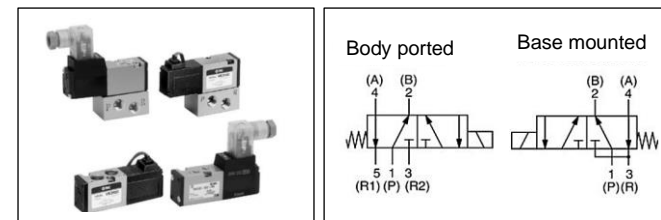


## Instruction Manual

## 5 Port Solenoid Valve

## Series VK3000



The intended use of this product is to control the movement of 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<sup>\*)</sup>, and other safety regulations.

<sup>\*)</sup> 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.

<b>Caution</b>	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
<b>Warning</b>	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
<b>Danger</b>	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

**Warning**

- Always ensure compliance with relevant safety laws and standards.
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

**Caution**

- The product is provided for use in manufacturing industries only. Do not use in residential premises.

## 2 Specifications

## 2.1 Valve specifications

Type of actuation	Direct operated type
Fluid	Air
Operating pressure range [MPa]	Standard 0 to 0.7
Flow characteristics	Low wattage (Y) Refer to catalogue
Ambient and fluid temperature [°C]	-10 to 50 (no freezing)
Response Time (at 0.5 MPa) [ms]	Standard ≤10
Duty cycle	Low wattage (Y) ≤15
Minimum operating frequency	Contact SMC
Maximum operating frequency [Hz]	1 cycle / 30 days
Manual override	10
Lubrication	Non-locking push type
Impact / Vibration resistance [m/s <sup>2</sup> ]	Not required
Enclosure (based on IEC60529)	300 / 50
	IP40

## 2 Specification - continued

Mounting orientation	Unrestricted
Weight	Body ported VK3120(Y) 90
	Base mounted VK3140(Y) 130

Table 1.

Note 1) Based on dynamic performance test, JIS B 8419: 2010. (Coil temperature: 20°C, at rated voltage, without surge suppressor).

Note 2) **Impact resistance:** No malfunction occurred when it is tested with a drop tester in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states every once for each condition. (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 at both energized states in the axial direction and at the right angles to the main valve and armature. (Values quoted are for a new valve).

## 2.2 Solenoid specification

Electrical entry	Grommet (G, H) DIN terminal (D, DO)		
Rated coil voltage [V]	AC 100, 110, 200, 220, 240 DC 12, 24		
Col insulation class	Contact SMC		
Allowable voltage fluctuation	±10% of rated voltage		
Apparent power [VA] <small>Note)</small>	Standard type	Inrush	50 Hz 9.5 60 Hz 8
		Holding	50 Hz 7 60 Hz 5
			Without indicator light
		With indicator light	Standard 4.3
Power consumption [W]	AC	Varistor	
Surge voltage suppressor	DC	Diode (12 VDC or less: Varistor)	
	AC	Neon bulb	
Indicator light	AC	Neon bulb	
	DC	LED	

Table 2.

Note) At the rated voltage.

## 2.3 Low wattage VK31#0Y type

- Specifications different from standard are as follows:

Power consumption [W]	DC	Without indicator light	2
		With indicator light	2.3

Table 3.

## 2.4 Light indication

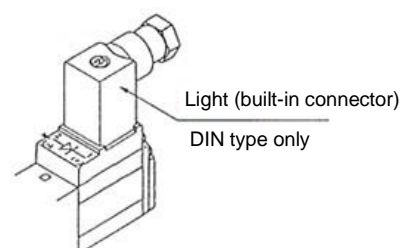


Figure 1.

## 2.5 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 mounting a valve or spacer on the manifold base or sub-plate, etc., the mounting orientation is already decided. If mounted in a wrong direction, the equipment to be connected may result in malfunction (see Figure 10 under section 3.14). VK300 series valves can be mounted on the manifold base VV5K3 of VK3000 series. Refer to catalogue for more details.

## 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.

## 3 Installation - continued

- 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.
- When the solenoid valve is mounted in a control panel or it is energized for a long time, make sure that the ambient temperature is within the specification of the valve.
- If using in an atmosphere where there is possible contact with water droplets, oil, weld spatter, etc., take suitable preventive measures.

## 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.

Port	Connection thread size (R, NPT)	Tightening Torque [N·m]
1(P), 2(A), 3(R)	M5 1/8	1 to 1.5 3 to 5

Table 4.

## 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 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 of the valve. Select an air filter with a filtration size of 5 µm or smaller.

## 3.6 Effect of back pressure when using a manifold

**Warning**

- Use caution when valves are used on a manifold, because an actuator may malfunction or unexpected movement may occur due to back pressure.
- For a single acting cylinder, take appropriate measures to prevent malfunction by using it with an individual exhaust manifold.

## 3.7 Light/surge voltage suppressor

## 3.7.1 AC

	Grommet (G)	DIN Terminal (D)
Without Indicator Light: S		
With indicator light: Z	None	

Figure 2.

## 3.7.2 .DC (24 V &amp; 48 V)

	Grommet (G)	DIN Terminal (D)
Without Indicator Light: S		
With indicator light: Z	None	

Figure 3.

## 3 Installation - continued

## 3.7.3 DC (6V &amp; 12V)

	Grommet (G)	DIN Terminal (D)
Without Indicator Light: S		
With indicator light: Z	None	

Figure 4.

**Caution**

In the case of valves without surge suppressor, the machine designer shall add suppression as close as possible to the valve.

## 3.7.4 Electrical connectors

Grommet type	DIN Terminal type
Red (+) Black (-) Surge voltage suppressor	Indicator light (Built-in connector) Surge voltage suppressor (Built-in terminal) Marking AC, 12 VDC or less for DC For 24 V or more

Figure 5.

## 3.8 Residual voltage of the surge voltage suppressor

**Caution**

- If a Zener diode or varistor voltage suppressor is used, the suppressor arrests the back EMF voltage from the coil to a level in proportion to the rated voltage.
- Ensure the transient voltage is within the specification of the host controller.
- Contact SMC for the Zener diode or varistor residual voltage.
- In the case of a diode, the residual voltage is approximately 1 V.
- Valve response time is dependent on surge suppression method selected.

## 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-energized 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 How to wire DIN terminal wiring

**Caution**

- The DIN terminal wiring connection can achieve IP65 (enclosure rating on the connector and cable entry only when using a heavy duty cable with O.D. of Ø3.5 mm to Ø7 mm, (0.5 mm<sup>2</sup> 2 core and 3 core wires equivalent to JIS C 3306).
- Cable must exit perpendicularly and not at an angle.
- Tighten the ground nut and set screw within the specified torque range.
- IP enclosure rating for all other valve parts remain as per Table 1.
- Refer to catalogue for additional details.

### 3 Installation - continued

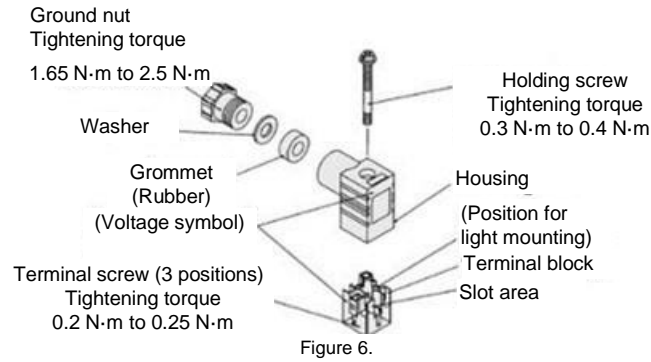


Figure 6.

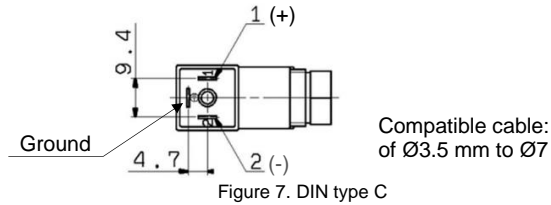


Figure 7. DIN type C

#### 3.10.1 Circuit with indicator light for DIN terminal

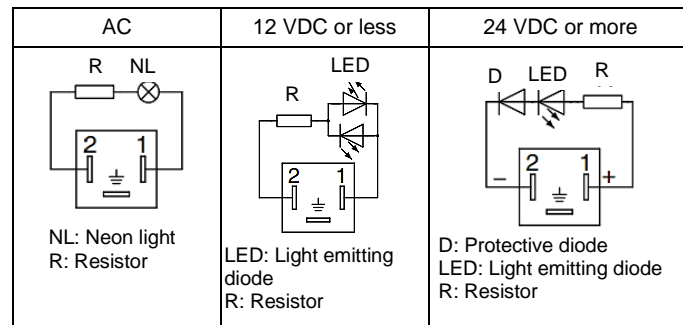


Figure 8.

#### 3.10.2 Changing cable entry direction

##### Caution

- After separating terminal block and housing, the cable entry direction can be changed by attaching the housing in the desired direction (4 directions in 90 degree increments).
- In the case of valve with indicator light, avoid damaging the light with lead wire.

#### 3.11 Extended periods of continuous energization

##### Warning

If a valve will be continuously energized for an extended period of time, the temperature of the valve will increase due to the heat generated by the coil assembly. This will likely adversely affect the performance of the valve and any nearby peripheral equipment. Therefore, if the valve is to be energized for periods of longer than 30 minutes at a time or if during the hours of operation the energized period per day is longer than the de-energized period, we advise using a valve with continuous duty such as SY series (with  $\leq 0.4$  W power or with power saving circuit).

#### 3.12 Manual override

##### Warning

Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Connected actuator is started by manual operation. Only use the manual override after confirming that there is no danger.

#### 3.13 Use as a 3-port valve

##### Caution

The VK3000 series can be used as 3 port valve, as a N.C. or N.O. type, by plugging either 4(A) or 2(B) cylinder Port. Make sure not to plug the exhaust ports 5(R1) and 3(R2).

### 3 Installation - continued

Plug position	B port	A port
Type of actuation	N.C.	N.O.
Pneumatic symbol		

Table 5.

#### 3.14 Mounting and removal of valves

##### Caution

- Ensure gaskets are in good condition, not deformed and are dust and debris free.
- When mounting valves ensure gaskets are present, aligned and securely in place.
- Tighten the valve mounting screw and bracket screw (if required) to the appropriate tightening torque of 0.6 N-m.
- Refer catalogue for details of mounting and removal of valves from manifold.

Manifold type	Correct mounting	Incorrect mounting
Base mounted / sub-plate		
Type 20 manifold		

Type 21 manifold		
Type 40 manifolds		
Type 41/42 manifold		
Type S41/S42 manifold		

Figure 9.

### 4 How to Order

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

### 5 Outline Dimensions

Refer to catalogue for outline dimensions.

### 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.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

### 7 Limitations of Use

#### 7.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

#### 7.2 Holding of pressure (including vacuum)

##### Warning

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

#### 7.3 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.

#### 7.4 Breathing hole

##### Caution

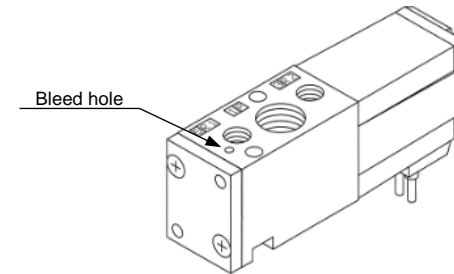


Figure 10.

There is a breathing hole on the bottom surface of the valve. Please note that liquid may enter or block the breathing hole, which may cause malfunction.

#### 7.5 Leakage voltage

##### Caution

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes  $\leq 2\%$  (for DC coils) or  $\leq 20\%$  (for AC coils) of rated voltage across the valve.

#### 7.6 Low temperature operation

##### Caution

Unless otherwise indicated in the specifications for each valve, operation is possible to  $-10^{\circ}\text{C}$ , but appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

### 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](http://www.smcworld.com) or [www.smc.eu](http://www.smc.eu) for your local distributor/importer.

## SMC Corporation

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