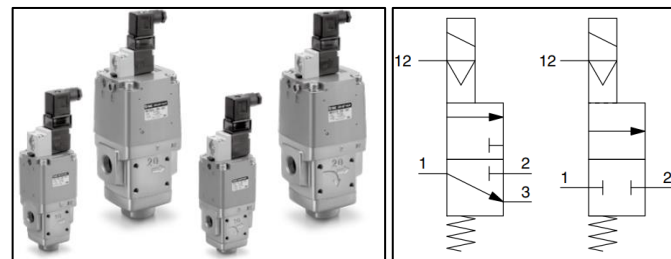




ORIGINAL INSTRUCTIONS

**Instruction Manual**  
**High Pressure Coolant Valve**  
**Series VNH**



The intended use of this valve is to control the flow of liquid coolant.

**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>(1)</sup>), and other safety regulations.

<sup>(1)</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**

Valve type	VNH□□1	VNH□□3
Fluid	Coolant <sup>Note 1)</sup>	
Operating pressure range [MPa]	0 to 3.5	0 to 7.0
Pilot operating pressure range [MPa]	0.25 to 0.7	
Proof pressure [MPa]	5.5	10.5
Ambient temperature [°C]	-5 to 50 <sup>Note 2)</sup>	
Fluid temperature [°C]	VNH□□□1(3)A	-5 to 60 <sup>Note 2)</sup>
	VNH□□□1(3)B	-5 to 60 <sup>Note 2)</sup>
Pilot air temperature [°C]	-5 to 50 <sup>Note 2)</sup>	
Flow characteristics	Refer to catalogue	
Response time [ms]	Contact SMC	
Duty cycle	Contact SMC	
Min. operating frequency	1 cycle / 30 days	
Max. operating frequency [Cycle/min]	20	
Manual override	Non-Locking push type	

**2 Specifications - continued**

Lubrication	Not required
Impact/Vibration resistance [m/s <sup>2</sup> ] <sup>Note 3)</sup>	150/30
Enclosure (based on IEC60529)	IP60
Mounting orientation	Vertically upwards
Wetted parts	Cast Iron, Aluminium Alloy, Iron, SUS.
Weight	Refer to catalogue

Table 1.

Note #) This product cannot be used for water applications

Note #) No Freezing

Note #) 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 and armature; in both energized and de-energized states and for every time in each condition. (Values quoted are for a new valve).

Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Tests are performed at both energized and de-energized states in the axial direction and at right angles to the main valve and armature. (Values quoted are for a new valve).

**2.2 Solenoid specifications**

Pilot valve	VO307-□□(Z)1-Q	
Coil rated voltage	DC [VDC]	24, 12
	AC [VAC]	100, 200, 110, 220, 240
Electrical entry	DIN Terminal	
Coil insulation class	Contact SMC	
Allowable voltage fluctuation	-15 to +10% of rated voltage	
Power consumption [W]	4 (without light), 4.2 (with light)	
Apparent power [VA]	Inrush	12.7 (50Hz), 10.7 (60Hz)
	Holding	7.6 (50Hz), 5.4 (60Hz)
Surge voltage suppressor	DC	Diode
	AC	Varistor
Indicator light	LED	

Table 2.

**2.3 Indicator light**

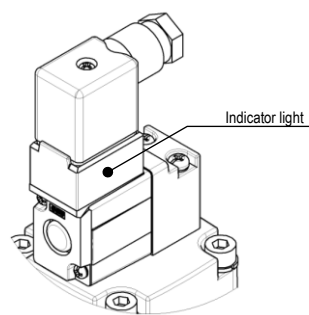


Figure 1.

**2.4 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.

**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.

**3 Installation - continued**

- Products compliant with IP60 enclosures are protected against dust.
- Products compliant with IP60 enclosures satisfy the specifications by mounting each product properly. Be sure to read the Specific Product Precautions for each product.

**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 1.5 to 2 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

Connection threads (Rc, G, NPT, NPTF)	Tightening torque [N·m]
1/8	7 to 9
1/4	12 to 14
3/8	22 to 24
1/2	28 to 30
3/4	45 to 50
1	65 to 70

Table 3.

**3.3.1 Pilot port piping**

**Caution**

- 12 (P1) and 10 (P2) piping should be as follows according to the table.
- | Port    | VNH            |
|---------|----------------|
| 12 (P1) | External pilot |
| 10 (P2) | Pilot Exhaust  |

Table 4.

- Installing a silencer to exhaust port is recommended for noise reduction and for dust entry prevention.

**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 Fluid supply**

**Warning**

- Valve is designed for use with coolant only. Do not use with water. The wetted parts are cast iron and will rust if used with improper fluids.
- Please note that fluids that contain foreign material (especially hard objects like glass chips), may cause damage to the valve, will reduce sealing performance, and may cause early failure.

**3.6 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.

**3.7 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.
- To operate the non-locking manual override, push the manual override until it stops.

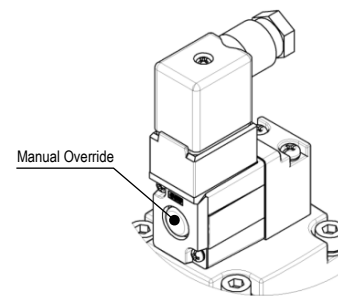


Figure 2.

**3 Installation - continued**

**3.8 Mounting**

**Warning**

- Do not mount with the coil facing downwards, otherwise any foreign objects in the fluid will adhere to the plate assembly leading to malfunction.
- 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.

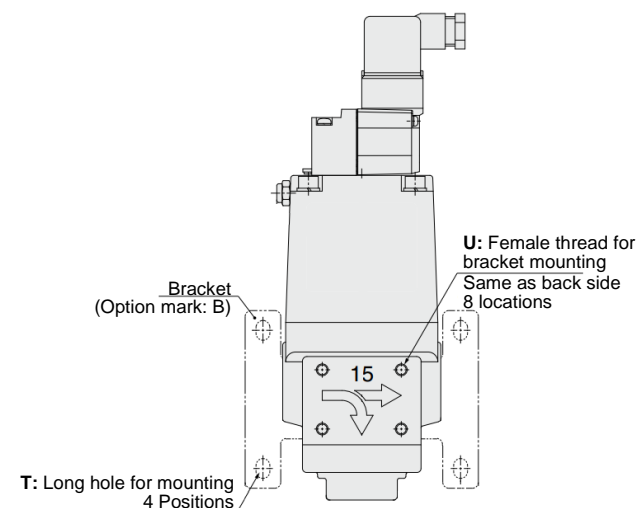


Figure 3.

Model	Dimension T	Dimension U	Bracket mounting (U) Tightening torque [N·m]
VNH1□□ <sup>A</sup> <sub>B</sub> -10A	6 x 8	M5 x 0.8 depth 5.5	2.7 to 3.3
VNH2□□ <sup>A</sup> <sub>B</sub> -15A	7 x 10	M6 x 1 depth 6	4.7 to 5.7
VNH3□□ <sup>A</sup> <sub>B</sub> -20A	9 x 12	M8 x 1.25 depth 6	11.3 to 13.7
VNH4□□ <sup>A</sup> <sub>B</sub> -25A			

Table 5.

**3.9 Electrical circuits**

**Caution**

Surge suppression should be specified by using the appropriate part number. If a valve type without suppression (Type D) is used, suppression must be provided by the host controller as close as possible to the valve.

**3.9.1 VO307 pilot valve**

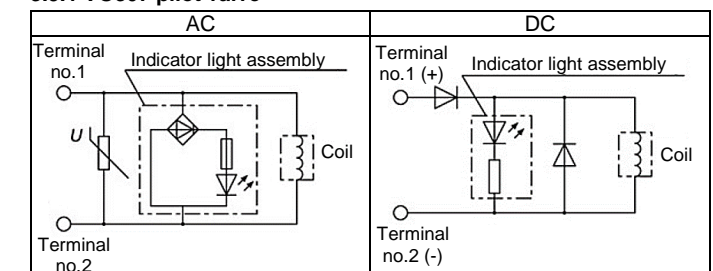


Figure 4.

**3.10 Electrical connectors**

**3.10.1 DIN Terminal**

**Caution**

- Applicable cable O.D. of Ø6 mm to Ø8 mm.
- Tighten screws within the specified torque range.
- Refer to catalogue for additional details.

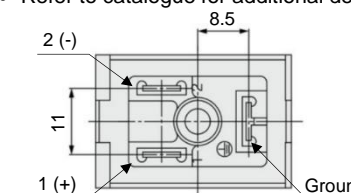


Figure 5.

Voltage	Colour
110 VAC	Blue
200 VAC	Red
DC	Red(+), Black(-)
Other	Grey

Table 6.

### 3 Installation - continued

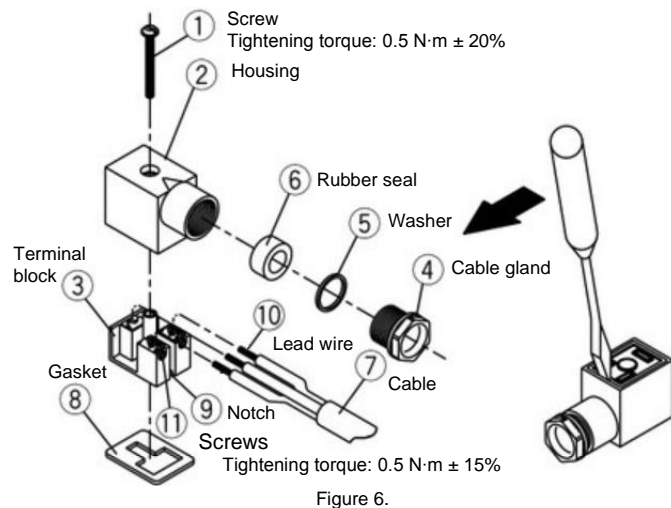


Figure 6.

#### Warning

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

#### 3.11 Residual voltage

##### Caution

- If a 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 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.

#### 3.12 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-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.

#### 3.13 Extended period of continuous energization

##### Warning

- The solenoid coil will generate heat when continuously energized so avoid installing in an enclosed space. Install the valve in a well-ventilated area.
- Do not touch the coil while it is being energized or immediately after energization.
- If a valve is continuously energised for long periods, heat generation of the coil may result in reduced performance and shorter service life. This also may have an adverse effect on the peripheral equipment in proximity. Should a valve be continuously energised for long periods, or its daily energised state exceed its non-energised state, please use a valve with DC specifications. Additionally, when using a valve with AC, energising for long periods of time continuously, select the air operated type and use the continuous duty VT307 for a pilot valve.

### 4 How to Order

Refer to catalogue for 'How to Order'.

### 5 Outline Dimensions

Refer to catalogue for outline dimensions.

### 6 Maintenance

#### 6.1 General maintenance

##### Warning

- With external pilot solenoids, the pilot solenoid valves are not splash proof specifications, and so care must be taken to not get fluid on one such as when performing 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.

#### 6.2 Mounting

##### Caution

- Ensure gaskets are in good condition, not deformed and are dust and debris free.
- When mounting pilot valves assume ensure gaskets are present, aligned and securely in place and tighten screws to a torque of 1.35 N·m (For VNH1-VNH4).
- Refer to Section 3.8 for additional mounting precautions.

#### 6.3 Replacement parts

- For pilot valve how to order refer to catalogue.
- Function plate for VO307 (D seal, with thread): DXT152-14-1A

##### Caution

- When replacing a pilot valve, if internal pilot solenoid is mounted in the wrong direction, it may malfunction or leak air.
- The orientation of the function plate cannot be selected.
- Changing the orientation of the function plate may cause malfunction.

#### 6.4 Storage

##### Caution

In the case of long-term storage, thoroughly remove all moisture to prevent rust and deterioration of rubber materials etc.

### 7 Limitations of Use

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

Refer to Handling Precautions for SMC Products.

##### Warning

#### 7.2 Effect of energy loss on valve switching

Air supply present, electrical supply cut	Valve returns to OFF position by spring force
Electrical supply present, air supply cut	Valve returns to OFF position by spring force

Table 7.

#### 7.3 Low temperature operation

- The valve can be used in an ambient temperature of down to -5 °C. However, take measures to prevent freezing or solidification of impurities, etc.
- When using valves in cold climates, take appropriate countermeasures to prevent the fluid from freezing in tubing after cutting the supply from the pump, by draining the fluid, etc. When using a heater, avoid heating the coil.
- For pilot air supply, appropriate measures should be taken to avoid solidification or freezing of drainage and moisture, etc.

### 7 Limitations of use - continued

#### 7.4 Holding of pressure

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

#### 7.5 Cannot be used as an emergency shut-off valve

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.

#### 7.6 Closed circuit

In a closed circuit, when liquid is static, pressure could rise due to changes in temperature. This pressure rise could cause malfunction and damage to components such as valves. To prevent this, install a relief valve in the system.

#### 7.7 Impact by rapid pressure fluctuation

When an impact caused by the rapid pressure fluctuation, such as water hammer etc., is applied, the solenoid valve may be damaged. Install water hammer relief equipment (accumulator, etc.).

##### Caution

#### 7.8 Leakage voltage

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes  $\leq 3\%$  (for DC coils) or  $\leq 15\%$  (for AC coils) of the rated voltage across the valve.

#### 7.9 Back pressure of 3 port valve

Ensure that back pressure of 3 port from VNH#13 is less than 5 MPa.

### 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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