ORIGINAL INSTRUCTIONS

Instruction Manual

Pilot Operated 2 Port Solenoid Valve for Dry Air Series VQ20/30

The intended use of this valve is to control the movement of an actuator.

1 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 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

⚠ 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

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

⚠ Caution

- The product is provided for use in manufacturing industries only. Do not use in residential premises.

2 Specifications

2.1 Valve specifications

Series	VQ20	VQ30
Valve construction	2 port poppet pilot operated	
Fluid	Air	
Maximum operating pressure [MPa]	0.6	0.5
Minimum operating pressure differential [MPa]	0.01	
Ambient and fluid temperature [°C]	-10 to 50	
Flow Characteristics	Refer to catalogue	
Response time [ms]	Refer to catalogue	
Duty cycle	Contact SMC	
Min. operating frequency	1 cycle / 30 days	
Max. operating frequency	Contact SMC	
Manual override	Slotted locking type (tool required) Note 1)	
Lubrication	Not required	
Impact/Vibration resistance [m/s^2] Note 2)	150 / 30	

2 Specifications - continued

Enclosure (based on IEC60529)		IP40 Note 3)	
Mounting orientation		Unrestricted	
Materials	Body	Resin	
	Core, Armature, Spring	SUS	
	Poppet	NBR	
	Diaphragm assembly	H NBR, Resin	
Weight		46 g	80 g

Table 1.

Note 1) Manual override is available only for DIN terminals type.
Note 2) Impact resistance: No malfunction occurred when it was tested with a drop tester in the axial direction and at right angles to the main valve and armature; in both energized and de-energised states and for every time in each condition. (Values quoted are for a new valve).
Vibration resistance: No malfunction occurred in a one-sweep test between 8.3 and 2000 Hz. Tests are performed at both energized and de-energized states in the axial direction and at right angles to the main valve and armature. (Values quoted are for a new valve).
Note 3) DIN terminal type: Applicable to dust tight and low jetproof (IP65).

2.2 Solenoid specifications

Coil rated voltage	DC [VDC]	12, 24
	AC [VAC]	100, 110, 200, 220
Electrical entry		Grommet, DIN terminal
Coil insulation class		Class B
Allowable voltage fluctuation		±10% of rated voltage
Apparent power [VA]		2
Power consumption [W]	DC (with power saving)	Inrush: 2.9, Holding: 0.6
	DC (without power saving)	2.9
Surge voltage suppressor		Diode

Table 2.

2.3 Pneumatic symbol

Refer to catalogue for pneumatic symbols.

2.4 Special products

⚠ Warning

Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.

3 Installation

3.1 Installation

⚠ Warning

- Do not install the product unless the safety instructions have been read and understood.

3.2 Environment

⚠ Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product’s specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product’s specifications.
- Products compliant with IP65 and IP67 enclosures are protected against dust and water, however, these products cannot be used in water.
- Products compliant with IP65 and IP67 enclosures satisfy the specifications by mounting each product properly. Be sure to read the Specific Product Precautions for each product.

3.3 Piping

⚠ Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.

3.4 Lubrication

⚠ Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, refer to catalogue for details.

3 Installation - continued

3.5 Air supply

⚠ Warning

- Use clean air. If the compressed air supply includes chemicals, synthetic materials (including organic solvents), salinity, corrosive gas etc., it can lead to damage or malfunction.

⚠ Caution

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

3.6 Manual override

⚠ Warning

- Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Since connected equipment will operate when the manual override is activated, confirm that conditions are safe prior to activation.
- Locked manual overrides might prevent the valve responding to being electrically de-energised or cause unexpected movement in the equipment.
- Refer to the catalogue for details of manual override operation.

3.7 Mounting

⚠ Warning

Do not mount the coil downwards. When mounting a valve with its coil positioned downwards, foreign objects in the fluid will adhere to the iron core leading to a malfunction.

⚠ Caution

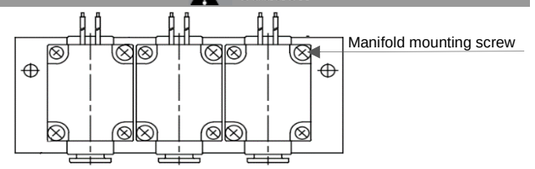


Figure 1.

- When mounting the valve, secure with brackets. Tighten the M3 mounting screws to a torque of 0.7 to 0.8 N·m.
- When mounting the valve directly, ensure gaskets are present, aligned and securely in place and tighten the M3 manifold mounting screws to a torque of 0.7 to 0.8 N·m.
- Ensure gaskets are in good condition, not deformed and are dust and debris free.

3.7.1 How to mount/remove from DIN rail

⚠ Caution

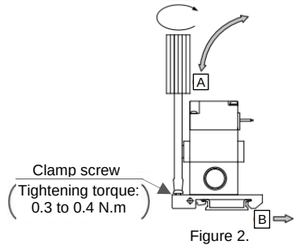


Figure 2.

- Refer to the catalogue for additional information.

3.8 Electrical circuits

⚠ Caution

Surge suppression should be specified by using the appropriate part number.

3.8.1 AC circuit

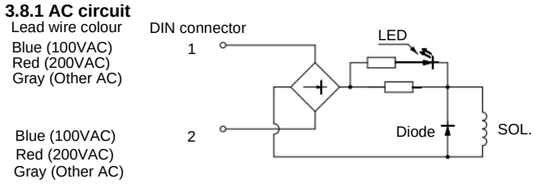
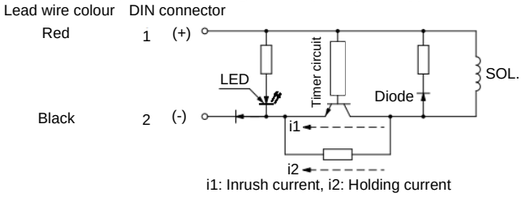


Figure 3.

3 Installation - continued

3.8.2 DC voltage power-saving circuit (with polarity)



i1: Inrush current, i2: Holding current

Figure 4.

⚠ Caution

- Grommet lead wire AWG22, Insulator O.D. 1.6mm.

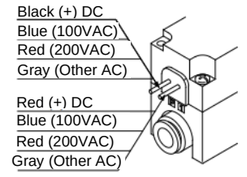


Figure 5.

3.8.3 How to wire DIN terminal

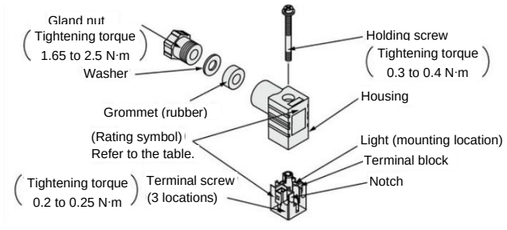


Figure 6.

- Refer to catalogue for additional information.
- Applicable cable O.D. Ø3.5 mm to Ø7 mm
- (Reference) 0.5mm^2, 2-core or 3-core, equivalent to JIS C 3306

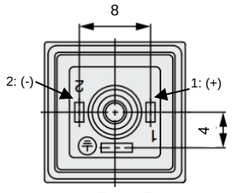


Figure 7.

- This DIN terminal corresponds to the Form C DIN connector with an 8mm terminal pitch, which complies with EN175301-803B.

3.8.4 Change of electrical entry

- Wire entry can be changed by mounting the housing in either direction (four directions at every 90˚) after separating the terminal block and the housing.
- For the indicator light type, be careful not to damage the light with the lead wire.

⚠ Caution

- Insert or pull the connector straight, not tilted.

3.8.5 DIN terminal circuit with indicator light

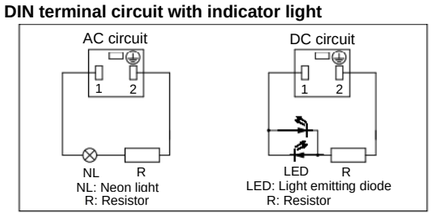


Figure 8.

3 Installation - continued

3.9 Residual voltage

Caution

- The suppressor arrests the back EMF voltage from the coil to a level in proportion to the rated voltage.
- Ensure the transient voltage is within the specification of the host controller.
- In the case of a diode, the residual voltage is approximately 1 V.
- Valve response time is dependent on surge suppression method selected.

3.10 Countermeasure for surge voltage

Caution

- At times of sudden interruption of the power supply, the energy stored in a large inductive device may cause non-polar type valves in a de-energised state to switch.
- When installing a breaker circuit to isolate the power, consider a valve with polarity (with polarity protection diode), or install a surge absorption diode across the output of the breaker.

3.11 Extended period of continuous energization

Warning

When energizing continuously, choose the option of an energy-saving circuit specifications. High speed response time type (with no energy-saving circuit) cannot be energized continuously.

3.12 Effect of back pressure when using a manifold

Warning

- Use caution when valves are used on a manifold, because an actuator may malfunction due to back-pressure.
- When the valve is closed, flow is blocked from port 1 to port 2. However, if the pressure in port 2 is higher than port 1, the valve will not be able to block the fluid and it will flow from port 2 to port 1.

4 How to Order

Refer to catalogue for ‘How to Order’.

5 Outline Dimensions

Refer to catalogue for outline dimensions.

6 Maintenance

6.1 General maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly, and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

6.2 Storage

Caution

In the case of long-term storage, thoroughly remove all moisture to prevent rust and deterioration of rubber materials, etc.

6.3 Mounting

Refer to 3.7 for mounting details and additional precautions.

6.4 Maintainable parts

Refer to catalogue for details of manifold valves, bracket assembly, DIN rail, DIN rail mounting bracket and blanking plate assembly.

7 Limitations of Use

7.1 Limited warranty and disclaimer/compliance requirements

Caution

Refer to Handling Precautions for SMC Products.

Warning

7.2 Effect of energy loss on valve switching

Air supply present, electrical supply cut	Valve returns to the OFF position by spring force.
Electrical supply present, air supply cut	Valve remains in the ON position

Table 3.

7.3 Low temperature operation

- The valve can be used in an ambient temperature down to -10 ˚C. However, take measures to prevent freezing or solidification of impurities, etc.
- 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. When warming by a heater, etc., be careful not to expose the coil portion to a heater. Installation of a dryer, heat retaining of the body is recommended to prevent freezing condition in which the dew point temperature is high, and the ambient temperature is low, and the high flow runs.

7.4 Holding of pressure

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

7.5 Cannot be used as an emergency shut-off valve

This product is not designed for safety applications such as an emergency shut-off valve. If the valves are used in this type of system, other reliable safety assurance measures should be adopted.

7.6 Closed circuit

In a closed circuit, when liquid is static, pressure could rise due to changes in temperature. This pressure rise could cause malfunction and damage to components such as valves. To prevent this, install a relief valve in the system.

7.7 Pressure differential

- If a restrictor (nozzle, etc.) is mounted on the outlet side, the outlet side pressure differential at the inlet side is smaller.
- Be sure the pressure differential when ON does not drop below 0.01 MPa.

Caution

7.8 Leakage voltage

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes ≤ 2% (for DC coils) or ≤10% (for AC coils) of the rated voltage across the valve.

8 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

9 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : https:// www.smcworld.com (Global) https:// www.smc.eu (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan
Specifications are subject to change without prior notice from the manufacturer.

Template DKP50047-F-085M