



ORIGINAL INSTRUCTIONS

Refer to Declaration of Conformity for relevant Directives



*(Electrical entry D or DZ and with -Q suffix only)

Instruction Manual
2 port valve for flow control

Series VNB



The intended use of this valve is to control the air in the down-stream pneumatic circuit.

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.

- *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: Manipulating industrial robots -Safety. etc.
- 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

Series	VNB	
Fluid	Water, Oil, Air, Vacuum, etc. (Refer to Table 6)	
Ambient Temperature	-5 to +50°C ^{Note 1)} (Air operated type: 60°C)	
Fluid Temperature	VNB□□□A, VNB□□□ ^B _C	-5 to +60 °C ^{Note 1)}
	VNB□□□ ^B _C	-5 to +99 °C ^{Note 1)} (Water, Oil etc. Air operated only)
Proof pressure	1.5 MPa	
Applicable pressure range ^{Note 2)}	VNB□□□□	Low vacuum to 0.5 MPa
	VNB□□□□ ² ₃ □ ⁴	Low vacuum to 1 MPa
External pilot air	Pressure	VNB□□□ ¹ ₄ □ 0.25 to 0.7 MPa VNB□□□ ² ₃ □ 0.1 + 0.25 x (Operating pressure) to 0.25 + 0.25 x (Operating pressure) MPa (Refer to Figure 1) ^{Note 3)}
	Lubrication	Not required (Refer to Section 3.4) ^{Note 4)}
Temperature	-5 to +50 °C (Air operated type: +60 °C)	

2 Specifications – continued

Flow	Refer to Catalogue	
Mounting orientation	Unrestricted ^{Note 5)}	
Max. operating frequency	VNB1, 2, 3, 4	30 times per minute
	VNB5, 6	20 times per minute
	VNB7	15 times per minute
Min. operating frequency	Once every 30 days	
Duty cycle	Contact SMC	
Response time	Contact SMC	
Weight	Refer to Catalogue	
Vibration resistance	30 m/s ²	
Impact resistance	150 m/s ²	

Table 1

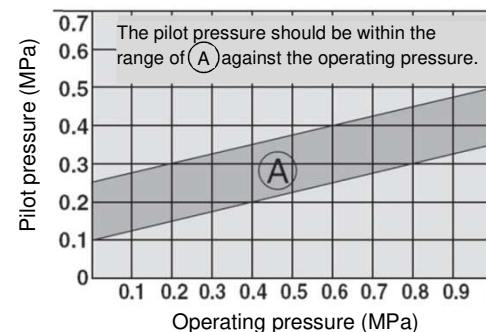


Figure 1

Notes:

- Note 1) No freezing
- Note 2) The pressure differential between Port 1 (A) and 2 (B) must not exceed the maximum operating pressure.
- Note 3) Adjust the operating pressure range from 0.125 MPa to 0.275 MPa for low vacuum.
- Note 4) Lubrication is not allowed in the case of seal material EPR.
- Note 5) For external pilot solenoid, it is recommended that the pilot solenoid valve be oriented either vertically upward or horizontally.

2.2 Vacuum pilot type

Fluid	Vacuum
Operating pressure range	-101 kPa to Atmospheric pressure
Pilot pressure range	-101 to -47.9 kPa

Table 2

Note) It is used when the valve is to be operated by the main vacuum in the absence of pressurized air.

2.3 Solenoid Specifications

Port size	6A to 25A	32A to 50A
Pilot solenoid valve	SF4-□□□-23	VO307-□□□1
	SF4-□ ^{DZ} -23-Q	VO307-□ ^{DZ} 1-Q
Electrical entry	Grommet terminal, Conduit terminal DIN terminal	Grommet terminal, DIN terminal
		DIN
Rated coil voltage	AC (50/60 Hz)	100 V, 200 V, Other voltage (Semi-standard)
	DC	24 V, Other voltage (Semi-standard)
Allowable voltage fluctuation	-15 % to +10 % of rated voltage	
Temperature rise	35 °C or less (When rated voltage is applied.) 50 °C or less (When rated voltage is applied.)	
Apparent power	AC	Inrush: 5.6 VA (50 Hz), 5.0 VA (60 Hz) Holding: 3.4 VA (50 Hz), 2.3 VA (60 Hz)
	DC	1.8 W (without light), 2 W (with light)
Power consumption	4 W (without light), 4.2 W (with light)	
Manual override	Non-locking-push type Other (Semi-standard)	Non-locking push type

Table 3

Notes:

- Note 1) For "How to Order" pilot solenoid valves, refer to the catalogue.
- Note 2) Vacuum pilot type pilot solenoid valves will become VO307V-□□□1
- Note 3) Vacuum pilot type CE-compliant pilot solenoid valves will become VO307V-□^{DZ}1-Q

2 Specifications – continued

2.4 Port size

Model	Port size Rc	Orifice dia. Ø (mm)
VNB1□□□-6A	1/8	7
VNB1□□□-8A	1/4	
VNB1□□□-10A		
VNB2□4□-10A	3/8	11
VNB2□□□-10A		15
VNB2□4□-15A	1/2	11
VNB2□□□-15A		15
VNB3□4□-20A	3/4	14
VNB3□□□-20A		20

Table 4

Model	Port size		Orifice dia. Ø (mm)
	Rc	Flange ^{Note 1)}	
VNB4□4□-25A	1	-	16
VNB4□□□-25A			25
VNB5□4□-32A	1 1/4	-	22
VNB5□□□-32A		32	
VNB5□4□-32F	-	32	22
VNB5□□□-32F			32
VNB6□4□-40A	1 1/2	-	28
VNB6□□□-40A		40	
VNB6□4□-40F	-	40	28
VNB6□□□-40F			40
VNB7□4□-50A	2	-	33
VNB7□□□-50A		50	
VNB7□4□-50F	-	50	33
VNB7□□□-50F			50

Table 5

Note 1) The flange should be JIS B 2210 10K (ordinary style) or its equivalent.

2.5 Applicable Fluids Check List

Wetted part Body material	Copper alloy: Standard			Aluminium: L			Stainless steel: S		
	NBR	FKM	EPR	NBR	FKM	EPR	NBR	FKM	EPR
Wetted part Seal material	: A	: B	: C	: A	: B	: C	: A	: B	: C
Fluid									
Air (Standard, Dry)	●	●	-	●	●	-	●	●	-
Low vacuum (Up to -101 kPa)	●	●	-	●	●	-	●	●	-
Carbon dioxide (CO ₂ , 0.7 MPa or less)	●	-	-	●	-	-	●	-	-
Carbon dioxide (CO ₂ , 0.7 to 1 MPa)	-	-	●	-	-	●	-	-	●
Nitrogen gas (N ₂)	●	●	●	●	●	●	●	●	●
Argon	●	●	-	●	●	-	●	●	-
Helium	-	●	-	-	●	-	-	●	-
Water (standard, up to 60 °C)	●	-	-	●	-	-	●	-	-
Water (up to 99 °C air operated type only)	-	●	-	-	●	-	-	●	-
Turbine oil	●	●	-	●	●	-	●	●	-
Spindle oil	-	●	-	-	●	-	-	●	-
Fuel oil Class 3 (C fuel oil)	-	●	-	-	●	-	-	●	-
Silicone oil	-	●	-	-	●	-	-	●	-
Naphtha	-	●	-	-	●	-	-	●	-
Ethylene glycol (up to 80 °C)	-	-	●	-	-	●	-	-	●
Boiler water	-	-	-	-	-	-	●	-	●

Table 6

2.6 Pneumatic symbols

Refer to catalogue for details of pneumatic symbols.

Caution

Special products 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.
- Some products in this series are heavy (up to 11.5 kg), take adequate measures when handling and installing it.

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.
- If this valve is exposed to water or oil droplets, ensure it is protected.

3.3 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.

3.4 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.

Thread	Appropriate tightening torque [N·m]
1/8	7 to 9
1/4	12 to 14
3/8	22 to 24
1/2	28 to 30
3/4	28 to 30
1	36 to 38
1 1/4	40 to 42
1 1/2	48 to 50
2	48 to 50

Table 7

3.4.1 Pilot ports P1 an P2

Caution

- Pilot port piping 12(P1) and 10(P2) piping should be as follows according to the model.

Standard

Port	VNB□0(1,4)□	VNB□02□	VNB□03□	VNB□1(1,2,4)□
12 (P1)	External pilot	Bleed port	External pilot*	External pilot
10 (P2)	Bleed port	External pilot	External pilot*	Pilot exhaust

*If the pilot air is not supplied, the valve position will not be held. Pressurize Port 12(P1) or Port 10(P2) when using product.

Table 8

Vacuum pilot

Port	VNB□01V□	VNB□02V□	VNB□1(1,2)V□
12 (P1)	Bleed port	External pilot	External pilot
10 (P2)	External pilot	Bleed port	Pilot exhaust

Table 9

- Installing a silencer to either the exhaust port or the bleed port is recommended for noise reduction and for dust entry prevention.

3 Installation - continued

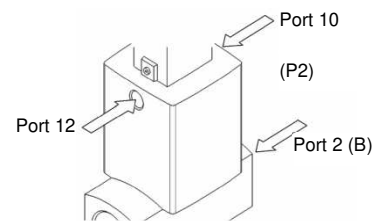


Figure 2

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

Install an air filter upstream of the valve. Select an air filter with a filtration size of 5µm or smaller.

3.6 Polarity

3.6.1 VNB1 to 4 (Valve size 1 to 4)

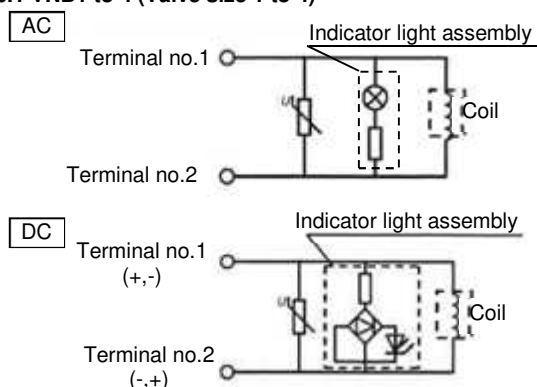


Figure 3

3.6.2 VNB5 to 7 (Valve size 5 to 7), Vacuum pilot type (Valve size 2 to 7)

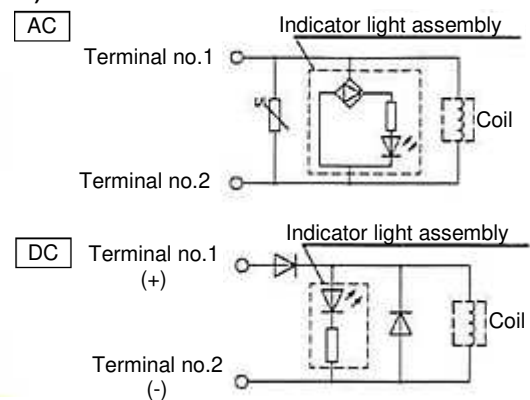


Figure 4

3.7 Electrical connection

- When electrical power is connected to a solenoid valve, be careful to apply the proper voltage. Improper voltage may cause malfunction or coil damage.
- After completing the wiring, confirm that the connections are correct.
- When DC power is connected to a solenoid valve equipped with light and/or surge voltage suppressor, check for polarity indications.
- For polarity indications: Valve sizes 5 to 7 have diodes to protect polarity: If the polarity connection is wrong then the valve will not switch. In addition to this, damage could be caused in the diode in the valve, the switching device at the control equipment or, the power supply.

3.7.1 DIN Connector

Refer to catalogue of pilot solenoid valve for additional details.

3 Installation - continued

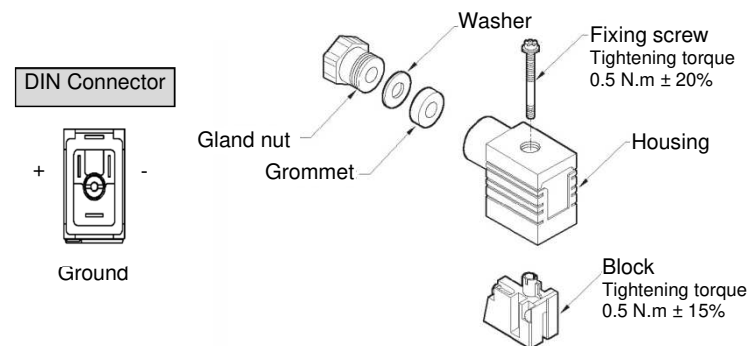


Figure 5



Warning

The ground terminal is connected to the coil assembly only and does not provide a protective earth for the body of the valve.

3.8 Mounting



Warning

- Do not apply external force to the coil section.** When tightening is performed, apply a wrench or other tool to the outside of the piping connection parts.
- Mount a valve with its coil position upwards, not downwards.** When mounting a valve with its coil positioned downwards, foreign objects in the fluid will adhere to the iron core leading to malfunction. Especially for strict leakage control, such as with vacuum applications and non-leak specifications, the coil must be positioned upwards.

3.8.1 Bracket (optional)

Valve series 1, 2, 3 and 4 can be mounted using a bracket (optional).

Thread	Appropriate tightening torque [N·m]
M4	1.5
M5	3.0
M6	5.2

Table 10

Refer to catalogue for additional information.

3.9 Manual Override



Warning

Since connected equipment will operate when the manual override is activated, confirm that conditions are safe prior to activation.

3.9.1 Non-locking push type

- VNB1-4** Push on the manual override button using a small bladed screwdriver until it stops ON. Hold this position for the duration of the check (ON position). Release the button and the override will re-set to OFF position
- VNB5-7** No tool needed.

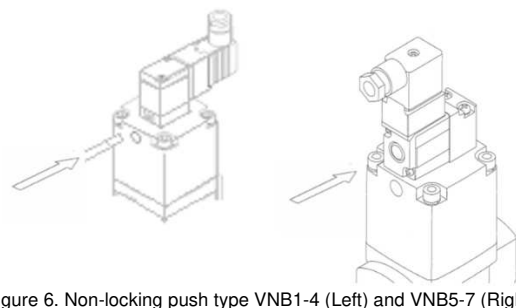


Figure 6. Non-locking push type VNB1-4 (Left) and VNB5-7 (Right)

3.9.2 Push-locking slotted type

- To lock
Using a small-bladed screwdriver in the slot, push the manual override button until it stops. Turn the override button 90° in the direction of the arrow until it stops (ON position). Remove the screwdriver



Warning

In this position the manual override is in the locked 'ON' position.

- To unlock
Place a small-bladed screwdriver in the slot and push the manual override button. Turn the override button 90° in the reverse direction of the arrow. Remove the screwdriver and the manual override will re-set to the OFF position.

3 Installation - continued

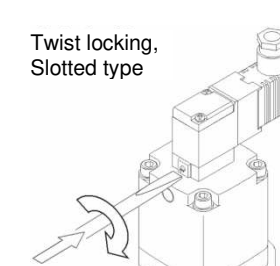


Figure 7. Push locking slotted type

4 How to Order

4.1 Standard Products

Refer to catalogue for 'How to Order'.

4.2 Special Products

For special products (-X number) refer to product drawing for "How to Order" and specification details.

5 Outline Dimensions (mm)

Refer to *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 Vacuum Pilot

When using VNB□□1V N.C. vacuum pilot, maintain the specified pilot pressure by providing a tank with an appropriate capacity or by acquiring the pilot pressure from an area near the vacuum pump.

6.3 Filters and strainers

- Be careful regarding clogging of filters and strainers.
- Replace filter elements after one year of use, or earlier, if the pressure drop reaches 0.1 MPa
- Clean strainers when the pressure drop reaches 0.1 MPa.

6.4 Storage

In case of long term storage after use with heated water, thoroughly remove all moisture to prevent corrosion, and deterioration of rubber materials etc.

6.5 Drain flushing

Remove drainage from air filters regularly. (Refer to the specifications)

6.6 Replacing Spare Parts

6.6.1 Replacing Plate Assembly and valve element (see Figure8)

- Remove body mounting screws.
- Apply sufficient air pressure to pilot port to release plate assembly.
- Place well-fitting slotted screwdriver into slot in piston rod and unscrew seal mounting nut with spanner.
- If spring pin is used, slide pin out and remove valve element.
- Slide off valve element, washers and plate assembly.
- Refitting is reverse of removal (use correct tightening torque).

6.6.2 Replacing Pilot Valve Assembly (see Figure)

- Remove pilot valve mounting screws.
- Remove pilot valve (retain DIN plug if necessary).
- Fitting of new pilot valve is reverse of removal assembly (use correct tightening torque).

6 Maintenance - continued

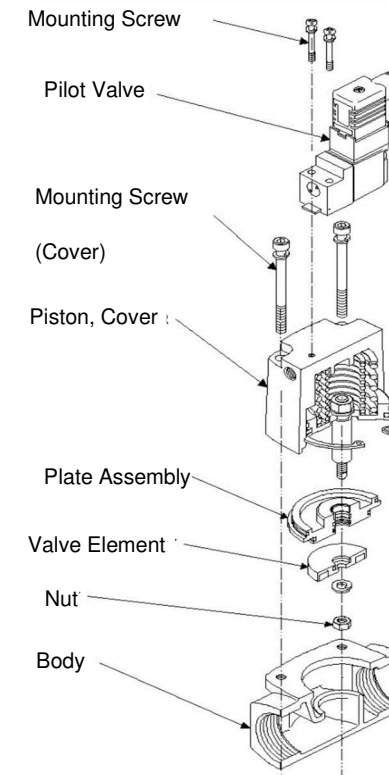


Figure 8



Caution

- Never remove inner circlip from valve.
- When replacing external pilot valve, ensure it is mounted in the correct direction. If mounted in the wrong direction, it may malfunction or leak air.

Tightening Torque (N·m)

Valve size	VNB1	VNB2	VNB3	VNB4	VNB5	VNB6	VNB7
Seal Mounting Nut	—	1.5	3	3	5.2	12.5	24.5
Piston Cover Mounting screw	1.5	1.5	3	5.2	5.2	12.5	12.5
Pilot Valve Mounting Screw	0.63	0.63	0.63	0.63	1.5	1.5	1.5

Table 11

7 Limitations of Use

7.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.



Warning

Do not exceed any of the specifications laid out in section 2 of this document or the specific product catalogue.



Warning

7.2 Extended periods of continuous energization

If a valve is continuously energized for an extended period of time, the temperature of the valve will increase due to the heat generated by the coil. This will likely adversely affect the performance of the solenoid valve and any nearby peripheral equipment. Should a valve be continuously energized for an extended period of time or its daily energized state exceeds its non-energized state, please use an energy saving type valve with DC specification. If an AC type is expected to be energized continuously for long periods of time, select the air-operated valve and use the continuous duty type of the VT307 for a pilot valve.

8 Product disposal

This product should 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 contacts.

SMC Corporation

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