Pilot Operated 2 Port Solenoid Valve
For Water, Oil, Air

Reduction of power consumption (DC specification)
6 W $\rightarrow$ 4.5 W / 5.5 W
8 W $\rightarrow$ 7 W
11.5 W $\rightarrow$ 10.5 W

New VX Series VXV21/22/23
Solenoid valves for various fluids used in a wide variety of applications.

Pilot Operated 3 Port Solenoid Valve

For Water, Oil, Air

New Series VXD21/22/23

<table>
<thead>
<tr>
<th>Normally Closed (N.C.)</th>
<th>Normally Open (N.O.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solenoid valve (Port size)</td>
<td>Orifice size</td>
</tr>
<tr>
<td>Body</td>
<td>Seal</td>
</tr>
<tr>
<td>VXD21</td>
<td>VXD22</td>
</tr>
<tr>
<td>02 (1/4)</td>
<td>—</td>
</tr>
<tr>
<td>03 (3/8)</td>
<td>—</td>
</tr>
<tr>
<td>04 (1/2)</td>
<td>—</td>
</tr>
<tr>
<td>06 (3/4)</td>
<td>—</td>
</tr>
<tr>
<td>08 (1)</td>
<td>—</td>
</tr>
<tr>
<td>10 (1)</td>
<td>—</td>
</tr>
<tr>
<td>Flange</td>
<td>—</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

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)
- 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.

Features 1

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VXD22: 8 W → 7 W

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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.
applications — New VX Series variations

Direct Operated 2 Port

**VX21/22/23**
For Air, Vacuum, Water, Steam, Oil

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Port size (mm)</th>
<th>Orifice size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.C./N.O.</td>
<td>1/8 to 1/2</td>
<td>2 to 10</td>
</tr>
</tbody>
</table>

Pilot Operated 2 Port

**VXP21/22/23**
For Steam (Air, Water, Oil)

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Port size (mm)</th>
<th>Orifice size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.C./N.O.</td>
<td>1/4 to 2</td>
<td>10 to 50</td>
</tr>
</tbody>
</table>

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

**VXF21/22, VXFA21/22**
For Air

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Port size (inch)</th>
<th>Orifice size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.C.</td>
<td>3/4 to 1 1/2</td>
<td>20 to 40</td>
</tr>
</tbody>
</table>

Pilot Operated 2 Port for Zero Differential Pressure

**VXR21/22/23**
For Water, Oil

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Port size (mm)</th>
<th>Orifice size (mm)</th>
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</thead>
<tbody>
<tr>
<td>N.C./N.O.</td>
<td>1/2 to 2</td>
<td>20 to 50</td>
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</tbody>
</table>

Air Operated 2/3 Port

**VXA21/22, VXA31/32**
For Air, Vacuum, Water, Oil

<table>
<thead>
<tr>
<th>Model</th>
<th>Valve type</th>
<th>Port size (inch)</th>
<th>Orifice size (mm)</th>
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</thead>
<tbody>
<tr>
<td>VXA21/22</td>
<td>N.C./N.O.</td>
<td>1/8 to 1/2</td>
<td>3 to 10</td>
</tr>
<tr>
<td>VXA31/32</td>
<td>COM.</td>
<td>1/8 to 3/3</td>
<td>1.5 to 4</td>
</tr>
</tbody>
</table>

Pilot Operated 2 Port for High Pressure

**VXH22**
For Air, Water, Oil

<table>
<thead>
<tr>
<th>Valve type</th>
<th>Port size (mm)</th>
<th>Orifice size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.C.</td>
<td>1/4 to 1/2</td>
<td>10</td>
</tr>
</tbody>
</table>

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

Features 2
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 solenoid valve, etc. is depending on “Table (1)”.

Table (1) Indication of Flow Characteristics

<table>
<thead>
<tr>
<th>Corresponding equipment</th>
<th>Indication by international standard</th>
<th>Other indications</th>
<th>Standards conforming to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment for pneumatics</td>
<td>$C, b$</td>
<td>$S$</td>
<td>ISO 6358: 1989</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>JIS B 8390: 2000</td>
</tr>
<tr>
<td></td>
<td>$S$</td>
<td></td>
<td>Equipment: JIS B 8373, 8374, 8375, 8379, 8381</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ANSI/(NFPA)T3.21.3: 1990</td>
</tr>
<tr>
<td>Equipment for controlling process fluids</td>
<td>$Av$</td>
<td>$Cv$</td>
<td>IEC60534-2-3: 1997</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>JIS B 2005: 1995</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Equipment: JIS B 8471, 8472, 8473</td>
</tr>
</tbody>
</table>

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 $C$: Values which divide the passing mass flow rate of an equipment in a choked flow condition by the product of the upstream absolute pressure and the density in the standard condition.
Critical pressure ratio $b$: It is the pressure ratio which will turn to the choke flow (downstream pressure/upstream pressure) when it is smaller than this values. (critical pressure ratio)
Choked flow: It is the flow in which the upstream pressure is higher than the downstream pressure and where sonic speed in a certain part of an equipment is reached.
Gaseous mass flow rate is in proportion to the upstream pressure and not dependent on the downstream pressure. (choked flow)
Subsonic flow: Flow greater than the critical pressure ratio
Standard condition: Air in a temperature state of 20°C, absolute pressure 0.1 MPa (= 100 kPa = 1 bar), relative humidity 65%.
It is stipulated by adding the abbreviation (ANR) after the unit depicting air volume. (standard reference atmosphere)

(3) Formula of flow rate
It can be indicated by the practical unit as following.
When $P_2 + 0.1 \leq b$, choked flow

$$Q = \frac{600 \times C (P_1 + 0.1)}{273 + t} \left( \frac{293}{273 + t} \right)^{P_2 + 0.1}{P_1 + 0.1}$$

When $P_2 + 0.1 > b$, subsonic flow

$$Q = \frac{600 \times C (P_1 + 0.1)}{273 + t} \left( \frac{293}{273 + t} \right)^{P_2 + 0.1}{P_1 + 0.1}$$

$Q$: Air flow rate [dm$^3$/min (ANR)], dm$^3$ (Cubic decimeter) of SI unit are also allowed to described by ℓ (liter), 1 dm$^3$ = 1 ℓ.
Solenoid Valves Flow Characteristics

$C$ : Sonic conductance $[\text{dm}^3/(\text{s} \cdot \text{bar})]$  
$b$ : Critical pressure ratio $[-]$  
$P_1$ : Upstream pressure $[\text{MPa}]$  
$P_2$ : Downstream pressure $[\text{MPa}]$  
$t$ : Temperature $[\degree \text{C}]$

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 for $P_1 = 0.4 \ [\text{MPa}]$, $P_2 = 0.3 \ [\text{MPa}]$, $t = 20 \ [\degree \text{C}]$ when a solenoid valve is performed in $C = 2 \ [\text{dm}^3/(\text{s} \cdot \text{bar})]$ and $b = 0.3$.

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

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

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

Hence, flow rate $= \text{Max. flow} \times \text{flow ratio} = 600 \times 0.7 = 420 \ [\text{dm}^3/\text{min (ANR)}]$

Graph (1) Flow characteristics line

(4) Test method
By attaching a test equipment with the test circuit indicated in Fig. (1) while maintaining to a certain amount which does not let the upstream pressure go down below 0.3 MPa, measure the maximum flow to be saturated in the first place. Next, measure this flow rate at 80%, 60%, 40%, 20% and the upstream and downstream pressure. And then, obtain the sonic conductance $C$ from this maximum flow rate. Besides that, substitute each data of others for the formula of subsonic flow in order to find $b$, then obtain the critical pressure ratio $b$ from that average.
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 $S$ is the cross-sectional area having an ideal throttle without friction deduced from the calculation of the pressure changes inside an air tank or without reduced flow when discharging the compressed air in a choked flow, from an equipment attached to the air tank. This is the same concept representing the “easy to run through” as sonic conductance $C$ (effective area).

(3) Formula of flow rate
When
$$Q = \frac{120 \times S}{(P_1 + 0.1) \left( \frac{293}{273 + t} \right)}$$

When
$$Q = \frac{240 \times S}{\left( \frac{P_2 + 0.1}{P_1 + 0.1} \right) (P_1 - P_2) \left( \frac{293}{273 + t} \right)}$$

Conversion with sonic conductance $C$:
$$S = 5.0 \times C$$

Note) Formula for subsonic flow (4) is only applicable when the critical pressure ratio $b$ is the unknown equipment. In the formula by sonic conductance $C$ (2), it is the same formula when $b = 0.5$.

(4) Test method
By attaching the equipment for testing with the test circuit shown in Fig. (2), discharge air into the atmosphere until the pressure inside the air tank goes down to 0.25 MPa (0.2 MPa) from an air tank filled with compressed air of a certain pressure (0.5 MPa) which does not go down below 0.6 MPa. At this time, measure the discharging time and the residual pressure inside the air tank which had been left until it turned to be the normal values, and then determine the effective area $S$ by using the following formula. The volume of air tank should be selected within the specified range by corresponding to the effective area of the equipment being tested. 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.

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

Fig. (2) Test circuit based on JIS B 8390
Solenoid Valves Flow Characteristics

2.3 Flow coefficient Cv factor

The United States Standard ANSI/(NFPA) T3.21.3:1990: Pneumatic fluid power—Flow rating test procedure and reporting method for fixed orifice components defines the Cv factor of flow coefficient by the following formula which is based on the test conducted by the test circuit analogous to ISO 6358.

\[
Cv = \frac{Q}{114.5 \sqrt{\frac{\Delta P (P_2 - P_3)}{T_1}}} \quad \text{..(7)}
\]

\(\Delta P\): Pressure drop between the static pressure tapping ports [bar]
\(P_1\): Pressure of the upstream tapping port [bar gauge]
\(P_2\): Pressure of the downstream tapping port [bar gauge]: \(P_2 = P_1 - \Delta P\)
\(Q\): Flow rate [dm³/s standard condition]
\(P_3\): Atmospheric pressure [bar absolute]
\(T_1\): Test conditions of the upstream absolute temperature [K]

\(P_1 + P_3 = 6.5 \pm 0.2\) bar absolute, \(T_1 = 297 \pm 5\) K, 0.07 bar \(\leq \Delta P \leq 0.14\) bar.

This is the same concept as effective area \(A\) which ISO6358 stipulates as being applicable only when the pressure drop is smaller than the upstream pressure and the compression of air does not become a problem.

3. Equipment for process fluids

(1) Standards conforming to


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

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

\[
A_v = Q \sqrt{\frac{\Delta P}{\rho}} \quad \text{..(8)}
\]

\(A_v\): Flow coefficient \([m^2]\)
\(Q\): Flow rate \([m^3/s]\)
\(\Delta P\): Pressure difference \([Pa]\)
\(\rho\): Density of fluid \([kg/m^3]\]

(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:

\[
Q = 1.9 \times 10^5 A_v \sqrt{\frac{\Delta P}{\rho}} \quad \text{..(9)}
\]

\(Q\): Flow rate \([l/min]\)
\(A_v\): Flow coefficient \([m^2]\)
\(\Delta P\): Pressure difference \([MPa]\)
\(\rho\): Relative density \([water = 1]\)

In the case of saturated aqueous vapor:

\[
Q = 8.3 \times 10^5 A_v \sqrt{\frac{\Delta P (P_2 + 0.1)}{G}} \quad \text{..(10)}
\]

\(Q\): Flow rate \([m^3/s]\)
\(A_v\): Flow coefficient \([m^2]\)
\(\Delta P\): Pressure difference \([Pa]\)
\(P_1\): Relative density \([MPa]\): \(\Delta P = P_1 - P_2\)
\(P_2\): Relative density \([MPa]\)
Solenoid Valves Flow Characteristics

Conversion of flow coefficient:
\[ Av = 28 \times 10^{-6} \quad Kv = 24 \times 10^{-6} \quad Cv \]  \hfill (11)

Here, 

\( Kv \) factor: Value of the clean water flow rate represented by the 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 figures representing the flow rate of clean water by US gal/min which runs through the valve at 60°F, when the pressure difference is 1 lb/in² (psi).

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

Example 1)
Obtain the pressure difference when water 15 [l/min] runs through the solenoid valve with an \( Av = 45 \times 10^{-6} \) [m²].
Since \( Q_0 = 15/45 = 0.33 \) [l/min], according to the Graph (2), if reading \( \Delta P \) when \( Q_0 \) is 0.33, it will be 0.031 [MPa].

Example 2)
Obtain the flow rate of saturated aqueous vapor when \( P_1 = 0.8 \) [MPa], \( \Delta P = 0.008 \) [MPa] with a solenoid valve with an \( Av = 1.5 \times 10^{-6} \) [m²].
According to the Graph (2), if reading \( Q_0 \) when \( P_1 \) is 0.8 and \( \Delta P \) is 0.008, it is 0.7 [kg/h]. Hence, the flow rate \( Q = 0.7 \times 1.5 = 1.05 \) [kg/h].
(4) Test method
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 $4 \times 10^4$.
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.

How to read the graph
The sonic range pressure to generate a flow rate of 6000 l/min (ANR) is

- For ø15 orifice (VXD214-03): $P_1 \approx 0.57 \text{ MPa}$
- For ø20 orifice (VXD215-06): $P_1 \approx 0.22 \text{ MPa}$
How to read the graph

When a water flow of 100 l/min is generated, \( \Delta P \approx 0.16 \text{ MPa} \) for a ø15 orifice (VXD214-04), \( \Delta P \approx 0.055 \text{ MPa} \) for a ø20 orifice (VXD215-02), and \( \Delta P \approx 0.032 \text{ MPa} \) for a ø25 orifice (VXD226-02).
Applicable Fluid Check List

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

Normally closed (N.C.)

Option Symbol and Components

<table>
<thead>
<tr>
<th>Option symbol</th>
<th>Seal material</th>
<th>Material Body: Shading coil</th>
<th>Coil insulation type</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard type NBR</td>
<td></td>
<td>Brass (C37) or CAC407/Cu</td>
<td>B</td>
<td>—</td>
</tr>
<tr>
<td>A</td>
<td>FKM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>EPDM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>FKM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>EPDM</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>NBR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>FKM</td>
<td>Stainless steel/Ag</td>
<td>B</td>
<td>—</td>
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<tr>
<td>J</td>
<td>EPDM</td>
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<td></td>
</tr>
<tr>
<td>L</td>
<td>FKM</td>
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<tr>
<td>N</td>
<td>FKM</td>
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<tr>
<td>P</td>
<td>EPDM</td>
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Fluid Name and Option

<table>
<thead>
<tr>
<th>Fluid (Application)</th>
<th>Option symbol and body material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable valve</td>
<td>10A to 50A</td>
</tr>
<tr>
<td>Caustic soda</td>
<td>—</td>
</tr>
<tr>
<td>Gas oil</td>
<td>A</td>
</tr>
<tr>
<td>Silicon oil</td>
<td>A</td>
</tr>
<tr>
<td>Steam system (Water for boiler)</td>
<td>—</td>
</tr>
<tr>
<td>Steam system (Condensation)</td>
<td>E</td>
</tr>
<tr>
<td>Perchloroethylene</td>
<td>A</td>
</tr>
<tr>
<td>Water (Max. 99°C)</td>
<td>D, E, N, P</td>
</tr>
</tbody>
</table>

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/Ag 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

<table>
<thead>
<tr>
<th>Option symbol</th>
<th>Seal material</th>
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<td>H</td>
<td>FKM</td>
<td>Stainless steel/Ag</td>
<td>B</td>
<td>—</td>
</tr>
<tr>
<td>J</td>
<td>EPDM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>FKM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>FKM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>EPDM</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fluid Name and Option

<table>
<thead>
<tr>
<th>Fluid (Application)</th>
<th>Option symbol and body material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable valve</td>
<td>15A to 50A</td>
</tr>
<tr>
<td>Caustic soda</td>
<td>—</td>
</tr>
<tr>
<td>Gas oil</td>
<td>A</td>
</tr>
<tr>
<td>Silicon oil</td>
<td>A</td>
</tr>
<tr>
<td>Steam system (Water for boiler)</td>
<td>—</td>
</tr>
<tr>
<td>Steam system (Condensation)</td>
<td>E</td>
</tr>
<tr>
<td>Perchloroethylene</td>
<td>A</td>
</tr>
<tr>
<td>Water (Max. 99°C)</td>
<td>E, N, P</td>
</tr>
</tbody>
</table>

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/Ag is not available for valve sizes from 32A to 50A.
Note 4) Consult with SMC for other than above fluids.

Front matter 9
## 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 (differential 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, $W = V \times A \cos \phi$. For DC, $W = V \times A$.
   - (Note) $\cos \phi$ shows power factor. $\cos \phi = 0.6$

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: Dusttight, Low jetproof type
   - “Low jetproof type” means that no water intrudes inside an equipment that could hinder 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®, Polytet®, 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.
   - $\phi$ 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 (C37)/CAC407, Stainless steel
  - Seal: NBR, FKM, EPDM

**Electrical Entry**

<table>
<thead>
<tr>
<th>Model</th>
<th>VXD2130</th>
<th>VXD2141</th>
<th>VXD2151</th>
<th>VXD2261</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body size</td>
<td>10A</td>
<td>15A</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>20A</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>25A</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Port size (Thread)</td>
<td>1/4, 1/2, 3/4</td>
<td>1/2, 5/8, 3/4</td>
<td>1/2, 5/8, 1/2</td>
<td>1/4</td>
</tr>
</tbody>
</table>

**Valve Specifications**

- **Valve construction**: Pilot operated 2 port diaphragm type
- **Withstand pressure (MPa)**: 5.0
- **Body material**: Brass (C37), Stainless steel, CAC407
- **Seal material**: NBR, FKM, EPDM
- **Enclosure**: Dusttight, Low jetproof (equivalent to IP65) Note 1)
- **Environment**: Location without corrosive or explosive gases

**Coil Specifications**

- **Rated voltage**
  - AC (Class B coil, with a full-wave rectifier)
  - DC (Class B coil only)
- **Allowable voltage fluctuation**
  - ±10% or less of rated voltage
  - ±20% or less of rated voltage
  - ±2% or less of rated voltage

**Solenoid Coil Specifications**

- **AC Specification (Class B coil)**

  - **Model**: VXD21, VXD22, VXD23
  - **Apparent power (VA)**: 9, 7, 5
  - **Temperature rise (°C)**: 60, 50, 45

- **DC Specification**

  - **Model**: VXD2130, VXD2141, VXD2261
  - **Power consumption (W)**: 5.5, 4.5, 4.5
  - **Temperature rise (°C)**: 50, 45, 45

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

  - **Model**: VXD21, VXD23
  - **Apparent power (VA)**: 9.5, 12
  - **Temperature rise (°C)**: 65

- **AC Specification (Class H coil)**

  - **Model**: VXD21, VXD22, VXD23
  - **Apparent power (VA)**: 19, 16, 16
  - **Temperature rise (°C)**: 45

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

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.

Approved

DC Specification

<table>
<thead>
<tr>
<th>Model</th>
<th>VXD2130</th>
<th>VXD2141</th>
<th>VXD2151</th>
<th>VXD2261</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power consumption (W)</td>
<td>5.5</td>
<td>4.5</td>
<td>4.5</td>
<td>-</td>
</tr>
<tr>
<td>Temperature rise (°C)</td>
<td>50</td>
<td>45</td>
<td>45</td>
<td>-</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Model</th>
<th>VXD21</th>
<th>VXD23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent power (VA)</td>
<td>9.5</td>
<td>12</td>
</tr>
<tr>
<td>Temperature rise (°C)</td>
<td>65</td>
<td>-</td>
</tr>
</tbody>
</table>

AC Specification (Class H coil)

<table>
<thead>
<tr>
<th>Model</th>
<th>VXD21</th>
<th>VXD22</th>
<th>VXD23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent power (VA)</td>
<td>19</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Temperature rise (°C)</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Voltage type</th>
<th>AC (Class B)</th>
<th>AC (with a full-wave rectifier)</th>
<th>DC (Class H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VX2D2130</td>
<td>–</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>VX2D221 □</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>VX2D231 □</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

DC, AC (Except VX2D130 AC/Class B) (Note 1)

Series □N□ —

VX02

1 | VX2D21 □
2 | VX2D22 □
3 | VX2D23 □

Rated voltage (Note 2)

1 | 100 VAC 50/60 Hz
2 | 220 VAC 50/60 Hz
3 | 240 VAC 50/60 Hz
4 | 220 VAC 50/60 Hz
5 | 12 VDC
6 | 48 VAC 50/60 Hz
J | 230 VAC 50/60 Hz

Note 1) The AC (Class B) coil for VX2D130 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
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
DS - DIN with surge voltage suppressor and light
DO - For DIN (without connector)

Table (2) Rated Voltage – Electrical Option

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>S - Light with surge voltage suppressor</th>
<th>L - W</th>
<th>Z - DC with surge voltage suppressor</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC/DC Voltage symbol</td>
<td>Voltage</td>
<td>With light</td>
<td>With surge voltage suppressor</td>
</tr>
<tr>
<td>1</td>
<td>100 V</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>2</td>
<td>220 V</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>3</td>
<td>220 V</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>4</td>
<td>220 V</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>5</td>
<td>24 V</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>6</td>
<td>240 V</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>7</td>
<td>48 V</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>8</td>
<td>48 V</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>J</td>
<td>230 V</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

DC specification is not available.

Note) DIN terminal and DC specification is not available.

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

Series □N□ —

VX02

1 | VX2D1 □
2 | VX2D2 □
3 | VX2D3 □

Rated voltage (Note 1)

1 | 100 VAC 50/60 Hz
2 | 110 VAC 50/60 Hz
3 | 110 VAC 50/60 Hz
4 | 110 VAC 50/60 Hz
5 | 120 VAC 50/60 Hz
6 | 120 VAC 50/60 Hz
7 | 220 VAC 50/60 Hz
8 | 220 VAC 50/60 Hz
9 | 240 VAC 50/60 Hz

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

Electrical entry

G - Grommet
GS - With grommet surge voltage suppressor
T - With conduit terminal
TS - With conduit terminal and surge voltage suppressor
TL - With conduit terminal and light
TZ - With conduit terminal, surge voltage suppressor and light
D - DIN
DS - DIN with surge voltage suppressor
DL - DIN with light
DS - DIN with surge voltage suppressor and light
DO - For DIN (without connector)

Table (3) Name Plate Part No.

<table>
<thead>
<tr>
<th>Name plate part no.</th>
<th>Clip part no. (For N.C.)</th>
<th>Clip part no. (For N.O.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For VX2D1: VX021N-10</td>
<td>For VX2D2: VX022N-10</td>
<td>For VX2D3: VX023N-10</td>
</tr>
</tbody>
</table>

* 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, as a standard.
## Model/Valve Specifications

### Normally closed (N.C.)

<table>
<thead>
<tr>
<th>Port size (mm)</th>
<th>Orifice size (mm)</th>
<th>Model</th>
<th>Min. operating pressure differential (MPa)</th>
<th>Max. operating pressure differential (MPa)</th>
<th>Flow characteristics</th>
<th>Max. system pressure (MPa)</th>
<th>Note</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/8 (8A)</td>
<td>10</td>
<td>VXD2130-02</td>
<td>0.02</td>
<td>0.7</td>
<td>0.5</td>
<td>46</td>
<td>1.9</td>
<td>420</td>
</tr>
<tr>
<td>5/32 (10A)</td>
<td>15</td>
<td>VXD2140-03</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>110</td>
<td>4.5</td>
<td>670</td>
</tr>
<tr>
<td>1/4 (15A)</td>
<td>10</td>
<td>VXD2130-04</td>
<td></td>
<td>0.7</td>
<td>0.5</td>
<td>58</td>
<td>2.4</td>
<td>500</td>
</tr>
<tr>
<td>5/32 (20A)</td>
<td>20</td>
<td>VXD2150-06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flange</td>
<td>1 (25A)</td>
<td>VXD2260-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32A</td>
<td>35</td>
<td>VXD2270-32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40A</td>
<td>40</td>
<td>VXD2380-40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50A</td>
<td>50</td>
<td>VXD2390-50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Normally open (N.O.)

<table>
<thead>
<tr>
<th>Port size (mm)</th>
<th>Orifice size (mm)</th>
<th>Model</th>
<th>Min. operating pressure differential (MPa)</th>
<th>Max. operating pressure differential (MPa)</th>
<th>Flow characteristics</th>
<th>Max. system pressure (MPa)</th>
<th>Note</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5/32 (10A)</td>
<td>15</td>
<td>VXD2142-03</td>
<td>0.02</td>
<td>0.7</td>
<td>0.5</td>
<td>740</td>
<td>31</td>
<td>6800</td>
</tr>
<tr>
<td>1/4 (15A)</td>
<td>20</td>
<td>VXD2152-06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/8 (20A)</td>
<td>25</td>
<td>VXD2262-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flange</td>
<td>32A</td>
<td>VXD2272-32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40A</td>
<td>40</td>
<td>VXD2382-40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50A</td>
<td>50</td>
<td>VXD2392-50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Operating Fluid and Ambient Temperature

- **Power source**
  - AC: 1 to 60
  - DC: 1 to 40
- **Solenoid valve option**
  - Nil, G, H, E, F
- **Ambient temperature**
  - Nil: 1 to 99
- **Operating fluid temperature (°C)**
  - Nil: 1 to 60
  - E: 1 to 99
  - F: -10 to 60

### Tightness of Valve (Leakage Rate)

- **Seal material**
  - NBR, FKM, EPDM
- **Leakage rate (With water pressure)**
  - 1/4 to 1
  - 32A to 50A
  - 0.2 cm/min or less
  - 1 cm/min or less
### Table (1) Port/Orifice Size

#### Normally closed (N.C.)

<table>
<thead>
<tr>
<th>Port no. (Port size)</th>
<th>Thread</th>
<th>Flange</th>
<th>Orifice symbol</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Body Seal</td>
</tr>
<tr>
<td>Model VXD20/VXD21/VXD22</td>
<td></td>
<td></td>
<td></td>
<td>Brass (C37), Stainless steel, EPDM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NBR, FKM, EPDM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Normally open (N.O.)

<table>
<thead>
<tr>
<th>Port no. (Port size)</th>
<th>Thread</th>
<th>Flange</th>
<th>Orifice symbol</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Body Seal</td>
</tr>
<tr>
<td>Model VXD20/VXD21/VXD22</td>
<td></td>
<td></td>
<td></td>
<td>Brass (C37), Stainless steel, EPDM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NBR, FKM, EPDM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table (2) Solenoid Valve Option

<table>
<thead>
<tr>
<th>Option symbol</th>
<th>Seal material</th>
<th>Body material/ Shading coil material</th>
<th>Insulation type</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>NBR</td>
<td>Brass (C37), Cu</td>
<td>B</td>
<td>—</td>
</tr>
<tr>
<td>G</td>
<td>EPDM</td>
<td>Stainless steel, Ag</td>
<td>H</td>
<td>—</td>
</tr>
<tr>
<td>P</td>
<td>FKM</td>
<td>Stainless steel, Ag</td>
<td>B</td>
<td>—</td>
</tr>
</tbody>
</table>

### Table (3) Rated Voltage – Electrical Option

<table>
<thead>
<tr>
<th>AC/DC Voltage symbol</th>
<th>Class A</th>
<th>Class B</th>
<th>Class C</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 V</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>200 V</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>300 V</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>400 V</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>500 V</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>600 V</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: Option S, Z are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.
**Series VXD21/22/23**

**For Oil**

Model/Valve Specifications

**Normally closed (N.C.)**

<table>
<thead>
<tr>
<th>Port size</th>
<th>Orifice size (mmø)</th>
<th>Model</th>
<th>Min. operating pressure differential (MPa)</th>
<th>Max. operating pressure differential (MPa)</th>
<th>Flow characteristics</th>
<th>Max. system pressure (MPa)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread</td>
<td></td>
<td></td>
<td>AC</td>
<td>DC</td>
<td>Av x 10⁻⁶m²</td>
<td>Cv converted</td>
<td></td>
</tr>
<tr>
<td>1/4 (8A)</td>
<td>10</td>
<td>VXD2130-02</td>
<td>0.5</td>
<td>0.4</td>
<td>46</td>
<td>1.9</td>
<td>420</td>
</tr>
<tr>
<td>5/16 (10A)</td>
<td>15</td>
<td>VXD2130-03</td>
<td>0.7</td>
<td>0.7</td>
<td>110</td>
<td>4.5</td>
<td>670</td>
</tr>
</tbody>
</table>

**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.)**

<table>
<thead>
<tr>
<th>Port size</th>
<th>Orifice size (mmø)</th>
<th>Model</th>
<th>Min. operating pressure differential (MPa)</th>
<th>Max. operating pressure differential (MPa)</th>
<th>Flow characteristics</th>
<th>Max. system pressure (MPa)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread</td>
<td></td>
<td></td>
<td>AC, DC</td>
<td>Av x 10⁻⁶m²</td>
<td>Cv converted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/8 (15A)</td>
<td>15</td>
<td>VXD2142-02</td>
<td>0.6</td>
<td>0.6</td>
<td>110</td>
<td>4.5</td>
<td>690</td>
</tr>
<tr>
<td>5/16 (15A)</td>
<td>20</td>
<td>VXD2142-04</td>
<td>1.5</td>
<td>1.5</td>
<td>130</td>
<td>5.5</td>
<td>1170</td>
</tr>
<tr>
<td>5/8 (20A)</td>
<td>25</td>
<td>VXD2152-06</td>
<td>0.3</td>
<td>0.3</td>
<td>230</td>
<td>9.5</td>
<td>5400</td>
</tr>
</tbody>
</table>

**Operating Fluid and Ambient Temperature**

<table>
<thead>
<tr>
<th>Power source</th>
<th>Operating fluid temperature (°C)</th>
<th>Ambient temperature (°C)</th>
<th>A, H</th>
<th>D, N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>-5 to 60</td>
<td>-5 to 100</td>
<td>-10 to 60</td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>-5 to 40</td>
<td>-10 to 40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tightness of Valve (Leakage Rate)**

<table>
<thead>
<tr>
<th>Seal material</th>
<th>Leakage rate (With oil pressure)</th>
<th>PKM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.2 cm³/min or less</td>
<td>1 cm³/min or less</td>
</tr>
</tbody>
</table>
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 comes with a full-wave rectifier.

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

Table (2) Solenoid Valve Option

<table>
<thead>
<tr>
<th>Port no. (Port size)</th>
<th>Thread type</th>
<th>Port size</th>
<th>Suffix</th>
<th>Rated voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 1/2&quot;</td>
<td>-</td>
<td>-</td>
<td>G</td>
<td>12 VDC</td>
</tr>
<tr>
<td>03 3/4&quot;</td>
<td>-</td>
<td>-</td>
<td>G</td>
<td>240 VAC 50/60 Hz</td>
</tr>
<tr>
<td>04 1&quot;</td>
<td>-</td>
<td>-</td>
<td>G</td>
<td>230 VAC 50/60 Hz</td>
</tr>
<tr>
<td>05 1 1/4&quot;</td>
<td>-</td>
<td>-</td>
<td>G</td>
<td>200 VAC 50/60 Hz</td>
</tr>
<tr>
<td>10 1&quot;</td>
<td>-</td>
<td>-</td>
<td>G</td>
<td>110 VAC 50/60 Hz</td>
</tr>
</tbody>
</table>

Table (3) Rated Voltage – Electrical Option

<table>
<thead>
<tr>
<th>Class B</th>
<th>Class H</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC/DC Voltage</td>
<td>Voltage</td>
</tr>
<tr>
<td>S</td>
<td>L</td>
</tr>
<tr>
<td>1</td>
<td>100 V</td>
</tr>
<tr>
<td>2</td>
<td>200 V</td>
</tr>
<tr>
<td>3</td>
<td>310 V</td>
</tr>
<tr>
<td>4</td>
<td>420 V</td>
</tr>
<tr>
<td>7</td>
<td>240 V</td>
</tr>
<tr>
<td>8</td>
<td>48 V</td>
</tr>
<tr>
<td>5</td>
<td>24 V</td>
</tr>
<tr>
<td>6</td>
<td>12 V</td>
</tr>
</tbody>
</table>

Note: Option S, Z are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.
**Series VXD21/22/23**

### For Air (Inert gas)

**Model/Valve Specifications**

#### Normally closed (N.C.)

<table>
<thead>
<tr>
<th>Port size</th>
<th>Orifice size (mmØ)</th>
<th>Model</th>
<th>Min. operating pressure differential (MPa)</th>
<th>Max. operating pressure differential (MPa)</th>
<th>Flow characteristics</th>
<th>Max. system pressure (MPa)</th>
<th>Note</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread</td>
<td></td>
<td></td>
<td>AC</td>
<td>DC</td>
<td>C</td>
<td>b</td>
<td>Cv</td>
<td></td>
</tr>
<tr>
<td>1/4 (8A)</td>
<td>10</td>
<td>VXD2130-02</td>
<td>0.9</td>
<td>0.7</td>
<td>8.5</td>
<td>2.0</td>
<td>1.5</td>
<td>420</td>
</tr>
<tr>
<td>3/8 (10A)</td>
<td>10</td>
<td>VXD2130-03-03</td>
<td>1.0</td>
<td>1.0</td>
<td>18.0</td>
<td>5.0</td>
<td>670</td>
<td></td>
</tr>
<tr>
<td>1/2 (15A)</td>
<td>15</td>
<td>VXD2140-03-04</td>
<td>0.9</td>
<td>0.7</td>
<td>9.2</td>
<td>2.4</td>
<td>670</td>
<td></td>
</tr>
<tr>
<td>3/4 (20A)</td>
<td>20</td>
<td>VXD2140-04-04</td>
<td>1.0</td>
<td>1.0</td>
<td>20.0</td>
<td>5.5</td>
<td>670</td>
<td></td>
</tr>
</tbody>
</table>

#### Normally open (N.O.)

<table>
<thead>
<tr>
<th>Port size</th>
<th>Orifice size (mmØ)</th>
<th>Model</th>
<th>Min. operating pressure differential (MPa)</th>
<th>Max. operating pressure differential (MPa)</th>
<th>Flow characteristics</th>
<th>Max. system pressure (MPa)</th>
<th>Note</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread</td>
<td></td>
<td></td>
<td>AC</td>
<td>DC</td>
<td>C</td>
<td>b</td>
<td>Cv</td>
<td></td>
</tr>
<tr>
<td>1/4 (32A)</td>
<td>10</td>
<td>VXD2226-10</td>
<td>1.0</td>
<td>225</td>
<td>0.02</td>
<td>1.5</td>
<td>1650</td>
<td></td>
</tr>
<tr>
<td>3/8 (40A)</td>
<td>20</td>
<td>VXD2227-32</td>
<td>1.0</td>
<td>415</td>
<td>0.03</td>
<td>1.5</td>
<td>5400</td>
<td></td>
</tr>
<tr>
<td>1/2 (50A)</td>
<td>35</td>
<td>VXD2330-40</td>
<td>1.0</td>
<td>560</td>
<td>0.03</td>
<td>1.5</td>
<td>6800</td>
<td></td>
</tr>
<tr>
<td>3/4 (20A)</td>
<td>50</td>
<td>VXD2390-50</td>
<td>1.0</td>
<td>880</td>
<td>0.03</td>
<td>1.5</td>
<td>8400</td>
<td></td>
</tr>
</tbody>
</table>

#### Operating Fluid and Ambient Temperature

<table>
<thead>
<tr>
<th>Power source</th>
<th>Operating fluid temperature (°C)</th>
<th>Ambient temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Nil, G</td>
<td>-1� to 60</td>
</tr>
<tr>
<td>DC</td>
<td></td>
<td>-1� to 60</td>
</tr>
</tbody>
</table>

**Tightness of Valve (Leakage Rate)**

- **Seal material**: NBR, FKM
- **Leakage rate (Air)**: 2 cm³/min or less
- **Seal rate**: 1/4 to 1/2 A to 2/3 A or less
### Pilot Operated 2 Port Solenoid Valve

#### Series VXD21/22/23

**For Air/Single Unit**

**How to Order (Single Unit)**

![Table of Order Symbols](image)

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

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

**Valve/Body configuration**

<table>
<thead>
<tr>
<th>N.C. / Single unit</th>
<th>N.O. / Single unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**Solenoid valve option**

Refer to “Table (2)” shown below for availability.

**Orifice size**

Refer to “Table (1)” shown below for availability.

**Port size**

Refer to “Table (1)” shown below for availability.

**Thread type**

- Nil
- T
- NPT
- G
- N
- NPT

**Rated voltage**

1. AC 100 VDC
2. AC 200 VDC
3. AC 220 VDC
4. AC 240 VDC
5. AC 100 V
6. AC 200 V
7. AC 220 V
8. AC 240 V
9. DC 24 V

**Option symbol**

- Nil
- G

**Coil insulation type**

- B

**Note**

Bracket: Nil None, B With bracket

With a full-wave rectifier, surge voltage suppressor

Electrical entry: Nil, T, C-Conduit

### Table (1) Port/Orifice Size

**Normally closed (N.C.)**

<table>
<thead>
<tr>
<th>Solenoid valve (Port size)</th>
<th>Orifice symbol</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>VXD21</td>
<td>VXD22</td>
</tr>
<tr>
<td>Port no. (Port size)</td>
<td>02 (1A)</td>
<td>03 (5A)</td>
</tr>
<tr>
<td>Flange</td>
<td>32 (32A)</td>
<td>40 (40A)</td>
</tr>
</tbody>
</table>

**Normally open (R.O.)**

<table>
<thead>
<tr>
<th>Solenoid valve (Port size)</th>
<th>Orifice symbol</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>VXD21</td>
<td>VXD22</td>
</tr>
<tr>
<td>Port no. (Port size)</td>
<td>03 (5A)</td>
<td>04 (2A)</td>
</tr>
<tr>
<td>Flange</td>
<td>32 (32A)</td>
<td>40 (40A)</td>
</tr>
</tbody>
</table>

### Table (2) Solenoid Valve Option

<table>
<thead>
<tr>
<th>Option</th>
<th>Seal material</th>
<th>Body material</th>
<th>Body insulation material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>NBR</td>
<td>Brass (C37), Cu</td>
<td>Shading coil material</td>
<td>B</td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>Stainless steel, Ag</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table (3) Rated Voltage – Electrical Option

<table>
<thead>
<tr>
<th>Rated voltage (V)</th>
<th>Electricity type</th>
<th>Class B</th>
<th>Class H</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 V</td>
<td>AC/DC</td>
<td>S</td>
<td>Z</td>
</tr>
<tr>
<td>200 V</td>
<td>AC/DC</td>
<td>S</td>
<td>Z</td>
</tr>
<tr>
<td>220 V</td>
<td>AC/DC</td>
<td>S</td>
<td>Z</td>
</tr>
<tr>
<td>240 V</td>
<td>AC/DC</td>
<td>S</td>
<td>Z</td>
</tr>
<tr>
<td>220 V</td>
<td>AC/DC</td>
<td>S</td>
<td>Z</td>
</tr>
<tr>
<td>240 V</td>
<td>AC/DC</td>
<td>S</td>
<td>Z</td>
</tr>
<tr>
<td>220 V</td>
<td>AC/DC</td>
<td>S</td>
<td>Z</td>
</tr>
<tr>
<td>240 V</td>
<td>AC/DC</td>
<td>S</td>
<td>Z</td>
</tr>
</tbody>
</table>

**Note:** Option B, Z are not available as surge voltage suppressor is integrated into the AC/Class B coil, as a standard.
Series VXD21/22/23

Construction

Normally closed (N.C.)
Body material: Brass (C37) (32A or more: CAC407), Stainless steel

Normally open (N.O.)
Body material: Brass (C37) (32A or more: CAC407), Stainless steel

Component Parts

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Size</th>
<th>Material Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body</td>
<td>10A to 25A</td>
<td>Brass (C37) Stainless steel</td>
</tr>
<tr>
<td>2</td>
<td>Body</td>
<td>32A to 50A</td>
<td>CAC407</td>
</tr>
<tr>
<td>3</td>
<td>Bonnet</td>
<td>10A to 25A</td>
<td>Brass (C37) Stainless steel</td>
</tr>
<tr>
<td>4</td>
<td>O-ring</td>
<td>32A to 50A</td>
<td>NBR FKM EPDM</td>
</tr>
<tr>
<td>5</td>
<td>O-ring</td>
<td>10A to 50A</td>
<td>NBR FKM EPDM</td>
</tr>
<tr>
<td>6</td>
<td>Diaphragm assembly</td>
<td>10A to 25A</td>
<td>Stainless steel, NBR</td>
</tr>
<tr>
<td>7</td>
<td>Valve spring</td>
<td>10A to 50A</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>8</td>
<td>Tube assembly</td>
<td>10A to 25A</td>
<td>Stainless steel, C37</td>
</tr>
<tr>
<td>9</td>
<td>Armature assembly</td>
<td>10A</td>
<td>Stainless steel, Ni plated</td>
</tr>
<tr>
<td>10</td>
<td>Return spring</td>
<td>10A to 50A</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>11</td>
<td>Solenoid coil</td>
<td>10A to 50A</td>
<td>Class B molded Class H molded</td>
</tr>
<tr>
<td>12</td>
<td>Name plate</td>
<td>10A to 50A</td>
<td>Aluminum</td>
</tr>
<tr>
<td>13</td>
<td>Clip</td>
<td>10A to 50A</td>
<td>SK</td>
</tr>
</tbody>
</table>

Material Options:
- Standard: Stainless steel, Brass (C37), NBR, FKM, EPDM
- Option: Stainless steel, Ni plated stainless steel, Brass (C37), CAC407

Operation:
- **Valve opened:** When the coil is energized, the armature assembly is attracted into the core of the tube assembly and the pilot valve opens. Then the pressure in the pressure action chamber falls to open the main valve.
- **Valve closed:** When the coil is not energized, the pilot valve is closed and the pressure in the pressure action chamber rises and the main valve closes.

Approved

The materials in parentheses are the seal materials.
Pilot Operated 2 Port Solenoid Valve Series VXD21/22/23
For Water, Oil, Air

Dimensions

Normally closed (N.C.): VXD2130

Grommet: G

Conduit: C

DIN terminal: D

Conduit terminal: T

VXD2130-04

<table>
<thead>
<tr>
<th>Model</th>
<th>Port size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>VXD2130</td>
<td>1/4, 3/8</td>
<td>26</td>
<td>20</td>
<td>30</td>
<td>80.5</td>
<td>11</td>
<td>21</td>
<td>32</td>
</tr>
<tr>
<td>VXD2130</td>
<td>1/2</td>
<td>28</td>
<td>24</td>
<td>26</td>
<td>86</td>
<td>14.5</td>
<td>28</td>
<td>34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Electrical entry (DC, AC/Class H coil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VXD2130</td>
<td>Grommet: H</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Electrical entry (AC/Class B coil)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>VXD2130</td>
<td>Grommet: H</td>
</tr>
</tbody>
</table>

* 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**

### Table: Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Port size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>Electrical entry (DC, AC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VXD2140</td>
<td>3/8, 1/2</td>
<td>63</td>
<td>51</td>
<td>53</td>
<td>35</td>
<td>38</td>
<td>30</td>
<td>17</td>
<td>37</td>
<td>43</td>
<td>19.5</td>
<td>28</td>
<td>Normally closed</td>
</tr>
<tr>
<td>VXD2142</td>
<td>3/8, 1/2</td>
<td>63</td>
<td>51</td>
<td>53</td>
<td>35</td>
<td>38</td>
<td>30</td>
<td>17</td>
<td>37</td>
<td>43</td>
<td>19.5</td>
<td>28</td>
<td>Normally closed</td>
</tr>
<tr>
<td>VXD2150</td>
<td>3/4</td>
<td>80</td>
<td>70</td>
<td>70</td>
<td>50</td>
<td>54</td>
<td>40</td>
<td>19.5</td>
<td>37</td>
<td>43</td>
<td>19.5</td>
<td>28</td>
<td>Normally closed</td>
</tr>
<tr>
<td>VXD2152</td>
<td>3/4</td>
<td>80</td>
<td>70</td>
<td>70</td>
<td>50</td>
<td>54</td>
<td>40</td>
<td>19.5</td>
<td>37</td>
<td>43</td>
<td>19.5</td>
<td>28</td>
<td>Normally closed</td>
</tr>
<tr>
<td>VXD2260</td>
<td>1</td>
<td>90</td>
<td>80</td>
<td>80</td>
<td>60</td>
<td>66</td>
<td>50</td>
<td>38.5</td>
<td>48.5</td>
<td>55</td>
<td>30</td>
<td>35</td>
<td>Normally closed</td>
</tr>
<tr>
<td>VXD2262</td>
<td>1</td>
<td>90</td>
<td>80</td>
<td>80</td>
<td>60</td>
<td>66</td>
<td>50</td>
<td>38.5</td>
<td>48.5</td>
<td>55</td>
<td>30</td>
<td>35</td>
<td>Normally closed</td>
</tr>
</tbody>
</table>

### Notes:
- (mm) denotes the value for N.O.
- Coil with a full-wave rectifier (electrical option “R”)
Pilot Operated 2 Port Solenoid Valve  Series VXD21/22/23

For Water, Oil, Air

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

Electrical entry (AC/Class B coil)

<table>
<thead>
<tr>
<th>Model</th>
<th>Electrical entry (AC)</th>
<th>Grommet</th>
<th>Conduit</th>
<th>DIN terminal</th>
<th>Conduit terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normally closed</td>
<td>Normally open</td>
<td>M N M N M N Q M N Q</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VXD2270  VXD2272</td>
<td>32  33  38  51.5  89  68.5  56.5  85  103.5  72.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VXD2380  VXD2382</td>
<td>103  36  38  54  99  71  59  97  106  78</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VXD2390  VXD2392</td>
<td>108  36  103.5  54  104.5  71  59  103.5  108  75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

( ) denotes the value for N.O.

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

Approved
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.

---

**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 catalog 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.

---

Note 1) ISO 4414: Pneumatic fluid power--General rules relating to systems.
Note 2) JIS B 8370: General Rules for Pneumatic Equipment
2 Port Solenoid Valve for Fluid Control/Precautions

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 catalog are not designed for safety applications such as an emergency shutoff valve. If the valves are used in this type of system, other reliable safety assurance measures should also be adopted.

2. Extended periods of continuous energization
   The solenoid coil will generate heat when continuously energized. Avoid using in a tightly shut container. Install it in a well-ventilated area. Furthermore, do not touch it while it is being energized or right after it is energized.

3. 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 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. Give an attention to it.

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 catalog.

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 catalog. Use a fluid with a dynamic viscosity of 50 mm²/s or less. If there is something you do not know, please contact us.
   2) Inflammable oil, Gas
      Confirm the specification for leakage in the interior and/or exterior area.

3. Fluid 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 valves at their upstream side. A filtration degree of 5 µm 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 at the upstream side of valves.
      If excessive carbon powder is generated by the compressor, it may adhere to the inside of the valves and cause a malfunction.
      Refer to SMC’s Best Pneumatics catalog vol. 14 for further details on compressed air quality.

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 valves at their upstream side. A filtration degree of 5 µm 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.
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      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 catalog vol. 14 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, confirm us separately.
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.

**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.

   ![Diagram of Leakage Voltage](image)
   - 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 dryer, heat retaining of the body is recommended to prevent a freezing condition in which the dew point temperature is high and the ambient temperature is low, and the high flow runs.

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

**Mounting**

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.

   ![Diagram of Leakage Voltage](image)
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**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.

<table>
<thead>
<tr>
<th>Connection threads</th>
<th>Proper tightening torque N-m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rc 1/8</td>
<td>7 to 9</td>
</tr>
<tr>
<td>Rc 1/4</td>
<td>12 to 14</td>
</tr>
<tr>
<td>Rc 3/8</td>
<td>22 to 24</td>
</tr>
<tr>
<td>Rc 1/2</td>
<td>28 to 30</td>
</tr>
<tr>
<td>Rc 3/4</td>
<td>36 to 38</td>
</tr>
<tr>
<td>Rc 1</td>
<td>46 to 48</td>
</tr>
</tbody>
</table>

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.**

---

Back page 3
2 Port Solenoid Valve for Fluid Control/Precautions

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 ±10% of the rated voltage. In cases with a DC power supply where importance is placed on responsiveness, stay within ±5% of the rated value. The voltage drop is the value in the lead wire section connecting the coil.

4. When a surge from the solenoid affects the electrical circuitry, install a surge absorber, etc., in parallel with the solenoid. Or, adopt an option that comes with the surge voltage protection circuit. (However, a surge voltage occurs even if the surge voltage protection circuit is used. For details, please consult with us.)

Electrical Connection

**Caution**

- **Grommet**

  Class H coil: AWG18 Insulator O.D. 2.2 mm
  Class B coil: AWG20 Insulator O.D. 2.5 mm

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Lead wire color</th>
<th>1 (±)</th>
<th>2 (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC (Class B only)</td>
<td>Black</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>100 VAC</td>
<td>Blue</td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>200 VAC</td>
<td>Red</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>Other AC</td>
<td>Gray</td>
<td>Gray</td>
<td></td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>Terminal no.</th>
<th>1 (±)</th>
<th>2 (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN terminal</td>
<td>+ (+)</td>
<td>- (-)</td>
</tr>
</tbody>
</table>

* There is no polarity.
* Use compatible heavy duty cords with cable O.D. of ø6 to 12.
* Use the tightening torques below for each section.

**Note**

- Compatible cable (Cable O.D. ø6 to 12 mm)
- Connector binding head screw with flange
- Binding head screw
- Tightening torque 0.5 to 0.6 Nm
- Gasket
- Washer
- Rubber seal
- Note: For an outside cable diameter of ø9 to 12 mm, remove the internal parts of the rubber seal before using.
2 Port Solenoid Valve for Fluid Control/Precautions

Be sure to read this before handling.
For detailed precautions on each series, refer to the main text.

**Caution**

**Electrical Connection**

**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.

![Diagram of Conduit Terminal Connection]

**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

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Lead wire color</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC</td>
<td>Black</td>
<td>VCW20-15-6</td>
</tr>
<tr>
<td>100 VAC</td>
<td>Blue</td>
<td>VCW20-15-6</td>
</tr>
<tr>
<td>200 VAC</td>
<td>Red</td>
<td>VCW20-15-6</td>
</tr>
<tr>
<td>Other AC</td>
<td>Gray</td>
<td>VCW20-15-6</td>
</tr>
</tbody>
</table>

**Note**: There is no polarity for DC.

**Electrical Circuit**

**Caution**

**DC circuit**

- Grommet, Conduit, 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, as a standard.

**AC/Class B, H coil circuit**

- Grommet, Conduit, Conduit terminal

**Approved**
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.

**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.

<table>
<thead>
<tr>
<th>Classification of viscosity (cst) (40°C)</th>
<th>Viscocity according to ISO Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idemitsu Kosan Co., Ltd.</td>
<td>Turbine oil P-32</td>
</tr>
<tr>
<td>Nippon Oil Corp.</td>
<td>Turbine oil 32</td>
</tr>
<tr>
<td>Cosmo Oil Co., Ltd.</td>
<td>Cosmo turbine 32</td>
</tr>
<tr>
<td>Japan Energy Corp.</td>
<td>Kyodo turbine 32</td>
</tr>
<tr>
<td>Kyburg Oil Co.</td>
<td>Turbine oil 32</td>
</tr>
<tr>
<td>Kyushu Oil Co.</td>
<td>Stork turbine 32</td>
</tr>
<tr>
<td>Nippon Oil Corp.</td>
<td>Mitsubishi turbine 32</td>
</tr>
<tr>
<td>Showa Shell Sekiyu K.K.</td>
<td>Turbine 32</td>
</tr>
<tr>
<td>Tonen General Sekiyu K.K.</td>
<td>General R turbine 32</td>
</tr>
<tr>
<td>Fuji Kosan Co., Ltd.</td>
<td>Fuscal turbine 32</td>
</tr>
</tbody>
</table>

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 from high temperature fluids. Use caution, as there is a danger of being burned if a valve is touched directly.
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- VENEZUELA: SMC Neumática Venezuela S.A.

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- AUSTRALIA: SMC Pneumatics (Australia) Pty. Ltd.
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