ORIGINAL INSTRUCTIONS

Instruction Manual
NAMUR Interface 3/5 Port Solenoid Valve
VFN Series

The intended use of this valve 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.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

⚠ Caution

- The product is provided for use in manufacturing industries only. Do not use in residential premises.

2 Specifications

2.1 Valve specifications

Size	VFN200	VFN2000	VFN3000
Valve construction	Rubber seal		
Fluid	Air		
Max. operating pressure [MPa]	0.9		1
Min operating pressure [MPa]	0.15		0.1
Ambient and fluid temperature [°C]	-10 to 60 (No freezing)		
Lubrication	Not required		
Pilot valve manual override	Non-locking push type (Flush / Extended) Locking type (Tool required)		
Enclosure (based on IEC60529)	IP50		
Duty cycle	Contact SMC		
Min. operating frequency	1 cycle / 30 days		

2 Specification - continued

Max. operating frequency [Hz]		10		20
Response times (ms)		50 or less		
Impact/Vibration resistance [m/s^2] Note 1)		150 / 50		
Mounting orientation	Single solenoid	Unrestricted		
	Double solenoid	Mount so spool is horizontal		
Weight [g]	Single solenoid	240	260	320
	Double solenoid	380	400	450

Table 1.

Note 1) Impact resistance: No malfunction occurred when it was tested with a drop tester in the axial direction and at right angles to the main valve and armature; in both energized and de-energised states and for every time in each condition. (Values quoted are for a new valve).
Vibration resistance: No malfunction occurred in a one-sweep test between 45 and 2000 Hz. Tests are performed at both energized and de-energized states in the axial direction and at right angles to the main valve and armature. (Values quoted are for a new valve).

2.2 Pilot valve specifications

Valve type			VFN200(0)	VFN3000
Pilot valve			SF4-####-12-X99-Q	SF4-##-12-# -X127-Q
Rated coil voltage [V] Note 1)	DC		12, 24	24
	AC (50/60Hz)		100, 110 to 120, 200, 220, 240	100, 200
Allowable voltage fluctuation			-15 to 10% of rated voltage	
Coil insulation type			Class B or equivalent	
Apparent power AC [VA] (W)	Inrush	50 Hz	5.6	
		60 Hz	5.0	
	Holding	50 Hz	3.4 (2.1)	
		60 Hz	2.3 (1.5)	
Power consumption DC [W]			1.8	
Electrical entry			Grommet, Grommet terminal., Conduit terminal, DIN terminal	
Surge voltage suppressor			Varistor, Diode (DC Grommet only)	
Indicator light	DC		LED	
	AC		Neon bulb	

Table 2.

Note 1) For other rated voltages, please contact SMC.

2.3 Flow characteristics

	1 → 4/2 (P → A/B)			4/2 → 5/3 (A/B → EA/EB)		
	C [dm^3/(s·bar)]	b	Cv	C [dm^3/(s·bar)]	b	Cv
VFN3000	6.65	0.16	1.56	6.99	0.23	1.72
VFN2000	3.48	0.25	0.85	4.57	0.17	1.06
VFN200	2.68	0.40	0.72	5.41	0.31	1.38

Table 3.

2.4 Pneumatic symbol

Single solenoid Double solenoid

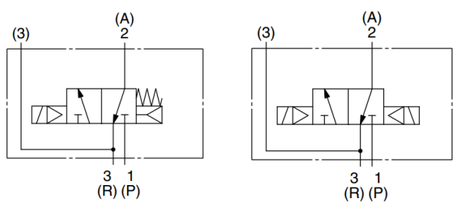


Figure 1. VFN200

2 Specification - continued

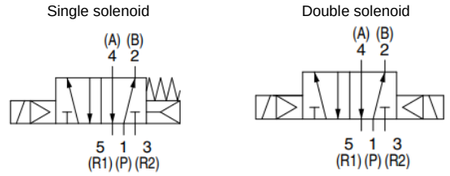


Figure 2. VFN2000/3000

2.5 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.

3.3 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 1.5 to 2 threads exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

	Ports	Thread (Rc, G, NPT)	Correct tightening torque [N·m]
5 port	1(P), 3(R2), 5(R1)	1/4	12 to 14
3 port	1(P), 3(R)		

Table 4.

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 specific product precautions 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.

⚠ Warning

- 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.

3 Installation - continued

⚠ Warning

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

3.6.1 Operating locking/non-locking manual override

⚠ Caution

- Refer to product drawing or catalogue for manual override location.
- Non-locking push type: Push down on the manual override button until it stops.

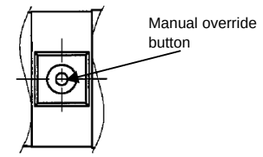


Figure 3. Non-locking push type manual override

- Locking type: Use a tool to turn the manual override 90° in the "1" direction, the valve will turn on and lock. To cancel the ON state, turn it 90° in the display "0" direction and check that it is in the OFF state.

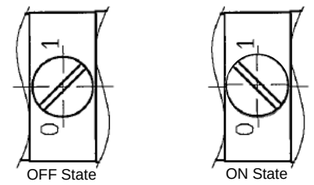
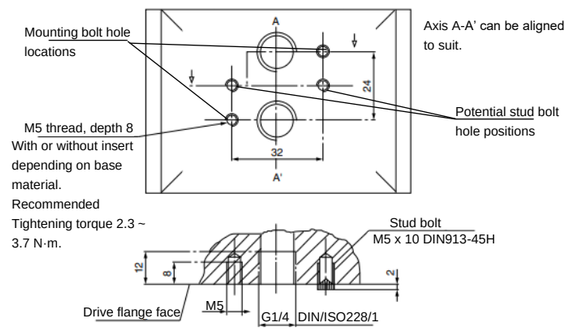


Figure 4. Locking type manual override

3.7 Mounting

⚠ Caution



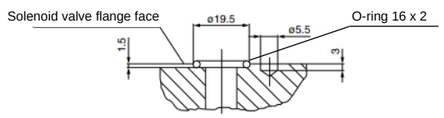


Figure 5. NAMUR mounting pattern

- The solenoid valve is attached with 2 mounting bolts, one bolt either side of the ports.

3 Installation - continued

- The positioning of the stud bolt hole is up to the manufacturer and thus also determines the location of the stud bolt.

Caution

- Ensure O-rings are in good condition, not deformed and are dust and debris free.
- When mounting valves ensure O-rings are present, aligned and securely in place and tighten screws to a torque of 2.3 ~ 3.7 N·m.

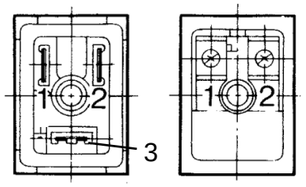
3.8 Electrical connections

3.8.1 DIN terminal, grommet terminal, conduit terminal

Caution

With DIN terminal block

With terminal block



Applicable terminal: 1.25-3, 1.25-3S, 1.25Y-3N, 1.25Y-3S, but in the case of with DIN terminal block, is not a terminal structure.

Note: There is no polarity (+, –).

1	(-)(+) (no polarity)
2	(+)(-) (no polarity)
3	Ground

Figure 6. Internal wiring of DIN terminal and terminal block (with indicator light/surge voltage suppressor)

- DIN/conduit terminal: Applicable heavy-duty cord O.D. ø4.5 mm to ø7 mm.
- Grommet terminal: Lead wire O.D. ø3.5 at max.

Caution

- To change direction of DIN terminal retaining screw, pull off outer cover, rotate connector board through 180°. Replace cover and tighten screw.

3.8.2 Grommet

- Refer to 3.9.3 Grommet (Type G).

3.9 Electrical circuits

Caution

3.9.1 AC – Types E, T, D, DO, Y, YO

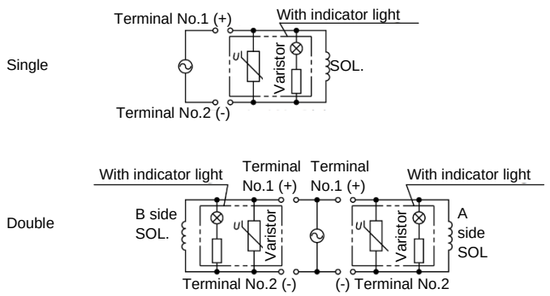


Figure 7. Light/Surge voltage suppressor circuit - AC

3.9.2 DC – Types E, T, D, DO, Y, YO

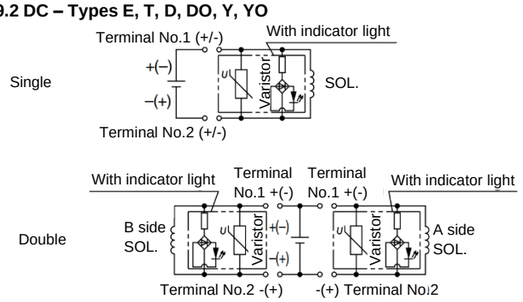


Figure 8. Light/Surge voltage suppressor circuit - DC

Note) There is no polarity (+,-) for 12 or 24 VDC

3 Installation - continued

3.9.3 Grommet (Type G)

Caution

*For AC there is no polarity (+/-)

Figure 9. Surge voltage suppressor - Grommet

3.10 Light/Surge voltage suppressor

Caution

- Surge suppression should be specified by using the appropriate part number. If a valve type without suppression is used, suppression must be provided by the host controller as close as possible to the valve.
- Refer to catalogue for indicator light locations.

3.11 Residual voltage

Caution

- If a 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 varistor residual voltage.
- In the case of a diode, the residual voltage is approximately 1 V.
- Valve response time is dependent on surge suppression method selected.

3.12 Countermeasure for surge voltage

Caution

- 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.

3.13 Extended period of energisation

Warning

If a valve will be continuously energised for an extended period of time, the temperature of the valve will increase due to the heat generated by the coil assembly. This will likely adversely affect the performance of the valve and any nearby peripheral equipment. Therefore, if the valve is to be energized for periods of longer than 30 minutes at a time or if during the hours of operation the energized period per day is longer than the de-energized period, we advise using a valve with specifications of 0.4 W or lower valve, such as the SY series, or a valve with a power-saving circuit.

4 How to Order

Refer to VFN200/2000 catalogue for 'How to Order' or to product drawing for VFN3000 and special products.

5 Outline Dimensions

Refer to catalogue for outline dimensions or to product drawing for special products.

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 Replacement parts

- Pilot valve: refer to table 5

Series	Pilot valve
VFN200(0)	SF4-####-12-X99-Q
VFN3000	SF4-##-12-# -X127-Q

Table 5.

- Refer to VFN2000 catalogue for How to Order Pilot Valve for VFN200/2000. Contact SMC for VFN3000 pilot.

7 Limitations of Use

7.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

7.2 Intermediate stopping

Warning

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

7.3 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.

7.4 Cannot be used as an emergency shut-off valve

Warning

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.

7.5 Leakage voltage

Caution

Ensure that any leakage voltage caused by the leakage current when the switching element is OFF causes ≤ 3% (for DC coils) or ≤ 20% (for AC coils) of the rated voltage across the valve.

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 Momentary energization

Caution

If a double solenoid valve is operated with momentary energization, it should be energized for at least 0.1 second. However, depending on the secondary load conditions, it should be energized until the cylinder reaches the stroke end position, as there is a possibility of malfunction otherwise.

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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