



Operation Manual

PRODUCT NAME

3 Port Solenoid Valve

MODEL / Series / Product Number

VT(O)325 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 relating to systems.

ISO 4413: Hydraulic fluid power -- General rules relating to systems.

IEC 60204-1: Safety of machinery -- Electrical equipment of machines .(Part 1: General requirements)

ISO 10218: Manipulating industrial robots -Safety.

etc.



Caution

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



Warning

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



Danger

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious 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. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

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

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



Safety Instructions

Caution

1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.

If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.

If anything is unclear, contact your nearest sales branch.

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 regulation 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.

Caution

SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.



VT325 Series 3 Port Solenoid Valve Precautions 1

Be sure to read this before handling products.

Design/Selection

Warning

1. Confirm the specifications.

This product is designed only for use in compressed air systems (including vacuum). Do not operate at pressures, temperatures, etc., beyond the range of specifications, as this can cause damage or malfunction. (Refer to the catalog)

Please contact SMC when using a fluid other than compressed air (including vacuum).

We do not guarantee against any damage if the product is used outside of the specification range.

2. Actuator drive

When an actuator, such as a cylinder, is to be driven using a valve, take appropriate measures (such as the installation of a cover or the restricting of access to the product) to prevent potential danger caused by actuator operation.

3. Effects of back pressure when using a manifold

Use caution when valves are used on a manifold because actuators may malfunction due to back pressure.

When a single acting cylinder is operated, take appropriate measures to prevent malfunction by using an individual exhaust manifold.

4. Holding pressure (including vacuum)

Since valves are subject to air leakage, they cannot be used for applications such as holding pressure (including vacuum) in a pressure vessel.

5. Not suitable for use as an emergency shutoff valve, etc.

The valves presented in this catalog are not designed for safety applications (e.g. emergency shutoff valve). If the valves are used in such applications, additional safety measures should be adopted.

6. Release of residual pressure

For maintenance and inspection purposes install a system for releasing residual pressure.

7. Operation in a vacuum condition

When a valve is used for switching a vacuum, take measures to install a suction filter or similar to prevent external dust or other foreign matter from entering inside the valve.

In addition, at the time of vacuum adsorption, be sure to supply a constant supply of vacuum. Failure to do so may result in foreign matter sticking to the adsorption pad or air leakage, causing the workpiece to drop.

8. Regarding vacuum switch valves and vacuum release valves

If a non-vacuum valve is installed in the middle of a piping system that contains a vacuum, the vacuum condition will not be maintained. Use a valve designed for use under vacuum conditions.

9. Ventilation

Provide ventilation when using a valve in a confined area, such as in a closed control panel. For example, install a ventilation opening, etc., in order to prevent pressure from increasing inside of the confined area and to release the heat generated by the valve.

10. Extended periods of continuous energization

Caution for high temperature

* The surface temperature of the valve may increase.

- If a valve will be continuously energized for an extended period of time, the temperature of the valve will increase due to the heat generated by the coil assembly. Therefore, when it is continuously energized for an extended period of time or when the energized period per day is longer than the de-energized period, use a continuous duty type valve.

Depending on the operating conditions, it may be possible to use other valves than the ones mentioned above. Please contact SMC for further information.

Additionally, the use of a valve with N.O. (normally open) specifications makes it possible to shorten the energized time.

- When the valve is mounted onto a control panel, take measures against heat radiation in order to keep the valve temperature within the specified range.

In particular, note that the temperature rise will be larger if three or more adjacent valves on the manifold are energized together for extended periods of time.

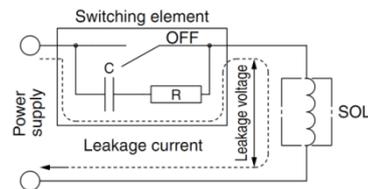
11. Do not disassemble the product or make any modifications, including additional machining.

Doing so may cause human injury and/or an accident.

Caution

1. Leakage voltage

Take note that the leakage voltage will increase when a resistor is used in parallel with a switching element or when a C-R circuit (surge voltage suppressor) is used for protecting a switching device because of the leakage voltage passing through the C-R circuit. The suppressor residual leakage voltage should be as follows.



DC coil 2% or less of the rated voltage

AC coil 15% or less of the rated voltage

2. Solenoid valve drive for AC with a solid state output (SSR, TRIAC output, etc.)

1) Current leakage

When using a snubber circuit (C-R element) for surge protection of the output, a very small amount of electrical current will continue to flow even during the OFF state.

This results in the valve not returning. In a situation where the tolerance is exceeded, as in the above case, take measures to install a bleeder resistor.

2) Minimum allowable load amount (Min. load current)

When the consumption current of a valve is less than the output's minimum allowable load volume or the margin is small, the output may not switch normally. Please contact SMC.



VT325 Series 3 Port Solenoid Valve Precautions 2

Be sure to read this before handling products.

Design/Selection

⚠ Caution

3. Surge voltage suppressor

If a surge protection circuit contains nonstandard diodes, such as Zener diodes or varistor, a residual voltage that is in proportion to the protective circuit and the rated voltage will remain. Therefore, take into consideration the surge voltage protection of the controller.

In the case of diodes, the residual voltage is approximately 1 V.

4. Operation in low temperature conditions

It is possible to operate the valve in extreme temperatures, as low as -10°C. Take appropriate measures to avoid the freezing of drainage, moisture, etc. in low temperatures.

5. Mounting orientation

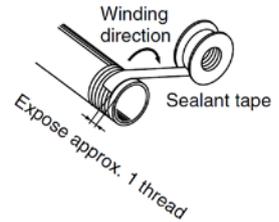
Mounting orientation is not specified.

6. Initial lubrication of main valve

Grease has been applied to the main valve as initial lubricant.

2. Winding of sealant tape

When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not enter the piping. Also, if sealant tape is used, leave 1 thread ridge exposed at the end of the threads.



3. Connection of fittings

For a fitting with sealant R or NPT, first, tighten it by hand, then use a suitable wrench for the hexagon flats of the body to tighten it a further two or three turns.

For a tightening torque guide, see the table below.

Connection thread size (R, NPT)	Proper tightening torque (N·m)
1/4	8 to 12
3/8	15 to 20

Mounting

⚠ Warning

1. Operation manual

Install the products and operate them only after reading the operation manual carefully and understanding its contents. Also, keep the manual where it can be referred to as necessary.

2. Ensure sufficient space for maintenance activities.

When installing the products, allow access for maintenance and inspection.

3. Tighten threads with the proper tightening torque.

When installing the products, follow the listed torque specifications.

4. 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.

5. Painting and coating

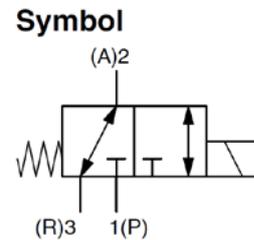
Warnings or specifications printed on or affixed to the product should not be erased, removed, or covered up.

Please consult with SMC before applying paint to resinous parts, as this may have an adverse effect due to the solvent in the paint.

4. Piping to products

When connecting piping to the product, refer to the catalog to avoid mistakes regarding the supply port, etc.

This product is universal porting type. N.C type, N.O. type, divider type and selector type can be used.



Wiring

⚠ Caution

1. Polarity

When connecting power to a solenoid valve with a DC specification and a light or surge voltage suppressor, pay attention to the polarity.

2. Applied voltage

When electric power is connected to a solenoid valve, be careful to apply the proper voltage. Improper voltage may cause malfunction or coil damage.

3. Check the connections.

Check if the connections are correct after completing all wiring.

4. External force applied to the lead wire

If an excessive force is applied to the lead wire, this may cause faulty wiring. Take appropriate measures so that a force of 30 N or more is not applied to the lead wire.

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.



VT325 Series 3 Port Solenoid Valve Precautions 3

Be sure to read this before handling products.

Lubrication

Warning

1. Lubrication

The valve has been lubricated for life by the factory and does not require any further lubrication.

If a lubricant is used in the system, use class 1 turbine oil (no additives), ISO VG32.

Once lubricant is utilized within the system, since the original lubricant applied within the product during manufacturing will be washed away, please continue to supply lubrication to the system. Without continued lubrication, malfunctions could occur.

If turbine oil is used, refer to the Safety Data Sheet (SDS) of the oil.

2. Lubrication amount

If too much oil is applied, it may accumulate in the product, causing malfunction or response delay. So, do not apply a large amount of oil.

Air Supply

Warning

1. Type of fluids

Please consult with SMC when using the product in applications other than compressed air.

2. When there is a large amount of drainage

Compressed air containing a large amount of drainage can cause the malfunction of pneumatic equipment. An air dryer or water separator should be installed upstream from filters.

3. Drain flushing

If condensation in the drain bowl is not emptied on a regular basis, the bowl will overflow. This may cause the malfunction of pneumatic equipment. If the drain bowl is difficult to check and remove, the installation of a drain bowl with an auto drain option is recommended.

For compressed air quality, refer to the SMC Best Pneumatics catalog No. 6.

4. Use clean air

Do not use compressed air that contains chemicals, synthetic oils that include organic solvents, salt, corrosive gases, etc., as it can cause damage or malfunction.

Caution

1. **When extremely dry air is used as the fluid, degradation of the lubrication properties inside the equipment may occur, resulting in reduced reliability (or reduced service life) of the equipment. Please consult with SMC.**

2. Install an air filter.

Install an air filter upstream near the valve. Select an air filter with a filtration size of 5 µm or smaller.

3. **Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.**

Compressed air that contains a large amount of drainage can cause the malfunction of pneumatic equipment, such as valves. Therefore, take appropriate measures to ensure air quality, such as by providing an aftercooler, air dryer, or water separator.

4. **If an excessive amount of carbon powder is present, 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 a valve and cause it to malfunction.

For compressed air quality, refer to the SMC Best Pneumatics catalog No. 6.

Operating Environment

Warning

1. **Do not use in an atmosphere containing corrosive gases, chemicals, sea water, water, water steam, or where there is direct contact with any of these.**
2. **Do not use in an environment where flammable gas or explosive gas exists. Usage may cause a fire or explosion. The products do not have an explosion proof construction.**
3. **Do not use in a place subject to heavy vibration and/or shock.**
4. **The valve should not be exposed to prolonged sunlight. Use a protective cover. Note that the valve is not for outdoor use.**
5. **Remove any sources of excessive heat.**
6. **If it is used in an environment where there is possible contact with oil, weld spatter, etc., exercise preventive measures.**
7. **When the solenoid valve is mounted in a control panel or it's energized for a long period of time, make sure the ambient temperature is within the specifications of the valve.**

Caution

1. Temperature of ambient environment

Use the valve within the range of the ambient temperature specification of each valve. In addition, pay attention when using the valve in environments where the temperature changes drastically.

2. Humidity of ambient environment

- When using the valve in environments with low humidity, take measures to prevent static.
- If the humidity rises, take measures to prevent the adhesion of water droplets on the valve.



VT325 Series

3 Port Solenoid Valve

Precautions 4

Be sure to read this before handling products.

Maintenance

Warning

- 1. Perform maintenance and inspection according to the procedures indicated in the operation manual.**

If handled improperly, human injury and/or malfunction or damage of machinery and equipment may occur.

- 2. Removal of equipment, and supply/exhaust of compressed air**

Before components are removed, first confirm that measures are in place to prevent workpieces from dropping, run-away equipment, etc. Then, cut off the supply air and electric power, and exhaust all air pressure from the system using the residual pressure release function.

When the equipment is operated after remounting or replacement, first confirm that measures are in place to prevent the lurching of actuators, etc. Then, confirm that the equipment is operating normally.

- 3. Low-frequency operation**

Valves should be operated at least once every 30 days to prevent malfunction. (Use caution regarding the air supply.)

- 4. Manual override**

When a manual override is operated, connected equipment will be actuated.

Operate only after safety is confirmed.

- 5. If the volume of air leakage increases or the valve does not operate normally, do not use the valve.**

Perform periodic maintenance on the valve to confirm the operating condition and check for any air leakage.

Caution

- 1. Drain flushing**

Remove drainage from the air filters regularly.

- 2. Lubrication**

In the case of rubber seals, once lubrication has been started, it must be continued.

Use class 1 turbine oil (with no additives), VG32. If other lubricant oil is used, it may cause a malfunction.



VT325 Series

Specific Product Precautions (1)

Be sure to read this before handling the products.

How to Use DIN Terminal

1. Disassembly

- 1) After loosening the screw (1), then if the housing (4) is pulled in the direction of the screw (1), the connector will be removed from the body of equipment (solenoid, etc.).
- 2) Pull out the screw (1), then remove the gasket (2).
- 3) On the bottom part of the terminal block (3), there's a cut-off part (indication of an arrow) (3a). If a small flat head screwdriver is inserted between the opening in the bottom, terminal block (3) will be removed from the housing (4). (Refer to graph at right.)
- 4) Remove the cable gland (5) and plain washer (6) and rubber seal (7).

2. Wiring

- 1) Pass the cable (8) through the cable gland (5), washer (6), rubber seal (7), in this order and then insert them into the housing (4).
- 2) Dimensions of the cable (8) are as shown in the right figure. Skin the cable and crimp the crimped terminal (9) to the edges.
- 3) Remove the screw (3f) from the bracket (3e). (Loosen in the case of Y-shape type terminal.) As shown in the right figure, mount a crimped terminal (9), and then again tighten the screw (3f).

Note) Tighten within the tightening torque of 0.5 N·m \pm 15%.

Note: a) It is possible to wire even in the state of bare wire. In that case, loosen the screw (3f) and place a lead wire into the bracket (3d), and then tighten it once again.

b) The maximum size for the round terminal (9) is 1.25 mm² - 3.5 and for the Y terminal is 1.25 mm² - 4.

c) Cable (8) outside diameter: ϕ 6 to ϕ 12 mm

Note) For the one with outside diameter ranged between ϕ 9 to ϕ 12 remove the inside parts of the rubber seal (7) before using.

3. Assembly

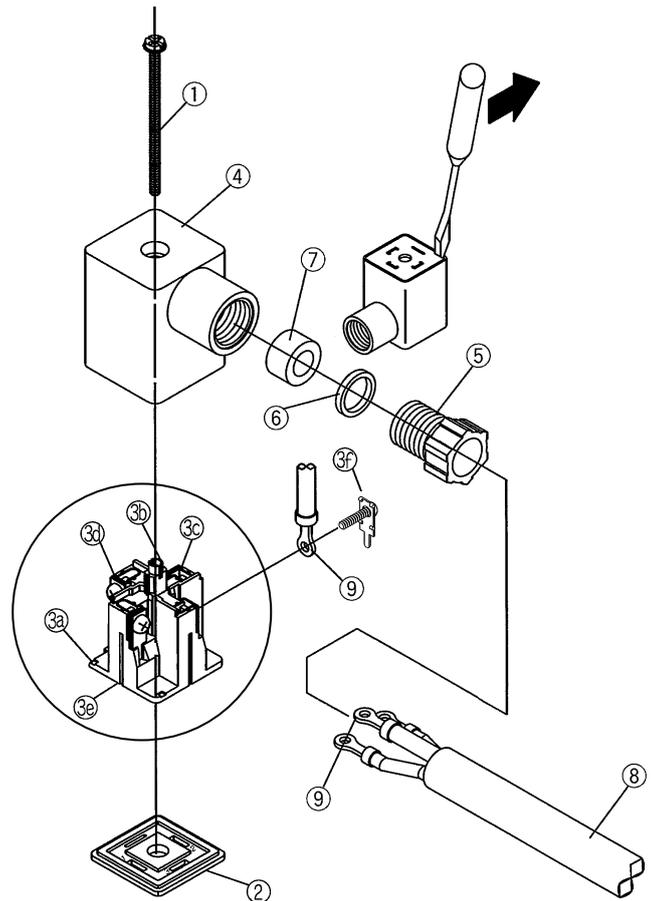
- 1) Terminal block (3) connected with housing (4) should be reinstated. (Push it down until you hear the click sound.)
- 2) Putting rubber seal (7), plain washer (6), in this order into the cable introducing slit on the housing (4), then further tighten the cable gland (5) securely.
- 3) By inserting gasket (2) between the bottom part of the terminal block (3) and a plug on an equipment, screw in (1) on top of the housing (4) and tighten it.

Note) Tighten within the tightening torque of 0.5 N·m \pm 20%.

Changing the entry direction

The cable entry direction of a connector can be changed as desired (4 directions at 90° intervals), depending on the combination of a housing (4) and a terminal block (3).

Exploded view



Wiring

If the rated voltage for the solenoid valve is DC type, connect the terminal No.1 to the positive (+) side and No.2 to the negative (-) side.

Connector for DIN Terminal

Description	Part no.
DIN connector	GDM2C



VT325 Series

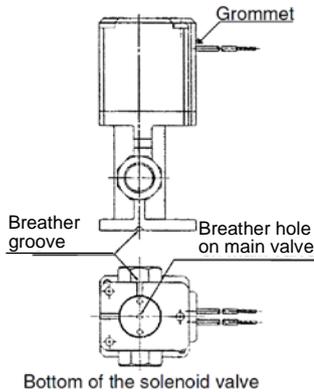
Specific Product Precautions (2)

Be sure to read this before handling the products.

Breathing hole

Caution

- The bottom of the solenoid valve has a breather hole for the main valve. Take proper measures to prevent this hole from being blocked as this will lead to a malfunction.
- Ordinarily, when the solenoid valve is mounted on a metal surface, it can breathe through the breather hole, via the breather groove. However, in particular, if the surface to be mounted is made of the rubber, the rubber could deform and block the hole.



- Make sure that dust and/or other foreign materials do not enter the valve from the unused port (e.g. exhaust port). The grommet portion contains a breather hole for the core. Take proper measures to prevent dust or foreign matter from accumulating in this area.

Lead wire color (Grommet type, conduit)

Voltage	Color
100 VAC	Blue
200V AC	Red
DC (With surge voltage suppressor)	Red (+), Black (-)
Other	Gray

* For "Nil: W/O light/surge voltage suppressor" with DC specification, there is no polarity.

Valve Option

1. For vacuum (VT/O325V: Valve specification V)

Operating pressure range	-101.2 kPa to 0.1 MPa
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This vacuum model has less air leakage than the standard model under low pressure. It is recommended for vacuum application.

Caution

- Since this valve has slight air leakage, it cannot be used for holding vacuum (including positive pressure holding) in the pressure container.

2. With surge voltage suppressor, with indicator light

Surge Voltage Suppressor

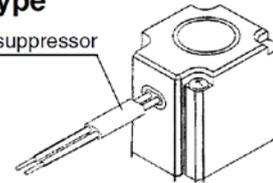
	AC	DC
Grommet (GS)		
Conduit (CS)		
Conduit terminal (TS)		

Circuit for Indicator Light

	AC	DC
DIN terminal with indicator light (DL)		
Conduit terminal with indicator light (TL)		

Grommet type

Surge voltage suppressor

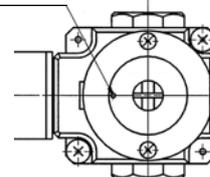


3. Manual override with lock

(VT/O325*-*-M: Valve specification M)

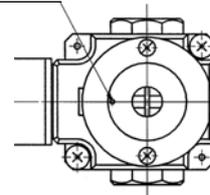
- Using a screwdriver, push the manual override button that is located in the head portion of the solenoid valve in order to directly push the spool valve downward, thus causing the valve to switch.
- With the button remaining pushed down, turn it approximately 90° clockwise or counterclockwise to maintain the manual override locked state.
- To revert to the original state, keep the button pushed down and turn it approximately 90° clockwise.

Engagement mark



Normal condition (Unlocked)

Engagement mark



Locked

Manifold specification

Manifold

For more than 4 stations, supply air from both P ports and exhaust air from both R ports.



VT325 Series

Specific Product Precautions (3)

Be sure to read this before handling the products.

Mounting

Warning

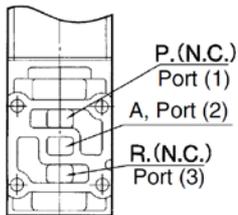
When mounting valves on the manifold base, the mounting orientation is decided. If it is mounted in the wrong direction, connected equipment may malfunction.

Caution

Changing from N.C. to N.O.

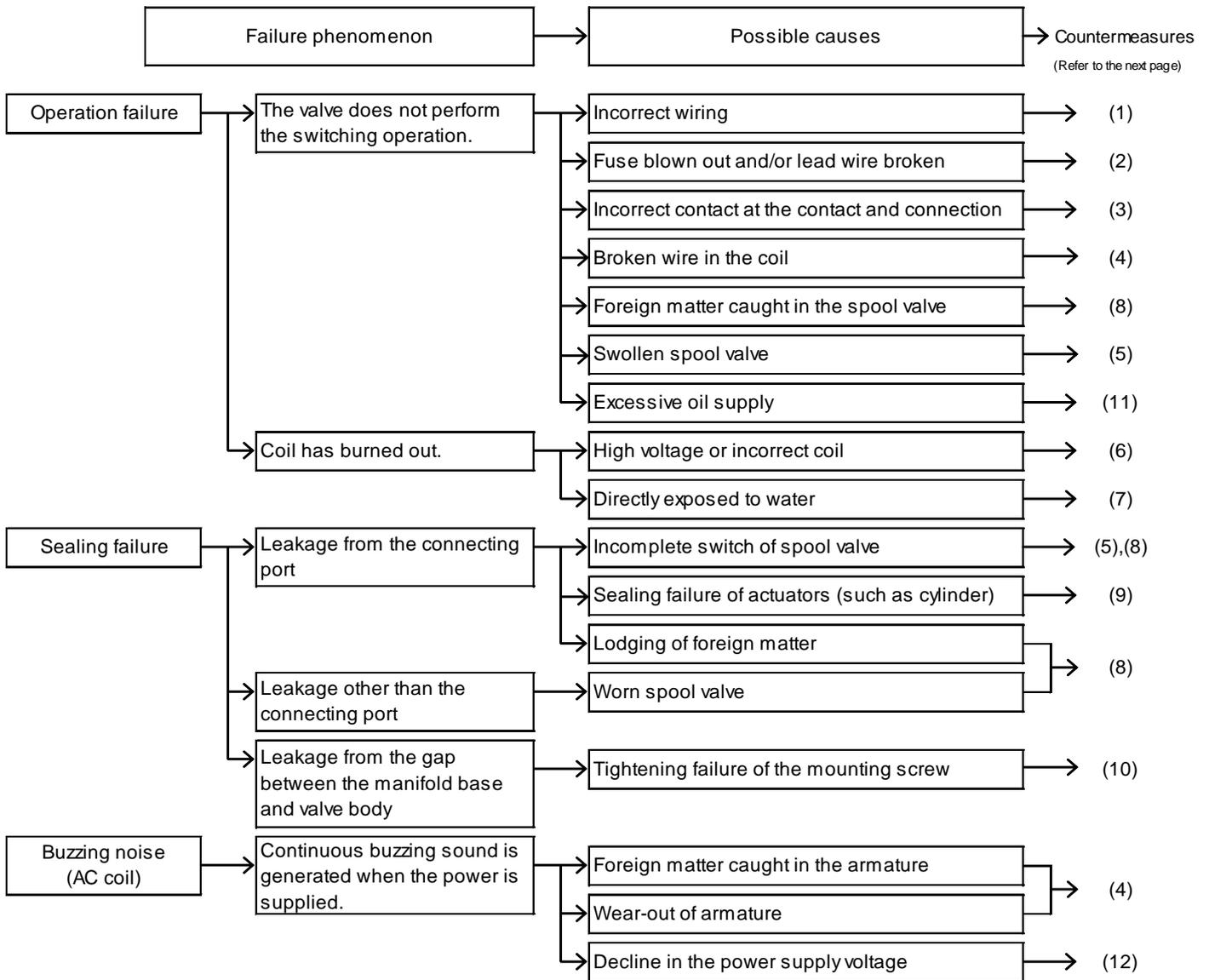
The valves are assembled as N.C. valves at the time of shipment. By removing the two retaining screws from the desired valves, and rotating each valve body 180° and reassembling it on the manifold base, it is possible to reassemble an N.C. valve as an N.O. valve. (When doing so, make sure that a gasket is attached to the mounting surface of the valve.) Properly tighten the screws. The tightening torque of the retaining screws is 3 N·m.

A single valve unit port location



Troubleshooting

Perform troubleshooting with higher possibility based on the failure phenomenon.



Countermeasures

No.	Countermeasures
(1)	Connect wires correctly.
(2)	Replace the part or valve.
(3)	Replace the parts or connect wires correctly.
(4)	Replace the valve.
(5)	<ul style="list-style-type: none"> • If incorrect oil has been used for lubrication, remove the oil with air blow, and replace the valve with a new one. If a lubricant is used in the system after replacing the valve, use turbine oil Class 1 (with no additive) ISO VG32. • If there is a large amount of condensate or condensate cannot be removed completely, mount an auto drain or install a dryer and replace the valve.
(6)	Check the voltage and replace the valve.
(7)	Protect the valve especially the coil to prevent it from being exposed to water.
(8)	If air leakage is caused by foreign matter, remove foreign matter in the piping by air blow and replace the valve.
(9)	Repair or replace the actuators.
(10)	Stop the air and ensure that the mounting screws are correctly tighten
(11)	Reduce the amount of lubrication to the amount at which the oil does not splash from the exhaust port (R port).
(12)	Adjust the voltage so that voltage during operation will satisfy the specification.

If the countermeasures above are not effective, there may be a problem with the valve. Stop using the valve immediately.

If any of the examples below are applicable, there may be an internal problem with the valve. Stop using the valve immediately.

1. The voltage used was not the rated voltage.
2. The oil supplied was not the specified type.
3. Lubrication was stopped during operation or lubrication was interrupted temporarily.
4. The product was directly exposed to water.
5. Severe impact was applied.
6. Foreign matter such as condensate or dust has entered the product.
7. Other than those specified, if precautions on the operation manual apply.

* If the product has failed, then please return the valve as it is.

Revision history		
A	Renewal	PS
B	Renewal	WQ

1st printing: KS

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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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No.VT325**-OMK0002-B