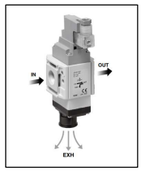
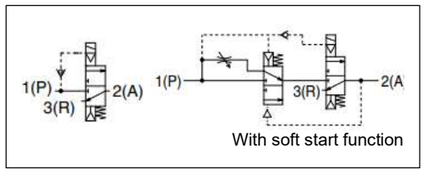
ORIGINAL INSTRUCTIONS

Instruction Manual

Modular Type 3-Port Solenoid Valve Residual Pressure Relief Type VP346E / VP546E / VP746E / VP946E





The intended use of this valve is to vent a system to atmosphere when it is de-energised.

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 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.

⚠ 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.

⚠ 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

Fluid	Air
Type of actuation	N.C.
Internal pilot operating pressure range [MPa] Note 1)	Standard: 0.2 to 0.7
	High pressure: 0.2 to 1.0 MPa
Operating and ambient temperatures [°C]	-10 to 50 (No freezing)
Flow characteristics	Refer to catalogue
Response time	Refer to catalogue
Duty cycle	Contact SMC
Max. operating frequency [Hz]	5 (1 for VP946E)
Manual override	Non-locking push type Non-locking push type (Manual) Push-turn locking type (Manual)
Pilot exhaust	Individual exhaust
Lubrication	Not required

Table 1.

2 Specifications - continued

Impact / Vibration resistance Note 2) [m/s²]		150/30
Enclosure		IP65 (based on IEC60529)
Mounting orientation		Unrestricted
Weight (g)	VP346E	195 (with soft-start-up: 290)
	VP546E	331 (with soft-start-up: 588)
	VP746E	676 (with soft-start-up: 1194)
	VP946E	1290 (with soft-start-up: 2170)

Table 1. – continued.

Note 1) This valve is a large flow rate pilot-operated solenoid valve. If the operating pressure falls below 0.2 MPa due to a pressure drop caused by insufficient air supply, it may not be able to switch properly.

Note 2) Impact resistance: No malfunction occurred when it is tested 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. The test was performed at both energized and de-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 specifications

Electrical entry			DIN terminal (D) DIN terminal (Y) <EN 175301-803C>
			D, Y
Coil rated voltage [V]	DC		24
Allowable voltage fluctuation Note 1)			±10% of the rated voltage
Power consumption [W]	DC	Standard	0.35 (With light: 0.45)
Surge voltage suppressor			Varistor
Indicator light			LED

Table 2.

Note 1) Valve state is not defined if electrical input is outside of specified operating ranges.

2.3 Indicator light

In the DIN terminal type, the light is installed in the connector.

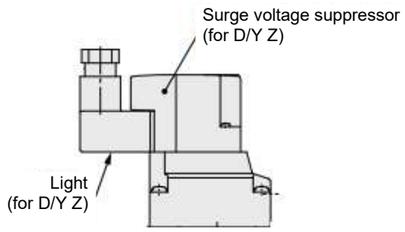


Figure 1.

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 IP65 enclosures are protected against dust and water, however, these products cannot be used in water.
- Products compliant with IP65 enclosures satisfy the specifications by mounting each product properly.
- Do not use in high humidity environment where condensation can occur.
- Contact SMC for altitude limitations.

⚠ Caution

- Temperature of ambient environment

Use the valve within the range of the ambient temperature specification of each valve. In addition, pay attention when using the valve in environments where the temperature changes drastically.

- Humidity of ambient environment

When using the valve in environments with low humidity, take measures to prevent static.
If the humidity rises, take measures to prevent adhesion of water droplets on the valve.

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.
- Exhaust port tightening torque: Please refer to AN Series specific product precautions. At the point where the thread begins to feel tight, use a wrench on the hexagonal flats to tighten an additional 1/4 turn.

Size		Silencer
VP346E	AC20	AN20-02, AN202-02
VP546E	AC30	AN30-03, AN302-03
VP746E	AC40	AN40-04, AN402-04
VP946E	AC60	AN600-10, ANA1-10

Table 3.

⚠ Warning

- Avoid excessive torsional moment or bending moment other than those caused by the equipment's own weight, as this can cause damage. Support external piping separately.
- Piping materials without flexibility, such as steel tube piping, are prone to be affected by excess moment loads and vibrations from the piping side. Use flexible tubing in between to avoid such effects.

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 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.
- Locked manual overrides might prevent the valve responding to being electrically de-energised or cause unexpected movement in the equipment.

3 Installation - continued

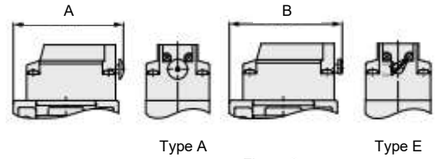


Figure 2.

Size		A [mm]	B [mm]
VP346E	AC20	- Note)	45.6
VP546E	AC30	55.5	55.4
VP746E	AC40	73.5	73.4
VP946E	AC60	92.3	92.2

Table 4.

Note) Type A manual override not available for this size.

3.7 Mounting

⚠ Caution

The valves are compatible with the modular FRL unit AC-D series, please observe the AC-D precautions for mounting orientation.

Figure 3.

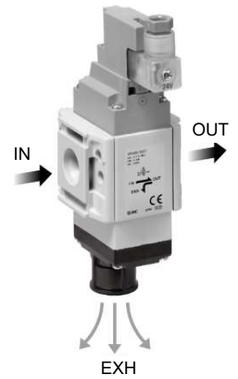


Figure 4.

⚠ Caution

- The valves require the use of Y#00T-D spacers with brackets.
- Ensure gaskets are in good condition, not deformed and are dust and debris free.
- When mounting the spacers ensure gaskets are present, aligned and securely in place and tighten the 2 holding screws evenly as per the values shown below.

Size		Spacer with bracket	Tightening torque [N·m]
VP346E	AC20	Y200T-D	0.36 ± 0.036
VP546E	AC30	Y300T-D	1.2 ± 0.05
VP746E	AC40	Y400T-D	1.2 ± 0.05
VP946E	AC60	Y600T-D	2.0 ± 0.1

Table 5.

3 Installation - continued

Figure 5. Y#00T-D

- If a threaded inlet/outlet port is required, a piping adapter E200-###-D (for VP346E), E300-###-D (for VP546E) and E400-###-D (for VP746E), E600-###-D (for VP946E) is required. Refer to catalogue “Modular F.R.L. Units AC-D” for details.

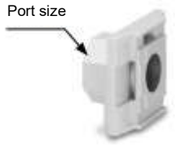


Figure 6. E#00-###-D

3.8 Electrical connection

⚠ Caution

- When electric power is connected to a solenoid valve, be careful to apply the proper voltage. Improper voltage may cause malfunction or coil damage.
- Check if the connections are correct after completing all wiring.

3.8.1 Pilot valve

3.8.1.1 Light / Surge voltage suppression

⚠ Caution

- If a valve type without suppression is used, suppression should be provided as close as possible to the valve by the host controller.
- For DIN terminal (DZ, YZ):

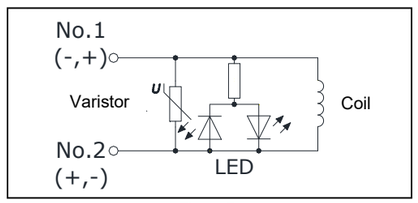


Figure 7.

DIN terminal has no polarity.

3.8.1.2 Pilot valve connections

- DIN interchangeability

The ‘Y’ type DIN terminal corresponds to the DIN connector with a terminal pitch of 8 mm, which complies with EN175301-803C. The pitch is different from the ‘D’ type DIN connector (which has a pitch of 9.4 mm), the two types are therefore not interchangeable.

- Applicable cable dia: Ø 3.5 ~ Ø 7 mm.

3.8.1.3 Using DIN connector with the pilot valve

⚠ Caution

- When making connections, note that using other than the supported size (Ø 3.5 to Ø 7) heavy duty cord will not satisfy IP65 (enclosure) standards.
- Also, be sure to tighten the gland nut and holding screw within their specified torque ranges.

3 Installation - continued

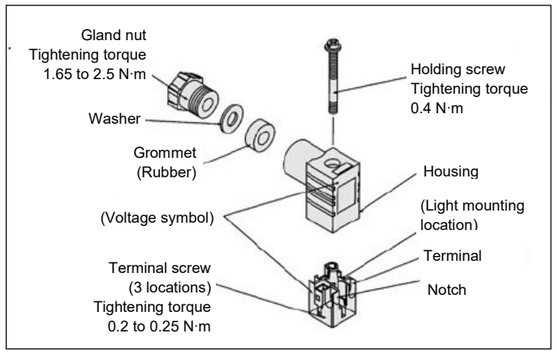


Figure 8.

3.8.1.4 Changing the entry direction for D and Y type DIN connector

⚠ Caution

- After separating the terminal block and housing, the cord entry can be changed by attaching the housing in the desired direction (4 directions at 90° intervals).
  * When equipped with a light, be careful not to damage the light with the cord’s lead wires.

3.9 Residual voltage

⚠ Caution

- If a varistor surge voltage suppressor is used, the suppressor arrests the back EMF voltage from the coil to approximately 47V.
- Ensure the transient voltage is within the specification of the host controller.

3.10 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.

3.11 Wiring

⚠ Caution

- If an excessive force is applied to the lead wire, this may cause faulty wiring. Take appropriate measures so that a force of 30 N or more is not applied to the lead wire.
- When instructions are given to the Specific Product Precautions, follow these specifications.

4 How to Order

Refer to drawings or catalogue for ‘How to Order’.

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.
- 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.

6 Maintenance - continued

- 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

⚠ Warning

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

7.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

⚠ Warning

7.2 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.

7.3 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.

7.4 Leakage voltage

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes ≤ 3% of the rated voltage across the valve.

7.5 Safety relays or PLC

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.

7.6 Effect of energy loss on valve switching

- Since there is a check valve in the pilot flow path, the pilot flow path remains pressurized even if the main air supply is cut off.
- Due to the trapped air in the pilot flow path, the main valve spool will move to the ON position if the solenoid is energised even in the case that there is no supply to port 1.
- To relieve the air from the pilot flow path, energise and de-energise the solenoid valve several times with no air supply to port 1.

Energy source status	Valve status
Electricity cut, air supply present	Spool returns to the OFF position by air and spring force
Electricity present, air supply cut	Due to the check valve, the pilot pressure remains, so the spool stays in the ON position.

Table 6.

7.7 Vent port

There is a vent port on each valve. Please note that these cannot be piped or plugged, and that liquid may enter or block the vent port, which may cause malfunction.

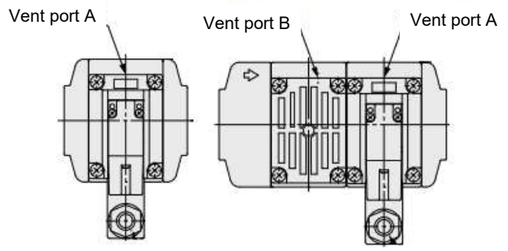


Figure 9.

Size		Vent port A	Vent port B
VP346E	AC20	Ø 3.8	Ø 2.3
VP546E	AC30	Ø 6.2	Ø 6.4
VP746E	AC40	Ø 6.2	Ø 6.4
VP946E	AC60	Ø 6.2	-

Table 7.

Note) Vent port B on VP946E is located on the side.

7 Limitations of Use - continued

⚠ Caution

7.8 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.

7.9 Air connection

To avoid reversed connections of the air inlet/outlet, make connections after confirming the “IN/OUT” marks or arrows that indicate the direction of air flow. Reversed connections can cause malfunction.

7.10 EMC restrictions

7.10.1 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.

⚠ Caution

- This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

7.10.2 Cable length to connect

The cable to connect the product shall be less than or equal to 30m.

7.10.3 Connecting the power supply

This product is not intended to be directly connected to any DC Distribution network.

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 or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : https:// www.smcworld.com (Global) https:// www.smc.eu (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan

Template DKP50047-F-085M