

Instruction Manual

3 Port Air Operated Valve

Series VPA300/500/700






The intended use of this product is to control the movement of an actuator.


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)^{*)}, and other safety regulations.

^{*)} 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.

2 Specifications

2.1 Valve specifications

Fluid		Air
Type of actuation		N.C. or N.O. (convertible)
Operating pressure range [MPa]	Standard	0.2 to 1.0
	For vacuum	-100 kPa to 0.2
Pilot pressure range [MPa] ^{Note 1)}		0.2 to 1.0 (Same as operating pressure or more)
Ambient and fluid temperature [°C]		-10 to 50 (no freezing)
Flow rate		Refer to catalogue
Minimum operating frequency		1 cycle / 30 days
Impact/Vibration resistance [m/s ²] ^{Note 2)}		300 / 50
Mounting orientation		Unrestricted
Weight		Refer to catalogue

Table 1.

Note 1) Valve state is not defined if the pilot input pressure is outside of specified ratings.

Note 2) Impact resistance: No malfunction to axis and right angle directions of main valve, each one time when pilot signal is ON and OFF. (Values quoted are for a new valve).

Vibration resistance: No malfunction from test with 45 and 2000 Hz one sweep, to axis and right angle direction of main valve, each one time when pilot signal is ON and OFF. (Values quoted are for a new valve).

2 Specifications - continued


2.2 Pneumatic Symbols

Refer to catalogue for pneumatic symbols.

2.3 Response time and maximum operating frequency

Response time and maximum operating frequency depends on the overall circuit design so must be determined by the circuit designer.


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.
 - If air leakage increases or equipment does not operate properly, stop operation.** Check mounting conditions when the air supply is connected. Initial function and leakage tests should be performed after installation.
 - Ensure sufficient space for maintenance activities.** When installing the products, allow access for maintenance.
 - Operation in a vacuum condition** When a valve is used for switching a vacuum, take measures to install a suction filter or similar to prevent external dust or other foreign matter from entering inside the valve.
 - About ventilation** When it is used inside a sealed control panel, etc., provide ventilation to prevent a pressure increase caused by exhausted air inside the control panel or temperature rise caused by the any heat generated.


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.
- Do not use in high humidity environment where condensation can occur.


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.



Series	Port	Connection thread (G, R, NPT)	Tightening torque [N·m]
VPA300 / 500 / 700	12 (PA)	1/8"	3 to 5
VPA300	1 (P), 2(A), 3(R)		
VPA300 / 500	1 (P), 2(A), 3(R)	1/4"	8 to 12
VPA500 / 700	1 (P), 2(A), 3(R)	3/8"	15 to 20
VPA700	1 (P), 2(A), 3(R)	1/2"	20 to 25

Table 2.

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.

4 Settings

4.1 Changing type of actuation

 **Warning**

When changing the actuation or restarting the valve after the change, make sure that safety is fully assured and pay great attention.
Example: Changing N.C. to N.O.
Refer to Specific Product Precautions in the catalogue for more details.

5 How to Order


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

6 Outline Dimensions (mm)


Refer to catalogue for outline dimensions.

7 Maintenance

7.1 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.
 - 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.

7.2 Low frequency operation

 **Caution**


Valves should be switched at least once every 30 days to prevent malfunction. (Use caution regarding the air supply).

7.3 Drain flushing

 **Caution**

Remove drainage from air filters regularly.


7.4 Removal and mounting of valves

-  **Caution**
- Ensure gaskets 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 screws to torques as per table below.

Mounting screw type	Tightening torque [N·m]
M3	0.8
M4	1.4
M5	2.9

Table 3.

8 Limitations of Use

 **Warning**

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

8.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

8.2 Effect of back pressure when using a manifold

- Use caution when valves are used on a manifold, because an actuator may malfunction due to back-pressure.
- Special caution must be taken when driving a single acting cylinder. To prevent a malfunction, implement counter measures such as using a single EXH spacer assembly or an individual exhaust manifold.

8 Limitations of Use - continued

8.3 Holding of pressure (including vacuum)

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


8.4 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.

8.5 Vacuum absorption


Stopping of continuous vacuum absorption can result in leakage, a workpiece dropping or problems from foreign matter sticking to the vacuum pad.

8.6 Low temperature operation

 **Caution**

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.

8.7 Air / spring returned spool valves

-  **Warning**
- The use of these valves needs to be carefully considered.


Valve type	Type of actuation	Valve option	Effect when pilot air cut
Body ported / Base mounted	N.C. N.O.	Standard	Valve returns to the off position by air and spring force
		For vacuum	Valve returns to the off position by air ^{Note 1)} and spring force

Table 4.

Note 1) Pilot pressure and vacuum pressure.

- If the pilot air pressure drops below the specified minimum operating pressure or the main valve inlet pressure the following might occur:
 - Unexpected movement of the actuator when the pilot air pressure is restored.
 - Prevention or delay of a stopping or reversing of movement.
 - An uncontrolled change of the original position (without an input signal).

8.8 Breathing hole

 **Caution**

There is a breathing hole on the bottom surface of the valve. Please note that liquid may enter or block the breathing hole, which may cause malfunction.

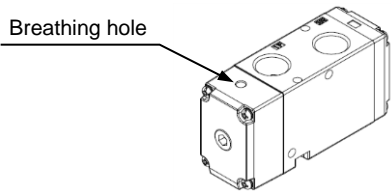


Figure 1.

9 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.

10 Contacts

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

SMC Corporation

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