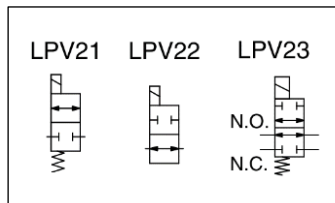




ORIGINAL INSTRUCTIONS

Instruction Manual
Solenoid Pinch Valve
LPV Series



The intended use of this product is for on/off flow control of fluid by pinching tubing and so avoiding fluid contact with the moving parts of the valve.

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) (1), and other safety regulations.

- 1) ISO 4414: Pneumatic fluid power — General rules and safety requirements for systems and their components.
- ISO 4413: Hydraulic fluid power — General rules and safety requirements for systems and their components
- 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.

Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate 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. This product must not be used in residential areas.

2 Specifications

2.1 Valve specifications

Model	LPV21	LPV22	LPV23
Valve type	N.C	N.O.	N.C. one side, N.O. one side
Applicable tubing ^{Note 1)}	Silicone, PHARMED® BPT (Hardness 64 (shore A) or less)		
Applicable tube sizes (O.D. x I.D.)	Metric [mm]	Code 3	03 x 01
		Code 4	04 x 02
	Code 6	06 x 04	
	Inch ["]	Code 3A	01/8 x 01/16
		Code 4A	05/32 x 01/32
Code 6A		01/4 x 01/8	
Fluid (within tubing, no contact with valve)	Air or liquid		
Switching method	Direct acting solenoid		
Working pressure [MPa] ^{Note 2)}	0 to 0.2		
Ambient and fluid temperature [°C] ^{Note 3), 5)}	0 to 50 (No freezing)		
Flow characteristics	As per tubing selected		
Response time ^{Note 6)}	Contact SMC		
Duty cycle	Contact SMC		
Minimum operating frequency	1 cycle / 30 days		

2 Specifications - continued

Maximum operating frequency	Contact SMC
Lubrication	Not required
Impact / vibration resistance [m/s ²] ^{Note 4), 5)}	150 / 30
Enclosure (based on IEC60529)	IP40
Mounting orientation	Unrestricted
Tube effective cross-sectional area ^{Note 6)}	70% or more of unclamped state
Operating noise [dB] ^{Note 7)}	80
Weight [g]	75

Table 1.

- Note 1) For the 3-port type, use the same type of tubing for the N.C. and N.O. sides.
- Note 2) Check the operating pressure range of the tube.
- Note 3) Operating temperature conditions differ depending on characteristics of tubes.
- Note 4) Impact resistance: No malfunction occurred when it is tested in the axial direction and at the right angles to the armature in both energized and de-energized states for each condition. (Values quoted are for a new valve).
Vibration resistance: No malfunction occurred in one sweep test between 45 and 2000 Hz in the axial direction and at the right angles to the main valve and armature in both energized and de-energized states for each condition. (Values quoted are for a new valve).
- Note 5) If used at ambient and fluid temperature of <5 °C or >40°C, or when the valve surface temperature is 60°C or over, valve response and resistance to impact / vibration may change from tubing material characteristic changes, hardness of the tubing, affected by its characteristics. In such a case, consider reducing the voltage applied to the valve (voltage fluctuation) within +10% / -5% of the rated voltage, as well as checking compatibility with your system in advance.
- Note 6) At tube installation.

Before installation	After installation	
	Pinch valve OPEN	Pinch valve CLOSE
Flow area: 100%	Flow area: ≥70%	Flow area: 0%

Note 7) Based on SMC test conditions. Sound level may vary according to customer's conditions of use.

2.2 Solenoid specifications

Model	LPV21	LPV22	LPV23
Coil rated voltage [VDC]	24, 12		
Electrical entry	Plug connector, Grommet		
Allowable voltage fluctuation ^{Note 1), 2)}	±10% of rated voltage		
Coil insulation class	B		
Power consumption [W]	T3(A), T4(A)	Inrush	8
		Holding	2 (Built-in power saving circuit)
	T6(A)	Inrush	24
		Holding	2.9 (Built-in power saving circuit)
Indicator light	LED		
Surge voltage suppressor	Diode (built-in to power saving circuit)		

Table 2.

- Note 1) Allowable voltage fluctuation may vary depending on characteristics of tubes.
- Note 2) When using the below solenoid valves at ambient and fluid temperatures between 5 °C and 40 °C, ensure that allowable voltage range is as per the table below.

Solenoid valve part number	Allowable voltage range (ambient and fluid temperatures between 5 °C and 40 °C)
LPV21-##-T4	+10% / -5% of the rated voltage
LPV21-6##-T6(A)	
LPV22-##-T4A	
LPV22-##-T6A	

Table 3.

2 Specifications - continued

2.3 Indicator light

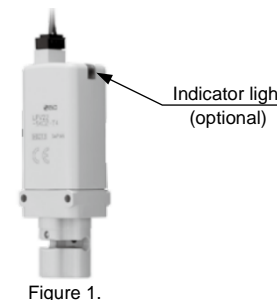


Figure 1.

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, liquids, salt water or steam can get on the valve.
- 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.

3.3 Piping

Caution

- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- Before use, check and ensure the compatibility between the tube and fluid to be used.
- When tubing is inserted into the clamp, ensure it is properly fitted in the pinch valve without causing damage to the tubing.

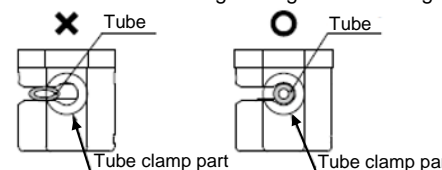


Figure 2.

- If the tube is repeatedly gripped for a long period of time, the life of the tube may reduce, causing unstable operation of the solenoid valve. Therefore, it is recommended to replace or change the gripping position and to replace the tube after 1 million cycles. In addition, when replacing the tubing for the LPV23 3-port type, replace the tubing on both the N.C. and N.O. sides at the same time.
- If the tube is too long or under certain conditions of use, it may cause damage to the tube clamp of the solenoid valve, dislodging of the tube or deterioration of the tube. In such cases, please secure the tube so that it does not become loose.

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 Installation - continued

3.5 Mounting

Warning

- Ensure sufficient space for maintenance activities.
- Always tighten threads with the proper tightening torque. When mounting the solenoid valve, tighten it with the proper tightening torque shown below.

Type of mounting	Thread size	Tightening torque [N·m]
Direct mounting	M2.5	0.25 to 0.35
Panel mounting	M3	0.4 to 0.6

Table 4.

- If equipment does not operate properly, stop operation.
- After mounting, perform suitable function and leak tests to confirm that the mounting is correct.

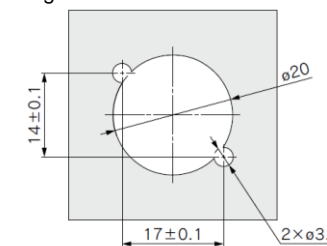


Figure 3. Recommended panel hole dimensions for valve mounting

3.6 Electrical circuit

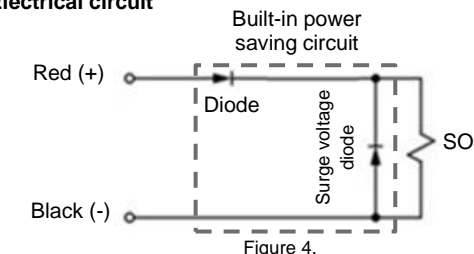


Figure 4.

3.7 Wiring

Warning

- Take measures to prevent static electricity since some fluids can cause static electricity.

Caution

- Apply the correct voltage. Applying incorrect voltage may cause a malfunction or a burned coil.
- Polarity LPV has an in-built circuit with polarity, ensure that the positive terminal is connected to the red lead wire and negative terminal is connected to the black lead wire. Otherwise, malfunction could occur.

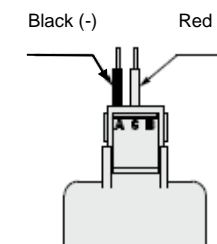


Figure 5.

- Wiring must be made avoiding an external force exceeding 10 N to be applied to the lead wire.
- Avoid mounting the coil downwards. When the coil is mounted downwards, in the event of tube damage, it may cause leakage of fluid into the coil and may result in coil burnout or damage.
- Power-saving circuit (PWM control) built in this product reduces power consumption by fast switching controlled by the PWM circuit after the rated voltage is applied for about 100 ms from the start of energization. Be aware that this PWM control may cause the following problems depending on your switch or drive circuit:
 - When the drive circuit uses a mechanical relay, the power-saving circuit may not turn on properly, if chattering occurs during application of the rated voltage for about 100 ms from the start of energization.

3 Installation - continued

- When a filter is fitted between the power and this product for noise reduction purposes, the filter may reduce the power required to drive this product, failing to turn the power-saving circuit on properly.
- When the drive circuit uses a SSR (solid state relay) that has a built-in photocoupler, the photocoupler fails to turn off, resulting in this product's failure to turn off (i.e., staying on).

3.8 Residual voltage

Caution

- 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.
- 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 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.
- The solenoid valve has a built-in power saving circuit, which is activated after 100 ms from the start of energization. Ensure that energizing time is 100 ms or more.
- If used for continuous energization, ensure that the surface temperature is below 70 °C. Be aware of a large temperature rise if solenoid valves are mounted closely each other and continuously energised at the same time. When the solenoid valve is mounted in a control panel, install a fan or take other measures against heat radiation to keep the temperature within the stated ambient temperature range. As a guide, if a single valve is continuously energized for 30 minutes at an ambient temperature of 25 °C, the surface temperature will not exceed 70 °C.

3.10 How to use a plug connector

Refer to catalogue for more information.

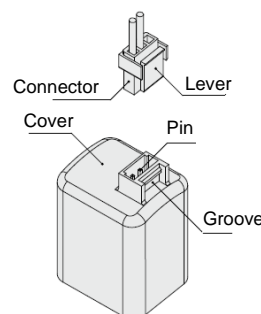


Figure 6.

4 How to Order

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

5 Outline Dimensions

Refer to drawings or 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 Storage

Caution

- In case of long-term storage after use, 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

	LPV21 (N.C.), LPV23	LPV22 (N.O.)
Electrical supply cut	Valve returns to the initial de-energised position by spring force.	Valve returns to the initial de-energised position by the tube reaction force.
Electrical supply present	Valve remains in the energised position.	

Table 5.

7.3 Application

Do not use this product in applications which may adversely affect human life (e.g., medical equipment connected to the human body for drip infusion).

7.4 Low temperature operation

Use within the operable ambient temperature range specified in table 1.

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 liquid 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.

Caution

7.7 Leakage voltage

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes $\leq 2\%$ of the rated voltage across the valve.

7.8 EMC restrictions

7.8.1 Class and group description

- This product is group 1, class A equipment according to EN55011.
- Group 1 equipment does not intentionally generate radio-frequency energy in the range 9kHz to 400 GHz.
- Class A equipment is equipment suitable for use in all locations other than those allocated in residential environments and those directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.
- This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

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 Return of Product

Warning

If the product to be returned is contaminated or is possibly contaminated with substances that are harmful to humans, for safety reasons, please contact SMC beforehand and then employ a specialist cleaning company to decontaminate the product. After the decontamination prescribed above has been carried out, submit a Product Return Request Sheet or the Detoxification/Decontamination Certificate to SMC and await SMC's approval and further instructions before attempting to return the item. Please refer to the International Chemical Safety Cards (ICSC) for a list of harmful substances. If you have any further questions, please don't hesitate to contact your SMC sales representative.

10 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
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