# Process Valve

## Series VNA

## 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

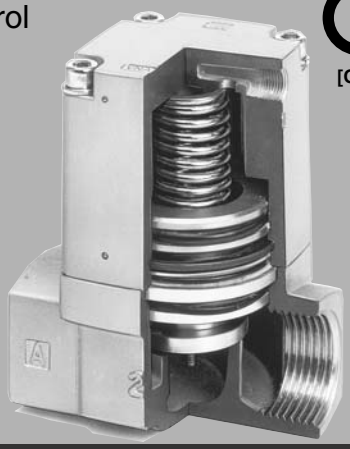
**Cylinder actuation by external pilot air**

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

**Operation from 0 MPa is possible.**

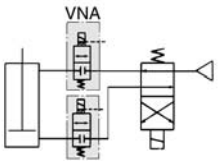
**Wide variations**
N.C., N.O., C.O., types are available. Threaded type from 6A to 50A is standardized.

CE [Option]

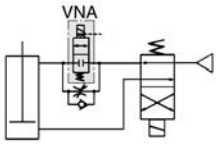


## Compressed Air Air pressure circuit: Application examples

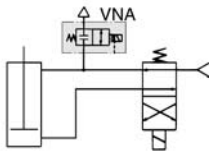
Actuator stop valve
Intermediate stop, inching



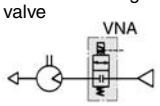

Actuator skip valve
Terminal deceleration, intermediate deceleration, accelerative start



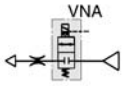

Actuator exhaust valve
High speed operation, high speed exhaust



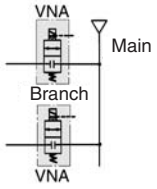

Air motor driving valve



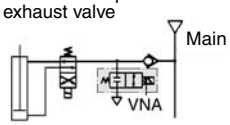

Air blow valve




Line stop valve

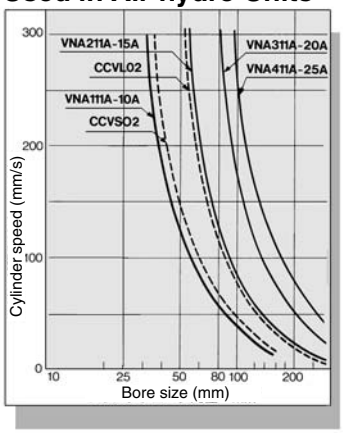



Residual line pressure exhaust valve




## Air-hydro Air pressure circuit: Application examples

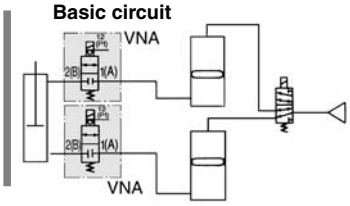
### Operation Capacity When Used in Air-hydro Units




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

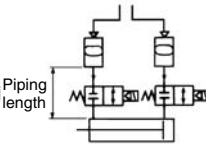
### Air-hydro circuit: Application example

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) |

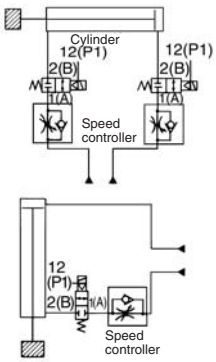



Refer to Air-hydro Unit pages in "Best Pneumatics No. 2" for further information on air-hydro.

### ⚠Caution

**When speed controller is mounted**

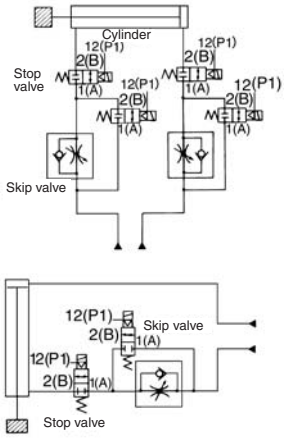
Connect a speed controller (Series AS etc.) to A port of VNA□11 (in order to protect the speed control valve from surges when cylinder operation is suspended, thus improving stopping accuracy).




### ⚠Caution

**Skip valve function**

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



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

[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 □ – □ – □

**CE compliant**

| | |
|---|---|
| Nil | — |
| Q | CE compliant |

Note) CE compliant: For D or DZ only

**Valve size / Valve type / Port size**

| Symbol | Orifice dia. (mm) | Valve type 1 N.C. | Valve type 2 N.O. | Valve type 3 Note) C.O. | Symbol | Port size Rc |
|---|---|---|---|---|---|---|
| 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

**Rated voltage**

| | |
|---|---|
| 1 | 100 VAC 50/60 Hz |
| 2 | 200 VAC 50/60 Hz |
| Note 2) 3 | 110 VAC 50/60 Hz |
| Note 2) 4 | 220 VAC 50/60 Hz |
| 5 | 24 VDC |
| Note 2) 6 | 12 VDC |
| Note 2) 7 | 240 VAC 50/60 Hz |
| Note 2) 9 | Other |

Note 1) CE compliant: For D or DZ only
Note 2) Semi-standard

**Manual override**

| | |
|---|---|
| **Nil**: Non-locking push type<br>**A**: Non-locking push type A Note) (projecting)<br>**B**: Slotted locking type B Note) (tool required) | Valve size 1 to 4 |
| **Nil**: Non-locking push type | Valve size 5 to 7 |

Note) Option

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

| Symbol | Electrical entry | Valve size |
|---|---|---|
| G | Grommet | Valve size 1 to 4 |
| 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 | |
| G | Grommet | Note 2) Valve size 5 to 7 |
| GS | Grommet with surge voltage suppressor | |
| C | Conduit | |
| T | Conduit terminal | |
| TS | Conduit terminal with surge voltage suppressor | |
| TZ Note 1) | Conduit terminal with light/surge voltage suppressor | |
| TL Note 1) | Conduit terminal with indicator light | |
| D | DIN terminal | |
| DL | DIN terminal with indicator light | |

**CE compliant**

| | | |
|---|---|---|
| D | DIN terminal | Valve size 1 to 7 |
| DZ | DIN terminal with light/surge voltage supressor | |

### 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)<br>Carbon dioxide ($CO_2$) (Less than 0.7 MPa)<br>Nitrogen gas ($N_2$)<br>Turbine oil, Hydraulic fluid (Kinematic viscosity 40 to 100 mm²/s) | Argon<br>Helium<br>Turbine oil, Hydraulic fluid (Kinematic viscosity 40 to 100 mm²/s) | Carbon dioxide ($CO_2$) (0.7 MPa or more) |

### ⚠ Caution
This product cannot be used for water application.

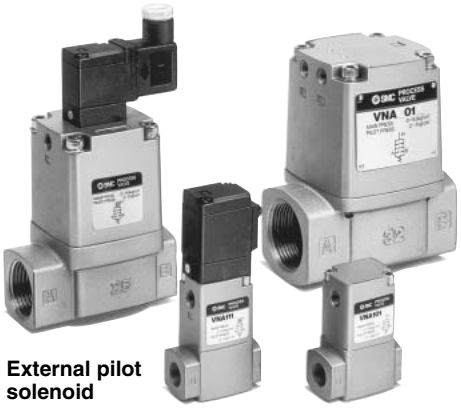
Note 1) Except rated voltage 6, 7, 9.
Note 2) For valve sizes 5 to 7 of the DZ DIN terminal with light/surge voltage suppressor, be sure to add suffix -X200 at the end of the part number. (For CE compliant product, -X200 is not required.) In this case, the pilot solenoid valve is VO307-□DZ.

## Model

| Model | Port size Rc | Orifice diameter ø (mm) | Flow characteristics | | | | Mass (kg) | |
|---|---|---|---|---|---|---|---|---|
| | | | Measured by air | | Measured by water Note) | | | |
| | | | C [dm³/ (bar·sec) ] | b | Cv | Av x $10^{-6}$ $m^2$ | Air operated | External pilot solenoid |
| **VNA1□□□-6A** | 1/8 | 10 | 3.5 | 0.35 | 0.88 | 25 | 0.1 | 0.2 |
| **VNA1□□□-8A** | 1/4 | | 5.9 | 0.24 | 1.5 | 41 | | |
| **VNA1□□□-10A** | 3/8 | | 7.9 | 0.16 | 1.9 | 51 | | |
| **VNA2□□□-10A** | | 15 | 16 | 0.35 | 3.8 | 110 | 0.3 | 0.4 |
| **VNA2□□□-15A** | 1/2 | | 23 | 0.25 | 4.8 | 130 | | |
| **VNA3□□□-20A** | 3/4 | 20 | 34 | 0.16 | 7.5 | 210 | 0.5 | 0.6 |

Note) This product cannot be used for water application.

| Model | Port size Rc | Orifice diameter ø (mm) | Flow characteristics | | Mass (kg) | |
|---|---|---|---|---|---|---|
| | | | Cv | Effective area $(mm)^2$ | Air operated | External pilot solenoid |
| **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 |




**External pilot solenoid**

**Air operated**

## Specifications

| | | |
|---|---|---|
| **Fluid (Main piping)** | | Refer to "Table (1)" on page 358. |
| **Fluid temperature** | **VNA□□□ A** | –5 to 60°C Note 1) |
| | **VNA□□□ B** □□□ **C** | –5 to 99°C Note 1) (Air operated type only) |
| **Ambient temperature** | | –5 to 50°C Note 1) (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. Note 2)) |
| | **Temperature** | –5 to 50°C Note 1) (Air operated type: 60°C) |
| **Mounting orientation** | | Unrestricted Note 3) |

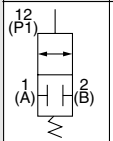
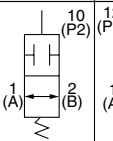
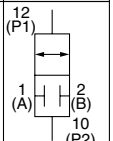
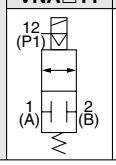
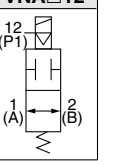
Note 1) No freezing
Note 2) Lubrication is not allowed for use with EPR seal material.
Note 3) For external pilot solenoid, it is recommended that the pilot solenoid valve be oriented either vertically upward or horizontally.

## Pilot Solenoid Valve Specifications

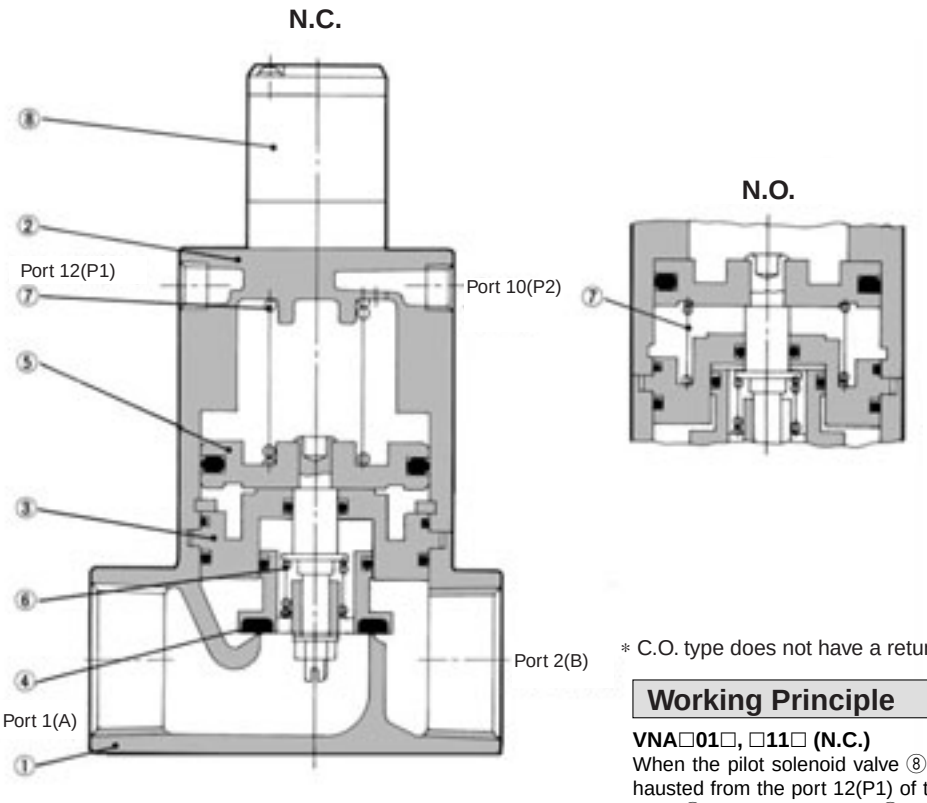
| **Port size** | | | 6A to 25A | 32A to 50A | 32A to 50A (CE compliant) |
|---|---|---|---|---|---|
| **Pilot solenoid valve** | | | **SF4-□□□-23** | **VO301-00□□□** | **VO307-00□$^{P}_{Bz}$-Q** |
| **Electrical entry** | | | Grommet, Grommet terminal Conduit terminal DIN terminal | Grommet, Conduit DIN terminal Other (Option) | DIN terminal |
| **Coil rated voltage (V)** | **AC (50/60 Hz)** | | 100 V, 200 V, Other voltage (Option) | | |
| | **DC** | | 24 V, Other voltage (Option) | | |
| **Allowable voltage fluctuation** | | | –15% to +10% of rated voltage | | |
| **Temperature rise** | | | 35°C or less (When rated voltage is applied.) | 70°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 VA (50 Hz), 10.5 VA (60 Hz) | 12.7 VA (50 Hz), 10.7 VA (60 Hz) |
| | | **Holding** | 3.4 VA (50 Hz), 2.3 VA (60 Hz) | 7.5 VA (50 Hz), 6 VA (60 Hz) | 7.6 VA (50 Hz), 5.4 VA (60 Hz) |
| **Power consumption** | **DC** | | 1.8 W (without light), 2 W (with light) | 4.8 W (without light), 5 W (with light) | |
| **Manual override** | | | Non-locking push type Other (Option) | Non-locking push type | |

Note) For "How to Order" pilot solenoid valves, refer to page 363.

## JIS Symbol

| Style \ Valve type | N.C. | N.O. | C.O. |
|---|---|---|---|
| | Normally closed | Normally open | Double acting |
| Air operated | **VNA□01** | **VNA□02** | **VNA□03** |
| |  |  |  |
| External pilot solenoid | **VNA□11** | **VNA□12** | |
| |  |  | |

## 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 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 port 12(P1) 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 port 12(P1) 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.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 style), 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 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 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

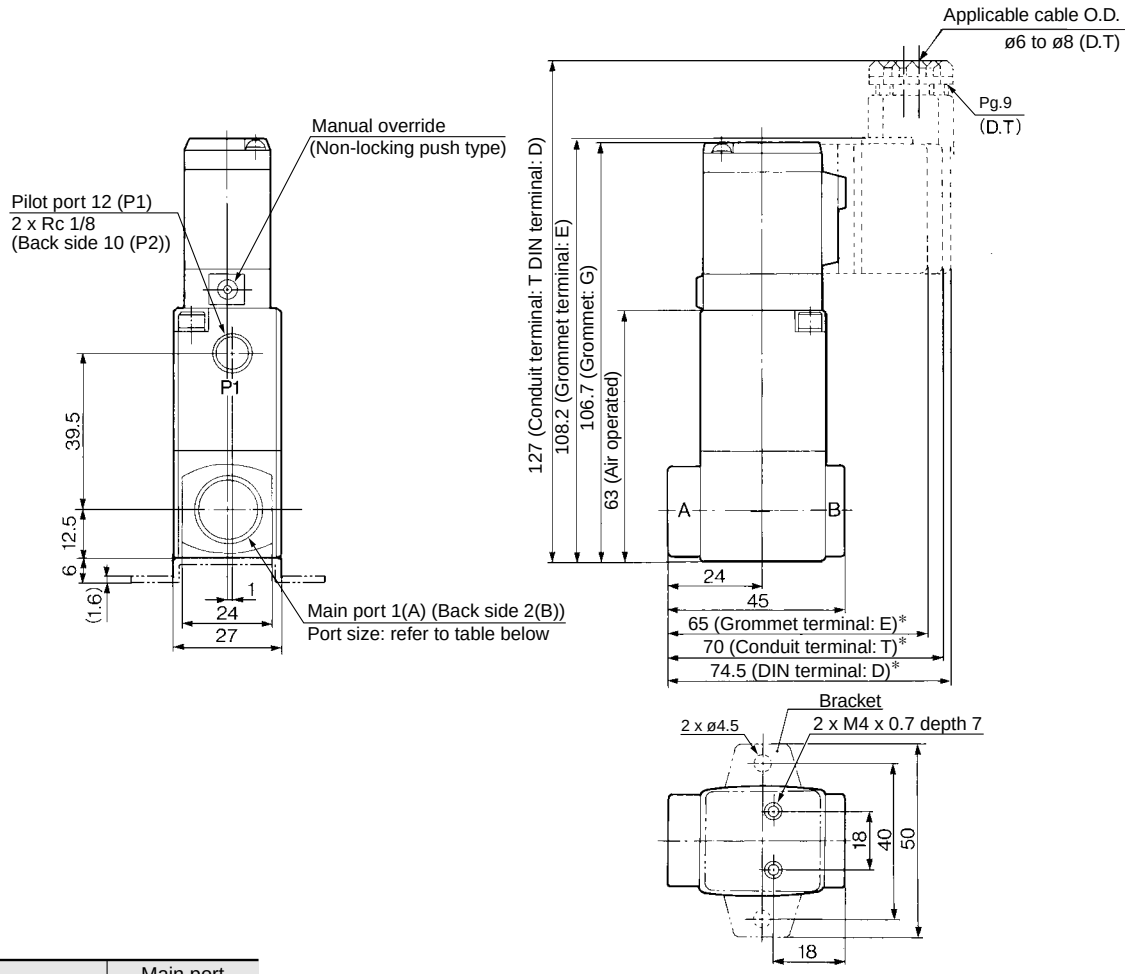
| No. | Description | Material | Note |
|---|---|---|---|
| 1 | **Body** | Aluminum alloy | Platinum silver painted |
| 2 | **Cover assembly** | Aluminum alloy | Platinum silver painted |
| 3 Note) | **Plate assembly** | Aluminum alloy | Valve material (NBR, FKM, EPR) |
| 4 Note) | **Valve element** | Aluminum alloy | Valve 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-A4AA | VN5-A4AA | VN6-A4AA | VN7-A4AA |
| | | | **FKM** | 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 page 363 for details.) | | | | VO301-00□□□ (Refer to page 363 for details.) | | |

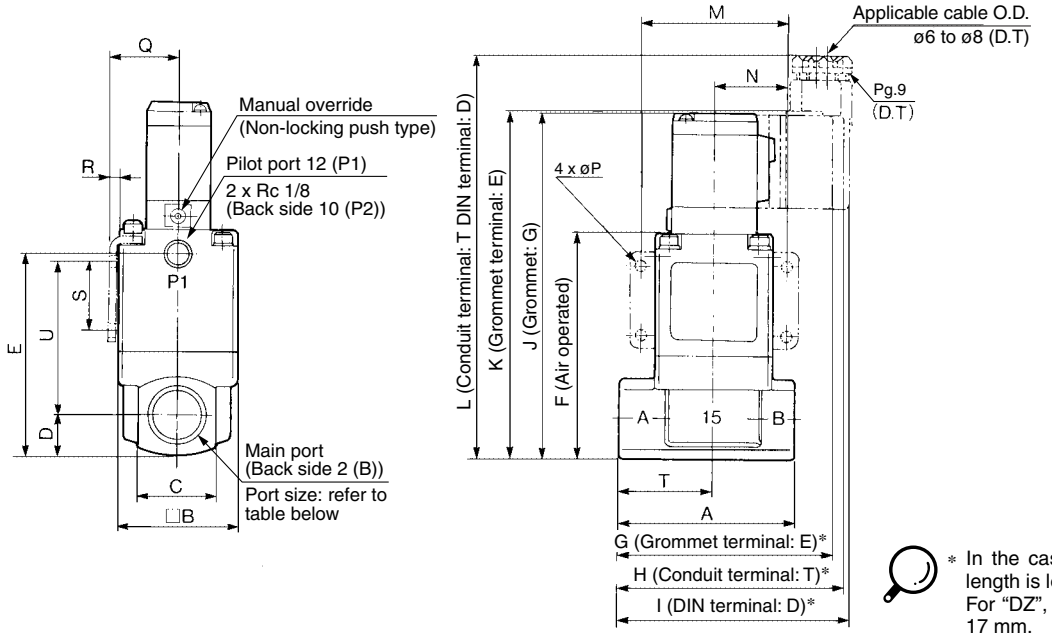
## Port size: 6A, 8A, 10A




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

∗ In the case of “EZ” or “TZ”, the length is longer by 10 mm. For “DZ”, the length is longer by 17 mm.

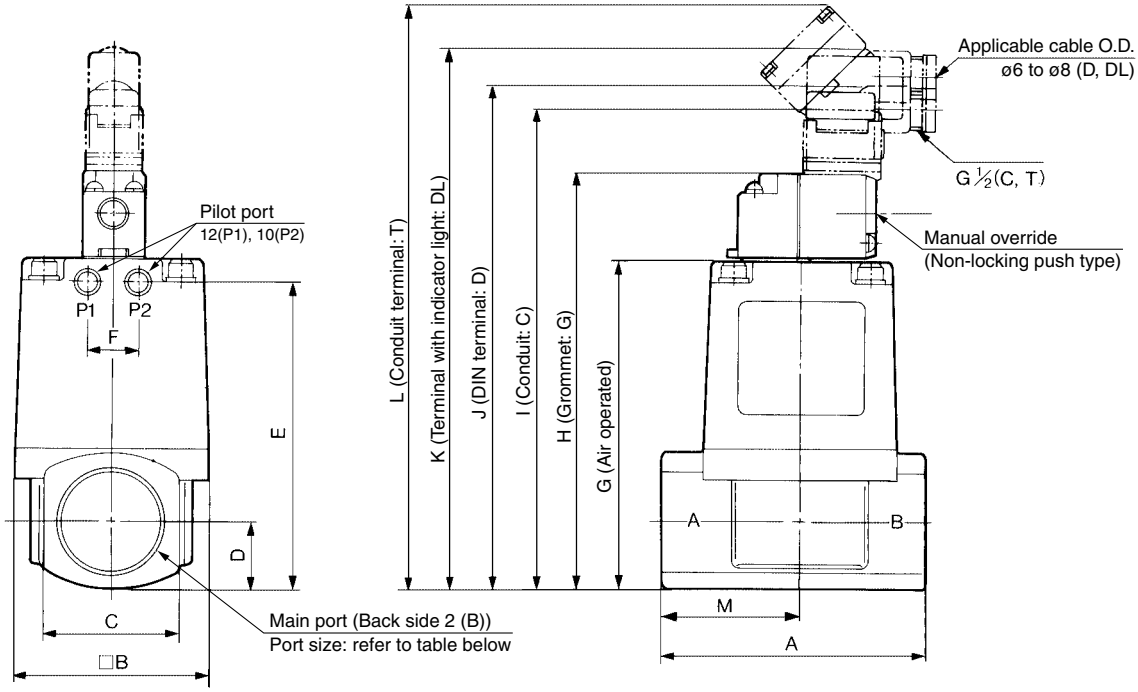
## Port size: 10A, 15A, 20A, 25A




* 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) | 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 | 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 Note) | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VNA5□□□-32A** | 1 1/4 | 1/8 | 105 | 77 | 53 | 26.5 | 120.5 | 20 | 129.5 | 163 | 175.5 | 219 (215.5) | 223 | 229.5 | 55 |
| **VNA6□□□-40A** | 1 1/2 | 1/4 | 120 | 96 | 60 | 30 | 137 | 24 | 147 | 180.5 | 193 | 236 (233) | 240.5 | 247 | 63 |
| **VNA7□□□-50A** | 2 | 1/4 | 140 | 113 | 74 | 37 | 160 | 24 | 170 | 203.5 | 216 | 259 (256) | 263.5 | 270 | 74 |

Note) ( ): CE compliant product (-Q)

## How to Order Pilot Solenoid Valves

### Valve size 1/2/3/4

**SF4 − 5 D □ − 23 − Q**

**SF4 − 5 D □ − 23**

**CE compliant**
Note) Electrical entry: D or DZ only

**Coil rated voltage**

| | |
|---|---|
| **1** | 100 VAC 50/60 Hz |
| **2** | 200 VAC 50/60 Hz |
| **3*** | 110 VAC 50/60 Hz |
| **4*** | 220 VAC 50/60 Hz |
| **5** | 24 VDC |
| **6*** | 12 VDC |
| **7*** | 240 VAC 50/60 Hz |
| **9*** | Other |

* Semi-standard

**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**

| | | CE compliant |
|---|---|---|
| **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

**VO307−00 5 D − Q**

**VO301−00 5 D □**

**CE compliant**
Note) Electrical entry: D or DZ only

**Coil rated voltage**

| | |
|---|---|
| **1** | 100 VAC 50/60 Hz |
| **2** | 200 VAC 50/60 Hz |
| **3*** | 110 VAC 50/60 Hz |
| **4*** | 220 VAC 50/60 Hz |
| **5** | 24 VDC |
| **6*** | 12 VDC |
| **7*** | 240 VAC 50/60 Hz |
| **9*** | Other |

* Semi-standard

**With surge voltage suppressor**

| | |
|---|---|
| **Nil** | None |
| **S** | Surge voltage suppressor (Except “DZ, DL”) |

**Electrical entry**

| | | CE compliant |
|---|---|---|
| **G** | Grommet | — |
| **C** | Conduit | — |
| **T** Note 1) | Conduit terminal | — |
| **D** | DIN terminal | ● |
| **DZ** Note 2) | DIN terminal with light/surge voltage suppressor | ● |
| **DL** Note 3) | DIN terminal with indicator light | — |

Note 1) When the electrical entry is T, the pilot solenoid valve parts are as follows;
**VO301-00□T□-X302**
- Light/Surge voltage Suppressor
- Coil rated voltage

Note 2) VO307 only
Note 3) Semi-standard

**Accessory**
Function plate for VO301 (D seal, with screw): DXT060-32-4A
Function plate for VO307 (D seal, with screw): DXT152-14-1A

# Series VNA
# Specific Product Precautions

**Be sure to read before handling. Refer to front matters 42 and 43 for Safety Instructions, and pages 17 to 19 for 2 Port Solenoid Valves for Fluid Control Precautions.**

## External Pilot

### ⚠Caution

**1. 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□1½□ |
|---|---|---|---|---|
| 12 (P1) | External pilot | Bleed port | External pilot | External pilot |
| 10 (P2) | Bleed port | External pilot | External pilot | Pilot exhaust |

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

## Piping

### ⚠Caution

When high temperature fluids are used, use fittings and tubing with heat resistant features.
(Self-align fittings, Teflon® 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

### ⚠Caution

**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.

### ⚠Caution

**1. Air bleeding**

Series VNA valves have no air bleeding port. Bleed air comes 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 for best performance of the Series VNA. (Piping: JIS K 6349 high pressure hose)

**Combination between Series-VNA and Speed 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 | 1 B (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 | 2 B (ø50.8) |