



# Operation Manual

Solenoid Valve

PRODUCT NAME

VQZ 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 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 10218-1992: Manipulating industrial robots -- Safety



## 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

### **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.\*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.



# Precautions for 3/5 Port Solenoid Valve ①

Be sure to read before handling. Refer to main text for detailed precautions on every series.

## Design / Selection

### ⚠ Warning

#### 1. Confirm the specification

Products represented in this instruction manual are designed only for use in compressed air systems (including vacuum).

#### 2. Actuator drive

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

#### 3. Intermediate stopping

For 3-position closed center type, it is difficult to make a piston stop at the required position accurately due to the compressibility of air. Furthermore, since valves and cylinders are not guaranteed for zero air leakage, it may not be possible to hold a stopped position for an extended period of time. Please contact SMC if it is necessary to hold a stopped position for an extended period of time.

#### 4. Effect of back pressure when using a manifold.

Use caution when valves are used on a manifold, because an actuator may malfunction due to back-pressure. For 3-position exhaust center valve or single acting cylinder, take appropriate measures to prevent the malfunction by using it with an individual EXH spacer assembly, a back pressure check valve or an individual exhaust manifold.

#### 5. Holding of pressure (including vacuum).

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

#### 6. Not suitable for use as an emergency shut-off valve, etc.

The valves listed in this catalog are not designed for safety applications such as an emergency shutoff valve. If the valves are used for the mentioned applications, additional safety measures should be adopted.

#### 7. Release of residual pressure

For maintenance purposes install a system for releasing residual pressure. Especially in the case of 3-position closed center valve or double check valve type, ensure that the residual pressure between the valve and the cylinder is released.

#### 8. 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 vacuum at all times. Failure to do so may result in foreign matter sticking to the adsorption pad, or air leakage causing the workpiece to drop.

#### 9. Regarding a vacuum switch valve and a vacuum release valve.

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

#### 10. Double solenoid type

When using the double solenoid type for the first time, actuators may travel in an unexpected direction depending on the switching position of the valve. Implement measures to prevent any danger from occurring when operation the actuator.

#### 11. 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.

#### 12. Extended periods of continuous energization

· 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. This will likely adversely affect the performance of the solenoid valve and any nearby peripheral equipment. Therefore, when it is continuously energized or the energized period per day is longer than the de-energized period use either: DC specification, power-saving type. In addition, it is possible to shorten the energized time by making a valve with an N.O. (normally open) specification.

· For applications such as mounting a valve on a control panel, incorporate measure to limit the heat radiation so that the temperature will be high when a 3 station manifold.

#### 13. Do not disassemble the product of make any modifications, including additional machining.

It may cause human injury and/or an accident.

### ⚠ Caution

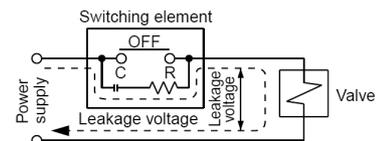
#### 1. Momentary energization

If a double solenoid valve is operated with momentary energization, it should be energized for at least 0.1 second. However, depending on the condition of the secondary load, it should be energized until the cylinder reaches the stroke and position, since there is a possibility of malfunction.

#### 2. Leakage voltage

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

The suppressor residual leakage voltage should be as follows.



DC coil

Should be 3% or less of the rated voltage.

AC coil

Should be 8% or less of the rated voltage.



## VQZ Series

# Precautions for 3/5 Port Solenoid Valve ②

Be sure to read before handling. Refer to main text for detailed precautions on every series.

### 3. Solenoid valve drive for AC with 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 the 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.

### 4. 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.

### 5. Surge voltage intrusion

With non-polar type solenoid valves, at times of sudden interruption of the loading power supply, such as emergency shutdown, surge voltage intrusion may be generated from loading equipment with a large capacity (power consumption), and the solenoid valve in a de-energized state may switch over (see Figure 1). When installing a breaker circuit for the loading power supply, consider using a solenoid valve with polarity protection diode, or install a surge absorption diode between the larding equipment COM line and the output equipment COM line (see Figure 2).

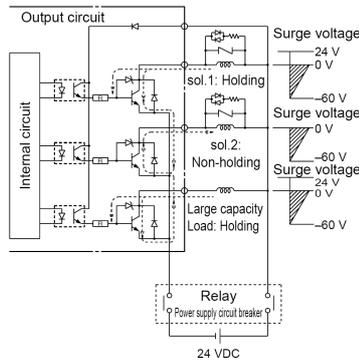


Figure 1. Surge intrusion circuit example (NPN outlet example)

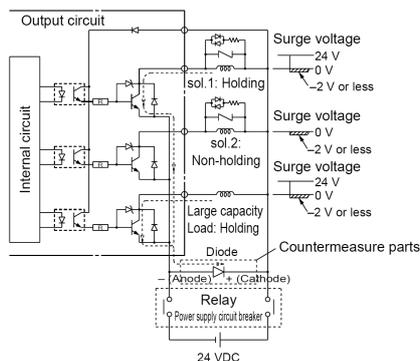


Figure 2. Surge intrusion circuit example (NPN outlet example)

### 6. Operation in a low temperature condition

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

### 7. Operation for air blowing

When using a solenoid valve for air blowing, use an external pilot type. Use caution because the pressure drop caused by the air blowing can have an affect on the internal pilot type valve and external pilot type valves are used on the same manifold.

Additionally, when compressed air within the pressure range of the established specifications is supplied to the external pilot type valve's port, and a double solenoid valve is used for air blowing, the solenoids should normally be energized when air is being blown.

### 8. Mounting orientation

Rubber seal : Refer to the specifications of each series. Please consult with SMC for models not indicated in the specification column.

Metal seal : Mounting orientation is necessary. When installing a double solenoid or a 3-position configuration, mount the valve so that spool valve is horizontal.

## 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.

#### 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 operated 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 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.



## VQZ Series

# Precautions for 3/5 Port Solenoid Valve ③

Be sure to read before handling. Refer to main text for detailed precautions on every series.

### Piping

#### ⚠ Caution

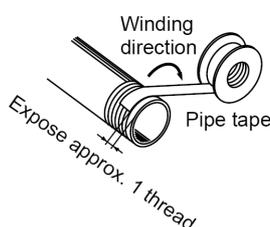
1. Refer to the Fittings and Tubing Precautions for handling one-touch fittings.

2. 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.

3. Wrapping of pipe 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 pipe tape is used, leave 1 thread ridges exposed at the end of the threads.



4. Closed center and double check valve types

For closed center type, check the piping to prevent air leakage from the piping between the valve and the cylinder.

5. Connection of fittings

When screwing fittings into valves, tighten as follows.

(1) Follow the procedures below when installing an SMC fitting, etc.

1) M3 types

After tightening the fitting by hand, use a wrench to tighten the fitting an additional approximately 1/4 turn. As a reference value, tightening torque is 0.4 to 0.5N·m.

Note) If tightened excessively, the thread of the product may break or the gasket may deform. If tightened insufficiently, the thread of the product may become loose. In either case, air leakage can occur.

2) M5 types

After tightening the fitting by hand, use a wrench to tighten the fitting a additional approximately 1/6 to 1/4 turn. As a reference value, tightening torque is 1 to 1.5 N·m.

(2) Follow the procedure of the manufacture when fittings other than SMC is used.

2) Rc type

Tighten with the proper torque shown below.

#### Tightening Torque for Piping Applicable

Screwing piping	Reasonable tightening torque N·m
Rc1/8	7~9
Rc1/4	12~14
Rc3/8	22~24

6. Piping to products

When piping to a product, refer to the instruction manual to avoid mistakes regarding the supply port, etc.

### Wiring

#### ⚠ Caution

1. Polarity

When connecting power to a solenoid valve with a DC specification and equipped with a light or surge voltage suppressor, check for polarity. If there is polarity, take note of the following.

**No diode to protect polarity.**

If a mistake is made regarding the polarity, damage may occur to the diode in the valve, the switching element in a control device or power supply equipment, etc.

**With diode to protect polarity.**

If polarity connection is wrong, the valve does not operate.

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.

### Lubrication

#### ⚠ Caution

1. Lubrication

[Rubber seal]

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

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

Once a lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away. If turbine oil is used, refer to the Material Safety Data Sheet (MSDS) of the oil.

[Metal seal]

1) There valves can be used without lubrication.

2) If a lubricant is used, refer to the Material Safety Data Sheet (MSDS) of the oil.

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

Lubricant manufacturer	Class 1 turbine oil (with no additive), ISO VG32
Idemitsu Kosan Co., Ltd.	Diana Fresia S32
Nippon Oil Corp.	Turbine Oil 32
Cosmo Oil Co., Ltd.	Cosmo Turbine 32
Japan Energy Corp.	Turbine 32
Kygnus Oil Co.	Turbine Oil 32
Fuji Kosan Co., Ltd.	Fucoal Turbine 32

Please contact SMC regarding class 2 turbine oil (with additives), ISO VG32.

### 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 malfunction of pneumatic equipment. An air dryer or water separator should be installed upstream from filters.



## VQZ Series

# Precautions for 3/5 Port Solenoid Valve ④

Be sure to read before handling. Refer to main text for detailed precautions on every series.

### Air Supply

#### 3. Drain flushing

If condensation in the drain bowl is not emptied on a regular basis, the bowl will overflow and allow the condensation to enter the compressed air lines. It causes malfunction of pneumatic equipment. If the drain bowl is difficult to check and remove, installation of a drain bowl with an auto drain option is recommended.

For compressed air quality, refer to SMC's Best Pneumatics catalog.

#### 4. Use clean air

Do not use compressed air that contains chemicals, synthetic oils including organic solvents, salt or corrosive gasses, 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 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 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 a valve and cause it to malfunction.

For compressed air quality, refer to SMC's Best Pneumatics catalog.

### 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. Products with IP65 enclosures (based on IEC60529) are protected against dust and water, however, these products cannot be used in water.
3. Products compliant to IP65 satisfy the specifications through mounting. Be sure to read the Precautions for each product.
4. 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.

5. Do not use in a place subject to heavy vibration and/or shock.
6. The valve should not be exposed to prolonged sunlight. Use a protective cover.
7. Remove any sources of excessive heat.
8. If it used in an environment where there is possible contact with oil, weld spatter, etc., exercise preventive measures.
9. When the solenoid valve is mounted in a control panel or its energized for a long time, make sure ambient temperatures is within the specification of the valve.

### Maintenance

### ⚠ Warning

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

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

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

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

For 3-position closed center type, exhaust the residual pressure between the valve and the cylinder.

When the equipment is operated after remounting or replacement, first confirm that measures are in place to prevent 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 operation**

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

Operate after safety is confirmed.

### ⚠ 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 additive), VG32 because if other lubricant oil is used, it may cause malfunction. Please contact SMC for suggested class 2 turbine oil class 2 (with additive), VG32.



## VQZ Series

### Precautions for 3/5 Port Solenoid Valve ⑤

Be sure to read before handling. Refer to main text for detailed precautions on every series.

#### How to Find the Flow Rate (at air temperature of 20 °C)

Subsonic flow when  $(P2+0.100)/(P1+0.100) > 0.5$

$$Q = 240S \sqrt{\Delta P (P1 + 0.100)}$$

Sonic flow when  $(P2+0.100)/(P1+0.100) \leq 0.5$

$$Q = 120S (P1 + 0.100)^{3/2}$$

Q: Air flow rate [dm<sup>3</sup>/min(ANR)]

S: Effective sectional area (mm<sup>2</sup>)

Δ P: Differential pressure P1- P2 [MPa]

P1: Upstream pressure [MPa]

P2: Downstream pressure [MPa]

※ Correction for different air temperatures

Multiply the flow rate calculated with the about formula by a coefficient from the table below.

Air temperature (°C)	-20	-10	0	10	30	40	50	60
Correction coefficient	1.08	1.06	1.04	1.02	0.98	0.97	0.95	0.94



# VQZ Series/Specific Product Precautions 1

Be sure to read this before handling

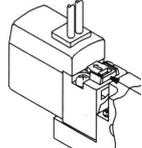
## Manual Override

### Warning

Without an electric signal for the solenoid valve the manual override is used for switching the main valve. Locking type (Tool required) is available as an option.

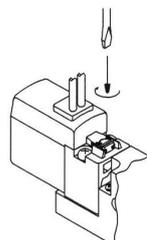
#### 1. For VQZ100

##### ■Non-locking push type



Press in the direction of arrow.

##### ■Locking slotted type (Tool required)

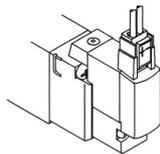


Turn clockwise 90°  
To lock it.

#### 2. For VQZ200/300/1000/2000/3000

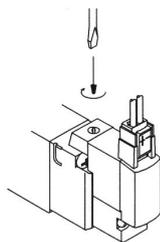
##### ■Push type (Tool required)

Push down on the manual override button with a small screwdriver until it stops. Release the screwdriver and the manual override will return.



##### ■Locking type (Tool required)

Push down completely on the manual override button with a small screwdriver. While down, turn clockwise 90° to lock it. Turn it counterclockwise to release it.



Locked position



Do not torque it more than required in case to operate a lock type manual.

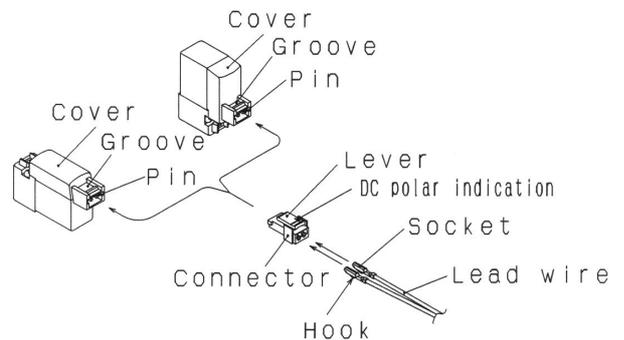
[Torque : 0.1N·m or less]

## How to Use Plug Connector

### Caution

#### 1. 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.

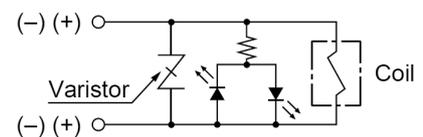


## Surge Voltage Suppressor

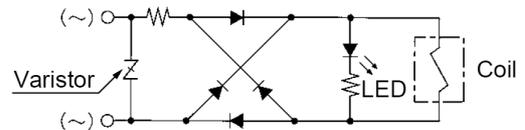
### Caution

#### L and M plug connector

<For DC>



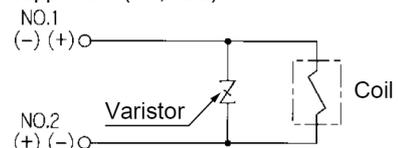
<For AC>



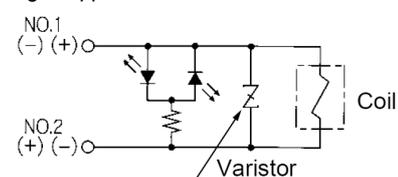
#### DIN terminal

<For DC>

With surge voltage suppressor (YS, YOS)



With light/surge voltage suppressor (YZ)





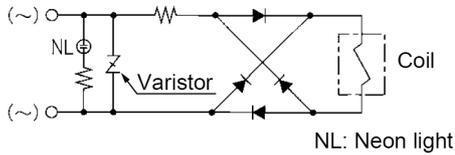
# VQZ Series/Specific Product Precautions 2

Be sure to read this before handling

## Surge Voltage Suppressor

<For AC>

With light (YZ)



Note) Surge voltage suppressor of varistor has residual voltage corresponding to the protective element and rated voltage ; therefore, protect the controller side from the surge voltage. The residual voltage of the diode is approximately 1V.

## Connection of Lead Wire

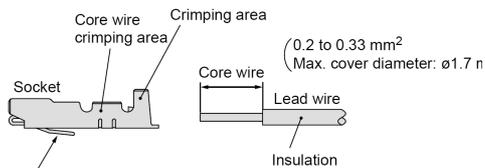
### Caution

Not necessary if ordering the lead wire pre-connected model.

#### Crimping of lead wires and sockets

Peel 3.2 to 3.7mm of the tip of lead wire, enter the core wires neatly into a socket and crimp it with a special crimp tool. Be careful so that the cover of lead wire does not enter into the crimping part.

Crimping tool : Model no. DXT170-75-1



Crimping tool part no. DXT170-75-1

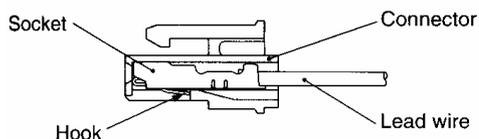
#### Connection/Disconnection of Socket with lead Wire

##### 1. Connection

Insert a socket into the square hole (Indicated as +,-) of connector, push the lead wire in and it by hanging the hook of socket to the seat of connector.(Pushing-in can open the hook and lock it automatically.) Then confirm the lock by lightly pulling on the lead wire.

##### 2. Disconnection

For pulling-out the socket from the connector, pull out the lead wire by pushing the hook on the socket with a stick with a fine point (approx. 1mm ). If the socket is to be re-used, spread the hook to the outside.



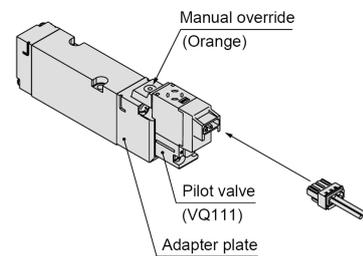
## Replacement of the pilot valve

### Caution

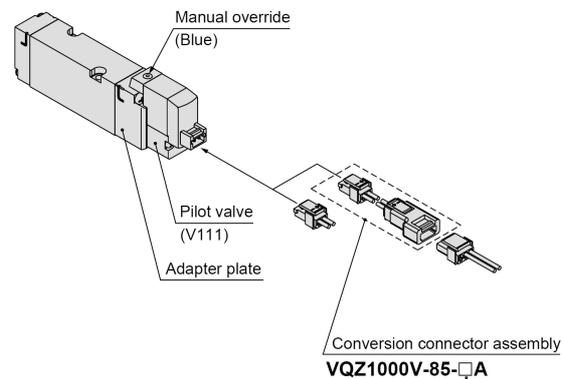
When replacing a conventional type valve with a new type for maintenance or other reasons, a "conversion connector assembly" is necessary to convert the connector from 3 terminals to 2 terminals and must be ordered separately. (When ordering, refer to the below part nos.)

For pilot valves, there is no compatibility between the conventional type and new type. When replacing a pilot valve, be sure to confirm whether it is the new type or the conventional type.

[Conventional]



[New]



#### Coil voltage

1	24/12 VDC
2	100 VAC
3	200 VAC
4	Other AC voltages



# VQZ Series/Specific Product Precautions 3

Be sure to read this before handling

## How to Use DIN Terminal

Conforming to ISO#: EN-175301-803C (Former DIN 43650C)  
(8 mm between pins)

The DIN terminal type with an IP65 enclosure is protected against dust and water, however, it must not be used in water.

### Connection

1. Loosen the holding screw and pull the connector out of the solenoid valve terminal block.
2. After removing the holding screw, insert a flat head screwdriver, etc. into the notch on the bottom of the terminal block and pry it open, separating the terminal block and the housing.
3. Loosen the terminal screws (slotted screws) on the terminal block, insert the cores of the lead wires into the terminals according to the connection method, and fasten them securely with the terminal screws.
4. Secure the cord by fastening the ground nut.

### Changing the entry direction

After separating the terminal block and housing, the cord entry can be changed by attaching the housing in the desired direction (4 directions at 90° intervals)

\*When equipped with a light, be careful not to damage the light with the cord's lead wires.

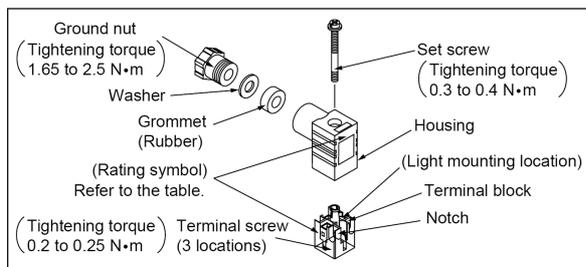
### Precautions

Plug in and pull out the connector vertically without tilting to one side.

### Compatible cable

Cord O.D.:  $\phi$  3.5 to  $\phi$  7

(Reference) 0.5mm<sup>2</sup>, 2-core or 3-core, equivalent to JIS C 3306

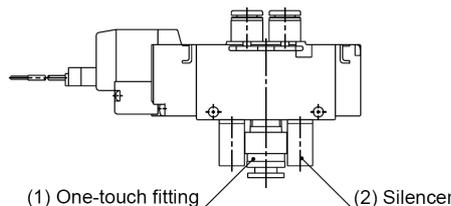


## Fitting and Silencer Part No. for P,R Ports When Using Valve as an Individual Unit

Part no. for One-fitting for 1(P) port and Silencer for 3(R2,R), 5(R1) port.

Series	(1) One-touch fitting for 1(P) port	(2) Silencer for 3(R2,R), 5(R1) port	
		Silencer	One-touch fitting
VQZ100/1000	KQ2H06-M5	AN120-M5	KJS04-M5
VQZ200/2000	KQ2S06-01S	INA-25-46	IN-457-32 (for $\phi$ 6)
VQZ300/3000	KQ2H08-02S	AN101-01	KQ2H06-01S

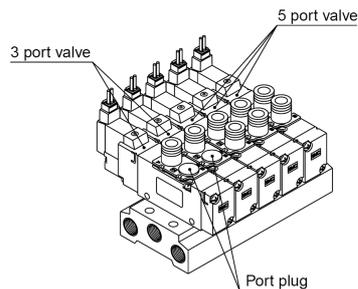
The diameter of the above fitting and silencer is the maximum diameter to in the EXH. port.



## Mounting 3 Port Valve on 5 Port Manifold

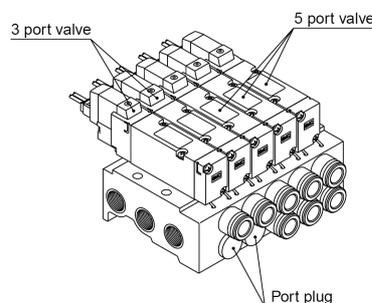
### Body Ported (VQZ $\frac{1}{3}$ 82 $\frac{0}{1}$ .N.C./VQZ $\frac{1}{3}$ 92 $\frac{0}{1}$ .N.O.)

Even though 3 port valves have the same construction as the 5 port single solenoid valves, the port plug is installed in the 2(B) port for N.C. type, and 4(A) port or N.O. type. By changing the port plug into a fitting, it can be used as the 5 port single solenoid valves, too.



### Base Mounted (VQZ $\frac{1}{3}$ 85 $\frac{0}{1}$ .N.C./VQZ $\frac{1}{3}$ 95 $\frac{0}{1}$ .N.O.)

3 port valves have the same external appearance as the 5 port valves. When using this type, 4(A) port on the 3 port valves can be used as 4(A) port on the 5 port valves' manifold, too. Besides, there's no problem, even though 2(B) port can be either plugged or unplugged.



When port plug is used on 2(B) port, indicate CM in manifold port no. and port size, and specify the port plug location in the manifold specification sheet.



# VQZ Series/Specific Product Precautions 4

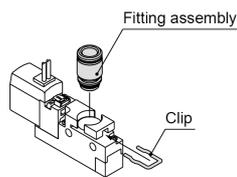
Be sure to read this before handling

## Changing the One-touch fitting

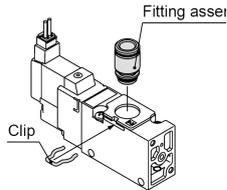
### ⚠ Caution

The built-in fittings on the manifold can be changed easily. Clip prevents the fittings to come off. After removing the corresponding valve and take out the clip with a screwdriver, etc., then replace the fittings. About mounting the fittings, after inserting the fitting until it stops, then put the clip into the prescribed position.

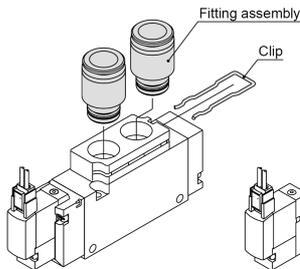
<VQZ100•300>



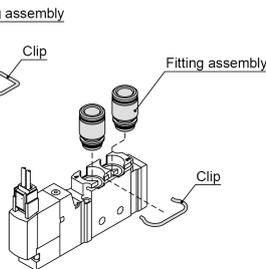
<VQZ200>



<VQZ1000/2000>



<VQZ3000>

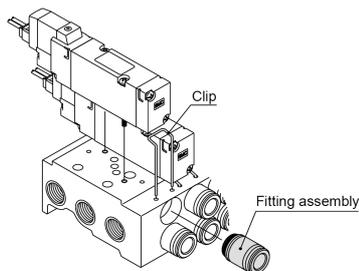


VQZ3000

VQZ1000/2000

VQZ200/1000/2000: Horizontally clipped to the valve body.  
VQZ100/300/3000: Vertically clipped to the valve body.

<For manifold>



### Precautions

When polling the fitting assembly away from the valve base, remove the clip, then connect a tube or plug (KQ2P-□□) with the One-touch fitting and pull it out holding the tube or plug. Do not hold the release bushing to avoid damage.

## DIN Rail Removal/Mounting

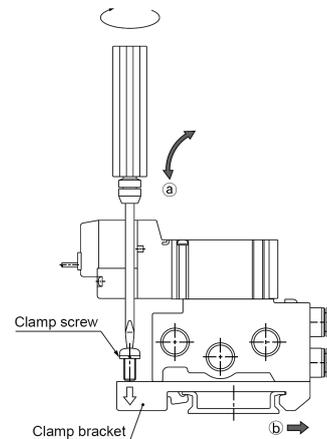
### ⚠ Caution

#### Removing

- 1) Loosen the clamp screw of both clamp metal fitting.
- 2) Lift the ① side of the manifold off the DIN rail and slide it in the direction.

#### Mounting

- 1) Catch the hook of the DIN rail bracket on the ② side on the DIN rail.
- 2) Push side ① onto the DIN rail and tighten the clamp screw. The proper tightening torque for screws is 0.3 to 0.4 N·m.

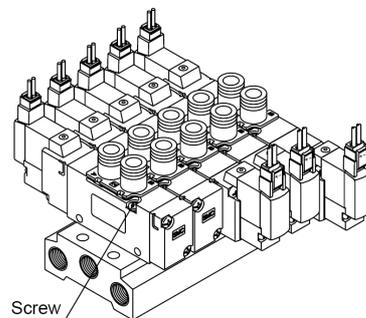


## Valve Mounting

### ⚠ Caution

After confirming the gasket is correctly placed under the valve, securely tighten the bolts with the proper torque shown in the table below.

Model	Proper tightening torque
VQZ100	0.13~0.19N·m
VQZ1000	0.18~0.25N·m
VQZ200•2000	0.25~0.35N·m
VQZ300•3000	0.5~0.7N·m





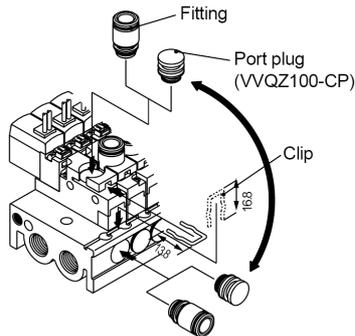
# VQZ Series/Specific Product Precautions 5

Be sure to read this before handling

## How to Change Piping Direction for VQZ100

### 1. How to replace the port direction

Fitting and port plug are modules. After removing the clip with a flat head screwdriver, take out the fitting and port plug. The piping direction (side or top) can be altered by exchanging the fitting and port plug. During exchange, insert the fitting and the port plug until they contact the wall, then, insert the clip to specified position.

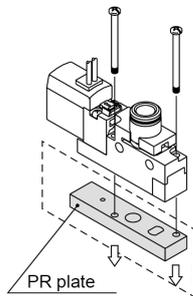


#### Precautions

The clip length for the valve and the base are different. Fitting may detach if the incorrect clip is used.

### 2. Valve piped on top can be operated independently by using PR plate.

(Refer to the below part numbers when placing an order.)



VQZ100-12A (Standard)  
VQZ100-12B (External pilot type)  
\* 2 set screws are included.

## Serial wiring EX510 precautions

### Design/Selection

#### Warning

##### 1) Use within the allowable voltage range.

Using beyond the allowable voltage range is likely to cause the units and connection devices to be damaged or to malfunction.

##### 2) Do not use beyond the specification range.

Using beyond the specification range is likely to cause a fire, malfunction, or breakdown in the units and connecting devices. Check the specifications before handling.

##### 3) Establish a backup system beforehand, which employs fail-safe concepts such as multiple equipment and devices to prevent breakage or malfunction of this product.

##### 4) Provide external emergency stop circuit that will immediately stop an operation and cut off the power supply.

##### 5) When using for an interlock circuit :

\*Provide a double interlock which is operated by another system (such as mechanical protection function).

\*Perform an inspection to check that it is working properly because it can cause possible injuries.

#### Caution

##### 1. Keep the surrounding space free for maintenance.

When designing a system, take into consideration the amount of free space needed for performing maintenance.

##### 2. Use the following UL approved products for DC power supply combinations.

(1) Controlled voltage current circuit conforming to UL508 Circuit uses the secondary coil of an isolated transformer as the power supply, satisfying the following conditions.

·Max. voltage (with no load) :

30 Vrms (42.4 V at peak) or less

·Max. current :

(1). 8 A or less (including shorts), and

(2).When controlled by circuit protector (fuse, etc.) with the following rating

No-load voltage (V peak)	Max. current rating
0 to 20 [V]	5.0
Over 20 [V] to 30 [V]	100 Peak voltage value

(2) A circuit (Class 2 circuit) with maximum 30 Vrms (42.4V peak) or less, and a power supply consisting of a class 2 power supply unit conforming to UL1310, or a class 2 transformer conforming to UL1585.

##### 3. This product is one of the components to be equipped into a final equipment. Confirm the adaptability to the EMC directive as the whole equipment by customers themselves.

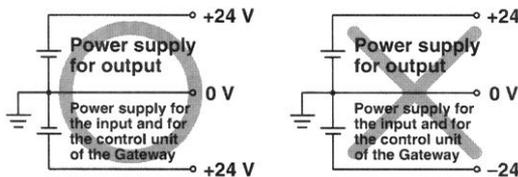


# VQZ Series/Specific Product Precautions 6

Be sure to read this before handling

## Design/Selection

4. The power supply for the Gateway unit should be 0V as the standard for both power supply for outputs as well as inputs and for the control unit of the Gateway.



## Mounting

### Caution

1. **Do not drop, bump, or apply excessive impact.**  
Otherwise, the unit can become damaged, malfunction, or fail to function.
2. **Hold the body while handling this product.**  
Otherwise, the unit can become damaged, malfunction, or fail to function.
3. **Observe the tightening torque range.**  
Tightening outside of the allowable torque range will likely damage the product.
4. **Do not install a unit in a place where it can be used as a scaffold.**  
Applying any excessive load such as stepping on the unit by mistake or placing a foot on it, will cause it to break.

## Wiring

### Warning

1. **Avoid miswiring.**  
If miswired, there is a probability of damaging units or connecting devices.
2. **Do not wire while energizing the product.**  
It is likely to damage the units or connecting devices.
3. **Avoid wiring the power line and high pressure line in parallel.**  
Noise or surge produced by signal line resulting from the power line or high pressure line could cause a malfunction. Wiring of the reduced-wiring system and the power line or high pressure line should be separated from each other.
4. **Confirm the wiring insulation.**  
Inferior insulation (contact with other circuit, insulation between terminals, etc.) will likely cause damage to the units or connecting devices due to excessive voltage or the influx of current.

### Caution

1. **Take measures to avoid applying repeated bending force or pulling force to the cable.**  
Also, pay attention not to place any heavy matter on the cable or clipping. It is likely to cause a broken wire.

2. **Confirm grounding to maintain the safety or the reduced wiring system and for anti-noise performance.**

Grounding should be close to units and keep the grounding distance short.

## Operating Environment

### Warning

1. **Do not use this product in the presence of dust, particles, water, chemicals, and oil.**  
Use with such materials is likely to cause a malfunction or breakage.
2. **Do not use this product in the presence of a magnetic field.**  
Use in such an environment is likely to cause a malfunction.
3. **Do not use this product in an atmosphere containing an inflammable gas, explosive gas, or corrosive gas.**  
Use in such an atmosphere is likely to cause a fire, explosion, or corrosion.  
This reduced-wiring system is not explosion-proof.
4. **Do not use this product in places where there are cyclic temperature changes.**  
In case that the cyclic temperature changes, the internal unit is likely to be adversely effected.
5. **Do not use this product in places where there is radiated heat around it.**  
Such a place is likely to cause a malfunction or breakage.
6. **Do not use this product near sources that generate a surge which exceeds the benchmark test, even though this product is CE-marked certified.**  
The internal circuit components are likely to deteriorate or become damaged when there are equipment (solenoid type lifter, high frequency guided furnace, motor, etc.) which generate a large surge around the reduced-wiring system. Take measures to prevent an electrical surge and avoid having the wires touch each other.
7. **Use the product type that has an integrated surge absorption element when directly driving a load which generates surge voltage by relay or solenoid valves.**
8. **The reduced wiring system should be installed in places with no vibration or shock.**  
If installed in a place with vibration or shock, a malfunction or breakage likely to occur.

## Adjustment and Operation

### Warning

1. **Do not short-circuit a load.**  
If a load is short-circuited, excessive can cause damage to the connected devices. The fuse of the input unit will melt and below. The output and SI unit will activate its overcurrent production function. However, they cannot cover all modes, so damage is likely to occur.



# VQZ Series/Specific Product Precautions 7

Be sure to read this before handling

## Adjustment and Operation

2. **Do not manipulate or perform settings with wet hands.**  
Performing such activity will likely cause an electrical shock.

### **Caution**

DIP switches and Rotary switches should be set with a small watchmaker's screwdriver.

## Maintenance

### **Warning**

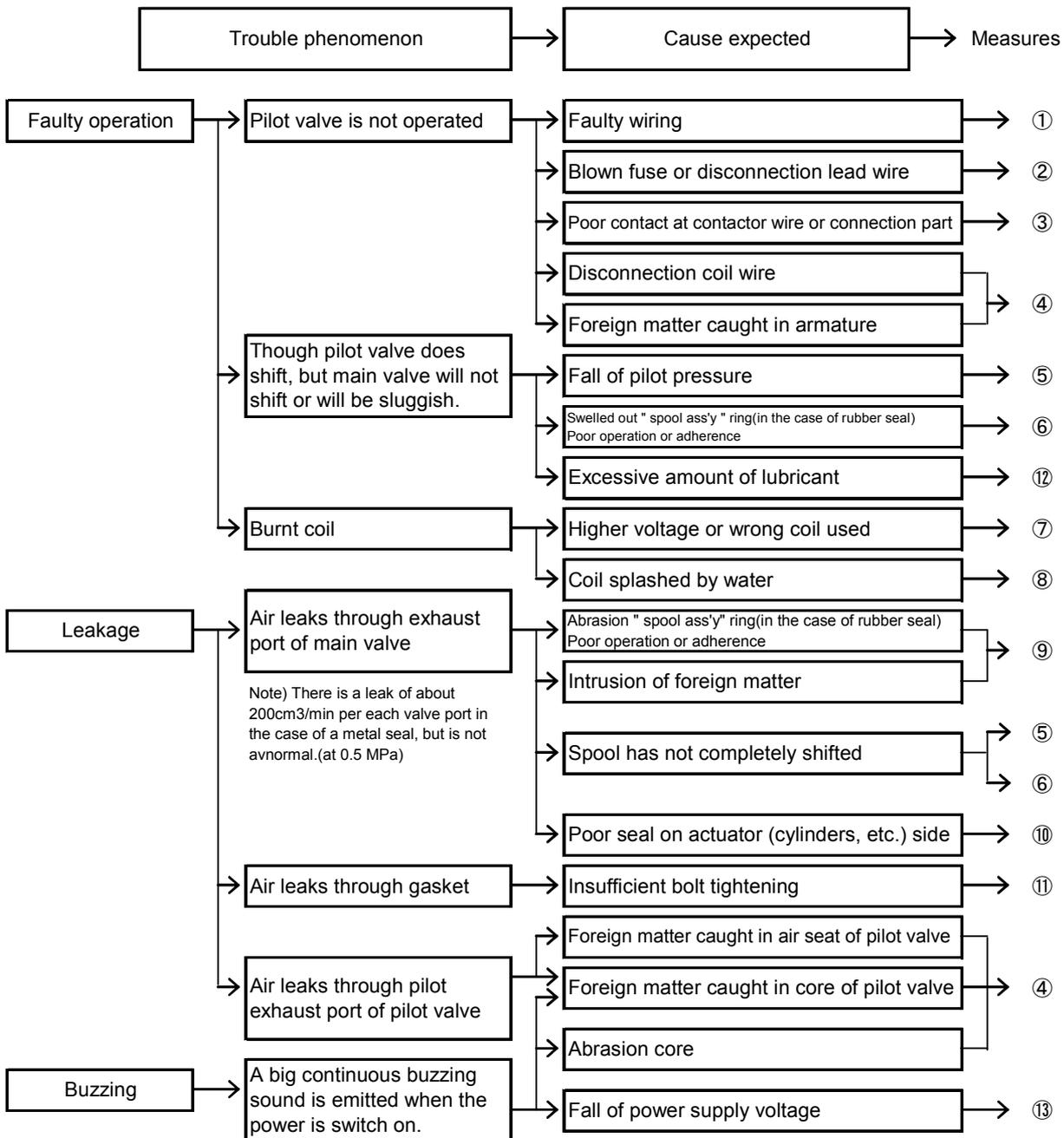
1. **Do not disassemble, modify (including circuit board replacement) or repair this product.**  
Such actions are likely to cause injuries or breakage.
2. **Perform periodic inspection.**  
Confirm that wiring or screws are not loose.  
Otherwise, unpredicted malfunction in the system composition devices is likely to occur.
3. **When an inspection is performed.**
  - Turn off the power supply.
  - Stop the supplied fluid and discharge the fluid in the piping and confirm the release to the atmosphere before performing an inspection. It is likely to cause injuries.

### **Caution**

**Do not wipe this product with chemicals such as benzine or thinner.**  
Using such chemicals is likely to cause damage.

## TROUBLESHOOTING

Should any trouble be found during operation, trace the source of the trouble in the following order and take corrective action.



No.	Remedy
①	Re-wire correctly.
②	Replace part.
③	Replace part or re-wire positively.
④	Replace valve. (pilot valve).
⑤	Regulate pressure so that pilot pressure will fall within operating pressure range during operation.
⑥	· If wrong oil is used, completely air blow to remove oil, and replace valve. After valve is replaced, use turbine oil class 1 (ISO VG32).
	· When a large quantity of drain is given and cannot carry out drain omission surely, install either an auto-drain or a dryer. The valve should be replaced.
⑦	Check voltage. Replace valve (pilot valve).
⑧	Protect the valve so that water does not splash the coil. Replace valve (pilot valve).
⑨	In case of intrusion of foreign matter, to remove foreign matter by air blow of piping and then replace valve.
⑩	Repair or replace actuators.
⑪	After stopping air and re-tighten the bolts.
⑫	Reduce the amount of lubricant to the degree that no oil splashes out of the air exhaust (R and PE) port.
⑬	Regulate voltage, so that the voltage at the time of the operation becomes specifications range.

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.

- ① Voltage out of rated voltage has been used.
- ② Oil other than the specified one has been lubricated.
- ③ Lubrication has been stopped intermediately, or lubrication was suspended temporary.
- ④ Water splashed directly.
- ⑤ Strong impact was given.
- ⑥ Alien substance such as drain and particle got into. Drain or garbage invaded a valve.
- ⑦ 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.

Record of changes	
<input type="checkbox"/> A Renewal	MY
<input type="checkbox"/> B Safety Instructions	oY

1st printing : KV

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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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