

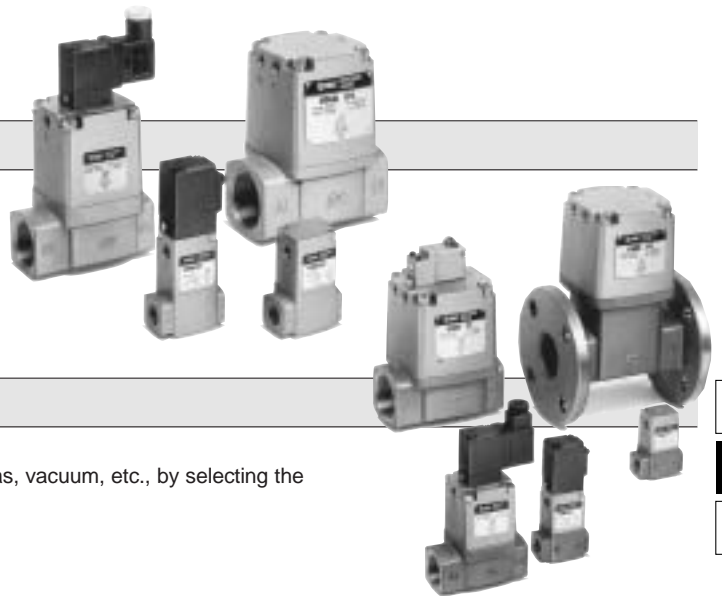
# For General Purpose 2/3 Port Valve

## Process Valve/Series VN

- The cylinder operation by external pilot air
- Can be operated with pressure differential zero.
- Wide variations

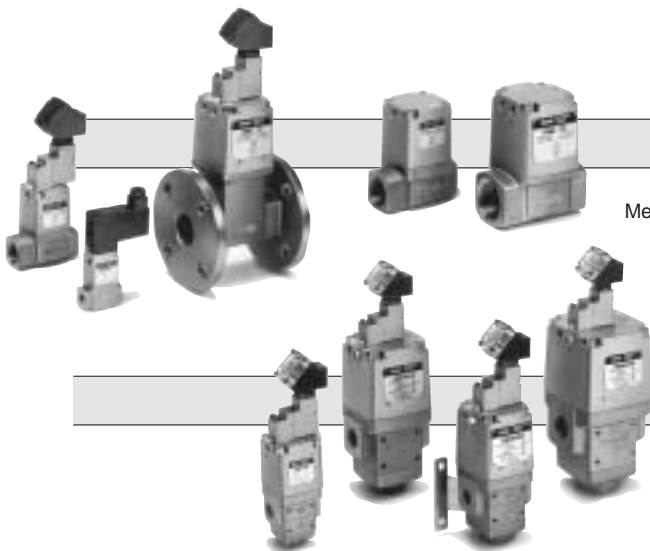
### Series VNA

For controlling pneumatic systems or air-hydro circuits.  
A balance poppet that enables air to flow forward or backward.



### Series VNB

For controlling various fluids  
Can operate with a wide range of fluids, such as air, water, oil, gas, vacuum, etc., by selecting the body material and the seal material.



### Series VNC

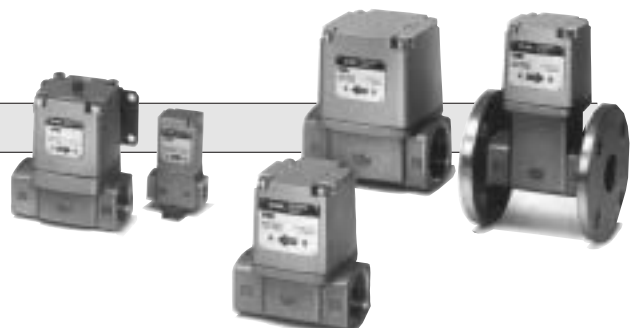
For controlling the cutting oils and coolants used in machine tools.  
Metal seals are used for preventing foreign matter such as cutting chips from entering.  
Maximum operating pressure: 0.5MPa, 1MPa

### Series VNH

For controlling the high pressure cutting oils and coolants used in machine tools.  
Maximum operating pressure: 3.5MPa, 7MPa

### Series VND

For steam control  
PTFE seal adopted  
With indicator (Option)



VX

VN□

VQ

# Series VN

## Process Valve

Series		Process valve Series VNA			Process valve Series VNB			Coolant valve Series VNC		Coolant valve for high pressure Series VNH	Steam valve Series VND		
Valve Style		N.C.	N.O.	C.O.	N.C.	N.O.	C.O.	N.C.	N.O.	N.C.	N.C.	N.O.	
Applicable fluid	Water	—	—	—	●	●	●	—	—	—	—	—	
	Air	●	●	●	●	●	●	—	—	—	—	—	
	Oil	●	●	●	●	●	●	●	●	●	—	—	
	Low vacuum (1 Torr)	—	—	—	●	●	●	—	—	—	—	—	
	Coolant	—	—	—	—	—	—	●	●	●	—	—	
	Steam	—	—	—	—	—	—	—	—	—	●	●	
Port size	Rc(PT)	1/8	●	●	●	●	●	●	●	●	—	●	●
		1/4	●	●	●	●	●	●	●	●	—	●	●
		3/8	●	●	●	●	●	●	●	●	●	●	●
		1/2	●	●	●	●	●	●	●	●	●	●	●
		3/4	●	●	●	●	●	●	●	●	●	●	●
		1	●	●	●	●	●	●	●	●	●	●	●
		1 1/4	●	●	●	●	●	●	●	●	—	●	●
		1 1/2	●	●	●	●	●	●	●	●	—	●	●
	Flange	2	●	●	●	●	●	●	●	●	—	●	●
		32A	—	—	—	●	●	●	●	●	—	●	●
		40A	—	—	—	●	●	●	●	●	—	●	●
		50A	—	—	—	●	●	●	●	●	—	●	●
		65A	—	—	—	—	—	—	●	●	—	—	—
		80A	—	—	—	—	—	—	●	●	—	—	—
Page		P.4.2-3 to P.4.2-10			P.4.2-11 to P.4.2-18			P.4.2-19 to P.4.2-27		P.4.2-28 to P.4.2-34		P.4.2-35 to P.4.2-42	

# 2 Port Valve for Compressed Air and Air-hydro Circuit Control Process Valve Series VNA

## Universal 2 Port Valve

Exclusively for air pressure system and air-hydro circuit control

The cylinder operation by external pilot air

The balance poppet permits normal and reverse flow.

Operation from 0 MPa is possible

Wide variations

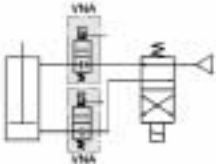
N.C., N.O., C.O., are available. Screw-in styles, 6A to 50A, are standardized.



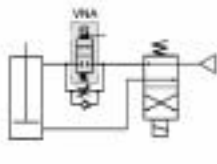
## Compressed Air

Air pressure circuit: Application examples

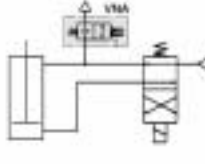
Actuator stop valve  
Emergency stop, intermediate stop, inching



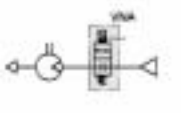
Actuator skip valve  
Terminal deceleration, intermediate deceleration, accelerative start



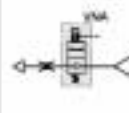
Actuator exhaust valve  
High speed operation, high-speed exhaust



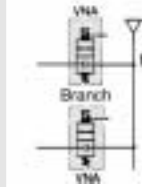
Air motor driving valve



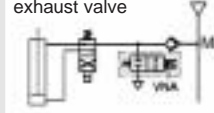
Air blow valve



Line stop valve

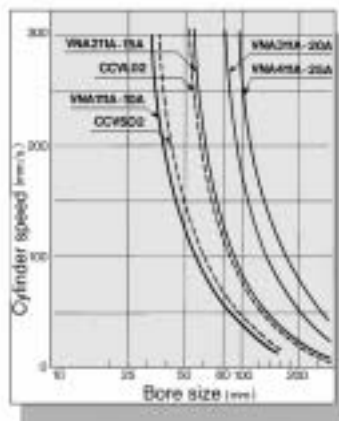


Residual line pressure exhaust valve



## Air-hydro

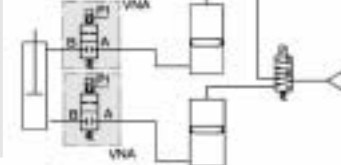
Operation capacity when used in air-hydro units



This series can supplement the capacity of conventional air-hydro valve units. They are suited to operate large bore cylinders as well as to simultaneously operate multiple cylinders and suspend their operation. Thus they can be used in the same as the conventional air-hydro units.

Air-hydro circuit: Application example

Basic circuit



Condition

Supply Pressure	0.49MPa	
Hydraulic fluid	ISO VG32	
Load	No load	
Piping length	1m	
Piping dia.	VNA111A CCVS02	3/8B(9 mm)
	VNA111A CCVS02	1/2B(13 mm)
	VNA311A	3/4B(19 mm)
	VNA411A	1B(25 mm)

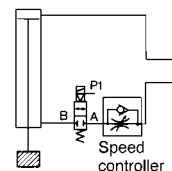
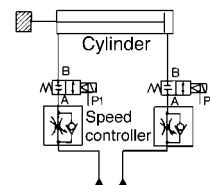


Refer to Best Pneumatics 2 for further information on air-hydro.

### Caution

When speed controller is mounted

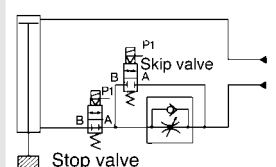
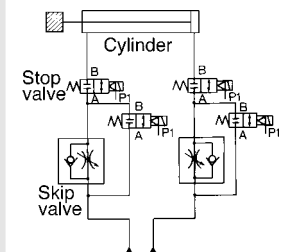
Connect a speed controller (Series AS etc.) to A port (cast in body A) of VNA\*11 (in order to protect the speed control valve from surges when cylinder operation is suspended, thus improving stopping accuracy)



### Caution

Skip valve function

Combination of 2 or more valves of Series VNA provides a skip valve function. Connect the skip valve to the A port side of a stop valve as in the case of the speed control valve.



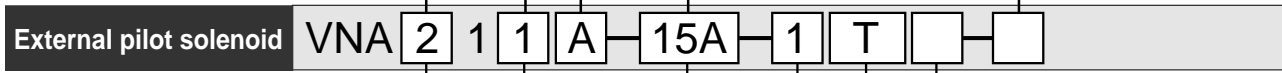
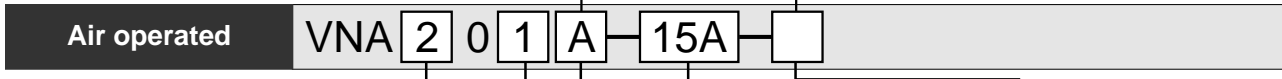
## How to Order

Seal material	
A	NBR seal
B	FPM seal
C	EPR seal

Refer to Table ① for application

Bracket	
—	Without bracket
B	With bracket

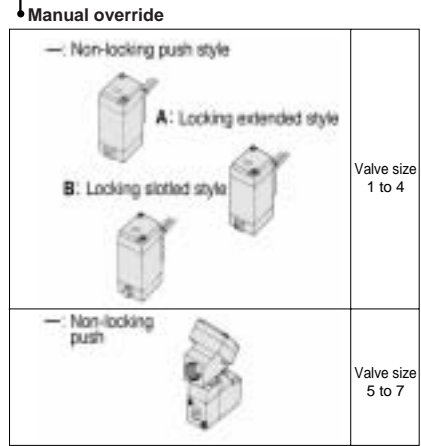
Only valve size 1, 2, 3, 4.



Symbol	Orifice size (mm)	Symbol			Symbol	Port size RC(PT)
		1	2	3>Note)		
		N.C.	N.O.	C.O.		
1	ø10	●	●	●	6A	1/8
		●	●	●	8A	1/4
		●	●	●	10A	3/8
2	ø15	●	●	●	10A	3/8
		●	●	●	15A	1/2
		●	●	●	20A	3/4
3	ø20	●	●	●	20A	3/4
4	ø25	●	●	●	25A	1
5	ø32	●	●	●	32A	1 1/4
6	ø40	●	●	●	40A	1 1/2
7	ø50	●	●	●	50A	2

Rated voltage	
1	100V AC 50/60Hz
2	200V AC 50/60Hz
3*	110V AC 50/60Hz
4*	220V AC 50/60Hz
5	24V DC
6*	12V DC
7*	240V AC 50/60Hz
9*	Other

\* Option



Note) Only air operated type.

**Electrical entry/Indicator light and surge voltage suppressor**

G	Grommet	Valve size 1 to 4
GS	Grommet with surge voltage suppressor	
E	Grommet terminal	
EZ	Grommet terminal with indicator light and surge suppressor	
T	Conduit terminal	
TZ	Conduit terminal with indicator light and surge suppressor	Valve size 5 to 7
D	DIN connector	
DZ	DIN connector with indicator light and surge suppressor	
G	Grommet	
GS	Grommet with surge voltage suppressor	
C	Conduit	
T	Conduit terminal	
TS	Conduit terminal with surge voltage suppressor	
TZ*	Conduit terminal indicator light and surge suppressor	
TL*	Conduit terminal with indicator light.	
D	DIN connector	
DL	DIN connector with indicator light	

**Table ① Applicable fluids**

Model	VNA□□□A (Valve material: NBR seal)	VNA□□□B (Valve material: FPM seal)	VNA□□□C (Valve material: EPR seal)
Applicable fluids	Air(standard dry) CO <sub>2</sub> (0.7 MPa Max.) Nitrogen gas(N <sub>2</sub> ) Freon 11, 113, 114, Turbine oil(40 to 100 cst), Hydraulic fluid	Argon, Helium, Turbine oil, Hydraulic fluid (99°C)	CO <sub>2</sub> (0.7 MPa max.)

**Caution** Contact SMC on other fluids, operating conditions, etc.

\* Except for rated voltage 6, 7, 9.



External pilot solenoid valve

Air operated valve

## Model

Model	Port Size Rc(PT)	Orifice size ø (mm)	Flow rate		Weight (kg)	
			Cv	Effective area (mm <sup>2</sup> )	Air operated	Solenoid
VNA1□□□-6A	1/8	10	0.7	13	0.1	0.2
VNA1□□□-8A	1/4		1.3	23		
VNA1□□□-10A	3/8		2	35		
VNA2□□□-10A	3/8	15	3.8	70	0.3	0.4
VNA2□□□-15A	1/2		5	90		
VNA3□□□-20A	3/4	20	8	140	0.5	0.6
VNA4□□□-25A	1	25	12	220	0.8	0.9
VNA5□□□-32A	1 1/4	32	18	320	1.3	1.4
VNA6□□□-40A	1 1/2	40	28	500	2.1	2.2
VNA7□□□-50A	2	50	43	770	3.1	3.2

## Valve Specifications

Fluid	Refer to table ① on page 4.2-4.	
Fluid temperature	VNA□□□A	-5 to 60°C (1)
	VNA□□□B/□□□C	-5 to 99°C (1) (Only air operated)
Ambient temperature	-5 to 50°C (Air operated: 60°C) (1)	
Proof pressure	1.5MPa	
Operating pressure range	0 to 1MPa	
External pilot air	Pressure range	0.2 to 0.7MPa
	Lubrication	Not required (Use turbine oil No.1 (ISO VG32) if lubricated) (2)
	Temperature	-5°C to 50°C (Air operated: 60°C)



Note 1) No freezing

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

## Symbol

Valve Style	N.C.	N.O.	C.O.
	Normally closed	Normally open	Double acting
Air operated	VNA□01 	VNA□02 	VNA□03 
	VNA□11 	VNA□12 	

## Pilot Solenoid Valve Specifications

Port size		6A to 25A	32A to 50A
Pilot solenoid valve		SF4-□□□-23	VO301-00 □□□
Electrical entry		Grommet, Grommet terminal Conduit terminal DIN connector	Grommet, Conduit, DIN connector Others (Option)
Coil rated voltage (V)	AC(50/60Hz)	100V, 200V, Others (Option)	
	DC	24V, Others (Option)	
Allowable voltage		-15% to +10% (rated voltage)	
Coil insulation		Class B or equivalent (130°C)	
Temperature rise		≤35°C (Application of rated voltage)	≤70°C (Application of rated voltage)
Apparent power	AC	Inrush	5.6VA(50Hz), 5.0VA(60Hz)
		Holding	3.4VA(50Hz), 2.3VA(60Hz)
Power consumption	DC		12VA(50Hz), -10.5VA(60Hz)
			7.5VA(50Hz), 6VA(60Hz)
Manual override		Non-locking push style Others (Option)	Non-locking push style

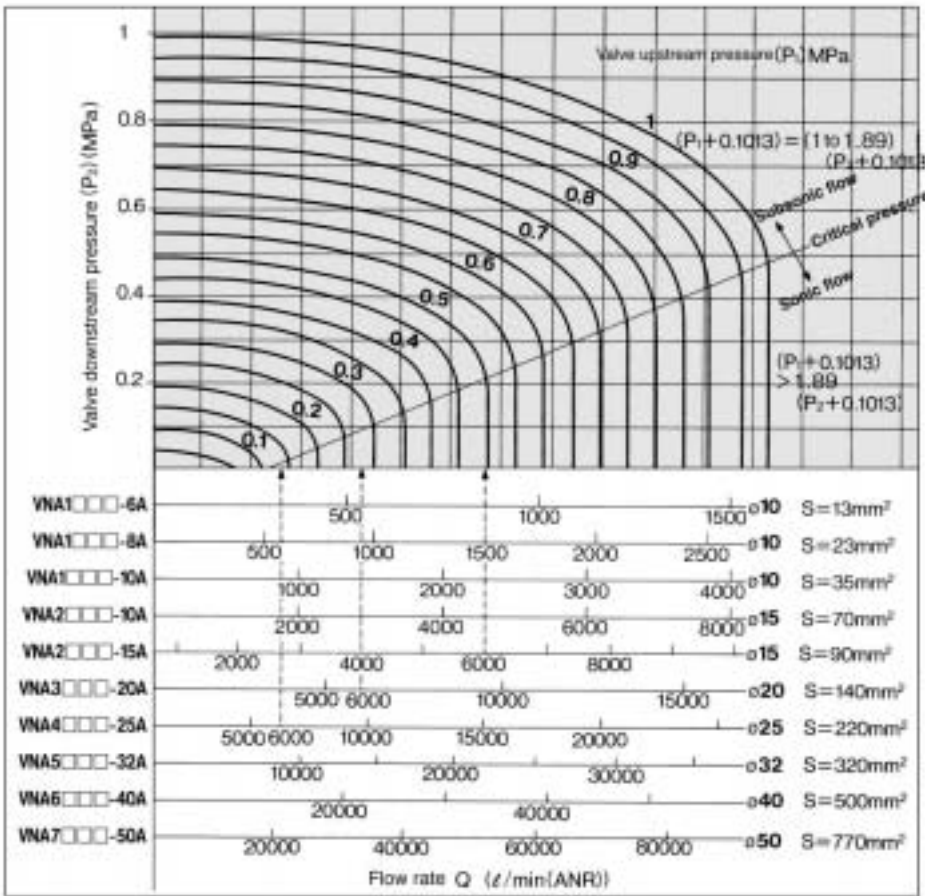
VX

VN□

VQ

## Flow Characteristics

### Air



### How to Read The Graph

In the sonic flow region: For a flow of 6000 (l/min)  
 VNA4mm(Orificeø25)....P1 ≅ 0.14MPa  
 VNA4mm(Orificeø20)....P1 ≅ 0.28MPa  
 VNA4mm(Orificeø15)....P1 ≅ 0.5MPa

### How to Calculate Flow

<Air and other gases>

① Equation in the domain of subsonic flow

• Calculation by Cv factor

$$Q = 4080 \cdot C_v \cdot \sqrt{\frac{\Delta P(P_2 + 0.1013)}{G}} \cdot \sqrt{\frac{273}{273 + \theta}}$$

..... l/min (ANR)

• Calculation by effective area

$$Q = 226 \cdot S \cdot \sqrt{\frac{\Delta P(P_2 + 0.1013)}{G}} \cdot \sqrt{\frac{273}{273 + \theta}}$$

..... l/min (ANR)

② Equation in the domain of sonic flow

• Calculation by Cv factor

$$Q = 2040 \cdot C_v \cdot (P_1 + 0.1013) \cdot \frac{1}{\sqrt{G}} \cdot \sqrt{\frac{273}{273 + \theta}}$$

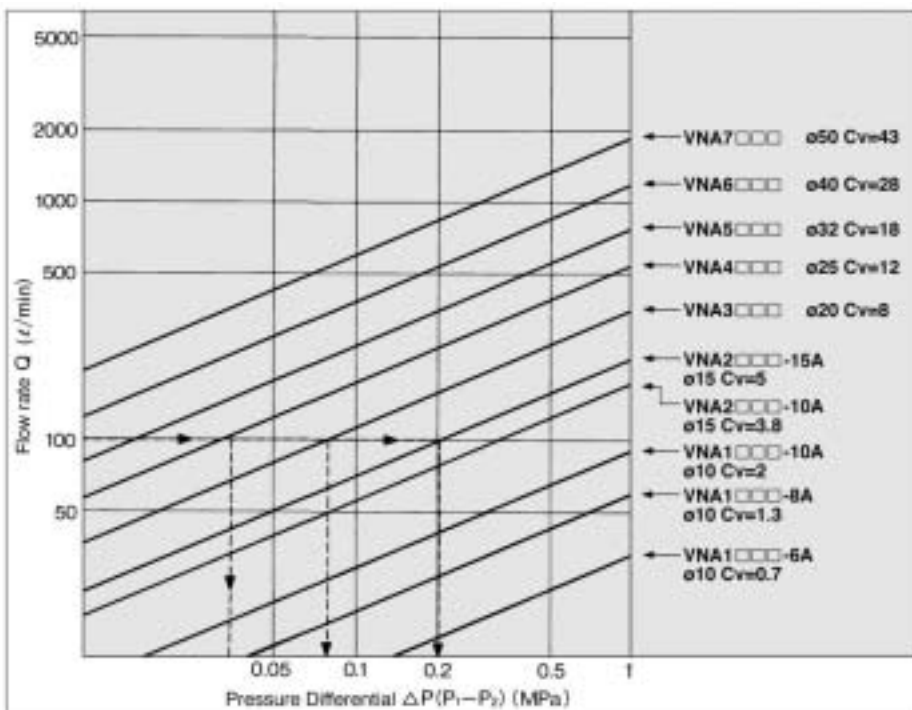
..... l/min (ANR)

• Calculation by effective area

$$Q = 113 \cdot S \cdot (P_1 + 0.1013) \cdot \frac{1}{\sqrt{G}} \cdot \sqrt{\frac{273}{273 + \theta}}$$

..... l/min (ANR)

### Turbine oil (ISO VG32)



### How to Read The Graph

In case of a flow of oil 100 l/min:  
 VNA4 (Orificeø24)....ΔP ≅ 0.035MPa  
 VNA4 (Orificeø20)....ΔP ≅ 0.08MPa  
 VNA4 (Orificeø15)....ΔP ≅ 0.2MPa

### How to Calculate Flow

• Calculation by Cv factor

$$Q = 14.2 \cdot C_v \cdot \sqrt{\frac{10.2 \Delta P}{G}} \text{ ..... l/min}$$

• Calculation by effective area

$$Q = 0.8 \cdot S \cdot \sqrt{\frac{10.2 \Delta P}{G}} \text{ ..... l/min}$$

Note) Calculation error of fluid with viscosity of 50 cSt or less will be very small.

### Symbol

Q : Flow rate (Air and other gases l/min (ANR))  
 (Water and other liquids l/min)

ΔP: Pressure differential (P1-P2)

P1 : Upstream pressure (MPa)

P2 : Downstream pressure (MPa)

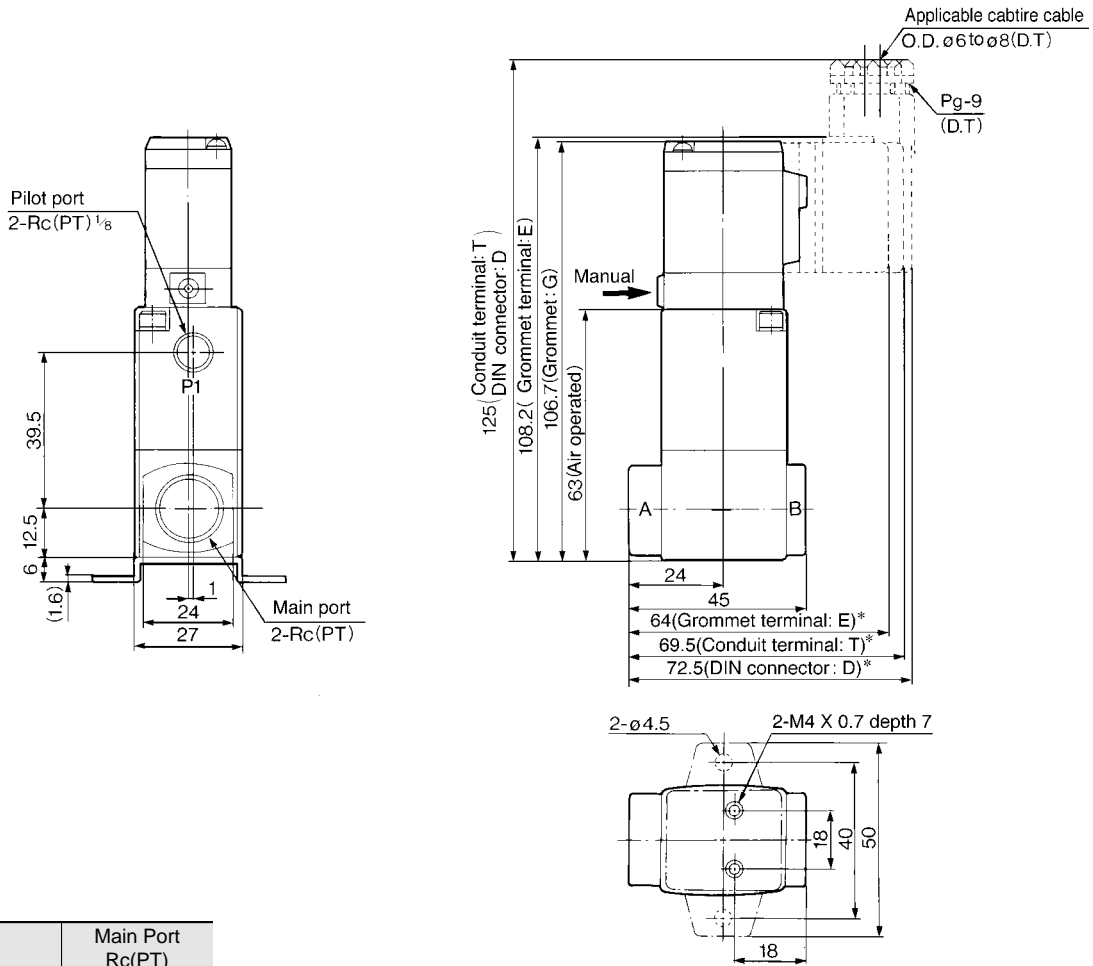
θ : Temperature of air and other gases (°C)

S : Effective area (mm²) S ≅ 18Cv

Cv : Cv factor ( / )

G : Specific gravity ( / ) Air/Water=1

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



Model	Main Port Rc(PT)
VNA1□□□-6A	$\frac{1}{8}$
VNA1□□□-8A	$\frac{1}{4}$
VNA1□□□-10A	$\frac{3}{8}$



\* EZ, TZ, DZ: 9mm longer

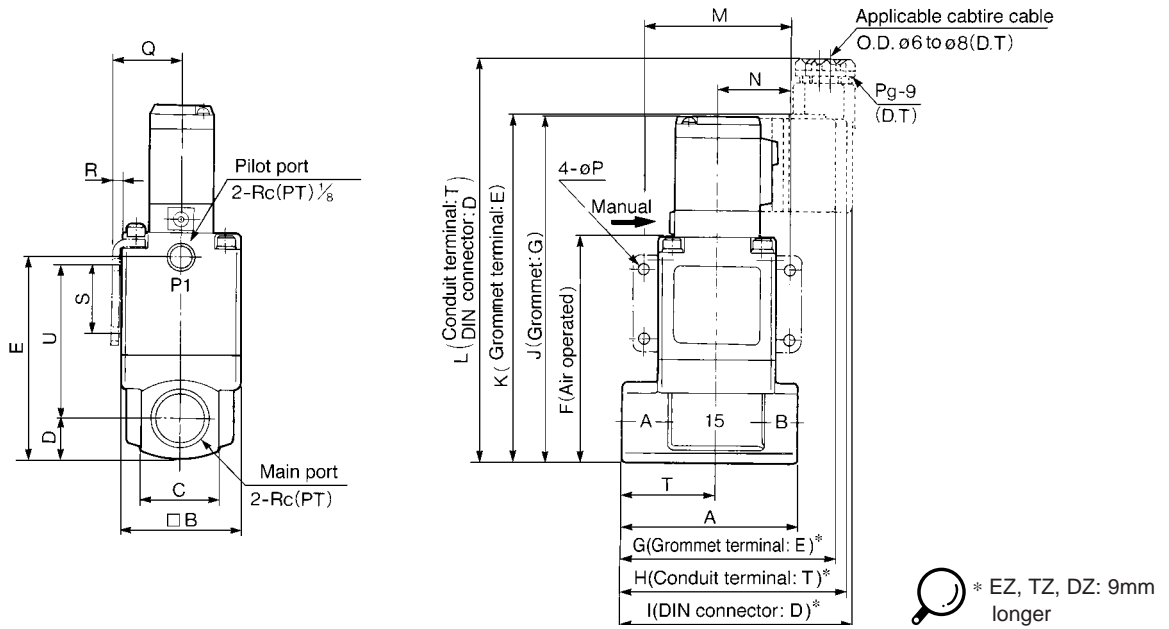
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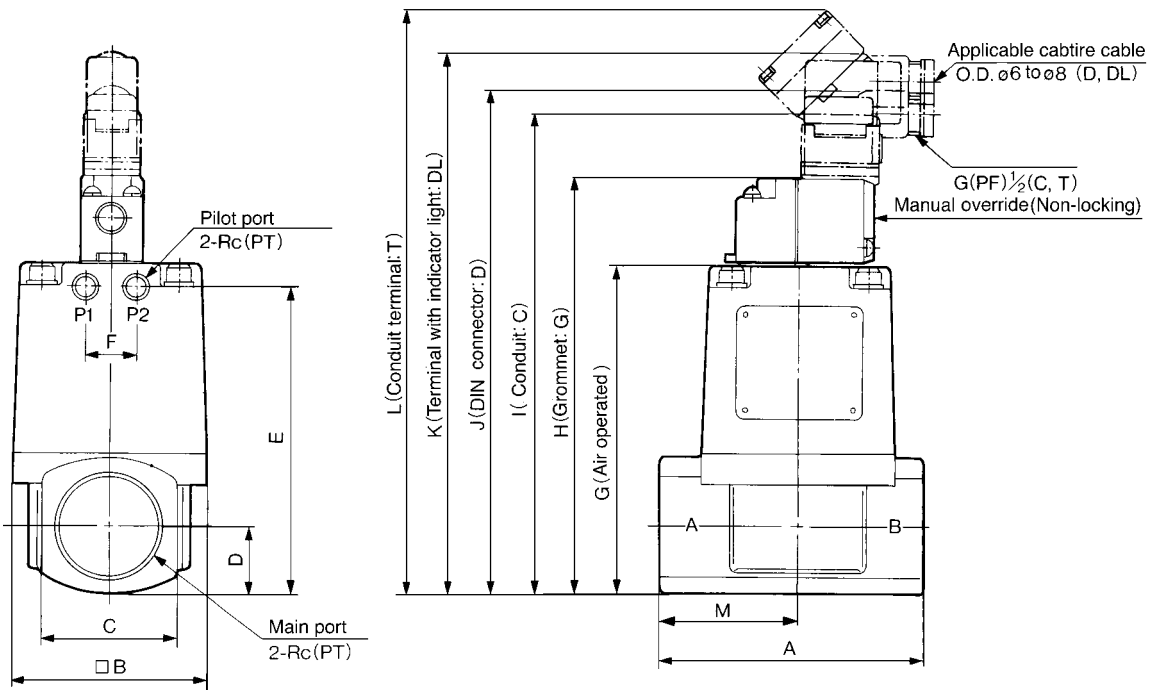


## Port size 10A, 15A, 20A, 25A



Model	Main Port Rc(PT)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U
VNA2□□□-10A	3/8	63	42	28	14	72.5	80.5	74.5	79.5	82.5	124	125.5	142.5	52	26	4.5	24.3	2.3	25	34	55
VNA2□□□-15A	1/2																				
VNA3□□□-20A	3/4	80	50	35	17.5	84	92	83.5	88.5	91.5	135.5	137	154	62	31	5.5	28.3	2.3	30	43	60.5
VNA4□□□-25A	1	90	60	40	20	100	108	89.5	94.5	97.5	151.5	153	170	72	36	6.5	33.3	2.3	35	49	73

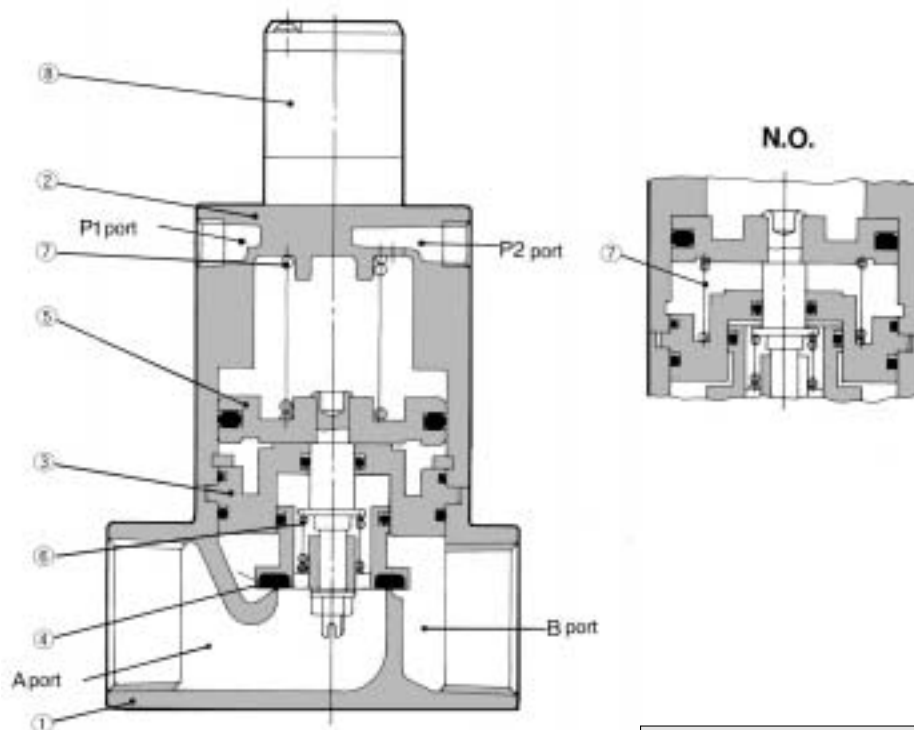
## Port size 32A, 40A, 50A



Model	Main Port Rc(PT)	Pilot port Rc(PT)	A	B	C	D	E	F	G	H	I	J	K	L	M
VNA5□□□-32A	1 1/4	1/8	105	77	53	26.5	120.5	20	129.5	163	175.5	219.5	222.5	229.5	55
VNA6□□□-40A	1 1/2	1/4	120	96	60	30	137	24	147	180.5	193	237	240	247	63
VNA7□□□-50A	2	1/4	140	113	74	37	160	24	170	203.5	216	260	263	270	74



## Construction



### Operation Principles

#### VNA□01□, □11□ (N.C.)

When the pilot solenoid valve ⑧ is not energized (or when air is exhausted from the P1 port of the air operated style), the valve element ④ linked to the piston ⑤ is closed by the return spring ⑦.

#### ●When valve element opens

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

#### ●When valve element closes

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

#### VNA□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 P2 port of the air operated style), the valve is held open by the return spring. When the pilot solenoid valve is energized (or when pressurized air enters through the P2 port of the air operated style), the valve element closes.

#### VNA□03□ (C.O.)

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

### Component Parts

No.	Description	Material	Note
①	Body	Aluminium alloy	Platinum silver painted
②	Cover assembly	Aluminium alloy	Platinum silver painted
③ <sup>(1)</sup>	Plate assembly	Aluminium alloy	Valve material(NBR, FPM, EPR)
④ <sup>(1)</sup>	Valve element	Aluminium alloy	Valve material(NBR, FPM, EPR)
⑤	Piston assembly	Aluminium alloy	—
⑥	Travel spring	Stainless steel	—
⑦	Return spring	Piano wire	—
⑧	Pilot solenoid valve	—	—



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

### Replacement Parts

No.	Description		Part No.							
			VNA1□□A -6A, 8A, 10A	VNA2□□□□ -10A, 15A	VNA3□□□□ -20A	VNA4□□□□ -25A	VNA5□□□□ -32A	VNA6□□□□ -40A	VNA7□□□□ -50A	
③	Plate assembly	Valve material	NBR	VN1-A3AA	VN2-A3AA	VN3-A3AA	VN4-A3AA	VN5-A3AA	VN6-A3AA	VN7-A3AA
		FPM	VN1-A3AB	VN2-A3AB	VN3-A3AB	VN4-A3AB	VN5-A3AB	VN6-A3AB	VN7-A3AB	
		EPR	VN1-A3AC	VN2-A3AC	VN3-A3AC	VN4-A3AC	VN5-A3AC	VN6-A3AC	VN7-A3AC	
④	Valve disc (Valve disc a'ssy for 25A-50A)	Valve material	NBR	VN1-4AA	VN2-4AA	VN3-4AA	VN4-A4AA	VN5-A4AA	VN6-A4AA	VN7-A4AA
		FPM	VN1-4AB	VN2-4AB	VN3-4AB	VN4-A4AB	VN5-A4AB	VN6-A4AB	VN7-A4AB	
		EPR	VN1-4AC	VN2-4AC	VN3-4AC	VN4-A4AC	VN5-A4AC	VN6-A4AC	VN7-A4AC	
⑧	Pilot solenoid valve		SF4-□□□-23 (Refer to p.4.2-10 for details)				VO301-00□□□ (Refer to p.4.2-10 for details)			

VX

VN□

VQ

## How to Order Pilot Solenoid Valve

### Valve size 1, 2, 3, 4

SF4-1-DZ-23

#### Coil rated voltage

- 1 — 100V AC 50/60Hz
- 2 — 200V AC 50/60Hz
- 3\* — 110V AC 50/60Hz
- 4\* — 220V AC 50/60Hz
- 5 — 24V DC
- 6\* — 12V DC
- 7\* — 240V AC 50/60Hz
- 9\* — Other

\* Option

- #### Manual override/classification
- Non-locking push style
  - A\* — Non-locking extended style
  - B\* — Locking slotted style

\* Option

#### Electrical entry/Indicator light and surge voltage suppressor.

G	Grommet
GS	Grommet with surge voltage suppressor
E	Grommet terminal
EZ	Grommet terminal with indicator light and surge voltage suppressor
T	Conduit terminal
TZ	Conduit terminal with indicator light and surge voltage
D	DIN connector
DZ	DIN connector with indicator light and surge voltage suppressor

### Valve size 5, 6, 7

VO301-00

#### Coil rated voltage

- 1 — 100V AC 50/60Hz
- 2 — 200V AC 50/60Hz
- 3\* — 110V AC 50/60Hz
- 4\* — 220V AC 50/60Hz
- 5 — 24V DC
- 6\* — 12V DC
- 7\* — 240V AC 50/60Hz
- 9\* — Other

\* Option

#### Surge voltage suppressor

- None
- S — Surge voltage suppressor (Except for DL)

#### Electrical entry

- G — Grommet
- C — Conduit
- T<sup>(1)</sup> — Conduit terminal
- D — DIN connector
- DL\* — DIN connector with indicator light

\* Option



Note 1) When the electrical entry is T, the pilot solenoid valve parts are as follows:

VO301-00-T-X302

- Indicator light and surge voltage suppressor
- Coil rated voltage

## ⚠ Precautions

Be sure to read before handling. Refer to p.0-33 for Safety Instructions and p.0-37 to 0-40 for common precautions.

### External Pilot

#### ⚠ Caution

##### Pilot port piping

Please arrange P<sub>1</sub> and P<sub>2</sub> piping as follows according to the model.

Port	VNA□01□	VNA□02□	VNA□03□	VNA□1□
P <sub>1</sub>	External pilot	Bleed port	External pilot	Pilot exhaust
P <sub>2</sub>	Bleed port	External pilot	External pilot	Pilot exhaust

It is recommended to mount a silencer in the EXH port and the bleed port for noise reduction and dust entry prevention.

### Piping

#### ⚠ Caution

To use the piping with a high temperature fluid, use heat resistant fittings and tubes.

(Self-align fittings, Teflon<sup>®</sup> tube copper pipe, etc.)

Teflon is a registered trademark of Dupont.

### Use with Air-hydro Unit

#### ⚠ Warning

##### ① Piping

When operation is suspended, surge pressure will be generated between the cylinder and VNA□11A. To directly thread in the cylinder, use durable fittings (SUS square nipples etc.) instead of ductile iron fittings (JIS B 2301) or steel pipe fittings (JIS B 2302).

When VNA□11A is to be installed away from the cylinder, use a high-pressure rubber hose (JIS B 6349) instead of steel pipe as much as possible.

#### ⚠ Caution

##### ① Air bleeding

Valves of Series VNA have no air bleeding port. Bleed air from the middle piping. Bleeding by a vacuum pump is more effective.

##### ② Hydraulic fluid

Turbine oil, Grade 1, ISO VG32, with petroleum hydraulic fluid is recommended.

##### ③ Speed control valve

The combination shown in the following table is recommended to bring the best of Series VNA. (Piping: JIS K 6349 high pressure hose)

Combination of Series VNA and flow control valve (Series AS)

	VNA	AS	Piping (I.D.)
10A	111	420-03	3/8 B(ø9.5)
15A	211	420-04	1/2 B(ø12.7)
20A	311	500-06	3/4 B(ø19.1)
25A	411	600-10	1B(ø25.4)
32A	511	800-12	1 1/4 B(ø31.8)
40A	611	900-14	1 1/2 B(ø38.1)
50A	711	900-20	2B(ø50.8)

# 2 Port Valve for Flow Control Process Valve

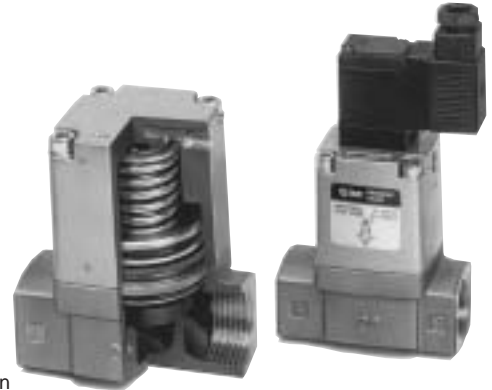
## Series VNB

**Extensive applicable fluids** The cylinder operated by external pilot air

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

### Many variations

The N.C, N.O, and C.O. types have made the screw-in styles (6A to 50A) and flanges (32F to 50F) into a series.



Air operated

External pilot solenoid

### Selection procedures

#### 1 Fluid

- Refer to Table ① to check that the desired fluid is applicable.
- Select the body and sealing materials that best suit the fluid to be used.

#### 2 Flow characteristics (Air and water)

- To find the flow rate of air or water, refer to the table of flow rate characteristics on page 4.2-14. 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.
- Refer to Table ② to select the port size of the screw-in styles (6A to 50A) and flanges (32F to 50F).

#### 3 Construction

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

#### 4 Supply voltage and electrical entry (External pilot solenoid)

- Select AC or DC power supply, and select the proper method of electrical entry according to Table ③.

Table ① Applicable fluid check list

Body material Seal material	BC6: Standard			Aluminum: L			Stainless steel: S		
	NBR : A	FPM : B	EPR : C	NBR : A	FPM : B	EPR : C	NBR : A	FPM : B	EPR : C
Fluid									
Air (Standard, Dry)	●	●		●	●		●	●	
Low vacuum (1 torr)	●	●		●	●		●	●	
Carbon dioxide (CO <sub>2</sub> , 0.7MPa or less)	●			●			●		
Carbon dioxide (CO <sub>2</sub> , 0.7 to 1MPa)			●			●			●
Nitrogen gas (N <sub>2</sub> )	●		●	●	●	●	●		●
Argon	●	●		●	●		●	●	
Helium		●			●			●	
Water (Standard, up to 60°C)	●						●		
Water (up to 99°C only air operated)		●	●					●	●
Turbine oil	●	●		●	●		●	●	
Spindle oil		●			●			●	
Kerosene		●			●			●	
Gas oil		●			●			●	
Fuel oil		●			●			●	
Brake oil (1)			●			●			●
Silicone oil		●						●	
Naphtha		●						●	
Ethyl alcohol		●						●	
Ethylene glycol (up to 80°C)			●						●
Boiler water							●		●
Copper free					●	●	●	●	●

VX  
VN□  
VQ

### ⚠ Caution

When fluid permits application of multiple body and sealing material, select the best ones according to the ambient environment (FPM or EPR seal material for high temperature) and other conditions (corrosion resistance and viscosity). Contact SMC on other fluids, operating conditions, etc..

Note 1) Some brake oils are not allowed.

Table ② Valve size, port size combinations

Valve size	Port size											
	6A	8A	10A	15A	20A	25A	32A	32F	40A	40F	50A	50F
1	●	●	●									
2			●	●								
3					●							
4						●						
5							●					
6								●				
7									●			●

Table ③ Combination of electrical entry and light/surge voltage suppressor

Valve size	Electrical entry						Indicator light and surge suppressor			Manual override
	G	E	C	T	D	DL	S	Z	L	
1, 2, 3, 4	●	●		●	●		●	●		●
5, 6, 7	●		●	●	●	●	●	●	●	

(Only G) (Except for G)  
(Except for DL) (Only T) (Only L)

## How to Order

**Seal material**

A	NBR seal
B	FPM seal
C	EPR seal

Refer to table ① for application.

**Bracket**

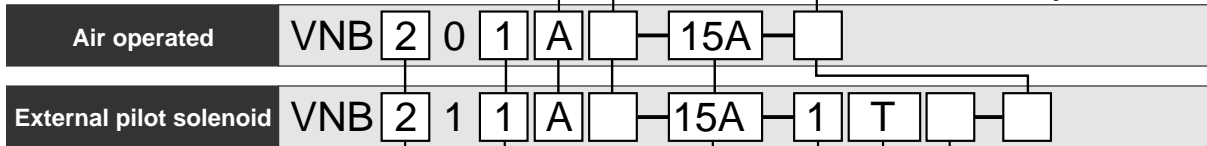
—	None
B	With bracket

Only valve size 1, 2, 3, 4

**Body option**

—	Standard
V*	Vacuum pilot
S**	Stainless steel body
L**	Aluminium body

\* Valve size: 2 to 7  
\*\* Threaded port only

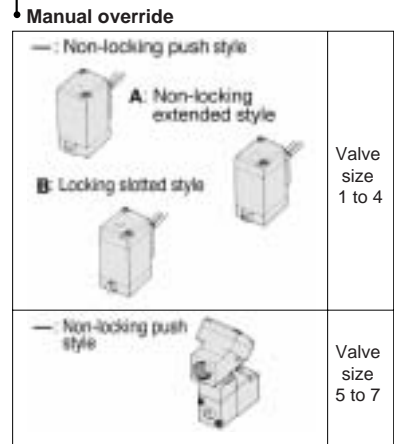


Symbol	Orifice size (mm)	Symbol				Symbol	Port size Rc(PT)
		1	2	3 <sup>(1)</sup>	4		
		N.C. 0.5MPa	N.O.	C.O.	N.C. 1MPa		
1	ø7	—	●	●	●	6A	1/8
		—	●	●	●	8A	1/4
		—	●	●	●	10A	3/8
		—	●	●	●	10A	3/8
2	ø11	—	—	—	—	15A	1/2
		—	—	—	—	15A	1/2
		—	—	—	—	15A	1/2
3	ø14	—	—	—	—	20A	3/4
		—	—	—	—	20A	3/4
4	ø16	—	—	—	—	25A	1
		—	—	—	—	25A	1
		—	—	—	—	25A	1
5	ø22	—	—	—	—	32A	1 1/4
		—	—	—	—	32F	1 1/4 B Flange
		—	—	—	—	32F	1 1/4 B Flange
6	ø28	—	—	—	—	40A	1 1/2
		—	—	—	—	40F	1 1/2 B Flange
7	ø50	—	—	—	—	50A	2
		—	—	—	—	50F	2B Flange
		—	—	—	—	50F	2B Flange

**Rated voltage**

1	100V AC 50/60Hz
2	200V AC 50/60Hz
3*	110V AC 50/60Hz
4*	220V AC 50/60Hz
5*	24V DC
6*	12V DC
7*	240V AC 50/60Hz
8*	Other

\* Option



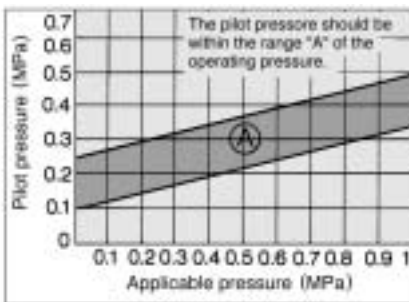
**Electrical entry/Indicator light and surge voltage suppressor**

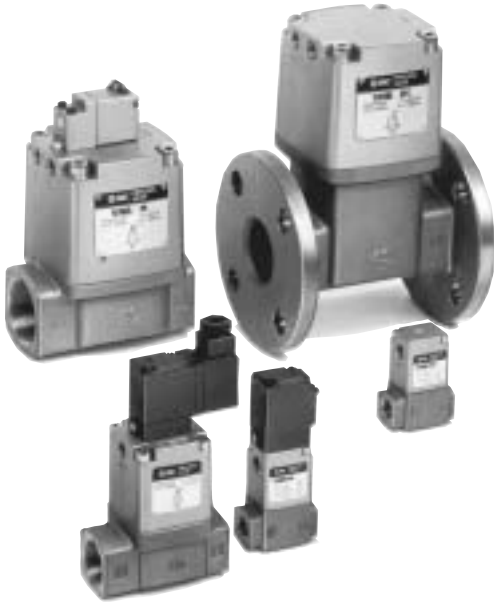
G	Grommet	Valve size 1 to 4
GS	Grommet with surge voltage suppressor	
E	Grommet terminal	
EZ	Grommet terminal with indicator light and surge suppressor	
T	Conduit terminal	Valve size 5 to 7
TZ	Conduit terminal with indicator light and surge suppressor	
DL	DIN connector	
DL	DIN connector with indicator light	

\* Except for rated voltage 6, 7, 9.

Note 1) Only air operated style

**Table ④ Applicable pressure —Pilot pressure**





## Model

Model	Port size		Orifice size ø (mm)	Flow rate		Weight (kg)	
	Rc(PT)	Flange <sup>(1)</sup>		Cv	Effective area (mm <sup>2</sup> )	Air operated	External pilot solenoid
VNB1□□□-6A	1/8	—	7	0.7	13	0.3	0.4
VNB1□□□-8A	1/4	—		1	18		
VNB1□□□-10A	—	—		1.3	23		
VNB2□4□-10A	3/8	—	11	2.5	45	0.6	0.7
VNB2□□□-10A			15	3.8	70		
VNB2□4□-15A	1/2	—	11	3	55		
VNB2□□□-15A	3/4	—	15	5	90	0.9	1.0
VNB3□4□-20A			14	5	90		
VNB3□□□-20A			20	8	140		
VNB4□4□-25A	1	—	16	7	130	1.4	1.5
VNB4□□□-25A			25	12	220		
VNB5□4□-32A	1 1/4	—	22	11	210	2.5	2.6
VNB5□□□-32A			32	18	320		
VNB5□4□-32F			22	11	210		
VNB5□□□-32F	—	32	32	18	320	5.7	5.8
VNB6□4□-40A	1 1/2	—	28	19	330	4.1	4.2
VNB6□□□-40A			40	28	500		
VNB6□4□-40F	—	40	28	19	330	7.7	7.8
VNB6□□□-40F			40	28	500		
VNB7□4□-50A			2	—	33		
VNB7□□□-50A	50	43			770		
VNB7□4□-50F	33	29			520		
VNB7□□□-50F	—	50	50	43	770	11.4	11.5



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

## Symbol

Valve Style	N.C. Normally closed	N.O. Normally open	C.O. Double acting
	<b>VNB□□□1</b>	<b>VNB□□□2</b>	<b>VNB□□□3</b>
Air operated			
External pilot solenoid	<b>VNB□□□11</b>	<b>VNB□□□12</b>	

## Option Specifications

### Vacuum pilot valve VNB□□□□□V

(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.

## Valve Specifications

Fluid	Vacuum
Pressure range	1 to 760 Torr
Pilot pressure range	1 to 400 Torr

Valve Style	N.C. Normally closed	N.O. Normally open
	<b>VNB□□□1□V</b>	<b>VNB□□□2□V</b>
Air operated		
External pilot solenoid	<b>VNB□□□11□V</b>	<b>VNB□□□12□V</b>

## Valve Specifications

Fluids	Water, Oil, Air, Vacuum, etc.	
Fluid temperature	VNB□□□□A: -5 to 60°C <sup>(1)</sup> VNB□□□□B: -5 to 99°C <sup>(1)</sup> (Water, oil etc. Only air operated)	
Ambient temperature	-5 to 50°C (Air operated type: 60°C) <sup>(1)</sup>	
Proof pressure	1.5MPa	
Applicable press. range	VNB□□□□1□: Low vacuum to 0.5MPa VNB□□□□□□: Low vacuum to 1MPa	
External pilot air	Press. VNB□□□□□□: 0.25 to 0.7MPa VNB□□□□□□: 0.1 to 0.5MPa See Table 4 on page P.	
	Lubrication	Not required (Use turbine oil No.1 (ISO VG32), if lubricated.) <sup>(2)</sup>
	Temperature	-5 to 50°C (Air operated: 60°C) <sup>(1)</sup>



Note 1) No freezing Note 2) Lubrication is not allowed in case of seal material EPR.

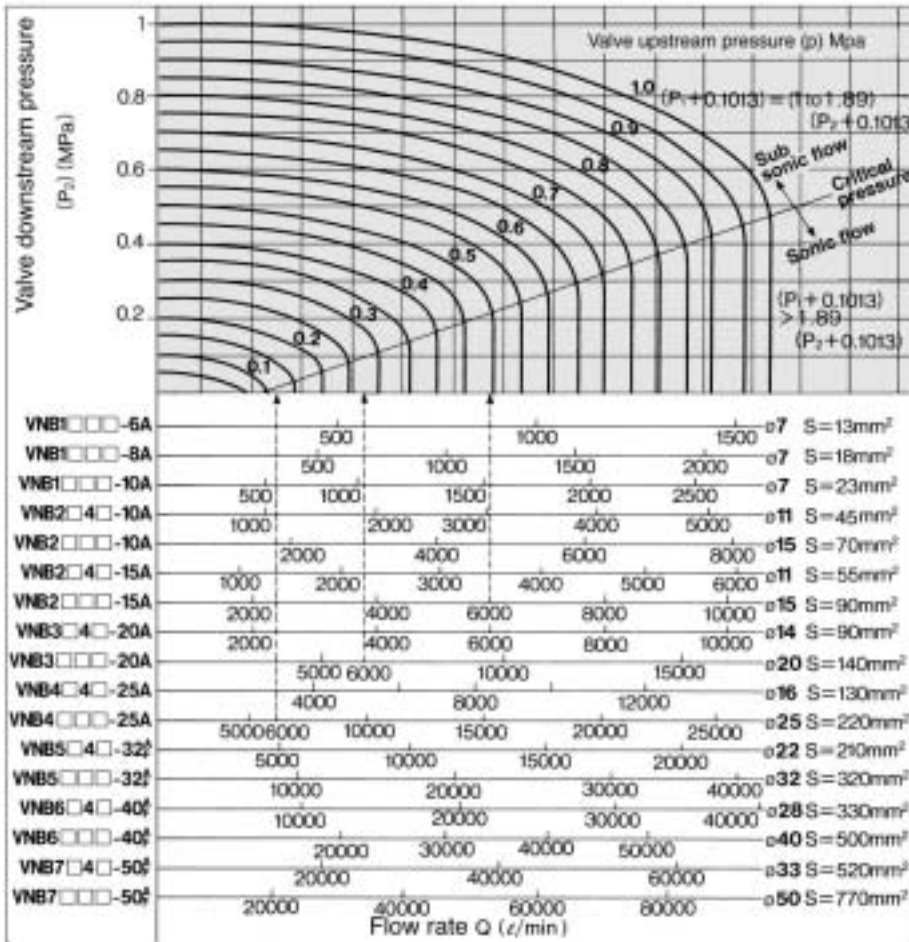
## Pilot Solenoid Specifications

Port size	6A to 25A	32A to 50A, 32F to 50F	
Pilot solenoid valve	SF4-□□□-23	VO301□-00 □□□	
Electrical entry	Grommet, Grommet, terminal, Conduit, terminal, DIN connector	Grommet, Conduit, DIN connector, Others (Option)	
Coil rated voltage	AC (50/60Hz)	100V, 200V, Others (Option)	
	DC	24V, Others (Option)	
Allowable voltage	-15% to +10% of rated voltage		
Coil insulation	Class B or equivalent (130°C)		
Temperature rise	≤35°C (Application of rated voltage)	≤70°C (Application of rated voltage)	
Apparent power	AC	Inrush: 5.6VA(50Hz), 5.0VA(60Hz)	12VA(50Hz), 10.5VA(60Hz)
		Holding: 3.4VA(50Hz), 2.3VA(60Hz)	7.5VA(50Hz), 6VA(60Hz)
Power consumption	DC	1.8W	4.8W
Manual override	Non-locking push style Others (Option)		



## Flow Characteristics

### Air



### How to Read The Graph

In the sonic flow region: For a flow of 6000 (l/min)  
 VNB4□□□ (Orifice ø25).....P1 ≅ 0.14MPa  
 VNB4□□□ (Orifice ø20).....P1 ≅ 0.28MPa  
 VNB4□□□ (Orifice ø15).....P1 ≅ 0.5MPa

### How to Calculate Flow

<Air and other gases>

① Equation in the domain of subsonic flow

• Calculation by Cv factor

$$Q = 4080 \cdot C_v \cdot \sqrt{\frac{\Delta P (P_2 + 0.1013)}{G}} \cdot \sqrt{\frac{273}{273 + \theta}}$$

..... l/min (ANR)

• Calculation by effective area

$$Q = 226 \cdot S \cdot \sqrt{\frac{\Delta P (P_2 + 0.1013)}{G}} \cdot \sqrt{\frac{273}{273 + \theta}}$$

..... l/min (ANR)

② Equation in the domain of sonic flow

• Calculation by Cv factor

$$Q = 2040 \cdot C_v \cdot (P_1 + 0.1013) \cdot \frac{1}{\sqrt{G}} \cdot \sqrt{\frac{273}{273 + \theta}}$$

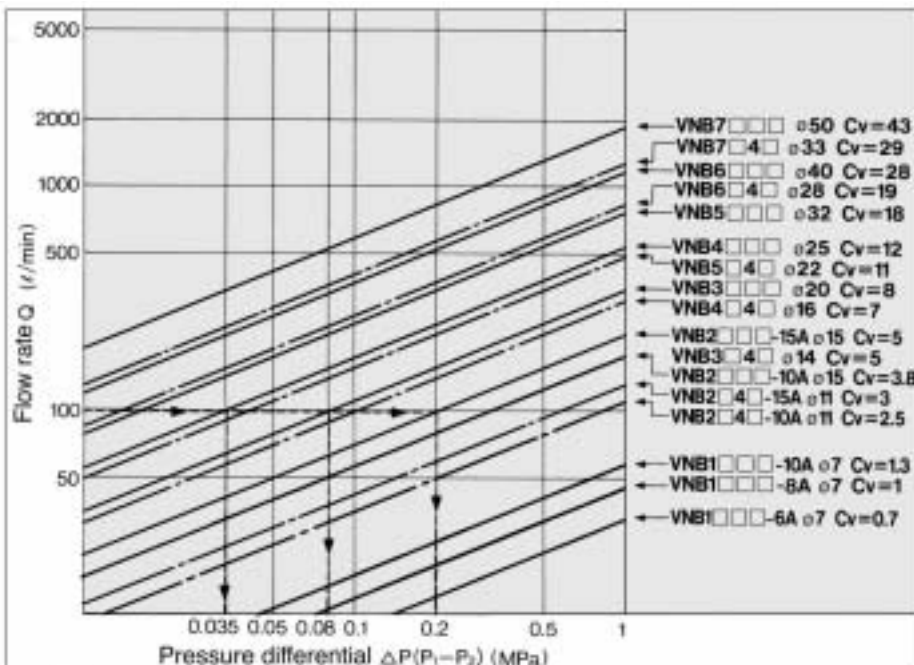
..... l/min (ANR)

• Calculation by effective area

$$Q = 113 \cdot S \cdot (P_1 + 0.1013) \cdot \frac{1}{\sqrt{G}} \cdot \sqrt{\frac{273}{273 + \theta}}$$

..... l/min (ANR)

### Water



### How to Read The Graph

In case of a flow of 100 l/min:  
 VNB4□□□ (Orifice ø25).....ΔP to 0.035MPa  
 VNB4□□□ (Orifice ø20).....ΔP to 0.08MPa  
 VNB4□□□ (Orifice ø15).....ΔP to 0.2MPa

### How to Calculate Flow

• Calculation by Cv factor

$$Q = 14.2 \cdot C_v \cdot \sqrt{\frac{10.2 \Delta P}{G}} \text{ ..... l/min}$$

• Calculation by effective area

$$Q = 0.8 \cdot S \cdot \sqrt{\frac{10.2 \Delta P}{G}} \text{ ..... l/min}$$

Note) Calculation error of fluid with viscosity of 50cSt or less will be very small.

### Symbol

Q : Flow rate (Air and other gases l/min(ANR))  
 (Water and other fluids l/min)

ΔP: Pressure differential(P1—P2)

P1 : Upstream pressure (MPa)

P2 : Downstream pressure (MPa)

θ : Temperature of air and other gases (°C)

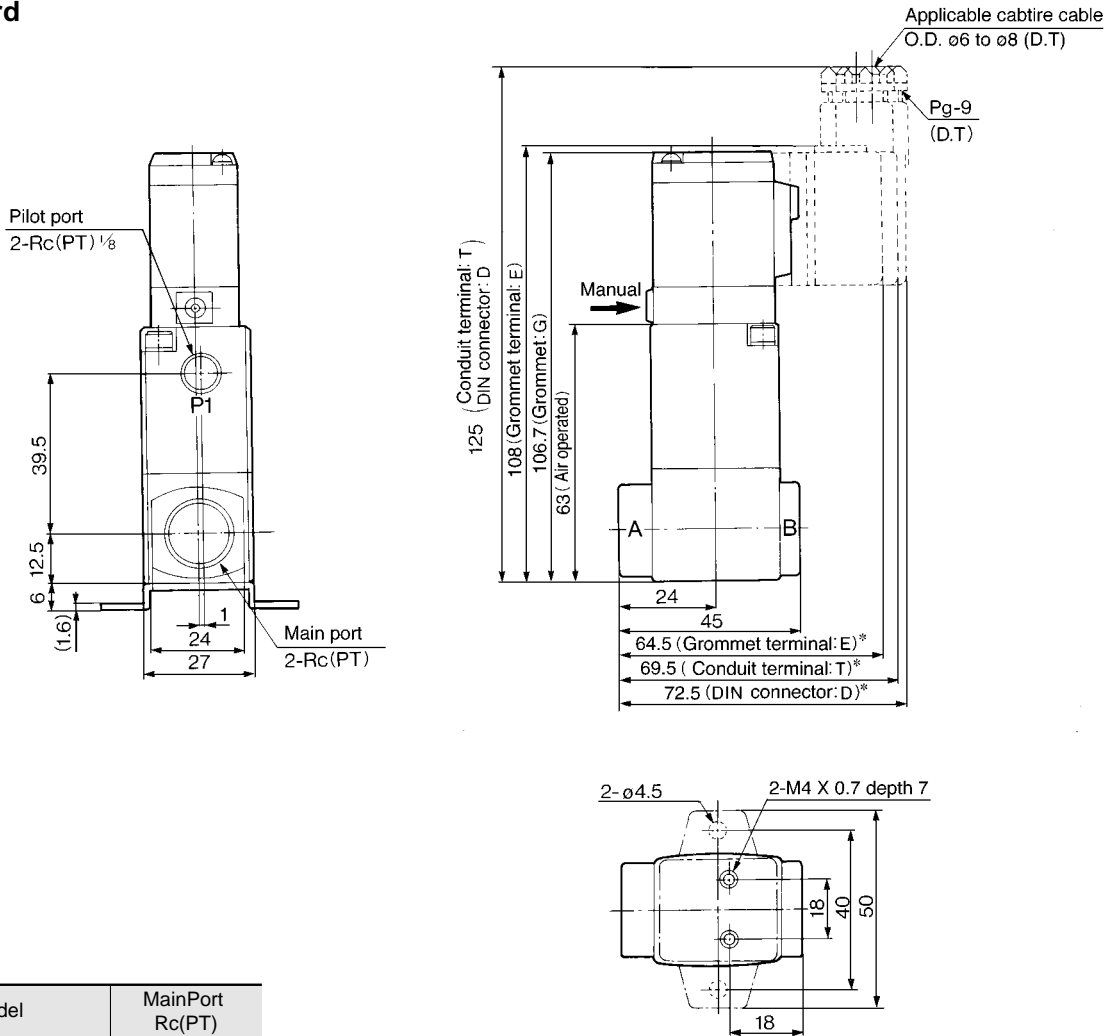
S : Effective area(mm²) S ≅ 18Cv

Cv : Cv factor ( / )

G : Specific gravity ( / ) Air/Water=1

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

### Standard



Model	MainPort Rc(PT)
VNB1□□□-6A	1/8
VNB1□□□-8A	1/4
VNB1□□□-10A	3/8

\* EZ, TZ, and DZ are 9mm longer

VX  
VN□  
VQ

## ⚠ Precautions

Be sure to read before handling. Refer to p.0-33 for Safety Instructions and p.0-37 to 0-40 for common precautions.

### External Pilot

#### ⚠ Caution

##### Pilot port piping

Please arrange P1 and P2 piping as follows according to the model.

#### Standard

Port	VNB□0□□	VNB□02□	VNB□03□	VNB□1□□
P1	External pilot	Bleed port	External pilot	External pilot
P2	Bleed port	External pilot	External pilot	Pilot exhaust

#### Vacuum pilot

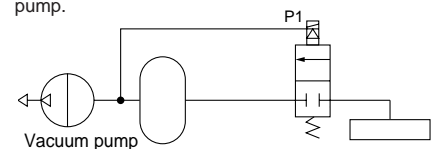
Port	VNB□01□V	VNB□02□V	VNB□1□□V
P1	Bleed port	External pilot	External pilot
P2	External pilot	Bleed port	Pilot exhaust

It is recommended to mount a silencer in the EXH port and the bleed port for noise reduction and dust entry prevention.

### Vacuum Pilot

#### ⚠ Caution

When using the VNB□1□V 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.



### Piping

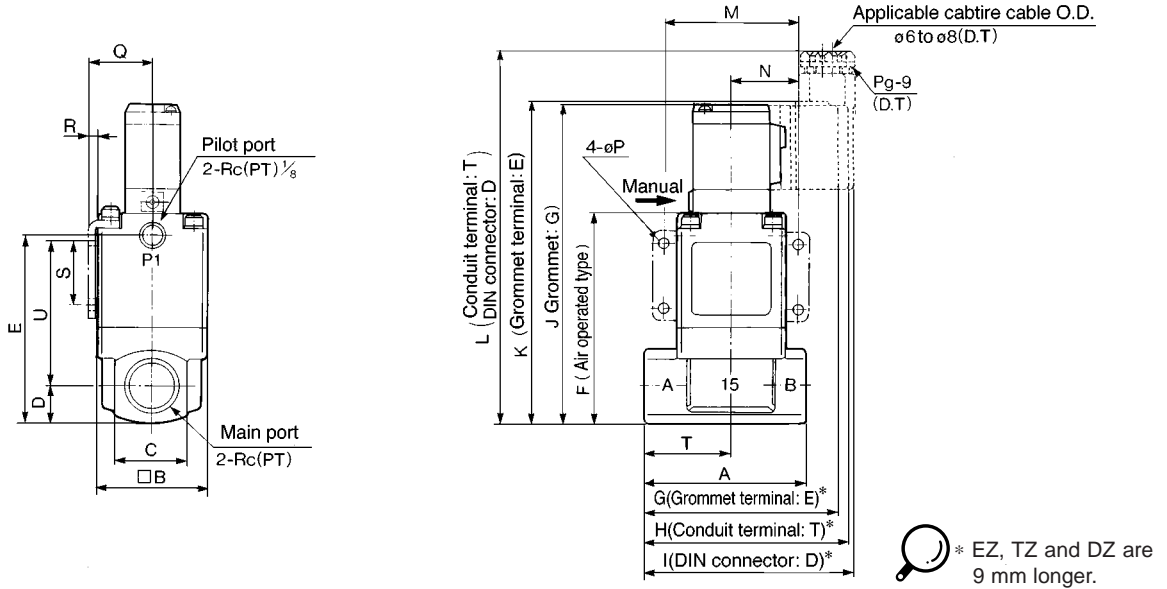
#### ⚠ Caution

To use the piping with a high temperature fluid, use heat resistant fittings and tubes. (Self-align fittings, Teflon, tube copper pipe, etc.)  
Teflon is a registered trademark of DuPont.



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

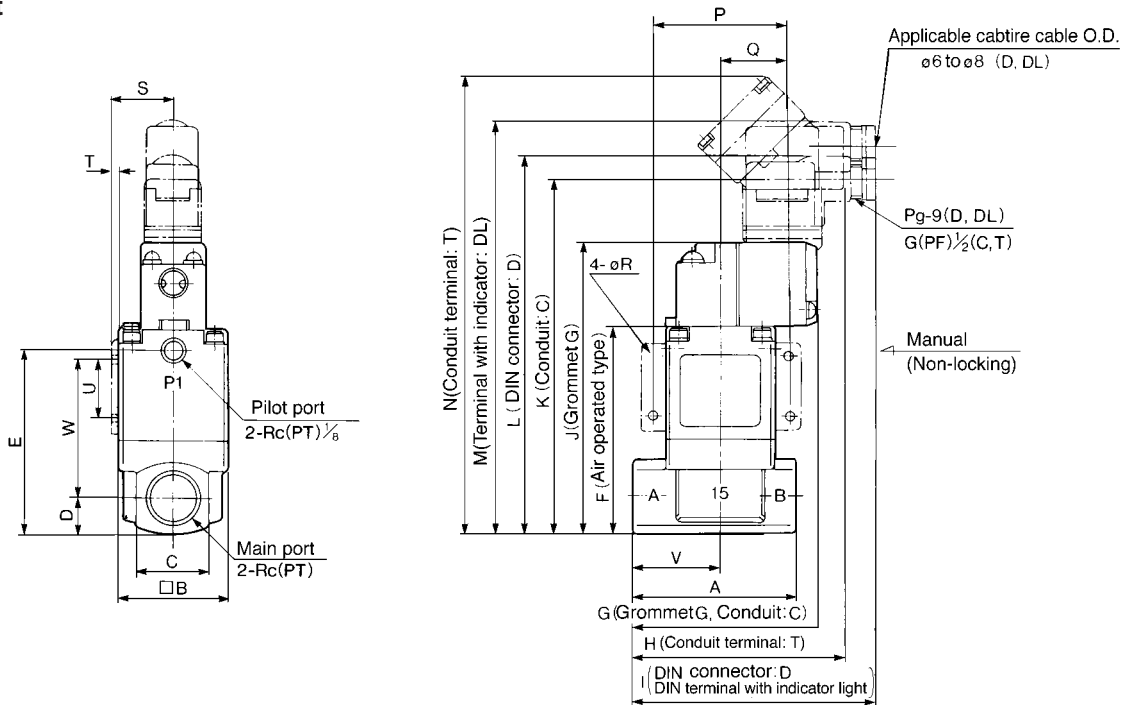
### Standard



Model	Main port Rc(PT)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U
VNB2□□□V-10A	3/8	63	42	28	14	72.5	80.5	74.5	79.5	82.5	124	125.5	142.5	52	26	4.5	24.3	2.3	25	34	55
VNB2□□□V-15A	1/2	63	42	28	14	72.5	80.5	74.5	79.5	82.5	124	125.5	142.5	52	26	4.5	24.3	2.3	25	34	55
VNB3□□□V-20A	3/4	80	50	35	17.5	84	92	83.5	88.5	91.5	135.5	137	154	62	31	5.5	28.3	2.3	30	43	60.5
VNB4□□□V-25A	1	90	60	40	20	100	108	89.5	94.5	97.5	151.5	153	170	72	36	6.5	33.3	2.3	35	49	73

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

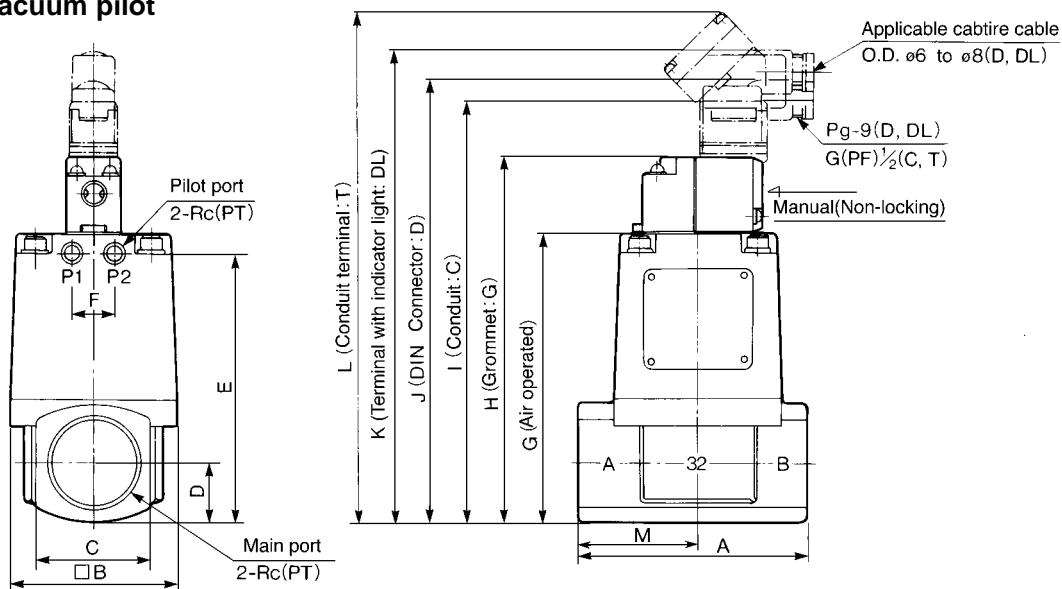
### Vacuum pilot



Model	Main port Rc(PT)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W
VNB2□□□V-10A	3/8	63	42	28	14	72.5	80.5	75	87	97	114	126.5	170.5	173.5	180.5	52	26	4.5	24.3	2.3	25	34	55
VNB2□□□V-15A	1/2	63	42	28	14	72.5	80.5	75	87	97	114	126.5	170.5	173.5	180.5	52	26	4.5	24.3	2.3	25	34	55
VNB3□□□V-20A	3/4	80	50	35	17.5	84	92	80	92	102	125.5	138	182	185	192	62	31	5.5	28.3	2.3	30	43	60.5
VNB4□□□V-25A	1	90	60	40	20	100	108	81	93	103	141.5	154	198	201	208	72	36	6.5	33.3	2.3	35	49	73

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

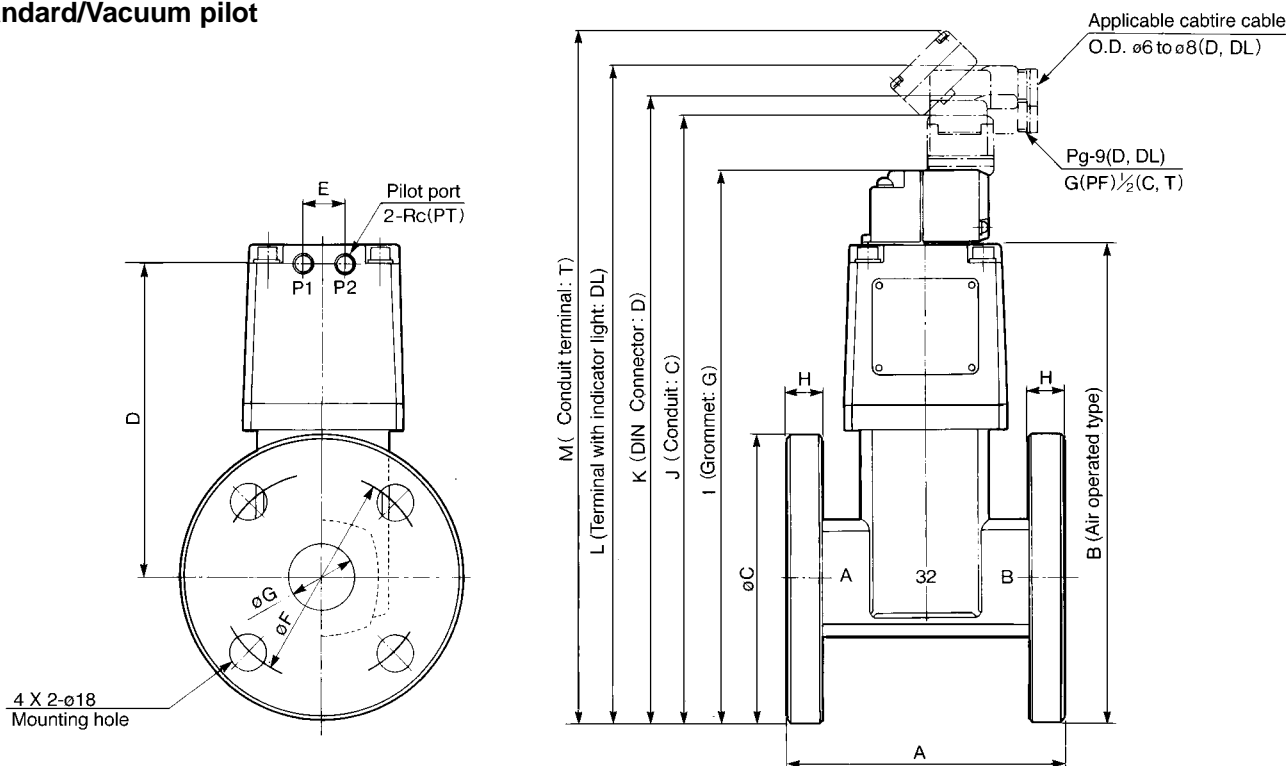
### Standard/Vacuum pilot



Model	Main port	Pilot port Rc(PT)	A	B	C	D	E	F	G	H	I	J	K	L	M
VNB5□□□□-32A	1 1/4	1/8	105	77	53	26.5	120.5	20	129.5	163	175.5	219.5	222.5	229.5	55
VNB6□□□□-40A	1 1/2	1/4	120	96	60	30	137	24	147	180.5	193	237	240	247	63
VNB7□□□□-50A	2	1/4	140	113	74	37	160	24	170	203.5	216	260	263	270	74

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

### Standard/Vacuum pilot



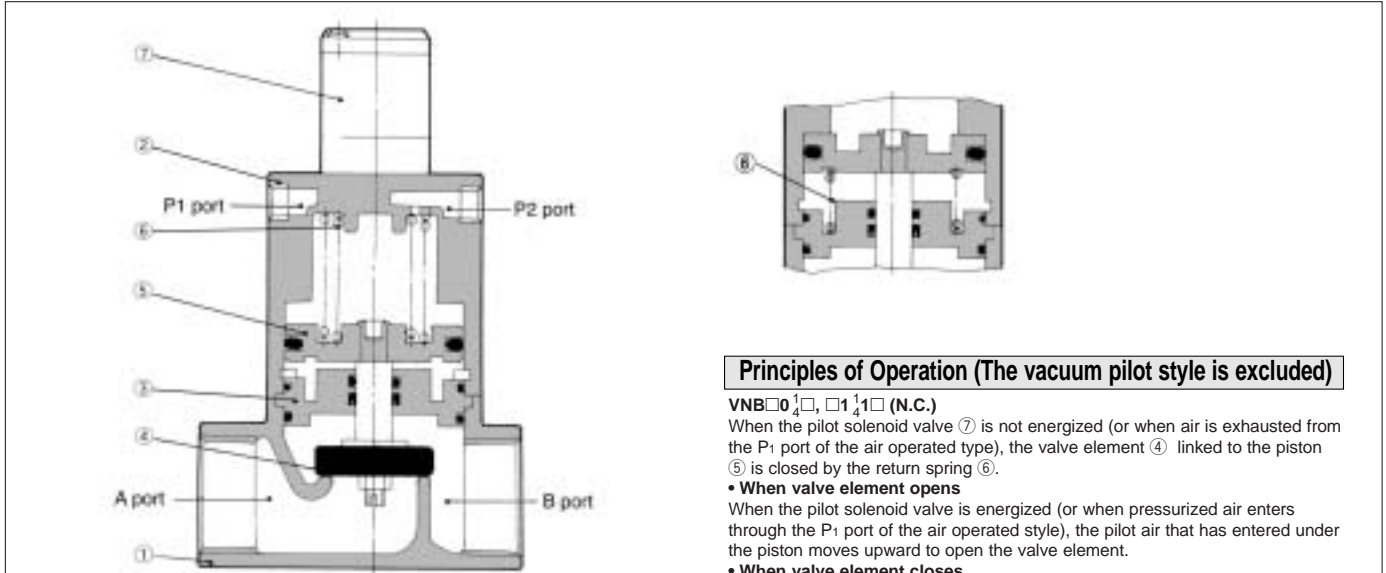
Model	Flange	Pilot port Rc(PT)	A	B	C	D	E	F	G	H	I	J	K	L	M
VNB5□□□□-32F	32	1/8	130	210.5	135	134	20	100	36	12	244	256.5	300.5	303.5	310.5
VNB6□□□□-40F	40	1/4	150	226	140	146	24	105	42	12	259.5	272	316	319	326
VNB7□□□□-50F	50	1/4	180	250	155	162.5	24	120	54	14	283.5	296	340	343	350

VX

VN□

VQ

## Construction



### Principles of Operation (The vacuum pilot style is excluded)

VNB□0<sup>1</sup>/<sub>4</sub>□, □1<sup>1</sup>/<sub>4</sub>□ (N.C.)

When the pilot solenoid valve ⑦ is not energized (or when air is exhausted from the P<sub>1</sub> port of the air operated type), the valve element ④ linked to the piston ⑤ is closed by the return spring ⑥.

#### • When valve element opens

When the pilot solenoid valve is energized (or when pressurized air enters through the P<sub>1</sub> port of the air operated style), the pilot air that has entered under the piston moves upward to open the valve element.

#### • When valve element closes

When the power to the pilot solenoid valve is turned off (or when fluid is exhausted from the P<sub>1</sub> port of the air operated style), 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 P<sub>2</sub> port of the air operated style), the valve is held open by the return spring. When the pilot solenoid valve is energized (or when pressurized air enters through the P<sub>2</sub> port of the air operated style), 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 P<sub>1</sub> and P<sub>2</sub> ports. When pressurized air enters the P<sub>1</sub> port (exhaust from the P<sub>2</sub> port), the valve element opens, and it closes when pressurized air enters the P<sub>2</sub> port (exhaust from the P<sub>1</sub> port).

### Component Parts

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

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

\* The body option "S" is stainless steel, and "L" is aluminum.

### Replacement Parts

No.	Description	Part No.											
		VNB1□□□ -6A, 8A, 10A	VNB2□□□ -10A, 15A	VNB3□□□ -20A	VNB4□□□ -25A	VNB5□□□ -32A, 32F	VNB5□4□ -32A, 32F	VNB6□□□ -40A, 40F	VNB6□4□ -40A, -40F	VNB7□□□ -50A, 50F	VNB7□4□ -50A, 50F		
③(1)	Plate assembly	Valve material	NBR	VN1-A3BA	VN2-A3BA	VN3-A3BA	VN4-A3BA	VN5-A3BA	VN5-A3BA	VN6-A3BA	VN6-A3BA	VN7-A3BA	VN7-A3BA
			FPM	VN1-A3BB	VN2-A3BB	VN3-A3BB	VN4-A3BB	VN5-A3BB	VN5-A3BB	VN6-A3BB	VN6-A3BB	VN7-A3BB	VN7-A3BB
			EPR	VN1-A3BC	VN2-A3BC	VN3-A3BC	VN4-A3BC	VN5-A3BC	VN5-A3BC	VN6-A3BC	VN6-A3BC	VN7-A3BC	VN7-A3BC
④(1)	Valve element (2)	Valve material	NBR	VN1-4BA	VN2-4BA	VN3-4BA	VN4-4BA	VN5-A4BA	VN5-A4BA-3	VN6-A4BA	VN6-A4BA-3	VN7-A4BA	VN7-A4BA-3
			FPM	VN1-4BB	VN2-4BB	VN3-4BB	VN4-4BB	VN5-A4BB	VN5-A4BB-3	VN6-A4BB	VN6-A4BB-3	VN7-A4BB	VN7-A4BB-3
			EPR	VN1-4BC	VN2-4BC	VN3-4BC	VN4-4BC	VN5-A4BC	VN5-A4BC-3	VN6-A4BC	VN6-A4BC-3	VN7-A4BC	VN7-A4BC-3
⑦	Pilot solenoid valve	SF4-□□□-23					VO301□-00□□□						

Note 1) In the cases of body options "S" and "L", the materials of the parts Nos. ③ and ④ are as follows: (Example): VN1-A3B□A

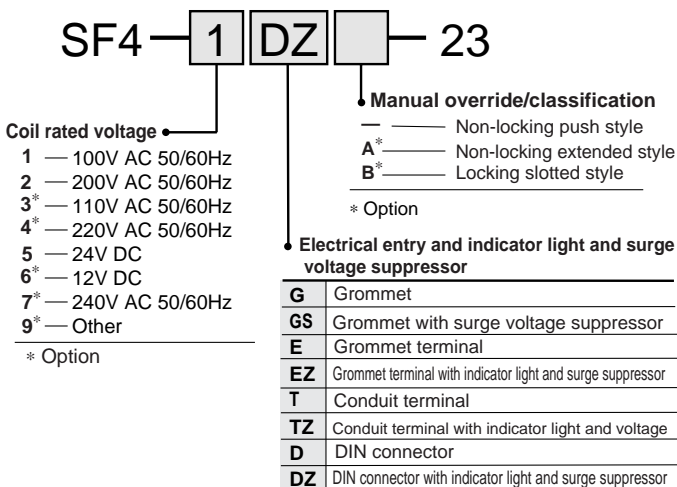
Note 2) 32<sup>A</sup>/<sub>F</sub> to 50<sup>A</sup>/<sub>F</sub> come in valve element assembly

□ L: Aluminum, S: Stainless steel

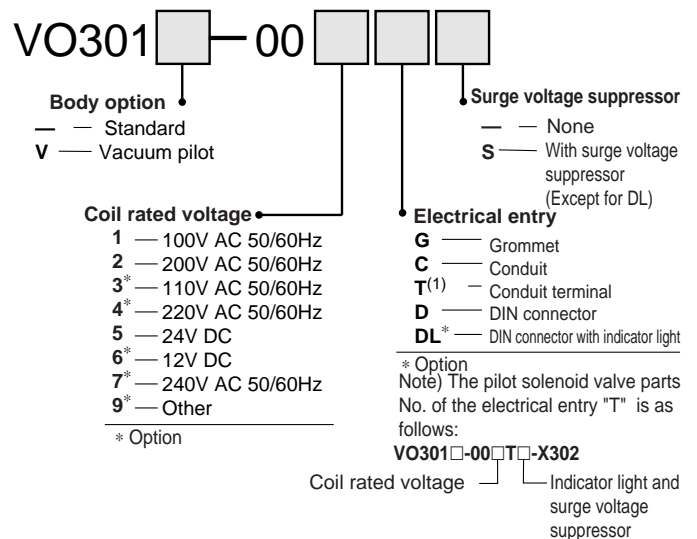
However all brackets of valve element of VNB 1 to 4 are made of stainless steel. (No need to add options "S" and "L".)

### How to Order Pilot Solenoid Valve

#### Valve size 1, 2, 3, 4



#### Valve size 5, 6, 7



# Air Operated Valve/External Pilot Solenoid Coolant Valve

## Series VNC

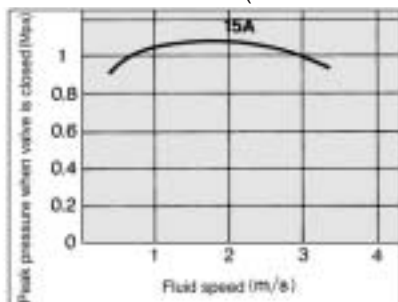
Cylinder operated by the  
external pilot

Wide selection of port  
sizes and variations

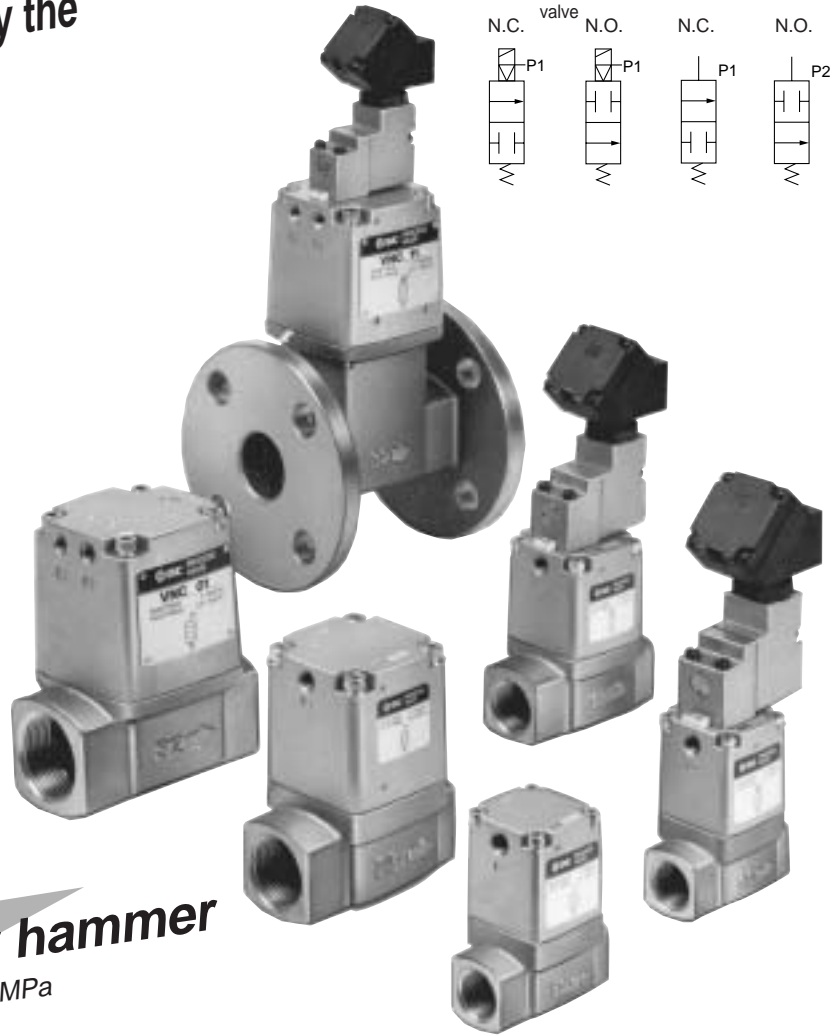
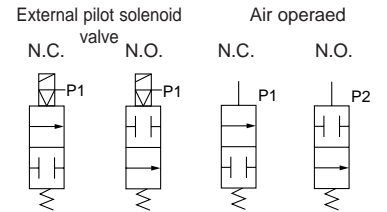
Thread (6A to 50A)  
Flange (32F to 80F)

Low water hammer  
Max. 1.2MPa

In case of VNC211A(N.C. 0.5MPa)



Conditions:  
Piping length/30m  
Steel tube, full pressure/0.5MPa



VX

VN□

VQ

Large flow capacity  
Cv0.7 to 100

## How to Order

Seal material	
A	NBR seal
B	FPM seal

Bracket	
—	None
B	With bracket

Valve size: 1, 2, 3, 4.

**Air operated** VNC 2 0 1 A 15A (Except for valve size 8, 9)

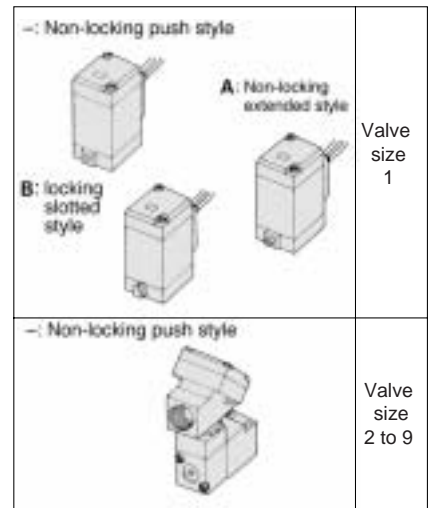
**External pilot solenoid** VNC 2 1 1 A 15A 1 T

Symbol	Orifice size (mm)	Valve style			Symbol	Port size Rc(PT)
		1 N.C. 0.5MPa	2 N.O. 1MPa	4 N.C. 1MPa		
1	ø7	—	●	●	6A	1/8
		—	●	●	8A	1/4
		—	●	●	10A	3/8
2	ø15(ø11)	●	●	●	10A	3/8
		●	●	●	15A	1/2
3	ø20(ø14)	●	●	●	20A	3/4
4	ø25(ø16)	●	●	●	25A	1
		●	●	●	32A	1 1/4
5	ø32(ø22)	●	●	●	32F	1 1/4 B Flange
		●	●	●	40A	1 1/2
6	ø40(ø28)	●	●	●	40F	1 1/2 B Flange
		●	●	●	50A	2
7	ø50(ø33)	●	●	●	50F	2B Flange
		●	●	●	65F	2 1/2 B Flange
8	ø65(ø45)	●	—	●	80F	2B Flange
9	ø80(ø56)	●	—	●		

Rated voltage	
—	Air operated
1	100V AC 50/60Hz
2	200V AC 50/60Hz
3*	110V AC 50/60Hz
4*	220V AC 50/60Hz
5	24V DC
6*	12V DC
7*	240V AC 50/60Hz
9*	Others

\* Option

### Manual override



### Electrical entry/Indicator light and surge voltage suppressor

Nil	Air operated	
G	Grommet	Valve size 1
GS	Grommet with surge voltage suppressor	
E	Grommet terminal	
EZ	Grommet terminal with indicator light and surge suppressor	
T	Conduit terminal	
TZ	Conduit terminal with indicator light and surge suppressor	Valve size 2 to 9
D	DIN connector	
DZ	DIN connector with indicator and surge suppressor	
T	Conduit terminal	
TS	Conduit terminal with surge voltage suppressor	
TZ*	Conduit terminal with indicator light and surge suppressor	
TL*	Conduit terminal with indicator light	

\*Rated voltage: except for 6, 7, 9.

( ) : In case of N.C.; 1MPa



## Model

Model	Port size		Orifice size ø (mm)	Flow rate		Weight (kg)	
	Rc(PT)	Flange <sup>(1)</sup>		Cv	Effe. area (mm <sup>2</sup> )	Air operated	External pilot solenoid
VNC1□□□-6A	1/8	—	7	0.7	13	0.2	0.3
VNC1□□□-8A	1/4	—		1	18		
VNC1□□□-10A	—	—		1.3	23		
VNC2□4□-10A	3/8	—	11	2.5	45	0.5	0.7
VNC2□□□-10A	—	—	15	3.8	70		
VNC2□4□-15A	1/2	—	11	3	55		
VNC2□□□-15A	—	—	15	5	90	0.8	1.0
VNC3□4□-20A	3/4	—	14	5	90		
VNC3□□□-20A	—	—	20	8	140		
VNC4□4□-25A	1	—	16	7	130	1.2	1.4
VNC4□□□-25A	—	—	25	12	220		
VNC5□4□-32A	1 1/4	—	22	11	210	2.2	2.4
VNC5□□□-32A	—	—	32	18	320		
VNC5□4□-32F	—	—	22	11	210	5.0	5.2
VNC5□□□-32F	—	—	32	18	320		
VNC6□4□-40A	1 1/2	—	28	19	330	3.6	3.8
VNC6□□□-40A	—	—	40	28	500		
VNC6□4□-40F	—	40	28	19	330	6.8	7.0
VNC6□□□-40F	—	—	40	28	500		
VNC7□4□-50A	2	—	33	29	520	5.5	5.7
VNC7□□□-50A	—	—	50	43	770		
VNC7□4□-50F	—	50	33	29	520	10.2	10.4
VNC7□□□-50F	—	—	50	43	770		
VNC814□-65F	—	65	45	49	880	—	15.7
VNC811□-65F	—	—	65	70	1260		
VNC914□-80F	—	80	56	73	1400	—	21.2
VNC911□-80F	—	—	80	100	1800		



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

## Symbol

Valve style Operation	N.C.	N.O.
	Air operated	VNC□□01□ 
External pilot operated	VNC□□01□ 	VNC□□12□ 

VX

VN□

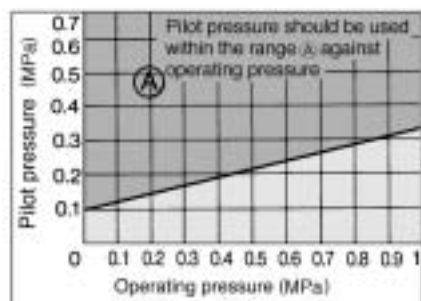
VQ

## Valve Specifications

Applicable fluids	VNC□□□A	Coolant
Fluid temperature	VNC□□□B	-5 to 60°C
Ambient temperature		-5 to 60°C (If over 60°C, consult SMC on air operated style)
Proof pressure		-5 to 50°C (Air operated: 60°C)
Applicable pressure range	VNC□□1□	1.5MPa
External pilot air	VNC□□2□	0 to 0.5MPa
	VNC□□4□	0 to 1MPa
	VNC□□2□	0.25 to 0.7MPa
		0.1 to 0.7MPa
	Lubrication	Refer to table 1: Not required (ISO VG32)
	Temperature	-5 to 50°C (Air operated: 60°C)

\* No freezing allowed

Table ① Operating pressure vs pilot pressure

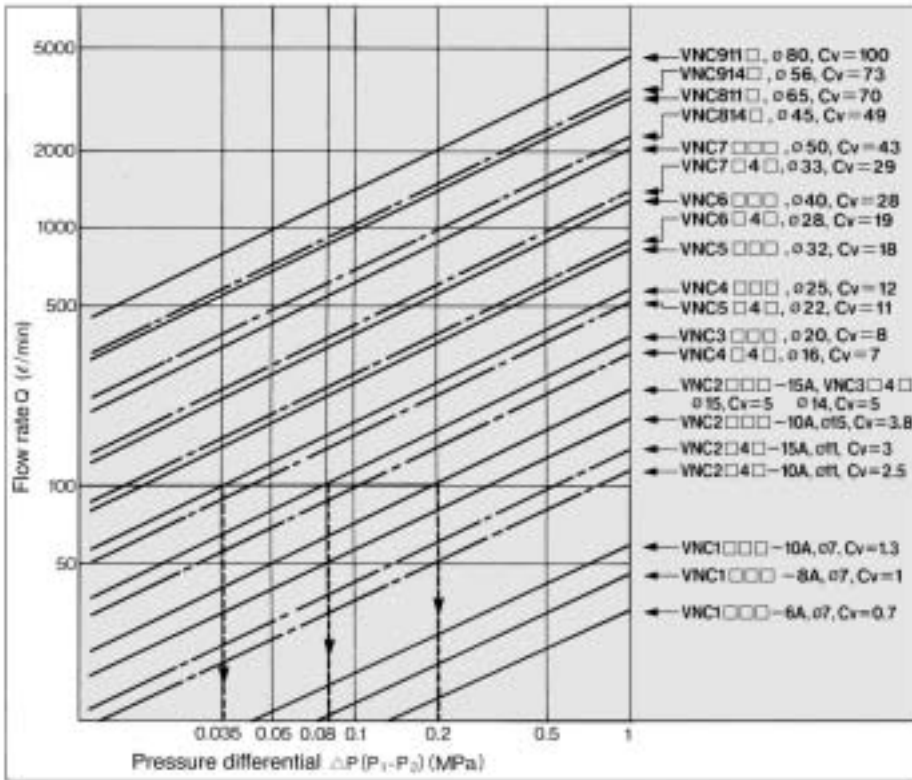


## Pilot Solenoid Valve Specifications

Model	VNC1□□□	VNC2□□□to 9□□□
Pilot solenoid valve	SF4-□□□-23	VO301-00□□-X302
Electrical entry	Grommet Grommet terminal Conduit terminal DIN Connector	Conduit terminal
Coil rated voltage	AC (50/60 Hz) DC	100V, 200V, others (Option) 24V, others (Option)
Allowable voltage range	-15% to +10% of rated voltage	
Coil insulation	Class B or equivalent (130°C)	
Temperature rise	35°C or less	70°C or less
Apparent power	AC In-rush Holding	5.6VA (50Hz) 5.0VA (60Hz) 3.4VA (50Hz) 2.3VA (60Hz)
Power consumption	DC	12VA (50Hz) 10.5VA (60Hz) 7.5VA (50Hz) 6VA (60Hz)
Manual override	1.8W	4.8W
	Non-locking push style, Option	Non-locking push style



## Flow Characteristics



### How to Read The Graph

Pressure differential when using a coolant (flow rate 100l/min) VNC4 □ □ □ (Orifice size ø 25):  $\Delta P \approx 0.035 \text{ MPa}$ , VNC2 □ □ □ (Orifice size ø 15):  $\Delta P \approx 0.2 \text{ MPa}$

### How to Calculate Flow

- Calculation by Cv factor

$$Q = 14.2 \cdot C_v \cdot \sqrt{\frac{10.2 \Delta P}{G}} \dots \dots \dots \text{l/min}$$

- Calculation by effective area

$$Q = 0.8 \cdot S \cdot \sqrt{\frac{10.2 \Delta P}{G}} \dots \dots \dots \text{l/min}$$

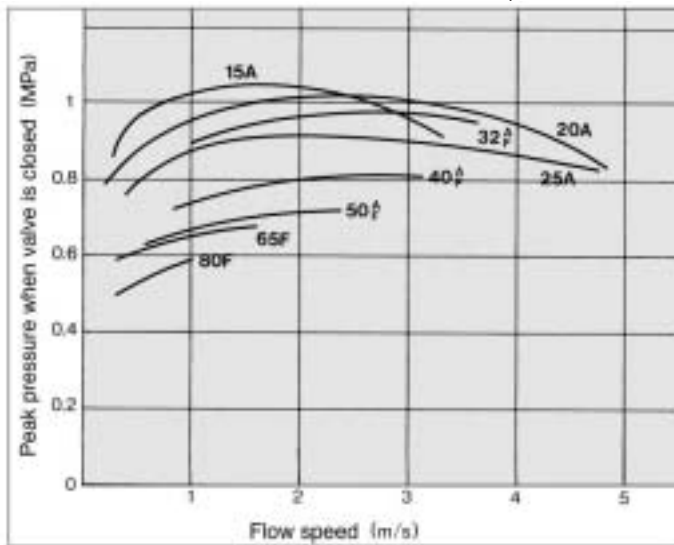
#### (Symbol)

Q: Flow rate (l/min)  
 $\Delta P$ : Pressure differential (P1-P2)  
 P1: Primary pressure (MPa)  
 P2: Secondary pressure (MPa)  
 S: Effective area (mm<sup>2</sup>)  $S \approx 18C_v$   
 Cv: Cv factor (/)  
 G: Specific gravity (/) Water = 1

## Water Hammer Characteristics

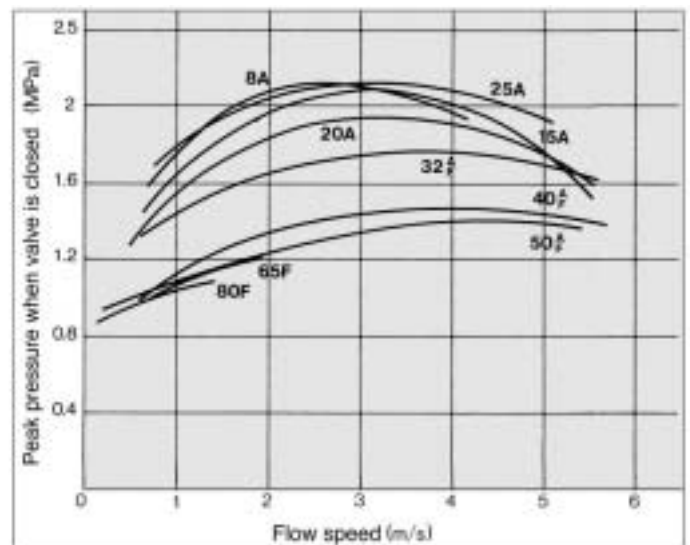
VNC □ □ 1 □ (N.C. 0.49MPa)

Conditions: Piping length/30m  
 Steel tube, full pressure/0.49MPa



VNC □ □ 4 □ (N.C. 0.97MPa)

Conditions: Piping length/30m  
 Steel tube, full pressure/0.97MPa



### How to Calculate Flow Speed

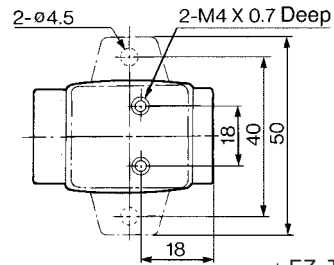
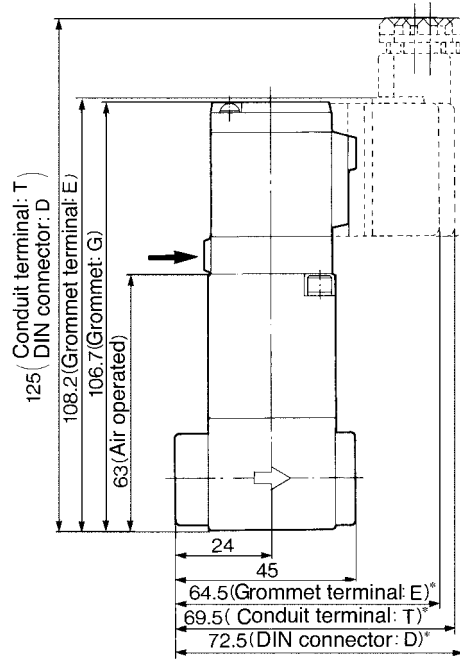
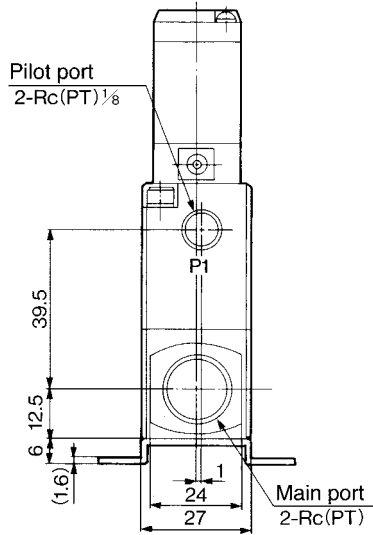
$$v = 212 \times Q / d^2$$

#### (Symbol)

v: Flow speed (m/s)  
 Q: Flow rate (l/min)  
 d: Piping bore size (mm)



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

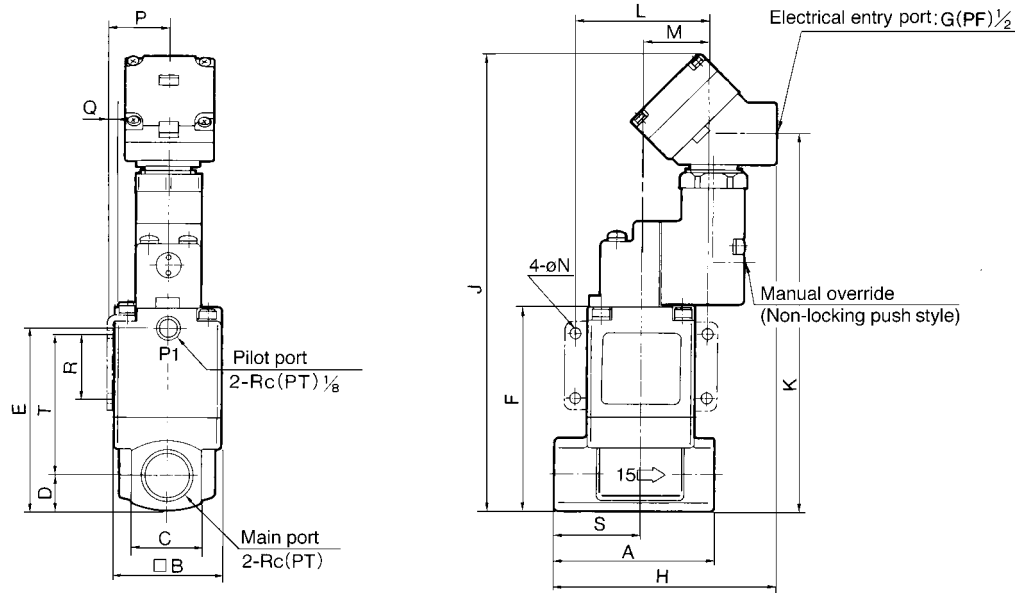


\* EZ, TZ, DZ: 9mm longer

Model	Port size Rc(PT)
VNC1□□□-6A	1/8
VNC1□□□-8A	1/4
VNC1□□□-10A	3/8

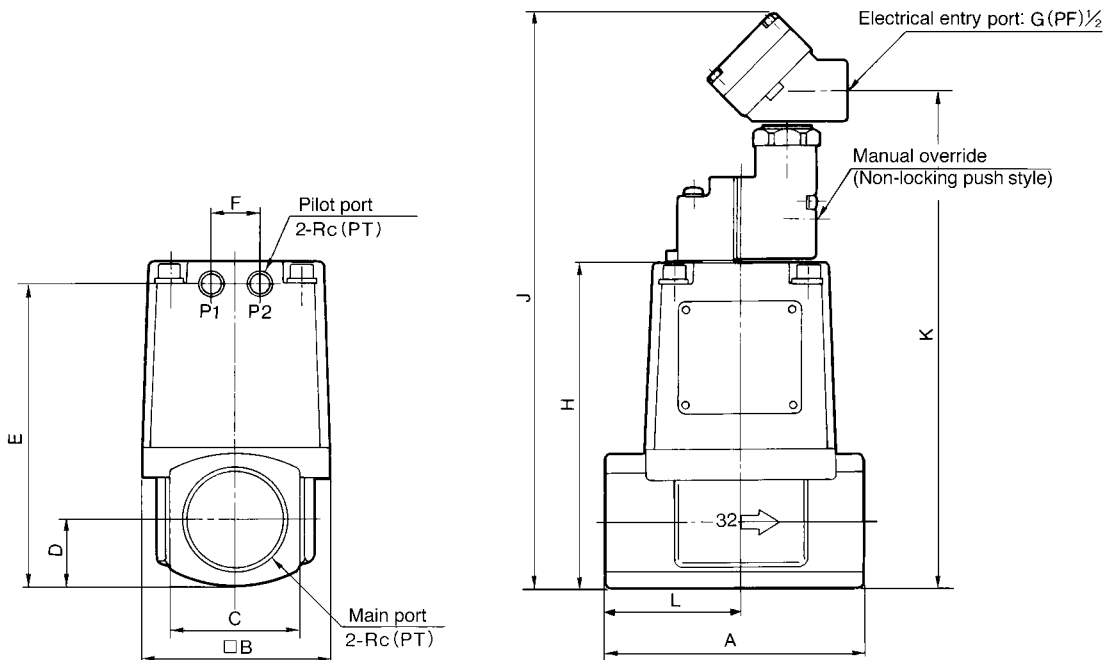
VX  
VN□  
VQ

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



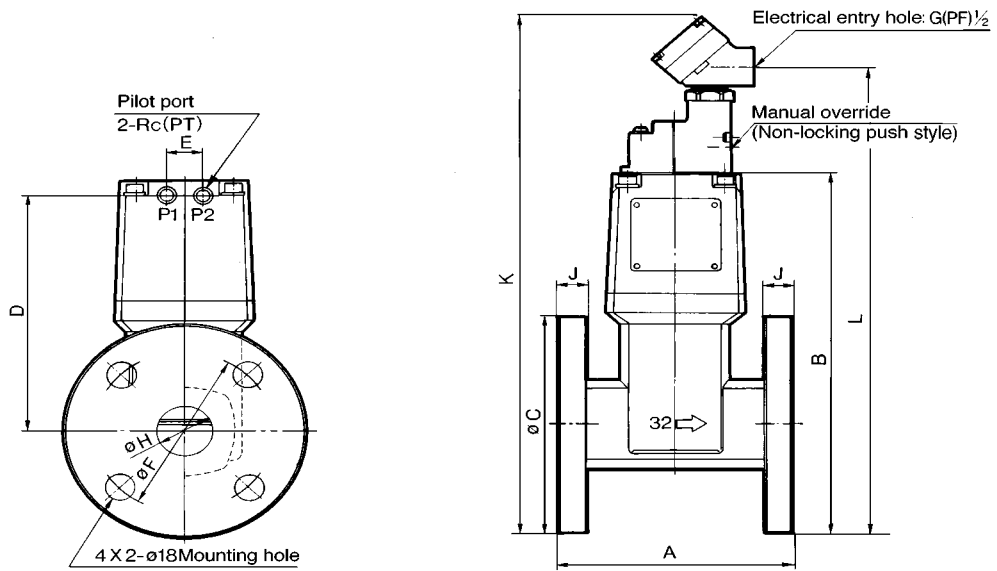
Model	MainPort Rc(PT)	A	B	C	D	E	F	H	J	K	L	M	N	P	Q	R	S	T
VNC2□□□-10A	3/8	63	42	28	14	72.5	80.5	87	180.5	148	52	26	4.5	24.3	2.3	25	34	55
VNC2□□□-15A	1/2	63	42	28	14	72.5	80.5	87	180.5	148	52	26	4.5	24.3	2.3	25	34	55
VNC3□□□-20A	3/4	80	50	35	17.5	84	92	92	192	159.5	62	31	5.5	28.3	2.3	30	43	60.5
VNC4□□□-25A	1	90	60	40	20	100	108	93	208	175.5	72	36	6.5	33.3	2.3	35	49	73

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



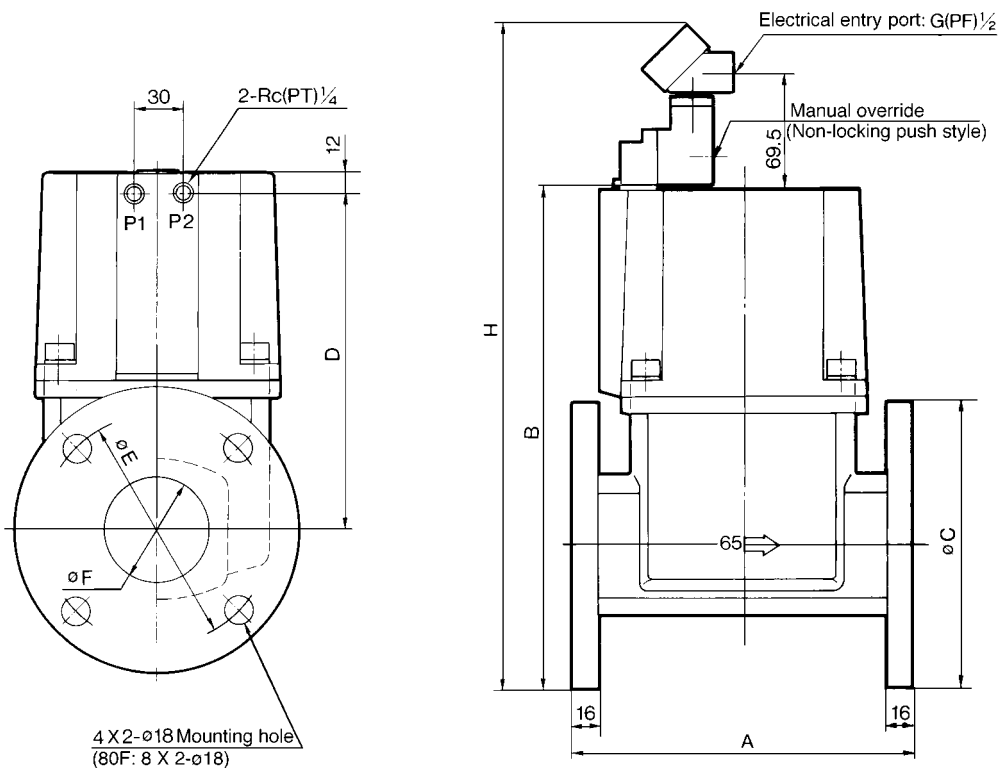
Model	MainPort Rc(PT)	Pilot port Rc(PT)	A	B	C	D	E	F	H	J	K	L
VNC5□□□-32A	1 1/4	1/8	105	77	53	26.5	120.5	20	129.5	229.5	197	55
VNC6□□□-40A	1 1/2	1/4	120	96	60	30	137	24	147	247	214.5	63
VNC7□□□-50A	2	1/4	140	113	74	37	160	24	170	270	237.5	74

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



Model	Applicable flange	Pilot port Rc(PT)	A	B	C	D	E	F	H	J	K	L
VNC5□□□-32F	32	1/8	130	210.5	135	134	20	100	36	12	310.5	278
VNC6□□□-40F	40	1/4	150	226	140	146	24	105	42	12	326	293.5
VNC7□□□-50F	50	1/4	180	250	155	162.5	24	120	54	14	350	317.5

## Flange connection Port size: 65F, 80F



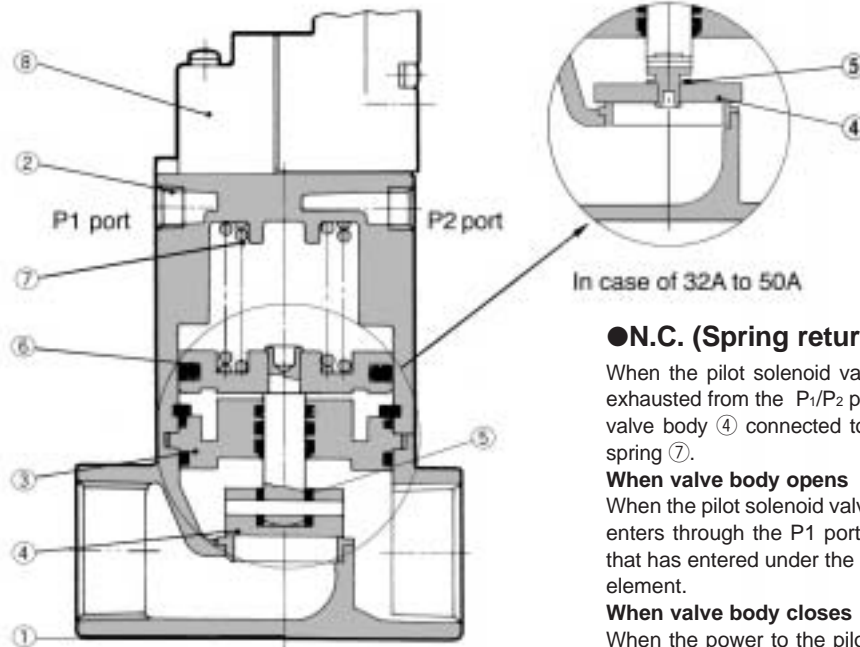
Model	Applicable flange	A	B	C	D	E	F	H
VNC81□-65F	65	210	305.5	175	204	140	65	405.5
VNC91□-80F	80	240	341.5	185	235	150	80	441.5

VX

VN□

VQ

## Construction



### ●N.C. (Spring return normally closed)

When the pilot solenoid valve ⑧ is not energized (or when air is exhausted from the P1/P2 port in case of the air operated style), the valve body ④ connected to the piston ⑥ is closed by the return spring ⑦.

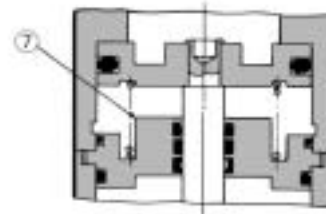
#### When valve body opens

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

#### When valve body closes

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

N.O.



### ●N.O. (Spring return normally open)

In contrast with the N.C., when the pilot solenoid valve is not energized (or when air is exhausted from the P2 port of the air operated style), the valve body is open by the return spring. When the pilot solenoid valve is energized (or when pressurized air enters through the P2 port of the air operated style), the valve body closes.

## Component Parts

No.	Description	Material	Note
①	Body assembly	Bronze	Coated
②	Cover assembly	Aluminium alloy	Platinum silver painted
③	Plate assembly	Metal	Valve seal, NBR/FPM
④	Valve body	Stainless steel	
⑤	Valve cover	NBR/FPM	32A to 50A: O ring
⑥	Piston assembly	Aluminium alloy	
⑦	Return spring	Piano wire	
⑧	Pilot solenoid valve	—	

Note) If replacement parts for ③ or ⑤ are desired, rubber material should be designated per the table below.

## Replacement Parts

No.	Description		Part No.							
			VNC1□□□ -6A, 8A, 10A	VNC2□□□ -10A, 15A	VNC3□□□ -20A	VNC4□□□ -25A	VNC5□□□ -32A, 32F	VNC6□□□ -40A, 40F	VNC7□□□ -50A, 50F	
③	Plate assembly	Valve seal	NBR	VN1-A3CA	VN2-A3CA	VN3-A3CA	VN4-A3CA	VN5-A3CA	VN6-A3CA	VN7-A3CA
			FPM	VN1-A3CB	VN2-A3CB	VN3-A3CB	VN4-A3CB	VN5-A3CB	VN6-A3CB	VN7-A3CB
⑤	Valve cover 32A to 50A: O ring	Valve seal	NBR	—	VN2-12CA		VN4-12CA	AS568-010	AS568-011	AS568-012
			FPM	—	VN2-12CB		VN4-12CB			
⑧	Pilot solenoid valve		SF4-□□□-23	VO301-00□□-X302 (Refer to How to Order on p.4.2-27)						

## Replacement Parts/Applicable Flange

No.	Description		Part No.		
			VNC811□-65F	VNC911□-80F	
③	Plate assembly	Valve seal	NBR	VN8-A3CA	VN9-A3CA
			FPM	VN8-A3CB	VN9-A3CB
⑤	Pilot solenoid valve		VO301-00□□-X302(Refer P.4.2-27for How to Order)		

## How to Order Pilot Solenoid Valve

### Valve size 1

SF4 — 1 — D — Z —    — 23

**Coil rated voltage**

- 1 — 100V AC 50/60Hz
- 2 — 200V AC 50/60Hz
- 3\* — 110V AC 50/60Hz
- 4\* — 220V AC 50/60Hz
- 5 — 24V DC
- 6\* — 12V DC
- 7\* — 240V AC 50/60Hz
- 9\* — Other

\* Option

**Manual override**

- — Non-locking push style
- A\* — Non-locking extended style
- B\* — Locking slotted style

\*Option

**Indicator light and surge voltage suppressor**

- — None
- Z — With Indicator light and surge voltage suppressor (unavailable for "G" type)
- S — With surge voltage suppressor (Available only for "G" type)

**Electrical entry**

- G — Grommet
- E — Grommet terminal
- T — Conduit terminal
- D — DIN connector

### Valve sizes 2 to 9

VO301-00 —    — T —    — X302

**Coil rated voltage**

- 1 — 100V AC 50/60Hz
- 2 — 200V AC 50/60Hz
- 3 — 110V AC 50/60Hz
- 4 — 220V AC 50/60Hz
- 5 — 24V DC
- 6\* — 12V DC
- 7 — 240V AC 50/60Hz
- 9\* — Other

\* Option

**Indicator and surge voltage suppressor**

- — None
- S — With surge voltage suppressor
- Z\* — With indicator light and surge voltage suppressor
- L\* — With indicator light.

\*Not available for 12V DC, 240V AC or other voltages.

## ⚠ Precautions

**Be sure to read before handling.**  
**Refer to p.0-33 for Safety Instructions and p.0-37 to 0-40 for common precautions.**

VX  
 VN□  
 VQ

### External Pilot

#### ⚠ Caution

**For piping to pilot port (P1, P2)**  
 Piping should be according to the below.

Port	Air operated		Solenoid
	VNC□0 $\frac{1}{4}$ □	VNC□02□	VNC□1 $\frac{1}{2}$ □
P1	External pilot	Bleed port	External pilot
P2	Bleed port	External pilot	Pilot exhaust

Installing silencer to the exhaust port and bleed port is recommended for noise reduction and reducing dust.

### Piping

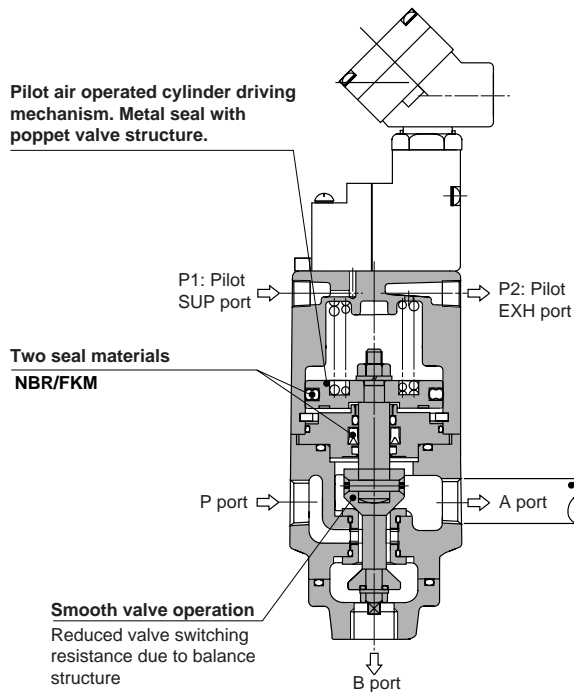
#### ⚠ Caution

When high temperature fluid is used, use the fittings and tube with heat-resistant type. (Self-align fittings, Teflon<sup>®</sup> tube or copper tube, etc.)

# 3.5MPa, 7.0MPa High Pressure Coolant Valve Series **VNH**

Corresponding to high speed grinding and long drilling processes

Valve for high pressure coolant liquid (up to 3.5 MPa or 7.0 MPa) that is ideal for lubrication, dust blowing and cooling.



#### Easy maintenance

Parts can be exchanged without removing the existing main piping

#### Series

Operating fluid pressure	Port	Port size
3.5MPa	3 port	3/8(10A), 1/2(15A) 3/4(20A), 1(25A)
	2 port (Large flow)	3/8(10A), 1/2(15A) 3/4(20A), 1(25A)
7.0MPa	3 port	3/8(10A), 1/2(15A) 3/4(20A), 1(25A)

VX

VN□

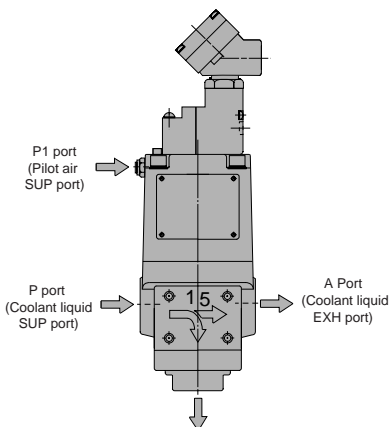
VQ

## Application examples

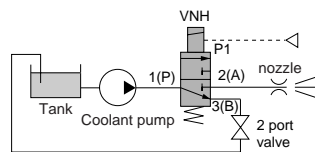
### 3 port valve (3.5MPa, 7.0MPa)

#### Piping

Primary side (supply side): P port  
Secondary side (exhaust side):  
A and B port  
Supply pilot air higher than 0.25MPa to P1 port

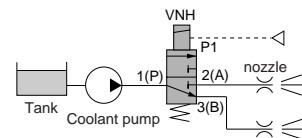


### Ex1) 3 port valve: Reducing load to pump



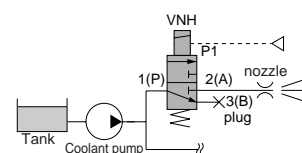
For reducing load to pump, coolant liquid is returned from B port to tank in each time.

### Ex2) 3 port valve: Switching nozzle



Switching nozzles on supplying coolant liquid.

### Ex3) 2 port valve: Nozzle ON/OFF

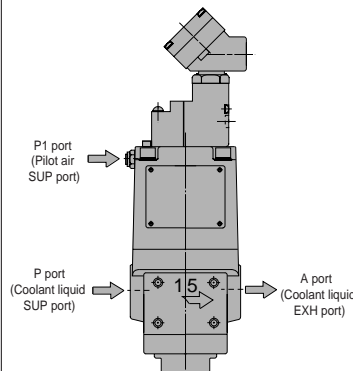


2 port valve application  
(Not applicable for 7.0MPa model)

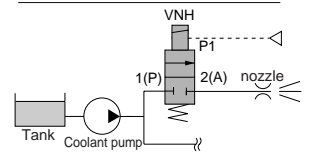
### 2 port valve (7.0MPa)

#### Piping

Primary side (supply side): P port  
Secondary side (exhaust side):  
A and B port  
Supply pilot air higher than 0.25MPa to P1 port.



### Ex1) 2 port valve: Nozzle ON/OFF



## How to Order

VNH 2 1 1 A 15A 1 T

Note) Standard model is equipped with silencer on EXH port P2

**Port**

1	3 port
3*	2 port

\* 2 port: 7.0MPa model only

**Valve style**

1	N.C./3.5MPa
3	N.C./7.0MPa

**Seal material**

A	NBR seal
B	FKM seal

**Bracket**

—	None
B	With bracket

**Electrical entry/Indicator light and surge voltage suppressor**

T	Conduit terminal
TS	Conduit terminal with surge voltage suppressor
TZ*	Conduit terminal with indicator light and surge voltage suppressor
TL*	Conduit terminal with indicator light

\* Except for rated voltage 6, 7, 9

**Rated voltage**

—	Air operated
1	100V AC 50/60Hz
2	200V AC 50/60Hz
3*	110V AC 50/60Hz
4*	220V AC 50/60Hz
5	24V DC
6*	12V DC
7*	240V AC 50/60Hz
9*	Other

\* Option

**Valve size**

1	10A	Rc 3/8
2	15A	Rc 1/2
3	20A	Rc 3/4
4	25A	Rc11

**Port size**

## How to Order Pilot Solenoid Valve

VO301-00 T X302

**Rated voltage**

1	100V AC 50/60Hz
2	200V AC 50/60Hz
3*	110V AC 50/60Hz
4*	220V AC 50/60Hz
5	24V DC
6*	12V DC
7*	240V AC 50/60Hz
9*	Other

**Indicator light and surge voltage suppressor**

—	None
S	With surge voltage suppressor
Z	With indicator light and surge suppressor
L	With indicator light

\*Option

### Option

Description	Part No.				
	VNH1□□	VNH2□□	VNH3□□	VNH4□□	
Bracket (with bolt and washer)	B	VNH1-16	VNH2-16	VNH3-16	VNH4-16



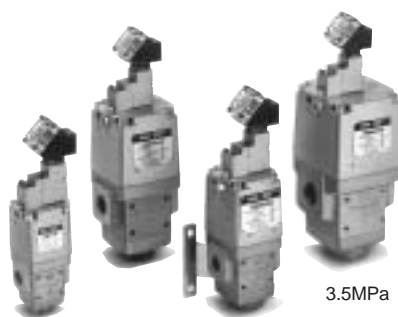
## Specifications

Model	3 port valve								2 port valve				
	VNH111 <sup>A</sup> <sub>B</sub> -10A	VNH211 <sup>A</sup> <sub>B</sub> -15A	VNH311 <sup>A</sup> <sub>B</sub> -20A	VNH411 <sup>A</sup> <sub>B</sub> -25A	VNH113 <sup>A</sup> <sub>B</sub> -10A	VNH213 <sup>A</sup> <sub>B</sub> -15A	VNH313 <sup>A</sup> <sub>B</sub> -20A	VNH413 <sup>A</sup> <sub>B</sub> -25A	VNH133 <sup>A</sup> <sub>B</sub> -10A	VNH233 <sup>A</sup> <sub>B</sub> -15A	VNH333 <sup>A</sup> <sub>B</sub> -20A	VNH433 <sup>A</sup> <sub>B</sub> -25A	
Operating fluid pressure	0 to 3.5MPa				0 to 7.0MPa								
Fluid	Fluid												
Operation	External pilot solenoid/Air operated												
Operating fluid temperature	-5 to 60°C/-5 to 60°C												
	-5 to 60°C/-5 to 99°C												
Pilot air	0.25 to 0.7MPa												
	-5 to 50°C												
	Not required (Use turbin oil class 1, ISO VG32 if lubricated)												
Proof pressure	5.5MPa				10.5MPa								
Ambient temperature	-5 to 50°C *												
Max. operating frequency	20 times/min												
Mounting orientation	Vertical upwards												
Port size	Rc 3/8	Rc 1/2	Rc 3/4	Rc1	Rc 3/8	Rc 1/2	Rc 3/4	Rc1	Rc 3/8	Rc 1/2	Rc 3/4	Rc1	
Orifice size	ø7.1 **	ø8.7 **	ø10.6 **	ø14.3 **	ø3.9 **	ø5.2 **	ø6.2 **	ø7.3 **	ø8 **	ø9.5 **	ø13.5 **	ø15.8 **	
Flow rate	Effective area	22mm <sup>2</sup>	41mm <sup>2</sup>	58mm <sup>2</sup>	112mm <sup>2</sup>	7.2mm <sup>2</sup>	13mm <sup>2</sup>	18mm <sup>2</sup>	25mm <sup>2</sup>	30mm <sup>2</sup>	43mm <sup>2</sup>	86mm <sup>2</sup>	120mm <sup>2</sup>
	Cv factor	1.2	2.3	3.2	6.2	0.4	0.7	1.0	1.4	1.7	2.4	4.8	6.6
Pilot port size	Rc 1/8		Rc 1/4		Rc 1/8		Rc 1/4		Rc 1/8		Rc 1/4		
Weight	2kg	3.1kg	5.6kg	8.2kg	2kg	3.1kg	5.6kg	8.2kg	2kg	3.1kg	5.6kg	8.2kg	
Face-to-face dimension	60mm	80mm	100mm	115mm	60mm	80mm	100mm	115mm	60mm	80mm	100mm	115mm	



\*No freezing allowed

\*\*Equivalent size



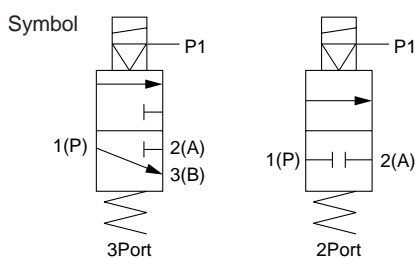
## Pilot Operated Solenoid Valve Specifications

Pilot operated solenoid valve	VO301-00□□-X302	
Electrical entry	Conduit terminal	
Coil rated voltage	AC(50/60/Hz)	100V, 200V, other voltages (Option)
	DC	24V, other voltages (Option)
Applicable voltage range	-15% to +10% of the rated voltage	
Coil insulation	Class B or equivalent (130°C)	
Temperature rise	70°C or less (Application of rated voltage)	
Apparent power	AC	Inrush 12VA(50Hz), 10.5VA(60Hz)
	DC	Holding 7.5VA(50Hz), 6VA(60Hz)
Power consumption	4.8W	
Manual override	Non-locking push style	

VX

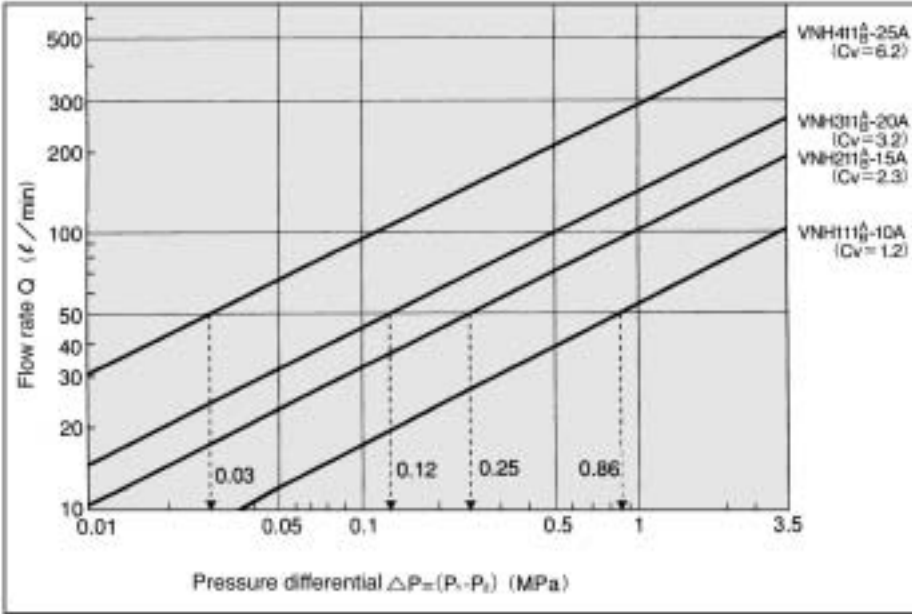
VN□

VQ



## Flow Characteristics

### 3.5MPa



#### <How to Read The Graph>

Pressure differential of coolant liquid whose flow rate is 50l/min

VNH411<sup>A</sup><sub>B</sub>(Cv=6.2):  $\Delta P \cong 0.03$ MPa

VNH311<sup>A</sup><sub>B</sub>(Cv=3.2):  $\Delta P \cong 0.12$ MPa

VNH211<sup>A</sup><sub>B</sub>(Cv=2.3):  $\Delta P \cong 0.25$ MPa

VNH111<sup>A</sup><sub>B</sub>(Cv=1.2):  $\Delta P \cong 0.86$ MPa

#### <How to Calculate Flow>

- Calculation by Cv factor

$$Q = 14.2 \cdot Cv \cdot \sqrt{\frac{10.2 \Delta P}{G}} \dots \dots \dots \text{l/min}$$

- Calculation by effective area

$$Q = 0.8 \cdot S \cdot \sqrt{\frac{10.2 \Delta P}{G}} \dots \dots \dots \text{l/min}$$

(Symbol)

Q : Flow rate(l/min)

$\Delta P$  : Pressure differential P<sub>1</sub>-P<sub>2</sub>(MPa)

P<sub>1</sub> : Primary pressure(MPa)

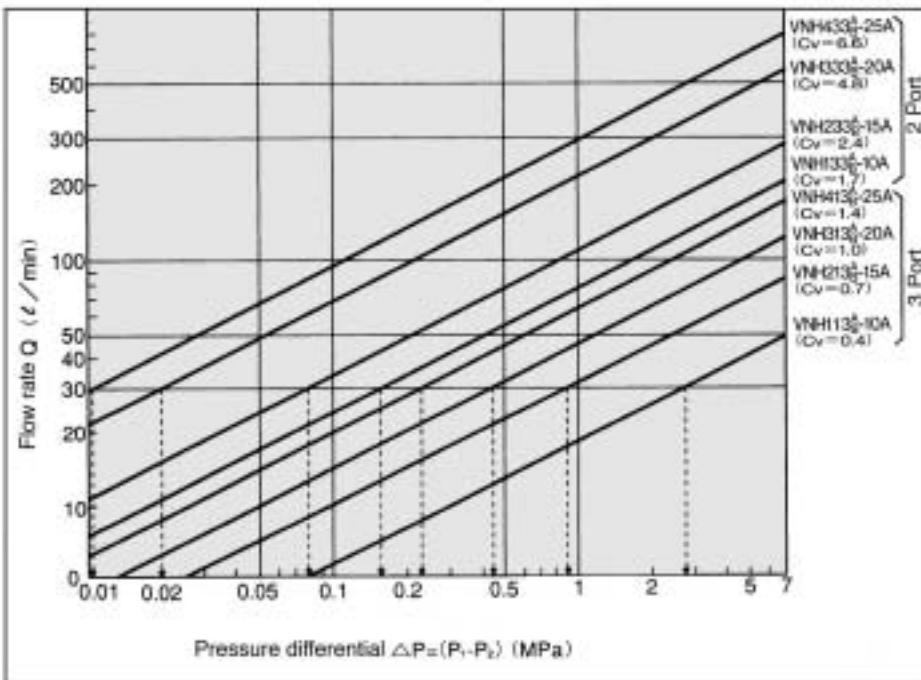
P<sub>2</sub> : Secondary pressure(MPa)

S : Effective area(mm<sup>2</sup>) S $\cong$ 18/Cv

Cv : Cv factor

G : Specific gravity Water=1

### 7.0MPa



#### <How to Read The Graph>

Pressure differential of coolant liquid whose flow rate is 30l/min:

VNH433<sup>A</sup><sub>B</sub>(Cv=6.6):  $\Delta P \cong 0.01$ MPa

VNH333<sup>A</sup><sub>B</sub>(Cv=4.6):  $\Delta P \cong 0.12$ MPa

VNH233<sup>A</sup><sub>B</sub>(Cv=2.4):  $\Delta P \cong 0.08$ MPa

VNH133<sup>A</sup><sub>B</sub>(Cv=1.7):  $\Delta P \cong 0.16$ MPa

VNH413<sup>A</sup><sub>B</sub>(Cv=1.4):  $\Delta P \cong 0.23$ MPa

VNH313<sup>A</sup><sub>B</sub>(Cv=1.0):  $\Delta P \cong 0.45$ MPa

VNH213<sup>A</sup><sub>B</sub>(Cv=0.7):  $\Delta P \cong 0.9$ MPa

VNH113<sup>A</sup><sub>B</sub>(Cv=0.4):  $\Delta P \cong 0.8$ MPa

#### <How to Calculate Flow>

- Calculation by Cv factor

$$Q = 14.2 \cdot Cv \cdot \sqrt{\frac{10.2 \Delta P}{G}} \dots \dots \dots \text{l/min}$$

- Calculation by effective area

$$Q = 0.8 \cdot S \cdot \sqrt{\frac{10.2 \Delta P}{G}} \dots \dots \dots \text{l/min}$$

(Symbol)

Q : Flow rate(l/min)

$\Delta P$  : Pressure differential P<sub>1</sub>-P<sub>2</sub>(MPa)

P<sub>1</sub> : Primary pressure(MPa)

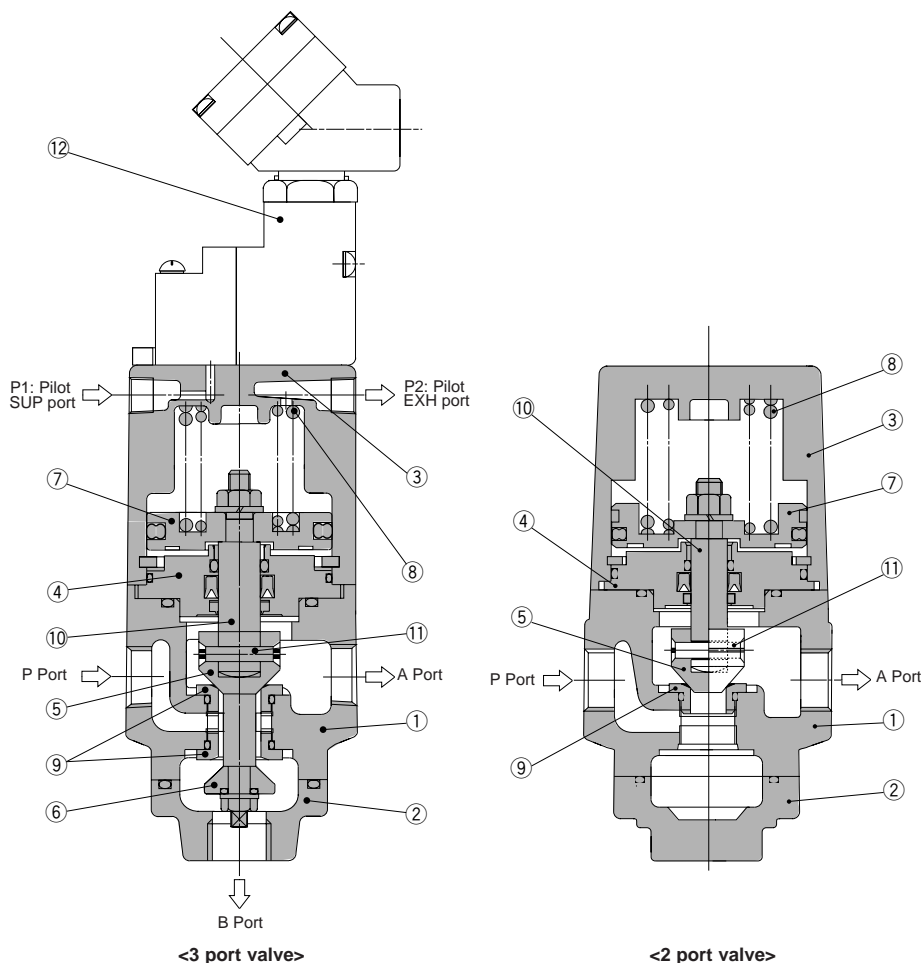
P<sub>2</sub> : Secondary pressure(MPa)

S : Effective area(mm<sup>2</sup>) S $\cong$  18/Cv

Cv : Cv factor

G : Specific gravity Water=1

## Construction



### Operation principles

When the pilot operated solenoid valve ⑫ is not energised, the valve element A ⑤ connected to the piston ⑦ is closed by the return spring ⑧. Then valve element B ⑥ connected to the valve element A ⑤ is open. When the pilot operated solenoid valve ⑫ is energized, the pilot air supplied to the bottom of the piston ⑦ moves upward to open the valve element A ⑤ and closes the valve element B ⑥. Because rod ⑩ is connected to valve element A ⑤ by parallel pin ⑪. Valve element becomes free to incline and it certainly reaches valve seat.

### Component Parts

No.	Description	Material	Note
①	Body	Cast iron	Coated
②	Undercover	Cast iron	Coated
③	Cover	Aluminium alloy	
④	Plate	Iron	
⑤	Valve element A	Stainless Steel	
⑥	Valve element B	Stainless Steel	
⑦	Piston	Aluminium alloy	
⑧	Return spring	Piano wire	
⑨	Valve seat	Stainless Steel	
⑩	Rod	Stainless steel	
⑪	Parallel pin	Stainless Steel	
⑫	Pilot solenoid valve	Refer to How to Order on p.4.2-30	

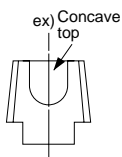
## ⚠ Precautions

Be sure to read before handling. Refer to p.0-33 for Safety Instructions and p.0-37 to 0-40 for common precautions.

### How to Use 2 Port Valve (VNH□11)

#### ⚠ Caution

① When plug is screwed to B port, use concave top plug. If using plug whose top is flat, valve element in the body may be pushed up and the valve cannot be closed.



② VNH□13 is not available to use as 2 port valve by plugging B port. Use 2 port valve VNH□33.

### Piping

#### ⚠ Caution

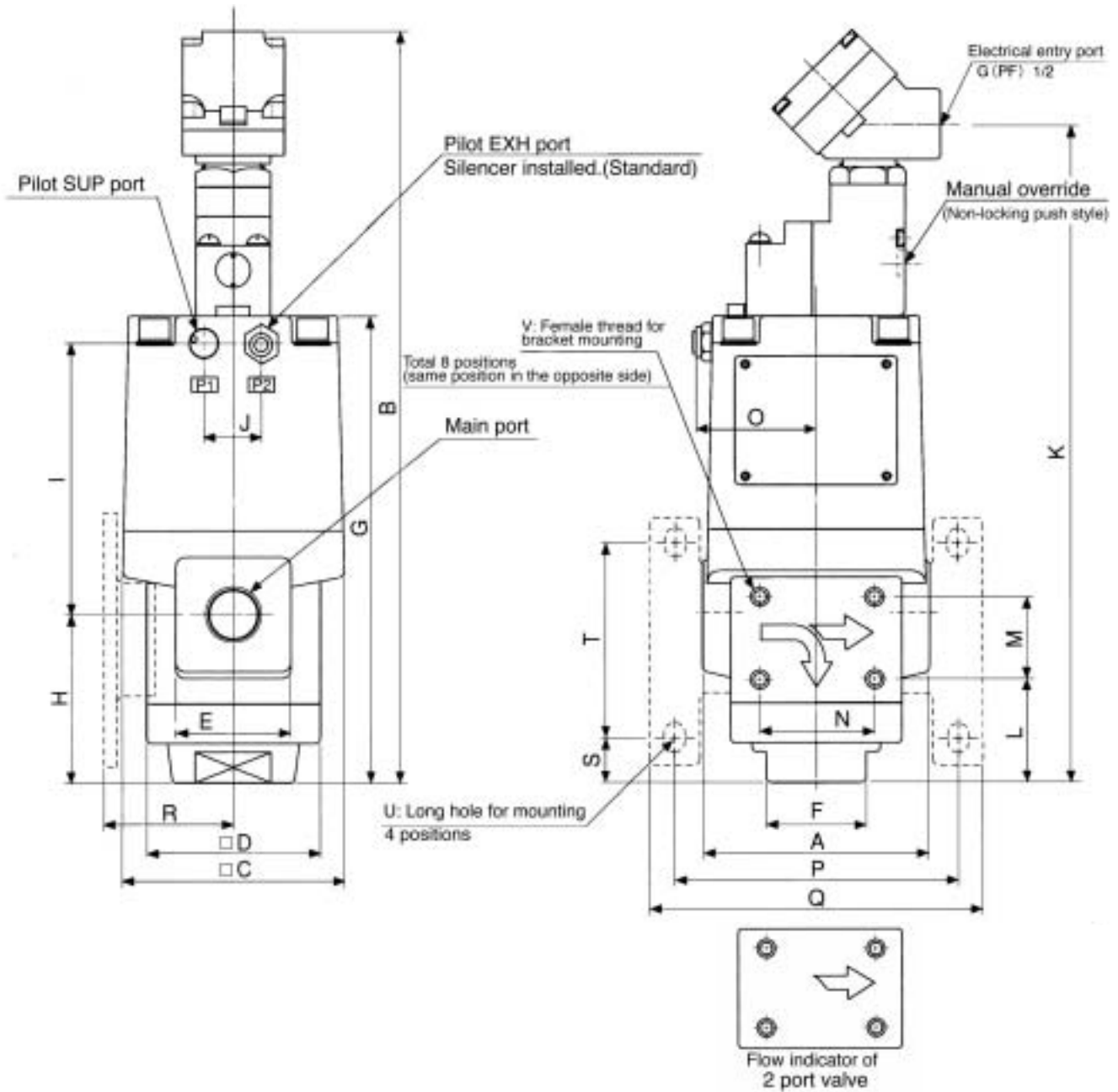
When high temperature fluids are used, use the fittings and tube with heat-resistant. (Self-align fittings, Teflon® tube or copper tube, etc.)

VX

VN□

VQ

## Dimensions



## Dimensions

(mm)

Model	Main port		Pilot port	A	B	C	D	E	F	G	H	I
	2 port	3 port										
VNH1□□□ $\frac{1}{8}$ -10A	2-Rc(PT) $\frac{3}{8}$	3-Rc(PT) $\frac{3}{8}$	Rc(PT) $\frac{1}{8}$	60	235.5	60	46	34	24	135	50	77
VNH2□□□ $\frac{1}{4}$ -15A	2-Rc $\frac{1}{2}$	3-Rc $\frac{1}{2}$	Rc $\frac{1}{8}$	80	265	77	60	40	36	164.5	60	95.5
VNH3□□□ $\frac{3}{8}$ -20A	2-Rc $\frac{3}{4}$	3-Rc $\frac{3}{4}$	Rc $\frac{1}{4}$	100	300	96	76	50	41	200	79	111
VNH4□□□ $\frac{1}{2}$ -25A	2-Rc1	3-Rc1	Rc $\frac{1}{4}$	115	319.5	113	85	60	50	219	90	119

Model	J	K	L	M	N	O	P	Q	R	S	T	U	V
VNH1□□□ $\frac{1}{8}$ -10A	—	202.5	29	25	30	37	75	88	34	10.5	62	6 X 8	M5 X 0.8 Depth 5.5
VNH2□□□ $\frac{1}{4}$ -15A	20	232	36	30	40	43	100	118	44.5	16	70	7 X 0	M6 X 1 Depth 6
VNH3□□□ $\frac{3}{8}$ -20A	24	267	48	35	50	50.5	126	148	60.5	19.5	92	9 X 2	M8 X 1.25 Depth 6
VNH4□□□ $\frac{1}{2}$ -25A	24	286.5	51	38	56	58.5	141	163	66.5	15.5	109	9 X 2	M8 X 1.25 Depth 6

# 2 Port Valve for Steam Steam Valve

## Series VND

2 Port Valve for Steam MAX.180°C

**By the adoption of a PTFE seal,  
the valve is suited for steam.**

**Body material:** Bronze (BC 6),  
Stainless steel

**Large valve capacity**

Cv0.7 to 43

**Many variations**

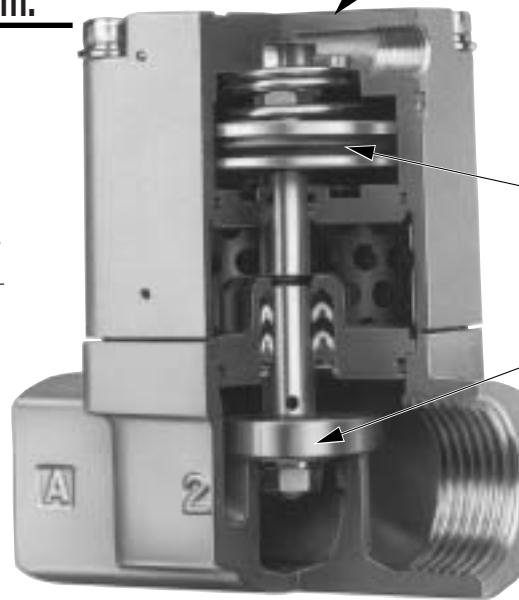
2 types — N.C., N.O.  
Screw-in (6A to 50A)  
Flange (32F to 50F)

**With indicator (option)**

Possible to mount the operation  
confirmation indicator on all valves.

**Cylinder actuation  
system by the external  
pilot air**

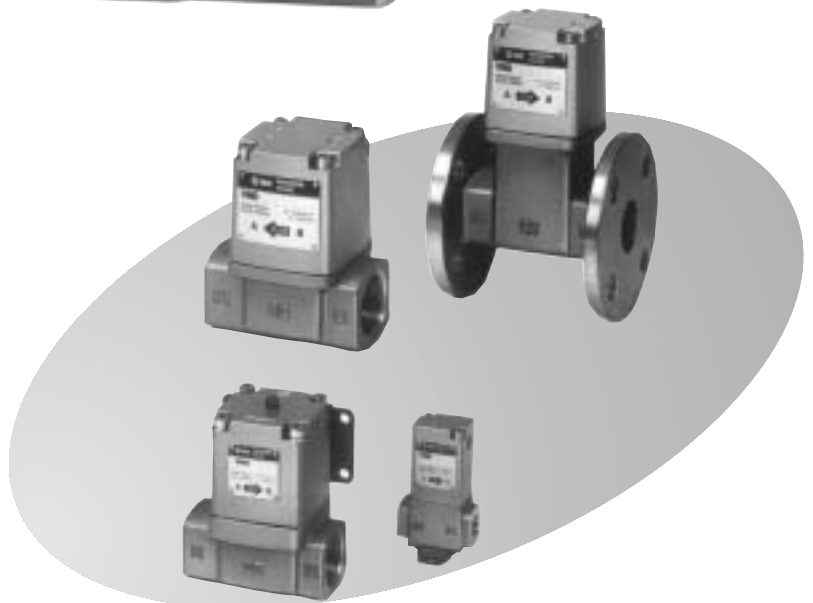
**PTFE seal**



VX

VN□


VQ



## How to Order

### Body option

—	Standard (BC6)
S*	Stainless steel body

 \*Only screw-in style

**Air Operated**

VND **2** **0** **D** **S** **15A** **□**

### Option

—	None
B*	With bracket
L	With indicator
BL*	With bracket, indicator

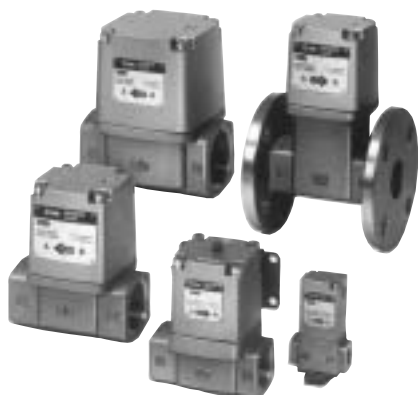
 \*Only valve size 1, 2, 3, 4

### Valve size

### Valve style

### Port size

Symbol	Orifice size (mm)	Symbol			Symbol	Portsize Rc(PT)
		0 N.C.	2 N.O.	4 N.C.		
1	ø7	—	●	●	6A	1/8
		—	●	●	8A	1/4
		—	●	●	10A	3/8
2	ø15	●	●	—	10A	3/8
		●	●	—	15A	1/2
3	ø20	●	●	—	20A	3/4
4	ø25	●	●	—	25A	1
		●	●	—	32A	1 1/4
5	ø32	●	●	—	32F	1 1/4 B Flange
		●	●	—	40A	1 1/2
6	ø40	●	●	—	40F	1 1/2 B Flange
		●	●	—	50A	2
7	ø50	●	●	—	50F	2B Flange
		●	●	—		



## Model

Model	Port size		Orifice size ø (mm)	Flow rate		Weight (kg)
	Rc(PT)	Flange <sup>(1)</sup>		Cv	Effe. area (mm <sup>2</sup> )	
VND10□D-6A	1/8	—	7	0.7	13	0.3
VND10□D-8A	1/4	—		1	18	
VND10□D-10A	3/8	—		1.3	23	
VND20□D-10A	—	—	15	3.8	70	0.6
VND20□D-15A	1/2	—		5	90	
VND30□D-20A	3/4	—	20	8	140	0.9
VND40□D-25A	1	—	25	12	220	1.4
VND50□D-32A	1 1/4	—	32	18	320	2.3
VND50□D-32F	—	32				5.5
VND60□D-40A	1 1/2	—	40	28	500	3.6
VND60□D-40F	—	40				7.2
VND70□D-50A	2	—	50	43	770	5.7
VND70□D-50F	—	50				10.8



Note 1) The companion flange is JIS B 2210 10K (Standard) or its equivalent.

## Valve Specifications

Fluid		Steam	
Fluid temperature		-5 to 180°C*	
Ambient temperature		-5 to 60°C*	
Proof pressure		1.5MPa	
Operating pressure range		0 to 0.97MPa	
External pilot air	Pressure	N.C.	0.3 to 0.7MPa
		N.O.	0.1 to 0.5MPa Refer to table ① for application
	Temperature	Not required (Use turbine oil No. 1 (ISO VG32), if lubricated.)	
		-5 to 60°C*	

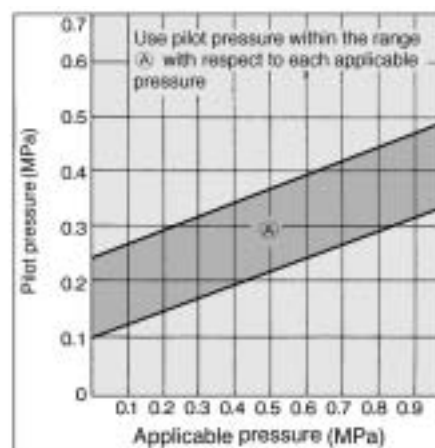


\* No freezing

## Symbol

Valve size	Valve	N.C.	N.O.
		Normally closed	Normally open
VND1			
VND2, 3, 4, 5, 6, 7			

Table ① Operating pressure - Pilot pressure (N.O.)



VX

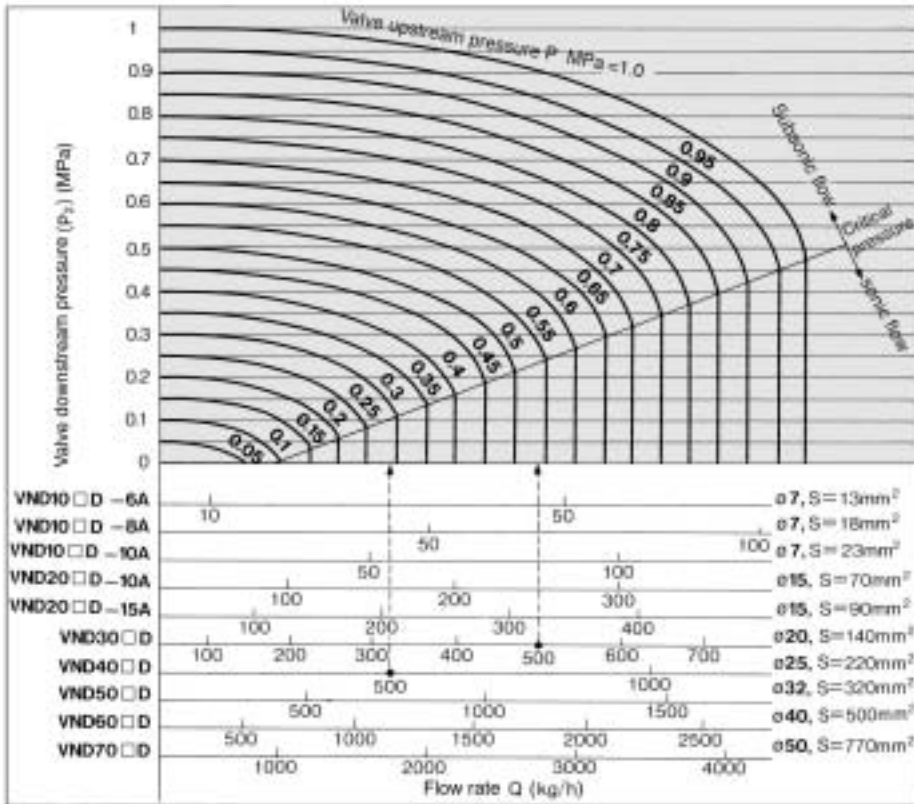
VN□

VQ



## Flow Characteristics

### Saturated Steam



#### How to Read The Graph

In the sonic flow region: For a flow of 500 Kg/h  
 VND30 □ D (Orifice ø20) ..... P<sup>1</sup> ≅ 0.55 MPa  
 VND40 □ D (Orifice ø25) ..... P<sup>1</sup> ≅ 0.3 MPa

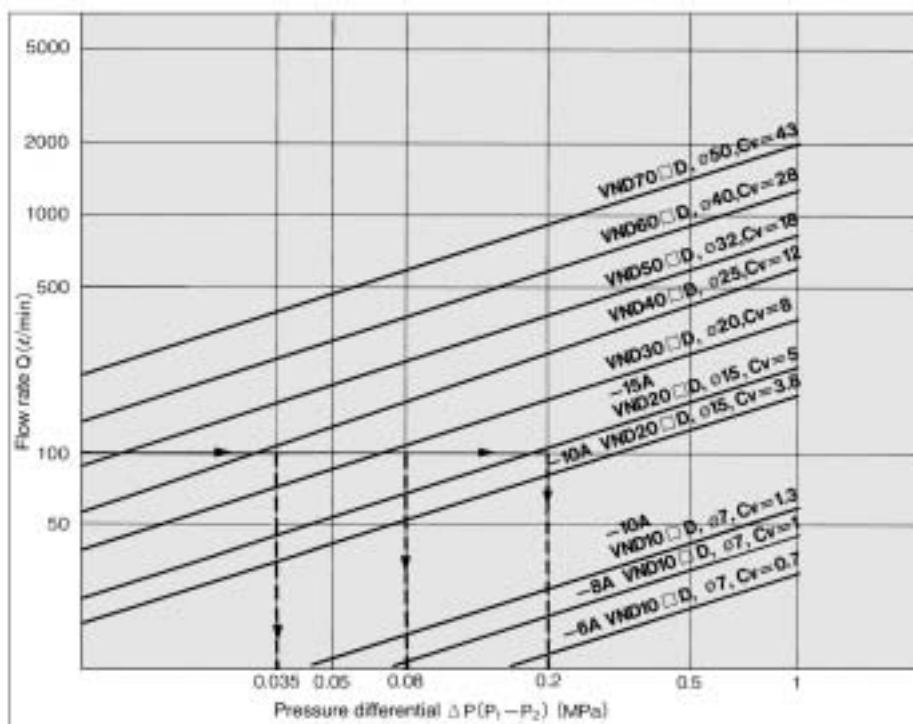
#### How to Calculate Flow

- ① Equation in the domain of subsonic flow
  - Calculation by Cv factor  
 $Q = 198 \cdot C_v \cdot \sqrt{\Delta P (P_2 + 1.033)}$  ..... kg/h
  - Calculation by effective area  
 $Q = 11 \cdot S \cdot \sqrt{\Delta P (P_2 + 1.033)}$  ..... kg/h
- ② Equation in the domain of sonic flow
  - Calculation by Cv factor  
 $Q = 98.9 \cdot C_v \cdot (P_1 + 1.033)$  ..... kg/h
  - Calculation by effective area  
 $Q = 5.51 \cdot S \cdot (P_1 + 1.033)$  ..... kg/h



## Flow Characteristics

Water/VND 2 to 7 should be N.O. to suppress water hammer.



### How to Read The Graph

In case of a water flow of 100 l/min.  
 VND40 □ D (Orifice ø25)  
 ..... ΔP ≅ 0.035MPa  
 VND30 □ D (Orifice ø20)  
 ..... ΔP ≅ 0.08MPa  
 VND20 □ D (Orifice ø15)  
 ..... ΔP ≅ 0.2MPa

### How to Calculate Flow/Water

<Water and other liquids>  
 • Calculation by Cv factor

$$Q = 14.2 \cdot Cv \cdot \sqrt{\frac{10.2 \Delta P}{G}} \dots \text{l/min}$$

• Calculation by effective area

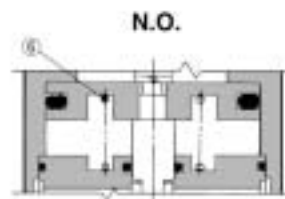
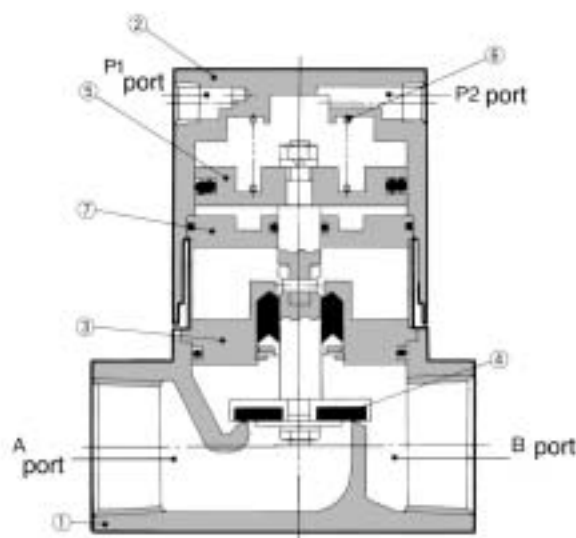
$$Q = 0.8 \cdot S \cdot \sqrt{\frac{10.2 \Delta P}{G}} \dots \text{l/min}$$

Note) Calculation error of fluid with viscosity of 50 cst or less will be very small.

### Symbol

Q : Flow rate (Air and other liquids l/min)  
 ΔP: Pressure differential (P1 - P2)  
 P1 : Upstream pressure (MPa)  
 P2 : Downstream pressure (MPa)  
 S : Effective area (mm<sup>2</sup>) S ≅ 18Cv  
 Cv : Cv factor (/)  
 G : Specific gravity (/) Air/Water = 1

## Construction



### Component Parts

No.	Description	Material	Note
①	Body	Bronze*	Clear coated
②	Cover assembly	Aluminum alloy	Platinum silver painted
③	Plate assembly	Brass*	PTFE, EPR, FPM
④	Valve element	Valve material (PTFE)	Brass*
⑤	Piston assembly	Aluminum alloy	—
⑥	Return spring	Piano wire	—
⑦	Second plate ass'y	Aluminum alloy	—

\* Body option S is made of stainless steel.

### Operation Principles

#### VND □ 0 □ (N.C.):

When fluid is exhausted from the P1 port, the valve ④ connected with the piston ⑤ is closed by the return spring ⑥

#### • When valve opens

When pressurized air enters through the P1 port, the valve piston moves upward by the pilot air that enters below the piston and the valve element opens.

#### • When valve closes:

When fluid is exhausted from the P1 port, the pilot air below the piston is exhausted and the valve element is closed by the return spring.

#### VND □ 02 □ (N.O.)

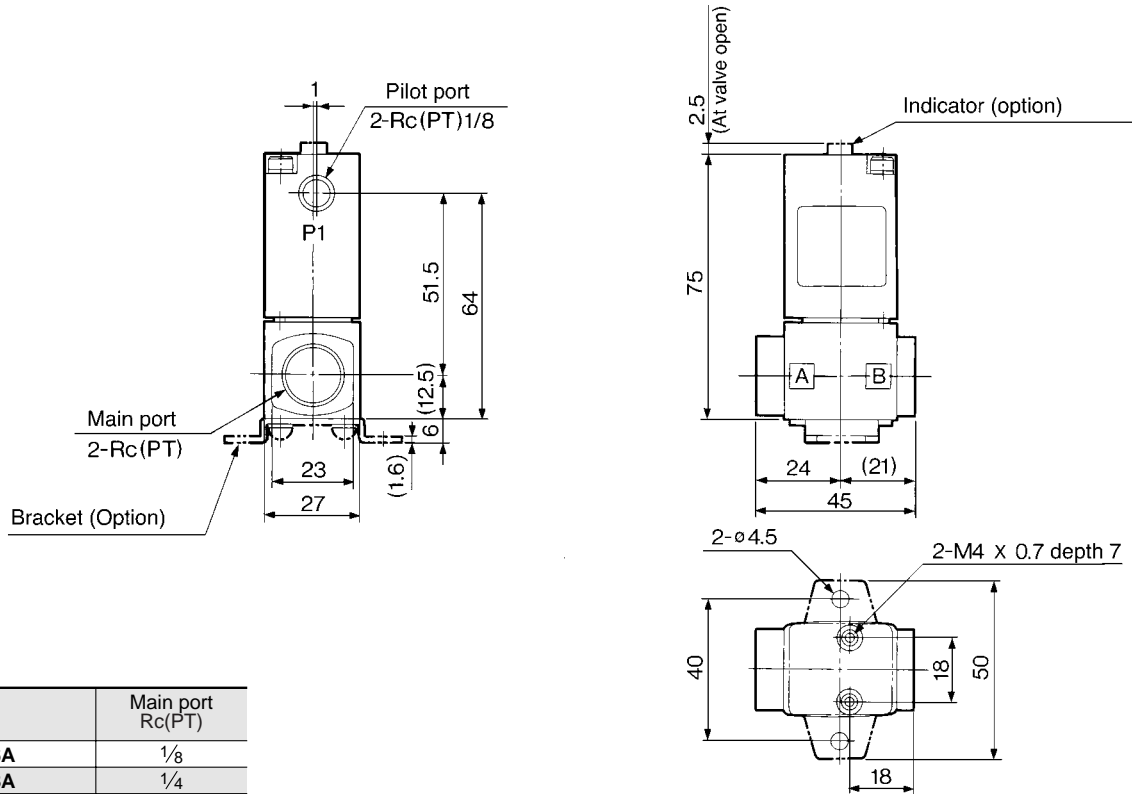
In contrast with the N.C., when air is exhausted from the P2 port, the return spring opens the valve element. Pressurized air that enters through the P2 port closes the valve element.

VX

VN □

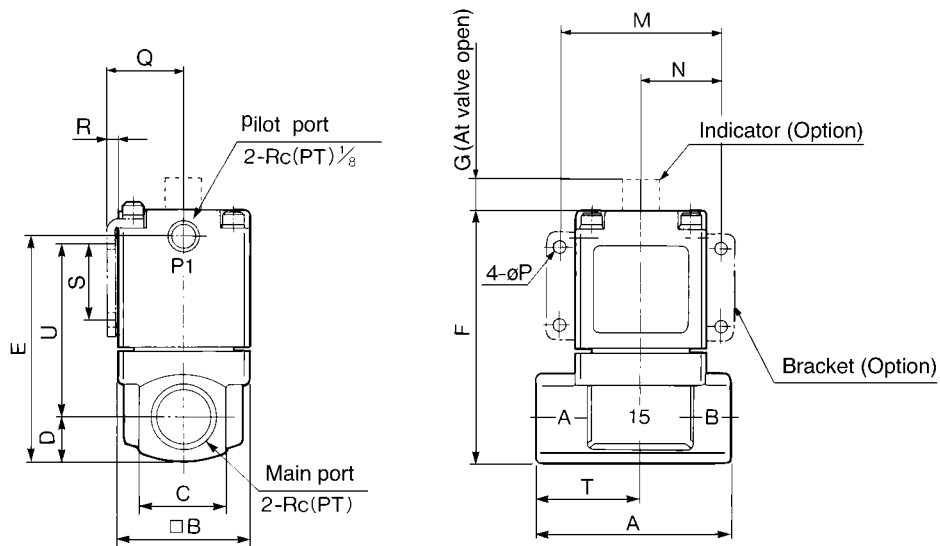
VQ

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



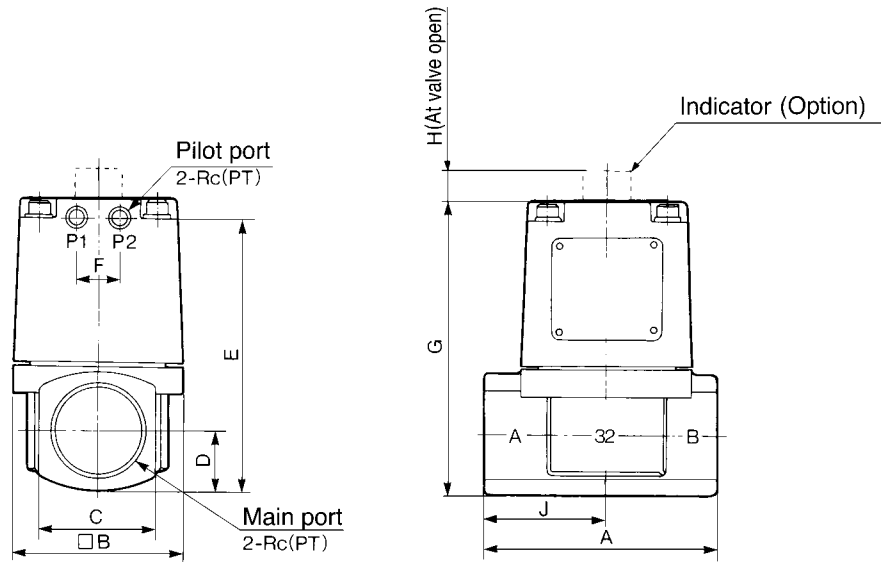
Model	Main port Rc(PT)
VND10□D-6A	1/8
VND10□D-8A	1/4
VND10□D-10A	3/8

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



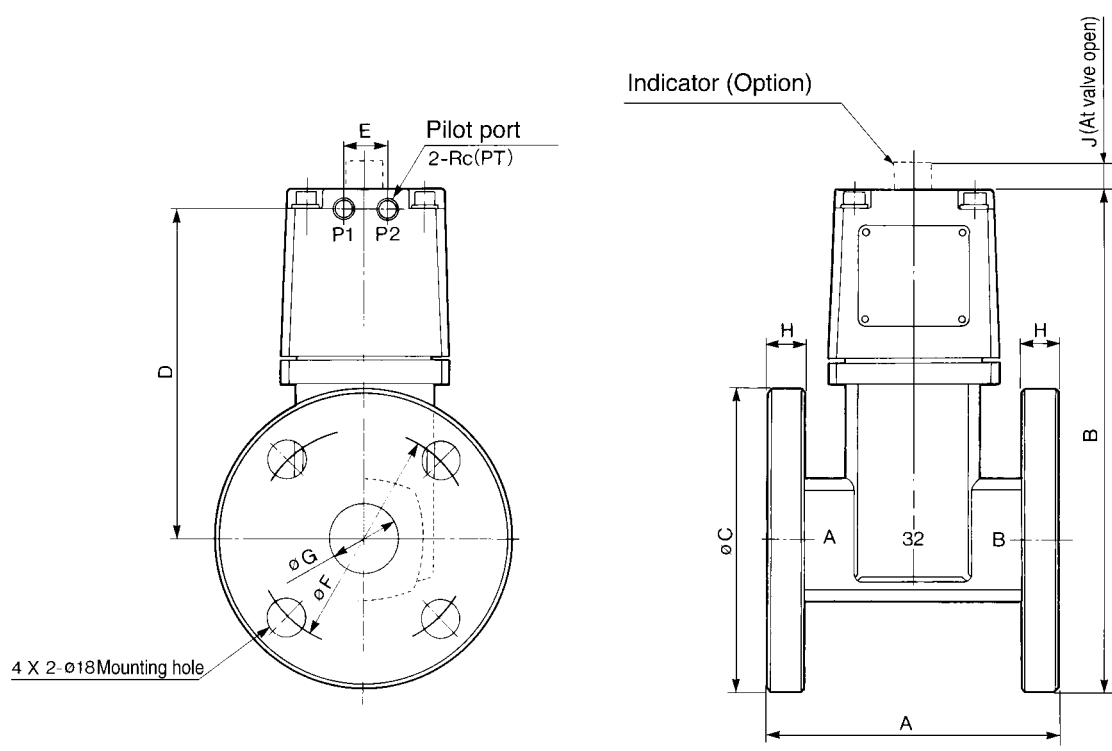
Model	Main port Rc(PT)	A	B	C	D	E	F	G	M	N	P	Q	R	S	T	U
VND20□D-10A	3/8	63	42	28	14	73.5	81.5	4	52	26	4.5	24.3	2.3	25	34	56
VND20□D-15A	1/2															
VND30□D-20A	3/4	80	50	35	17.5	85	93	5	62	31	5.5	28.3	2.3	30	43	61.5
VND40□D-25A	1	90	60	40	20	101	109	6	72	36	6.5	33.3	2.3	35	49	74

**Port size 32A, 40A, 50A**



Model	Main port Rc(PT)	Pilot port Rc(PT)	A	B	C	D	E	F	G	H	J
VND50□D-32A	1 1/4	1/8	105	77	53	26.5	121.5	20	130.5	8	55
VND60□D-40A	1 1/2	1/4	120	96	60	30	138	24	148	10	63
VND70□D-50A	2	1/4	140	113	74	37	161	24	171	12	74

**Port size Flange/32F, 40F, 50F**



Model	Applicable flange	Pilot port Rc(PT)	A	B	C	D	E	F	G	H	J
VND50□D-32F	32	1/8	130	211.5	135	135	20	100	36	12	8
VND60□D-40F	40	1/4	150	227	140	147	24	105	42	12	10
VND70□D-50F	50	1/4	180	251	155	163.5	24	120	54	14	12

- VX
- VN□
- VQ

## ⚠ Precautions

Be sure to read before handling. Refer to p.0-33 for Safety Instructions p.0-37 to 0-40 for common precautions.

### External Pilot

#### ⚠ Caution

##### Piping of pilot port (P1, P2)

P1 and p2 piping should be as follows according to the model.

Port	VND□O□D	VND□O2D
P1	External pilot	Exhaust
P2	Exhaust	External pilot

It is recommended to mount a silencer in the bleed port to prevent entry of dust into the valve.

### Piping

#### ⚠ Caution

To use the piping with a high temperature fluid, use heat resistant fittings and tubes. (Self-align fittings, Teflon<sup>®</sup> tube or copper pipe, etc.) Teflon is a registered trademark of DuPont.

### Adiabatic Space

#### ⚠ Caution

There is a space between body and cover (\*: approximate 1mm) for adiabatic effect.

