Installation and Maintenance Manual

5 Port Solenoid Valve, Series VQC

Read this manual before using this product

- The information within this document is to be used by pneumatically trained personnel only.
- For future reference, please keep manual in a safe place.
- This manual should be read in conjunction with the current catalogue.

1 SAFETY RECOMMENDATION

1.1 General recommendation

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by label of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO4414 (Note1), JIS B 8370 (Note2) and other safety practices.

Note 1:ISO 4414:Pneumatic fluid power - General rules relating to systems.
Note 2:JIS B 8370:Pneumatic system axiom.

CAUTION: Operator error could result in injury or equipment damage.

WARNING: Operator error could result in serious injury or loss of life.

DANGER: In extreme conditions, there is a possible result of serious injury or loss of life.

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 are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your 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 operators.
- **Do not service machinery/equipment or attempt to remove component until safety is confirmed.**
  - Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
  - 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.
  - Before machinery/equipment is re-started, ensure all safety measures to prevent sudden movement of cylinders etc. (Bleed air into the system gradually to create backpressure, i.e. incorporate a soft-start valve).
- **Contact SMC if the product is to be used in any of the following conditions:**
  - Conditions and environments beyond the given specifications, or if product is used outdoors.
  - 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.
  - An application, which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

CAUTION:

- Ensure that the air supply system is filtered to 5 micron.

1.2 Conformity to standard

This product is certified to and complies with the following standards:

EMC Directive 89/336/EEC	**EN61000-6-2, EN55011, EN61000-4-5**

2 INTENDED CONDITIONS OF USE

2.1 Specifications

			Metal seal	Rubber seal
Valve specification	Valve Configuration		Metal seal	Rubber seal
	Fluid		Air/Inert gas	
	VQC1000/2000 Max. operating pressure		0.7MPa (High pressure type: 1.0MPa) (Note 4)	
	VQC1000/2000 Min. operating pressure	Single	0.1MPa	0.15MPa
		Double	0.1MPa	
		3-position	0.1MPa	0.2MPa
		4-position	-	0.15MPa
	VQC4000 Max. operating pressure (Note 3)		1.0MPa (0.7MPa)	
	VQC4000 Min. operating pressure	Single	0.15MPa	0.2MPa
		Double	0.15MPa	
		3-position	0.15MPa	0.2MPa
	Proof pressure		1.5MPa	
	Ambient and fluid temperature		-10° to 50°C (Note 1)	
	Lubrication		Not required	
	Manual override		Push type/Locking type (tool required) optional	
	Impact resistance/ Vibration resistance		150/30 m/s^2 (Note 2)	
	Enclosure		IP67	
Electrical specification	Rated coil voltage		12VDC, 24 VDC	
	Allowable voltage fluctuation		±10% of rated voltage	
	Coil insulation type		Equivalent to B type	
	Power consumption (current)	24VDC	1W DC (42mA), 0.5W DC (21mA)	
		12VDC	1W DC (83mA), 0.5W DC (42mA)	

(Note 1) Use dry air to prevent condensation at low temperatures.

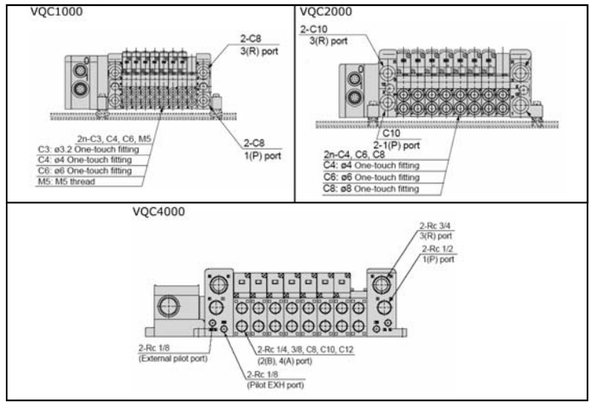
(Note 2) Impact resistance: No malfunction resulted from the impact test using a drop impact tester. The test was performed one time each in the axial and right angle directions of the main valve and armature, for both energized and de-energized states.

Vibration resistance: No malfunction occurred in a one-sweep test between 8.3 and 2000Hz. Test was performed in the axial and right angle directions of the main valve and armature for both energized and de-energized states.

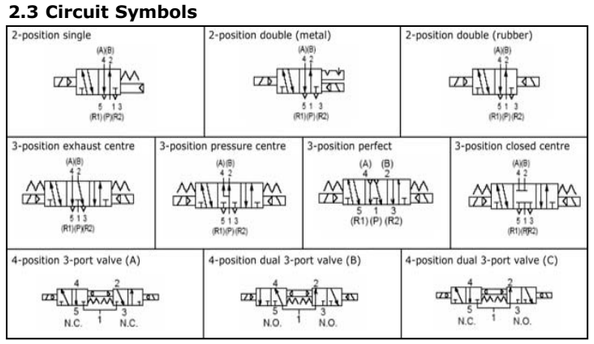
(Note 3) Values in ( ) are for the low wattage (0.5W) specification.

(Note 4) Metal seal type only.

2.2 Piping



2.3 Circuit Symbols



3 INSTALLATION

WARNING:

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

3.1 Environment

WARNING:

- Do not use in an environment where the product is directly exposed to corrosive gases, chemicals, salt water, water or steam.
- Do not use in an explosive atmosphere.
- The product should not be exposed to prolonged sunlight. Use a protective cover.
- Do not mount the product in a location where it is subject to strong vibrations and/or shock. Check the product specifications for above ratings.
- Do not mount the product in a location where it is exposed to radiant heat.

3.2 Piping

CAUTION:

- Before piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fitting into a port, ensure that sealant material does not enter the port inside. When using seal tape, leave 1.5 to 2 threads exposed on the end of pipe/fitting.

Thread	Appropriate tightening torque (Nm)
Rc(PT) 1/8	7 to 9
Rc(PT) 1/4	12 to 14
Rc(PT) 3/8	22 to 24
Rc(PT) 1/2	28 to 30
Rc(PT) 3/4	28 to 30

3.3 Electrical connection

CAUTION:

- When DC power is connected to a solenoid valve equipped with light and/or surge voltage suppressor, check for polarity indications.
- For polarity indications:
  1. No diode to protect polarity: if polarity connection is wrong, the diode in the valve or switching device at control equipment or power supply may be damaged.
  2. With diode to protect polarity: if polarity connection is wrong, the valve does not switch.

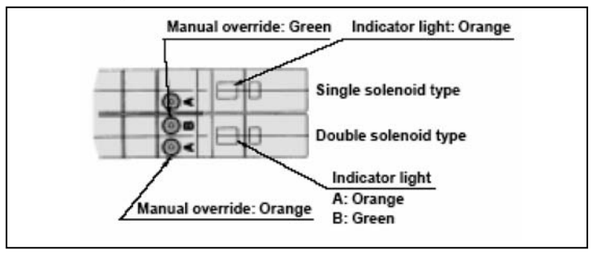
3.3.2 Cable safety instructions

1. Avoid miswiring, as this can cause malfunction, damage and fire in the unit.
2. To prevent noise and surge in signal lines, keep all wiring separate from power lines and high voltage lines. Otherwise, this can cause a malfunction.
3. Check wiring insulation, as defective insulation can cause damage to the unit when excessive voltage or current is applied.
4. Do not bend or pull cables repeatedly, and do not place heavy objects on them or allow them to be pinched. This can cause broken

3.3.3 Light/Surge voltage suppressor VQC1000/2000

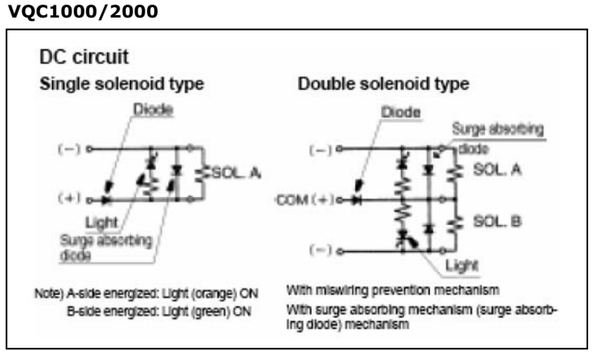
Indicator lights are all positioned on one side for both single solenoid and double solenoid type valves.

For double solenoid type, 2 colors that are same as the manual override are used to indicate the energization of A-side or B-side.

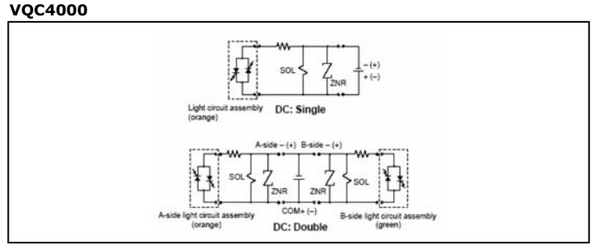


3.3.4 Internal wiring specification

VQC1000/2000

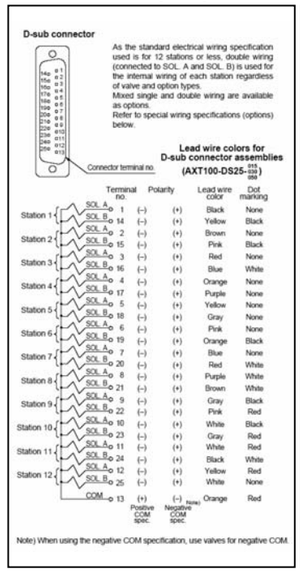


VQC4000

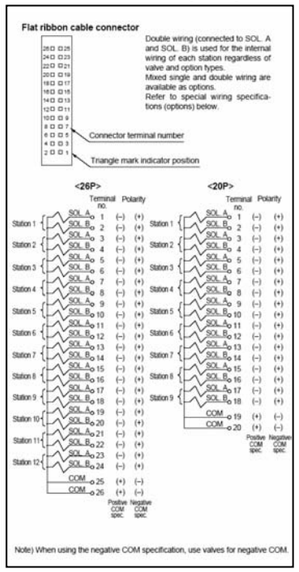


3.3.5 Electrical Wiring

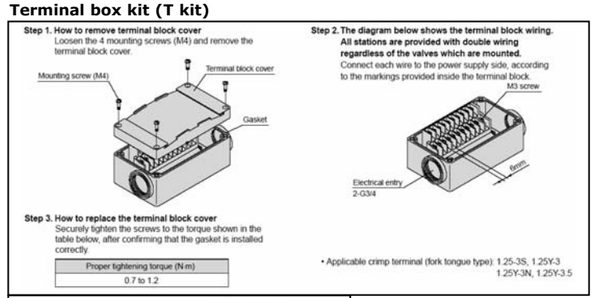
D-sub connector (F kit)

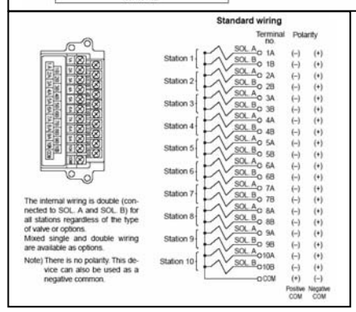


Flat cable connector (P kit)

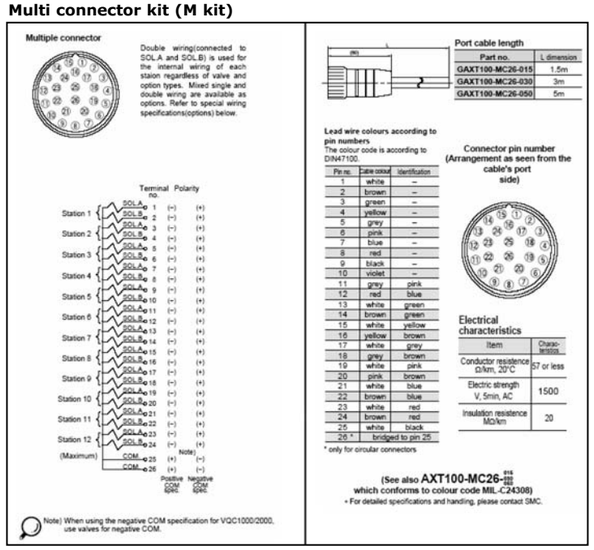


Terminal box kit (T kit)

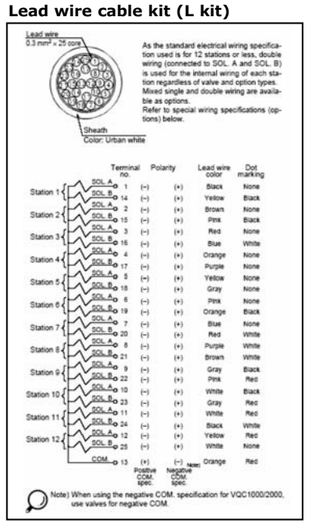




Multi connector kit (M kit)



Lead wire cable kit (L kit)



3.4 Mounting

- **If air leakage increases or equipment does not operate properly, stop operation.**
  After mounting, repairs, or equipment modification, connect the compressed air and power supplies, and perform appropriate function and leakage inspections to confirm that the unit is mounted properly.
- **Instruction manual**
  Mount and operate the product only after reading the manual carefully and understanding its contents. Always keep the manual handy for easy reference.
- **Painting and coating**
  Warnings or specifications printed or pasted on the product should not be erased, removed or covered up.

Solenoid valve removal and mounting VQC1000/2000

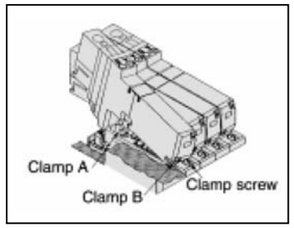
Removal steps

1. Loosen the clamp screws until they turn freely. (The screws do not come out.)
2. Remove the solenoid valve from clamp B by lifting the coil side of the valve while pushing on the screw top. If pushing down on the screw is difficult, you can alternately press down on the valve gently in the area near the manual override.

Mounting steps

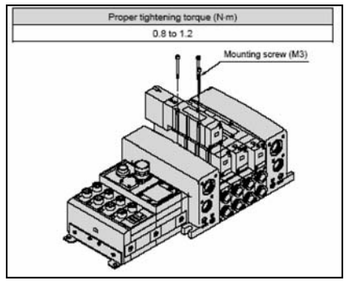
1. Push the clamp screws. Clamp A opens. Now insert the end plate hook of the valve into clamp B from an angle.
2. Push the valve down into place. (When you release the screws, the valve will be locked into clamp A.)
3. Tighten the clamp screws with a tightening torque of 0.25 to 0.35N-m for VQC1000 and 0.5 to 0.7N m for VQC2000.

⚠ CAUTION:
Do not let foreign matter stick on the seal side of the gasket and solenoid, as this will cause air leakage.



Valve mounting VQC4000

After confirming that the gasket is installed correctly, securely tighten the mounting screws according to the tightening torque shown below.



3.5 Lubrication

⚠ CAUTION:

- SMC products have been lubricated for life at manufacturer, 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.

1. The valve has been lubricated for life at the factory, and does not require any further lubrication.
2. Should you wish to apply additional lubrication, however, please be sure to use ISO VG32 Class 1 turbine oil (without additives).
   Please be aware, however, that once additional lubrication is applied, it must be continued to avoid malfunctions, as the new lubricant will completely cancel out the original lubrication.

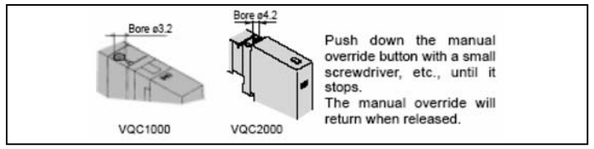
4 SETTINGS AND PROGRAMMING

Manual override

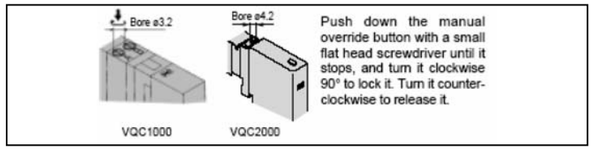
Since connected equipment will operate when the manual override is activated, confirm that conditions are safe prior to activation.
The non-locking push type (tool required) is standard, and the slotted locking type (tool required) is optional.

VQC1000/2000

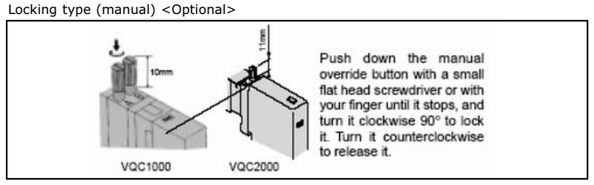
Non-locking push type (tool required)



Slotted locking type (tool required) <Optional>

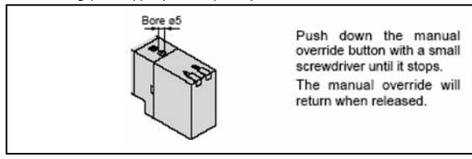


Locking type (manual) <Optional>

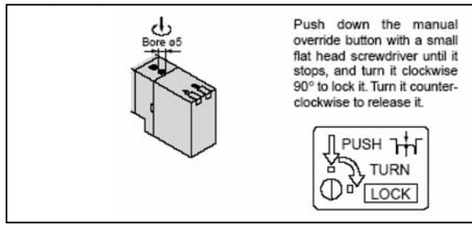


VQC4000

Non-locking push type (tool required)



Locking type (manual) <Optional>



5 MAINTENANCE

⚠ WARNING:

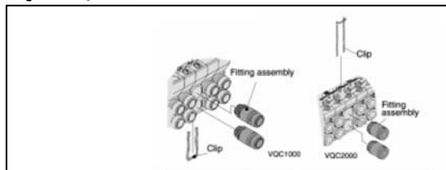
- Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.
- If handled improperly, compressed air can be dangerous. Assembly, handling and repair of pneumatic system should be performed by qualified personnel only.
- Drain: remove condensate from the filter bowl on a regular basis.
- Shut-down before maintenance: before attempting any kind of maintenance make sure the supply pressure is shut off and all residual air pressure is released from the system to be worked on.
- Start-up after maintenance: apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, please verify product set-up parameters.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

- **Perform maintenance procedures as shown in the instruction manual.**
  If handled improperly, malfunction or damage of machinery or equipment may occur.
- **Equipment removal and supply/exhaust of compressed air**
  When equipment is to be removed, first confirm that measures are in place to prevent dropping of driven objects and run-away of equipment, etc. Then cut the supply air pressure and electric power, and exhaust all compressed air from the system using its residual pressure release function.
- **Infrequent operation**
  Valves should be switched at least once every 30 days to prevent malfunction. (Use caution regarding the air supply.)
- **Manual override operation**
  When the manual override is operated, connected equipment will be actuated. Confirm safety before operating.

Replacing one-touch fittings

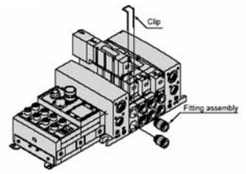
- Cylinder port fittings are available in cassette type and can be replaced easily.
- Fittings are secured with a retaining clip that is inserted from the top side of the valve. After removing the valve, remove the clip with a flat head screw driver to replace the fittings.
- To mount a fitting, insert the fitting assembly until it stops and reinsert the retaining clip to its designated position.

VQC1000/2000



Applicable tube O.D.	Fitting assembly part no.	
	VQC1000	VQC2000
ø3.2	VVQ1000-50A-C3	—
ø4	VVQ1000-50A-C4	VVQ1000-51A-C4
ø6	VVQ1000-50A-C6	VVQ1000-51A-C6
ø8	—	VVQ1000-51A-C8
M5	VVQ1000-50A-M5	—
ø1/8"	VVQ1000-50A-N1	—
ø5/32"	VVQ1000-50A-N3	VVQ1000-51A-N3
ø1/4"	VVQ1000-50A-N7	VVQ1000-51A-N7
ø5/16"	—	VVQ1000-51A-N9

VQC4000



Applicable tube O.D.	Fitting assembly part no.
	VQC4000
ø8	VVQ4000-50B-C8
ø10	VVQ4000-50B-C10
ø12	VVQ4000-50B-C12
ø1/4"	VVQ4000-50B-N7
ø5/16"	VVQ4000-50B-N9
ø3/8"	VVQ4000-50B-N11

6 LIMITATIONS OF USE

⚠ WARNING:

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

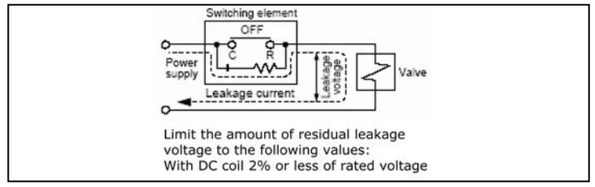
1. Confirm all specifications.
The products featured in this catalog are designed only for use in compressed air systems (including vacuum). Do not operate at pressures or temperatures beyond the range of specifications, as this can cause damage or malfunction. (Refer to specifications.) Contact SMC when using a fluid other than compressed air (including vacuum).

2. Extended periods of continuous en-ergization
Contact SMC if valves will be continuously energized for extended periods of time.

⚠ CAUTION:

1. Momentary en-ergization
If a double solenoid valve will be operated with momentary en-ergization, 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. If the valve is to be used in an air blowing application, it should be energized continuously during the application.

2. Leakage voltage
When using a C-R element (surge voltage suppressor) for protection of the switching element, please keep in mind that leakage voltage will increase due to leakage current flowing through the C-R element.



3. Low temperature operation
Avoid ambient temperatures outside the range of -10°C to 50°C. At low temperatures, take any necessary steps to avoid solidification or freezing of drainage and moisture.

4. For air blowing applications
When using solenoid valves for air blowing, use external pilot type valves. Also, air supply to the external pilot port should be compressed air that is within the pressure range prescribed in the specifications.

5. Mounting orientation
In the case of a 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. Also, when mounting for an application that will inevitably involve vibration or impact, mount so that the spool valve is at a right angle to the direction of vibration. Do not use in applications where vibration or impact exceed the product's specifications.

7 EUROPEAN CONTACT LIST

7.1 SMC Corporation

Country	Telephone	Country	Telephone
Austria	(43) 2262-62 280	**Italy**	(39) 02-92711
Belgium	(32) 3-355 1464	**Netherlands**	(31) 20-531 8888
Czech Republic	(420) 5-414 24611	**Norway**	(47) 67 12 90 20
Denmark	(45) 70 25 29 00	**Poland**	(48) 22-548 50 85
Finland	(358) 9-859 580	**Portugal**	(351) 22 610 89 22
France	(33) 1-64 76 1000	**Spain**	(34) 945-18 4100
Germany	(49) 6103 4020	**Sweden**	(46) 8 603 12 00
Greece	(30) 1- 342 6076	**Switzerland**	(41) 52-396 3131
Hungary	(36) 23 511 390	**Turkey**	(90) 212 221 1512
Ireland	(353) 1-403 9000	**United Kingdom**	(44) 1908-56 3888

7.2 Websites

SMC Corporation	www.smcworld.com
SMC Europe	www.smceu.com