



ORIGINAL INSTRUCTIONS

Instruction Manual

5 Port Air Operated Valve

Series VFA1000/3000/5000



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)⁽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.

2 Specifications

2.1 Valve specifications ^{Note 1)}

Model		VFA1000	VFA3000	VFA5000
Fluid		Air		
Operating pressure range [MPa]	2 position single	0.15 to 1.0		
	2 position double	-101.2 kPa to 1.0		
	3 position ^{Note 2)}			
Pilot pressure range [MPa]	2 position single	(0.4 x P + 0.1) to 1.0 (P: Operating pressure)		
	2 position double	0.1 to 1.0		
	3 position	0.15 to 1.0		
Ambient and fluid temperature [°C]		-10 to 50 (No freezing)		
Minimum operating frequency		1 cycle / 30 days		
Maximum operating frequency [Hz]		See 2.6		
Lubrication		Not required		
Impact / Vibration resistance [m/s ²]		300 / 50		
^{Note 3)}				
Mounting orientation		Free		
Weight [g]		Refer to catalogue		

Table 1.

Note 1) VFA1000 not available base mounted.

Note 2) Except VFA1000.

2 Specifications - continued

Note 3) Impact resistance:

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

Vibration resistance:

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

2.2 Pilot pressure range (single pilot)

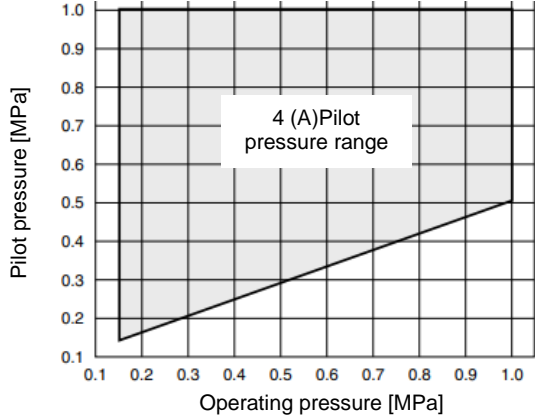


Figure 1.

2.3 Manifold specifications

Model	VFA1#30		VFA3#30	VFA5#20	
Manifold base model	VV5FA1-30	VV5FA1-31	VV5FA3-30	VV5FA5-20	VV5FA5-21
EXH port type	Common EXH	Individual EXH	Common EXH		
Stations	2 to 20		2 to 20	2 to 10	2 to 15
Base weight: W [g], stations: n	W=29n+21	W=51n+35	W=63n+64	W=97n+80	W=139n+550

Table 2.

2.4 Flow characteristics

Refer to catalogue.

2.5 Pneumatic symbol

Refer to catalogue.

2.6 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.

2.7 Construction

Refer to catalogue.

2.8 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.
- 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.
- 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 Installation - continued

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 a high humidity environment where condensation may occur.
- Contact SMC for altitude limitations.

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.

3.3.1 Single unit

Connection thread	VFA1000	VFA3000	VFA5000	Appropriate tightening torque [N·m]
M5	1 (P), 2 (B), 3 (EB), 4 (A), 5 (EA)	-	-	1 to 1.5
1/8	1(P), 2 (B), 4 (A) Pilot port	1 (P), 2 (B), 3 (EB), 4 (A), 5 (EA) Pilot port	Pilot port	3 to 5
1/4	-	1(P), 2 (B), 4 (A)	1 (P), 2 (B), 3 (EB), 4 (A), 5 (EA)	8 to 12

3/8	-	-	1 (P), 2 (B), 3 (EB), 4 (A), 5 (EA)	15 to 20
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Table 3. Body ported single unit

Connection thread	VFA3000	VFA5000	Appropriate tightening torque [N·m]
M5	-	Breathing hole	1 to 1.5
1/8	Pilot port	Pilot port	3 to 5
1/4	1 (P), 2 (B), 3 (EB), 4 (A), 5 (EA)	1 (P), 2 (B), 3 (EB), 4 (A), 5 (EA)	8 to 12
3/8	1 (P), 2 (B), 3 (EB), 4 (A), 5 (EA)	1 (P), 2 (B), 3 (EB), 4 (A), 5 (EA)	15 to 20
1/2	-	1 (P), 2 (B), 3 (EB), 4 (A), 5 (EA)	20 to 25

Table 4. Base mounted single unit

3.3.2 Manifold

Connection thread	VFA1000	VFA3000	VFA5000	Appropriate tightening torque [N·m]
M5	2 (B), 3 (EB), 5 (EA), 4 (A)	-	-	1 to 1.5
1/8	1 (P), 2 (B), 4 (A), 5/3 (R), Pilot port	2 (B), 4 (A), Pilot port	Pilot port	3 to 5
1/4	-	1 (P), 2 (B), 3 (R), 4 (A), 5 (R)	2 (B), 4 (A)	8 to 12
3/8	-	-	1 (P), 2 (B), 3 (R), 4 (A), 5 (R)	15 to 20
1/2	-	-	1 (P), 3 (R), 5 (R)	20 to 25

Table 5. Body ported manifold

3 Installation - continued

Connection thread	VFA3000	VFA5000	Appropriate tightening torque [N·m]
M5	-	Breathing hole	1 to 1.5
1/8	Pilot port	Pilot port	3 to 5
1/4	1 (P), 2 (B), 3 (R), 4 (A), 5 (R)	2 (B), 4 (A)	8 to 12
3/8	-	1 (P), 3 (R), 5 (R)	15 to 20

Table 6. Base mounted manifold

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 5µm or smaller.

3.6 Mounting

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 a torque of 1.4 N·m (M4 mounting screws).

Warning

- When mounting a valve or spacer on the manifold base or sub-plate, etc., the mounting orientation is already decided. If mounted in the wrong direction, the equipment to be connected may result in a malfunction.

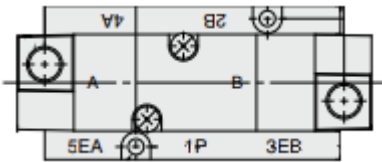


Figure 2. Example of VFA3000 base mounted

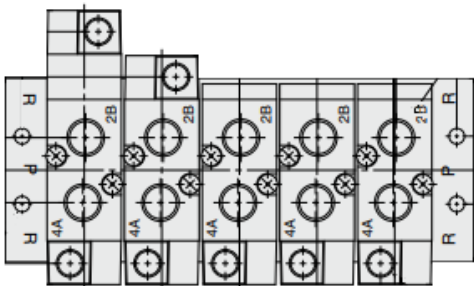


Figure 3. VFA3000 common exhaust body ported manifold

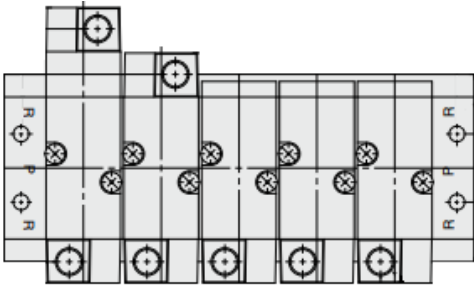


Figure 4. VFA3/5000 common exhaust base mounted manifold (Ports A and B indicated in Figure 14)

- Refer to catalogue for further information.

3 Installation - continued

3.7 Effect of back pressure

Warning

- Use caution when valves are used on a manifold, because an actuator may malfunction due to back-pressure.
- Special caution must be taken when using 3 position exhaust centre valve or 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.

4 How to Order

Refer to catalogue for 'How to Order' or to product drawing for special product.

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.
- 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 Low frequency operation

Caution

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

6.3 Drain flushing

Caution

Remove drainage from air filters regularly.

6.4 Brackets and replacement parts

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 a torque of 1.4 N·m (M4 mounting screws).

6.4.1 Mounting bracket (for VFA1000 and VFA3000 only)

Caution

The bracket for the single type cannot be connected after delivery.

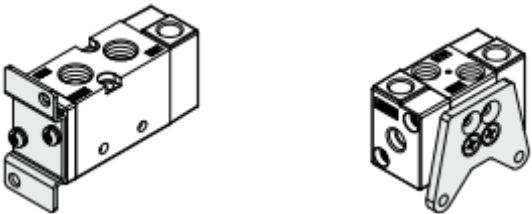


Figure 5. Single type VFA1000/3000 (left) and double type VFA1000 only (right)

6 Maintenance - continued

6.4.2 Replacement parts (base mounted single unit)

Caution

Refer to catalogue for gasket, sub-plate and screw part numbers.

6.4.3 Replacement parts (manifold)

Caution

Refer to catalogue for additional information.

6.4.3.1 Blanking plate assembly

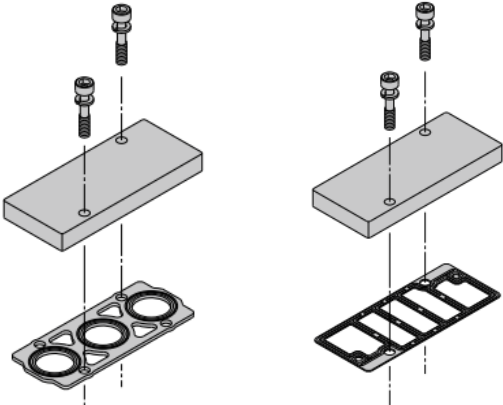


Figure 6. For body ported (left) and base mounted (right)

6.4.3.2 Mounting screws and gasket

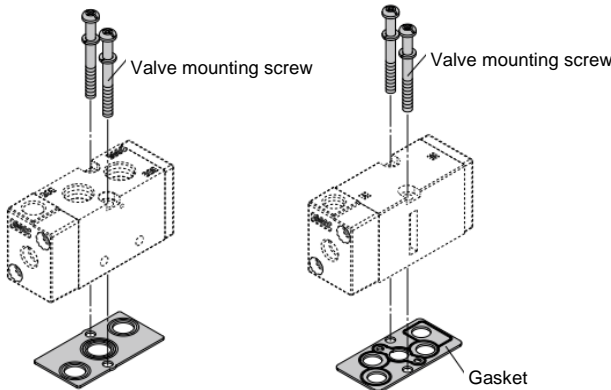


Figure 7. For body ported (left) and base mounted (right)

6.4.3.3 Individual EXH spacer assembly

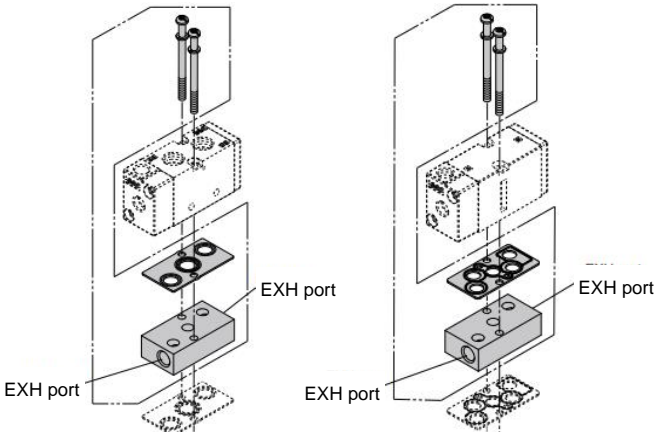


Figure 8. For body ported (left) and base mounted (right)

7 Limitations of Use

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 Effect of energy loss on valve switching

Warning

Energy source status	Single	Double	3 position
Main air supply present, pilot air cut	Valve spool returns to the OFF position by air and spring force	Valve spool will stop moving, position cannot be defined	Valve spool returns to OFF position by spring force
Main air supply cut, pilot air present	Valve spool stays in the ON position	Valve spool stays in the position in which pilot air was applied	Valve spool stays in the position in which pilot air was applied
Both main and pilot air supply cut	Valve spool position cannot be defined	Valve spool will stop moving, position cannot be defined	Valve spool returns to OFF position by spring force

Table 7.

7.3 Breathing hole

Warning

- Do not block, pressurise or let liquid enter the breathing holes.

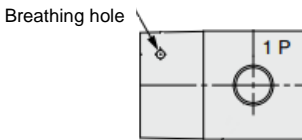


Figure 9. Body ported example

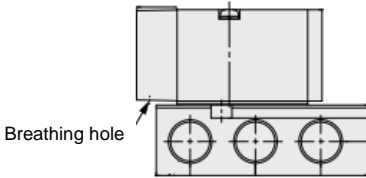


Figure 10. Base mounted VFA3000

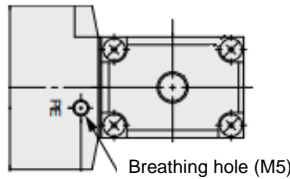


Figure 11. Base mounted VFA5000

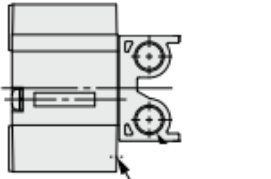


Figure 12. Body ported manifold common exhaust

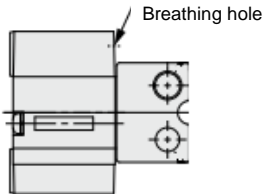


Figure 13. Individual exhaust

7 Limitations of Use - continued

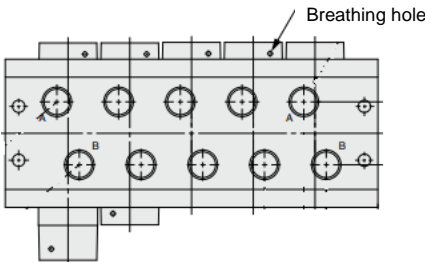


Figure 14. Base mounted manifold common exhaust VFA3000

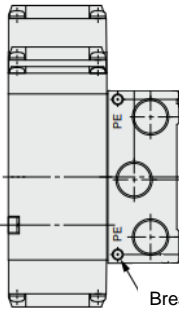


Figure 15. Base mounted manifold common exhaust VFA5000

- Refer to catalogue for more details.

7.4 Intermediate stopping

Warning

Refer to Handling Precautions for 3/4/5 port Solenoid Valves.

7.5 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.

7.6 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.

7.7 Vacuum absorption

Caution

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

7.8 Momentary operation

Caution

If a 2 position double valve is operated with impulse air signals, the air signal should be applied until the cylinder reaches the stroke end position, as there is a possibility of malfunction.

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
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Template DKP50047-F-085M