4 Port Solenoid Valve

**VQD1000 Series**

*Rubber Seal* Direct Operated Poppet Type

### Unprecedented high speed, with stable response times
- ON: 4 ms, OFF: 2 ms, Dispersion accuracy ±1 ms (With light/surge voltage suppressor at a supply pressure of 0.5 MPa)
- (Use clean and dry air.)

### Compact and lightweight (34 g) with large flow capacity
- Body width of 10 mm, C: 0.22 dm³/(s·bar) 2 W
- C: 0.27 dm³/(s·bar) 3.2 W (U type: Large flow)

### Available in vacuum applications (Up to –101.2 kPa)
- Can be used in vacuum/release circuits
- When used as a 3 port valve, conversion from N.O. to N.C. and vice versa is possible by plugging either port 4(A) or 2(B).

### Clean room specifications available as special.
- Since the main valve has no sliding seals, non-oil treatment specification at the fluid contacting section is available (Made-to-Order part no. X16). The external non-leak specification is also available (10- series).

### Copper-free specifications
- The fluid contacting section is copper-free and the standard type can be used as it is.

---

#### Cylinder Speed Chart

**Use as a guide for selection. Please confirm the actual conditions with SMC Sizing Program.**

<table>
<thead>
<tr>
<th>Base Mounted</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Series</strong></td>
<td><strong>CJ2 series</strong></td>
</tr>
<tr>
<td><strong>Average speed (mm/s)</strong></td>
<td><strong>Pressure: 0.5 MPa</strong></td>
</tr>
<tr>
<td><strong>Stroke 60 mm</strong></td>
<td><strong>Load factor 50%</strong></td>
</tr>
<tr>
<td><strong>Stroke 300 mm</strong></td>
<td><strong>ON: 4 ms, OFF: 2 ms</strong></td>
</tr>
<tr>
<td><strong>Dispersion accuracy ±1 ms</strong></td>
<td><strong>Speed controller</strong></td>
</tr>
<tr>
<td><strong>VQD1151U</strong></td>
<td><strong>Tu0425 x 1m</strong></td>
</tr>
</tbody>
</table>

- **Base mounted**
- **CJ2 series**
- **CM2 series**
- **VQD1151U**
- **Tu0425 x 1m**
- **AS120IF-04**
- **AN120-M5**

---

* It is when the cylinder is extending that is meter-out controlled by speed controller which is directly connected with cylinder, and its needle valve with being fully open.

* The average velocity of the cylinder is what the stroke is divided by the total stroke time.

* Load factor: ((Load weight x 9.8)/Theoretical force) x 100%
4 Port Solenoid Valve
Direct Operated Poppet Type

VQD1000 Series

How to Order Valves

VQD1 [ ] [ ] [ ] [ ]

Type of actuation
1 Single type
2 Latching type

Body type
2 Body ported (Single unit)
3 Body ported (Manifold)
5 Base mounted

Valve option
Nil Standard
V Vacuum
U For large flow, vacuum
W For large flow, vacuum

Rated voltage
5 24 VDC
6 12 VDC

Standard Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Standard single type</th>
<th>Large-flow single type</th>
<th>Large-flow latching type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve construction</td>
<td>4 port direct operated poppet valve</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid</td>
<td>Air</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum operating pressure</td>
<td>0 MPa / –101.2 kPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time(1)</td>
<td>ON: 4ms±1, OFF: 2ms±1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>–10 to 50°C(2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication</td>
<td>Not required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual override</td>
<td>Non-locking push type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact/Vibration resistance(3)</td>
<td>15G/3G m/s²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting position</td>
<td>Unrestricted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enclosure</td>
<td>Dust tight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>34 g</td>
<td>37 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coil rated voltage</td>
<td>DC 24 V, 12 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowable voltage fluctuation</td>
<td>±10% of rated voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coil insulation type</td>
<td>Class B or equivalent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>DC 2 W</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical entry</td>
<td>L plug connector, M plug connector</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1) Based on response time measurement, JIS B8419: 2010. (Coil temperature: 20°C, pressure: 0.5 MPa, at rated voltage, with light and surge suppressor, value at operation including restart period) The period immediately after a restart may be delayed for about 1 msec depending on operating conditions.

Note 2) Operating the valve at low temperatures may cause condensate to form, therefore dry air must be used.

Note 3) Impact resistance: No malfunction occurred when it is tested with a drop tester in the axial direction and at the right angles to the main valve and armature. (Values at the initial period)

Note 4) For the start-up time, refer to the energy saving type's electrical power waveform on page 1399 "Wiring Specifications".
Flow Rate Characteristics

<table>
<thead>
<tr>
<th>Valve model</th>
<th>Port size</th>
<th>Flow rate characteristics</th>
<th>1 → 4/2 (P → A/B)</th>
<th>4/2 → 5/3 (A/B → EA/EB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body ported</td>
<td>VQD1121</td>
<td>M5 x 0.8</td>
<td>C [dm³/(s·bar)]</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td>VQD1121</td>
<td></td>
<td>0.22</td>
<td>0.16</td>
</tr>
<tr>
<td>Base mounted</td>
<td>VQD1151</td>
<td></td>
<td>0.22</td>
<td>0.10</td>
</tr>
<tr>
<td>(With sub-plate)</td>
<td>VQD151</td>
<td></td>
<td>0.27</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Construction

Component Parts (Single Type)

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Solenoid coil assembly</td>
<td>—</td>
<td>VQD1000-S-M5 (Base mounted only)</td>
</tr>
<tr>
<td>2</td>
<td>Sub-plate</td>
<td>Aluminum</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Body</td>
<td>ZDC</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Spool valve</td>
<td>Aluminum</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Poppet</td>
<td>HNBR</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Guide ring</td>
<td>Resin</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Return spring</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Manual override</td>
<td>Aluminum</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Gasket</td>
<td>HNBR</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Round head combination screw</td>
<td>Steel</td>
<td></td>
</tr>
</tbody>
</table>

Note) Body cannot be disassembled.

Valve Single Unit Option

Piping plate assembly
VQD1000-20A

Manifold type (VQD1131) can be changed to single unit type (VQD1121) by mounting plate assembly.

Note) Plate should be mounted with manifold mounting screws (M1.7 x 20).
Proper tightening torque of thread: 0.18 to 0.25 N·m
VQD1000 Series

Dimensions/Body Ported

L plug connector: VQD1121□-□L-M5
M plug connector: VQD1121□-□M-M5

Lead wire length 300 mm

Indicator light

2 x M5 x 0.8
4(A), 2(B) port

Direct manual override

2 x ø3.5 mounting hole

M plug connector (M)

L plug connector (L)
Dimensions/Base Mounted

L plug connector: VQD1151□□□L-M5
M plug connector: VQD1151□□□M-M5

M plug connector (M)

L plug connector (L)
VQD1000 Series

Dimensions/Base Mounted

L plug connector: VQD1251□-□L-M5
M plug connector: VQD1251□-□M-M5

Lead wire length 300 mm

Direct manual override
Indicator light

2 x mounting hole

28
27
10.9
9.1
27

Lead wire: White
Lead wire: Red
Lead wire: Black

∗ In the case of +COM

4 x M5 x 0.8
1(P), 4(A), 2(B), 3(R) port

• The dashed line indicates L plug connector.
**4 Port Solenoid Valve Direct Operated Poppet Type VQD1000 Series**

### How to Order Manifold

**Plug lead unit manifold**

<table>
<thead>
<tr>
<th>VV4QD1</th>
<th>5</th>
<th>(\text{CE-compliant})</th>
</tr>
</thead>
</table>

**Manifold**

- 2 Body ported
- 5 Base mounted

**Valve station**

<table>
<thead>
<tr>
<th>Station</th>
<th>Number of Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>2 stations</td>
</tr>
<tr>
<td>20</td>
<td>20 stations (Max.)</td>
</tr>
</tbody>
</table>

**Port size (cylinder port)**

- Nil: Body ported
- M5: Base mounted
- C4: M5 thread

**How to Order Manifold Assembly**

Specify the part numbers for valves and options together beneath the manifold base part number.

**Example**

- Plug lead unit manifold: VV4QD15-05M5
- Manifold base part no.: 1 set
- Blanking plate part no. (1st station): VQD1000-10A-5
- Valve part no. (2 to 5th station): VQD1151-5L

Prefix the asterisk to the part nos. of the solenoid valve, etc.

Enter in order starting from the first station on the D side.

### How to Order Valves

**Type of actuation**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single type</td>
</tr>
<tr>
<td>2</td>
<td>Latching type</td>
</tr>
</tbody>
</table>

**Body type**

- 3 Body ported
- 5 Base mounted

**Valve option**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Standard</td>
</tr>
<tr>
<td>V</td>
<td>Vacuum</td>
</tr>
<tr>
<td>U</td>
<td>For large flow</td>
</tr>
<tr>
<td>W</td>
<td>For large flow, vacuum</td>
</tr>
</tbody>
</table>

**Rated voltage**

<table>
<thead>
<tr>
<th>Option</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>24 VDC</td>
</tr>
<tr>
<td>6</td>
<td>12 VDC</td>
</tr>
</tbody>
</table>

**CE-compliant**

- Nil: —
- Q: CE-compliant

**Electrical entry**

- L: Plug lead type
  - L plug connector, With lead wire
  - L plug connector, With light/surge voltage suppressor
- L0: Plug lead type
  - L plug connector, Without connector
  - L plug connector, Without light/surge voltage suppressor
- M: Plug lead type
  - M plug connector, With lead wire
  - M plug connector, With light/surge voltage suppressor
- M0: Plug lead type
  - M plug connector, Without connector
  - M plug connector, Without light/surge voltage suppressor
VQD1000 Series

**Manifold Options**

**Blanking plate assembly/Body ported**

**VVQD1000-10A-2**

Blanking plate assembly includes 2 screws and gasket

**Blanking plate assembly/Base mounted**

**VVQD1000-10A-5**

Blanking plate assembly includes 2 screws and gasket

**Individual SUP spacer/Base mounted**

**VVQD1000-P-M5-5**

Mount the individual SUP spacer on the manifold base, and thus making it possible to have supply port individually for each valve.

**Individual EXH spacer/Base mounted**

**VVQD1000-R-M5-5**

Mount the individual EXH spacer on the manifold base, and thus making it possible to have exhaust port individually for each valve. (Common EXH type)
## Dimensions/Body Ported

Plug lead unit manifold (VV4QD12-□)

### M plug connector (M)

![Diagram of M plug connector](image)

### L plug connector (L)

![Diagram of L plug connector](image)

### Dimensions

<table>
<thead>
<tr>
<th>n</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>39</td>
<td>50</td>
<td>61</td>
<td>72</td>
<td>83</td>
<td>94</td>
<td>105</td>
<td>116</td>
<td>127</td>
<td>138</td>
<td>149</td>
<td>160</td>
<td>171</td>
<td>182</td>
<td>193</td>
<td>204</td>
<td>215</td>
<td>226</td>
<td>237</td>
</tr>
<tr>
<td>L2</td>
<td>31</td>
<td>42</td>
<td>53</td>
<td>64</td>
<td>75</td>
<td>86</td>
<td>97</td>
<td>108</td>
<td>119</td>
<td>130</td>
<td>141</td>
<td>152</td>
<td>163</td>
<td>174</td>
<td>185</td>
<td>196</td>
<td>207</td>
<td>218</td>
<td>229</td>
</tr>
</tbody>
</table>
VQD1000 Series

Dimensions/Base Mounted

Plug lead manifold unit (VV4QD15-□)

M plug connector (M)

L plug connector (L)

Dimensions

<table>
<thead>
<tr>
<th>n: Stations</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>39</td>
<td>50</td>
<td>61</td>
<td>72</td>
<td>83</td>
<td>94</td>
<td>105</td>
<td>116</td>
<td>127</td>
<td>138</td>
<td>149</td>
<td>160</td>
<td>171</td>
<td>182</td>
<td>193</td>
<td>204</td>
<td>215</td>
<td>226</td>
<td>237</td>
</tr>
<tr>
<td>L2</td>
<td>31</td>
<td>42</td>
<td>53</td>
<td>64</td>
<td>75</td>
<td>86</td>
<td>97</td>
<td>108</td>
<td>119</td>
<td>130</td>
<td>141</td>
<td>152</td>
<td>163</td>
<td>174</td>
<td>185</td>
<td>196</td>
<td>207</td>
<td>218</td>
<td>229</td>
</tr>
</tbody>
</table>
VQD1000 Series
Specific Product Precautions 1
Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 3 to 9 for 3/4/5 Port Solenoid Valve Precautions.

**Warning Operation**

- **Warning**
  - Connected actuator is started by manual operation. Use the manual override after confirming that there is no danger.
  - Single type: Non-locking push type (Tool required)

- **Latching type: Locking type (Tool required)**

  - In order to turn it ON, push down the manual override button in the direction the arrow (→) indicates until it stops (approx. 0.5 mm), and release it to turn it OFF.

- **Warning**
  - Continuous Energization
    - Coil temperature may get high due to ambient temperature or energizing duration. Do not touch the valve by hand directly. When there is such a dangerous case to be touched by hands directly, install a protective cover.
    - When you expect to energize the single type for extended periods of time, refer to page 3 for details.
    - The latching type should not be energized over 30 seconds. Be sure to wait more than you energize the unit (both A and B should be turned off) before you move on to the next operation.

**Mounting of Valves**

- **Caution**
  - When piping and mounting valves, clamp the body part in place to avoid applying force to the coil. If you apply force over 120 N to coil, connection pins deform, which may cause malfunction. (Latching: 50 N or more)

**Wiring Specifications**

- **Caution**
  - Single type (Standard: 2 W)
    - Lead wire Red (+,−)
    - Black (−, +) (Energy saving type)
    - Note) Coil surge voltage generated when OFF is about 60 V. Please consult with SMC when you need to reduce the surge voltage.

- **Latching solenoid type**
  - 3.2 W type (Energy saving type) reduces current consumption at holding which reduces the overall power consumption using the circuit shown in the left figure. Refer to the energy saving type's electrical power waveform below.
  - <Energy saving type's electrical power waveform> (Rated voltage: 24 VDC)

- **Positive common**
  - Lead wire Red (+)
  - Black (−)

- **Negative common**
  - Lead wire Black (−)
  - White (+)

- **Lead wire length**
  - Nil 300 mm
  - 6 600 mm
  - 10 1000 mm
  - 20 2000 mm
  - 30 3000 mm

- **Plug connector lead wire length**
  - Lead wire length of plug connector valve with lead wire is 300 mm. When ordering a valve with a lead wire of 600 mm or longer, be sure to indicate the model number of the valve without connector and connector assembly.
VQD1000 Series
Specific Product Precautions 2

Be sure to read this before handling the products.
Refer to back page 50 for Safety Instructions and pages 3 to 9 for 3/4/5 Port Solenoid Valve Precautions.

**Latching**

**Caution**

**Latching Type**

The latching is equipped with a self-holding mechanism, which permits a movable iron core in the solenoid to hold the set (A-ON) and reset (B-ON) positions during momentary energization (50 ms or longer). Therefore, there is no need to energize continuously.

- **Special Cautions for Latching**
  1. Use in a circuit that does not have simultaneous energization of A-ON and B-ON signals.
  2. The minimum energization time required for self-holding is 50 ms.
  3. Although there is no problem for normal operations and environments, please consult SMC when operating in an environment with vibration (10G or more) or strong magnetic fields.
  4. When there is the magnetic body at the valve side, it may cause malfunction.
     Allow a space over 10 mm between the valve and magnetic body.
  5. Even though this valve is held on to B-ON position (passage: P → B), it may switch to the set position during transportation or due to impact when mounting valves, etc.
     Therefore, check the initial position by means of power supply or manual override prior to use.

**Energization**

<table>
<thead>
<tr>
<th>Energization</th>
<th>Passage</th>
<th>Light color</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-ON (Set)</td>
<td>A (-)</td>
<td>Black</td>
</tr>
<tr>
<td></td>
<td>C (+)</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>P → A</td>
<td>Orange</td>
</tr>
<tr>
<td></td>
<td>(B → R)</td>
<td></td>
</tr>
<tr>
<td>B-ON (Reset)</td>
<td>B (-)</td>
<td>White</td>
</tr>
<tr>
<td></td>
<td>C (+)</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>P → B</td>
<td>Green</td>
</tr>
<tr>
<td></td>
<td>(A → R)</td>
<td></td>
</tr>
</tbody>
</table>

Note) For positive common

**How to Use the Valve for Vacuum Applications**

(When used as a 3-port valve)

**Caution**

Application example of “VQD12/21Y” (Symbols used are typical examples.)

- Use a VQD12/21Y valve for vacuum applications.
  - Connect the vacuum source to the 3(R) port.
  - Air pressure cannot be applied to the 3(R) port.
  - When used as a 3-port valve, conversion from N.O. to N.C. and vice versa is possible by plugging either port 4(A) or 2(B).
  - Cannot be used as a 2-port valve.

**How to Calculate the Flow Rate**

For obtaining the flow rate, refer to front matter.

**How to Use Plug Connector**

**Caution**

**Attaching and detaching connectors**

- To attach a connector, hold the lever and connector unit between your fingers and insert straight onto the pins of the solenoid valve so that the lever’s pawl is pushed into the groove and locks.
- To detach a connector, remove the pawl from the groove by pushing the lever downward with your thumb, and pull the connector straight out.

Note) Gently pull the lead wire, otherwise it may cause contact failure or disconnection.