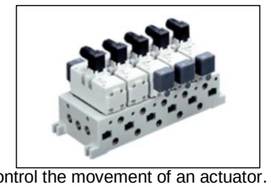
ORIGINAL INSTRUCTIONS

Instruction Manual
5 Port Solenoid Valve / ISO Standard
Series VQ7-(6,8)



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

Valve type		Metal Seal	Rubber seal
Fluid		Air	
Maximum operating pressure [MPa]		1.0	
Minimum operating pressure [MPa]	Single	0.15	0.2
	Double		0.15
	3-position		0.2
Ambient and fluid temperature [°C] Note 1)		-10 to 60 (no freezing)	-5 to 60 (no freezing)
Flow characteristics		Refer to catalogue	
Response time [ms]			
Duty cycle		Contact SMC	
Minimum operating frequency		1 cycle / 30 days	
Maximum operating frequency		Contact SMC	
Manual override		Push type (tool required)	
Impact / vibration resistance [m/s^2] Note 2)		150 / 30	
Lubrication		Not required	

2 Specification - continued

Mounting orientation	Single	Unrestricted
	Double, 3-position	Spool valve to be horizontal
Enclosure (based on IEC60529)		IP65
Weight [g]		Refer to catalogue

Table 1.

Note 1) Use dry air to prevent condensation when operating at low temperatures.
Note 2) Impact resistance: No malfunction occurred when it is tested with a drop tester in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states every once for each condition. (Values quoted are for a new valve).
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Test was performed at both energized states in the axial direction and at the right angles to the main valve and armature. (Values quoted are for a new valve).

2.2 Solenoid specifications

Rated coil voltage	DC [VDC]	12, 24
	AC [VAC] (50 / 60 Hz)	100, 110, 200, 220, 240
Electrical entry		M12 (Prewired), DIN terminal
Allowable voltage fluctuation Note 1)		±10% of rated voltage
Coil insulation type		Equivalent to Class B
Power consumption [W] (current [mA])	24 VDC	1 (42)
	12 VDC	1 (83)
Power consumption [VA] (current [mA]) Note 2)	100 VAC	1.2 (12)
	110 VAC	1.3 (11.5)
	120 VAC	1.5 (12)
	200 VAC	2.5 (12.5)
	220 VAC	2.6 (13)
	230 VAC	2.8 (12.5)
	240 VAC	3 (13)
Surge voltage suppressor	DC	Varistor
	AC	Diode
Indicator light		LED

Table 2.

Note 1) Valve state is not defined if electrical input is outside of specified operating ranges.
Note 2) Valves with AC coils come with a rectifying device; therefore, there is no difference in the consumption current when it is in the inrush and holding states.

2.3 Manifold specifications

Manifold block size			Size 1	Size 2
Series			VQ7-6 (VV71)	VQ7-8 (VV72)
Port size	1(P), 3(R2), 5(R1)		1/4”, 3/8”, C12	1/2”, 3/4"
	2(B), 4(A)	Side ported	1/4”, 3/8” C6, C8, C10	3/8”, 1/2”
		Bottom ported	1/4”, 3/8”	
Maximum number of stations Note 1)			10 stations	

Table 3.

Note 1) When equipped with control unit, 1 or 2 stations are used for mounting.

2.4 Pneumatic symbol

Refer to catalogue for pneumatic symbols.

2.5 Indicator light

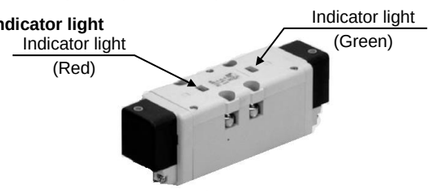


Figure 1.

2.6 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 Installation - continued

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 enclosures are protected against dust and water; however, these products cannot be used in water.
- Products compliant with IP65 enclosures satisfy the specifications by mounting each product properly. Be sure to read the Specific Product Precautions for each product.
- Do not use in high humidity environment where condensation can occur.
- Contact SMC for altitude limitations.

3.3 Piping

⚠ Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

Connection thread size (Rc, G, NPTF)	Tightening Torque [N·m]
1/8	3 to 5
1/4	8 to 12
3/8	15 to 20
1/2	20 to 25
3/4	28 to 30

Table 4.

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.

3.5 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.
- Refer to the catalogue for details of manual override operation.

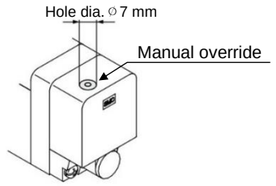


Figure 2.

3.7 Mounting

⚠ Caution

- Ensure gaskets are in good condition, not deformed and are dust and debris free.
- When mounting valves ensure gaskets are present, aligned and securely in place and tighten screws to torque values as per table below.

3 Installation - continued

Series	Thread size	Recommended tightening torque [N·m]
VQ7-6	M5	2.3 to 3.7
VQ7-8	M6	4 to 6

Table 5.

3.8 Electrical circuit

⚠ Caution

- Surge suppression should be specified by using the appropriate part number. If a valve type without suppression (Type ‘Nil’) is used, suppression must be provided by the host controller as close as possible to the valve.
- Terminal numbers in the circuits are for a DIN connector. Numbers inside ( ) are pre-wired connector pin numbers.

3.8.1 DC

3.8.1.1 Single

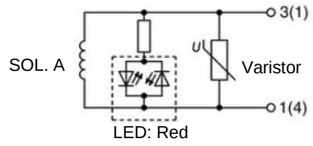


Figure 3.

3.8.1.2 Double

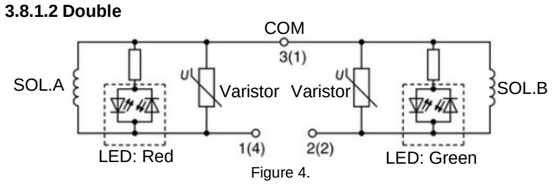


Figure 4.

3.8.2 100 VAC

3.8.2.1 Single

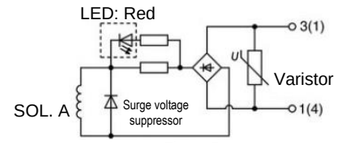


Figure 5.

3.8.2.2 Double

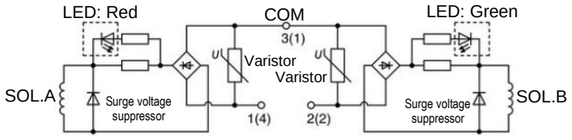


Figure 6.

3.8.3 200 VAC or more

3.8.3.1 Single

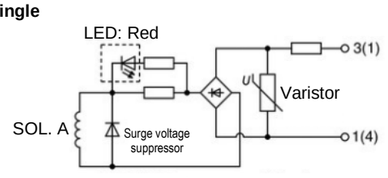


Figure 7.

3.8.3.2 Double

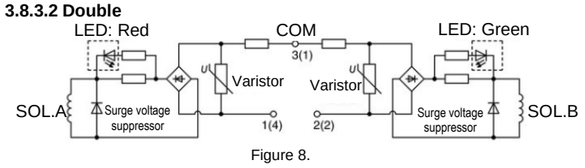


Figure 8.

3 Installation - continued

3.9 How to wire DIN terminal

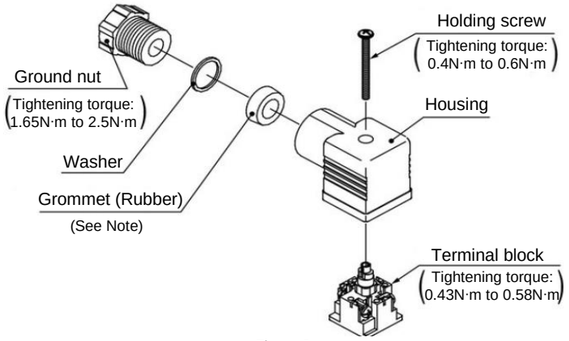
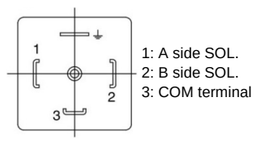


Figure 9.

Note) Applicable cable – O.D. ∅6 mm to ∅12 mm. Inside bore of grommet will need to be trimmed if cable O.D. is >ø9 mm.

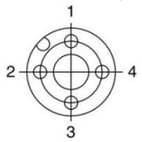
3.10 Wiring specifications

DIN terminal
DIN 43650 A compatible



1: A side SOL.
2: B side SOL.
3: COM terminal

M12 connector (pre-wired)
(conforms to NECA (Nippon Electric Control Equipment Industries Association) standard 4202)



1: COM. pin
2: B side SOL.
3: Not in use
4: A side SOL.

Figure 10.

Note: There is no polarity. It can be used as -COM

3.11 Residual voltage

Caution

- If a diode or varistor surge voltage suppressor is used, 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 varistor, the residual voltage is approximately 60 V.
- In the case of a diode, the residual voltage is approximately 1 V.
- Valve response time is dependent on surge suppression method selected.

3.12 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.

3.13 Extended periods of continuous energization

Warning

- If a valve will be continuously energized for an extended period of time or is mounted in a control panel, the temperature of the valve will increase due to the heat generated by the coil assembly. This will likely adversely affect the performance of the valve and any nearby peripheral equipment. Therefore, if the valve is to be energized for periods of longer than 30 minutes at a time or if during the hours of operation the energized period per day is longer than the de-energized period, we advise using a valve with power consumption of 0.4 W or lower, such as the SY series, or a valve with a power-saving circuit.

3.14 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.
- Special caution must be taken when using 3 position exhaust centre valve or when driving a single acting cylinder. To prevent a malfunction, implement counter measures such as using an individual EXH spacer assembly, a back pressure check valve or an individual exhaust manifold.

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 Replacement parts and manifold option parts

Refer to 3.7 for valve mounting details.
Refer to catalogue for additional information.

6.3 Installation and removal of pilot valve cover

Refer to catalogue for additional information.

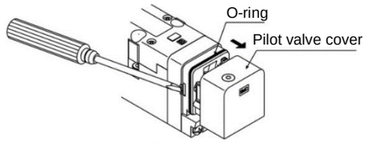


Figure 11.

6.4 Pilot valve replacement

Refer to catalogue for additional information.

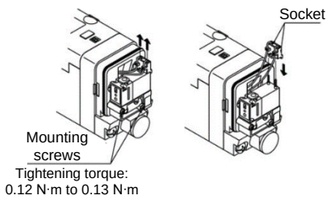


Figure 12.

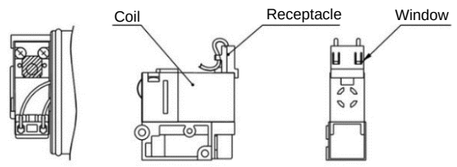


Figure 13.

7 Limitations of Use

Warning

The system designer should determine the effect of the possible failure modes of the product on the system.

7.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

Warning

7.2 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.

7.3 Holding of pressure (including vacuum)

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

7.4 Intermediate stopping

Refer to Handling Precautions for 3/4/5 port Solenoid Valves.

7.5 Safety relay or PLC

If a safe output from a safety relay or PLC is used to operate this valve, ensure that any output test pulse duration is shorter than 1 ms to avoid the valve solenoid responding.

Caution

7.6 Leakage voltage

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF is ≤2% for DC coils or ≤12.5% for AC coils of the rated voltage across the valve.

7.7 Low temperature operation

Unless otherwise indicated in the specifications for each valve, operation is possible to -10˚C for metal seals and -5˚C for rubber seals, but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

7.8 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 secondary load conditions, it should be energized until the cylinder reaches the stroke end position, as there is a possibility of malfunction otherwise.

7.9 Mounting orientation

In the case of single solenoid, the mounting orientation is unrestricted. In the case of double solenoid or 3 position valves, mount so that the spool valve is horizontal.

7.10 Air returned or air/spring returned spool valves

Warning

- The use of 2-position single valves with air returned or air/spring returned spools has to be carefully considered.
- The return of the valve spool into the de-energized position depends on the pilot pressure. If the pilot pressure drops below the specified operating pressure the position of the spool cannot be defined.
- The design of the system must take into account such behaviour.
- Additional measures might be necessary. For example, the installation of an additional air tank to maintain the pilot pressure.

Energy source status	Single	Double	3 position
Air supply present, electricity cut	Spool returns to the off position by air force and spring force	Spool stops moving after electricity cut (Position cannot be defined)	Spool returns to the off position by spring force
Air supply cut before electricity cut	Spool returns to the off position by spring force	Spool stops moving after air pressure cut (Position cannot be defined)	Spool returns to the off position by spring force

Table 6.

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