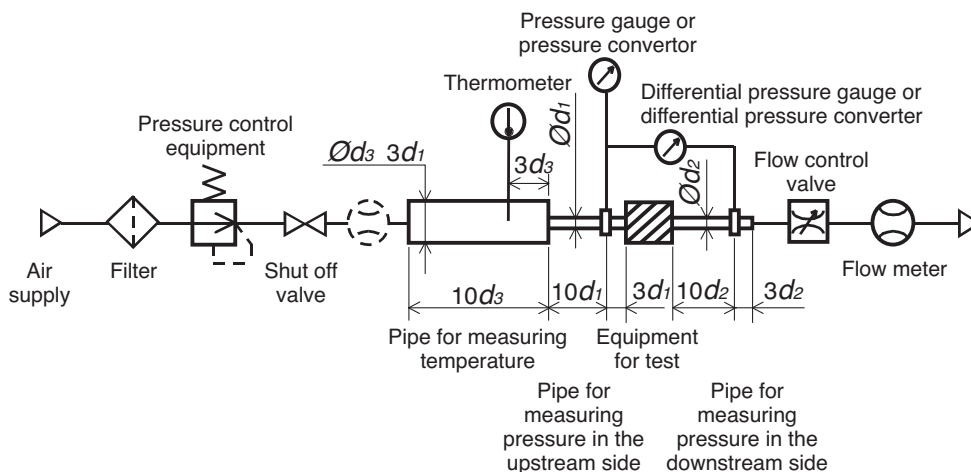


Fig. (1) Test circuit based on ISO 6358, JIS B 8390

Solenoid Valve Flow Characteristics

2.2 Effective area S

(1) Conformed standard

JIS B 8390: 2000: Pneumatic fluid power—Components using compressible fluids—Determination of the 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

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

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

When

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

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

Conversion with sonic conductance C :

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

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.

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

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]

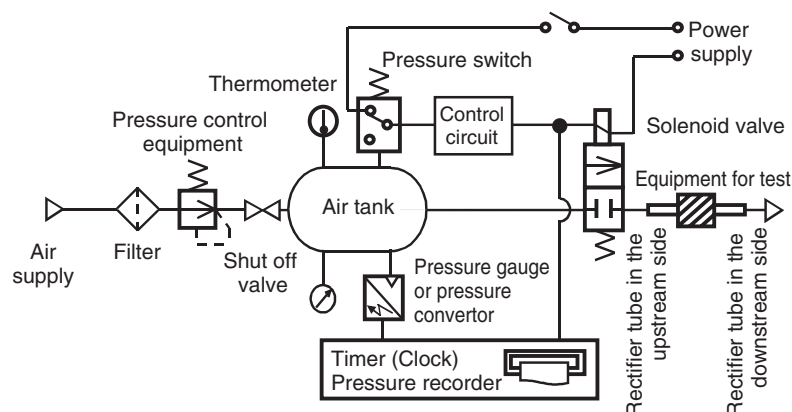


Fig. (2) Test circuit based on JIS B 8390

Solenoid Valve Flow Characteristics

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

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

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

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

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

Q : Flow rate [dm³/s standard condition]

P_a : Atmospheric pressure [bar absolute]

T_1 : Upstream absolute temperature [K]

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

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

3. Process fluid control equipment

(1) Conformed standard

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

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

Equipment standards: JIS B 8471: Solenoid valve for water

JIS B 8472: Solenoid valve for steam

JIS B 8473: Solenoid valve for fuel oil

(2) Definition of the flow characteristics

A_v 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.

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

A_v : 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:

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

Q : Flow rate [ℓ/min]

A_v : Flow coefficient [m²]

ΔP : Pressure difference [MPa]

G : Specific gravity [water = 1]

In the case of saturated steam:

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

Q : Flow rate [kg/h]

A_v : Flow coefficient [m²]

ΔP : Pressure difference [MPa]

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

P_2 : Downstream pressure [MPa]

Solenoid Valve Flow Characteristics

Conversion of the flow coefficient:

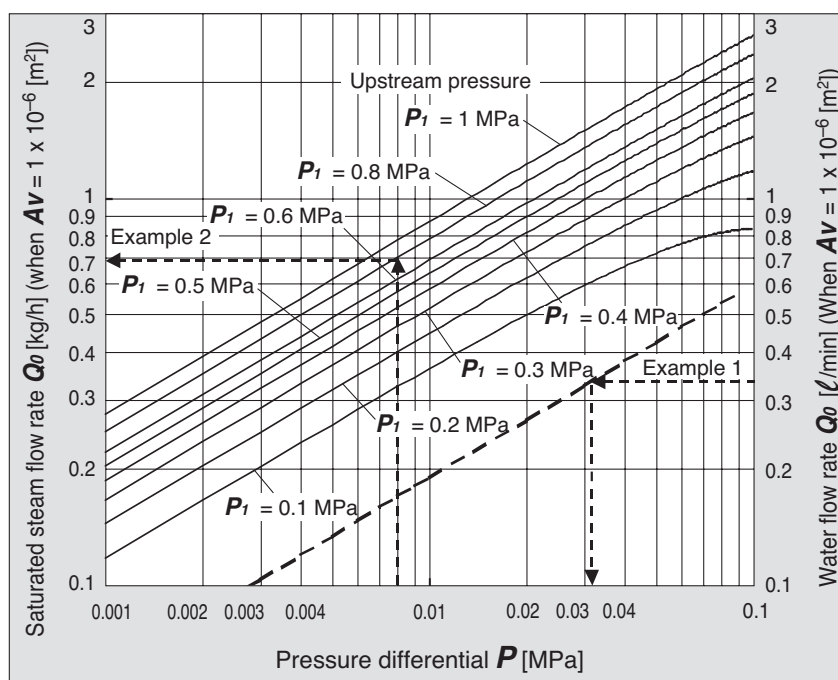
$$Av = 28 \times 10^{-6} Kv = 24 \times 10^{-6} Cv \dots\dots\dots(11)$$

Here,

Kv factor: Value of the clean water flow rate represented by m³/h which runs through a valve at 5 to 40 °C, when the pressure difference is 1 bar.

Cv factor (Reference values): Value of the clean water flow rate represented by US gal/min which runs through a valve at 60F, when the pressure difference is 1 lbf/in² (psi).

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



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 P when Q_0 is 0.33, it will be 0.031 [MPa].

Example 2)

Obtain the saturated steam flow rate when $P_1 = 0.8 [MPa]$, $P = 0.008 [MPa]$ 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 P 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 .

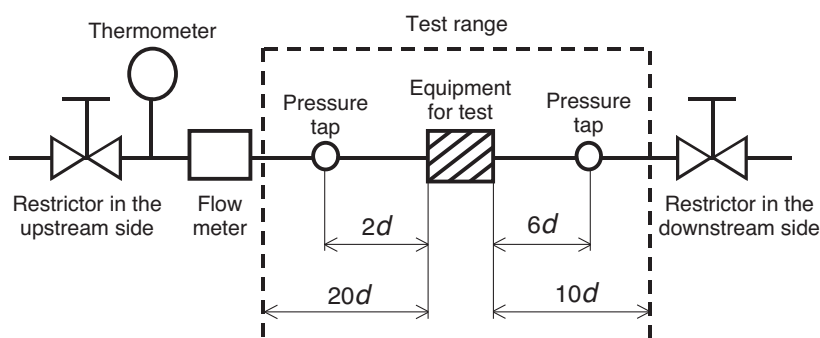
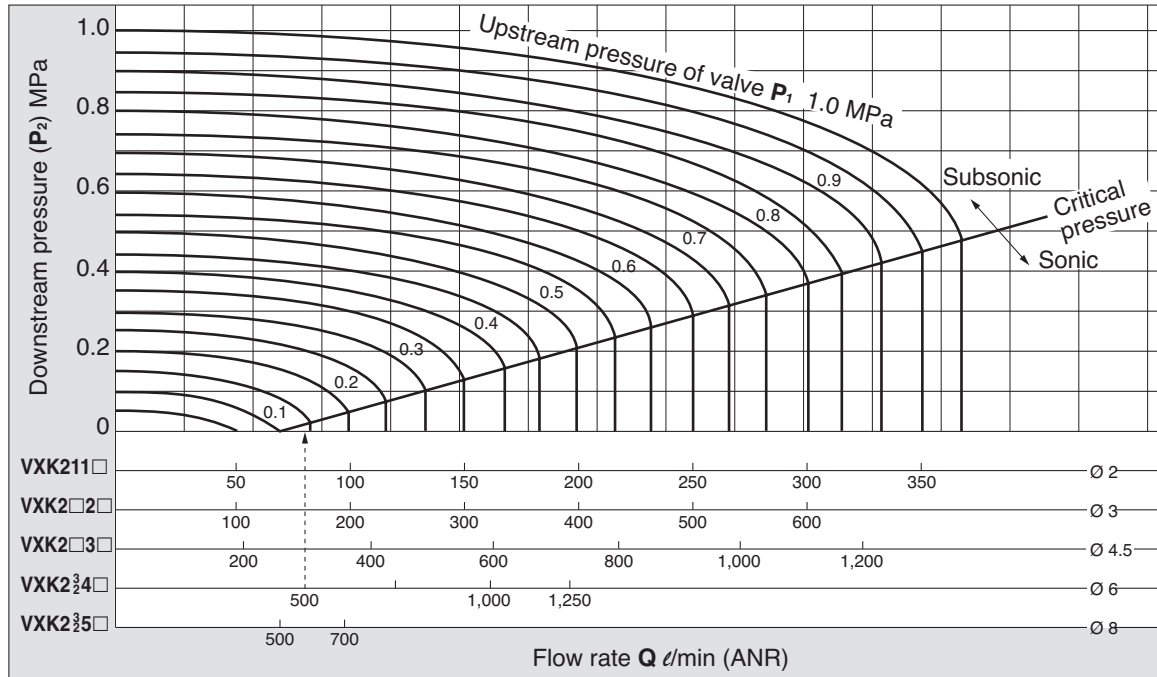


Fig. (3) Test circuit based on IEC60534-2-3, JIS B 2005

Flow Characteristics

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

Air



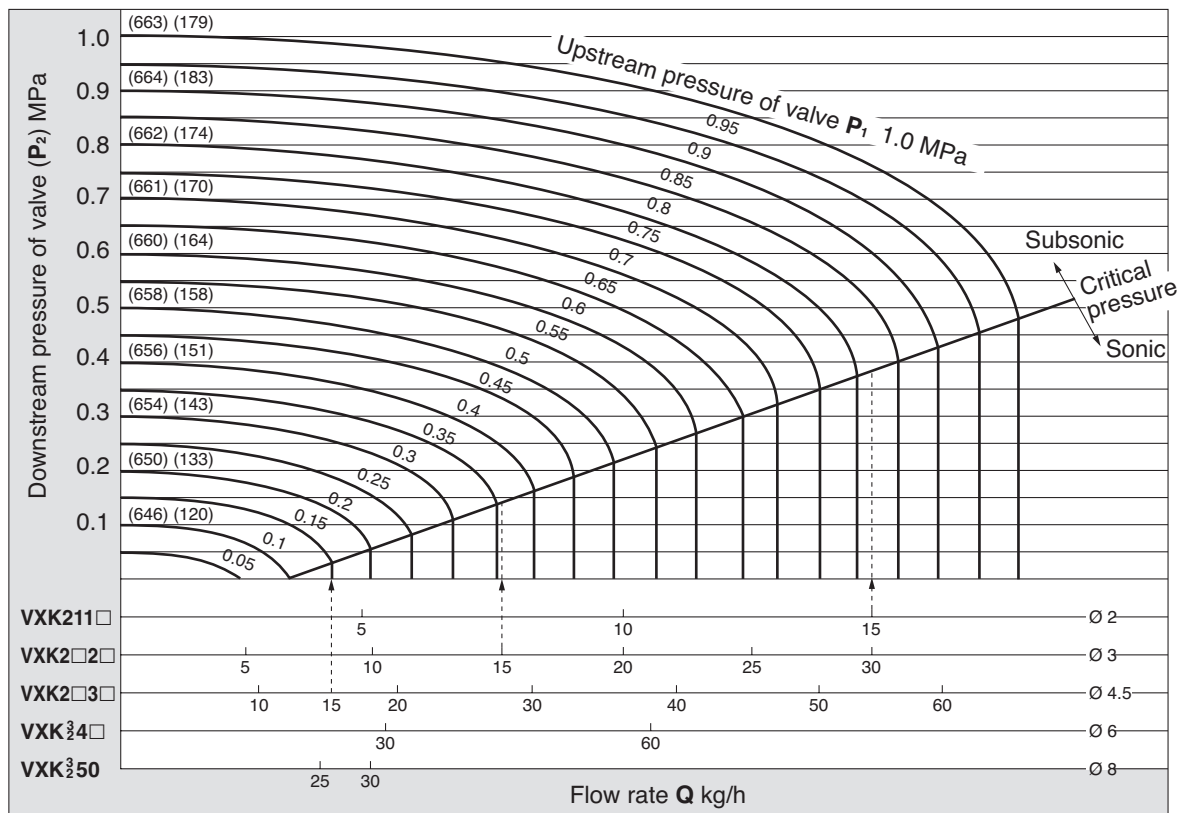
How to read the graph

The sonic range pressure to generate a flow rate of 500 l/min (ANR) is

P_1 0.14 MPa for a Ø 6 orifice (VXK2 $\frac{3}{4}$ □) and

P_1 0.3 MPa for a Ø 4.5 orifice (VXK2□3□).

Saturated Steam



() : Saturated steam holding heat (kcal/kg) () : Saturation temperature (°C)

How to read the graph

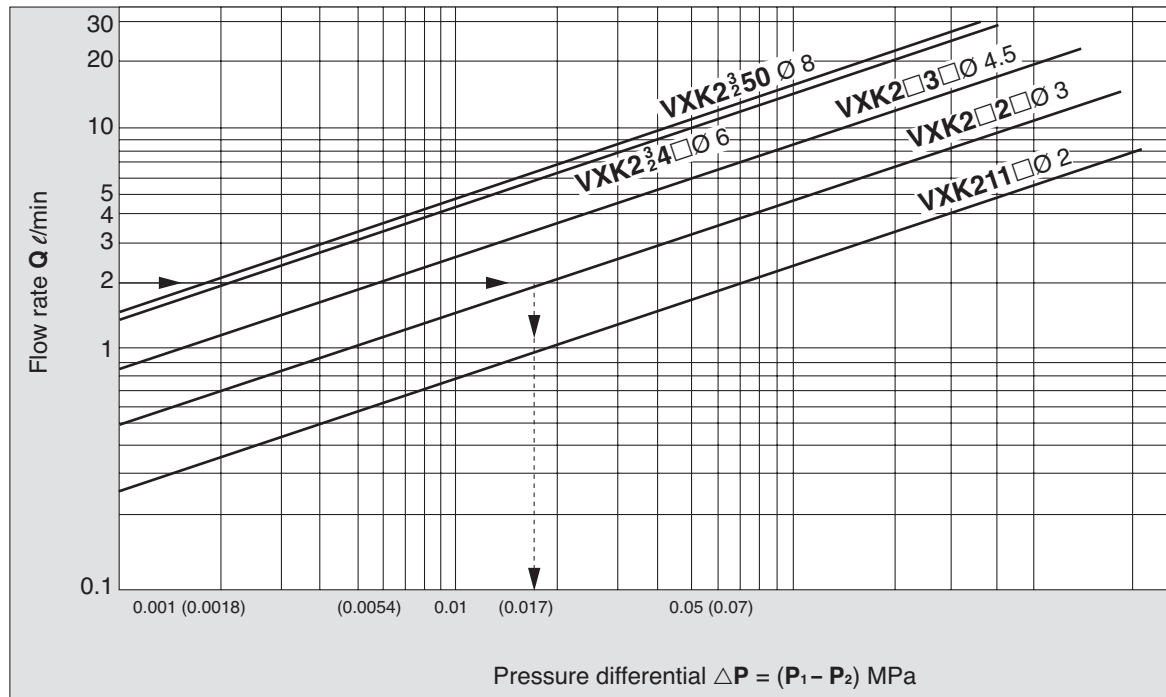
The sonic range pressure to generate a flow rate of 15 kg/h is

P_1 0.15 MPa for Ø 4.5 orifice (VXK2□3□S), P_1 0.37 MPa for Ø 3 orifice (VXK2□2□S), and

P_1 0.82 MPa for Ø 2 orifice (VXK211□S). The holding heat slightly differs depending on the pressure P_1 , but at 15 kg/h it is approx. 9700 kcal/h.

Flow Characteristics

Water



How to read the graph

When a water flow of 2 l/min is generated, ΔP 0.017 MPa for a valve with Ø 3 orifice (VXK212□, 222□, 232□).

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 stably operating.

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)

5. 100 mesh

The number of meshes over a length of 25.4 mm (1 inch).

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: 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.

Others

1. Material

NBR: Nitrile rubber

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

EPDM: Ethylene propylene rubber

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

2. Oil-free treatment

The degreasing and washing of wetted parts.

3. Passage symbol

In the JIS symbol (止動符) IN and OUT are in a blocked condition (止), but actually in the case of reverse pressure (OUT>IN), there is a limit to the blocking.

(ϕ) is used to indicate that blocking of reverse pressure is not possible.



Series VXX

Specific Product Precautions 1

Be sure to read this before handling the products.

Refer to back cover for Safety Instructions.

Design

⚠ Warning

1. Cannot be used as an emergency shutoff valve etc.

The valves presented in this catalogue 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 energisation

The solenoid coil will generate heat when continuously energised. Avoid using in a tightly shut container. Install it in a well ventilated area. Furthermore, do not touch it while it is being energised or right after it is energised.

3. Closed liquid circuit

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

4. Actuator drive

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

5. Pressure (including vacuum) holding

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

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

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

Selection

⚠ Warning

1. Fluid

1) Type of fluid

Before using a fluid, check whether it is compatible with the materials of each model by referring to the fluids listed in this catalogue. Use a fluid with a kinematic viscosity of 50 mm²/s or less.

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

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

Selection

⚠ Warning

2. Fluid quality

<Air>

1) Use clean air.

Do not use compressed air that contains chemicals, synthetic oils including organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

2) Install an 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.

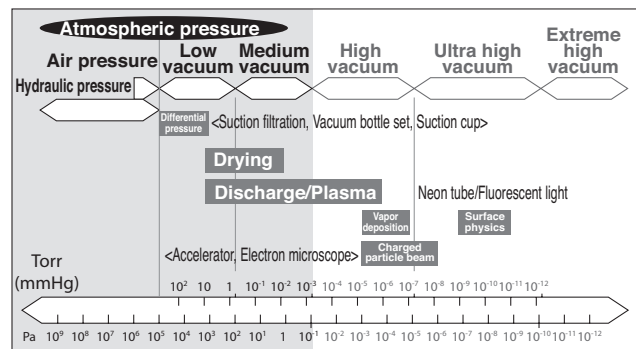
3) If excessive carbon powder is generated, eliminate it by installing mist separators at the upstream side of valves.

If excessive carbon powder is generated by the compressor, it may adhere to the inside of the valves and cause a malfunction.

Refer to Best Pneumatics No.5 for further details on compressed air quality.

<Vacuum>

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



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

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



Series VXX

Specific Product Precautions 2

Be sure to read this before handling the products.

Refer to back cover for Safety Instructions.

Selection

⚠ Warning

<Water>

The supply water includes materials that generate hard sediment or sludge such as calcium and magnesium. Since such scale and sludge can cause the valve to malfunction, install water softening equipment 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.

<Oil>

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

<Steam>

The supply water to a boiler includes materials that create a hard sediment or sludge such as calcium and magnesium. Sediment and sludge from steam can cause the valve to not operate properly. Install a water softening device, which removes these materials. Do not use operation steam which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as these can cause damage or deterioration.

3. Ambient environment

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

4. Countermeasures against static electricity

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

5. Low temperature operation

- 1) The valve can be used in an ambient temperature of between -20 °C. However, take measures to prevent freezing or solidification of impurities, etc.
- 2) When using valves for water application in cold climates, take appropriate countermeasures to prevent the water from freezing in tubing after cutting the water supply from the pump, by draining the water etc. When warming by a heater etc., be careful not to expose the coil portion to a heater. Installation of a dryer, heat retaining of the body is recommended to prevent a freezing condition in which the dew point temperature is high and the ambient temperature is low, and the high flow runs.

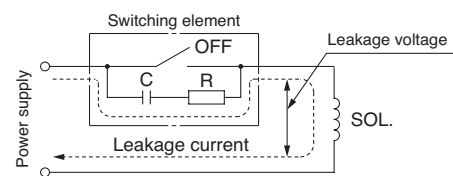
Selection

⚠ Caution

1. Leakage voltage

When operating the solenoid valve with the controller, take appropriate measures so that the leakage current does not exceed the allowable leakage voltage of the product.

Particularly when using a resistor in parallel with a switching element and using a C-R element (surge voltage suppressor) to protect the switching element, take note that leakage current will flow through the resistor, C-R element, etc., creating a possible danger that the valve may not turn off.



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

2. Selecting model

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

3. When the fluid is oil.

The kinematic viscosity must not exceed 50 mm²/s.

Mounting

⚠ Warning

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

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

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

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

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

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

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

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

5. Secure with the mounting holes firmly, except in the case of steel piping and copper fittings.

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 labelled on the product should not be erased, removed or covered up.



Series VVK

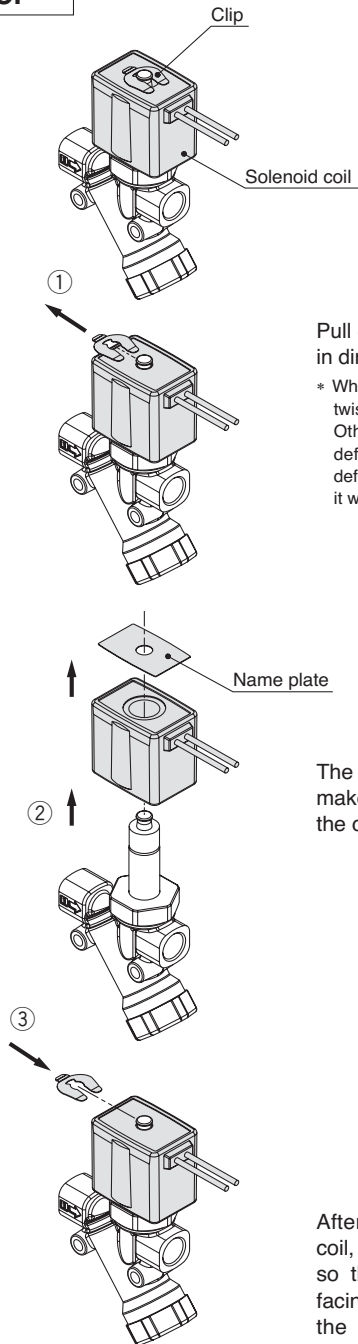
Specific Product Precautions 3

Be sure to read this before handling the products.

Refer to back cover for Safety Instructions.

Replacement of Solenoid Coil

N.C.



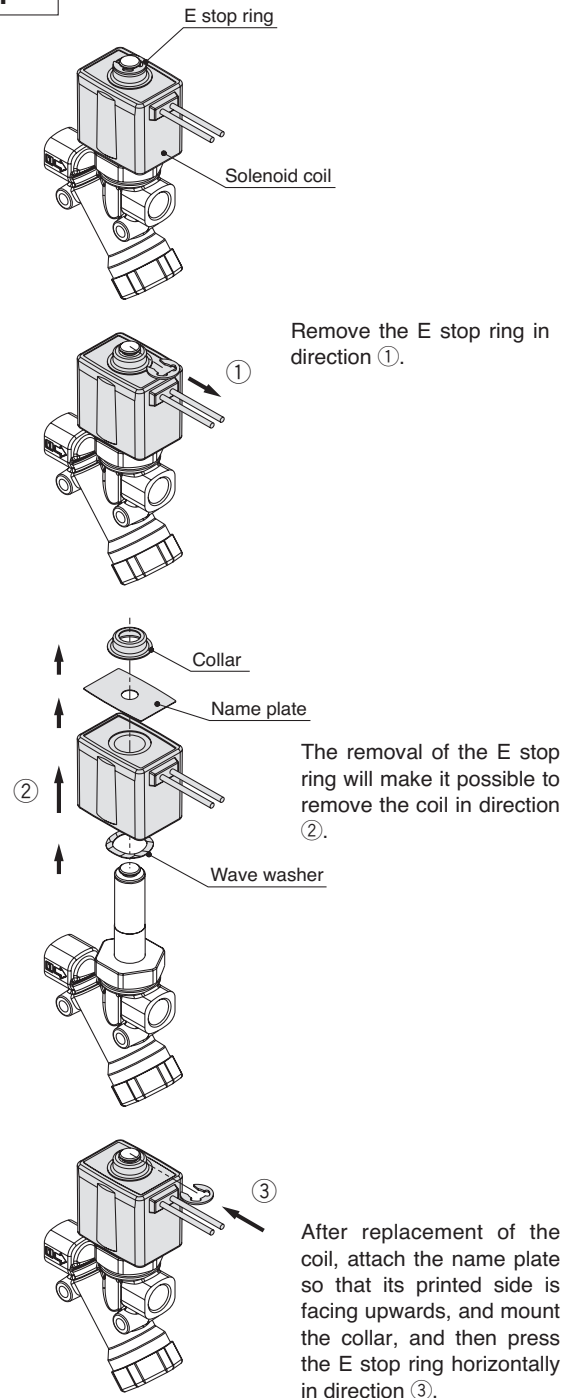
Pull out the clip horizontally in direction ①.

* When doing this, do not apply twisting or torsion to the clip. Otherwise, the clip may be deformed. If the clip is deformed by mistake, replace it with a new one.

The removal of the clip will make it possible to remove the coil in direction ②.

After replacement of the coil, attach the name plate so that its printed side is facing upwards, and press the clip horizontally in direction ③.

N.O.



Remove the E stop ring in direction ①.

The removal of the E stop ring will make it possible to remove the coil in direction ②.

After replacement of the coil, attach the name plate so that its printed side is facing upwards, and mount the collar, and then press the E stop ring horizontally in direction ③.

Warning

1. When replacing the solenoid coil, turn off the power supply.
2. Be careful of possible high temperature of the solenoid coil due to the fluid temperature and operating conditions.
3. Check the type of the solenoid coil (size, rated voltage, voltage specification, insulation specification).

- * Replacement of solenoid coil
 - Cannot be changed between DC and AC.
 - Can be changed between DC and AC (built-in full-wave rectifier type).
 - Can be changed from DC to DC.
 - Can be changed from AC to AC.



Series VXX

Specific Product Precautions 4

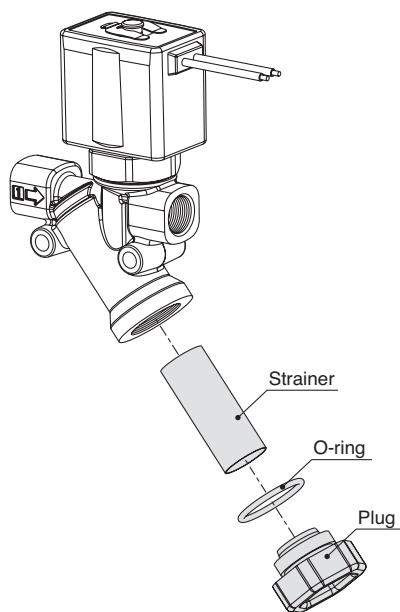
Be sure to read this before handling the products.

Refer to back cover for Safety Instructions.

Replacement of Strainer

⚠ Warning

1. The valve will reach high temperatures from high temperature fluids such as steam. Confirm that the valve has cooled sufficiently before performing works.
If touched inadvertently, there is a danger of being burned.
2. Shut off the fluid supply and release the fluid pressure in the system.
3. Shut off the power supply.
 - 1) Turn and remove the plug (width across flats of 27 mm).
 - 2) Remove the strainer, and clean or replace it.
 - 3) Mount the O-ring on the plug and insert the strainer to the end of the plug.
 - 4) Screw the plug into the body.
(Recommended tightening torque: 23 to 27 N·m)



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.

Piping

⚠ Caution

2. Avoid connecting ground lines to piping, as this may cause electric corrosion of the system.
3. Always tighten threads with the proper tightening torque.

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

Lower tightening torque will lead into fluid leakage.

Tightening Torque for Piping

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

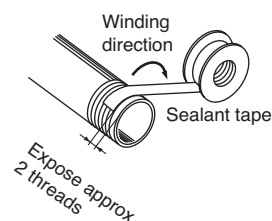
4. Connection of piping to products

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

5. Winding of sealant tape

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

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



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

Wiring

⚠ Caution

1. As a rule, use electrical wire with a cross sectional area of 0.5 to 1.25 mm² for wiring.
Furthermore, do not allow excessive force to be applied to the lines.
2. Use electrical circuits which do not generate chattering in their contacts.
3. Use voltage which is within $\pm 10\%$ of the rated voltage. In cases with a DC power supply where importance is placed on responsiveness, stay within $\pm 5\%$ 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.)



Series VXX

Specific Product Precautions 5

Be sure to read this before handling the products.

Refer to back cover for Safety Instructions.

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. Strainers

- 1) Be careful regarding clogging of strainers.
- 2) Clean strainers when the pressure drop reaches 0.1 MPa.

2. Lubrication

When using after lubricating, never forget to lubricate continuously.

3. Storage

In case of long term storage after use, thoroughly remove all moisture to prevent rust and deterioration of rubber materials etc.

4. Exhaust the drainage from an air filter periodically.

Operating Precautions

Warning

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

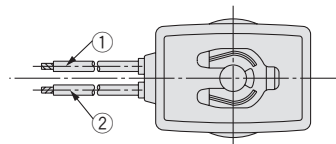
Electrical Connections

Caution

■ Grommet

Class H coil: AWG18 Insulator O.D. 2.2 mm

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

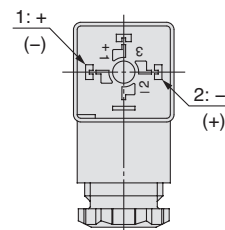


Rated voltage	Lead wire color	
	①	②
DC	Black	Red
100 VAC	Blue	Blue
200 VAC	Red	Red
Other AC	Gray	Gray

* There is no polarity.

■ DIN terminal

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



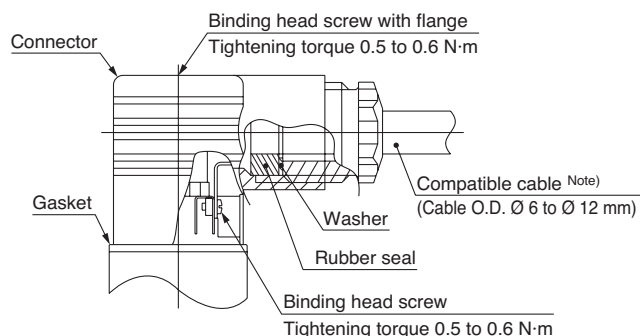
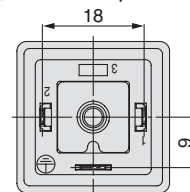
Terminal no.	1	2
DIN terminal	+ (-)	- (+)

* There is no polarity.

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

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.



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



Series VXX

Specific Product Precautions 6

Be sure to read this before handling the products.
Refer to back cover for Safety Instructions.

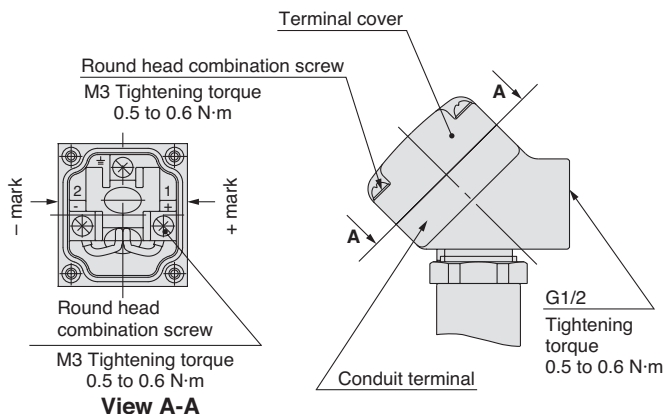
Electrical Connections

Caution

Conduit terminal

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

- Use the tightening torques below for each section.
- Properly seal the terminal connection (G 1/2) with the special wiring conduit etc.



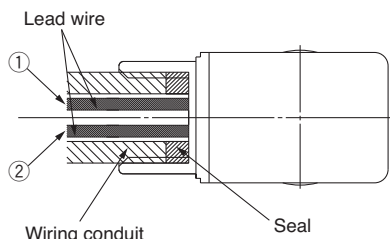
(Internal connection diagram)

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



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

Rated voltage	Lead wire colour	
	①	②
DC	Black	Red
100 VAC	Blue	Blue
200 VAC	Red	Red
Other AC	Grey	Grey

* There is no polarity.
(For the power saving type, there is polarity.)

Description	Part no.
Seal	VCW20-15-6

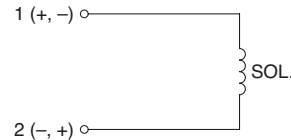
Note) Please order separately.

Electrical Circuits

Caution

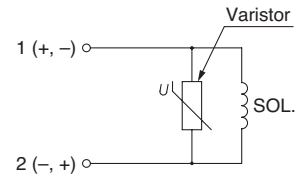
[DC circuit]

Grommet, Faston terminal



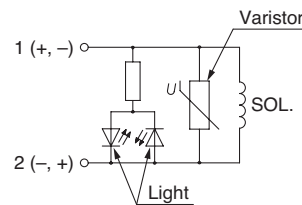
Without electrical option

Grommet, DIN terminal, Conduit terminal, Conduit



With surge voltage suppressor

DIN terminal, Conduit terminal

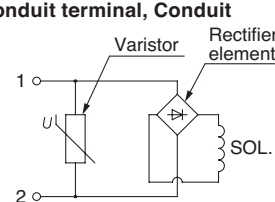


With light/surge voltage suppressor

[AC circuit]

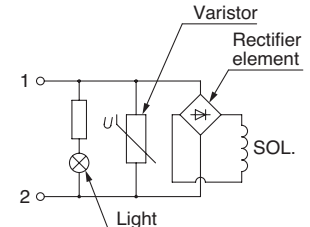
* For AC, the standard product is equipped with surge voltage suppressor.

Grommet, DIN terminal, Conduit terminal, Conduit



Without electrical option

DIN terminal, Conduit terminal



With light/surge voltage suppressor

Note 1) Coil for DIN terminal H type with AC voltage does not have full-wave rectifier. Full-wave rectifier is built in the DIN connector. Refer to page 39 to order it as an accessory.

One-touch Fitting

Caution

For information on handling one-touch fittings (KQ2 series) and appropriate tubing, refer to SMC website, <http://www.smc.eu>

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.

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

- 1) ISO 4414: Pneumatic fluid power – General rules and safety requirements for systems and their components.
ISO 4413: Hydraulic fluid power – General rules and safety requirements for systems and their components.
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.
etc.

Warning

- 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 catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.
- 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.
- Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**
 - 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.
 - 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.
 - Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.**
 - Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
 - Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogues and operation manuals.
 - Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

Caution

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries. Use in non-manufacturing industries is not covered.
Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.
The new Measurement Act prohibits use of any unit other than SI units in Japan.

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

- 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.
- 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.
- Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.
- 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

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

Safety Instructions

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

SMC Corporation (Europe)

Austria	+43 (0)2262622800	www.smc.at	office.at@smc.com
Belgium	+32 (0)33551464	www.smc.be	info@smc.be
Bulgaria	+359 (0)2807670	www.smc.bg	sales.bg@smc.com
Croatia	+385 (0)13707288	www.smc.hr	sales.hr@smc.com
Czech Republic	+420 541424611	www.smc.cz	office.at@smc.com
Denmark	+45 70252900	www.smc.dk	smc.dk@smc.com
Estonia	+372 651 0370	www.smc.ee	info.ee@smc.com
Finland	+358 207513513	www.smc.fi	smc.fi@smc.com
France	+33 (0)164761000	www.smc-france.fr	supportclient.fr@smc.com
Germany	+49 (0)61034020	www.smc.de	info.de@smc.com
Greece	+30 210 2717265	www.smcHELLAS.gr	sales@smcHELLAS.gr
Hungary	+36 23513000	www.smc.hu	office.hu@smc.com
Ireland	+353 (0)14039000	www.smcautomation.ie	technical.ie@smc.com
Italy	+39 03990691	www.smcitalia.it	mailbox.it@smc.com
Latvia	+371 67817700	www.smc.lv	info.lv@smc.com

Lithuania	+370 5 2308118	www.smclt.lt	info.lt@smc.com
Netherlands	+31 (0)205318888	www.smc.nl	info@smc.nl
Norway	+47 67129020	www.smc-norge.no	post.no@smc.com
Poland	+48 22 344 40 00	www.smc.pl	office.pl@smc.com
Portugal	+351 214724500	www.smc.eu	apoiocliente.pt@smc.com
Romania	+40 213205111	www.smcromania.ro	office.ro@smc.com
Russia	+7 (812)3036600	www.smc.eu	sales@smcru.com
Slovakia	+421 (0)413213212	www.smc.sk	sales.sk@smc.com
Slovenia	+386 (0)73885412	www.smc.si	office.si@smc.com
Spain	+34 945184100	www.smc.eu	post.es@smc.com
Sweden	+46 (0)86031240	www.smc.nu	order.se@smc.com
Switzerland	+41 (0)523963131	www.smc.ch	helpcenter.ch@smc.com
Turkey	+90 212 489 0 440	www.smcturkey.com.tr	satis@smcturkey.com.tr
UK	+44 (0)845 121 5122	www.smc.uk	sales.gb@smc.com
South Africa	+27 10 900 1233	www.smcza.co.za	Sales.za@smc.com