



ORIGINAL INSTRUCTIONS

Instruction Manual

Compact Proportional Solenoid Valve Series PVQ



The intended use of this valve is to control flow rate of compressed air.

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.

**Caution**

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

2 Specifications

2.1 Valve specifications

Model	PVQ13	PVQ31	PVQ33
Valve function	Proportional, N.C		
Fluid	Air		
Max. operating pressure [MPa]	1		
Min. operating pressure [MPa] (Vacuum) <sup>Note 1)</sup>	0 (0.1 Pa.abs)		
Ambient and fluid temperature [°C] <sup>Note 2)</sup>	0 to 50		
Flow characteristics	Refer to Catalogue		
Response time [ms]	See <sup>Note 3)</sup>		
Duty cycle	Contact SMC		
Min. operating frequency	1 cycle / 30 days		
Max. operating frequency [Hz]	See <sup>Note 4)</sup>		
Manual override	None		
Lubrication	Not required		
Impact/Vibration resistance [m/s <sup>2</sup> ]	See <sup>Note 5)</sup>		
Enclosure (based on IEC60529)	IP40		
Mounting orientation	Unrestricted		
Weight (with sub-plate) [g]	30 (60)	110	85 (190)

Table 1.

2 Specification - continued

Note 1) For vacuum application, max. operating pressure range is 0.1 Pa-abs to max. operating pressure differential. A(2) port is applicable for vacuum pressure.

Note 2) Indicates the ambient temperature when the valve is not energized. When the valve is continuously energized (when applying maximum current) and the ambient temperature is kept at 50°C due to the convection of the air around the valve; The PVQ10 coil outer surface reaches approximately 90°C, and the coil proximal section (1 mm) reaches approximately 60°C. The PVQ30 coil outer surface reaches approximately 100°C, and the coil proximal section (1 mm) reaches approximately 70°C. Use the product at a temperature of no more than 50°C. \* Refer to precautions in section 3.10.

Note 3) Valve has no defined response time as it is similar to an electric regulator. Note 4) Valve has no defined maximum frequency as it is not designed for fast ON/OFF operation.

Note 5) Do not use in locations subject to vibration or impact.

2.2 Solenoid specifications

Model	PVQ13		PVQ31 / PVQ33	
Coil rated voltage [VDC]	24	12	24	12
Coil current [mA]	0 to 85	0 to 170	0 to 165	0 to 330
Power consumption [W]	0 to 2		0 to 4	
Electrical entry	L / M plug connector		Grommet	
Insulation class	Class B			
Surge voltage suppressor	None			
Indicator light	None			

Table 2.

2.3 PVQ13 characteristic specifications

Orifice	0.3	0.4	0.6	0.8
Max. operating pressure diff. [MPa] <sup>Note 1)</sup>	0.7	0.45	0.2	0.1
Flow rate (at max. pressure diff.) [L/min] <sup>Note 2)</sup>	0 to 5	0 to 6		0 to 5
Hysteresis (at max. pressure diff.)	10% or less			
Repeatability (at max. pressure diff.)	3% or less			
Start up current (at max. pressure diff.)	50% or less			

Table 3.

Note 1) Maximum operating pressure differential indicates pressure differential (difference between inlet and outlet pressure) which can be allowed for operation with the valve closed or open. If the pressure differential exceeds the max. operating pressure differential of orifice, the valve may leak.

Note 2) Flow rate depends on individual differences between valves and piping conditions. Refer to catalogue for flow rate characteristics charts.

2.4 PVQ31 / PVQ33 characteristic specifications

Orifice	1.6	2.3	4.0
Max. operating pressure diff. [MPa] <sup>Note 1)</sup>	0.7	0.35	0.12
Flow rate (at max. pressure diff.) [L/min] <sup>Note 2)</sup>	0 to 100	0 to 75	
Hysteresis (at max. pressure diff.)	10% or less	13% or less	
Repeatability (at max. pressure diff.)	3% or less		
Start up current (at max. pressure diff.)	50% or less	65% or less	

Table 4.

Note 1) Maximum operating pressure differential indicates pressure differential (difference between inlet and outlet pressure) which can be allowed for operation with the valve closed or open. If the pressure differential exceeds the max. operating pressure differential of orifice, the valve may leak.

Note 2) Flow rate depends on individual differences between valves and piping conditions. Refer to catalogue for flow rate characteristics charts.

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.

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.
- Employ suitable protective measures where there is contact with water droplets, oil or welding spatter.

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 threads exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

Model	Connection threads	Tightening torque [N·m]
PVQ10	M5	1 to 1.5
PVQ30	Rc 1/8	7 to 9

Table 5.

3.4 Lubrication

**Caution**

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.

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 Mounting

**Caution**

- Ensure O-rings are in good condition, not deformed and are dust and debris free.
- When mounting valves ensure gaskets are present, aligned and securely in place and tighten the mounting screws to the torque stated below.

Model	Mounting screw size	Tightening torque [N·m]
PVQ10	M1.7	0.15 to 0.22
PVQ30	M3	0.8 to 1.0

Table 6.

3.7 Electrical circuits

**Caution**

- Valve is non-polar and has no surge voltage suppression.
- If a valve type without suppression is used, suppression must be provided by the host controller as close as possible to the valve.
- Use circuits that do not generate chattering in their contacts.
- As a rule, use electrical wire with a cross section of 0.5 to 1.25 mm<sup>2</sup> for wiring. Furthermore, do not allow excessive force to be applied to the lines.

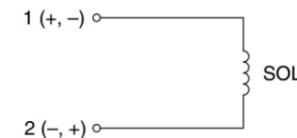


Figure 1.

3.8 Electrical connectors

**Caution**

3.8.1 Plug connectors (PVQ10)

- Class B coil.
- AWG24 insulator O.D 1.45 mm.
- Lever and groove latch connector in place.

3 Installation - continued

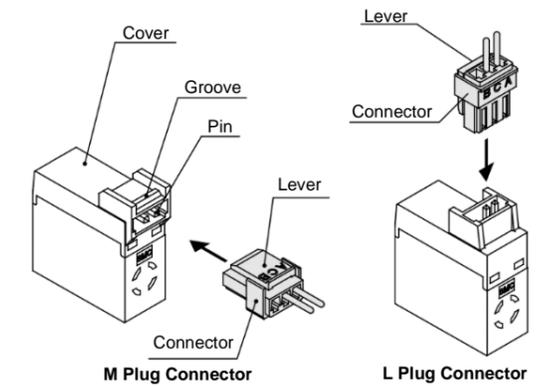


Figure 2.

3.8.2 Grommet (PVQ30)

- Class B coil.
- AWG20 insulator O.D 1.8 mm.

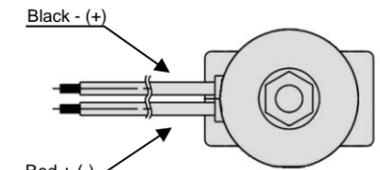


Figure 3.

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-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.

3.10 Extended period of continuous energization

**Warning**

- When the valve is continuously energized (when applying maximum current) and the ambient temperature is kept at 50°C due to the convection of the air around the valve, the coil outer surface reaches approximately 90°C for the PVQ10 series and 100°C for the PVQ30 series.
- The valve proximal section (approx. 1 mm) reaches approximately 60°C for the PVQ10 series and 70°C for the PVQ30 series.
- When the valve is mounted inside the enclosed control panel (in a state without convection of air), however, the above temperature may be exceeded due to the rise in coil temperature or the influence of other equipment. Take measures to release the heat, for example, to create a convection of the air around the valve or provide an air vent.
- Do not touch the valve directly. The coil can be hot depending on the ambient temperature or energising time.
- Install a protective cover over the valve if it can be touched directly.

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

**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.

## 6 Maintenance - continued

- 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

Refer to 3.6 for details.

### 6.3 Maintainable parts

#### ⚠ Caution

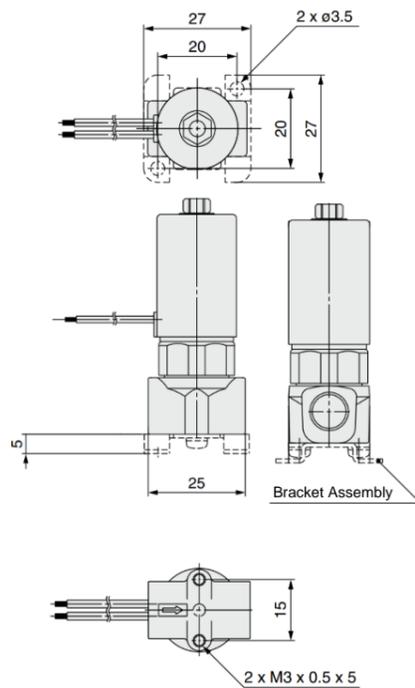


Figure 4.

Refer to catalogue for additional information on sub-plates, brackets or electrical connector assemblies.

- PVQ10: Sub-plate and connector assembly available.
- PVQ30: Bracket assembly and sub-plate available.

## 7 Limitations of Use

### 7.1 Limited warranty and disclaimer/compliance requirements

#### ⚠ Warning

Refer to Handling Precautions for SMC Products.

### 7.2 Effect of energy loss on valve switching

In the event of loss of electrical supply, the valve armature will return to the OFF position by spring force.

### 7.3 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.

### 7.4 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.

#### ⚠ Caution

### 7.5 Handling

This product is adjusted to the respective specifications at SMC factory before delivery. Do not disassemble the product or remove part as it could cause breakdown.

## 7 Limitations of Use - continued

### 7.6 Pressure difference

Leakage from the valve may be caused if the pressure difference is larger than the maximum operating pressure differential of the respective models.

### 7.7 Flow rate

Flow rate varies depending on model differences and piping conditions. Select the model that fully satisfies the necessary flow rate based on the flow characteristics graphs.

### 7.8 Operation in vacuum

When product is used with vacuum, apply vacuum pressure to the A (2) port. The pressure at P (1) port should be larger than at A (2) port.

### 7.9 Leakage voltage

Valve uses proportional control so cannot allow for any leakage voltage.

### 7.10 Low temperature operation

Unless otherwise indicated in the specifications for each valve, operation is possible to 0°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](https://www.smcworld.com) or [www.smc.eu](https://www.smc.eu) for your local distributor/importer.

## SMC Corporation

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