



# Operation Manual

Steam Valve

PRODUCT NAME

VND Series

MODEL/ Series

**SMC Corporation**

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# Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)\*1), and other safety regulations.

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



## Danger

**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



## Warning

**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



## Caution

**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

## Warning

### **1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### **2. Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

### **3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### **4. Our products cannot be used beyond their specifications. Our products are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not covered.**

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, fuel equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.

3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.



# Safety Instructions

## Caution

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.

**Use in non-manufacturing industries is not covered.**

Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

## Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

### Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

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

\*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.



# VND Series Valves for Fluid Control Precautions 1

Be sure to read this before handling.

## 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. Ensure sufficient space for maintenance activities.

When installing the products, allow access for maintenance.

#### 3. Liquid rings

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

#### 4. Actuator drive

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

#### 5. Pressure (including vacuum) holding

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

#### 6. When an impact, such as water hammer, etc., caused by the rapid pressure fluctuation is applied, the 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 specified operating ranges in this catalog.

#### 2. Fluids

##### 1) Type of fluids

Before using a fluid, confirm whether it is compatible with the materials from each model by referring to the fluids listed in the catalog.

If there is something you do not know, please contact SMC.

##### 2) Corrosive gas

Cannot be used since it will lead to cracks by stress corrosion or result in other incidents.

3) When a bronze body is used, then depending on water quality, corrosion and internal leakage may occur. If such abnormalities occur, exchange the product for a stainless steel body.

#### 3. Fluid quality

The use of a fluid that contains foreign matter can cause problems such as malfunction and seal failure by promoting wear of the valve seat, and by transformation of valve element, etc. Install a suitable filter (strainer) immediately upstream from the valve. As a general rule, use 80 to 100 mesh.

When used to supply water to boilers, substances such as calcium and magnesium which generate hard scale and sludge are included. Since this scale and sludge can cause the valve to malfunction, install water softening equipment, and a filter (strainer) directly upstream from the valve to remove these substances.

#### 4. Air quality

##### 1) Use clean air.

Do not use compressed air that contains chemicals, synthetic oils including 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  $5\mu\text{m}$  or less should be selected.

##### 3) Install an aftercooler or air dryer, etc.

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

##### 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 malfunction.

Refer to SMC's Best Pneumatics catalog 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 certain that the fluid used does not touch the external surface of the product.

#### 6. Low temperature operation

1) The valve can be used in an ambient temperature of  $-5^{\circ}\text{C}$ .

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. Installation of a dryer, heat retaining of the body is recommended to prevent a freezing condition in which the dew point temperature is high and the ambient temperature is low, and the high flow runs.

#### 7. Do not disassemble the product or make any modifications, including additional machining.

It may cause human injury and/or an accident.

## Mounting

### Warning

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

After mounting is completed, confirm that it has been done correctly by performing a suitable function test. body only. They can cause the coil to burn out.

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

#### 3. Avoid sources of vibration, or adjust the arm from the body to the minimum length so that resonance will not occur.

#### 4. Painting and coating

Warnings or specifications printed or labeled on the product should not be erased, removed or covered up.



# VND Series Valves for Fluid Control Precautions 2

Be sure to read this before handling.

## Piping

### ⚠ Caution

#### 1. Preparation before piping

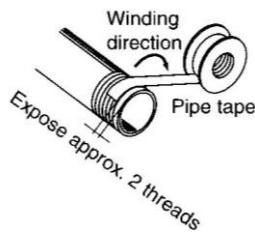
Before piping is connected, it should be thoroughly blow out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.

Install piping so that it does not apply pulling, pressing, bending or other forces on the valve body.

#### 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. Tighten threads with the proper tightening torque.

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

Tightening Torque for Piping

Connection thread	Proper tightening torque (N·m)
Rc1/8	7 to 9
Rc1/4	12 to 14
Rc3/8	22 to 24
Rc1/2	28 to 30
Rc3/4	28 to 30
Rc1	36 to 38
Rc1 1/4	40 to 42
Rc1 1/2	48 to 50
Rc2	48 to 50

#### 5. Connection of piping to products

When connecting piping to a product, refer to its operation 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.

## Operating Environment

### ⚠ Warning

1. Do not use in an atmosphere having corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these .
2. Do not use in explosive atmospheres.
3. Do not use in locations subject to vibration or impact.

#### 4. Do not use in locations where radiated heat will be received from nearby heat sources.

#### 5. Employ suitable protective measures in locations where there is contact with water droplets, oil or welding spatter, etc.

## Maintenance

### ⚠ Warning

#### 1. Removal of product

The valve will reach a high temperature when used with high temperature fluids. Confirm that the valve temperature has dropped sufficiently before performing work. If touched inadvertently, there is a danger of being burned.

- 1) Shut off the fluid supply and release the fluid pressure in the system.
- 2) Shut off the power supply.
- 3) Dismount the product.

#### 2. Low frequency operation

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

### ⚠ Caution

#### 1. 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 0.1MPa.
3. Clean strainers when the pressure drop reaches 0.1MPa.

#### 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 drainage from an air filter periodically.

## 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.
2. For pilot type 2-port valves, when the valve is closed, sudden pressure resulting from the startup of the fluid supply source (pump, compressor, etc.) may cause the momentary valve to open and leakage to occur, so please exercise caution.
3. When problems are caused by a water hammer, install water hammer relief equipment (accumulator, etc.).



# VND Series Valves for Fluid Control Specific Product Precautions 1

Be sure to read this before handling.

## External Pilot

### Caution

#### Piping of pilot port [12(P1), 10(P2)]

P1 and P2 piping should be as follows according to the model.

Port	VND□0□D	VND□02D
12(P1)	External Pilot	Bleed port
10(P2)	Bleed port	External Pilot

Installing a silencer to the exhaust port and the bleed port is recommended for noise reduction and for dust entry prevention.

## Piping

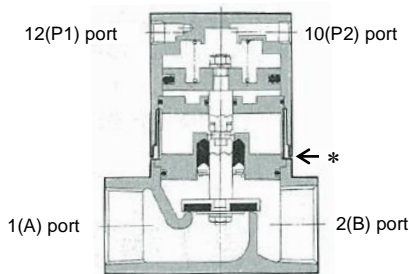
### Caution

To use the piping with a high temperature fluid, use heat resistant fittings and tubing (Self-align fittings, Fluoropolymer tubing, Copper piping, etc.).

## Adiabatic Space

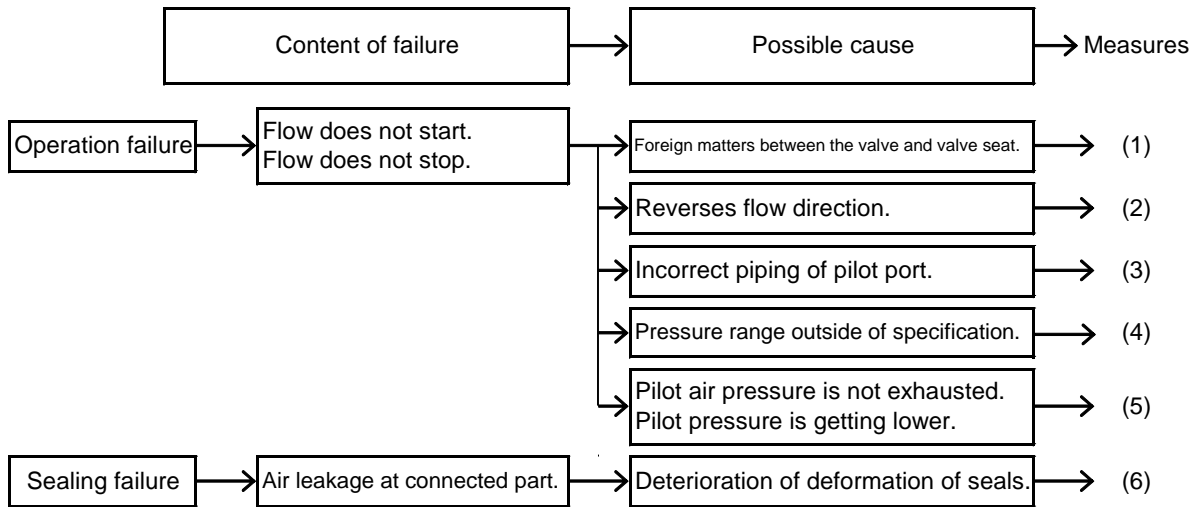
### Caution

There is a space between body and cover (\*: approximate 1 mm) for adiabatic effect.



## TROUBLESHOOTING

Check the possible cause according to the content of failure in order of possibility, and take measures.



## Measures

No.	Remedy
(1)	In case of intrusion of foreign matter, to remove foreign matter by air blow of piping and then replace valve.
(2)	Check the flow direction and connect piping.
(3)	Correct piping.
(4)	Adjust the pressure within the specification.
(5)	Check the pilot air valve and pilot air pressure.
(6)	Replace valve.

## Warning

Ensure the humidity at piping and the valve has declined sufficiently, and there is no pressure left in the system before replacing the solenoid valve.

If no improvement is achieved in spite of the above countermeasure, inside of the valve may have some abnormality. In this case, stop using the valve immediately.

If any of followings are carried out, inside of the valve may have some failure. In this case, stop using the valve immediately.

- Lubrication has been stopped intermediately, or lubrication was suspended temporary.
- Strong impact was given.
- Prohibited way of using the valve which is written at "Precautions" section in this operation manual was carried out excluding above-mentioned.

In addition, in the case of trouble, please send it back to the supplier for repair or replacement.



Revision history		
<b>B</b>	Renewal	oo
<b>C</b>	Safety Instructions	Po
<b>D</b>	Renewal	RP
<b>E</b>	Renewal	CU

<b>B</b>	Renewal	oo
<b>C</b>	Safety Instructions	Po
<b>D</b>	Renewal	RP
<b>E</b>	Renewal	CU

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.  
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