# 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

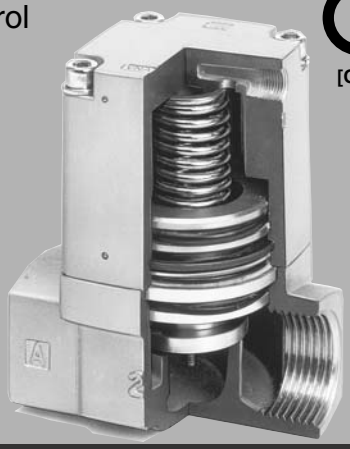
**Cylinder actuation by external pilot air**

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

**Operation from 0 MPa is possible.**

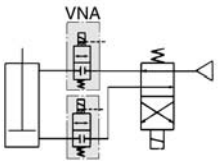
**Wide variations**
N.C., N.O., C.O., types are available. Threaded type from 6A to 50A is standardized.

CE [Option]

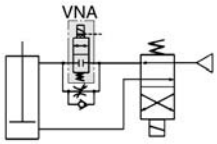


## Compressed Air Air pressure circuit: Application examples

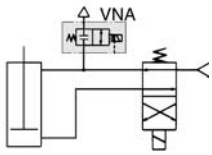
Actuator stop valve
Intermediate stop, inching



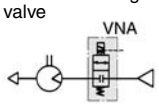

Actuator skip valve
Terminal deceleration, intermediate deceleration, accelerative start



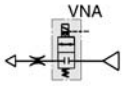

Actuator exhaust valve
High speed operation, high speed exhaust



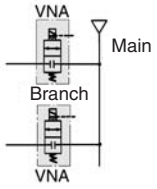

Air motor driving valve



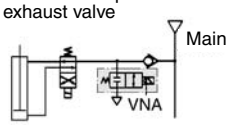

Air blow valve




Line stop valve

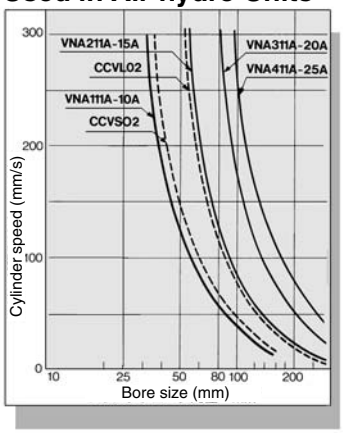



Residual line pressure exhaust valve




## Air-hydro Air pressure circuit: Application examples

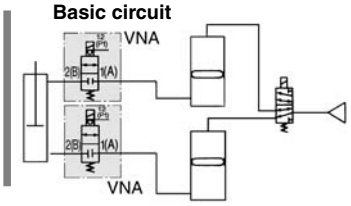
### Operation Capacity When Used in Air-hydro Units




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

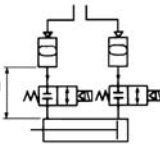
Basic circuit




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) |

Piping length

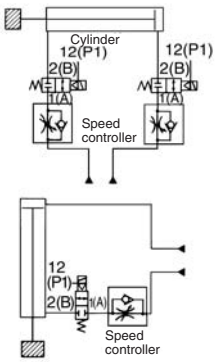


Refer to Air-hydro Unit pages in "Best Pneumatics No. 2" for further information on air-hydro.

### ⚠Caution

**When speed controller is mounted**

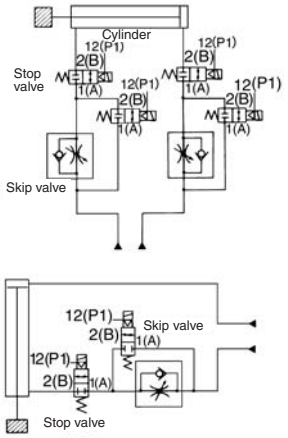
Connect a speed controller (Series AS etc.) to A port of VNA□11 (in order to protect the speed control valve from surges when cylinder operation is suspended, thus improving stopping accuracy).




### ⚠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 Symbol 1 N.C. | 2 N.O. | 3 Note) C.O. | Port size 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.

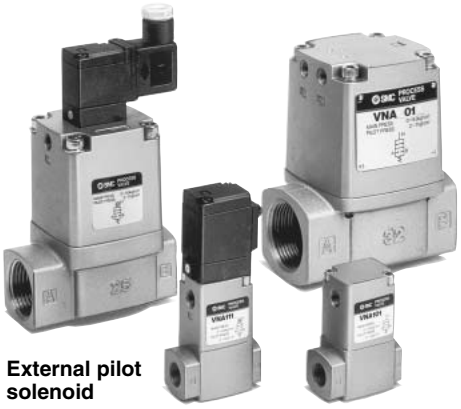
Note 1) Except rated voltage 6, 7, 9.
Note 2) For valve sizes 5 to 7 of the DZ DIN terminal with light/surge voltage suppressor, be sure to add suffix -X200 at the end of the part number. (For CE compliant product, -X200 is not required.) In this case, the pilot solenoid valve is VO307-□DZ.

## 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) |

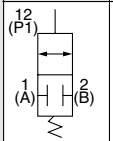
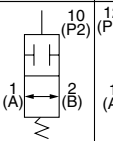
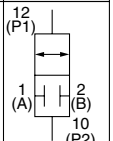
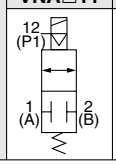
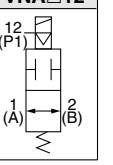
Note 1) No freezing
Note 2) Lubrication is not allowed for use with EPR seal material.
Note 3) For external pilot solenoid, it is recommended that the pilot solenoid valve be oriented either vertically upward or horizontally.

## Pilot Solenoid Valve Specifications

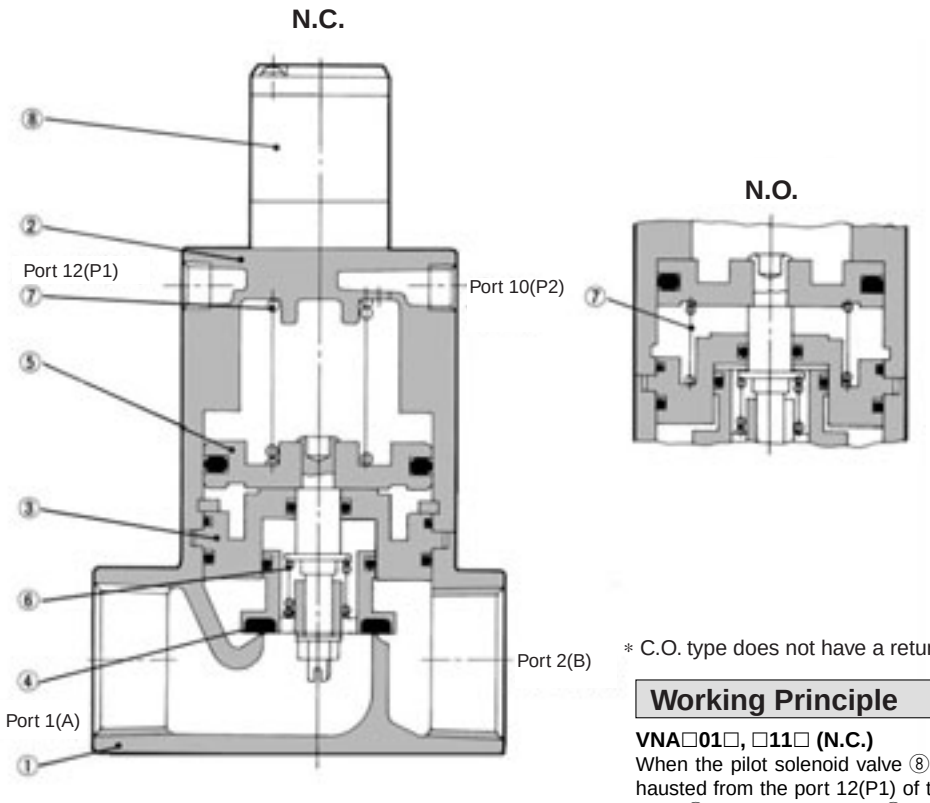
| **Port size** | | | 6A to 25A | 32A to 50A | 32A to 50A (CE compliant) |
|---|---|---|---|---|---|
| **Pilot solenoid valve** | | | **SF4-□□□-23** | **VO301-00□□□** | **VO307-00□$^{P}_{Bz}$-Q** |
| **Electrical entry** | | | Grommet, Grommet terminal Conduit terminal DIN terminal | Grommet, Conduit 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.) | | |

# Process Valve

## Series VNB

## 2 Port Valve For Flow Control

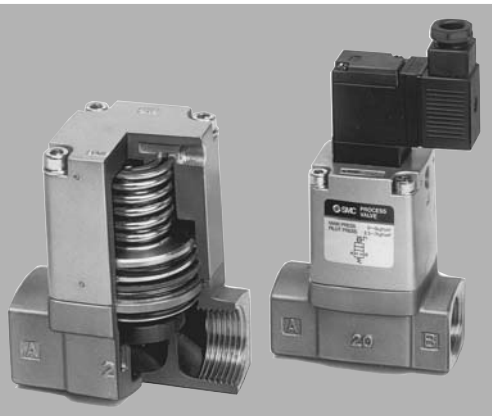
# A wide variety of applicable fluids

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

### Cylinder actuation by external pilot air

### Wide variations

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



**Air operated** **External pilot solenoid**

CE [Option]

## Selection Procedure

### 1 Applicable fluids

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

### 2 Flow characteristics (Air, Water)

- To find the flow rate of air or water, refer to the table of flow rate characteristics on page 10 to 16. Use the flow rate calculation equation to find the exact answer. Although the flow rate is the same, the operating pressure differs according to the valve size. Therefore, select the proper valve size from applicable valves.
- Refer to "Table (2)" to select the port size of the threaded type (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. 1 MPa (normally closed) types. Select the proper one according to the operating conditions.

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

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

### Table (1) Applicable Fluids Check List

| Wetted part Body material | Copper alloy: Standard | | | Aluminum: L | | | Stainless steel: S | | |
|---|---|---|---|---|---|---|---|---|---|
| Wetted part Seal material | NBR | FKM | EPR | NBR | FKM | EPR | NBR | FKM | EPR |
| Fluid | : A | : B | : C | : A | : B | : C | : A | : B | : C |
| Air (Standard, Dry) | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Low vacuum (Up to –101kPa) | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Carbon dioxide ($CO_2$, 0.7 MPa or less) | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Carbon dioxide ($CO_2$, 0.7 to 1 MPa ) | | | ● | | | ● | | | ● |
| Nitrogen gas ($N_2$) | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Argon | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Helium | | ● | | | ● | | | ● | |
| Water (standard, up to 60°C) | ● | | | | | | ● | | |
| Water (up to 99°C air operated type only) | | ● | ● | | | | | ● | ● |
| Turbine oil | ● | ● | | ● | ● | | ● | ● | |
| Spindle oil | | ● | | | ● | | | ● | |
| Fuel oil Class 3 (C fuel oil) | | ● | | | ● | | | ● | |
| Brake oil Note) | | | ● | | | ● | | | ● |
| Silicon oil | | ● | | | | | | ● | |
| Naphtha | | ● | | | | | | ● | |
| Ethylene glycol (up to 80°C) | | | ● | | | | | | ● |
| Boiler water | | | | | | | ● | | ● |

### ⚠ Caution

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

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

Note 3) Some brake oils are not allowed.

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

| 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) Combinations between Electrical Entry and Light/Surge Voltage Suppressor

| Valve size | Electrical entry | | | | | | Light/Surge voltage suppressor | | | Manual override |
|---|---|---|---|---|---|---|---|---|---|---|
| | G | E | C | T | D | DL | S | Z | L | |
| 1, 2, 3, 4 | ● | ● | ● | ● | ● | | ● | ● | | ● |
| 5, 6, 7 | ● | | ● | ● | ● | ● | ● | ● | ● | |

(Only "G") (Except "G")

(Except "DL") (Only "T") (Only "T")