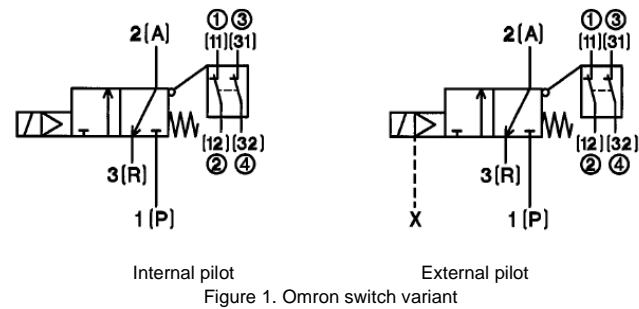




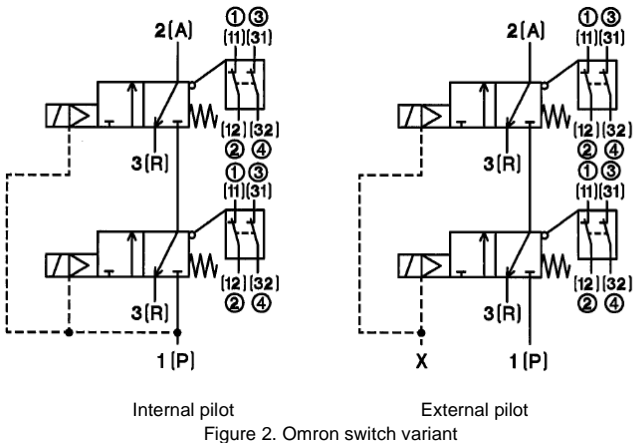
2 Specifications - continued

2.7 Pneumatic symbols (examples)

2.7.1 VP#42#-X536



2.7.2 VP#44#-X538



2.7.3 VP#44-X555/585

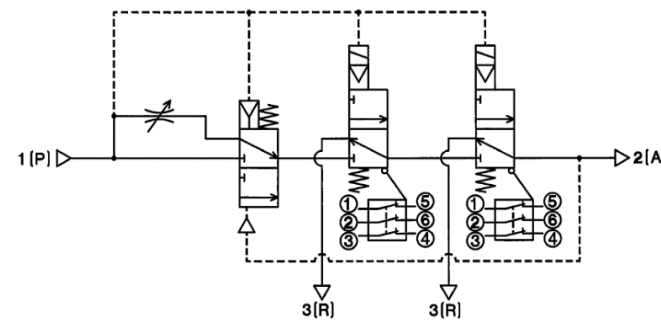


Figure 3. Internal pilot, Rockwell switch variant

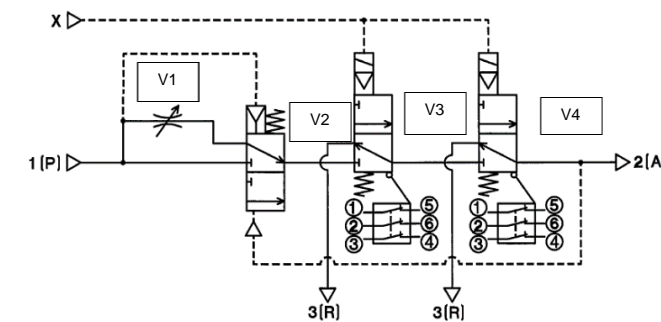


Figure 4. External pilot, Rockwell switch variant

2 Specifications - continued

2.8 Soft start specification and operating principle

2.8.1 Operating principle

- In a safety related application, the machine safety system will energise the safety valves (V3 and V4 in Figure 4) when the machine is safe to operate. When both valves are energised air will flow into the protected system via port 2 (A). The flow is initially limited by needle valve V1 and pressure in the protected system will remain low as the system fills or actuators move slowly. The pressure will eventually rise as the system becomes full or the actuators stop moving. As P2 pressure increases (see Figure 5) valve V2 switches and valve V1 is by-passed. In this condition air will flow into the protected system according to the figures given in section 2.3.
- When either of the valves V3 or V4 are de-energised the protected system is vented to atmosphere. When the protected system pressure drops below P2 valve V2 returns to its spring state with V1 limiting the flow to V3 and V4.

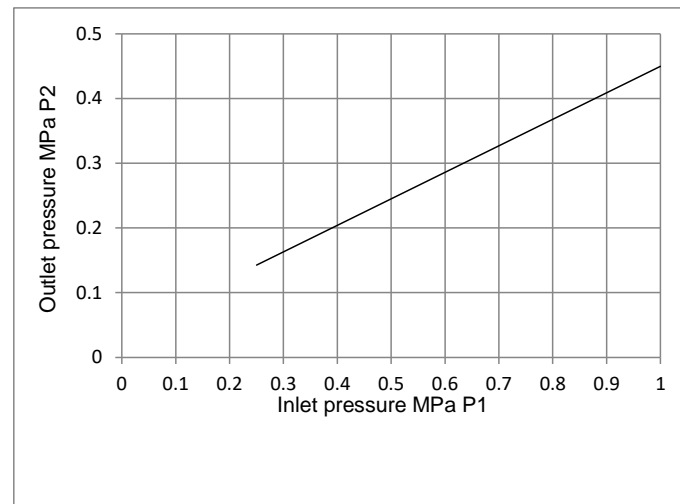


Figure 5. Switching pressure (Close → Open) of soft start-up valve V2

2.8.2 Soft start flow

The restricted flow is set by V1. This can be adjusted or there are product options with fixed orifices.

Variant (see section 4)	Soft start flow	
	VP500	VP700
Variable	(See fig. 6)	
10	Ø1 mm	Ø1 mm
15	Ø1.5 mm	Ø1.5 mm
20	-	Ø2 mm

Table 7. Soft start flow options

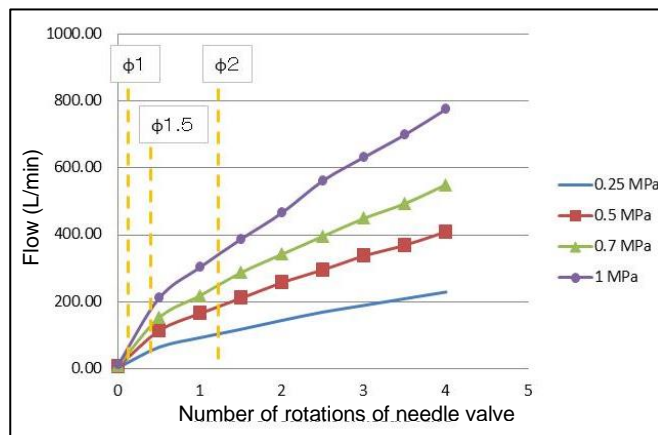


Figure 6. Needle valve flow characteristics (Use this graph as a guide only)

2 Specifications - continued

2.9 Declaration of Conformity

Original declaration Doc. No. VP500-TF1Z304EU

**EU DECLARATION OF CONFORMITY**

SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, JAPAN, declares under its sole responsibility, that the following equipment:

**Residual pressure relief valve with direct monitoring for use in safety related systems**  
 (25A-JVP542/544(R)-X536(-##), (25A-JVP544(R)-X538(-##), 25A-JVP544(R)-X544, (25A-JVP544(R)-X555(-##), VP544R-X575, (25A-JVP544(R)-X585(-##), VP542R-X562, VP544R-X563, VP544R-X577, VP544(R)-X594, VP544(R)-X596, VP544R-X597, VP542R-X615, VP542-X617, (25A-JVP742/744(R)-X536(-##), (25A-JVP744(R)-X538(-##), 25A-JVP744(R)-X544, (25A-JVP744(R)-X555(-##), VP744(R)-X557, VP742R-X562, VP744R-X563, (25A-JVP744(R)-X585(-##), VP744(R)-X596, VP744-X597

**Batch No. ZY onwards Marked H**  
 is in conformity with the relevant Union harmonisation legislation and has been demonstrated to fulfil the requirements with reference to the harmonised standard(s) or applied standard(s) as listed below:

Directive	Requirements	Harmonised/applied standards
2006/42/EC [Machinery Directive]	Annex I	EN ISO 13849-1:2015 EN ISO 13849-2:2012 EN ISO 4414:2010
2014/30/EU [EMC Directive]	Annex I	EN 61000-6-2:2005
2011/65/EU <sup>(1)</sup> [RoHS Directive]	Annex II	EN IEC 63000:2018

<sup>(1)</sup> Including substances added by Commission Delegated Directive (EU) 2015/863.

Name and address of the person authorised to compile the technical file<sup>(2)</sup>:  
 Mr Lucio Moriggi, General Manager, SMC Italia S.p.A.  
 Via delle Donne Lavoratrici, 21-20861 BRUGHERIO (MB), ITALY

Importer/Distributor contact details [www.SMC.eu](http://www.SMC.eu), [www.SMCworld.com](http://www.SMCworld.com)

Tokyo, Date: 14<sup>th</sup> Feb. 2022

*Shinichi Yoshimura*  
 Shinichi Yoshimura  
 General Manager  
 Product Development Division - 1  
 4-2-2, Kinunodai, Tsukubamirai-shi, Ibaraki 300-2436, JAPAN

Figure 7.

2 Specifications - continued

Original declaration Doc. No. VP500-TF1Z304UK

**UK DECLARATION OF CONFORMITY**

SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, JAPAN, declares under its sole responsibility, that the following equipment:

**Residual pressure relief valve with direct monitoring for use in safety related systems**  
 (25A-JVP542/544(R)-X536(-##), (25A-JVP544(R)-X538(-##), 25A-JVP544(R)-X544, (25A-JVP544(R)-X555(-##), VP544R-X575, (25A-JVP544(R)-X585(-##), VP542R-X562, VP544R-X563, VP544R-X577, VP544(R)-X594, VP544(R)-X596, VP544R-X597, VP542R-X615, VP542-X617, (25A-JVP742/744(R)-X536(-##), (25A-JVP744(R)-X538(-##), 25A-JVP744(R)-X544, (25A-JVP744(R)-X555(-##), VP744(R)-X557, VP742R-X562, VP744R-X563, (25A-JVP744(R)-X585(-##), VP744(R)-X596, VP744-X597

**Batch No. Zy onwards Marked H**  
 is in conformity with relevant statutory regulations (including amendments) and has been demonstrated to fulfil the requirements with reference to the designated standards as listed below:

Statutory Instrument	Requirements	Designated Standards/Technical Specifications
Supply of Machinery (Safety) Regulations 2008	Schedule 2	EN ISO 13849-1:2015 EN ISO 13849-2:2012 EN ISO 4414:2010
Electromagnetic Compatibility Regulations 2016	Schedule 1	EN 61000-6-2:2005
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012	Schedule 2	EN IEC 63000:2018

Importer/Distributor contact details:  
**SMC**  
 Vincent Avenue  
 Milton Keynes  
 MK8 0AN  
[www.smc.eu](http://www.smc.eu), [www.smcworld.com](http://www.smcworld.com)

The person authorised to compile the technical file is the person named at the address below:

Tokyo, Date: 14<sup>th</sup> Feb. 2022

*Shinichi Yoshimura*  
 Shinichi Yoshimura  
 General Manager  
 Product Development Division - 1  
 4-2-2, Kinunodai, Tsukubamirai-shi, Ibaraki 300-2436, JAPAN

Figure 9.

2.10 Base mounted valve identification

VP#44 valves are marked with mounting arrows, which are designed to point towards a mating arrow on the sub plate.

2.11 Batch code

The batch code indicated in the product label translates to construction year / month according to the following table (eg. "ZQ = Mar 2021):

Construction Year / Month	Production batch codes											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	Zo	ZP	ZQ	ZR	ZS	ZT	ZU	ZV	ZW	ZX	Zy	ZZ
2022	Ao	AP	AQ	AR	AS	AT	AU	AV	AW	AX	Ay	AZ
...	...	...	...	...	...	...	...	...	...	...	...	...
2024	Co	CP	CQ	CR	CS	CT	CU	CV	CW	CX	Cy	CZ

Table 8.

2.12 Safety system

2.12.1 Timing diagram

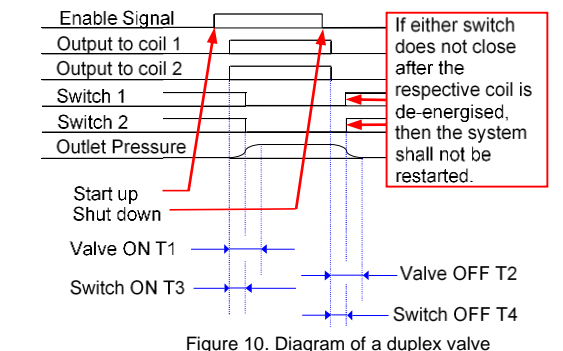


Figure 10. Diagram of a duplex valve

Note: The monitor switches are Normally Closed, i.e. closed when the valve solenoids are de-energised. The monitor signals are therefore shown 'High' when the valve is de-energised.



### 3 Installation - continued

3) Loosen the terminal screws (slotted screws) on the terminal block, insert the cores of the lead wires into the terminals according to the connection method, and fasten them securely with the terminal screws.  
4) Secure the cord by fastening the ground nut.

#### ⚠ Caution

- When making connections, take note that using other than the supported size (ø3.5 to ø7) heavy duty cord will not satisfy IP65 (enclosure) standards.
- Also, be sure to tighten the ground nut and holding screw within their specified torque ranges.
- Ensure sealing gaskets are correctly installed.

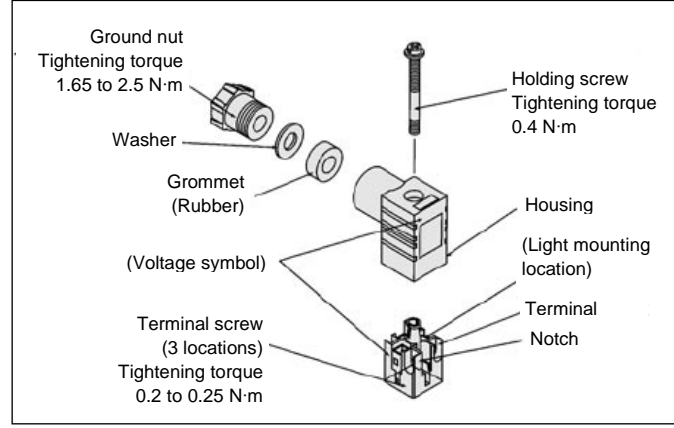


Figure 15.

#### Changing the entry direction

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.

#### Precautions

Plug in and pull out the connector vertically without tilting to one side.

#### Compatible cable

Cord O.D.: Ø3.5 to Ø7  
(Reference) 0.5 mm<sup>2</sup>, 2-core or 3-core, equivalent to JIS C 3306

#### 3.8.2 Omron limit switch: conduit type

##### 3.8.2.1 Limit switch screw tightening torque

Screw position	Tightening torque [N·m]
Terminal screw	0.6 to 0.8
Cover clamping screw	0.5 to 0.7
Conduit mounting connection	1.8 to 2.2

Table 13. Conduit terminals tightening torque

##### 3.8.2.2 Wiring

- When connecting to the terminals via insulating tube and M3.5 crimp terminals, arrange the crimp terminals as shown below so that they do not rise up onto the case or the cover. Application lead wire size: AWG20 to AWG18 (0.5 to 0.75 mm<sup>2</sup>)

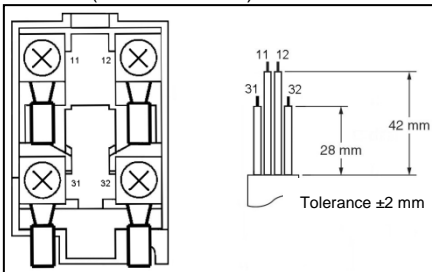


Figure 16.

- Do not push crimp terminals into gaps in the case interior. Doing so may cause damage or deformation of the case.
- Use crimp terminals not more than 0.5 mm in thickness. Otherwise, they will interfere with other components inside the case. The crimp terminal shown below are not more than 0.5 mm thick.

### 3 Installation - continued

Manufacturer	Type	Wire size
J.S.T.	FV0.5-3.7 (F type) V0.5-3.7 (straight type)	AWG20 (0.5 mm <sup>2</sup> )

J.S.T. is a Japanese manufacturer.

Table 14.

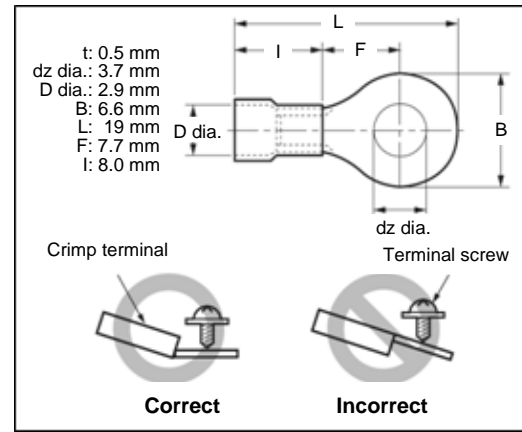


Figure 17.

##### 3.8.2.3 Conduit opening

- Connect a recommended connector to the opening of the conduit and tighten the connector to the specified torque. The case may be damaged if an excessive tightening torque is applied.
- Use a cable with a suitable diameter for the connector.

##### 3.8.2.4 Recommended connectors

- Use connectors with screws not exceeding 9 mm, otherwise the screws will protrude into the case interior, interfering with other components in the case.
- The connectors listed in the following table have connectors with thread sections not exceeding 9 mm. Use the recommended connectors to ensure conformance to the stated IP level.

Size	Manufacturer	Model	Applicable cable diameter
G 1/2	LAPP	ST-PF1/25380-1002	6.0 to 12.0 mm
	Ohm Denki	OA-W1609	7.0 to 9.0 mm
		OA-W1611	9.0 to 11.0 mm

LAPP is a German manufacturer.

Ohm Denki is a Japanese manufacturer.

Table 15. Recommended conduit connectors

- Use LAPP connectors together with seal packing (JPK-16, GP-13.5, GPM20, or GPM12), and tighten to the specified tightening torque. Seal packing is sold separately.

##### 3.8.3 Omron limit switch: M12 connector type

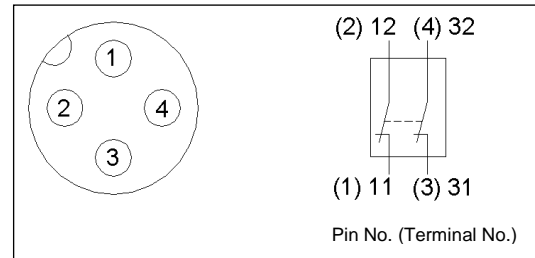


Figure 18.

Orientation of the M12 connector is not guaranteed. Only a straight connector should be used.

### 3 Installation - continued

#### 3.8.4 Rockwell Automation limit switch: M12 connector type

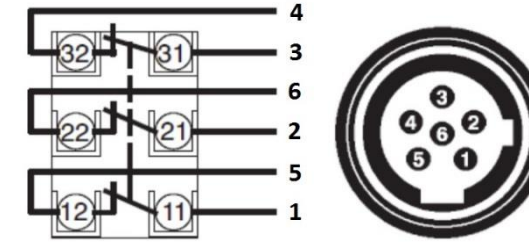


Figure 19.

##### 3.8.4.1 Socket tightening

- Turn the socket connector screws by hand and tighten until no space remains between the socket and the plug.
- Make sure that the socket connector is tightened securely. Otherwise, the rated degree of protection may not be maintained and vibration may loosen the socket connector.
- Orientation of the M12 connector is not guaranteed. Only a straight connector should be used.

#### 3.9 Residual voltage

#### ⚠ Caution

- If a Zener diode or 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 Zener diode or varistor residual voltage.

#### 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 Extended periods of continuous energization

#### ⚠ Warning

- If a valve will be continuously energized for an extended period of time, the temperature of the valve will increase due to the heat generated by the coil assembly.

### 4 How to Order

- Refer to catalogue for "How to Order" of standard products "-X536/8, X555".
- Refer to product drawing for special products "-X585", "-X###" and "-###" other than standard "-X536/8, X555".

Note) The 25A- variants are compatible for use in the secondary battery manufacturing environment. These variants are copper and zinc free and suitable for use with low dew point air supplies (-70°C). Contact SMC for more information.

### 5 Outline Dimensions

- Refer to catalogue for dimensions of standard products "-X536/8, X555".
- Refer to product drawing for special products "-X585", "-X###" and "-###" other than standard "-X536/8, X555".

### 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.

#### 6.2 Maintainable parts

#### ⚠ Warning

- Under no circumstances attempt to change the solenoid of the pilot valve as this is an integral part of the valve and doing so will negate any such SMC warranty.
- Do not attempt to replace the limit switches. M4 limit switch retaining screws are secured into position with adhesive, do not remove.
- There are no replaceable parts on these safety products.

#### 6.3 Periodic testing

The product should be tested for proper operation of the safety function once per month or whenever considered necessary for the purposes of the end user. The test should consist of operation of the safety system and observation of the following:

- When the connected control system is energising the solenoids:
  - Check that the solenoid indicator lights are illuminated.
  - Check that the connected downstream system is properly pressurised.
  - Check that the switch contacts are open.
  - For duplex valve assemblies check that when only one channel of the system (one of the solenoids) is energised the protected system does not become pressurised. Check this for both channels.

When the connected control system is not energising the solenoids:

- Check that the solenoid indicator lights are not illuminated.
- Check that the connected downstream system is properly vented to atmosphere and ensure that the condition of the silencers is not causing an extension of the vent time.
- Check that the switch contacts are closed.
- For duplex valve assemblies check that when only one channel of the system (one of the solenoids) is de-energised the protected system is vented to atmosphere. Check this for both channels.

#### ⚠ Warning

The specification of the valve requires the valve to be cycled (energised and de-energised) at least once per week.

#### 6.4 Silencers

#### ⚠ Warning

- Ensure that any silencers fitted to the valve remain clean and uncontaminated in operation because blockage will affect the safety function.
- Examine any silencers at least once per month and more frequently if necessary due to the nature of the application environment.

#### 6.5 Troubleshooting guide

Symptom	Possible fault	Action
Valve does not open	Pilot valve is not energised	Check pilot solenoid indicator (light) is illuminated and that voltage is within specification
	Supply pressure is too low	Check supply pressure
	Pilot valve has failed	Replace the entire unit
Valve does not close	Pilot valve remains energised	Check pilot solenoid indicator (light)
	Pilot valve is jammed	Replace the entire unit
	Main valve is jammed	Replace the entire unit
Switch contacts do not open	Switch has failed	Replace the entire unit
Switch contacts do not close	Switch has failed	Replace the entire unit
Valve operation is noisy or erratic	Supply flow is inadequate	Increase supply pressure and/or flow
Valve is slow to pressurise protected system	Supply flow is inadequate	Increase supply pressure and/or flow.
Valve is slow to vent protected system	Once channel of valve is not functioning	Check 'Valve does not open' symptoms above
	Inadequate flow area in protected system	Revise flow in protected system
Valve is slow to vent protected system	One channel of valve is not functioning	Check 'Valve does not close' symptoms above

Note) If one channel fails in a duplex valve, replace the entire unit.

Table 16.

## 7 Limitations of Use

### Danger

- The machine designer is responsible for ensuring that the operation of this device is compatible with relevant safety regulations.
- Fitting a soft start device does not contribute to human risk reduction.
- The limited flow phase and the transition to full flow might cause unpredictable machine movements.

### Warning

The 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.

#### 7.2 Holding of pressure

### Warning

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

#### 7.3 Safety relays or PLC

### Warning

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.

#### 7.4 Leakage voltage

### Caution

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

#### 7.5 Low temperature operation

### Caution

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

#### 7.6 Limitations

### Caution

- This product is CE/UKCA marked as a safety component as defined under the Machinery Directive 2006/42/EC / The Supply of Machinery (safety) Regulations 2008. For details, please refer to the Declaration of Conformity supplied with the product.
- The valve may only be used to provide the stated safety function for the supply and removal of pressure from all or part of a pneumatic system, under the total control of a supervisory device. The valve can only perform as a safety component when properly installed in a system conforming to the appropriate safety standards.
- Any such use must be within the specified limits and application conditions for the product.
- In order to meet a required performance level as defined by the appropriate safety standard, the user must provide all the other necessary components to complete function of the safety system.
- The user is responsible for the specification, design, implementation, validation and maintenance of the safety system.

## 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

URL : <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)  
 SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan  
 Specifications are subject to change without prior notice from the manufacturer.  
 © 2022 SMC Corporation All Rights Reserved.  
 Template DKP50047-F-085M