Two Hand Control Valve
Series VR51

An output is available through synchronized, two-handed operation (within 0.5 s)!

Conforming to EN574

Example of a basic circuit diagram

Two Hand Control Valve

Push button operated valve

Cylinder

Air operated valve

Equipment having a safety circuit

When starting an operation, accidents such as fingers being caught can be prevented, by requiring both hands to start these push button operated valves.

Application Examples

One-handed operation

Press fitting with an air cylinder, Caulking

Two-handed operation

Clamping

Press fitting with an air cylinder, Caulking

VM
VMG
VR
VH

1913
Two Hand Control Valve
Series VR51

Specifications

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating pressure</td>
<td>0.25 to 1 MPa</td>
</tr>
<tr>
<td>Proof pressure</td>
<td>1.5 MPa</td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>–5 to 60°C (with no freezing)</td>
</tr>
<tr>
<td>Flow characteristics</td>
<td>C [dm³/(s·bar)]</td>
</tr>
<tr>
<td>P → A</td>
<td>0.3</td>
</tr>
<tr>
<td>A → R</td>
<td>1.0</td>
</tr>
<tr>
<td>Port size</td>
<td>Metric size</td>
</tr>
<tr>
<td></td>
<td>ø6</td>
</tr>
<tr>
<td>Applicable tubing material</td>
<td>Nylon, Soft nylon, Polyurethane, Flame resistant (FR) soft nylon, FR double layer, FR double layer polyurethane</td>
</tr>
<tr>
<td>Mass</td>
<td>340 g</td>
</tr>
<tr>
<td>Accessory</td>
<td>Silencer</td>
</tr>
<tr>
<td></td>
<td>Part No.: AN101-01</td>
</tr>
<tr>
<td>Option</td>
<td>Bracket</td>
</tr>
<tr>
<td></td>
<td>Part No.: VR51B</td>
</tr>
<tr>
<td></td>
<td>Class: Type III A</td>
</tr>
</tbody>
</table>

Note) In the case of using soft nylon or polyurethane tubing, use caution when the maximum operating pressure of the tubing is used.

Example of a Basic Circuit Diagram
Two Hand Control Valve Series VR51

Construction

Component Parts

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cover</td>
<td>Aluminum die-cast</td>
<td>Urban gray</td>
</tr>
<tr>
<td>2</td>
<td>Body</td>
<td>Aluminum die-cast</td>
<td>Urban white</td>
</tr>
<tr>
<td>3</td>
<td>Plate</td>
<td>Rolled steel</td>
<td>Nickel plated</td>
</tr>
<tr>
<td>4</td>
<td>Spool valve</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Orifice</td>
<td>Brass</td>
<td>Electroless nickel plated</td>
</tr>
<tr>
<td>6</td>
<td>Valve seat</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Valve guide B</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Valve guide A</td>
<td>Aluminum alloy</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Guide</td>
<td>Brass</td>
<td>Electroless nickel plated</td>
</tr>
</tbody>
</table>

Timing of Motion

* The time lag for operation is different depending on the operating pressure. The higher the operating pressure, the shorter the time lag, and vice versa. When the operating pressure is 1 MPa, the time lag will be within approximately 0.1 seconds.

Circuit Diagram

Output stops if either of the inputs are applied or neither are applied.

No output

0.5 s or more*
Series VR51

Dimensions

<Back side>

Supply port P1(11)
Flame resistant One-touch fitting: ø6, ø1/4

Exhaust port (with silencer) R(4)

Output port A(2)
Flame resistant One-touch fitting: ø6, ø1/4

Bracket mounting dimensions

Supply port P2(12)
Flame resistant One-touch fitting: ø6, ø1/4

Mounting thread
2 x M5 x 0.8
Thread depth 5

Mounting thread
2 x ø6.5
Thread depth 5

Back side mounting

Bottom mounting
Series VR51
Specific Product Precautions 1

Be sure to read before handling.
Refer to front matters 58 and 59 for Safety Instructions and pages 3 to 7 for 3/4/5 Port Solenoid Valve Precautions.

Warning

1. 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.

2. Maintenance space
The installation should allow sufficient space for maintenance activities.

3. Ventilation
When a valve is used inside a sealed control panel, etc., provide ventilation to prevent a pressure increase caused by exhausted air inside the control panel or temperature rise caused by the heat generated by the valve.

Selection

1. Confirm the specification.
The products presented in this catalog are designed only for use in compressed air systems. Do not operate at pressures or temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to specifications.)

2. Using in low temperature
In the case of using in low temperature, take measures not to freeze the drainage or moisture.

Mounting

Warning

1. If air leakage increases or equipment does not operate properly, stop operation.
Check mounting conditions when air and power supplies are connected. Initial function and leakage tests should be performed after installation.

2. Instruction manual
Mount and operate the product after reading the manual carefully and understanding its contents.
Also keep the manual where it can be referred to as necessary.

3. Painting and coating
Warnings or specifications printed or pasted on the product should not be erased, removed or covered up.
Consult with SMC if paint is to be applied to resinous parts, as this may have an adverse effect due to the paint solvent.

Caution

1. Tubing, with the exception of coiled tubing, requires stationary installation. Do not use standard tubing (non-coiled) in applications where tubing is required to travel within a cable carrier. Tubing that travels may sustain abrasion, extension, or severance due to tensile force, or may result in removal of tubing from fitting. Use caution prior to use for proper application.

2. Transportation, installation, piping, operation, manipulation, maintenance, and inspection should be conducted by a knowledgeable and experienced person.
Otherwise, electric shock, injuries, fire, etc. may occur.

3. Do not modify the product because this will likely cause injuries and damage.

4. Do not wipe the product with a cloth containing chemicals.

5. Do not use fluids other than specified. The only fluid that can be used is air.

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.

2. When piping on the product
In the case of connecting piping to the product, consult the instruction manual and use caution to avoid making a mistake with the supply port, etc.

3. Connect tubing with some extra length to prevent torsion, stretching, or a moment load from being applied to the fittings and tubing. Damage to the fittings or flattening, as well as bursting or releasing of the tubing may occur, if the above is not followed.

4. The tubing connected to the product should be more than its minimum bending radius. If the minimum bending radius is tighter than that it should be, bending or flating of the tubing may occur.
The minimum bending radius is measured as following in accordance with JIS B 8381-1995.
JIS specifies the tubing deformation ratio measured at the minimum bending radius to be 25% or less.

* Except for the TU, TIUB, TUH, TRBU, TAU and TUS series
Tube deformation ratio at the minimum bending radius is obtained through the following formula, based on tubing diameter and mandrel diameter by wrapping the same radius mandrel tube.

\[
\eta = \left(1 - \frac{L-D}{2D}\right) \times 100
\]

Here,
\(\eta\): Deformation ratio (%)
\(d\): Tube diameter (mm)
\(L\): Measured length (mm)
\(D\): Mandrel diameter (mm)
(Twice against the minimum bending radius)
Test temperature: 20 ± 5°C
Relative humidity: 65 ± 5%

5. Do not use fluids other than specified. The only fluid that can be used is air.
Series VR51
Specific Product Precautions 2

Be sure to read before handling.
Refer to front matters 58 and 59 for Safety Instructions and pages 3 to 7 for 3/4/5 Port Solenoid Valve Precautions.

Handling of One-touch Fittings

⚠️ Caution
1. Tube insertion and removal from One-touch fittings
   1) Attaching of tubing
      a. Cut the tube perpendicularly, being careful not to damage the outside surface. Use SMC tube cutter “TK-1”, “TK-2” or “TK-3”. Do not cut the tube with pliers, nippers, scissors, etc., otherwise, the tube will be deformed and troubles may result.
      b. Outside diameter of polyurethane tubing is swelled by applying internal pressure. As such, it may be that the tubing cannot be re-inserted into One-touch fittings. Make sure to confirm the tubing outside diameter, and when the accuracy of the outside diameter is more than +0.15, insert into One-touch fitting again, not cutting the tubing to use it. When tubing is re-inserted into One-touch fitting, make sure to confirm that the tubing was able to go through the release bush smoothly.
      c. Grasp the tube, slowly push it into the One-touch fittings until it comes to a stop.
      d. Pull the tubing back gently to make sure it has a positive seal. Insufficient installation may cause air to leak or the tube to release.
   2) Removal of tubing
      a. Sufficiently depress the release bushing and tubing, making sure to apply even pressure around the release bushing.
      b. Pull out the tubing while depressing the release bushing so that it does not pop out. If the release bushing is not depressed sufficiently, there will be an increased bite on the tubing and it will become more difficult to pull out.
      c. When the removed tubing is reused, first cut off the section of the tubing which has been clamped. Reusing the clamped portion of the tubing can cause problems such as leakage, difficulties in removal, etc.

Precautions on Other Tubing Brands

⚠️ Caution
1. When using tubing brands other than SMC, confirm that the tubing outside diameter tolerances satisfy the following specifications.
   1) Nylon tubing  ±0.1 mm
   2) Soft nylon tubing  ±0.1 mm
   3) Polyurethane tubing  ±0.15 mm
      within ±0.2 mm

Do not use tubing if the outside diameter tolerance is not satisfied. It may not be possible to connect the tubing, or leakage or disconnection may occur after connection.

Lubrication

⚠️ Caution
1. Lubrication
   1) The valve has been lubricated for life at the manufacturer, and does not require any further lubrication.
   2) If a lubrication is applied in the system, use turbine oil Class 1 (no additive), ISO VG32. However, once lubrication is applied it must be continued, as loss of the original lubricant may lead to malfunction.

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

<table>
<thead>
<tr>
<th>Classification of viscosity CST (40°C)</th>
<th>Viscosity according to ISO Grade</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idemitsu Kosan Co., Ltd.</td>
<td>Turbine oil P-32</td>
<td></td>
</tr>
<tr>
<td>Nippon Oil Corp.</td>
<td>Turbine oil 32</td>
<td>32</td>
</tr>
<tr>
<td>Mitsubishi</td>
<td>Turbine 32</td>
<td></td>
</tr>
<tr>
<td>Cosmo Oil Co., Ltd.</td>
<td>Cosmo turbine 32</td>
<td></td>
</tr>
<tr>
<td>Japan Energy Corp.</td>
<td>Kyodo turbine 32</td>
<td></td>
</tr>
<tr>
<td>Kygnus Oil Co.</td>
<td>Turbine oil 32</td>
<td></td>
</tr>
<tr>
<td>Tonen General Sekiyu K.K.</td>
<td>General R turbine 32</td>
<td></td>
</tr>
<tr>
<td>Fuji Kosan Co., Ltd.</td>
<td>Fucoal turbine 32</td>
<td></td>
</tr>
</tbody>
</table>

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

Air Supply

⚠️ Warning
1. Use clean air.
   Do not use compressed air which contains chemicals, synthetic oils containing organic solvents, salts or corrosive gases, etc., as this can cause damage or malfunction.

⚠️ Caution
1. Install air filters.
   Install air filters close to valves at their upstream side. A filtration degree of 5 μm or less should be selected.

2. Install an air dryer, after cooler or Drain Catch, etc.
   Air that includes excessive drainage may cause malfunction of valves and other pneumatic equipment. To prevent this, install an air dryer, after-cooler or water separator, etc.

3. If excessive carbon powder is seen, install a mist separator on the upstream side of the valve.
   If excessive carbon dust is generated by the compressor, it may adhere to the inside of valves and cause malfunction.

Refer to SMC’s "Air Cleaning Equipment" catalog for compressed air quality.

Pneumatic Pressure

⚠️ Warning
1. Do not use the product with a pressure of under 0.25 MPa. The time lag for operating the VR51 is different depending on the operating pressure. The higher the operating pressure, the shorter the time lag, and vice versa. If used under 0.25 MPa, an output will be available; however, safety is not likely to be maintained, even though the time lag may exceed 0.5 seconds.
Series VR51
Specific Product Precautions 3

Warning
1. Do not use in atmospheres where the valve is in direct contact with corrosive gases, chemicals, salt water, water or steam.
2. Do not use in locations subject to vibration or impact. Confirm the specifications in the main section of the catalog.
3. Use a protective cover, etc., to shield valves from direct sunlight.
4. Shield valves from radiated heat generated by nearby heat sources.
5. Employ suitable protective measures in locations where there is contact with oil or welding spatter, etc.

Caution
1. Avoid using in a place where there is splashing oil, coolant, or water. In addition, avoid using where dust may adhere to it.

Warning
1. Perform maintenance procedures as shown in the instruction manual.

Caution
1. Design and prepare the buttons in accordance with instruction manuals and European directives [Safety of machinery - Two handed control equipment - Functionality aspects - Design principle] (EN574)

Caution on Preparing the Buttons for Manipulation
1. If the manipulating buttons are incorrectly arranged, an unexpected motion is likely to occur and the safety cannot be maintained.

Caution on Piping Length in the Outlet Side
1. When the outlet side piping length of the VR51 series is extremely long or the piping capacity is large due to a branch, output from the A port may not occur when operation buttons are operated simultaneously because the outlet pressure slowly rises.

Maintenance
2. Do not repair the fittings or patch the tubing for reuse.
3. Drain flushing
   Remove drainage from air filters regularly.

Warning
1. During regular maintenance, check for the following and replace any components as necessary.
   a) Scratches, gouges, abrasion, corrosion
   b) Leakage
   c) Flattening or distortion of tubing
   d) Hardening, deterioration or softness of tubing

Caution
1. When the outlet side piping length of the VR51 series is extremely long or the piping capacity is large due to a branch, output from the A port may not occur when operation buttons are operated simultaneously because the outlet pressure slowly rises.

The applicable piping capacity for the outlet side of the VR51 is indicated by the tubing length of T0604 (I.D. ø4 mm). The outlet side piping length should be less than the values shown in the graph below.

Supply pressure and piping length at the outlet side

<table>
<thead>
<tr>
<th>Supply pressure (MPa)</th>
<th>0</th>
<th>0.2</th>
<th>0.4</th>
<th>0.6</th>
<th>0.8</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outlet piping length (m)</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

When the piping length is long and capacity is large due to a branch, install a speed controller (AS2051F-06, AS3001F-06, etc.) close to the A port of the VR51 in accordance with the below figure. Use the VR51 after adjusting properly to operate it.