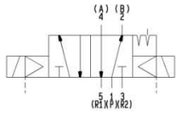
ORIGINAL INSTRUCTIONS

Installation and Maintenance Manual

Bistable external pilot 5/2 spool valve with detent

VQC4201R-5-X77



The intended use of this product is to control an actuator.

Validated according to ISO13849
Refer to document: VQC4000-SMR0001

1 Safety Instructions

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- These instructions indicate the level of potential hazard by label of “Caution”, “Warning” or “Danger”, followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.
- Always ensure compliance with relevant safety laws and standards.

⚠ **Caution**	Indicates a hazard with a low level of risk, which if not avoided, could result in minor or moderate injury.
⚠ **Warning**	Indicates a hazard with a medium level of risk, which if not avoided, could result in death or serious injury.
⚠ **Danger**	Indicates a hazard with a high level of risk, which if not avoided, will result in death or serious injury.

⚠ Warning

- The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.

  Since the products specified here can be used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and/or tests to meet specific requirements.
- **Only trained personnel should operate pneumatically operated machinery and equipment.**

  Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced personnel.
- **Do not service machinery/equipment or attempt to remove components until safety is confirmed.**

  1) Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.

  2) When equipment is to be removed, confirm the safety process as mentioned above. Switch off air and electrical supplies and exhaust all residual compressed air in the system.

  3) Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Supply air into the system gradually to create back pressure, i.e. incorporate a soft-start valve).
- **Do not use this product outside of the specifications. Contact SMC if it is to be used in any of the following conditions:**

  1) Conditions and environments beyond the given specifications, or if the product is to be used outdoors.

1 Safety Instructions (continued)

2) Installations in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.

3) An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

- **Follow applicable system safety standards such as ISO 4414 and EN60204-1**

⚠ Caution

- Ensure that the air supply quality meets the specification in section 2.

2 Specifications

2.1 General specifications

Valve specifications	Valve Type	Special 5-Port Solenoid Valve [Note 1)]
	Valve Configuration	Rubber seal (Pilot valve VQ100)
	De-energized actuation	Bistable with mechanical detent
	Fluid	Air
	Minimum air quality	5ìm filtration. See also section3.6
	Max. operating pressure	1.0 MPa
	Min. operating pressure	Vacuum
	External pilot pressure range	0.15 to 1.0 MPa
	Flow	See Table2
	Proof pressure	1.5 MPa
	Minimum frequency	1 cycle / 30 days
	Maximum frequency	5Hz
	Duty cycle	Contact SMC
	Response time	Less than 17 ms [(Note 2)]
	Mass	260g
	Ambient temperature	-10 to +50°C (No freezing)
	Lubrication	Not required
	Manual override	Push type
	Vibration resistance (EN60068)	50m/s² (0.35mm) [(Note3)]
	Impact resistance (EN60068)	150m/s² at 11ms duration[(Note4)]
	Mounting orientation	universal
	Enclosure	IP67
	B_{10}	Refer to VQC4000-SMR0001
Elect.	Rated coil voltage	24VDC
	Polarity	Negative common
	Allowable voltage fluctuation	±10 % of rated voltage
	Coil insulation type	Class B or equivalent
	Power consumption (Current)24VDC	1W DC (42mA)

Table 1General specifications

Note 1)
When the external pilot pressure is removed or the coils are de-energised the main valve remains in position. The valves are to be used with a suitable external pilot sub-base or manifold or VQC2101NY-5-X10.
Note 2)
Based on JIS B 8375-1981 (Coil temperature: 20°C)
Note 3)
No malfunction occurred in a round sweep test between 5 and 200 Hz. The test was performed at both energised and de-energised states in the axial direction and at the right angles to the main valve and armature.

2 Specifications(continued)

Note 4)
No malfunction occurred when tested in the axial direction and at the right angles to the main valve and armature in both energised and de-energised states, five times for each condition.

Flow path			
1→4,2 (P→A,B)		4,2→5,3 (A,B→R1,R2)	
C (dm³/(s.bar))	C (dm³/(s.bar))	C (dm³/(s.bar))	C (dm³/(s.bar))
7.2	0.43	7.3	0.38

Table 2 Flow characteristics

2.2 Indicators, override position and senses

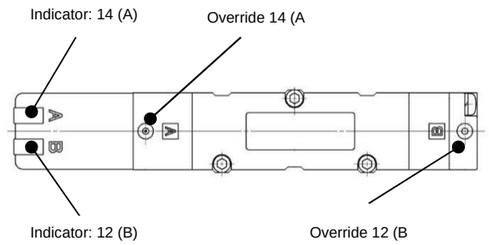


Figure 1

2.3 Surge suppressors

The valve is fitted with diode surge suppressors, see Figure 2. Note that this valve is configured negative common (PNP compatible). The surge suppressor will limit the transient voltage to about 1V.

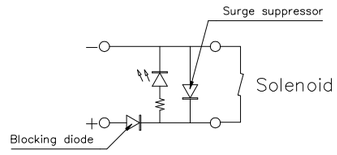


Figure 2

⚠ 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

3.1 Installation

⚠ Warning

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

1. Use caution when valves are used on a manifold because an actuator may malfunction due to back-pressure.
2. This valve is not suitable for use as an emergency shut-off valve. Additional safety measures should be adopted.
3. Operation in vacuum. Protect the valve from dirt and debris which might be drawn in.
4. Actuators may move unpredictably when connected to bi-stable valves for the first time. Ensure all bi-stable valves are in the correct position before the system is pressurised.

3 Installation (continued)

5. Provide ventilation when using the valve in a confined space such as an enclosure to prevent the pressurising effect of released airand heat generation.
6. Valves which are energised for a long period will become hot. Protect operators if this is a hazard.
7. Do not disassemble this product or make any modifications.
8. To ensure proper switching, the valve should be energised for at least 100ms. Always ensure the energisation time is adequate for the application conditions.
9. The pilot valve exhaust is connected to the manifold pilot exhaust line (PE). Ensure that this line is properly vented and any transient manifold exhaust pressure does not cause unexpected pilot valve actuation when the valve is in the de-energised state.
10. Warnings or specifications printed or affixed to the product should not be erased, removed or covered up.
11. Do not paint this product.

3.2 Environment

⚠ Warning

- Do not use in an environment where the product is directly exposed to corrosive gases, chemicals, salt water, water, steam or weld spatter.
- 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. Check the product specifications.
- Do not mount in a location exposed to radiant heat.
- Products with IP67 enclosures (based on IEC60529) are protected against dust and water, however, these products cannot be used in water.
- Products compliant with IP67 satisfy the specification through mounting. Ensure the connections are made according to the appropriate product specification.
- Do not use in an environment subject to heavy vibration and/or shock.

3.3 Piping

⚠ Caution

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

3.4 Wiring

⚠ Caution

1. This valve has polarity. Ensure the polarity of the supply is correct before connecting to the valve to prevent damage to the valve or connected system.
2. Ensure the supply voltage is correct before connecting to the valve to prevent damage to the valve or connected system.
3. Check if the connections are correct before completing the wiring.

3.5 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, use turbine oil Class 1 (no additive), ISO VG32. Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.
- Once lubrication is used in the system, it must be continued for the life of the valve

⚠ Warning

If excessive lubricant is used the oil may accumulate in the pilot valve causing malfunction or delayed response.

3 Installation (continued)

3.6 Air supply

Warning

1. 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.
2. Ensure filter drains are maintained regularly.
3. Use clean air. Do not use air that contains chemicals, synthetic oils including organic solvents, salt or corrosive gasses, etc.

Caution

1. When extremely dry air is used as the fluid, degradation of the lubrication properties inside the valve may occur, resulting in reduced reliability and service life. Refer to SMC if extremely dry air is used.
2. Install an air filter to protect the valve and connected system.
3. Take measures to ensure air quality such as installing an aftercooler, air dryer or water separator.
4. If excessive carbon dust is generated is seen, install a mist separator on the upstream side of the valve. Dust might accumulate inside the valve and cause malfunction.

4 Settings

4.1 Manual override

Warning

Since connected equipment will operate when the manual override is activated, confirm that conditions are safe prior to activation. Since two overrides are fitted, ensure the correct one is operated. Once the override is used the valve will remain in position until the other override is used or the appropriate coil energised. See Figure 1.

Non-locking push type (Tool required)

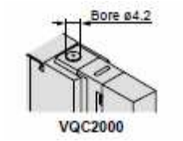


Figure 3

5 Outline Dimensions (mm)

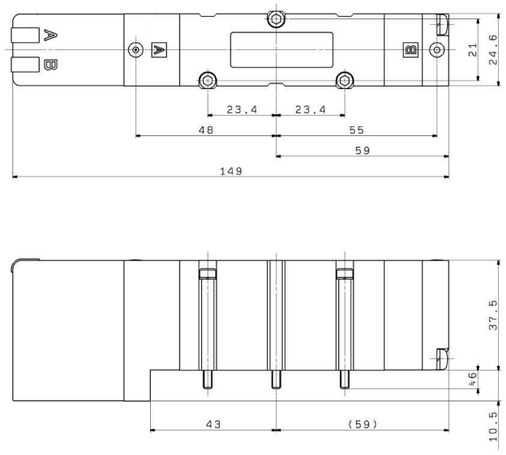


Figure 4

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.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.
- Operate the valve according to the minimum operating frequency given in section 2.

7 Limitations of Use

Caution

- **Leakage voltage**

Ensure that any leakage current when the switching element is OFFcauses < 2% of the rated voltage across the valve.

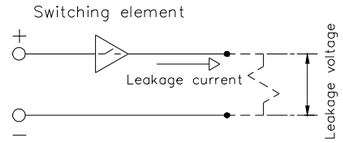


Figure 5

- **Low temperature operation**

According to the specification operation is possible to -10℃, but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

7 Limitations of Use (continued)

Warning

Any use in an EN ISO 13849 system must be within the specified limits and application conditions. The user is responsible for the specification, design, implementation, validation and maintenance of the safety system (SRP/CS)'

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.

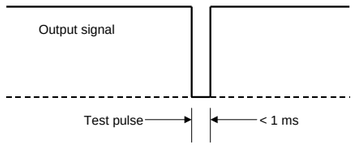


Figure 6

8 Contacts

AUSTRIA	(43) 2262 62280-0	**LATVIA**	(371) 781 77 00
BELGIUM	(32) 3 355 1464	**LITHUANIA**	(370) 5 264 8126
BULGARIA	(359) 2 974 4492	**NETHERLANDS**	(31) 20 531 8888
CZECH REP.	(420) 541 424 611	**NORWAY**	(47) 67 12 90 20
DENMARK	(45) 7025 2900	**POLAND**	(48) 22 211 9600
ESTONIA	(372) 651 0370	**PORTUGAL**	(351) 21 471 1880
FINLAND	(358) 207 513513	**ROMANIA**	(40) 21 320 5111
FRANCE	(33) 1 6476 1000	**SLOVAKIA**	(421) 2 444 56725
GERMANY	(49) 6103 4020	**SLOVENIA**	(386) 73 885 412
GREECE	(30) 210 271 7265	**SPAIN**	(34) 945 184 100
HUNGARY	(36) 23 511 390	**SWEDEN**	(46) 8 603 1200
IRELAND	(353) 1 403 9000	**SWITZERLAND**	(41) 52 396 3131
ITALY	(39) 02 92711	**UNITED KINGDOM**	(44) 1908 563888

SMC Corporation

URL : http// www.smcworld.com (Global) http// www.smceu.com (Europe)

SMC Corporation, Akihabara UDX15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101 0021