



## Installation and Maintenance Manual VCB Direct Operated 2 Port Solenoid Valve for Heated Water



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

#### 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	EN 61000-6-2, EN55011
Low Voltage Directive	DIN VDE 0580

### 2 INTENDED CONDITIONS OF USE

#### 2.1 Specifications

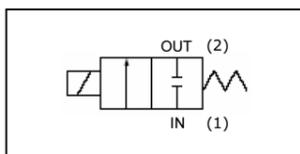
##### Standard Specifications

Valve specifications	Valve construction	Direct operated poppet	
	Fluid	Heated water (99°C or less)	
	Withstand pressure MPa	5.0	
	Body material	CAC406 (BC6), SUS	
	Seal material	FKM, EPDM	
	Ambient temperature °C	-20 to 100	
	Fluid temperature °C	99 or less	
	Enclosure	Dust proof, Splash proof (equivalent to IP65)	
	Environment	Location without corrosive or explosive gases	
	Valve leakage cm <sup>3</sup> /min	0 (with water pressure)	
Coil specifications	Mounting orientation	Unrestricted	
	Vibration/Impact m/s <sup>2</sup> (Note 1)	30/150 or less	
	Rated voltage	100VAC, 110VAC, 200VAC, 220VAC, 230VAC (50/60Hz)	
	Allowable voltage fluctuation	±10% of rated voltage	
	Coil insulation type	Class H	
	Power consumption W 50/60Hz	VCB2: 4.9/4.1, VCB3: 7.7/6.6, VCB4: 10.5/9.3	
	Apparent power VA 50/60Hz	Inrush	VCB2: 22/19, VCB3: 36/30, VCB4: 45/37
		Holding	VCB2: 10/8, VCB3: 15/13, VCB4: 19/16

(Note 1) Vibration resistance: Conditions when tested with one sweep of 10 to 250Hz in the axial direction and at a right angle to the armature, in both energized and de-energized states

Impact resistance: Conditions when tested with a drop tester in the axial direction and at a right angle to the armature, one time each in energized and de-energized states

#### 2.2 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.

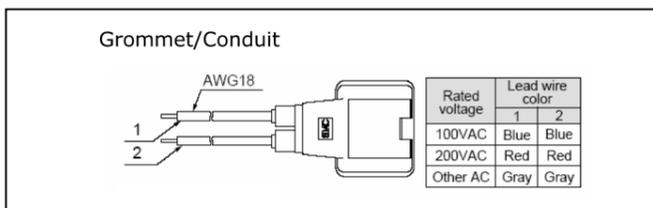
Thread	Appropriate tightening torque (Nm)
Rc 1/8	7 to 9
Rc 1/4	12 to 14
Rc 3/8	22 to 24
Rc 1/2	28 to 30
Rc 3/4	28 to 30

#### 3.3 Electrical connection

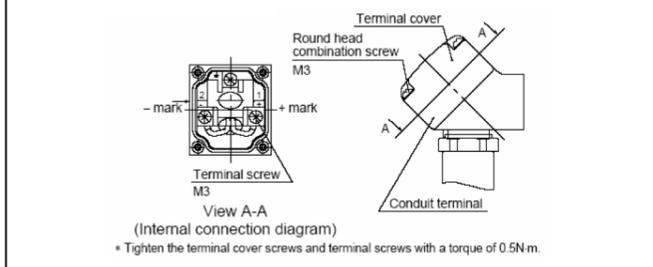
**CAUTION:**

- When DC power is connected to a solenoid valve equipped with light and/or surge voltage suppressor, check for polarity indications.
- For polarity indications:
  - 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.
- As a rule, use electrical wire with a cross sectional area of 0.5 to 1.25mm<sup>2</sup> for wiring. Furthermore, do not allow excessive force to be applied to the wires.

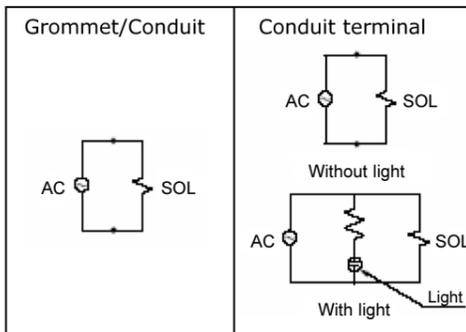
- Use electrical circuits which do not generate chattering in their contacts.
- Use voltage which is within ±10% of the rated voltage. In cases with a DC power supply where importance is placed on responsiveness, stay within ±5% of the rated value. The voltage drop is the value in the lead wire section connecting the coil.
- When surge from the solenoid affects the electrical circuitry, install a surge absorber, etc., in parallel with the solenoid.



**Conduit terminal**  
In the case of the conduit terminal, make connections according to the marks shown below.



#### Electrical Circuits



#### 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.
- Do not apply external force to the coil section. When tightening is performed, apply a wrench or other tool to the outside of the piping connection parts.
- Do not warm the coil assembly with a heat insulator, etc. Use tape and heaters, etc., for freeze prevention on the piping and body only. They can cause burn out of the coil.
- Secure with brackets, where appropriate.
- Avoid sources of vibration, or redesign mounting so that resonance will not occur.
- Instruction manual. Mount 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.

#### 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.

### 4 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 in accordance with the procedures in the instruction manual.**

- Improper handling can cause damage or malfunction of machinery and equipment, etc. In addition, perform maintenance inspections once every six months to ensure optimum performance.

#### Removing the product

- The valve will reach a high temperature when used with high temperature fluids. Confirm that the valve temperature has dropped sufficiently before performing work. If touched inadvertently, there is a danger of being burned.

#### Removal

- Shut off the fluid supply and release the fluid pressure in the system.
- Shut off the power supply.
- Demount the product.

#### Low frequency operation

- Switch valves at least once every 30 days to prevent malfunction.

**CAUTION:**

#### Filters and strainers

- Be careful regarding clogging of filters and strainers.
- Replace filter elements after one year of use, or earlier if the pressure drop reaches 0.1MPa.
- Clean strainers when the pressure drop reaches 0.1MPa.

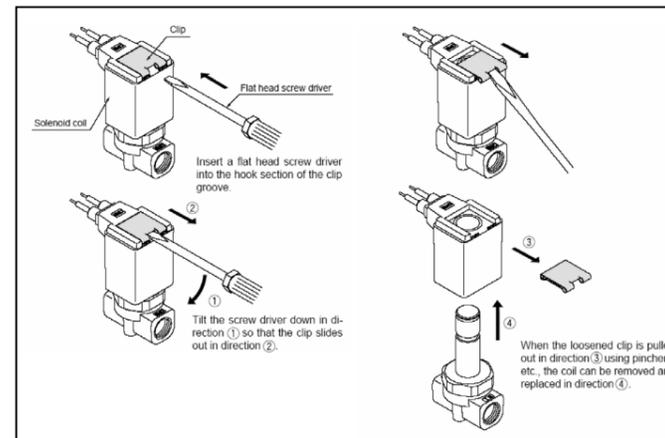
#### Storage

- In case of long term storage after use with heated water, first thoroughly remove all moisture to prevent rust and deterioration of rubber materials, etc.

#### Replacing Solenoid Coil

**CAUTION:**

The valve will reach high temperatures from high temperature fluids such as heated water. Confirm that the valve has cooled sufficiently before performing work. If touched inadvertently, there is a danger of being burned.



After replacing the coil, the clip is reinstalled by pushing it back in the direction opposite to its removal.

## 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.

#### Confirm the specifications.

- Give careful consideration to operating conditions such as the application, fluid and environment, and use within the operating ranges.

#### Fluid temperature

- Operate within the prescribed fluid temperature range. The temperature range changes depending on the seal material, coil insulation and the type of power supply, etc.

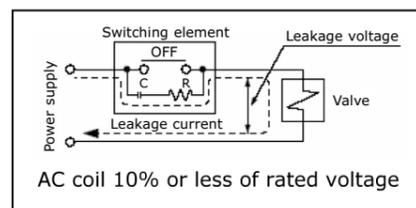
#### Fluid quality

- The use of fluid which contains foreign matter can cause problems such as malfunction and seal failure by promoting wear of the valve seat and armature, and by sticking to the sliding parts of the armature, etc. Install a suitable filter (strainer) immediately upstream from the valve. As a general rule, use 80 to 100 mesh. When used to supply water to boilers, substances such as calcium and magnesium which generate hard scale and sludge are included. Since this scale and sludge can cause valve malfunction, install water softening equipment, and a filter (strainer) directly upstream from the valve to remove these substances.

### CAUTION:

#### Leakage voltage

- Particularly when using a resistor in parallel with a switching element and using a C-R element (surge voltage suppressor) to protect the switching element, take note that leakage current will flow through the resistor and C-R element, etc., creating a danger that the valve may not shut OFF.



#### Low temperature operation

- The valve can be used at ambient temperatures as low as -20°C, but take measures to prevent freezing or solidification of impurities, etc.
- When used in cold areas, adopt freeze prevention measures such as draining the water from pipelines. If warmed with a heater, etc., avoid the coil unit. Also, implement warming or other freeze prevention measures for the body.

## 7 EUROPEAN CONTACT LIST

### 7.1 SMC Corporation

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

### 7.2 Websites

<b>SMC Corporation</b>	www.smcworld.com
<b>SMC Europe</b>	www.smceu.com