



ORIGINAL INSTRUCTIONS

Instruction Manual

5 port solenoid valve

Series VQ(C)4000/5000



The intended use of this product is to control the movement on 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.

2 Specifications - continued

Lubrication	Not required
Manual override	Non-locking Push type, Locking type (Tool required, Manual)
Impact/Vibration resistance	150/30 m/s ² (Note 3)
Mounting orientation	Refer to 3.2 and 7.4
Enclosure (based on IEC60529)	IP40 (IP65 and IP67 compatible) (Note 4)

Table 1.

Note 1) For VQ(C)5000 metal seal

Note 2) Use dry air to prevent condensation at low temperatures.

Note 3) **Impact resistance:** No malfunction resulted from the impact test using a drop impact tester. Test was performed one time each in the axial and right angle directions of the main valve and armature for both energized and de-energized states. (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 in the axial and right angle directions of the main valve and armature for both energized and de-energized states. (Values quoted are for a new valve)

Note 4) Refer to 2.3 for applicable variations.

2.2 Solenoid specifications

Rated coil voltage [VDC]	12, 24
Allowable voltage fluctuation	± 10 % of rated voltage (Note 1)
Coil insulation type	Class B or equivalent
Power consumption (Current) [W]	24 VDC 0.95 (standard), 0.4 (low wattage) 12 VDC 0.95 (standard), 0.4 (low wattage)
Surge voltage suppressor	Varistor
Indicator light	LED

Table 2.

Note 1) Valve state is not defined if electrical input is outside the specified operating range.

2.3 Manifold specifications

2.3.1 VQ4000/5000

Series		VQ4000	VQ5000	VQ4000	VQ5000
				Maximum number of stations (solenoids)	
Electrical entry and ingress protection (Based on IEC60529)	D-sub	IP40		18 (36)	12 (24)
	Terminal block box ¹⁾	IP65		18 (36)	12 (24)
	Individual terminal block kit		IP40		12 (24)
	Lead wire cable ¹⁾	IP65		16 (32)	12 (24)
	EX123, EX124 ¹⁾	IP65		18 (36)	12 (24)
Port size	1(P), 3(R1), 5(R2)	1/2	3/4		
	2(A), 4(B)	C6, C8, C10, C12 1/4 3/8 N7, N9, N11	3/8 1/2		
	Bottom ported	1/4	1/2		

Table 3.

Note 1) When W type is chosen.

2.3.2 VQC4000/5000

Series		VQC4000	VQC5000	VQC4000	VQC5000
				Maximum number of stations (solenoids)	
Electrical entry and ingress protection (Based on IEC60529)	D-sub, Flat ribbon cable, EX260	IP40		12 (24)	
	EX245	IP65			
	EX126			8 (16)	
	EX250, EX260, EX500, EX600	IP67		12 (24)	
	Lead wire Circular connector				
Terminal block box				10 (20)	

2 Specifications - continued

Port size	1(P), 3(R)		P: 1/2 R: 3/4	D side: 1/2 U side: 3/4	
	2(A), 4(B)	Side ported	C6, C8, C10, C12 1/4 3/8	3/8, 1/2	
	2(A), 4(B)	Bottom ported	1/4	1/2	

Table 4.

2.4 Indicator light and override positions

In the double solenoid type, A side and B side energization are indicated by two colours which match the colours of the manual overrides.

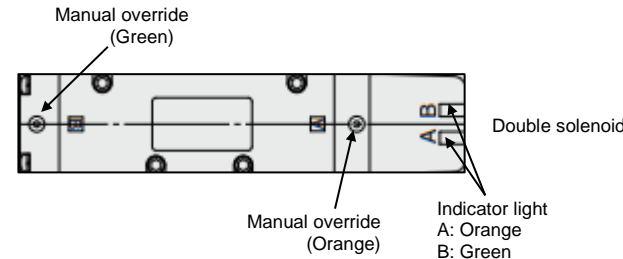


Figure 1. ON/OFF indicator and override buttons of VQ(C)5000.

2.5 Pneumatic symbols

Refer to catalogue and special drawings for 'Pneumatic symbols'.

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.
- When using double solenoid type for the first time, actuators may travel in an unexpected direction depending on the switching position of the valve. Implement countermeasures to avoid any danger that may occur due to the actuator's operation.

3.2 Environment



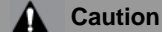
Warning

- 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 with IP65 and IP67 enclosures (based on IEC60529) are protected against dust and water; however, these products cannot be used in water.
- Products compliant with IP65 and IP67 satisfy the specification through mounting the product properly. Be sure to read the Specific Product Precautions for each product.
- When using built-in silencer type manifold with an IP67 enclosure, keep the exhaust port of the silencer from coming in direct contact with water or other liquids.
- If using in an atmosphere where there is possible contact with water drop-lets, oil, weld spatter, etc., take suitable preventative measures.
- When the solenoid valve is mounted in a control panel or is energized for a long time, make sure that the ambient temperature is within the valve's specified range.
- The metal seal valve is provided with a hole to discharge the pilot EXH. When using in atmospheres containing water and dust, mount horizontally.

3 Installation - continued

- 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 (R, NPT)	Tightening Torque [N·m]
M5	1 to 1.5
1/8	3 to 5
1/4	8 to 12
3/8	15 to 20
1/2	20 to 25

Table 5.

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 One-touch fittings



Caution

When fittings are used, they may interfere with one another depending on their types and sizes. Therefore, the dimensions of the fittings to be used should first be confirmed in their respective catalogues.

3.5.1 Tube attachment and detachment



Caution

Refer to the Specific Precautions of Fittings and Tubing in the catalogue.

3.5.2 Precautions on other tube brands



Caution

- When using non-SMC brand tubes, refer to the Specific Precautions of Fittings and Tubing in the catalogue.

3.6 Light/Surge voltage suppressor



Caution

The valve is fitted with varistor surge suppressors, see Figure 2 and 3.

Refer to 3.8 for Residual voltage value.

3.6.1 Single solenoid

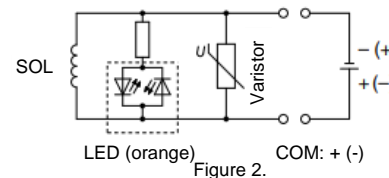


Figure 2.

3.6.2 Double solenoid

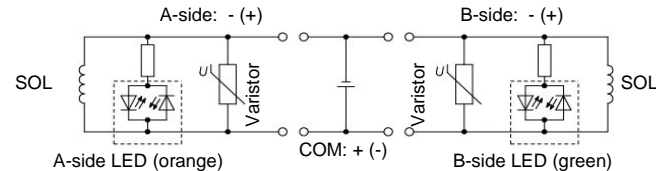


Figure 3.



Caution

The surge suppressors fitted to the valve are intended to protect the output device so that the surge generated inside the valve does not affect the output device. External overvoltage or overcurrent might damage the surge suppressor, the valve and the output device itself. Additional safety measures should be taken to prevent the effect of overcurrent on the valve and connected devices.

3 Installation - continued

3.7 Mounting

Caution

After confirming that the gasket is installed correctly, securely tighten the mounting screws (M3 for VQC4000 and M4 for VQC5000) according to the tightening torque shown below.

Proper Tightening Torque [N·m]	
VQ(C)4000 (M3 mounting screw)	0.8 to 1.2
VQ(C)5000 (M4 mounting screw)	1 to 1.8

Table 6.

Refer to Specific Product Precautions in the catalogue for more details.

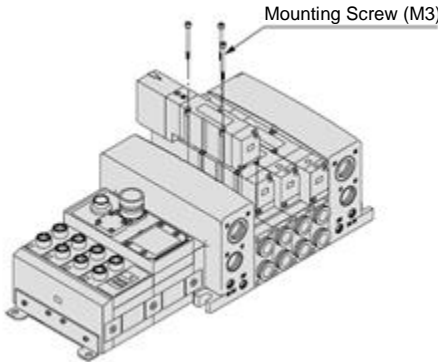


Figure 4. (Example shows VQC4000)

3.8 Residual voltage of the surge voltage suppressor

Caution

Note) If a varistor surge voltage suppressor is used, there is some residual voltage to the protection element and rated voltage. Therefore, refer to the table below and pay attention to the surge voltage protection on the controller side.

VQ(C)4000	Approx. 60 V
VQ(C)5000	Approx. 60 V

Table 7.

3.9 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.

3.10 Extended periods of continuous energization

Caution

- When the product is continuously energized for a long period of time (10 minutes or longer), select the low wattage type.
- Refer to '3, 4, 5 port solenoid valves precautions' for more details.
- When solenoid valves are mounted in a control panel, employ measures to radiate excess heat, so that temperatures remain within the valve specification range. Use special caution when three or more stations sequentially aligned on the manifold are continuously energized since this will cause a drastic temperature rise.

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

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.
- For a 3-position exhaust centre valve or single acting cylinder, take appropriate measures to prevent malfunction by using it with an individual EXH interface block.

3 Installation - continued

3.13 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.
- Do not apply excessive torque when turning the locking type manual override, (0.1 N·m or less).

3.14 External pilot exhausts

Caution

The external pilot variants use the exhaust port of the manifold. Ensure that this connection is always vented to atmosphere and do not block the exhaust port when arranging the piping.

3.15 Electrical wiring specification

Refer to catalogue for electrical wiring specifications.

4 How to Order

4.1 Standard products

Refer to catalogue for 'How to Order' or to product drawing for special products.

5 Outline Dimensions

Refer to catalogue and special drawings for outline dimensions.

6 Maintenance - continued

6.2 Replacement parts

6.2.1 Installation/removal of light cover

Caution

Refer to catalogue for additional information.

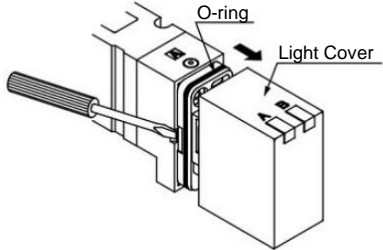


Figure 5. VQ(C)4000

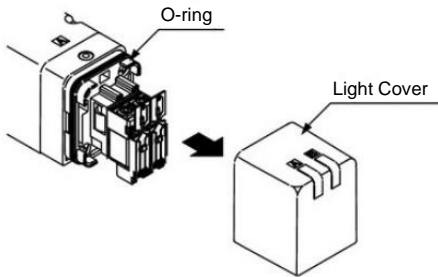


Figure 6. VQ(C)5000

6.2.2 Replacement of the pilot valve

Caution

After confirming the gasket is correctly placed under the valve, securely tighten the bolts with the proper torque shown in figure 7.

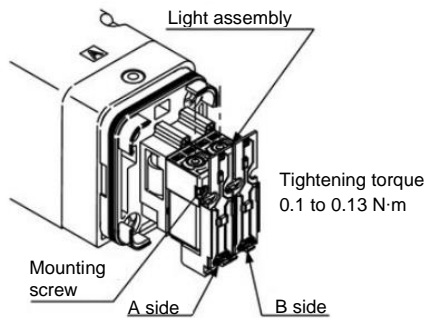


Figure 7.

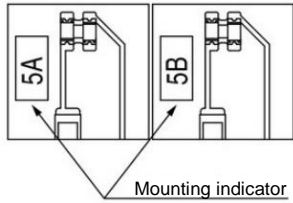


Figure 8.

Note) The light circuit boards: A side is red and the B side is green. It must be mounted on the pilot valve in accordance with the mounting indicators.

6 Maintenance - continued

6.2.3 Plug lead type

Caution

Refer to catalogue for additional information.

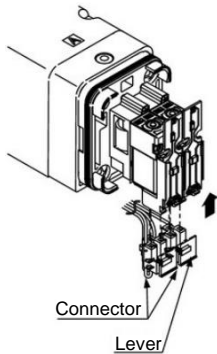


Figure 9.

7 Limitations of Use

Warning

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

Do not exceed any of the specifications laid out in section 2 of this document or the specific product catalogue.

7.2 Leakage voltage

Caution

Ensure that any leakage current when the switching element is OFF causes ≤ 3% of the rated voltage across the valve.

7.3 Low temperature operation

Caution

Unless otherwise indicated in the specifications for each valve, operation is possible to -10°C (-5°C for VQC5000), but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

7.4 Mounting orientation

Caution

Valve type, coil type		Mounting orientation
Rubber	All types	Unrestricted (Universal)
	Single	
Metal	Double Including 3-position type	Main valve spool to be horizontal

Table 8.

7.5 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.

7 Limitations of Use - continued

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 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 off position by spring force

Table 9.

7.6 Intermediate stopping

 **Warning**

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

7.7 Holding of pressure

 **Warning**

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

7.8 Cannot be used as an emergency shut-off valve

 **Warning**

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.

7.9 Safety relay or PLC

 **Warning**

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.

7.10 Momentary energization

 **Caution**

If a double solenoid valve will be 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.

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 for or www.smc.eu for your local distributor/importer.

SMC Corporation

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Template DKP50047-F-085H