

# Process Valve

## VNA Series

### 2 Port Valve For Compressed Air and Air-hydro Circuit Control

Exclusively for air pressure system and air-hydro circuit control

#### Universal 2 Port Valve

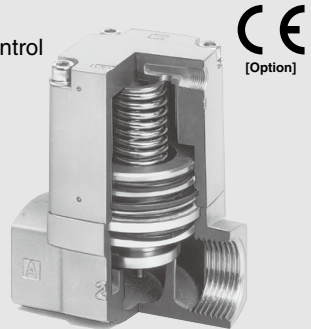
**Cylinder actuation by external pilot air**

**The balance poppet permits normal and reverse flow.**

**Operation from 0 MPa is possible.**

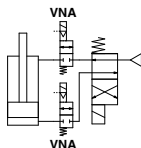
**Wide variations**

N.C., N.O., C.O., types are available. Threaded type from 6A to 50A is standardized.

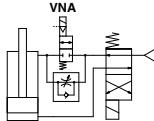


#### Compressed Air Air pressure circuit: Application examples

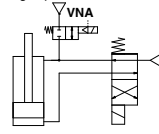
Actuator stop valve  
Intermediate stop, inching



Actuator skip valve  
Terminal deceleration,  
intermediate deceleration,  
accelerative start



Actuator exhaust valve  
High speed operation,  
high speed exhaust



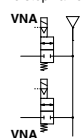
Air motor driving  
valve



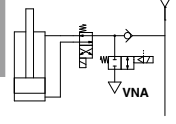
Air blow valve



Line stop valve

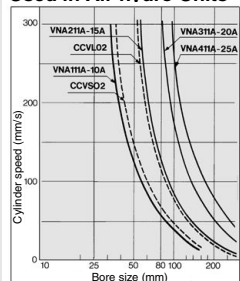


Residual line pressure  
exhaust valve



#### Air-hydro Air pressure circuit: Application examples

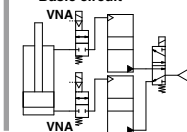
##### Operation Capacity When Used in Air-hydro Units



This series can supplement the capacity of current 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 way as the current air-hydro units.

##### Air-hydro circuit: Application example

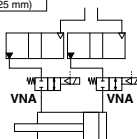
###### Basic circuit



###### Conditions

Supply pressure	0.49 MPa
Hydraulic fluid	ISO VG32
Load	No load
Piping length	1 m
Piping diameter	VNA111A, CCVSO2 3/8B (9 mm)
	VNA211A, CCVLO2 1/2B (13 mm)
	VNA311A 3/4B (19 mm)
	VNA411A 1B (25 mm)

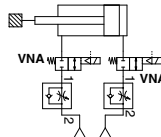
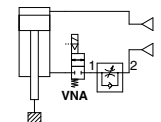
Refer to Air-hydro Unit pages in "Best Pneumatics No. 2-1 (CC series)" for further information on air-hydro.



##### ⚠ Caution

###### When speed controller is mounted

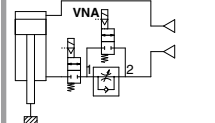
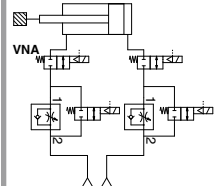
Connect a speed controller (AS series etc.) to a port of VNA□11 (in order to protect the speed control valve from surges when cylinder operation is suspended, thus improving stopping accuracy).



##### ⚠ Caution

###### Skip valve function

Combination of 2 or more valves of VNA series provides a skip valve function. Connect the skip valve to the A port side of a stop valve.



VNA

VNB

SGC

SGH

VNC

VNH

VND

VCC

TQ

# Process Valve: 2 Port Valve

## For Compressed Air and Air-hydro Circuit Control

# VNA Series



[Option]  
Note) CE-compliant: For D or DZ only

### How to Order

**Seal material**

A	NBR seals
B	FKM seals
C	EPR seals

Refer to "Table (1)" for availability.

**Thread type**

Nil	Rc
F	G
N	NPT
T	NPTF

**Bracket (Valve size: 1/2/3/4.)**

Nil	None
B (Note)	With bracket

Note) Only valve sizes 1, 2, 3 and 4.  
Shipped after assembled at our factory.  
Bracket part no.  
Valve size 1: VN1-A16 (with thread)  
Valve sizes 2 to 4: VN□-16  
2 to 4

**Air operated** VNA 2 0 1 A - 15A -

**External pilot solenoid** VNA 2 1 1 A - 15A - 1 T -

**Valve size**

Symbol	Orifice dia. (mm)	1	2	3 (Note)	Symbol	Port size Rc
		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
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

Note) Air operated only

**Valve type**

**Port size**

**Rated voltage**

1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3 (Note 2)	110 VAC 50/60 Hz
4 (Note 2)	220 VAC 50/60 Hz
5	24 VDC
6 (Note 2)	12 VDC
7 (Note 2)	240 VAC 50/60 Hz

Note 1) CE-compliant: For D or DZ only  
Note 2) Semi-standard  
Note 3) For other rated voltages, please consult with SMC.

**CE-compliant**

Nil	—
Q	CE-compliant

Note) CE-compliant: For D or DZ only

**Manual override**

Nil: Non-locking push type		Valve size 1 to 4
A: Non-locking push type A (projecting) B: Slotted locking type B (tool required)		
Nil: Non-locking push type		Valve size 5 to 7

Note) Semi-standard

**Table (1) Applicable Fluids**

Model	VNA□□□A (Valve material: NBR seal)	VNA□□□B (Valve material: FKM seal)	VNA□□□C (Valve material: EPR seal)
Fluid	Air (Standard, Dry) Carbon dioxide (CO <sub>2</sub> ) (Less than 0.7 MPa) Nitrogen gas (N <sub>2</sub> ) Turbine oil (kinematic viscosity 40 to 100 mm <sup>2</sup> /s) Hydraulic fluid (40 to 100 mm <sup>2</sup> /s)	Argon Helium Turbine oil (kinematic viscosity 40 to 100 mm <sup>2</sup> /s) Hydraulic fluid (40 to 100 mm <sup>2</sup> /s)	Carbon dioxide (CO <sub>2</sub> ) (0.7 MPa or more)

### Caution

This product cannot be used for water application.

### Electrical entry/With light/surge voltage suppressor

Symbol	Electrical entry	Valve size 1 to 4	Valve size 5 to 7
G	Grommet	●	●
GS	Grommet with surge voltage suppressor	●	●
E	Grommet terminal	●	●
EZ	Grommet terminal with light/surge voltage suppressor	●	●
T	Conduit terminal	●	●
TZ	Conduit terminal with light/surge voltage suppressor	●	●
D	DIN terminal	●	●
DZ	DIN terminal with light/surge voltage suppressor	●	●

### CE-compliant

Symbol	Electrical entry	Valve size 1 to 4	Valve size 5 to 7
D	DIN terminal	●	●
DZ	DIN terminal with light/surge voltage suppressor	●	●

# Process Valve: 2 Port Valve For Compressed Air and Air-hydro Circuit Control

# VNA Series

## Model

Model	Port size Rc	Orifice diameter ø (mm)	Flow rate characteristics					Weight (kg)	
			Measured by air			Measured by water <sup>Note)</sup>		Air operated	External pilot solenoid
			C [dm <sup>3</sup> /(bar·sec)]	b	Cv	Kv	Conversion Cv		
VNA1□□□-6A	1/8	10	3.5	0.35	0.88	0.9	1.0	0.1	0.2
VNA1□□□-8A	1/4		5.9	0.24	1.5	1.5	1.7		
VNA1□□□-10A			7.9	0.16	1.9	1.8	2.1		
VNA2□□□-10A	3/8	15	16	0.35	3.8	3.9	4.5	0.3	0.4
VNA2□□□-15A	1/2		23	0.25	4.8	4.6	5.4		
VNA3□□□-20A	3/4	20	34	0.16	7.5	7.5	8.7	0.5	0.6

Note) This product cannot be used for water application.

Model	Port size Rc	Orifice diameter ø (mm)	Flow rate characteristics			Weight (kg)	
			Measured by air		Measured by water	Air operated	External pilot solenoid
			Effective area (mm <sup>2</sup> )		Kv Conversion Cv		
VNA4□□□-25A	1	25	220		10.4	12	0.8
VNA5□□□-32A	1 1/4	32	320		15.6	18	1.3
VNA6□□□-40A	1 1/2	40	500		24.2	28	2.1
VNA7□□□-50A	2	50	770		37.2	43	3.1



External pilot  
solenoid

Air operated

## Specifications

Fluid (Main piping)		Refer to "Table (1)" on page 560.	
Fluid temperature	VNA□□□ A	-5 to 60°C <sup>Note 1)</sup>	
	VNA□□□ B	-5 to 99°C <sup>Note 1)</sup>	
	□□□ C	(Air operated type only)	
Ambient temperature		-5 to 50°C <sup>Note 1)</sup> (Air operated type: 60°C)	
Proof pressure		1.5 MPa	
Operating pressure range		0 to 1 MPa	
External pilot air	Pressure range	0.2 to 0.7 MPa	
	Lubrication	Not required (Use turbine oil Class 1 ISO VG32, if lubricated. <sup>Note 2)</sup>	
	Temperature	-5 to 50°C <sup>Note 1)</sup> (Air operated type: 60°C)	
Mounting orientation		Unrestricted <sup>Note 3)</sup>	

Note 1) No freezing

Note 2) Lubrication is not allowed for use with EPR seal material.

Note 3) 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
Pilot solenoid valve		SF4-□□□-23 SF4-□□□-23-Q	VO307-□□□1 VO307-□□□-Q
Electrical entry		Grommet, Grommet terminal Conduit terminal DIN terminal	Grommet, DIN terminal
Coil rated voltage (V)	AC (50/60 Hz)	100 V, 200 V, Other voltage (Semi-standard)	
	DC	24 V, Other voltage (Semi-standard)	
Allowable voltage fluctuation		-15% to +10% of rated voltage	
Temperature rise		35°C or less (When rated voltage is applied.)	50°C or less (When rated voltage is applied.)
Apparent power	AC	Inrush 5.6 VA (50 Hz), 5.0 VA (60 Hz)	12.7 VA (50 Hz), 10.7 VA (60 Hz)
	DC	Holding 3.4 VA (50 Hz), 2.3 VA (60 Hz)	7.6 VA (50 Hz), 5.4 VA (60 Hz)
Power consumption		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

Note) For "How to Order" pilot solenoid valves, refer to page 565.

## Symbol

Type	Valve type	N.C. Normally closed	N.O. Normally open	C.O. Double acting
Air operated	VNA□01			
	VNA□11			
	VNA□12			

VNA

VNB

SGC

SGH

VNC

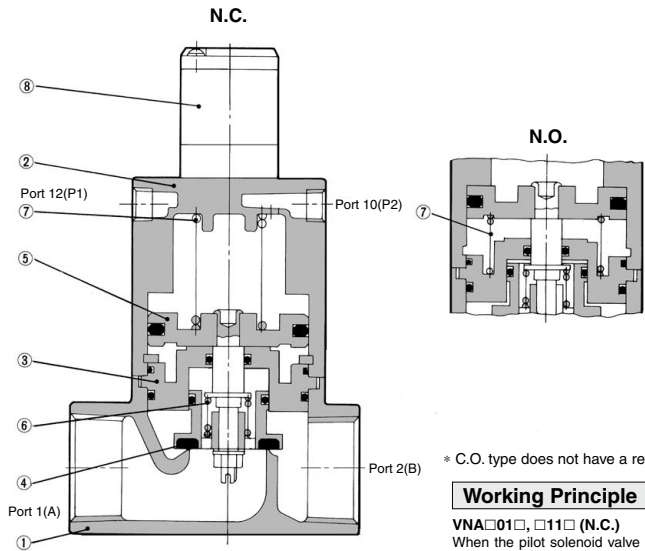
VNH

VND

VCC

TQ

Construction



\* C.O. type does not have a return spring ⑦.

Working Principle

VNA□01□, □11□ (N.C.)

When the pilot solenoid valve ⑧ is not energized (or when air is exhausted from the port 12(P1) of the air operated type), 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 port 12(P1) of the air operated type), 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 port 12(P1) of the air operated type), the pilot air under the piston is exhausted, and the return spring closes the valve element.

VNA□02□, □12□ (N.C.)

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 10(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 10(P2) of the air operated type), 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 ports 12(P1) and 10(P2). When pressurized air enters the port 12(P1) (exhaust from the port 10(P2)), the valve element opens, and it closes when pressurized air enters the port 10(P2) (exhaust from the port 12(P1)).

Component Parts

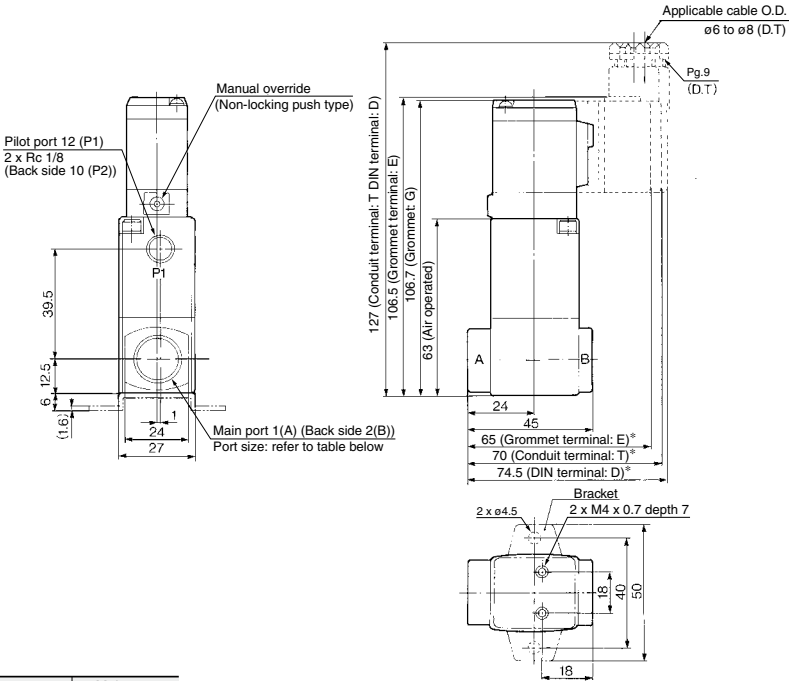
No.	Description	Material	Note
1	Body	Aluminum alloy	Platinum silver painted
2	Cover assembly	Aluminum alloy	Platinum silver painted
3 Note)	Plate assembly	Aluminum alloy	Seal material (NBR, FKM, EPR)
4 Note)	Valve element	Aluminum alloy	Seal material (NBR, FKM, EPR)
5	Piston assembly	Aluminum alloy	—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

Note) Parts ③ and 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	Seal material	NBR VN1-A3AA	VN2-A3AA	VN3-A3AA	VN4-A3AA	VN5-A3AA	VN6-A3AA	VN7-A3AA
			FKM 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 assembly for 25A-50A)	Seal material	NBR VN1-4AA	VN2-4AA	VN3-4AA	VN4-4AA	VN5-4AA	VN6-4AA	VN7-4AA
			FKM VN1-4AB	VN2-4AB	VN3-4AB	VN4-4AB	VN5-4AB	VN6-4AB	VN7-4AB
			EPR VN1-4AC	VN2-4AC	VN3-4AC	VN4-4AC	VN5-4AC	VN6-4AC	VN7-4AC
8	Pilot solenoid valve		SF4-□□□-23 (Refer to page 565 for details.)				VO307-□□□1 (Refer to page 565 for details.)		

Port size: 6A, 8A, 10A



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

Model	Main port 1(A), 2(B)
VNA1□□□-6A	1/8
VNA1□□□-8A	1/4
VNA1□□□-10A	3/8

VNA

VNB

SGC

SGH

VNC

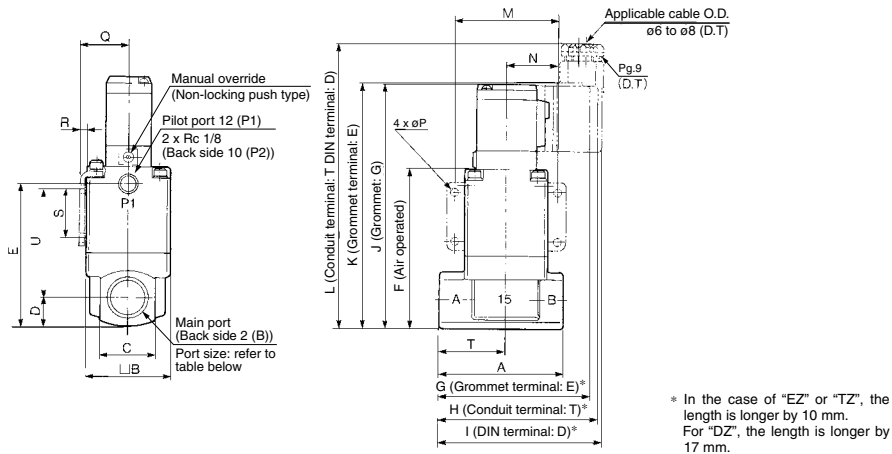
VNH

VND

VCC

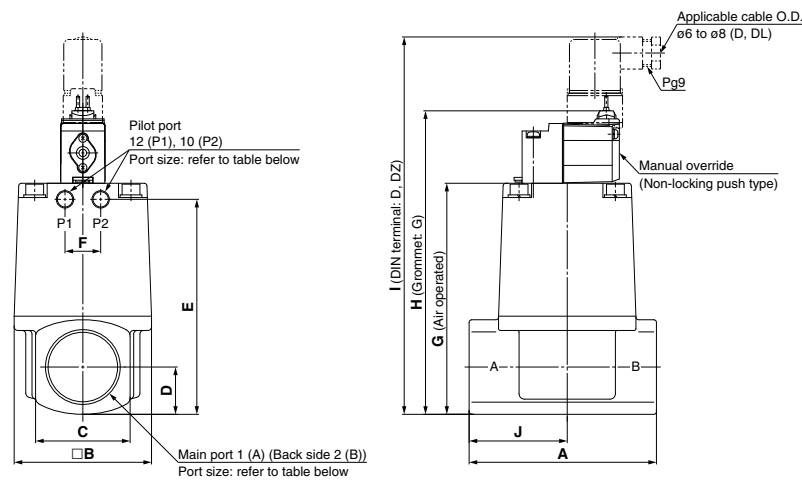
TQ

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



Model	Main port 1(A), 2(B)	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	29	14	72.5	80.5	75	80	84.5	124	125.5	144.5	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	84	89	93.5	135.5	137	156	62	31	5.5	28.3	2.3	30	43	60.5
VNA4□□□-25A	1	90	60	40	20	100	108	90	95	99.5	151.5	153	172	72	36	6.5	33.3	2.3	35	49	73

Port size: 32A, 40A, 50A



Model	Main port 1(A), 2(B)	Pilot port 12(P1), 10(P2)	A	B	C	D	E	F	G	H	I	J
VNA5□□□-32A	1 1/4	1/8	105	77	53	26.5	120.5	20	129.5	170.1	211.5	55
VNA6□□□-40A	1 1/2	1/4	120	96	60	30	137	24	147	187.6	229	63
VNA7□□□-50A	2	1/4	140	113	74	37	160	24	170	210.6	252	74

How to Order Pilot Solenoid Valves

Valve size 1/2/3/4

SF4 - 5 D - 23 - Q

Coil rated voltage

1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3 <small>Note 1)</small>	110 VAC 50/60 Hz
4 <small>Note 1)</small>	220 VAC 50/60 Hz
5	24 VDC
6 <small>Note 1)</small>	12 VDC
7 <small>Note 1)</small>	240 VAC 50/60 Hz

Note 1) Semi-standard

Note 2) For other rated voltages, please consult with SMC.

CE-compliant

Nil	—
Q	CE-compliant

Note) Electrical entry:  
D or DZ only

Manual override

Nil	Non-locking push type
A*	Non-locking push type A (projecting)
B*	Slotted locking type B (tool required)

\* Semi-standard

Electrical entry/  
With light/surge voltage suppressor

G	Grommet	—
GS	Grommet with surge voltage suppressor	—
E	Grommet terminal	—
EZ	Grommet terminal with light/surge voltage suppressor	—
T	Conduit terminal	—
TZ	Conduit terminal with light/surge voltage suppressor	—
D	DIN terminal	●
DZ	DIN terminal with light/surge voltage suppressor	●

Valve size 5/6/7

VO307 - 5 D 1 - Q

Coil rated voltage

1	100 VAC 50/60 Hz
2	200 VAC 50/60 Hz
3 <small>Note 1)</small>	110 VAC 50/60 Hz
4 <small>Note 1)</small>	220 VAC 50/60 Hz
5	24 VDC
6 <small>Note 1)</small>	12 VDC
7 <small>Note 1)</small>	240 VAC 50/60 Hz

Note 1) Semi-standard

Note 2) For other rated voltages, please consult with SMC.

CE-compliant

Nil	—
Q	CE-compliant

Note) Electrical entry:  
D or DZ only

Electrical entry

G	Grommet	—
GS	Grommet with surge voltage suppressor	—
D	DIN terminal	●
DZ	DIN terminal with light/surge voltage suppressor	●

Accessory  
Function plate for VO307 (D seal, with screw): DXT152-14-5A

- VNA
- VNB
- SGC
- SGH
- VNC
- VNH
- VND
- VCC
- TQ



# VNA 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

#### 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 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.

### Mounting

#### 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

##### 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

#### Caution

##### Pilot port piping

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

Port	VNA□01□	VNA□02□	VNA□03□	VNA□1 $\frac{1}{2}$ □
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.

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

### Piping

#### Warning

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

### Mounting Direction of Pilot Solenoid Valve

#### 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.

### Use with Air-hydro Unit

#### Warning

##### 1. Piping

Surge pressure is generated between the cylinder and the VNA during intermediate stoppage. To directly thread in the cylinder, use durable fittings (Stainless steel square nipples etc.) instead of ductile iron fittings (JIS B 2301) or steel pipe fittings (JIS B 2302). When VNA is installed away from the cylinder, use a high-pressure rubber hose (JIS B 6349) instead of steel pipe, when possible.

##### 2. Air bleeding

The VNA series valves have no air bleeding port. Bleed air comes from the middle piping. Bleeding by a vacuum pump is more effective.

##### 3. Hydraulic fluid

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

##### 4. Speed control valve

The combination shown in the following table is recommended for best performance of the VNA series. (Piping: JIS K 6349 high pressure hose)

### Combination between the VNA series and Speed controller (AS series)

	VNA	AS	Piping (I.D.)
10A	VNA111	AS420-03	3/8B (ø9.5)
15A	VNA211	AS420-04	1/2B (ø12.7)
20A	VNA311	AS500-06	3/4B (ø19.1)
25A	VNA411	AS600-10	1B (ø25.4)
32A	VNA511	AS800-12	1 1/4B (ø31.8)
40A	VNA611	AS900-14	1 1/2B (ø38.1)
50A	VNA711	AS900-20	2B (ø50.8)

For details about speed control valve (AS series), refer to Best Pneumatics No. 7.