

Pilot Operated 2 Port Solenoid Valve

For Water, Oil, Air



New
VXD Series **VXD21/22/23**

Solenoid valves for various fluids used in a wide variety of

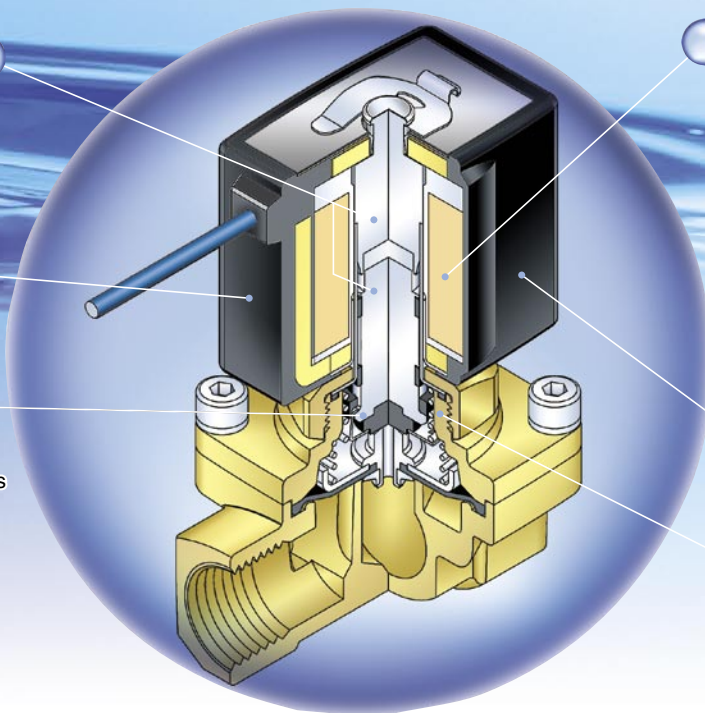
Improvement of corrosion resistance

Special magnetic material adopted

Enclosure: IP65

Low noise construction

Special construction enables to reduce the metal noise. (DC specification)



Reduction of power consumption (DC specification)

VXD21: 6 w

→ **4.5 w** (VXD2140 to 2150)

→ **5.5 w** (VXD2130)

VXD22: 8 w → **7 w**

VXD23: 11.5 w → **10.5 w**

Flame resistance UL94V-0 conformed

Flame resistant mold coil material

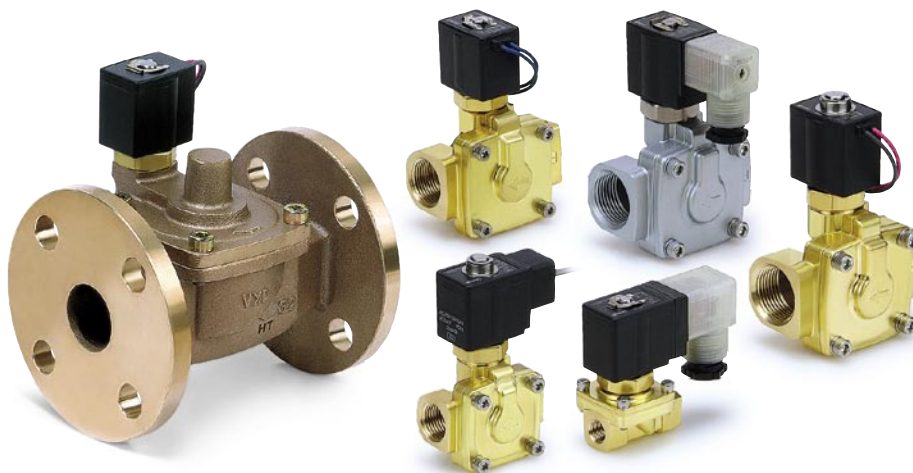
Improvement of maintenance performance

Maintenance is performed easily due to the threaded assembly.

Pilot Operated 3 Port Solenoid Valve

For Water, Oil, Air

New Series VXD21/22/23



Normally Closed (N.C.)

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

Normally Open (N.O.)

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

applications — **New VX Series variations**

Direct Operated 2 Port

VX21/22/23

For Air, Vacuum, Water, Steam, Oil



| Valve type | Port size | Orifice size mmØ |
|------------|------------|------------------|
| N.C./N.O. | 1/8 to 1/2 | 2 to 10 |

Pilot Operated 2 Port for Zero Differential Pressure

VXZ22/23

For Air, Vacuum, Water, Oil



| Valve type | Port size | Orifice size mmØ |
|------------|-----------|------------------|
| N.C./N.O. | 1/4 to 1 | 10 to 25 |

Direct Operated 3 Port

VX31/32/33

For Air, Vacuum, Water, Steam, Oil



| Valve type | Port size | Orifice size mmØ |
|----------------|------------|------------------|
| N.C./N.O. COM. | 1/8 to 3/8 | 1.5 to 4 |

Pilot Operated 2 Port

VXP21/22/23

For Steam (Air, Water, Oil)



| Valve type | Port size | Orifice size mmØ |
|------------|------------------------|------------------|
| N.C./N.O. | 1/4 to 2 32A to 50A | 10 to 50 |

Water Hammer Relief, Pilot Operated 2 Port

VXR21/22/23

For Water, Oil

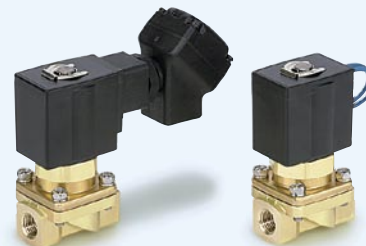


| Valve type | Port size | Orifice size mmØ |
|------------|-----------|------------------|
| N.C./N.O. | 1/2 to 2 | 20 to 50 |

Pilot Operated 2 Port for High Pressure

VXH22

For Air, Water, Oil



| Valve type | Port size | Orifice size mmØ |
|------------|------------|------------------|
| N.C. | 1/4 to 1/2 | 10 |

2 Port for Dust Collector (Solenoid type, Air Operated type)

VXF21/22, VXFA21/22

For Air



| Valve type | Port size | Orifice size mmØ |
|------------|--------------|------------------|
| N.C. | 3/4 to 1 1/2 | 20 to 40 |

Air Operated 2/3 Port

VXA21/22, VXA31/32

For Air, Vacuum, Water, Oil



| Model | Valve type | Port size | Orifice size mmØ |
|----------|------------|------------|------------------|
| VXA21/22 | N.C./N.O. | 1/8 to 1/2 | 3 to 10 |
| VXA31/32 | COM. | 1/8 to 3/8 | 1.5 to 4 |

The VX series has been renewed as the **new VX series**, with a new construction

Solenoid Valves Flow Characteristics

(How to indicate flow characteristics)

1. Indication of flow characteristics

Indication of the flow characteristics in specifications for equipment such as a solenoid valve, etc. is depending on "Table (1)".

Table (1) Indication of Flow Characteristics

| Corresponding equipment | Indication by international standard | Other indications | Standards conforming to |
|--|--------------------------------------|-------------------|---|
| Equipment for pneumatics | 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 |
| Equipment for controlling process fluids | A_v | — | IEC60534-2-3: 1997 JIS B 2005: 1995 |
| | — | C_v | Equipment: JIS B 8471, 8472, 8473 |

2. Equipment for pneumatics

2.1 Indication according to the international standards

(1) Standards conforming to

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

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

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

Critical pressure ratio b : Checked flow will occur when the pressure ratio (downstream pressure/upstream pressure) is at or smaller than this value.

Choked flow : It is the flow in which the upstream pressure is higher than the downstream pressure and where sonic speed is reached in a certain part of the equipment.
Gaseous mass flow rate is in proportion to the upstream pressure and not dependent on the downstream pressure.

Subsonic flow : Flow when the pressure ratio is 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 abbreviation (ANR) after the unit depicting air volume.
(standard reference atmosphere)

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

(3) Formula of flow rate

It can be indicated by the practical unit as following.

When

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

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

When

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

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

Q : Air flow rate [dm³/min (ANR)], the SI unit dm³ (Cubic decimetre) is also allowed to be described by ℓ (liter). 1 dm³ = 1 ℓ.

Solenoid Valves Flow Characteristics

C : Sonic conductance [dm³/(s·bar)]

b : Critical pressure ratio [—]

P_1 : Upstream pressure [MPa]

P_2 : Downstream pressure [MPa]

t : Temperature [°C]

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

Flow characteristics curve is indicated in the Graph (1) For details, please use SMC's "Energy Saving Program".

Example)

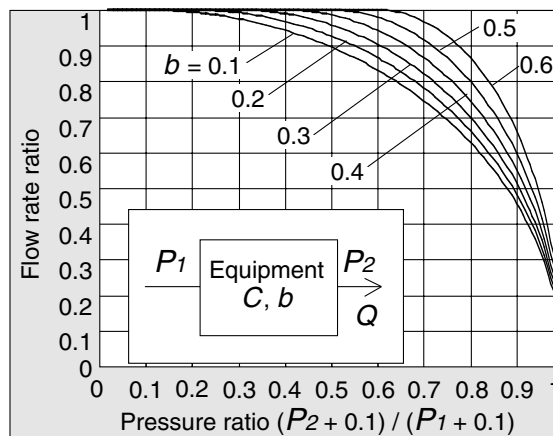
Obtain the air flow rate when $P_1 = 0.4$ [MPa], $P_2 = 0.3$ [MPa], $t = 20$ [°C] for a solenoid valve where $C = 2$ [dm³/(s·bar)] and $b = 0.3$.

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)]

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

Based on the Graph (1), the flow rate ratio is going to be 0.7 if it is read with a pressure ratio of 0.8 and a flow ratio of $b = 0.3$.

Hence, flow rate = Max. flow rate x flow rate ratio = $600 \times 0.7 = 420$ [dm³/min (ANR)]



Graph (1) Flow characteristics line

(4) Test method

Pipe the test equipment to the test circuit shown in Fig. (1). Keep the upstream pressure at a certain constant level above 0.3MPa. First measure the maximum flow rate in saturation. Then, measure the flow rate, upstream pressure and downstream pressure each at 80%, 60%, 40% and 20% points of the flow rate. Calculate the sonic conductance C from the maximum flow rate. Also substitute other data for variables in the formula for subsonic flow and obtain the critical pressure rate b by averaging the critical pressure rates at those points.

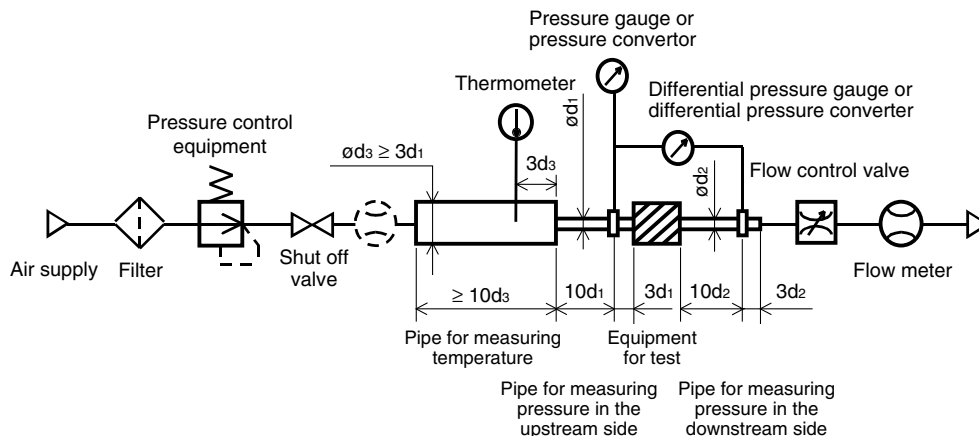


Fig. (1) Test circuit based on ISO 6358, JIS B 8390

Solenoid Valves Flow Characteristics

2.2 Effective area S

(1) Standards conforming to

**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 flow ability of a component, represented by its equivalent "ideal" cross sectional area. This effective area is calculated under sonic conditions by measuring pressure loss in an air tank. Like sonic conductance C , the effective area is a method of expressing the flow rate of a product.

(3) Formula of 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)], the SI unit dm³ (cubic decimetre) is also allowed to be described by ℓ (litre)

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 unknown. It is the same as the formula for sonic conductance C (2) only when $b=0.5$

(4) Test method

Pipe the test equipment to the test circuit shown in Fig. (2). Fill the air tank with compressed air and keep the pressure at a constant level above 0.6MPa (0.5MPa). Then discharge the air until the pressure in the tank drops to 0.25MPa (0.2MPa). Measure the time required to discharge the air and the residual pressure in the air tank after leaving it until the pressure becomes stable in order to calculate the effective sectional area S by the following formula. Select the capacity of the air tank according to the effective sectional area of the test equipment. In the case of JIS B 8373, 8374, 8375, 8379, 8381, the pressure values are in parentheses and the coefficient of 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]

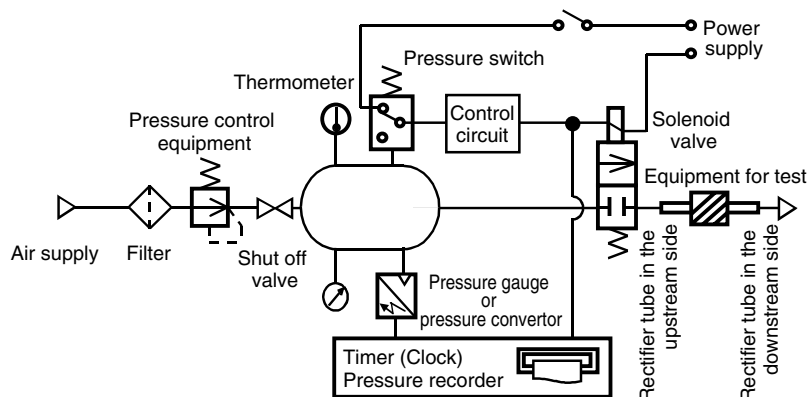


Fig. (2) Test circuit based on JIS B 8390

Solenoid Valves 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 flow coefficient C_v factor by the following formula which is based on testing conducted with a 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, $T_1 = 297 \pm 5K$, $0.07 \text{ bar} \leq \Delta P \leq 0.14 \text{ bar}$.

This is the same concept as effective area A which ISO6358 stipulates as being applicable only when the pressure drop is small in relation to the upstream pressure so that the compression of air is negligible.

3. Equipment for process fluids

(1) Standards conforming to

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: Regulator for water

JIS B 8472: Solenoid valve for steam

JIS B 8473: Solenoid valve for fuel oil

(2) Definition of flow characteristics

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

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

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 known unit. Also, the flow characteristics line shown in the Graph (2).

In the case of liquid:

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

Q : Flow rate [ℓ/min]

Av : Flow coefficient [m²]

ΔP : Pressure difference [MPa]

G : Relative density [water = 1]

In the case of saturated aqueous vapour:

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

Q : Flow rate [kg/h]

Av : Flow coefficient [m²]

ΔP : Pressure difference [MPa]

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

P_2 : Downstream pressure [MPa]

Solenoid Valves Flow Characteristics

Conversion of flow coefficient:

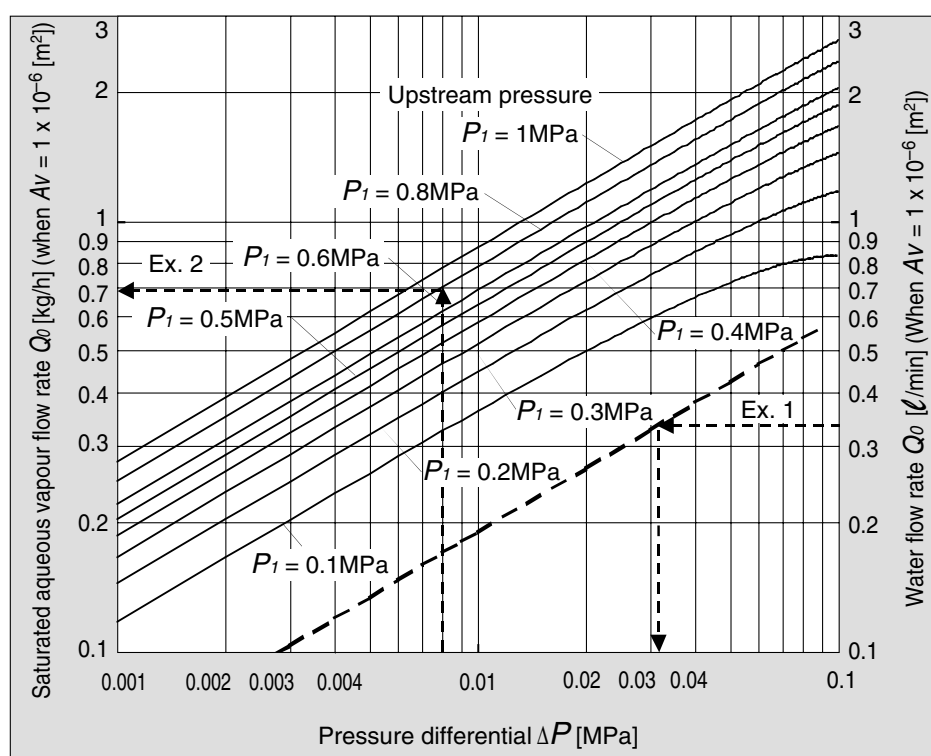
$$Av = 28 \times 10^{-6} Kv = 24 \times 10^{-6} Cv \dots\dots\dots(11)$$

Here,

Kv factor: It is the value representing the flow rate of clean water in m³/h which runs through the valve at 5 to 40°C, when the pressure difference is 1 bar.

Cv factor (Reference values): It is the value representing the flow rate of clean water in US gal/min which runs through the valve at 60°F, when the pressure difference is 1 lbf/in² (psi).

Values of pneumatic Kv are different from Cv because the testing method is different from each other.



Graph (2) Flow characteristics line

Example 1)

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

Example 2)

Obtain the flow rate of saturated aqueous vapour 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 the 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 $Q = 0.7 \times 1.5 = 1.05 [kg/h]$.

Solenoid Valves Flow Characteristics

(4) Test method

By attaching the equipment for testing with the test circuit shown in Fig. (3) and running water at 5 to 40°C, 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 .

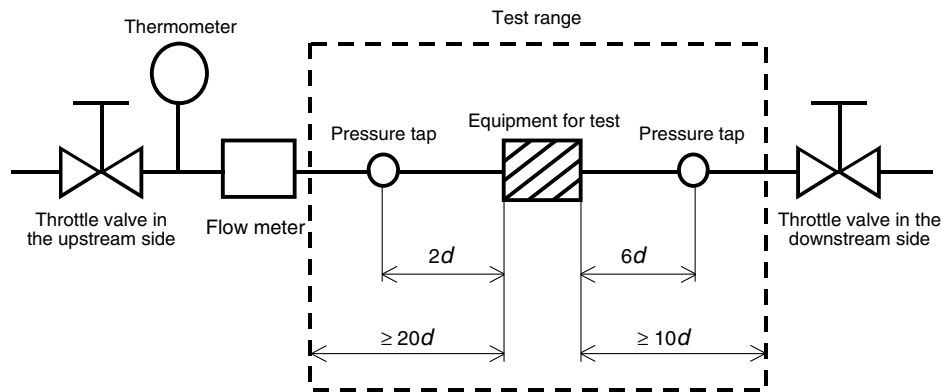
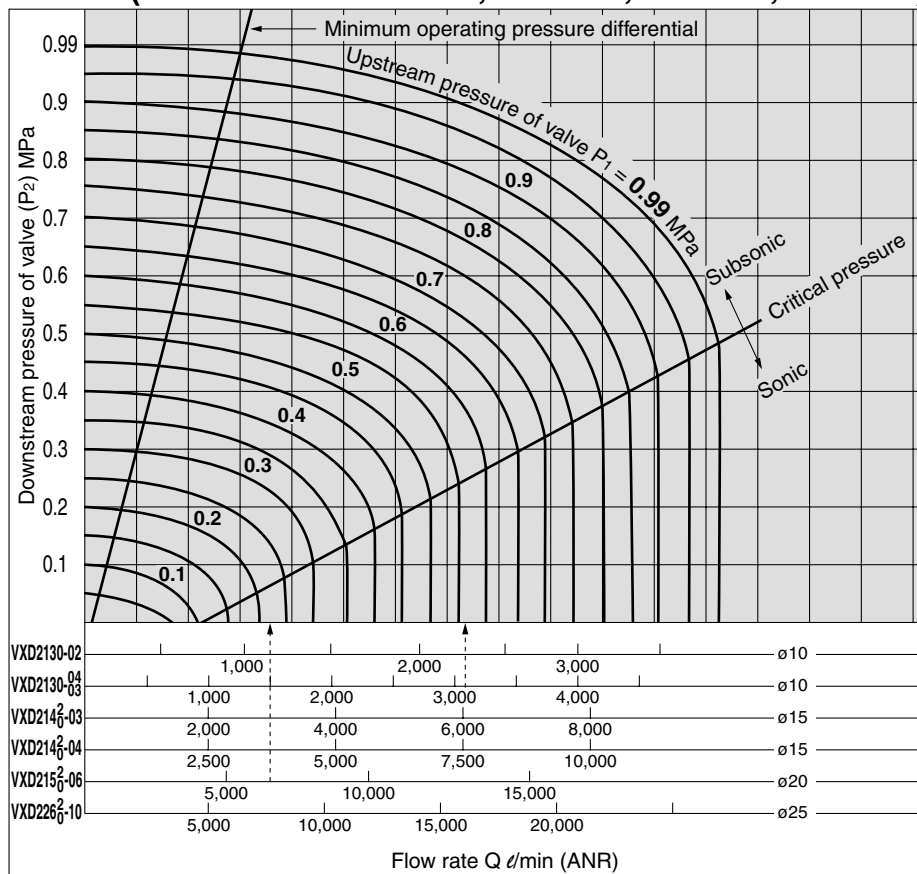


Fig. (3) Test circuit based on IEC60534-2-3, JIS B 2005

Flow Characteristics

Note) Use this graph as a guide. In the case of obtaining an accurate flow rate, refer to front matter pages 1 to 6.

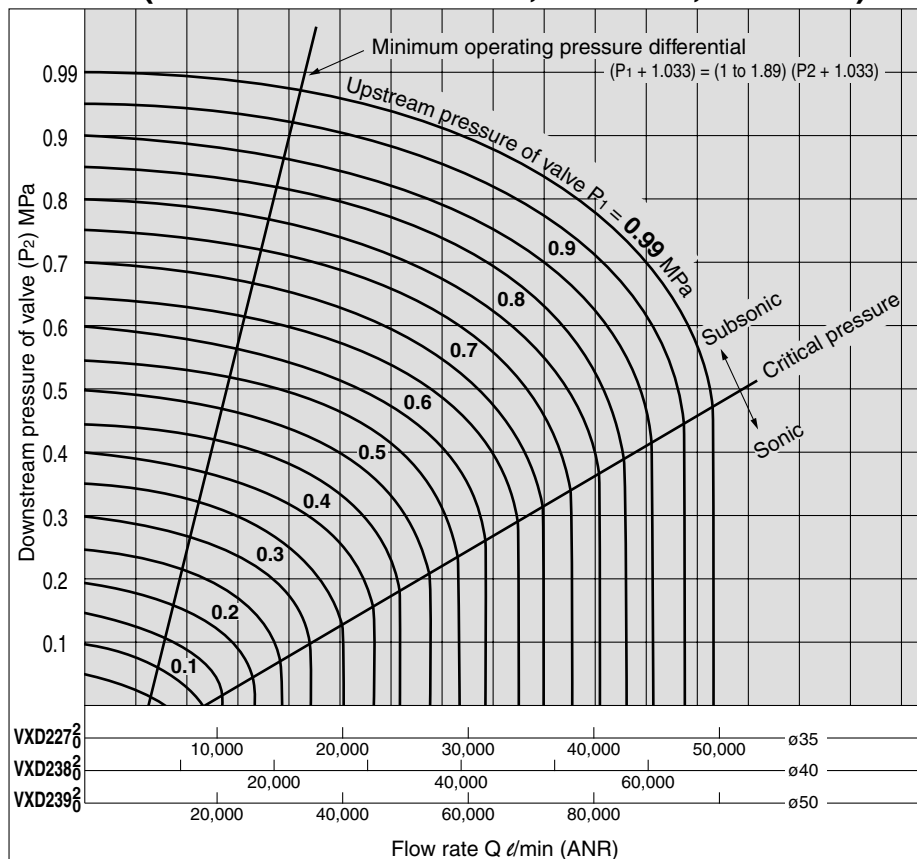
For Air (Orifice size: ø10 mm, ø15 mm, ø20 mm, ø25 mm)



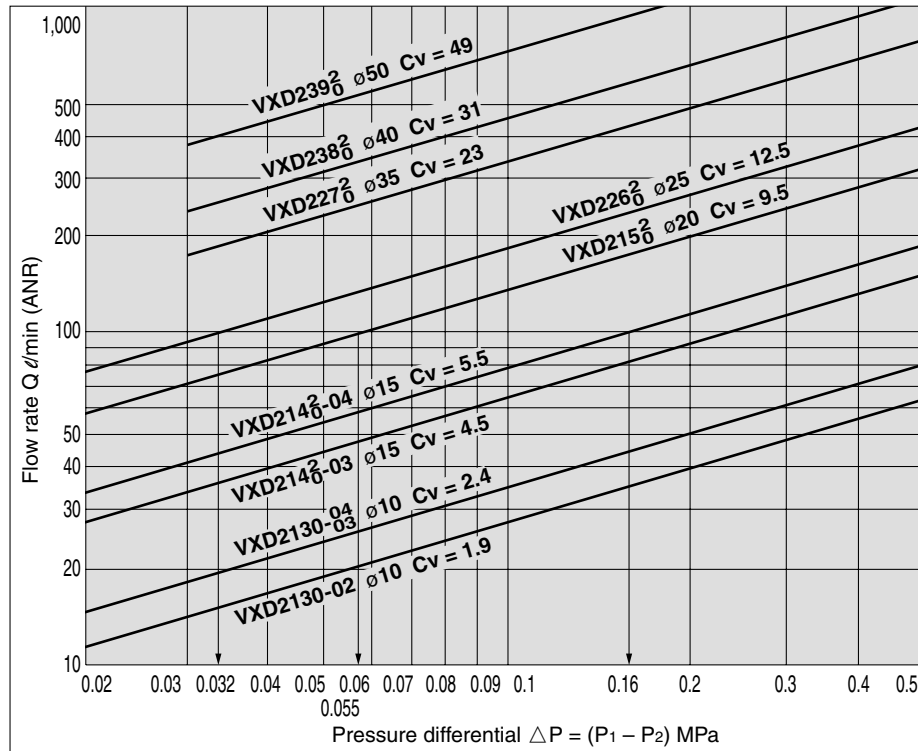
How to read the graph

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 (VXD2140-03) and $P_1 \approx 0.22$ MPa for a ø20 orifice (VXD2150-06).

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



For Water



How to read the graph

When a water flow of 100 d/min is generated,
 $\Delta P \approx 0.16$ MPa for a $\phi 15$ orifice (VXD214²₀-04),
 $\Delta P \approx 0.055$ MPa for a $\phi 20$ orifice (VXD215²₀), and
 $\Delta P \approx 0.032$ MPa for a $\phi 25$ orifice (VXD226²₀).

Applicable Fluid Check List

Pilot Operated 2 Port Solenoid Valve *Series VXD21/22/23*



Normally closed (N.C.)

Option Symbol and Components

| Option symbol | Seal material | Material Body/Shading coil | Coil insulation type | Note |
|---------------|---------------|--|----------------------|-------------------------------------|
| Standard | NBR | Note 1) Brass (C37) or Bronze (CAC407)/Copper | B | — |
| A | FKM | | | |
| B | EPDM | | H | |
| D | FKM | | | |
| E | EPDM | | | |
| G | NBR | Note 3) Stainless steel/Silver | B | — |
| H | FKM | | | |
| J | EPDM | | | |
| L | FKM | | H | High corrosion resistance, Oil-free |
| N | FKM | | | |
| P | EPDM | | | |

Fluid Name and Option

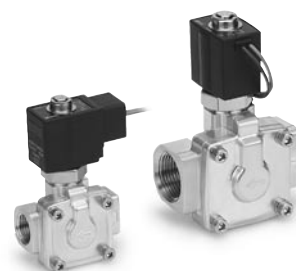
| Fluid (Application) | Option symbol and body material | |
|---------------------------------|---------------------------------|-----------------|
| | Brass (C37) or Bronze (CAC407) | Stainless steel |
| Applicable valve | 10A to 50A | 10A to 25A |
| Caustic soda (25% ≥) | — | J |
| Gas oil | A | H |
| Silicon oil | A | H |
| Steam system (Water for boiler) | — | G, J |
| Steam system (Condensation) | E | P |
| Perchloroethylene | A | H |
| Water (Max. 99°C) | D, E | N, P |

Note 1) 10A to 25A are C37 and 32A to 50A are CAC407.

Note 2) The highest operating temperature of 32A to 50A is 80°C.

Note 3) Stainless steel/Silver is not available for valve sizes from 32A to 50A.

Note 4) Consult with SMC for other than above fluids.



Normally open (N.O.)

Option Symbol and Components

| Option symbol | Seal material | Material | | Coil insulation type | Note |
|---------------|---------------|---|--------------------------------|----------------------|--|
| | | Body/ Shading coil | Inside bushing rod assembly | | |
| Standard | NBR | Brass (C37) or Note 1) Bronze (CAC407)/ Copper | PPS | B | — |
| A | FKM | | | | |
| B | EPDM | | | | |
| D | FKM | | | | |
| E | EPDM | | | | |
| G | NBR | Stainless steel/Silver Note 3) | PPS | B | High corrosion resistance, Oil-free |
| H | FKM | | | | |
| J | EPDM | | | | |
| L | FKM | | | H | — |
| N | FKM | | | | |
| P | EPDM | | | | |

Fluid Name and Option

| Fluid (Application) | Option symbol and body material | |
|---------------------------------|---------------------------------|-----------------|
| | Brass (C37) or Bronze (CAC407) | Stainless steel |
| Applicable valve | 15A to 50A | 15A to 25A |
| Caustic soda (25% ≥) | — | J |
| Gas oil | A | H |
| Silicon oil | A | H |
| Steam system (Water for boiler) | — | G, J |
| Steam system (Condensation) | E | P |
| Perchloroethylene | A | H |
| Water (Max. 99°C) | E | N, P |

Note 1) 10A to 25A are C37 and 32A to 50A are CAC407.

Note 2) The highest operating temperature of 32A to 50A is 80°C.

Note 3) Stainless steel/Silver is not available for valve sizes from 32A to 50A.

Note 4) Consult with SMC for other than above fluids.

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 downstream pressure is 0 MPa, this becomes the maximum operating pressure.

2. Minimum operating pressure differential

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

Note) If the pressure differential is the minimum operating pressure differential when the valve is closed, it may be below the minimum operating pressure differential when the valve is open.

3. Maximum system pressure

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

(The pressure differential of the solenoid valve unit must be less than the maximum operating pressure differential.)

4. Proof pressure

The pressure which must be withstood without a drop in performance after 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 dissipation (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 in the shut-off unit by shutting off the power.

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, low jetproof type

"Low jetproof type" means that no water intrudes inside the equipment that could hinder it from operating normally by means of discharging water for 3 minutes in the prescribed manner. Take appropriate protection measures, since a device is not usable in an environment where a water drop 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®

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.

Pilot Operated 2 Port Solenoid Valve

Series VXD21/22/23

For Water, Oil, Air

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/Bronze,
Stainless steel
Seal NBR, FKM, EPDM

■ Electrical Entry

• Grommet • DIN terminal
• Conduit • Conduit terminal



| Model | VXD2130 | VXD214 $\frac{0}{2}$ | VXD215 $\frac{0}{2}$ | VXD226 $\frac{0}{2}$ |
|--------------------|---------------|----------------------|----------------------|----------------------|
| Body size | 10A | ● | — | — |
| | 15A | — | ● | — |
| | 20A | — | — | ● |
| | 25A | — | — | ● |
| Port size (Thread) | 1/4, 3/8, 1/2 | 3/8, 1/2 | 3/4 | 1 |

| Model | VXD227 $\frac{0}{2}$ | VXD238 $\frac{0}{2}$ | VXD239 $\frac{0}{2}$ |
|--------------------|----------------------|----------------------|----------------------|
| Body size | 32A | ● | — |
| | 40A | — | ● |
| | 50A | — | ● |
| Port size (Flange) | 32A | 40A | 50A |

Standard Specifications

| | | | |
|----------------------|-------------------------------|---|--|
| Valve specifications | Valve construction | | Pilot operated 2 port diaphragm type |
| | Withstand pressure (MPa) | | 5.0 |
| | Body material | | Brass (C37), Stainless steel, Bronze (CAC407) |
| | Seal material | | NBR, FKM, EPDM |
| | Enclosure | | Dust-tight, Low jetproof (equivalent to IP65) ^{Note 1)} |
| | Environment | | Location without corrosive or explosive gases |
| Coil specifications | Rated voltage | AC (Class B coil, with a full-wave rectifier) | 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) | |
| | Allowable voltage fluctuation | | 24 VDC, 12 VDC |
| | Allowable leakage voltage | AC (Class B coil, with a full-wave rectifier) | ±10% of rated voltage |
| | | AC (Class B coil/H coil) ^{Note 2)} | ±10% or less of rated voltage |
| | | DC (Class B coil only) | ±20% or less of rated voltage |
| | Coil insulation type | | ±2% or less of rated voltage |
| | | Class B, Class H | |

Note 1) Electrical entry, Grommet with surge voltage suppressor (GS) has a rating of IP40.

Note 2) The AC (Class B) coil for the VXD2130 comes with a full-wave rectifier.

Solenoid Coil Specifications

Note) The values are for an ambient temperature of 20°C and at the rated voltage.

DC Specification

| Model | Power consumption (W) | Temperature rise (C°) ^{Note)} |
|---|-----------------------|--|
| VXD2130 | 5.5 | 50 |
| VXD214 $\frac{0}{2}$ /215 $\frac{0}{2}$ | 4.5 | 45 |
| VXD226 $\frac{0}{2}$ /227 $\frac{0}{2}$ | 7 | 45 |
| VXD238 $\frac{0}{2}$ /239 $\frac{0}{2}$ | 10.5 | 60 |

AC Specification (Class B coil)

| Model | Frequency (Hz) | Apparent power (VA) | | Temperature rise (C°) ^{Note)} |
|-------|----------------|---------------------|-----------|--|
| | | Inrush | Energised | |
| VXD21 | 50 | 19 | 9 | 45 |
| | 60 | 16 | 7 | 40 |
| VXD22 | 50 | 43 | 19 | 55 |
| | 60 | 35 | 16 | 50 |
| VXD23 | 50 | 62 | 30 | 65 |
| | 60 | 52 | 25 | 60 |

* The AC (Class B) coil for the VXD2130 comes with a full-wave rectifier.

AC Specification (Class B coil, with a full-wave rectifier)

| 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, energisation, or frequency of the power, since the AC coil uses a rectifying circuit.

AC Specification (Class H coil)

| Model | Frequency (Hz) | Apparent power (VA) | | Temperature rise (C°) ^{Note)} |
|-------|----------------|---------------------|-----------|--|
| | | Inrush | Energised | |
| VXD21 | 50 | 19 | 9 | 45 |
| | 60 | 16 | 7 | 40 |
| VXD22 | 50 | 43 | 19 | 55 |
| | 60 | 35 | 16 | 50 |
| VXD23 | 50 | 62 | 30 | 65 |
| | 60 | 52 | 25 | 60 |

How to Order Solenoid Coil Assembly

Table (1) Model and Solenoid Coil Type

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

| Voltage type | | AC | | AC (with a full-wave rectifier) | DC |
|-------------------------|-----------------------------------|-----------------------|--------------|---------------------------------|-----------------------|
| Coil insulation type | | Class B | Class H | Class B | Class B |
| (Solenoid valve option) | | (-, A, B, G, H, J, L) | (D, E, N, P) | (-, A, B, G, H, J, L) | (-, A, B, G, H, J, L) |
| Model | VXD2130 | — Note) | A | C | B |
| | VXD21 ⁴ ₅ □ | A | A | C | A |
| | VXD22 ⁶ ₇ □ | A | A | C | A |
| | VXD23 ⁸ ₉ □ | A | A | C | A |

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

AVX02 1N-5G

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

| | |
|---|---------------|
| - | Class B |
| H | Class H Note) |

Note) DIN terminal and DC are not available.

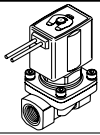
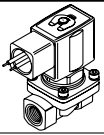
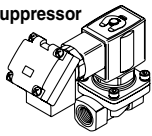
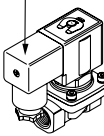
Valve

| Symbol | Valve |
|--------|-------|
| - | N.C. |
| 2 | N.O. |

Note 1) The AC (Class B) coil for VXD2130 only comes with a full-wave rectifier.

Note 2) Refer to "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 DS - DIN with surge voltage suppressor DL - DIN with light DZ - DIN with surge voltage suppressor and light DO - For DIN (without connector)  |

* Refer to "Table (2)" for the available combinations between each electrical option and rated voltage.

BVX021N-5G-Z

Rated voltage

| | |
|---|--------|
| 5 | 24 VDC |
| 6 | 12 VDC |

Table (2) Rated Voltage – Electrical Option

| Rated voltage | | | Class B | | | Class H | | |
|---------------|----------------|---------|-------------------------------|------------|---|------------------------------------|------------|---|
| 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 | ● | — | — | ● | — | — |
| DC | J | 230 V | ● | — | — | ● | — | — |
| | 5 | 24 V | ● | ● | ● | DC specification is not available. | | |
| | 6 | 12 V | ● | — | — | | | |

* Option S, Z are not available as a surge voltage suppressor is integrated into the AC/Class B coil (with a full wave rectifier) as standard.

* When changing coils, AC/DC are not interchangeable with each other, and Class B and H coils are also not interchangeable with each other.

AC/Class B (with a full-wave rectifier)/DC are interchangeable with each other.

AC/Class B (with a full-wave rectifier)

CVX02 1N-1GR

Series

| | |
|---|---------|
| 1 | VXD21□□ |
| 2 | VXD22□□ |
| 3 | VXD23□□ |

Rated voltage Note 1)

| | |
|---|------------------|
| 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 |

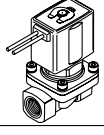
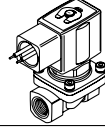
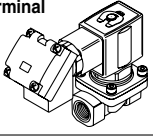
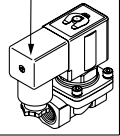
Valve

| Symbol | Valve |
|--------|-------|
| - | N.C. |
| 2 | N.O. |

Electrical entry

Note 1) Refer to "Table (2)" for the available combinations.

Electrical entry

| | |
|---|---|
| G - Grommet  | C - Conduit  |
| T - With conduit terminal TL - With conduit terminal and light  | D - DIN DL - DIN with light DO - For DIN (without connector)  |

* Refer to "Table (2)" for the available combinations between each electrical option and rated voltage.

* A surge voltage suppressor is integrated into the AC/Class B coil (with a full wave rectifier) as standard.

• Name plate part no.

AZ-T-VX **Valve model**

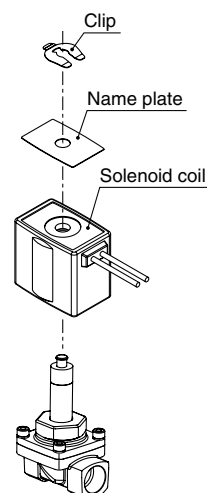
↑ Enter by referring to "How to Order".

• Clip part no. (For N.C.)

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

• Clip part no. (For N.O.)

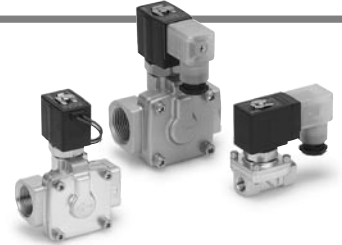
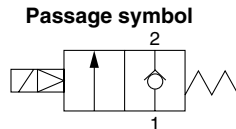
For VXD21: ETW-7
For VXD22: ETW-8
For VXD23: ETW-9



For Water

Model/Valve Specifications

Normally closed (N.C.)



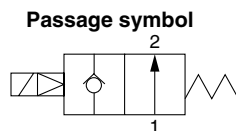
| Port size | | Orifice size (mmø) | Model | Min. operating pressure differential (MPa) | Max. operating pressure differential (MPa) | | Flow characteristics | | Max. system pressure (MPa) | ^(Note) Weight (g) | |
|-----------|-----------|--------------------|------------|--|--|-----|--------------------------------------|--------------|----------------------------|---------------------------------|--|
| | | | | | AC | DC | Av x 10 ⁻⁶ m ² | Cv converted | | | |
| Thread | 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 | | 670 | |
| | | 15 | VXD2140-03 | | | | 110 | 4.5 | | 500 | |
| | 1/2 (15A) | 10 | VXD2130-04 | | 0.7 | 0.5 | 58 | 2.4 | | 670 | |
| | | 15 | VXD2140-04 | | | | 130 | 5.5 | | 1150 | |
| | 3/4 (20A) | 20 | VXD2150-06 | | 1.0 | 1.0 | 230 | 9.5 | | 1650 | |
| | 1 (25A) | 25 | VXD2260-10 | | | | 310 | 13 | | 5400 | |
| Flange | 32A | 35 | VXD2270-32 | 0.03 | | | 550 | 23 | 6800 | | |
| | 40A | 40 | VXD2380-40 | | | | 740 | 31 | 8400 | | |
| | 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 terminal type respectively.

• Refer to "Glossary of Terms" on front matter 10, for details on the max. operating pressure differential and the max. system pressure.

Normally open (N.O.)



| 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 | 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 terminal type respectively.

• Refer to "Glossary of Terms" on front matter 10, for details on the max. operating pressure differential and the max. system pressure.

Operating Fluid and Ambient Temperature

| Power source | Operating fluid temperature (°C) | | Ambient temperature (°C) |
|--------------|----------------------------------|---------|--------------------------|
| | Solenoid valve option | | |
| | Standard, G, H | E, P | |
| AC | 1 to 60 | 1 to 99 | -10 to 60 |
| DC | 1 to 60 | — | -10 to 60 |

Note 1) Since the AC/Class B coil (with a full-wave rectifier) uses a rectifying circuit, the fluid and ambient temperature are the same as the DC specifications.

Note 2) With no freezing.

Tightness of Valve (Leakage Rate)

| Seal material | Leakage rate (With water pressure) | |
|----------------|------------------------------------|--------------------------------|
| | 1/4 to 1 | 32A to 50A |
| NBR, FKM, EPDM | 0.2 cm ³ /min or less | 1 cm ³ /min or less |

Pilot Operated 2 Port Solenoid Valve *Series VXD21/22/23*

For Water/Single Unit

How to Order

DC/AC (except VXD2130 AC/Class B)
AC/Class B coil (with a full-wave rectifier)

* The AC (Class B) coil for VXD2130 only comes with a full-wave rectifier.

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

Valve/Body configuration • Refer to "Table (1)" shown below for availability.

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

Suffix •

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

Rated voltage •

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

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

Electrical entry •

Bracket •

With a full-wave rectifier, surge voltage suppressor

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
DS - DIN with surge voltage suppressor
DL - DIN with light
DZ - DIN with surge voltage suppressor and light
DO - For DIN (without connector)

* DIN type is available with class B insulation only.

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

* Option S, Z are not available as a surge voltage suppressor is integrated into the AC/Class B coil (with a full-wave rectifier) as standard.

Table (1) Port/Orifice Size

Normally closed (N.C.)

| Solenoid valve (Port size) | | | | Orifice symbol | | | | | | | 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) | — | — | — | — | ● | — | — | — | — | | |
| | Flange | — | 10 (1) | — | — | — | — | ● | — | — | — | Bronze (CAC407) | |
| | | — | 32 (32A) | — | — | — | — | — | ● | — | — | | |
| | | — | — | 40 (40A) | — | — | — | — | — | ● | — | | |
| | | — | — | 50 (50A) | — | — | — | — | — | — | ● | | |

Normally open (N.O.)

| Solenoid valve (Port size) | | | | Orifice symbol | | | | | | 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) | — | — | — | ● | — | — | — | — | | |
| | Flange | — | 10 (1) | — | — | — | ● | — | — | — | Bronze (CAC407) | |
| | | — | 32 (32A) | — | — | — | — | ● | — | — | | |
| | | — | — | 40 (40A) | — | — | — | — | ● | — | | |
| — | — | 50 (50A) | — | — | — | — | — | — | ● | | | |

Table (2) Solenoid Valve Option

| Option symbol | Seal material | Body material/ Shading coil material | Coil insulation type | Note |
|---------------|---------------|---|----------------------|---|
| — | NBR | Brass (C37)/Copper | B | — |
| G | | Stainless steel/Silver | | |
| E | EPDM | Brass (C37)/Copper | H | Heated water (AC only) |
| P | | Stainless steel/Silver | | |
| L | FKM | Stainless steel/Silver | B | High corrosion resistance specification, Oil-free |

Table (3) Rated Voltage – Electrical Option

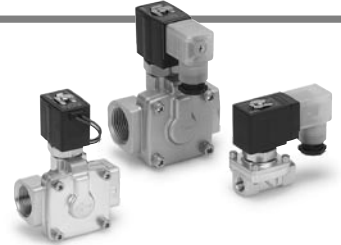
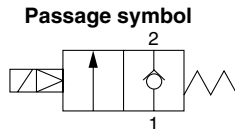
| Rated voltage | | | Class B | | | Class H | | |
|---------------|----------------|---------|------------------------------------|-----------------|--|------------------------------------|-----------------|--|
| AC/DC | Voltage symbol | Voltage | S With surge voltage suppressor | L With light | Z With light and surge voltage suppressor | 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 | ● | — | — | ● | — | — |
| | 8 | 48 V | ● | — | — | ● | — | — |
| | J | 230 V | ● | — | — | ● | — | — |
| DC | 5 | 24 V | ● | ● | ● | DC specification is not available. | | |
| | 6 | 12 V | ● | — | — | | | |

Note) Option S, Z are not available as a surge voltage suppressor is integrated into the AC/Class B coil (with a full-wave rectifier) as standard.

For Oil

Model/Valve Specifications

Normally closed (N.C.)



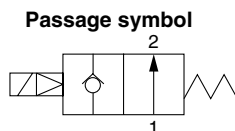
| Port size | | Orifice size (mmø) | Model | Min. operating pressure differential (MPa) | Max. operating pressure differential (MPa) | | Flow characteristics | | Max. system pressure (MPa) | (Note) Weight (g) | | |
|-----------|-----------|--------------------|------------|--|--|-----|--------------------------------------|--------------|------------------------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



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

• Refer to "Glossary of Terms" on front matter 10, for details on the max. operating pressure differential and the max. system pressure.

Normally open (N.O.)



| 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 | 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 terminal type respectively.

• Refer to "Glossary of Terms" on front matter 10, for details on the max. operating pressure differential and the max. system pressure.

Operating Fluid and Ambient Temperature

| Power source | Operating fluid temperature (°C) | | Ambient temperature (°C) |
|--------------|----------------------------------|-----------|--------------------------|
| | Solenoid valve option | | |
| | A, H | D, N | |
| AC | −5 to 60 | −5 to 100 | −10 to 60 |
| DC | −5 to 60 | — | −10 to 60 |

Note 1) Kinematic viscosity: 50 mm²/s or less.

Note 2) Since the AC/Class B coil (with a full-wave rectifier) uses a rectifying circuit, the fluid and ambient temperature are the same as the DC specifications.

Tightness of Valve (Leakage Rate)

| Seal material | Leakage rate (With oil pressure) | |
|---------------|----------------------------------|--------------------------------|
| | 1/4 to 1 | 32A to 50A |
| FKM | 0.2 cm ³ /min or less | 1 cm ³ /min or less |

Pilot Operated 2 Port Solenoid Valve *Series VXD21/22/23*

For Oil/Single Unit

How to Order

DC/AC (except VXD2130 AC/Class B)
AC/Class B coil (with a full-wave rectifier)

* The AC (Class B) coil for VXD2130 only comes with a full-wave rectifier.

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 •

| | |
|---|----------|
| - | Oil-free |
| Z | Oil-free |

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

| | |
|---|------|
| - | Rc |
| T | NPTF |
| F | G |
| N | NPT |

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

Electrical entry •

Bracket

| | |
|---|--------------|
| - | None |
| B | With bracket |

* Bracket is not removable.

With a full-wave rectifier, surge voltage suppressor

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
DS - DIN with surge voltage suppressor
DL - DIN with light
DZ - DIN with surge voltage suppressor and light
DO - For DIN (without connector)

* DIN type is available with class B insulation only.

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 2 for ordering coil only.

Table (1) Port/Orifice Size

Normally closed (N.C.)

| Solenoid valve (Port size) | | | | Orifice symbol | | | | | | | 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) | — | — | — | — | ● | — | — | — | — | | |
| | Flange | — | 10 (1) | — | — | — | — | ● | — | — | — | Bronze (CAC407) | |
| | | — | 32 (32A) | — | — | — | — | — | ● | — | — | | |
| | | — | — | 40 (40A) | — | — | — | — | — | ● | — | | |
| | | — | — | 50 (50A) | — | — | — | — | — | — | ● | | |

Normally open (N.O.)

| Solenoid valve (Port size) | | | | Orifice symbol | | | | | | 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) | — | — | — | ● | — | — | — | — | | |
| | Flange | — | 10 (1) | — | — | — | ● | — | — | — | Bronze (CAC407) | |
| | | — | 32 (32A) | — | — | — | — | ● | — | — | | |
| | | — | — | 40 (40A) | — | — | — | — | ● | — | | |
| — | — | 50 (50A) | — | — | — | — | — | ● | — | | | |

Table (2) Solenoid Valve Option

| Option symbol | Seal material | Body material/ Shading coil material | Coil insulation type |
|---------------|---------------|---|----------------------|
| A | FKM | Brass (C37)/Copper | B |
| H | | Stainless steel/Silver | |
| D | | Brass (C37)/Copper | H |
| N | | Stainless steel/Silver | |

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 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 specification is not available. | | |
| | 6 | 12 V | ● | — | — | | | |

Note) Option S, Z are not available as a surge voltage suppressor is integrated into the AC/Class B coil (with a full-wave rectifier) as standard.

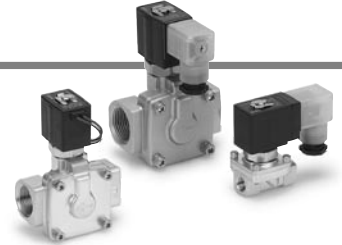
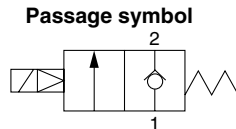
Series VXD21/22/23

For Air

(Inert gas)

Model/Valve Specifications

Normally closed (N.C.)



| Port size | | Orifice size (mmø) | Model | Min. operating pressure differential (MPa) | Max. operating pressure differential (MPa) | | Flow characteristics | | | Max. system pressure (MPa) | Weight (g) ^(Note) |
|-----------|-----------|--------------------|------------|--|--|-----|----------------------|------|-----|----------------------------|------------------------------|
| | | | | | AC | DC | C | b | Cv | | |
| Thread | 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 | | 670 |
| | | 15 | VXD2140-03 | | 1.0 | 1.0 | 18.0 | | 5.0 | | 500 |
| | 1/2 (15A) | 10 | VXD2130-04 | | | | 9.2 | | 2.4 | | 670 |
| | | 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 |

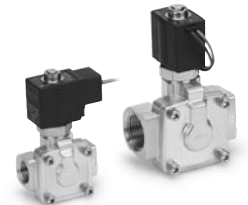
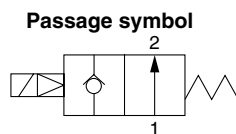
| Port size | | Orifice size (mmø) | Model | Min. operating pressure differential (MPa) | Max. operating pressure differential (MPa) | Flow characteristics | Max. system pressure (MPa) | (Note) Weight (g) |
|-----------|---------|-----------------------|------------|--|---|----------------------|----------------------------------|-------------------------|
| | | | | | AC, DC | Effective area (mm²) | | |
| Thread | 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 terminal type respectively.

• Refer to "Glossary of Terms" on front matter 10, for details on the max. operating pressure differential and the max. system pressure.

Normally open (N.O.)



| Port size | | Orifice size (mmø) | Model | Min. operating pressure differential (MPa) | Max. operating pressure differential (MPa) | | Flow characteristics | | | Max. system pressure (MPa) | Weight (g) ^(Note) |
|-----------|-----------|--------------------|------------|--|--|--|----------------------|------|-----|----------------------------|------------------------------|
| | | | | | AC, DC | | C | b | Cv | | |
| Thread | 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) | (Note) Weight (g) |
|-----------|---------|--------------------|------------|--|--|----------------------|----------------------------|----------------------|
| | | | | | AC, DC | Effective area (mm²) | | |
| Thread | 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 terminal type respectively.

• Refer to "Glossary of Terms" on front matter 10, for details on the max. operating pressure differential and the max. system pressure.

Operating Fluid and Ambient Temperature

| Power source | Operating fluid temperature (°C) | Ambient temperature (°C) |
|--------------|----------------------------------|--------------------------|
| | Solenoid valve option | |
| | Standard, G | |
| AC | −10 ^{Note)} to 60 | −10 to 60 |
| DC | −10 ^{Note)} to 60 | −10 to 60 |

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

Tightness of Valve (Leakage Rate)

| 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 |

Pilot Operated 2 Port Solenoid Valve Series VXD21/22/23

For Air/Single Unit

How to Order (Single Unit)

DC VXD 21 3 0 [] [] 02 [] 5 G 1 []

AC/Class B coil (with a full-wave rectifier) VXD 21 3 0 [] [] 02 [] 1 G R1 []

* The AC (Class B) coil for VXD2130 only comes with a full-wave rectifier.

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 |

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

Thread type •

| | |
|---|------|
| - | Rc |
| T | NPTF |
| F | G |
| N | NPT |

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

Suffix •

| | |
|---|----------|
| - | — |
| Z | Oil-free |

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.

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
DS - DIN with surge voltage suppressor
DL - DIN with light
DZ - DIN with surge voltage suppressor and light
DO - For DIN (without connector)

* DIN type is available with class B insulation only.

Bracket

| | |
|---|--------------|
| - | None |
| B | With bracket |

* Bracket is not removable.

With a full-wave rectifier, surge voltage suppressor

Connector

Refer to page 2 for ordering coil only.

Table (1) Port/Orifice Size

Normally closed (N.C.)

| Solenoid valve (Port size) | | | | Orifice symbol | | | | | | | 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) | — | — | — | ● | — | — | — | — | | |
| | Flange | — | 10 (1) | — | — | — | ● | — | — | — | Bronze (CAC407) | |
| | | — | 32 (32A) | — | — | — | — | ● | — | — | | |
| | | — | — | 40 (40A) | — | — | — | — | ● | — | | |
| | | — | — | 50 (50A) | — | — | — | — | — | ● | | |

Normally open (N.O.)

| Solenoid valve (Port size) | | | | Orifice symbol | | | | | | 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) | — | — | ● | — | — | — | — | | |
| | Flange | — | 10 (1) | — | — | ● | — | — | — | Bronze (CAC407) | |
| | | — | 32 (32A) | — | — | — | ● | — | — | | |
| | | — | — | 40 (40A) | — | — | — | ● | — | | |
| | | — | — | 50 (50A) | — | — | — | — | ● | | |

Table (2) Solenoid Valve Option

| Option symbol | Seal material | Body material/ Shading coil material | Coil insulation type | Note |
|---------------|---------------|---|----------------------|------|
| - | NBR | Brass (C37)/Copper | B | — |
| G | | Stainless steel/Silver | | |

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 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 | ● | — | — | ● | — | — |
| DC | J | 230 V | ● | — | — | ● | — | — |
| | 5 | 24 V | ● | ● | ● | DC specification is not available. | | |
| | 6 | 12 V | ● | — | — | | | |

Note) Option S, Z are not available as a surge voltage suppressor is integrated into the AC/Class B coil (with a full-wave rectifier) as standard.

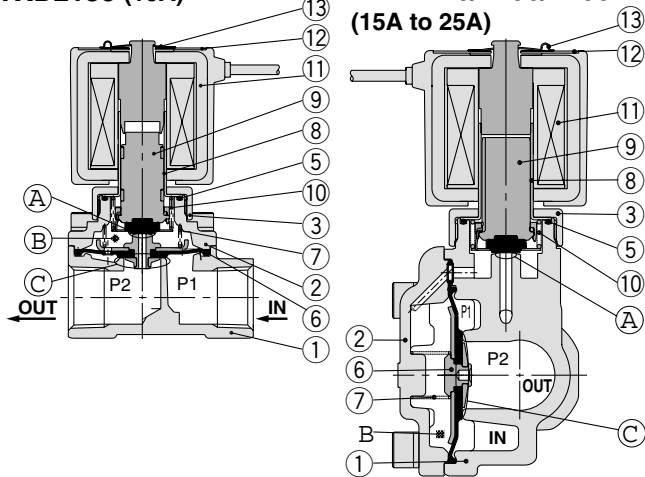
Series VXD21/22/23

Construction

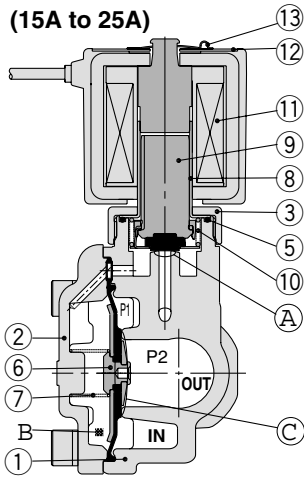
Normally closed (N.C.)

Body material: Brass (32A or more: Bronze), Stainless steel

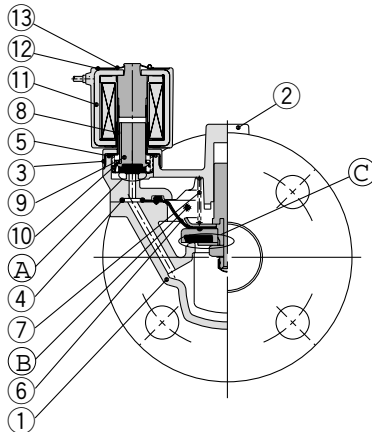
VXD2130 (10A)



VXD2140/2150/2260 (15A to 25A)



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



Operation

<Valve opened> When the coil ⑪ is energised, the armature assembly ⑨ is attracted into the core of the tube assembly ⑧ and the pilot valve ① opens. Then the pressure in the pressure action chamber ② falls to open the main valve ③.

<Valve closed> When the coil ⑪ is not energised, the pilot valve ① is closed and the pressure in the pressure action chamber ② rises and the main valve ③ closes.

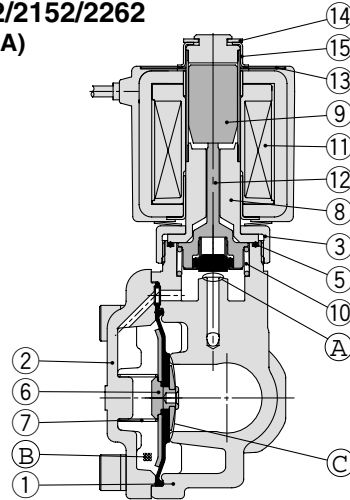
Component Parts

| No. | Description | Size | Material | |
|-----|--------------------|------------|------------------------------|---|
| | | | Standard | Option |
| 1 | Body | 10A to 25A | Brass | Stainless steel |
| | | 32A to 50A | Bronze | |
| 2 | Bonnet | 10A to 25A | Brass | Stainless steel |
| | | 32A to 50A | Bronze | |
| 3 | Nut | 10A to 50A | Brass | Brass, 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, Brass (NBR) | Stainless steel, (FKM, EPDM) |
| 7 | Valve spring | 10A to 50A | Stainless steel | |
| 8 | Tube assembly | 10A to 25A | Stainless steel, Copper | Stainless steel, Silver |
| | | 32A to 50A | | — |
| 9 | Armature assembly | 10A | Stainless steel, PPS, (NBR) | Stainless steel, PPS, (FKM) |
| | | 15A to 50A | | Stainless steel, (EPDM) |
| 10 | Return spring | 10A to 50A | Stainless steel | |
| 11 | Solenoid coil | 10A to 50A | Class B molded | Class H molded |
| 12 | Name plate | 10A to 50A | Aluminum | |
| 13 | Clip | 10A to 50A | SK | |

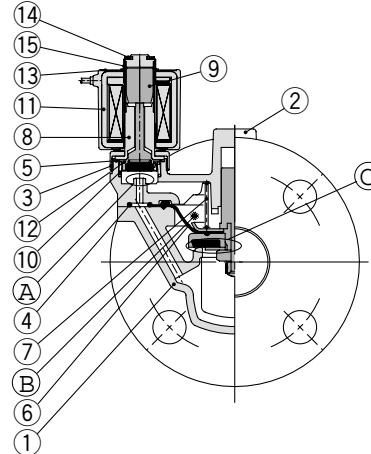
Normally open (N.O.)

Body material: Brass (32A or more: Bronze), Stainless steel

VXD2142/2152/2262 (15A to 25A)



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



Operation

<Valve opened> When the coil ⑪ is energised, the opened pilot ① closes, the pressure in pressure action chamber ② rises and the main valve ③ closes.

<Valve closed> When the coil ⑪ is not energised, the closed pilot valve ① opens, the pressure in pressure action chamber ② drops and the main valve ③ opens.

Component Parts

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

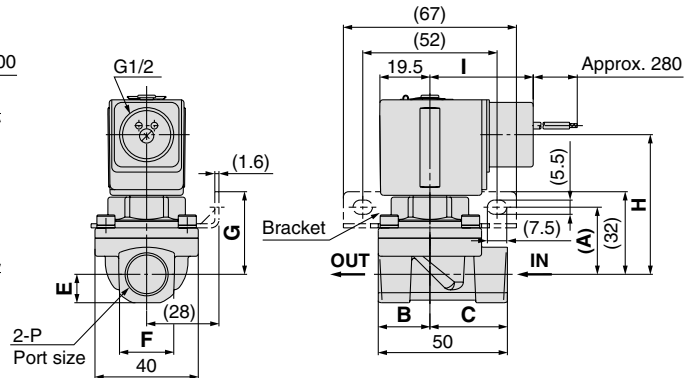
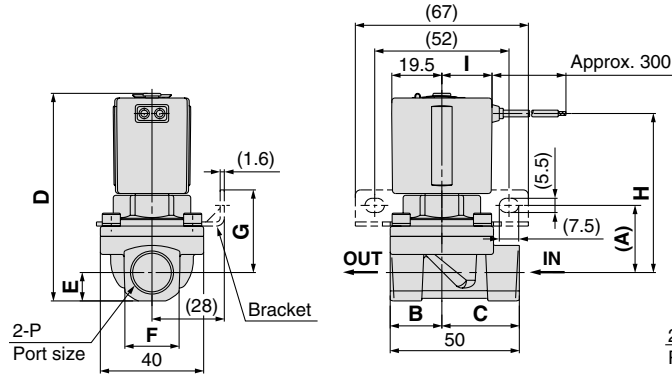
The materials in parentheses are the seal materials.

Dimensions

Normally closed (N.C.): VXD2130

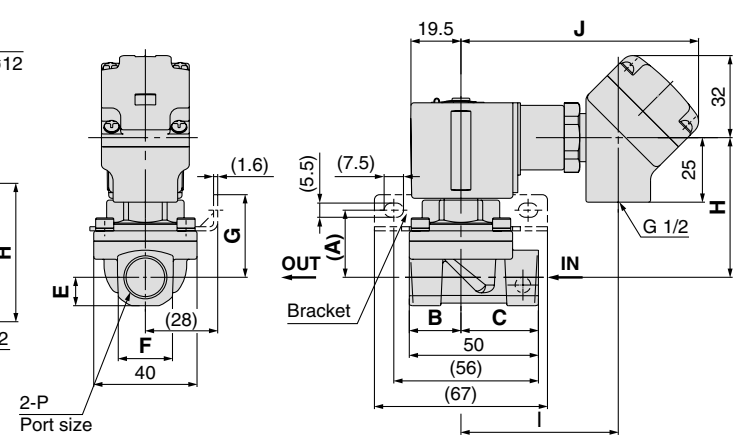
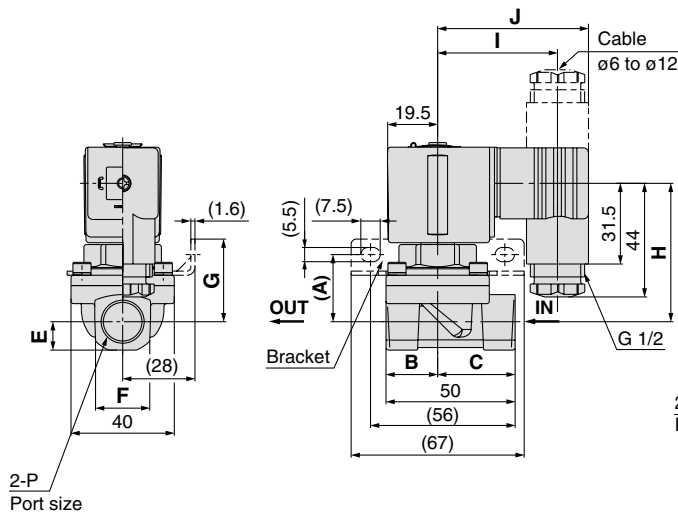
Grommet: G

Conduit: C

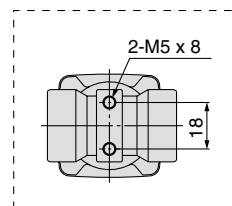


DIN terminal: D

Conduit terminal: T



VXD2130-04



| (mm) | | | | | | | | | | | | | | | | | | |
|-----------------|-----------------------|----------|----------|----------|----------|----------|----------|----------|--|----------|----------|----------|--------------|----------|------------------|----------|----------|----------|
| Model | Port size P | A | B | C | D | E | F | G | Electrical entry (DC, AC/Class H coil) | | | | | | | | | |
| | | | | | | | | | Grommet | | Conduit | | DIN terminal | | Conduit terminal | | | |
| | | | | | | | | | H | I | H | I | H | I | J | H | I | J |
| Normally closed | | | | | | | | | 62 | 19.5 | 54.5 | 40 | 54 | 46.5 | 58.5 | 54.5 | 61 | 92 |
| VXD2130 | 1/4, 3/8 | 26 | 20 | 30 | 80.5 | 11 | 21 | 32 | 62 | 19.5 | 54.5 | 40 | 54 | 46.5 | 58.5 | 54.5 | 61 | 92 |
| | 1/2 | 28 | 24 | 26 | 86 | 14.5 | 28 | 34 | 64 | 19.5 | 56.5 | 40 | 56 | 46.5 | 58.5 | 56.5 | 61 | 92 |

| Model | Electrical entry (AC/Class B coil)* | | | | | | | | | |
|----------------------------|-------------------------------------|----|---------|------|--------------|------|------------------|----|------|-------|
| | Grommet | | Conduit | | DIN terminal | | Conduit terminal | | | |
| | H | I | H | I | H | I | H | I | J | J |
| Normally closed VXD2130 | 58 | 30 | 53 | 48.5 | 54 | 53.5 | 65.5 | 53 | 69.5 | 100.5 |
| | 60 | 30 | 55 | 48.5 | 56 | 53.5 | 65.5 | 55 | 69.5 | 100.5 |

* Coil with a full-wave rectifier (electrical option "R")

Series VXD21/22/23

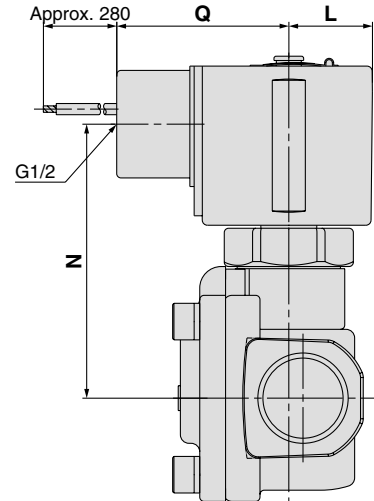
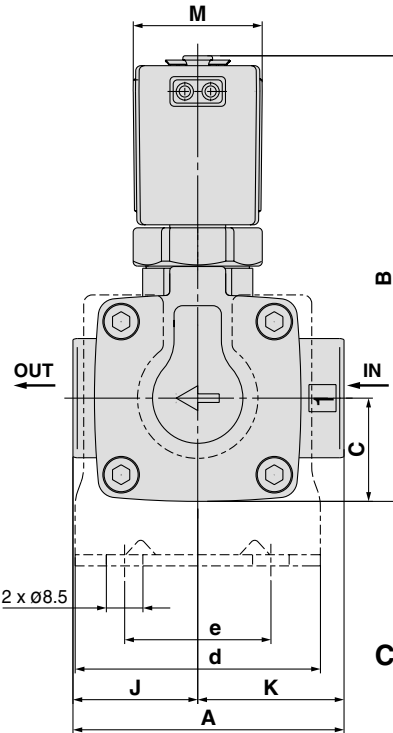
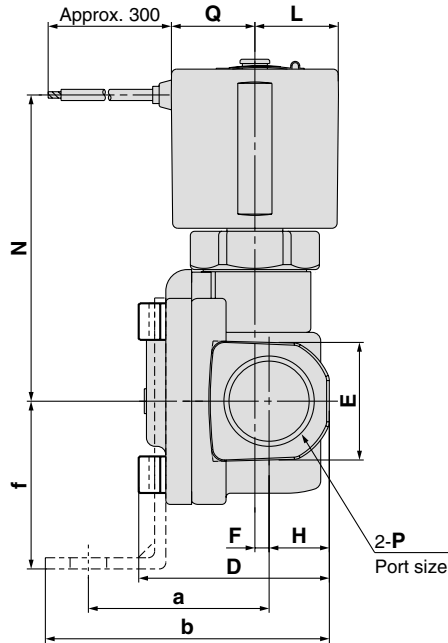
Dimensions

Normally closed (N.C.): VXD2140/2150/2260

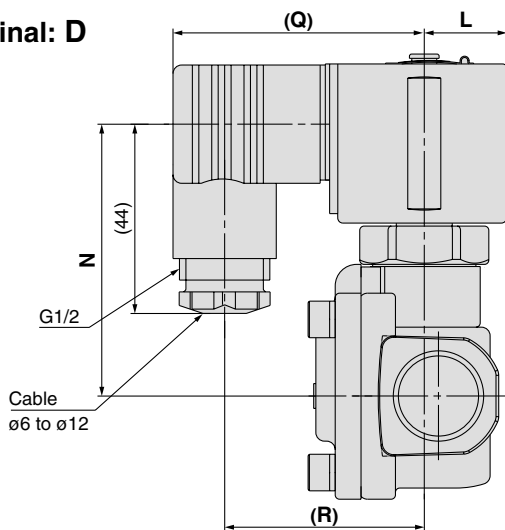
Normally open (N.O.): VXD2142/2152/2262

Grommet: G

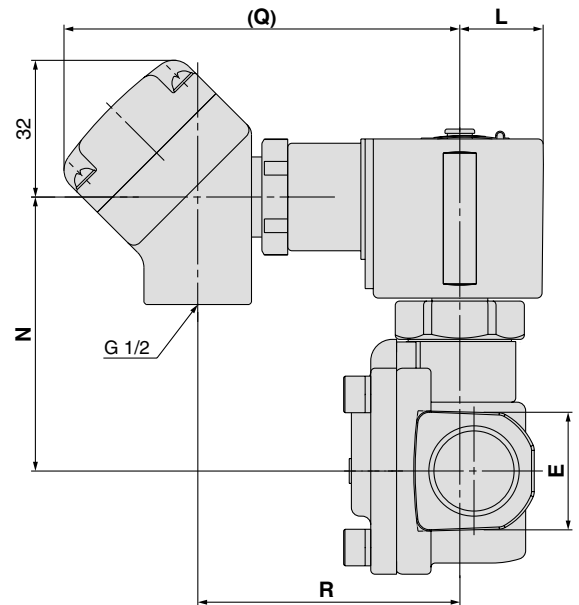
Conduit: C



DIN terminal: D



Conduit terminal: T



| (mm) | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|---------------|----------------|----|-------------|----|------|----|-----|----|----|----|------|----|---------------------------|------|---------|----|--------------|------|------|------------------|----|----|
| Model | | Port size P | A | B | C | D | E | F | H | J | K | L | M | Electrical entry (DC, AC) | | | | | | | | | |
| | | | | | | | | | | | | | | Grommet | | Conduit | | DIN terminal | | | Conduit terminal | | |
| Normally closed | Normally open | | | | | | | | | | | | | N | Q | N | Q | N | Q | R | N | Q | R |
| VXD2140 | VXD2142 | 3/8, 1/2 | 63 | 104 (110.5) | 24 | 44.5 | 28 | 3.5 | 14 | 29 | 34 | 19.5 | 30 | 71.5 | 19.5 | 64 | 40 | 63.5 | 58.5 | 46.5 | 64 | 92 | 61 |
| VXD2150 | VXD2152 | 3/4 | 80 | 115.5 (122) | 29 | 51.5 | 35 | 4.5 | 17 | 37 | 43 | 19.5 | 30 | 78 | 19.5 | 70.5 | 40 | 70 | 58.5 | 46.5 | 70.5 | 92 | 61 |
| VXD2260 | VXD2262 | 1 | 90 | 133 (140.5) | 33 | 60 | 42 | 4.5 | 20 | 43 | 47 | 22.5 | 35 | 92 | 22.5 | 84.5 | 43 | 84 | 61.5 | 49.5 | 84.5 | 95 | 64 |

() denotes the value for N.O.

| Model | | Port size P | Bracket mounting | | | | |
|-----------------|---------------|----------------|------------------|----|----|----|------|
| | | | | | | | |
| | | | a | b | d | e | f |
| Normally closed | Normally open | | | | | | |
| VXD2140 | VXD2142 | 3/8, 1/2 | 42 | 66 | 57 | 34 | 39 |
| VXD2150 | VXD2152 | 3/4 | 46 | 73 | 74 | 51 | 45.5 |
| VXD2260 | VXD2262 | 1 | 56 | 86 | 81 | 58 | 49.5 |

| Model | | Electrical entry (AC/Class B coil)* | | | | | | | | |
|-----------------|---------------|-------------------------------------|----|------|---------|------|------|--------------|-------|------|
| | | Grommet | | | Conduit | | | DIN terminal | | |
| | | N | Q | R | N | Q | R | N | Q | R |
| Normally closed | Normally open | | | | | | | | | |
| VXD2140 | VXD2142 | 67.5 | 37 | 62.5 | 48.5 | 63.5 | 53.5 | 62.5 | 100.5 | 69.5 |
| VXD2150 | VXD2152 | 74 | 37 | 69 | 48.5 | 70 | 53.5 | 69 | 100.5 | 69.5 |
| VXD2260 | VXD2262 | 88 | 40 | 83 | 51.5 | 84 | 56.5 | 83 | 103.5 | 72.5 |

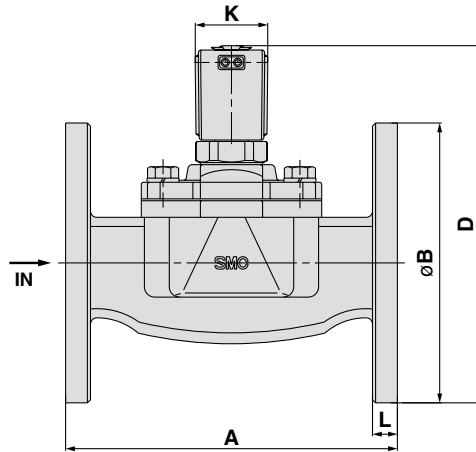
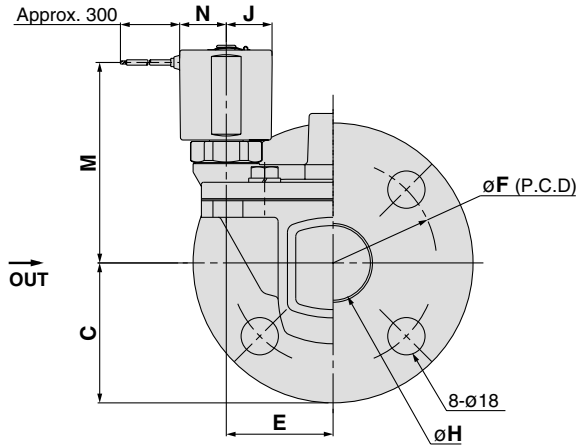
* Coil with a full-wave rectifier (electrical option "R")

Dimensions

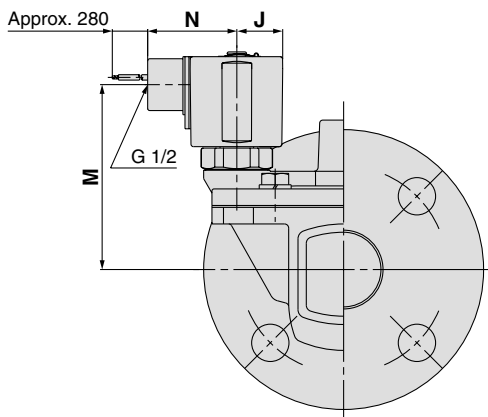
Normally closed (N.C.): VXD2270/2380/2390

Normally open (N.O.): VXD2272/2382/2392

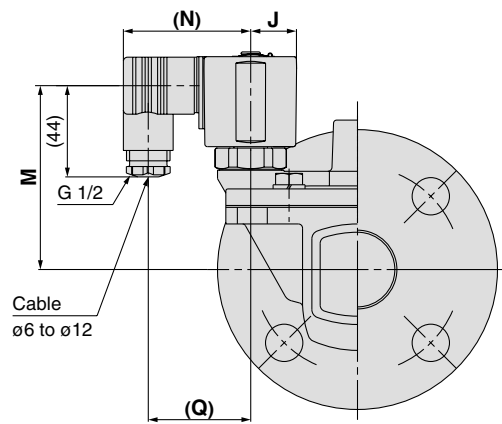
Grommet: G



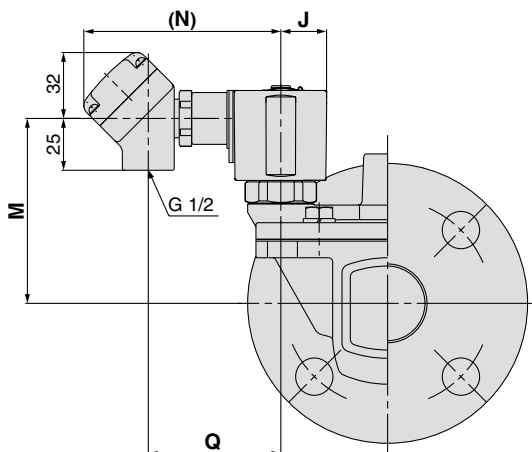
Conduit: C



DIN terminal: D



Conduit terminal: T



(mm)

| Model | | Electrical entry (AC/Class B coil)* | | | | | | | | | |
|-----------------|---------------|-------------------------------------|----|---------|------|--------------|------|------|------------------|-------|------|
| | | Grommet | | Conduit | | DIN terminal | | | Conduit terminal | | |
| Normally closed | Normally open | M | N | M | N | M | N | Q | M | N | Q |
| VXD2270 | VXD2272 | 93 | 33 | 88 | 51.5 | 89 | 68.5 | 56.5 | 88 | 103.5 | 72.5 |
| VXD2380 | VXD2382 | 103 | 36 | 98 | 54 | 99 | 71 | 59 | 98 | 106 | 75 |
| VXD2390 | VXD2392 | 108.5 | 36 | 103.5 | 54 | 104.5 | 71 | 59 | 103.5 | 106 | 75 |

(mm)

| Model | | Applicable flange | Electrical entry (DC, AC) | | | | | | | | | |
|-----------------|---------------|-------------------|---------------------------|-----|------|---------------|------|-----|----|------|----|----|
| | | | A | B | C | D | E | F | H | J | K | L |
| Normally closed | Normally open | | | | | | | | | | | |
| VXD2270 | VXD2272 | 32A | 160 | 135 | 67.5 | 172.5 (180) | 51.5 | 100 | 36 | 22.5 | 35 | 12 |
| VXD2380 | VXD2382 | 40A | 170 | 140 | 70 | 185 (192.5) | 54.5 | 105 | 42 | 25 | 40 | 14 |
| VXD2390 | VXD2392 | 50A | 180 | 155 | 77.5 | 198.5 (205.5) | 59 | 120 | 52 | 25 | 40 | 14 |


() denotes the value for N.O.





Series **VXD21/22/23**

Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by labels of "**Caution**", "**Warning**" or "**Danger**". To ensure safety, be sure to observe ISO 4414 ^{Note 1)}, JIS B 8370 ^{Note 2)} and other safety practices.

 **Caution** : Operator error could result in injury or equipment damage.

 **Warning** : Operator error could result in serious injury or loss of life.

 **Danger** : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power--General rules relating to systems.

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

Warning

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

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or post analysis and/or tests to meet your specific requirements. The expected performance and safety assurance are the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalogue information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

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

1. Inspection and maintenance of machinery/equipment should only be performed once measures to prevent falling or runaway of the driven objects have been confirmed.
2. When equipment is removed, confirm that safety process as mentioned above. Turn off the supply pressure for this equipment and exhaust all residual compressed air in the system.
3. Before machinery/equipment is restarted, take measures to prevent quick extension of a cylinder piston rod, etc.

4. Contact SMC if the product will be used in any of the following conditions:

1. Conditions and environments beyond the given specifications, or if product is used outdoors.
2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.



2 Port Solenoid Valve for Fluid Control/Precautions 1

Be sure to read this before handling.

For detailed precautions on each series, refer to the main text.

Caution on 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. This solenoid valve cannot be used for explosion proof applications.

4. Maintenance space

The installation should allow sufficient space for maintenance activities (removal of valve, etc.).

5. Liquid rings

In cases with a flowing liquid, provide a bypass valve in the system to prevent the liquid from entering the liquid seal circuit.

6. 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.

7. 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.

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

9. When an impact, such as water hammer, etc., caused by the rapid pressure fluctuation is applied, the solenoid valve may be damaged. Please pay attention to this.

Selection

Warning

1. Confirm the specifications.

Give careful consideration to the operating conditions such as the application, fluid and environment, and use within the operating ranges specified in this catalogue.

2. Fluid

1) Type of fluid

Before using a fluid, confirm whether it is compatible with the materials from each model by referring to the fluids listed in this catalogue. Use a fluid with a kinematic viscosity of 50 mm²/s or less. If there is something you do not know, please contact SMC.

2) Inflammable oil, Gas

Confirm the specification for leakage in the interior and/or exterior area.

Selection

Warning

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 oily particles must not enter the fluid passage.

5) Applicable fluid on the list may not be used depending on the operating condition. Just because the compatibility list shows the general case, still give adequate confirmation when selecting a model.

3. Fluid quality

The use of a fluid which contains foreign matter can cause problems such as malfunction and seal failure by promoting wear of the valve seat and armature, and by sticking to the sliding parts of the armature, etc. Install a suitable filter (strainer) immediately upstream from the valve. As a general rule, use 80 to 100 mesh. When used to supply water to boilers, substances such as calcium and magnesium which generate hard scale and sludge are included. Since this scale and sludge can cause the valve to malfunction, install water softening equipment, and a filter (strainer) directly upstream from the valve to remove these substances.

4. Air quality

1) Use clean air.

Do not use compressed air which includes chemicals, synthetic oils containing organic solvents, salt or corrosive gases, etc., as it can cause damage or malfunction.

2) Install air filters.

Install air filters close to the valves on their upstream side. A filtration degree of 5µm or less should be selected.

3) Install an air dryer or after cooler, etc.

Compressed air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer or after cooler, etc.

4) If excessive carbon powder is generated, eliminate it by installing mist separators on the upstream side of the 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 SMC's Best Pneumatics catalogue for further details on compressed air quality.

5. Ambient environment

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

6. Countermeasures against static electricity

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

7. For the low particle generation specification, please contact SMC.



2 Port Solenoid Valve for Fluid Control/Precautions 2

Be sure to read this before handling.

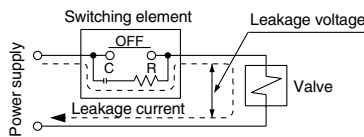
For detailed precautions on each series, refer to the main text.

Selection

⚠ Caution

1. Leakage voltage

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



AC/Class B coil with a full-wave rectifier: 10% or less of rated voltage
AC/Class B, H coil: 20% or less of rated voltage
DC coil: 2% or less of rated voltage

2. Low temperature operation

1. The valve can be used in an ambient temperature of between -10 to -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 heating by steam, be careful not to expose the coil portion to steam. Installation of a dryer or, 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.

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. Be sure not to position the coil downwards.

When mounting a valve with its coil positioned downwards, foreign objects in the fluid will adhere to the iron core leading to a malfunction.

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

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

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

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.

Piping

⚠ Caution

1. Preparation before piping

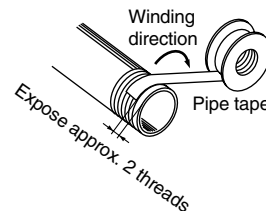
Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

Avoid pulling, compressing, or bending the valve body when piping.

2. Wrapping of pipe tape

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

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



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

4. Always tighten threads with the proper tightening torque.

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

Tightening Torque for Piping

| Connection threads | Proper tightening torque N·m |
|--------------------|------------------------------|
| Rc 1/8 | 7 to 9 |
| Rc 1/4 | 12 to 14 |
| Rc 3/8 | 22 to 24 |
| Rc 1/2 | 28 to 30 |
| Rc 3/4 | |
| Rc 1 | 36 to 38 |

5. Connection of piping to products

When connecting piping to a product, refer to its instruction manual to avoid mistakes regarding the supply port, etc.

6. Steam generated in a boiler contains a large amount of drainage.

Be sure to operate it with a drain trap installed.

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



2 Port Solenoid Valve for Fluid Control/Precautions 3

Be sure to read this before handling.

For detailed precautions on each series, refer to the main text.

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 absorber, etc., in parallel with the solenoid. Or, adopt the option that comes with the surge voltage protection circuit. (However, a surge voltage occurs even if the surge voltage protection circuit is used. For details, please contact SMC).

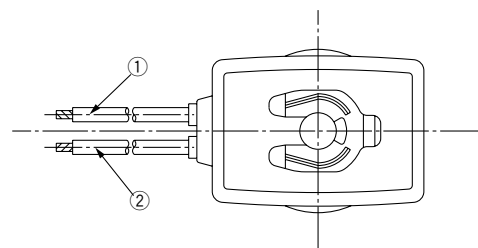
Electrical Connection

⚠ Caution

Grommet

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

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

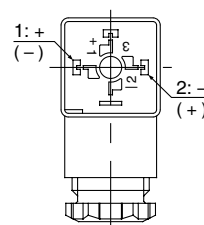


| Rated voltage | Lead wire colour | |
|-------------------|------------------|------|
| | ① | ② |
| DC (Class B only) | Black | Red |
| 100 VAC | Blue | Blue |
| 200 VAC | Red | Red |
| Other AC | Gray | Gray |

* There is no polarity.

DIN connector (Class B only)

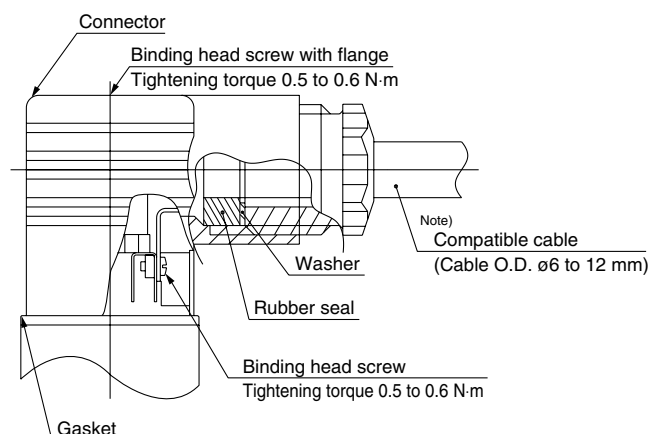
Since internal connections are as shown below for the DIN connector, make connections to the power supply accordingly.



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

* There is no polarity.

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



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



2 Port Solenoid Valve for Fluid Control/Precautions 4

Be sure to read this before handling.

For detailed precautions on each series, refer to the main text.

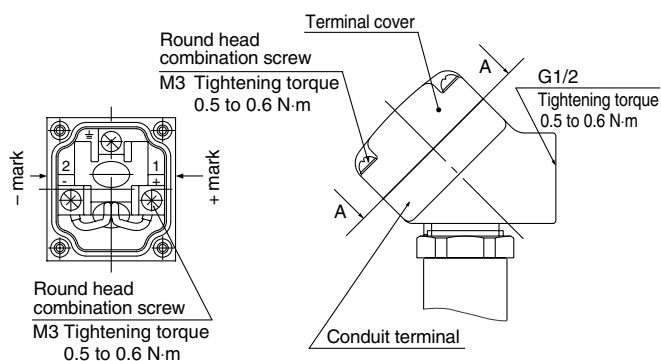
Electrical Connection

Caution

Conduit terminal

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

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



View A-A

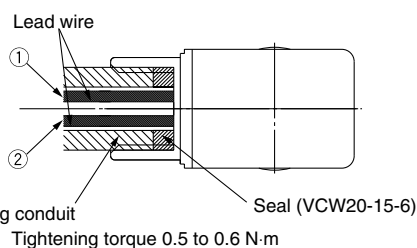
(Internal connection diagram)

Conduit

When used as an IP65 equivalent, use seal (part no. VCW20-15-6) to install the wiring conduit. Also, use the tightening torque below for the conduit.

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

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



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

* There is no polarity for DC.

| Description | Part no. |
|-------------|------------|
| Seal | VCW20-15-6 |

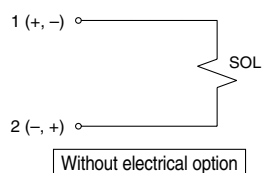
Note) Please order separately.

Electrical Circuit

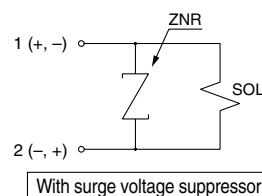
Caution

DC circuit

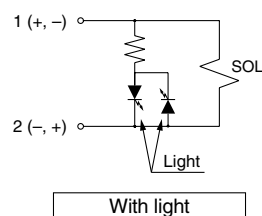
Grommet, Conduit, Conduit terminal, DIN connector



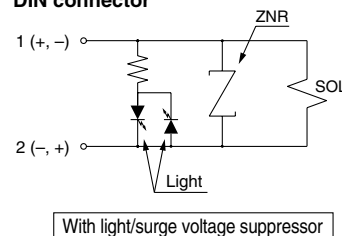
Grommet, Conduit terminal, DIN connector



Conduit terminal, DIN connector



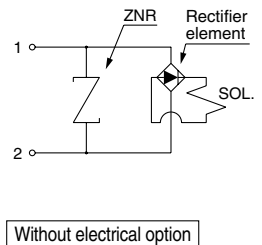
Conduit terminal, DIN connector



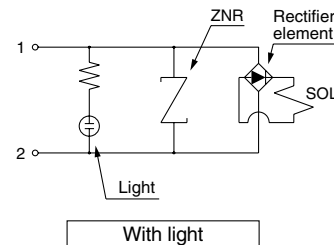
AC/Class B (with a full-wave rectifier) coil circuit

* Surge voltage suppressor is attached to the AC/Class B coil (with a full-wave rectifier) as standard.

Grommet, Conduit, Conduit terminal, DIN connector

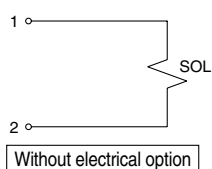


Conduit terminal, DIN connector

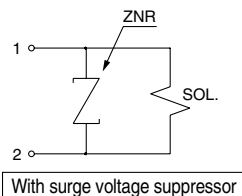


AC/Class B, H coil circuit

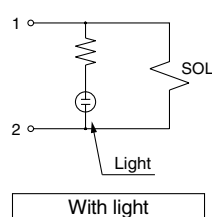
Grommet, Conduit, Conduit terminal



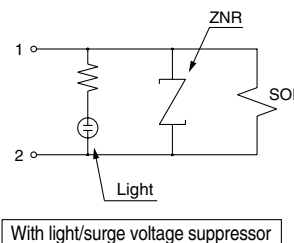
Grommet, Conduit terminal



Conduit terminal



Conduit terminal





2 Port Solenoid Valve for Fluid Control/Precautions 5

Be sure to read this before handling.

For detailed precautions on each series, refer to the main text.

Operating Environment

Warning

1. Do not use the valves in an atmosphere having corrosive gases, chemicals, salt 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.

Lubrication

Caution

1. This solenoid valve can be operated without lubrication.

If a lubricant is used in the system, use turbine oil Class 1, ISO VG32 (with no additive). But do not lubricate a valve with EPDM seal.

Refer to the table of brand name of lubricants compliant with Class 1 turbine oil (with no additive), ISO VG32.

Class 1 Turbine Oil (with no additive), ISO VG32

| Classification of viscosity (cst) (40°C) | Viscosity according to ISO Grade | 32 |
|--|----------------------------------|-----------------------|
| Idemitsu Kosan Co.,Ltd. | | Turbine oil P-32 |
| Nippon Oil Corp. | | Turbine oil 32 |
| Cosmo Oil Co.,Ltd. | | Cosmo turbine 32 |
| Japan Energy Corp. | | Kyodo turbine 32 |
| Kygnus Oil Co. | | Turbine oil 32 |
| Kyushu Oil Co. | | Stork turbine 32 |
| Nippon Oil Corp. | | Mitsubishi turbine 32 |
| Showa Shell Sekiyu K.K. | | Turbine 32 |
| Tonen General Sekiyu K.K. | | General R turbine 32 |
| Fuji Kosan Co.,Ltd. | | Fucoal turbine 32 |

Please contact SMC regarding Class 2 turbine oil (with additives), ISO VG32.

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. Demount the product.

2. Low frequency operation

Switch valves at least once every 30 days to prevent malfunction. Also, in order to use it under the optimum state, conduct a regular inspection once a half year.

Caution

1. Filters and strainers

1. Be careful regarding clogging of filters and strainers.
2. Replace filter elements after one year of use, or earlier if the pressure drop reaches 0.1 MPa.
3. Clean strainers when the pressure drop reaches 0.1 MPa.

2. Lubrication

When using after lubricating, never forget to lubricate continuously.

3. Storage

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

4. Exhaust the drain from an air filter periodically.

Operating Precautions

Warning

1. Valves will reach high temperatures when used with high temperature fluids. Use caution, as there is a danger of being burned if the valve is directly touched.



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