



ORIGINAL INSTRUCTIONS



Refer to Declaration of Conformity for relevant Directives

Instruction Manual
3 Port Solenoid Valve
Direct operated Poppet Type
Series VT307/VO307



The intended use of this product is to control compressed air or vacuum in pneumatic industrial automation systems and 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^{*)}, and other safety regulations.
*) 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: Manipulating industrial robots -Safety, etc.
• 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.

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

2 Specifications

2.1 VT307/VO307(K) valve specifications

Type of actuation	Direct operated type 2 position single solenoid
Fluid	Air
Operating pressure range	0 to 1MPa (High-pressure type), 0 to 0.7MPa (Standard type)
Ambient and fluid temperature/°C	-10 to 50 (No freezing)
Response time ^{Note 1)}	20 ms or less (at 0.5MPa)
Max. operating frequency	10Hz
Min. operating frequency	See Section 2.3, 3.14, 6.1
Lubrication	Not required (See section 3.)
Manual override	Non-locking push type
Mounting orientation	Unrestricted
Impact / Vibration resistance ^{Note 2)}	150 / 50 m/s ²
Enclosure	IP50 equivalent (for DIN terminal)
Duty cycle	See Section 2.3 and 3.14
Flow characteristics	Refer to SMC catalogue

Table 1

Note 1) Based on dynamic performance test, JIS B 8374-1981. (Coil temperature: 20°C, at rated voltage, without surge voltage suppressor).

2 Specifications - continued

Note 2) **Impact resistance:** No malfunction occurred when it was tested with a drop tester in the axial direction and at right angles to the main valve & armature; in both energized & de-energized states and for every time in each condition (Values at the initial period).
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 1000 Hz. Tests was performed at both energized and de-energized states in the axial direction and at right angles to the main valve & armature. (Valves at the initial period).

2.2 Solenoid specifications

Electrical entry	DIN terminal, grommet	
Coil rated voltage (V)	AC (50/60 Hz)	100,200,110,220,240
	DC	24,12
Allowable voltage fluctuation	-15 to 10% of rated voltage ^{Note 1)}	
	Apparent power	Inrush 12.7VA (50Hz), 10.7VA (60Hz)
Power consumption ^{Note 2, Note 3)}	AC	Holding 7.6VA (50Hz), 5.4VA (60Hz)
	DC	Without indicator light: 4W, With indicator light: 4.2W
Light/Surge voltage suppressor	AC	Varistor, LED
	DC	Diode, LED

Table 2

Note 1) Valve state is not defined if electrical input is outside the specified operating range.

Note 2) At rated voltage.

Note 3) The value is different for continuous duty type (VT307E) and energy-saving type (VT307Y/W). See below for details.

2.3 Continuous duty type: VT/VO307E

VT307E is recommended for continuous duty with long ON time.

Caution

- 1) This model is for continuous duty, not for high cycle rates. But even for low cycle rates, if energizing the valve more than once a day, please consult with SMC.
- 2) De-energize solenoid at least once every 30 days.

Specifications different from standard are as follows:

Apparent power / AC	Inrush	7.9VA (50Hz), 6.2VA (60Hz)
	Holding	5.8VA (50Hz), 3.5VA (60Hz)
Power consumption DC	1.8W, With indicator light: 2W	
Response time ^{Note)}	30ms or less (at 0.5MPa)	

Table 3

Note) Based on dynamic performance test, JIS B 8374-1981. (Coil temperature: 20°C, at rated voltage, without surge voltage suppressor).

2.4 Energy saving type: VT/VO307Y (VT/VO307W)

If low power consumption is required for electronic control, VT307Y(W) (1.8 W) is recommended.

Specifications different from standard are as follows:

Power consumption DC	1.8W, With indicator light: 2W
Response time ^{Note)}	25ms or less (at 0.5MPa)

Table 4

Note) Based on dynamic performance test, JIS B 8374-1981. (Coil temperature: 20°C, at rated voltage, without surge voltage suppressor).

2.5 Vacuum type: VT/VO307V (VT/VO307W)

The vacuum model has less air leakage than the standard model under low pressure. It is recommended for vacuum application.

Caution

Since this valve has slight air leakage, it cannot be used for vacuum holding (including positive pressure holding) in a pressure container.

Operating pressure range	-101.2kPa to 0.1MPa
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Table 5

2.6 Symbol

Refer to catalogue.

2.7 Indicator light

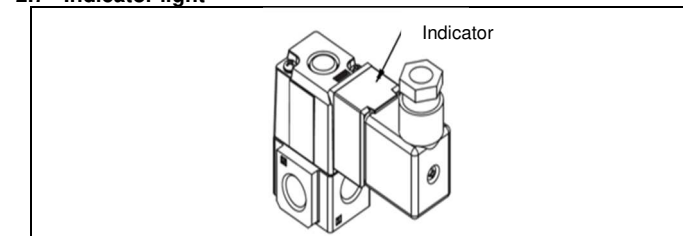


Figure 1

2 Specifications - continued

Caution

Special products 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.

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.
- 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.
- Do not use in high humidity environment where condensation can occur.
- Contact SMC for altitude limitations.

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.

Connection thread size (R, NPT)	Tightening Torque (N·m)
1/8	3 to 5
1/4	8 to 12

Table 6

Caution

For the common-exhaust type, pressurization or evacuation of the 3(R) port can cause a malfunction.

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 Indicator Light/Surge Voltage Suppressor

Surge suppression should be specified by using the appropriate part number. If a valve type without suppression is used, suppression must be provided by the host controller.

Caution

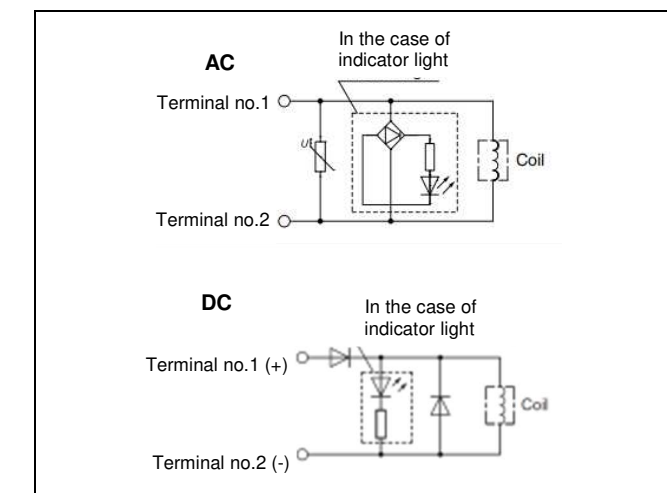


Figure 2

3 Installation - continued

3.6 Residual voltage

If a surge protection circuit contains non-ordinary diodes such as zener diodes or varistor, a residual voltage will remain that is in proportion to the protective elements and the rated voltage. Therefore, give consideration to surge voltage protection of the controller. In the case of diodes, the residual voltage is approximately 1 V.

Contact SMC for the varistor's residual voltage.

3.7 Countermeasure for surge voltage

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-energised 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.

3.8 Electrical Connection

Caution

DIN terminal is wired internally as shown below. Connect each of the wires to the corresponding wire of the power supply.

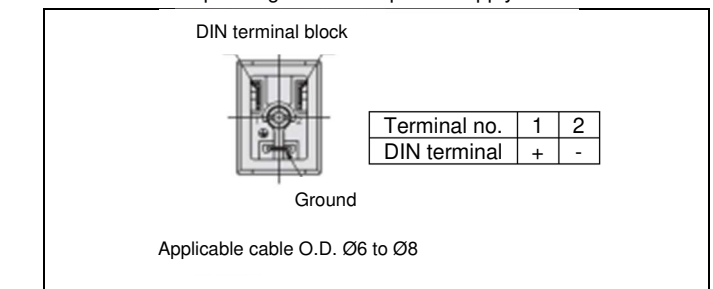


Figure 3

3.9 Lead wire colour (Grommet)

Voltage	Colour
100VAC	Blue
200VAC	Red
DC	Red (+), Black (-)
Others	Grey

Table 7

3.10 Extended periods of continuous energization

Caution hot surface

* Be aware that the valve surface may get hot.

Caution

If the standard and low-power consumption types are energized continuously for a long time, switch the valve at least once every 30 days and the operating time should not exceed 1400 hours (equivalent to 2 months) per year.

If the operating time exceeds 1400 hours, use a continuous duty type valve (VT307E).

Note that the valve should be switched at least once every 30 days in this case.

If the valve is used for special applications, please contact your SMC sales representative.

Cannot be used as an emergency shutoff valve.

Caution

Refer to "3, 4, 5 port solenoid valves precautions" for more details.

- When solenoid valves are mounted in a control panel, employ measures to radiate excess heat, so that temperatures remain within the valve specification range. Use special caution when three or more stations sequentially aligned on the manifold are continuously energized since this will cause a drastic temperature rise.

3.11 Operation in a vacuum condition

Caution

For operation in a vacuum condition, use VT/VO307V. Note that if the valve is used in an environment where the product is exposed to a large amount of dust, install a filter to the R port. If a suction pad is used, install a filter between the suction pad and valve. These valves are not intended as vacuum retaining valves.

3 Installation (continued)

3.12 Bracket mounting:

VT307

Description	Part no.
Bracket	DXT152-25-1A (with screws)

Table 8

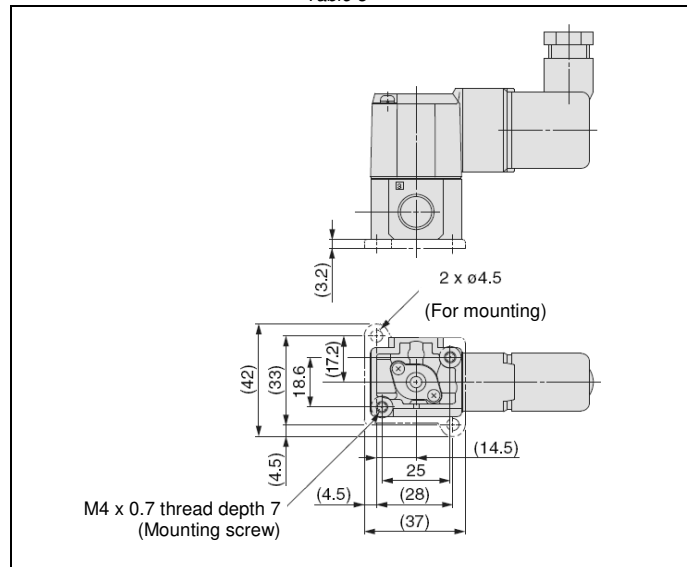


Figure 4

3.13 Manifold

Warning

When mounting a valve on the manifold base, N.C. and N.O. can be selected by the function plate orientation. Also, since the cylinder operates in reverse, confirm that the function plate is correctly mounted.

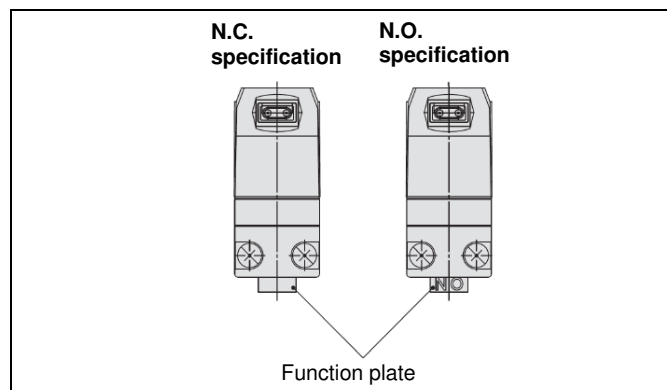


Figure 5

Caution

- Each valve is fixed to the manifold base with two M4 mounting screws. Tighten the screws firmly when re-mounting.
- For mounting, tighten M4, or equivalent screws, evenly to the manifold base.
Tightening torque of the mounting screw (M4): 1.4 N·m

3.14 Changing from N.C. to N.O. (Manifold)

Caution

This product is delivered as N.C. valve. If N.O. valve is required, remove mounting screws of the required valve and turn over the function plate. (Ensure that there are gaskets on both sides of the plate.) Then, tighten the mounting screws to fix the valve to the manifold base.

Description	Part no.
Function Plate	DXT152-14-1A
(with gasket)	DXT152-14-1B (for 'E' option)

Table 9

3 Installation - continued

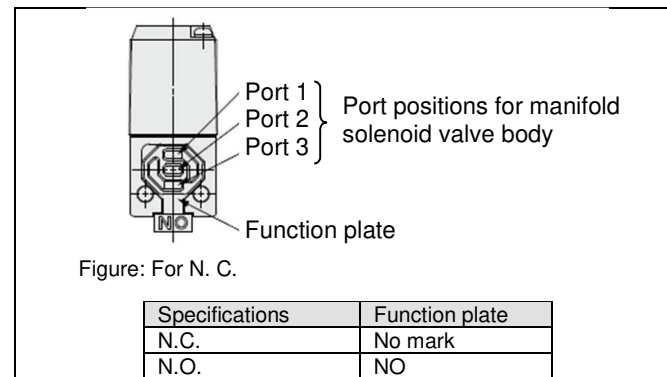


Figure: For N. C.

Figure 6

3.15 How to use DIN Terminal

Refer to Specific Product Precautions in the catalogue for more details.

Connector for DIN terminal

Description	Part no.
DIN connector	B1B09-2A (Standard)
	GM209NJ-B17 (CE-compliant)

Table 10

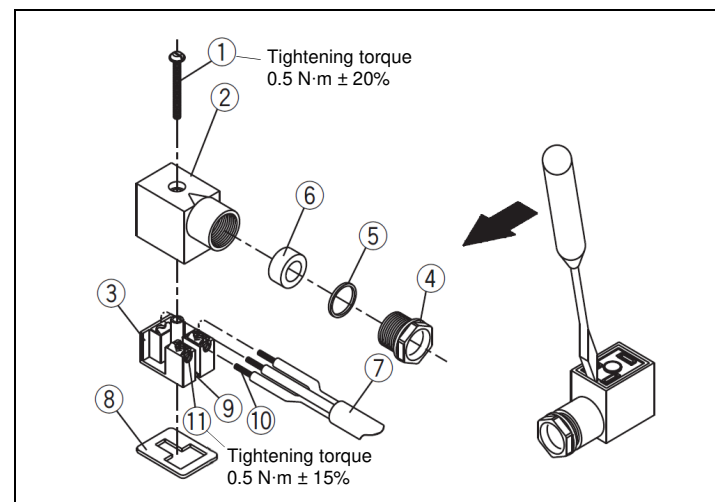


Figure 7

Warning

The ground terminal is connected to the coil assembly only and does not provide a protective earth for the body of the valve.

3.16 Effect of back pressure when using a manifold

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

3.17 Manual Override

Warning

Regardless of an electric signal for the valve, the manual override is used for switching the main valve. Since connected equipment will operate when the manual override is activated, confirm that conditions are safe prior to activation.

3 Installation - continued

Refer to the catalogue for details of manual override operation.

4 How to Order

4.1 Standard products

Refer to catalogue for 'How to Order'.

4.2 Special products

Refer to drawings for 'How to order' of special products.

5 Outline Dimensions (mm)

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.
- Low frequency operation**
Valves should be operated at least once every 30 days to prevent malfunction. (Use caution regarding the air supply).

6.2 Supply air

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.
- Install an air filter
Install an air filter upstream near the valve. Select an air filter with a filtration size 5 µm or smaller.

6.3 Blanking plate assembly

Description	Part no.
Blanking Plate	DXT060-51-13A
(with gasket and screws)	DXT060-51-13B (for 'E' option)

Table 11

- For blanking off any spare stations on the manifold assembly.
- Assemble blanking plate to manifold block ensuring gasket is present.
- Torque tighten mounting screws to a torque of 1.4 N·m.

Caution

- Before disassembly, be sure to turn off electric power and air supplies.
- Confirm that the air has been completely exhausted before performing any work.
- Take care not to get scratches or dirt etc. on the seals, as this can cause leakage.

7 Limitations of Use

Warning

System designer should determine the effect of the possible failure states on the system.

7.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

Warning

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

7 Limitations of Use - continued

Caution

7.2 Leakage voltage

If a resistor or C-R element is used in parallel with the switching element, ensure that any leakage voltage, due to the leakage current, meets the following limits:

- DC coil: 3% or less of rated voltage
- AC coil: 15% or less of rated voltage

7.3 Solenoid valve drive for AC with a solid state output (SSR, TRIAC output, etc.)

7.3.1 Current leakage

When using a snubber circuit (C-R element) for surge protection of the output, a very small amount of electrical current will continue to flow even during the OFF state.

This results in the valve not returning. In a situation where the tolerance is exceeded, as in the above case, take measures to install a bleeder resistor.

7.3.2 Minimum allowable load amount (Min. load current)

When the consumption current of a valve is less than the output's minimum allowable load volume or the margin is small, the output may not switch normally. Please contact SMC.

7.4 Low temperature operation

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

7.5 Mounting orientation

Mounting orientation is universal.

Danger

This product has variants which can be configured Normally Open (N.O.) or Normally Closed (N.C.). The user is responsible for ensuring that all necessary measures are taken to prevent foreseeable misuse.

7.6 Safety relay or PLC

Warning

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.

7.7 Return of the spool to the de-energised position

Warning

When electricity is cut, the spool valve returns to the de-energised position by spring force.

8 Contacts

Refer to Declaration of Conformity and www.smcworld.com for contacts.

SMC Corporation

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