



Installation and Maintenance Manual

VQ5000 series, 5 Port Metal Seal/Rubber Seal Solenoid Valve



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 components 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 on equipment 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
Low Voltage Directive 90/68/EEC	DIN VDE 0580

2 INTENDED CONDITIONS OF USE

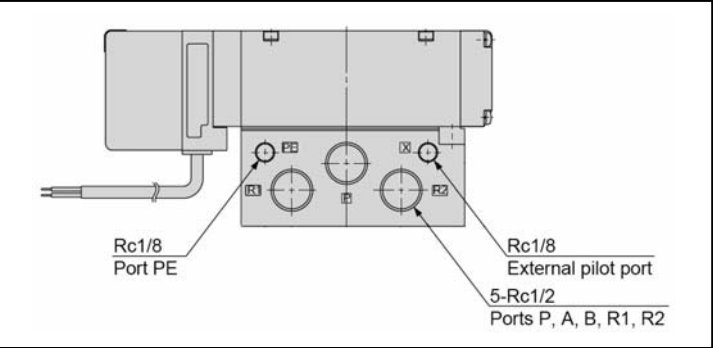
2.1 Specifications

Standard specifications

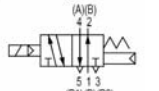

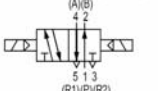
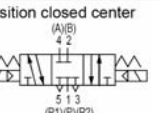
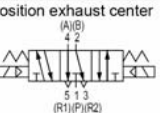
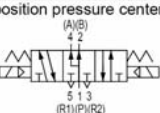
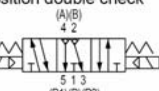
Valve specifications	Valve construction		Metal Seal	Rubber Seal
	Fluid		Air, Inert gas	Air, Inert gas
	Max. operating pressure ^{Note 3)}		1.0MPa (0.7MPa)	
	Minimum. operating pressure	Single	0.10MPa	0.20MPa
		Double	0.10MPa	0.15MPa
		3 position	0.15MPa	0.20MPa
	Proof pressure		1.5MPa	
	Ambient and fluid temperature		-10 to 50°C ^{Note 1)}	-5 to 50°C ^{Note 1)}
	Lubrication		Not required	
	Manual override		Non-locking push type/Slotted locking type (tool requires) optional	
Solenoid specifications	Impact/Vibration resistance		150/30 m/s ^{Note 2)}	
	Enclosure		Dust proof (IP65 type available)	
	Rated coil voltage		12VDC, 24VDC, 100VAC, 110VDC, 200VAC, 220VAC (50/60HZ)	
	Allowable voltage fluctuation		+/-10% of rated voltage	
	Coil insulations type		Class B equivalent	
	Power consumption (current value)	24VDC	DC1W (42mA), ^{Note3)}	DC0.5W (21mA)
		12VDC	DC1W (83mA), ^{Note 3)}	DC0.5W (42mA)
		100VAC	Inrush 1.2VA (12mA), Holding 1.2VA (12mA)	
		110VAC	Inrush 1.3VA (11.7mA), Holding 1.3VA (11.7mA)	
		200VAC	Inrush 2.4VA (12mA), Holding 2.4VA (12mA)	
		220VAC	Inrush 2.6VA (11.7mA), Holding 2.6VA (11.7mA)	

Note 1) At low temperatures, use dry air with no condensation.
Note 2) Impact resistance No malfunction when tested with a drop tester in the axial direction and at a right angle to the main valve and armature, one time each in both energized and de-energized states. (initial value)Vibration resistance ... No malfunction when tested with one sweep of 45 to 2000Hz in the axial direction and at a right angle to the main valve and armature, one time each in both energized and de-energized states. (initial value)
Note 3) Values inside () are for energy saving (0.5W) specifications.

2.2 Piping



2.3 Circuit Symbols

2 position single 	2 position double (metal) 	2 position double (rubber) 
3 position closed center 	3 position exhaust center 	3 position pressure center 
3 position double check 		

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)
Rc1/8	7 to 9
Rc1/4	12 to 14
Rc3/8	22 to 24
Rc1/2	28 to 30
Rc3/4	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:
 - 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.
 - With diode to protect polarity: if polarity connection is wrong, the valve does not switch.

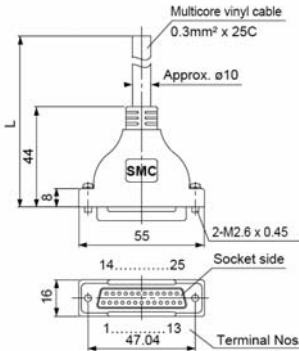
D Sub Connector

015
AXT100-DS25- 030
050

D sub connector cable assembly (option)

Cable length (L)	Assembly No.	Note
1.5m	AXT100-DS25-015	Cable:25 cores
3m	AXT100-DS25-030	x 24AWG
5m	AXT100-DS25-050	

*If a commercially available connector is purchased use a MIL-C-24308 standard 25 pin type female connector.

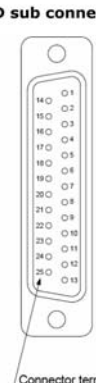


D sub connector cable assembly wire colours by terminal number

Terminal No.	Lead wire colour	Dot marking
1	Black	None
2	Brown	None
3	Red	None
4	Orange	None
5	Yellow	None
6	Pink	None
7	Blue	None
8	Purple	White
9	Grey	Black
10	White	Black
11	White	Red
12	Yellow	Red
13	Orange	Red

Terminal No.	Lead wire colour	Dot marking
14	Yellow	Black
15	Pink	Black
16	Blue	White
17	Purple	None
18	Grey	None
19	Orange	Black
20	Red	White
21	Brown	White
22	Pink	Red
23	Grey	Red
24	Black	White
25	White	None

Electrical Wiring Specifications

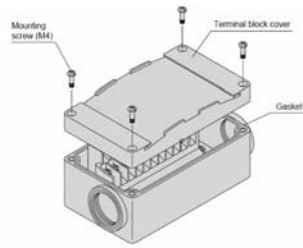
D sub connector	Standard wiring	D sub connector assembly (AXT100-DS25-015/030/050) wire colors			
		Terminal No.	Polarity	Lead wire color	Dot marking
	1 station	SOL A 1	(-)	(+) Black	None
		SOL B 14	(-)	(+) Yellow	Black
	2 stations	SOL A 2	(-)	(+) Brown	None
		SOL B 15	(-)	(+) Pink	Black
	3 stations	SOL A 3	(-)	(+) Red	None
		SOL B 16	(-)	(+) Blue	White
	4 stations	SOL A 4	(-)	(+) Orange	None
		SOL B 17	(-)	(+) Purple	None
	5 stations	SOL A 5	(-)	(+) Yellow	None
		SOL B 18	(-)	(+) Gray	None
	6 stations	SOL A 6	(-)	(+) Pink	None
		SOL B 19	(-)	(+) Orange	Black
	7 stations	SOL A 7	(-)	(+) Blue	None
		SOL B 20	(-)	(+) Red	White
	8 stations	SOL A 8	(-)	(+) Purple	White
		SOL B 21	(-)	(+) Brown	White
	9 stations	SOL A 9	(-)	(+) Gray	Black
		SOL B 22	(-)	(+) Pink	Red
	10 stations	SOL A 10	(-)	(+) White	Black
		SOL B 23	(-)	(+) Gray	Red
	11 stations	SOL A 11	(-)	(+) White	Red
		SOL B 24	(-)	(+) Black	White
	12 stations	SOL A 12	(-)	(+) Yellow	Red
		SOL B 25	(-)	(+) White	None
		COM. 13	(+)	Note: (-) Orange	Red

The internal wiring is double (connected to SOL. A and SOL. B) for all stations regardless of the type of valve or Options.
Optional specifications permit single and double wiring to be mixed.
Note: There is no polarity. It can also be used as a negative Common.

Terminal Block connection

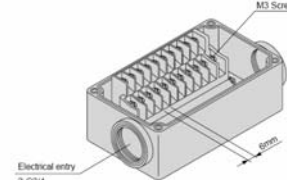
Step 1) Removing block cover

Loosen the 4 mounting screws (M4) and open the terminal block cover.



Step 2) See below for terminal block wiring

Connect each wire to the power supply side, according to the markings provided inside the terminal block.



Step 3)Attaching the terminal block cover

Securely tighten the screws with the torque shown in the table below, after confirming that the gasket is installed correctly.

Proper tightening torque Nm
0.7 to 1.2

Electrical Wiring Specifications (IP65 available)

Standard wiring	Terminal Nos.	Polarity	
		(-)	(+)
1 station	SOL A 1A	(-)	(+)
	SOL B 1B	(-)	(+)
2 stations	SOL A 2A	(-)	(+)
	SOL B 2B	(-)	(+)
3 stations	SOL A 3A	(-)	(+)
	SOL B 3B	(-)	(+)
4 stations	SOL A 4A	(-)	(+)
	SOL B 4B	(-)	(+)
5 stations	SOL A 5A	(-)	(+)
	SOL B 5B	(-)	(+)
6 stations	SOL A 6A	(-)	(+)
	SOL B 6B	(-)	(+)
7 stations	SOL A 7A	(-)	(+)
	SOL B 7B	(-)	(+)
8 stations	SOL A 8A	(-)	(+)
	SOL B 8B	(-)	(+)
9 stations	SOL A 9A	(-)	(+)
	SOL B 9B	(-)	(+)
10 stations	SOL A 10A	(-)	(+)
	SOL B 10B	(-)	(+)
		(+)	(-)
		Positive Common	Negative Common

The internal wiring is double (connected to SOL. A and SOL. B) for all stations Regardless of the type of valve or options. Optional specifications permit single and Double wiring to be mixed. Note: There is no polarity. It can also be Used as a negative common.

Individual Terminal Block Connections

Terminal block marking	1	3	2	4
Model				
VQ510 ⁰ ₁	A side +	A side -		
VQ520 ⁰ ₁	A side +	A side -	B side +	B side -
³ ₅ VQ5 ⁴ ₀ ⁰ ₁ ⁶	A side +	A side -	B side +	B side -

- Compatible crimp-style terminals: 1.25-3S.
- There is no polarity (+,-)

Lead Wire specifications

- IP65 enclosure available
- Direct electrical entry type available with two or more stations
- Electrical entry can be selected on either the U side or the D side according to the mounting orientation
- 12 stations maximum

Three lead wires are attached to each other station regardless of the type of valve which is mounted. The red wire is for COM connection.

Lead wire color

SOL.A (-) (+) Black

COM (+) (-) Red

SOL.B (-) (+) White

Positive common

Negative common

Single solenoid type

Lead wire color

SOL.A (-) (+) Black

COM (+) (-) Red

SOL.B (-) (+) White

Positive common

Negative common

Double solenoid type

Lead wire length	Part no.
0.6m	VVQ5000-44A-8-□
1.5m	VVQ5000-44A-15-□
3m	VVQ5000-44A-30-□

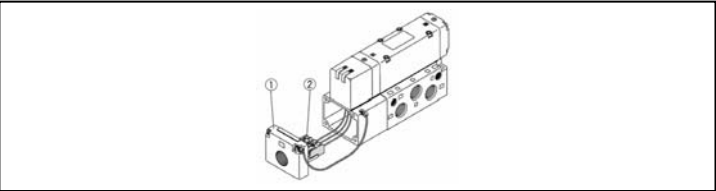
□: Number of stations 1 to 12

Note) There is no polarity. It can also be used as a negative common.

Lead Wire specifications

Plug-in sub plate (with terminal block)

- When the sub plate junction cover (1) is removed, the terminal block (2) is found attached inside.



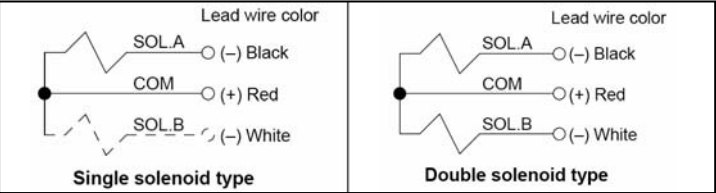
- The terminal block is marked as follows. Connect wiring to each of the power supply terminals.

Terminal block marking	1	3	2	4
Model				
VQ510 ⁰ ₁	A side +	A side -		
VQ520 ⁰ ₁	A side +	A side -	B side +	
³ ₅ VQ5 ⁴ ₀ ⁰ ₁ ⁶	A side +	A side -	B side +	

Note 1) There is no polarity. It can be used as -COM.
Note 2) The sub plate is double wired even for the VQ510

Plug Lead: Grommet type

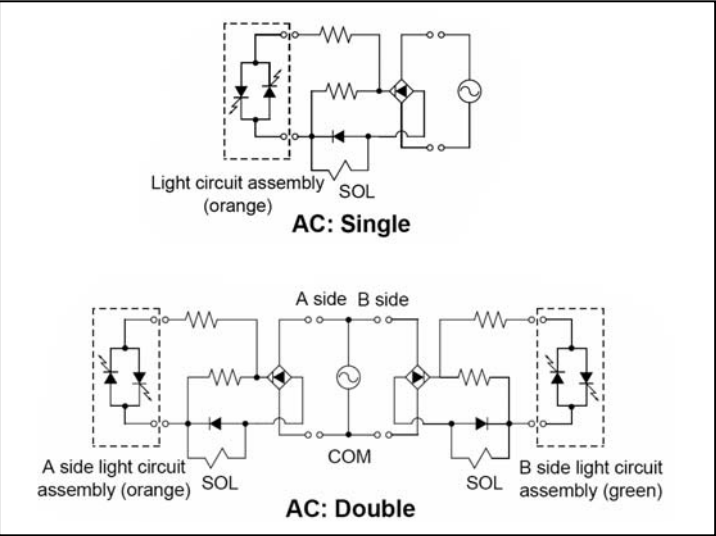
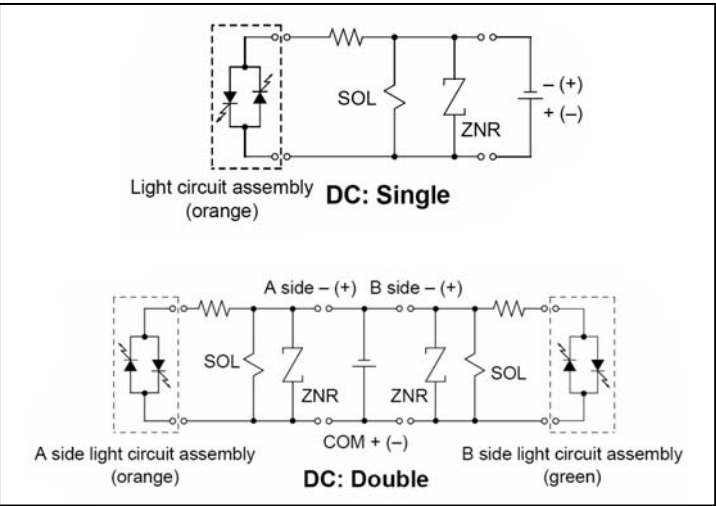
Make connections to each corresponding wire



	Single solenoid type	Double solenoid type
Standard		
Enclosure IP65		

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

Internal Wiring Specifications



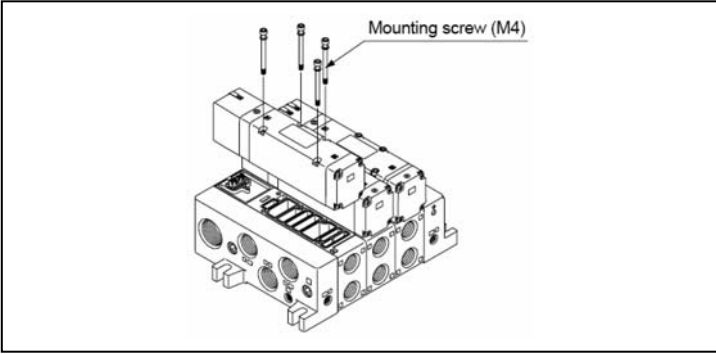
3.4 Mounting

- If air leakage increases or equipment does not operate properly, stop operation.**
After mounting is completed, confirm that it has been done correctly by performing a suitable function test.
- Instruction manual**
Mount and operate the product after reading the manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.
- Painting and coating**
Warnings or specifications printed or pasted on the product should not be erased, removed or covered up.

Valve Mounting

After confirming that the gasket is installed correctly, securely tighten the mounting screws with the tightening torque shown in the table below.

Proper tightening torque N.m
1 to 1.8



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.
- The valve has been lubricated for life at the factory, and does not require any further lubrication.
- In the event that it is lubricated, use Class 1 turbine oil (without additives), ISO VG32. However, once lubrication is applied it must be continued, as the original lubricant may be eliminated leading to malfunction.

4 SETTINGS AND PROGRAMMING

Manual Override

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

Non-locking push type (tool required)

Bore ø6.1

Push down the manual Override button with a Small screwdriver, etc, until it stops. The manual override will Return when released.

Slotted locking type (tool required)

Bore ø6.1

Push down the manual override button with a small flat head screwdriver until it stops, and turn it clockwise 90° to lock it. Turn it counter clockwise to release it.

5 MAINTENANCE

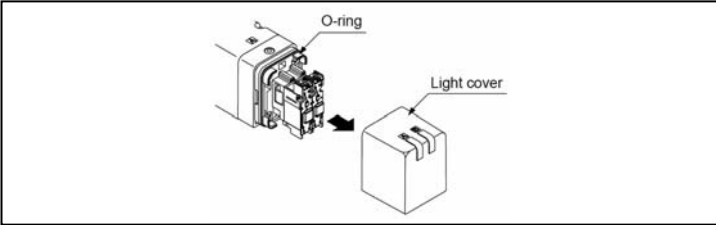
- WARNING:**
Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.
- If handled improperly, compressed air can be dangerous. Assembly, handling and repair of pneumatic system should be performed by qualified personnel only.
- Drain: 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.
- Valves should be switched at least once every 30 days to prevent malfunction. (Use caution regarding the air supply.)
- When the manual override is operated, connected equipment will be actuated. Confirm safety before operating.
- In the case of the rubber seals, once lubrication has been started, it must be continued. Use Class 1 turbine oil (without additives) VG32. Other lubricating oils will cause malfunction or other trouble. Contact SMC regarding Class 2 turbine oil (with additives) VG32.

- 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 removed, first confirm that measures are in place to prevent dropping of work pieces and run-away of equipment, etc. Then cut the supply pressure and power, and exhaust all compressed air from the system using its residual pressure release function. When the equipment is to be started again after remounting or replacement, first confirm that measures are in place to prevent lurching of actuators, etc., and then confirm that the equipment is operating normally.
- Low frequency 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.

Installation/Removal of light cover

- Removal**
To remove the pilot cover pull it straight off. If it is pulled off at an angle, the pilot valve may be damaged and/or the protective O-ring may be scratched.
- Installation**
Place the cover straight over the pilot assembly so that the pilot valve is not touched, and push it until the cover hook locks without twisting the protective O-ring. (When pushed in, the hook opens and locks automatically.)



Changing the Pilot Valve

- Removal**
 - Remove the mounting screw that holds the pilot valve using a small screwdriver.
 - When equipped with light, remove the light circuit board which is installed on the pilot valve by pulling it straight off the connector pins.
- Installation**
 - Insert the light circuit board straight onto the connector pins following the guide. If it is pushed in without following the guide, there is a danger of bending the board contacts.
 - After confirming that the gasket is installed correctly, securely tighten the mounting screws with the torque shown in the table below.

Proper tightening torque N.m
0.1 to 0.13

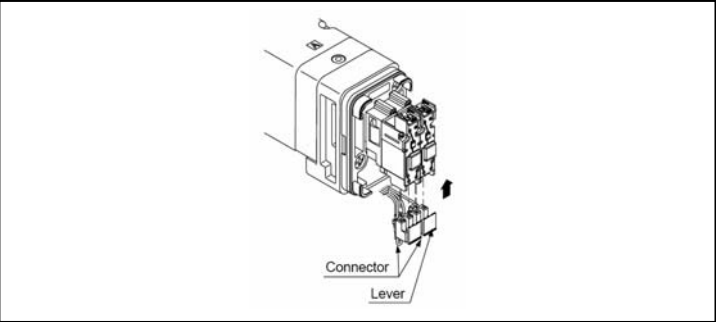
Note) The mounting of pilot valves is not directional with respect to the A and B sides. However, the light circuit board's A side is orange and B side is green, and it must be mounted on the pilot valve in accordance with the mounting indicators. The light will not go on if the mounting is reversed.

Light circuit board no.	
SOL.A	VQZ100-47-A
SOL.B	VQZ100-47-B

Plug Lead Type
Installation/Removal of Plug connector

- To install the connector, hold the lever and connector between your fingers and insert it straight onto the pins. Then push the lever's hook into the cover's groove and lock it into place.
- To remove the connector, pull it straight off while pushing down on the lever with your thumb to remove the hook the groove.

Note: Do not pull on the lead wires with excessive force. This can cause faulty contacts and/or broken wires.

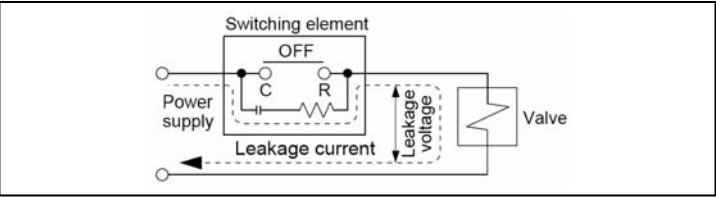


6 LIMITATIONS OF USE

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

1. Momentary energization
If a double solenoid valve will be operated with momentary energization, it should be energized for at least 0.1 second.

2. Leakage voltage
Particularly when using a C-R element (surge voltage suppressor) for protection of the switching element, take note that leakage voltage will increase due to leakage current flowing through the C-R element, etc.



Limit the amount of residual leakage voltage to the following values:

With DC coil	With AC coil
2% or less of rated voltage	12.5% or less of rated voltage

3. Low temperature operation
Avoid ambient temperatures outside the range of -10°C to 50°C. At low temperatures, measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

4. Operation for air blowing
When using solenoid valves for air blowing, an external pilot type or direct solenoid operated type should be used.
Also, supply to the external pilot port compressed air 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 in a location with vibration or impact, mount so that the spool valve is at a right angle to the direction of vibration.
Do not use in locations where vibration or impact exceeds 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