# **Process Valve**

# VNB Series

## **2 Port Valve For Flow Control**

# A wide variety of applicable fluids

Proper selection with body and sealing materials permits application with a wide variety of fluids such as air, water, oil, gas and vacuum.

# Cylinder actuation by external pilot air

#### Wide variations

N.C., N.O., C.O., types are available. Screw-in type (6A to 50A) and the flange (32F to 50F) are standardized.

#### **Selection Procedure**

# Applicable fluids

- Refer to "Table (1)" to check that the desired fluid is applicable.
- Select the body and sealing materials, depending on the fluid.



- To find the flow rate of air or water, refer to the table of flow rate characteristics on page 10 to 16. Use the flow rate calculation equation to find the exact answer. Although the flow rate is the same, the operating pressure differs according to the valve size. Therefore, select the proper valve size from applicable valves.
- Arefer to "Table (2)" to select the port size of the threaded type (6A to 50A) and flanges (32F to 50F).



Select the air operated or external pilot solenoid types. Valves come in N.C. (normally closed), N.O. (normally open), C.O. (double acting), and N.C. 1 MPa (normally closed) types. Select the proper one according to the operating conditions.



 Select the AC/DC power source and choose the electrical entry according to "Table (3)".





VNA

VNB

VCC

#### Table (1) Applicable Fluids Check List

Wetted part Body material		er alloy: S	Standard	AI	uminum	:L	Stainless steel: S		
Wetted part Seal material	NBR	FKM	EPR	NBR	FKM	EPR	NBR	FKM	EPR
Fluid	L : A	⊥:B	L:C	(:A	:B	└:¢	L:A	: B	:c
Air (Standard, Dry)	<b>⊢_</b> ∳-	— <b>•</b> –			-+-				
Low vacuum (Up to -101kPa)	<b>—</b> •	_ <b>+</b> _		-+-	-+-	_	-•-		_
Carbon dioxide (CO2, 0.7 MPa or less)	<b>•</b>					_	-•-		_
Carbon dioxide (CO2, 0.7 to 1 MPa )		_	-+-			-+-			_ <b>•</b> -
Nitrogen gas (N2)		<del>_</del>	_ <b>+</b> _		-+-	-+-			-•-
Argon		_ <b>+</b> _			-+-	_			
Helium		_ <b>+</b> _			-+-	_			
Water (standard, up to 60°C)	<b>⊢</b> •	_	_				-+-		
Water (up to 99°C air operated type only)		<del>_</del> _	_ <b>+</b> _			_			-•-
Turbine oil		_ <b>+</b> _			-+-	_			
Spindle oil		<del>_</del> _			-+-				
Fuel oil Class 3 (C fuel oil)		<del>_</del> _			-+-			-+-	
Silicone oil		<del>_</del> _						-+-	
Naphtha									
Ethylene glycol (up to 80°C)			-+-						
Boiler water					_				

#### **▲**Caution

Note 1) When fluid permits application of multiple body and sealing materials, select the most suitable one according to the ambient environment (FKM or EPR seal material for high temperature) and other conditions (corrosion resistance and viscosity), etc.

Note 2) Test fluids to see if it will wash out cleaning liquid such as grease.

#### Table (2) Combinations between Valve Size and Port Size

Valve			н	F	ort size				SGC
size				20A 2	5A 32A	32F 40A	40F 50A	50F	
1	<b>├-</b> •─-•	<b>•</b> • •						<u> </u>	SGH
2		•						<u> </u>	
3				•				<u> </u>	VNC
4	<u> </u>				•				VINC
5	<u> </u>					•		<u> </u>	NAME:
6	<u> </u>							<u> </u>	VNH
7	i								
· · ·	1 1		1	1	1	I		-	VND

# Table (3) Combinations between Electrical Entry and Light/Surge Voltage Suppressor



# Process Valve: 2 Port Valve For Flow Control **VNB Series**

How to Order

[Option] \* Electrical entry: D or DZ

only.



**SMC** 

# Process Valve: 2 Port Valve For Flow Control **VNB** Series



#### Symbol

$\begin{tabular}{ c c c c c c } \hline VNB & N.C. N.O. C.O. \\ \hline Type & WPP & Normally closed & Normally cpen & Double acting \\ \hline Normally closed & Normally cpen & Double acting \\ \hline VNB & 02 & VNB & 02 \\ \hline VNB & 02 & VNB & 02 \\ \hline (P1) & & (P2) & (P1) & (P1) & (P2) & (P1) & (P2) & (P1) & (P2) &$				
Type     VMB     Normally clean dividual colspan="2">Normally clean dividual colspan="2">Normally clean dividual colspan="2">Double acting the colspan="2">Normally clean dividual colspan="2">Normally clean dividual colspan="2">Double acting the colspan="2">Normally clean dividual colspan="2">Double acting the colspan="2">Normally clean dividual colspan="2"       Articlean dividual colspan="2"       Normally clean dividual colspan="2"       VNB 11       VNB 11       VNB 11       VNB 11       VNB 11       VNB 12       Image: Normally clean dividual colspan="2"       Image: Normally clean dividual colspan="2"       VNB 11       VNB 11       VNB	Valve	N.C.	N.O.	C.O.
VNB:01         VNB:02         VNB:03 $12$ $12$ $12$ $12$ $12$ $12$ $12$ $12$ $12$ $12$ $12$ $12$ $11$ $12$ $12$ $12$ $11$ $12$ $11$ $12$ $11$ $11$ $12$ $11$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $12$ $11$ $12$ $11$ $12$ $11$ $11$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $11$ $12$ $12$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $11$ $12$ $12$ $12$ $12$ </td <td>Туре</td> <td>Normally closed</td> <td>Normally open</td> <td>Double acting</td>	Туре	Normally closed	Normally open	Double acting
Air operated $\frac{12}{(P1)} + \frac{10}{(P2)} + \frac{12}{(P1)} + \frac{10}{(P1)} + \frac{12}{(P1)} + \frac{11}{(P1)} + \frac{11}{(P1)} + \frac{11}{(P2)} + \frac$			VNBD02	VNBD03
External pilot solenoid	Air operated			12 (P1) 1 1 (P2) 1 (P2) 1
External pilot solenoid $\begin{bmatrix} 12 & & & \\ (P1) & & & \\ 1 & & & 2 \\ \hline \\$			VNBD12	
	External pilot solenoid			

lote) Flow direction should be from port 1(A) to port 2(B) for vacuum applications.

#### **Option Specifications**

Vacuum pilot valve VNB (Valve size 2 to 7)

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

#### Specifications (Vacuum pilot type)

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

#### Symbol (Vacuum pilot type)



#### Model

		Orifice	Flow	rate cl	haract	teristic	s	Maight (kg)			
Model	Port size	dia.	Measu	red by a	air	Measure	ed by water	vveig	пт (кд)		
	Rc	ø (mm)	C [dm3/(bar.sec	;)] b	Cv	Kv	Conversion Cv	Air operated	External pilot solenoid		
VNB100-6A	1/8		3.3	0.29	0.80	0.9	1.0				
VNB100-8A	1/4	7	4.6	0.17	1.0	1.0	1.2	0.3	0.4		
VNB100-10A		1	4.7	0.18	1.1	1.1	1.3				
VNB2040-10A	3/8	11	9.6	0.40	2.6	2.5	2.9				
VNB200-10A		15	17	0.32	4.0	3.9	4.5	0.6	0.7		
VNB2□4□-15A	1/6	11	9.6	0.40	2.6	2.7	3.1	0.0	0.7		
VNB200-15A	72	15	19	0.24	4.8	5.0	5.8				
VNB3□4□-20A	3/.	14	18	0.42	5.4	5.0	5.8	0.0	1.0		
VNB3DD-20A	74	20	35	0.13	7.4	9.6	11	0.9	1.0		
	Port size		Orifice	Flow r	ate ch	aracte	eristics				
Model	-	0120	dia.	Measure	d by air	Measure	d by water	Weight (kg)			
	Rc	Flange Note)	ø (mm)	Effective an	ea (mm²)	Kv	Conversion Cv	Air operated	External pilot solenoid		
VNB4□4□-25A			16	130		6.1	7.0		4.5		
VNB400-25A	1		25	220		10.4	12	1.4	1.5		
VNB5040-32A	41/		22	21	0	9.8	11	0.5	0.6		
VNB500-32A	174		32	32	0	15.6	18	2.5	2.0		
VNB5□4□-32F			22	21	0	9.8 11		F 7	5.0		
VNB500-32F	—	32	32	32	0	15.6	18	5.7	5.6		
VNB6□4□-40A	11/6		28	33	0	16.4	19	4.1	4.2		
VNB600-40A	172	_	40	50	0	24.2	28	4.1	4.2		
VNB6□4□-40F		40	28	33	0	16.4	19	77	7.8		
VNB600-40F	_	40	40	50	0	24.2	28	1.1	7.0		
VNB7□4□-50A	~		33	520		520 25.1 29		25.1 29		63	6.4
VNB700-50A	2	_	50	770		37.2 43		0.0	0.4		
VNB7□4□-50F		50	33	520		25.1	29	11.4	11.5		
VNB700-50F	_	50	50	770		37.2	43	11.4	11.5		

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

#### Specifications

Fluid			Water/Oil/Air/Vacuum, etc.							
<b>Finite</b>	<b>VNB</b>	□□A, VNB□1□₿	-5 to 60°C Note 1)							
Fiuld			-5 to 99°C Note 1)							
temperature	VINDL		(Water, Oil etc. Air Operated only)							
Ambient tempe	rature	•	-5 to 50°C Note 1) (Air operated type: 60°C)							
Proof pressure			1.5 MPa							
Applicable Note 4)	VNB	III	Low vacuum to 0.5 MPa							
pressure range	VNB		Is a second							
		VNB 1	0.25 to 0.7 MPa							
	Pressure		0.1 + 0.25 x (Operating pressure) to							
External pliot			0.25 + 0.25 x (Operating pressure) MPa Note 3) Refer to "Graph (1)" on page 568.							
all	L	ubrication	Not required (Use turbine oil Class 1 ISO VG32, if lubricated. Note 2))							
Temperature			-5 to 50°C (Air operated type: 60°C)							
Mounting orientation			Unrestricted Note 5)							

Note 2) Lubrication is not allowed in the case of seal material EPR.

Note 3) Adjust the operating pressure range from 0.125 MPa to 0.275 MPa for low vacuum. Note 4) The pressure differential between Port 1 (A) and 2 (B) must not exceed the maximum operating pressure. Note 5) For external pilot solenoid, it is recommended that the pilot solenoid valve be oriented either

vertically upward or horizontally.

#### Pilot Solenoid Valve Specifications

Port size				6A to 25A	32A to 50A	SGH					
Pilot soleno	id v	alve	Note1)	SF4-□□-23 SF4-□ <sup>D</sup> <sub>D2</sub> -23-Q	VO307-□□1 VO307-□bz1-Q	VNC					
Electrical en	ıtry			Grommet, Grommet terminal Conduit terminal DIN terminal	Grommet, DIN terminal	VNH					
Coil rated	AC	; (5	0/60 Hz)	100 V, 200 V, Other voltage (Semi-standard)							
voltage (V)		I	DC	24 V, Other voltage (Semi-standard)							
Allowable vo	Itag	e flu	uctuation	-15% to +10% of rated voltage							
Temperature	e ris	e		35°C or less (When rated voltage is applied.)	50°C or less (When rated voltage is applied.)	VCC					
Apparent			Inrush	5.6 VA (50 Hz), 5.0 VA (60 Hz)	12.7 VA (50 Hz), 10.7 VA (60 Hz)	100					
power	1	40	Holding	3.4 VA (50 Hz), 2.3 VA (60 Hz)	7.6 VA (50 Hz), 5.4 VA (60 Hz)	то					
Power consumption DC			DC	1.8 W (without light), 2 W (with light) 4 W (without light), 4.2 W (with light)							
Manual override				Non-locking push type Other (Semi-standard) Non-locking push type							
Nata 4) Ear (01)	A.	- 0-									

Note 1) For "How to Order" pilot solenoid valves, refer to page 570.

Note 2) Vacuum pilot type pilot solenoid valves will become VO301V-00

Note 3) Vacuum pilot type CE-compliant pilot solenoid valves will become VO307V-Dpz-Q.



VNA

VNB

SGC

#### How to Order Pilot Solenoid Valves



#### Construction



#### **Component Parts**

No.	Description	Material	Note
1	Body	Bronze Note 2)	Clear coated
2	Cover assembly	Aluminum alloy	Platinum silver painted
3 Note 1)	Plate assembly	Brass Note 2)	Seal material (NBR, FKM, EPR)
4 Note 1)	Valve element	Stainless steel or brass Note 2)	Seal material (NBR, FKM, EPR)
5	Piston assembly	Aluminum alloy	—
6	Return spring	Piano wire	—
7	Pilot solenoid valve	_	_

Note 1) Parts (3) and (4) are for selection of valve composition.

Note 2) The body option "S" is stainless steel, and "L" is aluminum.

#### **Replacement Parts**

#### Valve size 5/6/7 and vacuum pilot type VO307 5 Q D Body option CE-compliant Nil Standard Nil v Vacuum pilot 0 CE-compliant Electrical entry: Coil rated voltage D or DZ only 100 VAC 50/60 Hz 1 2 200 VAC 50/60 Hz 3 Note 1) 110 VAC 50/60 Hz Electrical entry CE-complia 4 Note 1) 220 VAC 50/60 Hz G Grommet 24 VDC 5 Grommet with surge GS 6 Note 1) 12 VDC voltage suppressor 7 Note 1) 240 VAC 50/60 Hz DIN terminal D . Note 1) Semi-standard DIN terminal with light/ DZ Note 2) For other rated voltage surge voltage suppressor es, please consult with SMC

Accessory

Function plate for VO307 (D sealing, with thread): DXT152-14-5A



C.O. type does not have a return spring 6.

#### Working Principle (Vacuum pilot type is excluded)

#### $VNB \square 0^1_4 \square$ , $\square 1^1_4 \square$ (N.C.)

When the pilot solenoid valve ⑦ is not energized (or when air is exhausted from the port P1 of the air operated type), the valve element (4) linked to the piston (5) is closed by the return spring (6).

#### When valve opens

When the pilot solenoid valve is energized (or when pressurized air enters through the port P1 of the air operated type), the pilot air that has entered under the piston moves upward to open the valve elemont

When valve closes.

When the power to the pilot solenoid valve is turned off (or when fluid is exhausted from the port P1 of the air operated type), the pilot air under the piston is exhausted, and the return spring closes the valve element

#### VNB 02 , 12 (N.O.)

In contrast with the N.C., when the power to the pilot solenoid valve is turned off (or when air is exhausted from the port P2 of the air operated type), the valve is held open by the return spring. When the pilot solenoid valve is energized (or when pressurized air enters through the port P2 of the air operated type), the valve element closes.

#### VNB 03 (C.O.)

The valve element for the C.O. type, which has no return spring, is in an arbitrary position when air is exhausted through the ports P1 and P2. When pressurized air enters the port P1 (exhaust from the port P2), the valve element opens, and it closes when pressurized air enters the port P2 (exhaust from the port P1)

								Par	t no.					
No.	Desc	ription		VNB1	VNB2	VNB3	VNB4	VNB5	VNB5 4	VNB6	VNB6 4 🗆	VNB7	VNB7 4 🗆	
				-6A, 8A, 10A	-10A, 15A	-20A	-25A	-32A, 32F	-32A, 32F	-40A, 40F	-40A, -40F	-50A, 50F	-50A, 50F	
Note 1)	Dista	Casi	NBR		VN2-A3BA	VN3-A3BA	VN4-A3BA	VN5-A3BA	VN5-A3BA	VN6-A3BA	VN6-A3BA	VN7-A3BA	VN7-A3BA	
3	Plate	sembly material	FKM		VN2-A3BB	VN3-A3BB	VN4-A3BB	VN5-A3BB	VN5-A3BB	VN6-A3BB	VN6-A3BB	VN7-A3BB	VN7-A3BB	
	assembly materi	material	" EPR	Refer to	VN2-A3BC	VN3-A3BC	VN4-A3BC	VN5-A3BC	VN5-A3BC	VN6-A3BC	VN6-A3BC	VN7-A3BC	VN7-A3BC	
Note 1)	Valve element	Casi	NBR	Note 2)	VN2-4BA	VN3-4BA	VN4-4BA	VN5-A4BA	VN5-A4BA-3	VN6-A4BA	VN6-A4BA-3	VN7-A4BA	VN7-A4BA-3	
4	32 F to 50 F come	50 F come Seal	FKM		VN2-4BB	VN3-4BB	VN4-4BB	VN5-A4BB	VN5-A4BB-3	VN6-A4BB	VN6-A4BB-3	VN7-A4BB	VN7-A4BB-3	
	assembly	material	EPR		VN2-4BC	VN3-4BC	VN4-4BC	VN5-A4BC	VN5-A4BC-3	VN6-A4BC	VN6-A4BC-3	VN7-A4BC	VN7-A4BC-3	
7	Pilot sole	noid v	alve	SF4-D	□ -23 (Refe	r to the table	below.)	VO307-□□□1 (Refer to the table below.)						

Note 1) In the case of body options "S" and "L", the materials of the part nos. 3 and 4 are as follows: (Example): VN1-A3B A

However all brackets of valve element VNB 1 to 4 are made of stainless steel. (No need to add options "S" and "L".) L: Aluminum, S: Stainless steel Note 2) Please request a factory repair.

A 570



#### Process Valve: 2 Port Valve For Flow Control **VNB** Series

#### Port size: 6A, 8A, 10A

VNB100-8A

VNB100-10A

1/4

3/8



 $\ast$  In the case of "EZ" or "TZ", the length is longer by 10 mm. For "DZ", the length is longer by 17 mm.

VNA
VNB
SGC
SGH
VNC
VNH
VND
VCC
TQ

#### Port size: 10A, 15A, 20A, 25A



Model	Main port	Δ	в	С	D	F	F	G	н	1	Ы	к	L	м	N	Р	0	R	s	т	u
	1(A), 2(B)		-		-	_	•	-		•	•	••	_			•	-		•	•	<u> </u>
VNB2	3/8	62	40	20	14	70 5	00 E	75	00	04 5	104	105 5	144 5	50	26	4.5	24.2	00	25	24	55
VNB2	1/2	03	42	20	14	12.5	00.5	13	00	04.5	124	125.5	144.5	52	20	4.5	24.3	2.3	20	54	55
VNB3DD-20A	3/4	80	50	35	17.5	84	92	84	89	93.5	135.5	137	156	62	31	5.5	28.3	2.3	30	43	60.5
VNB4DD-25A	1	90	60	44	22	100	108	90	95	99.5	151.5	153	172	72	36	6.5	33.3	2.3	35	49	73

#### Port size: 10A, 15A, 20A, 25A

Vacuum pilot



Model	Main port 1(A), 2(B)	A	в	с	D	Е	F	G	н	I	J	к	L	м	N	Р	Q	R	s
VNB2DDDV-10A	3/8	63	12	28	14	72.5	80.5	72.2	05.3	121.1	162.5	52	26	4.5	24.3	23	25	34	55
VNB2	1/2	05	42	20	14	12.5	00.5	12.2	33.5	121.1	102.5	52	20	4.5	24.5	2.5	23	54	55
VNB3DDV-20A	3/4	80	50	35	17.5	84	92	77.2	100.3	132.6	174	62	31	5.5	28.3	2.3	30	43	60.5
VNB4DDV-25A	1	90	60	44	22	100	108	78.2	101.3	148.6	190	72	36	6.5	33.3	2.3	35	49	73

A 572

#### Port size: 32A, 40A, 50A

#### Standard/Vacuum pilot



Model	Main port 1(A), 2(B)	Pilot port 12(P1), 10(P2)	A	в	с	D	E	F	G	н	I	J
VNB5000-32A	11/4	1⁄8	105	77	53	26.5	120.5	20	129.5	170.1	211.5	55
VNB6000-40A	11/2	1/4	120	96	60	30	137	24	147	187.6	229	63
VNB7000-50A	2	1/4	140	113	74	37	160	24	170	210.6	252	74

#### Port size: Flange: 32F, 40F, 50F

#### Standard/Vacuum pilot



Мос	del	Applicable flange 1(A), 2(B)	Pilot port 12(P1), 10(P2)	Α	в	С	D	E	F	G	н	I	J
VNB5	□ <b>□-32</b> F	32	1/8	130	210.5	135	134	20	100	36	12	251.1	292.5
VNB6	□ <b>□-40F</b>	40	1/4	150	226	140	146	24	105	42	12	266.6	308
VNB7	□ <b>□-50</b> F	50	1/4	180	250	155	162.5	24	120	54	14	290.6	332

VNA
VNB
SGC
SGH
VNC
VNH
VND
VCC
TQ



## **VNB** Series Specific Product Precautions

Be sure to read this before handling the products. Refer to back page 50 for Safety Instructions and pages 17 to 19 for 2 Port Solenoid Valve for Fluid Control Precautions.

Design

# **M**Warning

#### Extended periods of continuous energization

If a valve is continuously energized for long periods, heat generation of the coil may result in reduced performance and shorter service life. This may also have an adverse effect on the peripheral equipment in proximity. Should a valve be continuously energized for long periods, or its daily energized state exceeds its non energized state, please use an energy saving type valve with DC specifications. Additionally, when using with AC, energizing for long periods of time continuously, select the air-operated valve and use the continuous duty type of the VT307 for a pilot valve.

#### Fluid Quality

### A Warning

If a fluid that contains foreign matter is used, foreign matter may enter the rod sliding part, causing malfunction or seal failure. If seal failure occurs in the rod sliding part, the fluid backflows in the pilot air piping and may enter units in the circuit connected to the pilot air piping, causing adverse effect. So, perform the maintenance work periodically or take preventive measures appropriately.

#### Mounting

### **A**Warning

#### 1. 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.

- 2. Do not warm the coil assembly with a heat insulator, etc. Use tape, heaters, etc., for freeze prevention on the piping and body only. They can cause the coil to burn out.
- 3. Avoid sources of vibration, or adjust the arm from the body to the minimum length so that resonance will not occur.

Piping

### Caution

When high temperature fluids are used, use fittings and tubing with heat resistant features. (Self-align fittings, PTFE tubing, Copper tubing, etc.)

Wiring

## **≜**Caution

#### 1. Applied voltage

When electric power is connected to a solenoid valve, be careful to apply the proper voltage. Improper voltage may cause malfunction or coil damage.

#### 2. Confirm the connections.

After completing the wiring, confirm that the connections are correct.

**External Pilot** 

# **≜** Warning

#### Pilot port piping

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

Standard

Port		VNB 02	VNB 03		
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 the product.

#### Vacuum pilot

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

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

#### Mounting Direction of Pilot Solenoid Valve

## **A**Warning

With external pilot solenoids, the pilot solenoid valves are not splash proof specifications, and so care must be taken not to get fluid on oneself such as when performing maintenance.

## **≜**Caution

#### **Direction of mounting**

When replacing a valve, if an external pilot solenoid valve is mounted in the wrong direction, it may malfunction or leak air.

Vacuum Pilot

### 

When using the VNB $\Box_1^0$ U, 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.



∕⊘SMC