

# MODEL DP-100 series Pilot-operated Solenoid Valve

## PRODUCT MANUAL

Thank you very much for choosing the Yoshitake's product. To ensure the correct and safe use of the product, please read this manual before use. This manual shall be kept with care for future references.

The symbols used in this manual have the following meanings.

|                                                                                   |                |                                                                                                                                                 |
|-----------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Warning</b> | This symbol indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.                          |
|  | <b>Caution</b> | This symbol indicates a hazardous situation that, if not avoided, may result in minor or moderate injury or may result in only property damage. |

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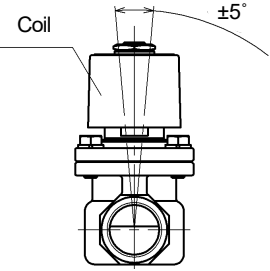
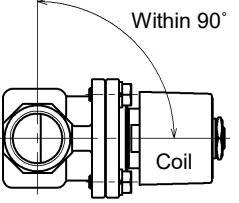
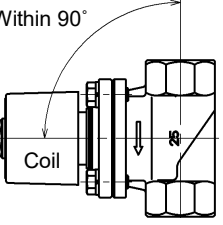
# YOSHITAKE

## 1. Specifications

|                                 |                 |                                                                                                             |                       |
|---------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------|-----------------------|
| Model                           | Normally closed | DP-100 and DP-100-D                                                                                         | DP-100F and DP-100F-D |
|                                 | Normally open   | DP-100-C                                                                                                    | DP-100F-C             |
| Nominal size                    |                 | 10-50A                                                                                                      | 15-65A                |
| Structure                       |                 | Pilot-operated piston type                                                                                  |                       |
| Application                     |                 | Steam, Air, Cold and hot water, N <sub>2</sub> gas, Co <sub>2</sub> gas (dry), Ar gas, Oil (20 cSt or less) |                       |
| Working pressure                |                 | 0-1.0 MPa (Unusable under vacuum)                                                                           |                       |
| Min. differential pressure (*1) |                 | 0 MPa<br>(0.03 MPa or more is required for vertical installation)                                           |                       |
| Allowable valve seat leakage    |                 | 50 mL/min under standard conditions (at air pressure of 0.6 MPa)                                            |                       |
| Temperature range               |                 | 5-180°C (no freeze condition)                                                                               |                       |
| Ambient temperature             |                 | 50°C or less (no freeze condition)                                                                          |                       |
| Installation posture (*1)       |                 | Vertical or horizontal installation<br>( within 90 degrees from upward position of the coil)                |                       |
| Material                        | Body            | Cast stainless steel                                                                                        |                       |
|                                 | Piston          | Stainless steel                                                                                             |                       |
|                                 | Valve disc      | PTFE                                                                                                        |                       |
| Connection                      |                 | JIS Rc screwed                                                                                              | JIS 10K FF flanged    |

\*1: See Table 1.

Table 1 Min. differential pressures and installation postures

|                   | Horizontal piping                                                                                                             | Vertical piping                                                                                                                |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Coil set upward   |  <p>Min. Differential press.: 0 MPa</p>    |                                                                                                                                |
| Coil set sideways |  <p>Min. Differential press.: 0.03 MPa</p> |  <p>Min. Differential press.: 0.03 MPa</p> |

Performance and specifications of AC coil (DP-100, DP-100F, DP-100-C and DP-100F-C)

| Rated voltage           | AC 100 / 200 V selective type |               | AC 110 / 220 V selective type |               |
|-------------------------|-------------------------------|---------------|-------------------------------|---------------|
|                         | 50 / 60 Hz common             |               |                               |               |
| Nominal size            | 10-25A                        | 32-65A        | 10-25A                        | 32-65A        |
| Rated current           | 0.34 / 0.17 A                 | 0.46 / 0.23 A | 0.32 / 0.16 A                 | 0.42 / 0.21 A |
| Starting current        | 1.64 / 0.82 A                 | 1.90 / 0.95A  | 1.48 / 0.74 A                 | 1.80 / 0.90 A |
| Allowable fluctuation   | Rated voltage -5% to +10%     |               |                               |               |
| Insulation class        | Insulation class H            |               |                               |               |
| Protective structure    | Dust tight, Splash proof      |               |                               |               |
| Ingress protection code | IP64 (JIS C0920)              |               |                               |               |
| Insulation resistance   | 50 MΩ and more / 500 V megger |               |                               |               |
| Withstand voltage test  | 1500 V/min                    |               |                               |               |

Performance and specifications of DC coil (DP-100-D and DP-100F-D)

|                         |                               |        |
|-------------------------|-------------------------------|--------|
| Rated voltage           | DC 24 V                       |        |
| Nominal size            | 10-25A                        | 32-65A |
| Rated current           | 1.34A                         | 1.14A  |
| Allowable fluctuation   | Rated voltage -5% to +10%     |        |
| Insulation class        | Insulation class H            |        |
| Protective structure    | Dust tight, Splash proof      |        |
| Ingress protection code | IP64 (JIS C0920)              |        |
| Insulation resistance   | 50 MΩ and more / 500 V megger |        |
| Withstand voltage test  | 1500 V/min                    |        |

- Coils equipped with a terminal box (made of plastic) are also available upon request.



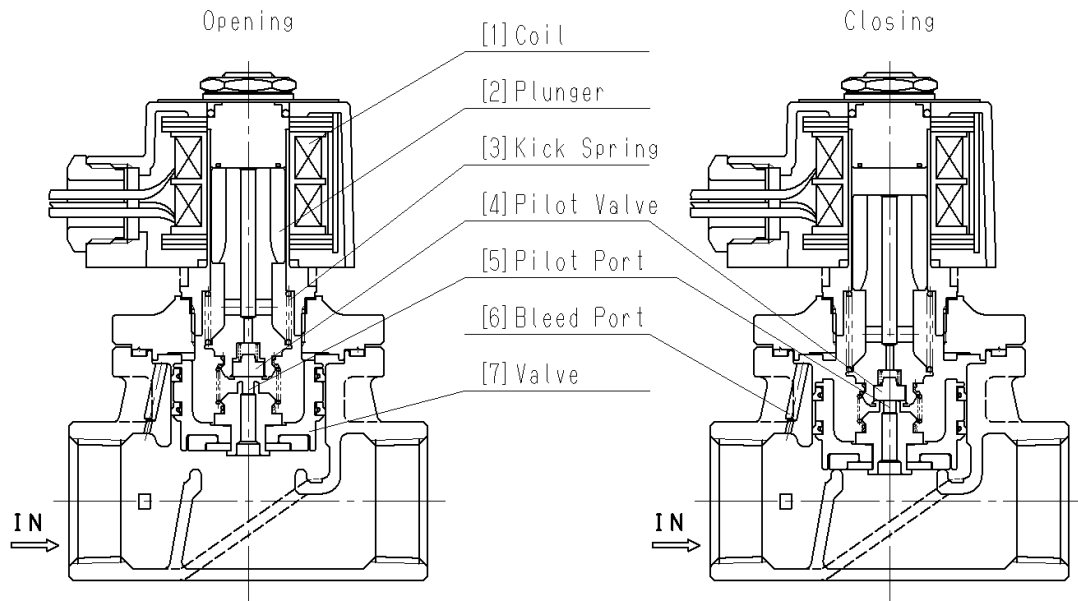
**Caution**

Please confirm that the indications on the product correspond with the specifications of the ordered product model before use.

\* If they are different, do not use the product and contact us.

## 2. Operation

- Normally closed type (DP-100, DP-100F, DP-100-D and DP-100F-D)



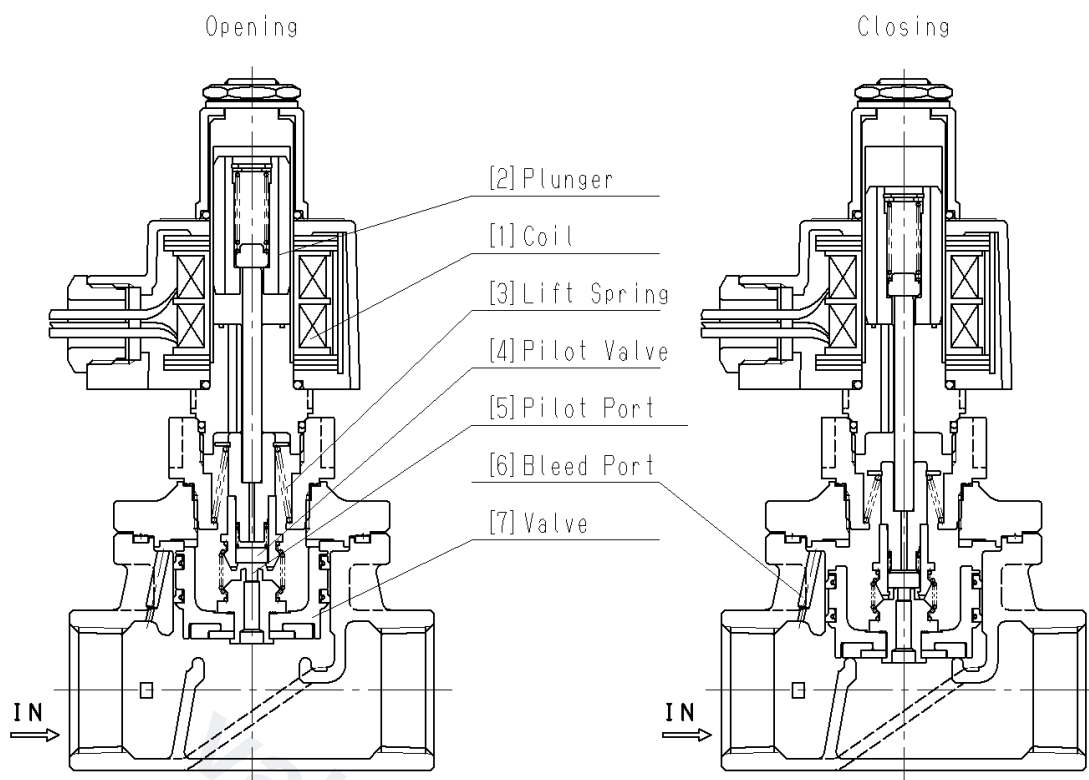
### (1) Opening operation (Power ON)

When the power is turned ON, the coil [1] is excited and pulls up the plunger [2], to open the pilot valve [4]. Next, the pressure at the upper part of the valve [7] drops since it flows to the outlet through the pilot port [5]. The valve [7] is then lifted up to open position by the inlet pressure.

### (2) Closing operation (Power OFF)

When the power is turned OFF, the coil [1] excitation is canceled and the plunger [2] drops down by force of the kick spring [3], to close the pilot valve [4]. The pressure at the upper part of the valve [7] rises due to the incoming inlet pressure from the bleed port [6] which is communicated with the inlet. With the support of the kick spring [3], this makes the valve [7] pushed down to closed position.

■ Normally open type (DP-100-C and DP-100F-C)



(1) Opening operation (Power OFF)

When the power is turned OFF, the coil [1] excitation is canceled and the pilot valve [4] and plunger [2] are lifted up by force of the lift spring [3], to open the pilot valve [4]. The pressure at the upper part of the valve [7] drops due to the outgoing pressure toward the outlet through the pilot port [5]. This makes the valve [7] lifted up to opened position by the inlet pressure.

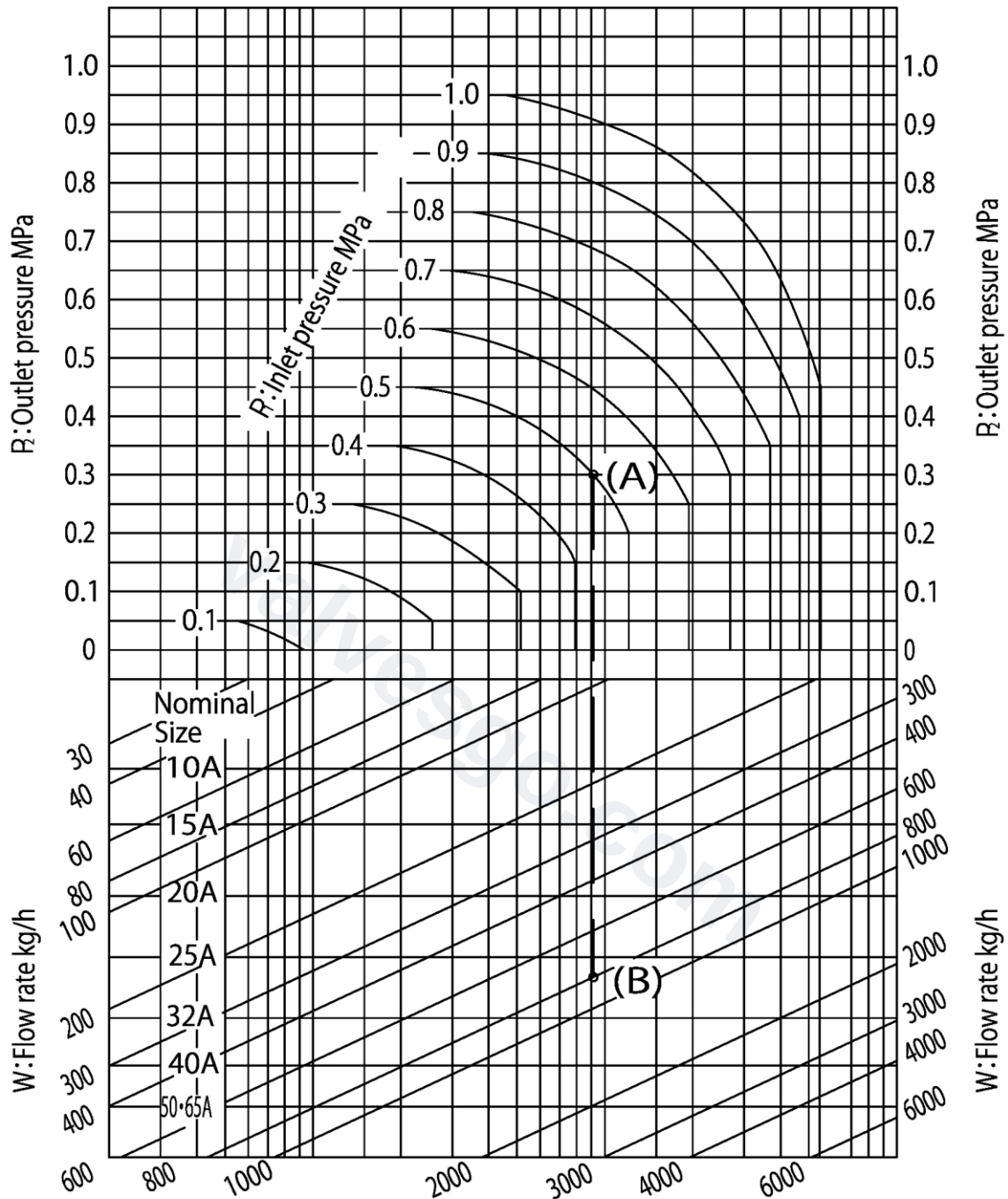
(2) Closing operation (Power ON)

When the power is turned ON, the coil [1] is excited and pulls down the plunger [2], to close the pilot valve [4]. The pressure at the upper part of the valve [7] rises due to the incoming inlet pressure from the bleed port [6] which is communicated with the inlet. With the support of attractive force of the plunger [2], this makes the valve [7] pushed down to closed position.

### 3. Nominal Size Selection

#### 3.1 Nominal size selection chart

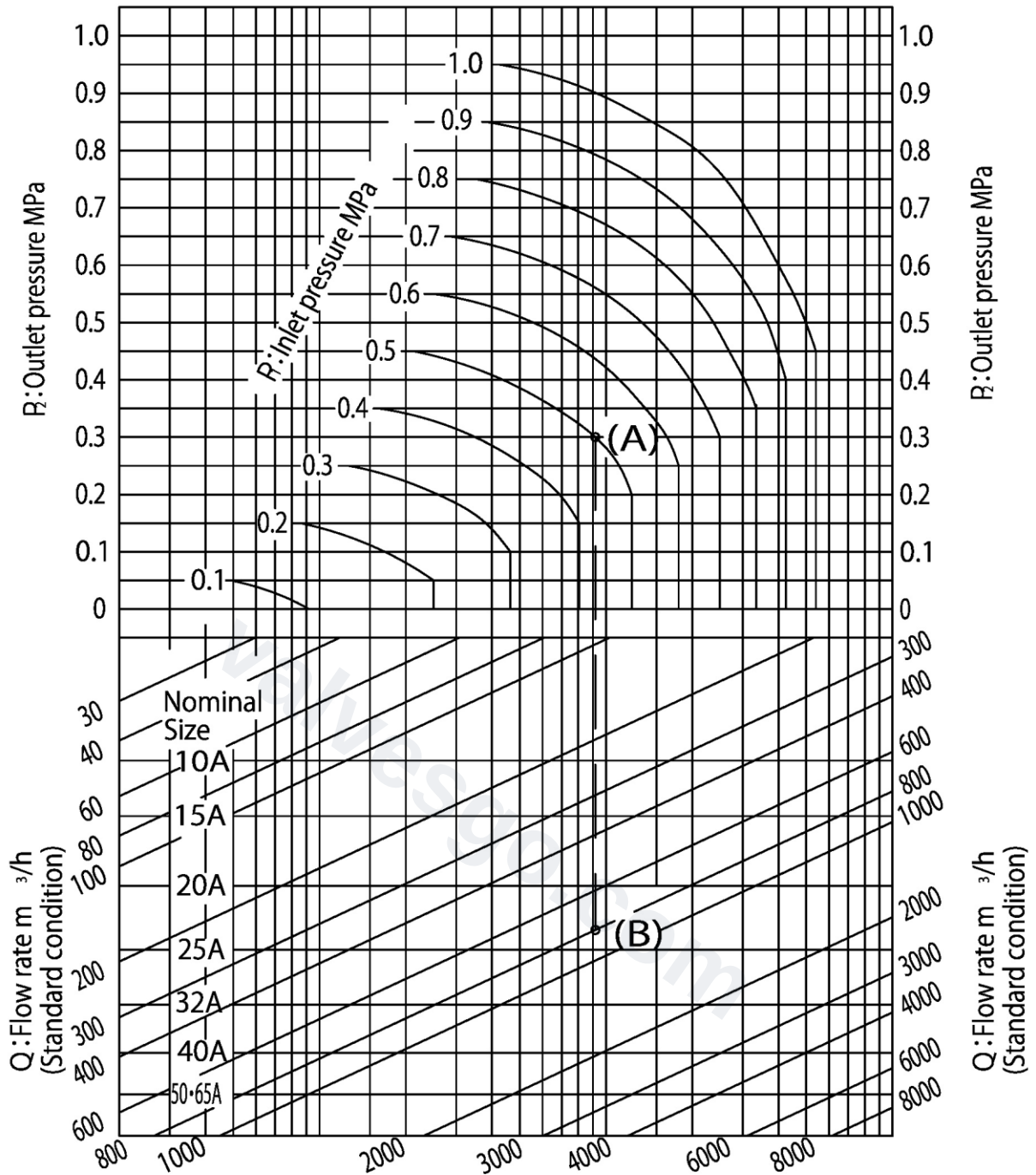
■ For steam



#### [How to use the chart]

When selecting the nominal size of a solenoid valve whose inlet pressure ( $P_1$ ), outlet pressure ( $P_2$ ) and steam (saturated steam) flow rate ( $W$ ) are 0.5 MPa, 0.3 MPa and 800 kg/h, respectively, first find intersection point (A) of  $P_1 = 0.5$  MPa and  $P_2 = 0.3$  MPa. Trace down vertically from this intersection point (A) to find intersection point (B) with  $W = 800$  kg/h. Since this intersection point (B) lies between nominal sizes 25A and 32A, select the larger one, 32A.

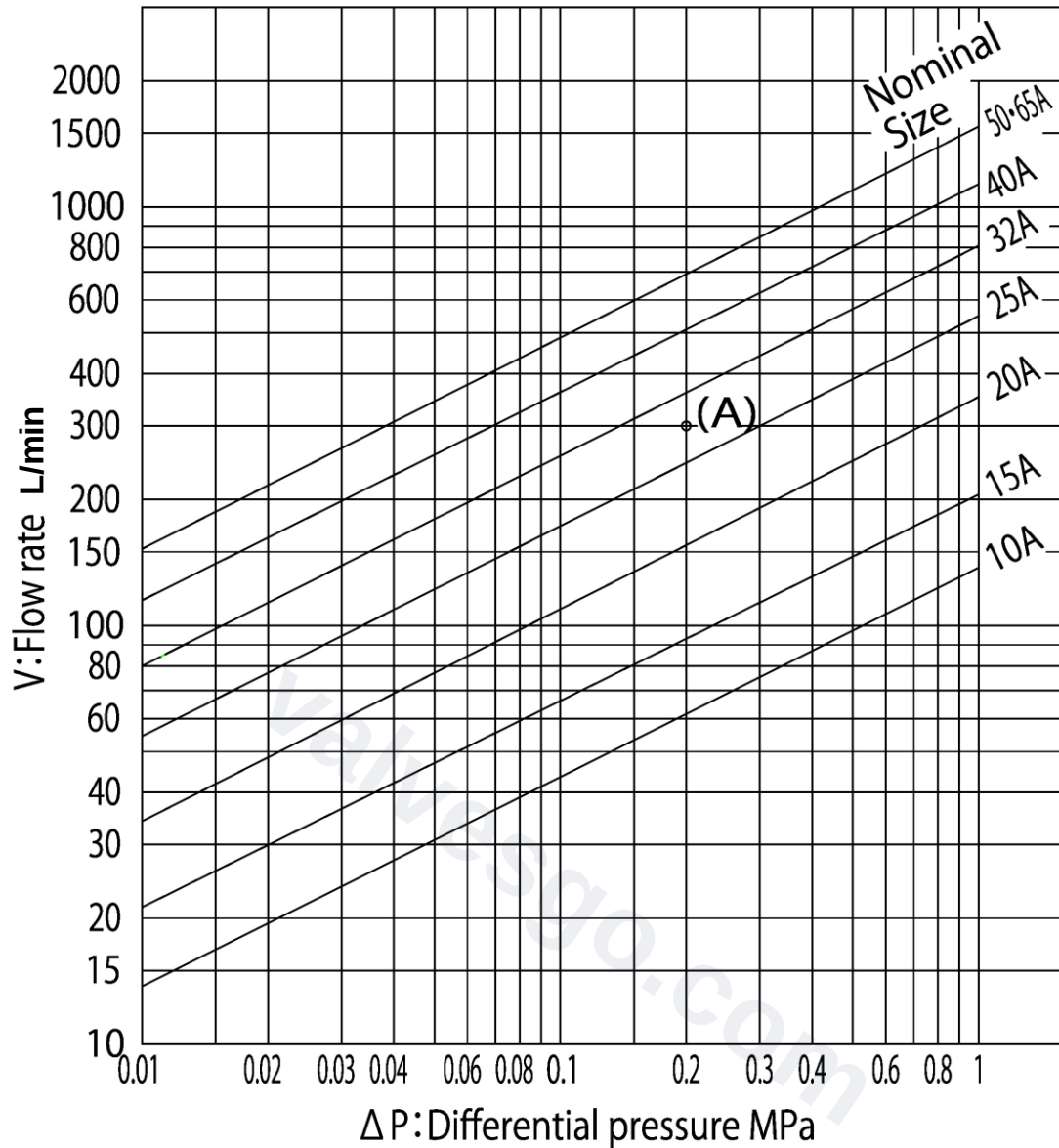
■ For air



#### [How to use the chart]

When selecting the nominal size of a solenoid valve whose inlet pressure (P<sub>1</sub>), outlet pressure (P<sub>2</sub>) and air (20°C) flow rate (Q) are 0.5 MPa, 0.3 MPa and 800 m<sup>3</sup>/h (standard condition), respectively, first find intersection point (A) of P<sub>1</sub> = 0.5 MPa and P<sub>2</sub> = 0.3 MPa. Trace down vertically from this intersection point (A) to find intersection point (B) with Q = 800 m<sup>3</sup>/h (standard condition). Since this intersection point (B) lies between nominal sizes 20 A and 25A, select the larger one, 25A.

■ For water



**[How to use the chart]**

When selecting the nominal size of a solenoid valve whose inlet pressure ( $P_1$ ), outlet pressure ( $P_2$ ) and flow rate ( $V$ ) are 0.5 MPa, 0.3 MPa and 300 L/min, respectively, first find intersection point (A) of the differential pressure before and after the valve [ $\Delta P = 0.5 - 0.3 = 0.2$  MPa] and  $V = 300$  L/min. Since this intersection point (A) lies between nominal sizes 25A and 32A, select the larger one, 32A.

### 3.2 Nominal size selection

#### ■ Cv value calculation formula

##### <Steam>

$$\text{When } P_2 > \frac{P_1}{2} \quad C_v = \frac{Wk}{138\sqrt{\Delta P(P_1 + P_2)}}$$

$$\text{When } P_2 \leq \frac{P_1}{2} \quad C_v = \frac{Wk}{120P_1}$$

##### <Air>

$$\text{When } P_2 > \frac{P_1}{2} \quad C_v = \frac{Q}{2940} \sqrt{\frac{(273 + t)G}{\Delta P(P_1 + P_2)}}$$

$$\text{When } P_2 \leq \frac{P_1}{2} \quad C_v = \frac{Q\sqrt{(273 + t)G}}{2550P_1}$$

##### <Liquid>

$$C_v = \frac{0.365V\sqrt{G}}{\sqrt{\Delta P}}$$

Cv: Cv value of each nominal size

W: Max. steam flow rate [kg/h]

Q: Max. gas flow rate [m<sup>3</sup>/h (standard condition)]

V: Max. liquid flow rate [m<sup>3</sup>/h]

P<sub>1</sub>: Inlet pressure [MPa·A]

P<sub>2</sub>: Outlet pressure [MPa·A]

ΔP: P<sub>1</sub> – P<sub>2</sub> [MPa]

K: 1 + 0.0013 × {superheated steam temp.[°C]

– saturated steam temp. [°C]}

G: Specific gravity (relative to air for gas,  
or relative to water for liquid)

#### ■ Cv value

| Nominal size                                                    | 10A | 15A | 20A | 25A  | 32A  | 40A  | 50A  | 65A  |
|-----------------------------------------------------------------|-----|-----|-----|------|------|------|------|------|
| DP-100, DP-100F,<br>DP-100-D, DP-100F-D,<br>DP-100-C, DP-100F-C | 3.0 | 4.5 | 7.5 | 12.0 | 17.7 | 25.0 | 33.6 | 33.6 |

## 4. Installation



### Warning

Electric wiring work must be done by experienced professional.

- If there is a risk of death, bodily injury or damage to property at the time of malfunction of the product, be sure to install a suitable safety device that controls fluid flow interception/release or sounds an alarm.
- The product cannot be used as an emergency shutoff valve.  
\* The product is not designed as a safety valve such as an emergency shutoff valve. If the product is applied to a system that needs safety measures, install other equipment besides the product to ensure the safety.
- The product is not explosion-proof. Do not use it in the area or ambience where explosive gases accumulate.  
\* Using the product under the said conditions may cause fire.
- Connect the cables only after confirming that no power is supplied.  
\* Failure to follow this notice may cause an electric shock.
- Connect the cables according to the instructions after confirming the rated voltage.  
\* Erroneous cable connection may cause an electric shock or fire.
- Do not supply electric power to the coil while it is detached from the valve.  
\* Failure to follow this notice may result in coil burnout or fire due to an overcurrent.

**Caution**

1. When installing the product with the coil set sideways, make sure that the differential pressure (the min. differential pressure to operate the valve) between the inlet and outlet is 0.03 MPa or more (see Table 1 on Page 1).  
\* Failure to follow this notice may result in an abnormal operation.
2. Though the product can be installed at any angle between vertical and horizontal, it cannot be installed upside-down (see Table 1 on Page 1).  
\* Failure to follow this notice may result in an abnormal operation.
3. Before connecting piping to the product, remove foreign substances and dirt inside the piping.  
\* Failure to follow this notice may prevent the product from functioning properly.
4. When installation, check the direction of the product so that the fluid flowing and the arrow marked on the product are in the same direction.  
\* Failure to follow this notice may prevent the product from functioning properly (the valve cannot close).
5. Make sure to connect a strainer (80–100 mesh) to the inlet of the product.  
\* Failure to follow this notice may prevent the product from functioning properly.
6. Do not apply excessive load, torque or vibration to the product.  
\* Failure to follow this notice may result in drastically shortened service life.
7. Secure enough space required for disassembly or removal of the product at maintenance or inspections.  
\* Failure to follow this notice prevents maintenance and inspections being implemented.

■ Minimum space for disassembly or removal

Model: DP-100, DP-100F

| Nominal size | L1  | L2,L3,L4 |
|--------------|-----|----------|
| 10-25A       | 185 | 150      |
| 32-65A       | 250 | 200      |

Model: DP-100-D, DP-100F-D

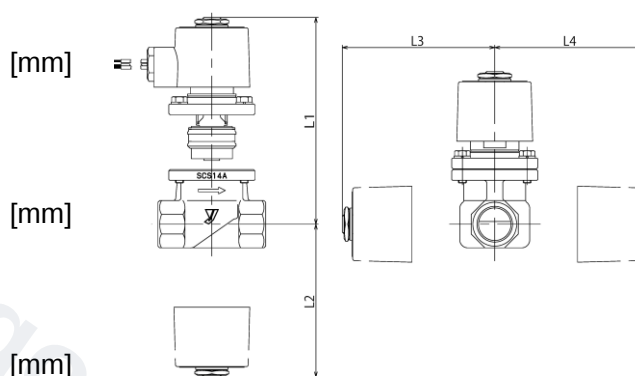
| Nominal size | L1  | L2,L3,L4 |
|--------------|-----|----------|
| 10-25A       | 200 | 165      |
| 32-65A       | 275 | 225      |

Model: DP-100-C, DP-100F-C

| Nominal size | L1  | L2,L3,L4 |
|--------------|-----|----------|
| 10-25A       | 230 | 200      |
| 32-65A       | 300 | 250      |

L1: Required space for removal/disassembly of the coil

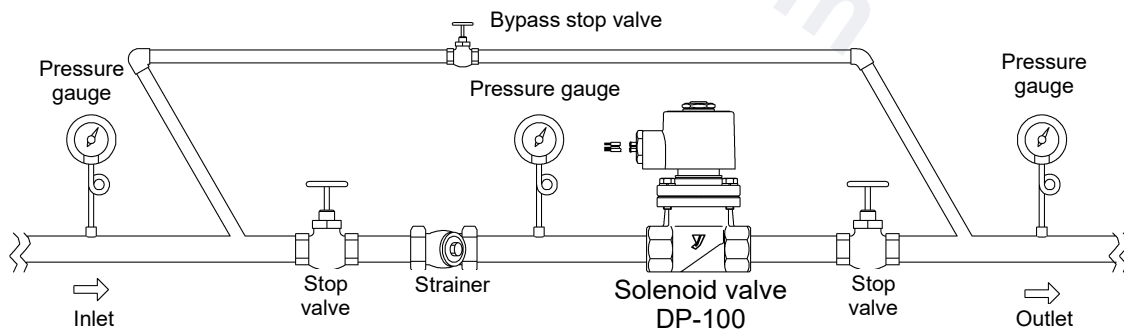
L2, L3, L4: Required space for replacement of the product



8. If the product is used outdoors, place protective covers or guards above the product in order to avoid exposure to water.  
\* Failure to follow this notice may cause an electric leakage.
9. Do not apply insulation to the solenoid coil.  
\* Failure to follow this notice may cause the coil burn out with abnormal temperature rise, which causes malfunction of the product.
10. When the product is used in a facility which cannot stop operating, install a bypass line with a bypass stop valve.  
\* Use the bypass line while troubleshooting or disassembling the product so that the facility can keep operating.
11. Before piping, remove foreign substances and note that seal materials must not flow into the inside of the valve and piping.  
\* Foreign substances may cause valve seat leakage and malfunction.
12. When using the product under the conditions where the outlet pressure can accidentally become higher than the inlet pressure, install a check valve at the outlet side to prevent backflow.  
\* Failure to follow this notice may cause backflow even during the solenoid valve is closed.
13. If the product is used in a steam line and negative pressure generates at its outlet side when it is closed, install a vacuum breaker at the outlet side.
14. When using the product in a steam line, install a steam trap in the line.  
\* Failure to follow this notice may cause condensate-induced problems.
15. When the product is used in a steam line, install it in such a way that avoids condensate accumulation at the inlet side.  
\* Failure to follow this notice may result in malfunction.

16. If case of a possible frozen line, take proper measures to remove water inside the piping or equip the product with insulating materials.  
\* Freezing may damage the product. However, do not insulate the coil.
17. When installing the product in the piping, do not grip and turn it with a tool.  
\* Failure to follow this notice may damage the coil.
18. Do not pull the lead wires or hold the wire to lift and carry the product.  
As for the terminal box attached type, do not pull the terminal box or carry the product by holding the terminal box only.  
\* Failure to follow this notice may damage the coil (or the terminal box).
19. Make the lead wires connected to the coil long enough so that the coil is easily dismantled or replaced when required.
20. Band and support the lead wires of the coil to avoid their contact with workers or other equipment and to avoid subjecting the wires to its own weight and tension.
21. Install the product vertically to a horizontal piping with the coil faced upward, if using the product for the equipments where the pressure difference between the inlet and outlet sides can accidentally become 0 MPa at least temporary, such as a heat exchanger (see the table 1 on Page 1).  
\* Failure to follow this notice may prevent the product from functioning properly.
22. When an automatic control valve is installed at the inlet or outlet side of the product, keep more than 3 meters between them.  
\* Failure to follow this notice may result in malfunction of the product due to differential pressure fluctuation caused by fluctuation in inlet pressure at the time of the product actuation.
23. The nominal size of piping at the product inlet side should not be smaller than that of the product (do not reduce the inlet pipe diameter).  
Additionally, use the stop valves at the inlet and outlet side of the product at full open condition (see "4.1 Piping example").  
\* Failure to follow this notice may result in malfunction of the product due to differential pressure fluctuation caused by fluctuation in inlet pressure at the time of the product actuation.
24. Installing the product in the closed piping may cause temperature rise and volume expansion of the fluid, which may damage the product.
25. High viscosity fluids may cause parts to stick and malfunction.
26. Do not use dissimilar metal pipes that generate potential differences. Products and parts may cause corrosion.
27. Please consider usage conditions such as frequency of use and durability when selecting the product.

#### 4.1 Piping example



- \* Differential pressure of at least 0.03 MPa is required to actuate the product when the coil is set sideways.
- \* Use the stop valves at the inlet and outlet of the product at full open condition.

## 4.2 Wiring method

1. Wiring method differs between the voltages, AC 100 / 110 V and 200 / 220 V. Bind the lead wires of the coil according to the instruction on the label attached to the coil.
2. In order to prevent disconnection or insulation failure, avoid unnecessarily pulling the lead wires or subjecting them to excessive load while wiring or use.
3. Use electric wires which have a core of 0.75 mm<sup>2</sup> or more.
4. Install a fuse (3A) to protect the electric circuit. In addition, if the product is used in a fuel supply system, install a circuit protector of a rated current shown in the following.

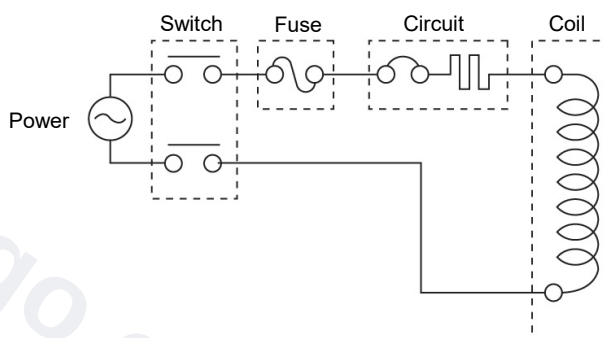
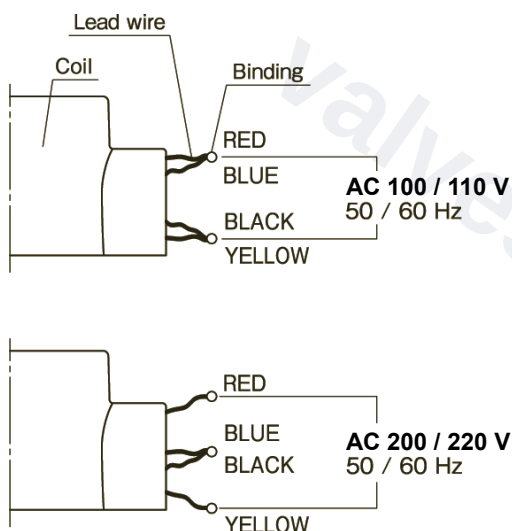
Rated current of circuit protector

[A]

| Model         |        | DP-100, DP-100F, DP-100-C and DP-100F-C |                | DP-100-D and DP-100F-D |
|---------------|--------|-----------------------------------------|----------------|------------------------|
| Rated voltage |        | AC 100 / 110 V                          | AC 200 / 220 V | DC 24 V                |
| Nominal size  | 10-25A | 0.5                                     | 0.3            | 2                      |
|               | 32-65A | 0.75-1                                  | 0.5            |                        |

5. When using a terminal box, do not rotate it to change its posture.

\* Failure to follow this notice may cause disconnection or insulation failure.



6. DC coil has two lead wires (red and black). Connect each of them to + and – (the correspondence relation is undecided).

## 5. Operating Procedure



### Warning

1. Do not touch the coil with bare hands while it is energized.  
\* Failure to follow this notice may result in burns.
2. Do not touch the product with bare hands when the product is used for hot fluid.  
\* Failure to follow this notice may result in burns.
3. Before leading fluid, make sure that there is no danger when the fluid flows to the end of piping.  
\* The fluid outflow may cause physical damage.  
\* The hot fluid, if spouted out, may scald your skin.



### Caution

1. When the product is newly installed or left without being operated for a long time, perform test working before starting operation.
2. Completely discharge the fluid inside of the product and line before leaving the product not operated for a long time.  
\* Failure to follow this notice may cause malfunction due to rust inside of the product and lines, or result in damage due to freezing.
3. Sudden application of pressure to the product may open the valve instantly and cause leakage.
4. When the product is used with AC voltage, it may produce a buzzing sound depending on the conditions of use.

### 5.1 Test working

Before performing test working, be sure to close the stop valves installed at both the inlet and outlet sides of the product and remove foreign substances and scale completely by flushing the bypass line.

1. Before leading the fluid into the product, switch it on and off a few times and confirm that clicking sound caused by the plunger when the coil turns on.
2. Fully open the stop valve at the outlet side.
3. With the product at open position, open the stop valve at the inlet side gradually and confirm that the fluid flows to the end of the piping.
4. Gradually close the stop valve at the outlet side, and confirm the fluid does not leak from the product or connection parts of the piping joints.
5. With the product at closed position, fully open the stop valves at both the inlet and outlet sides.
6. Switch on and off a few times to confirm that the product opens and closes properly.
7. With the product at closed position, confirm there is no leakage at the end of the piping.

In case of any abnormal condition observed during test working, refer to “6. Maintenance” to take proper measures and treatment.

## 6. Maintenance

Since most of the troubles with the product are caused by foreign substances inside of the piping, care should be taken. Note that any repairs caused by foreign substances or scales are subject to a charge even during the warranty period.



### Warning

Disassembly and maintenance must be done by experienced professional or valve manufacturer.

1. Confirm that no power is supplied before disassembling or maintenance.  
\* Failure to follow this notice may cause an electric shock.
2. Completely discharge the pressure inside of the product, line and equipment before disassembling or maintenance and cool down the product till it can be touched with bare hands in the case of high-temperature fluid.  
\* Failure to follow this notice may result in injury or burns due to residual pressure.
3. Do not supply electric power to the coil while it is detached from the valve.  
\* Failure to follow this notice may result in coil burnout or fire due to an overcurrent.



## Caution

1. Conduct daily/periodic inspections in order to maintain the optimal performance of the product.
2. Be careful not to drop the product at the time of disassembling, and put the disassembled parts on soft cloth in order to avoid scratch and damage.  
\* Failure to follow this notice may prevent the product from functioning properly.
3. When repairing, do not use the parts other than the dedicated parts manufactured by Yoshitake. Do not modify the product.  
\* Failure to follow this notice may cause damage to the product, or may result in scalds or injury due to blow-off or malfunction.
4. In the event of troubles, close the stop valves and turn off the power before inspection.  
\* Failure to follow this notice may result in bodily injury.
5. If any defect is found on the product during the daily/periodic inspections, be sure to contact the local distributor and follow its instructions.
6. Be sure to replace the gasket with new one at the time of reassembly of the product.  
\* Failure to follow this notice may cause leakage of the fluid.
7. After re-assembling, perform test working before starting operation again.
8. While disassembling, the fluid leaks from inside of the product. Set a container to collect the fluid. Completely discharge the fluid inside of the product prior to disassembly.
9. When reassembling, connect all the parts securely. Tighten the bolts uniformly in diagonal positions to prevent uneven tightening.

### 6.1 Daily and periodic inspections

Conduct daily and periodic inspection/replacement in order to maintain the optimal performance of the product.

■ Daily inspection (to be conducted once every operational day.)

| Item               | How to inspect                                                             | Trouble and remedy                                       |                            |
|--------------------|----------------------------------------------------------------------------|----------------------------------------------------------|----------------------------|
| Working conditions | Check that the valve opens when switched on, and closes when switched off. | The valve does not open.<br>(Fluid does not flow.)       | See “6.3 Troubleshooting.” |
|                    |                                                                            | The valve does not close.<br>(Fluid flow does not stop.) |                            |
| Outside leakage    | Inspect the product visually.                                              | See “6.3 Troubleshooting.”                               |                            |

■ Periodic inspection (to be conducted once every year.)

| Item                                                 | How to inspect                                                          | Trouble and remedy                                      |                                                                   |
|------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------|
| Seal seat surfaces of the body and the valve element | Disassemble the product and visually inspect the parts.                 | Seal seat surface of the valve is damaged.              | Replace the valve complete set (or the upper parts complete set). |
|                                                      |                                                                         | Seal seat surface of the body is damaged.               | Replace the product.                                              |
| Seal seat surface and sliding surface of the plunger | Disassemble the product and visually inspect the parts.                 | Seal seat surface, sliding surface or both are damaged. | Replace the valve complete set (or the upper parts complete set). |
| Sliding movement of the piston ring                  | Disassemble the product and inspect movement of the valve complete set. | The piston ring is damaged.                             | Replace the valve complete set (or the upper parts complete set). |
|                                                      |                                                                         | The piston ring cannot be detached from the valve.      |                                                                   |

## 6.2 Periodic replacement of parts

|                                                                                                  |                                                                                                                    |                                                  |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
|  <b>Caution</b> | Replace the following parts when the time below comes in order to maintain the optimal performance of the product. |                                                  |
|                                                                                                  | ■ Part replacement                                                                                                 |                                                  |
|                                                                                                  | Part                                                                                                               | Recommended replacement period                   |
|                                                                                                  | Piston ring*                                                                                                       | Per the earlier of 500,000 actuations or 2 years |
|                                                                                                  | Inner ring*                                                                                                        |                                                  |
|                                                                                                  | Valve*                                                                                                             |                                                  |
|                                                                                                  | Plunger*                                                                                                           |                                                  |
|                                                                                                  | Coil                                                                                                               | Per 4 years                                      |
| * These parts are replaced together as a valve complete set (or upper parts complete set).       |                                                                                                                    |                                                  |
| * Replace the cover gasket at the same time.                                                     |                                                                                                                    |                                                  |

## 6.3 Troubleshooting

| Trouble                                                  | Cause                                                                                    | Remedy                                                                                                                                                                                   |
|----------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The valve does not open.<br>(Fluid does not flow.)       | 1. Strainer installed at the inlet side of the product is clogged.                       | 1. Clean the strainer.                                                                                                                                                                   |
|                                                          | 2. Plunger a'ssy is stuck with foreign substances in the piping.                         | 2. Disassemble the product and remove foreign substances. Make sure that the sliding action is smooth.                                                                                   |
|                                                          | 3. Pilot valve seat portion gets stuck with foreign substances                           | 3. Replace the valve complete set (or the upper parts complete set).                                                                                                                     |
|                                                          | 4. Fluid pressure exceeds the specified working pressure.                                | 4. Adjust the fluid pressure to the appropriate level.                                                                                                                                   |
|                                                          | 5. Fluid viscosity exceeds 20 cSt.                                                       | 5. Adjust the fluid viscosity to the appropriate level.                                                                                                                                  |
|                                                          | For Model DP-100, DP-100F, DP-100-D or DP-100F-D, see *1.                                |                                                                                                                                                                                          |
|                                                          | For Model DP-100-C or DP-100F-C, see *2                                                  |                                                                                                                                                                                          |
| The valve does not close.<br>(Fluid flow does not stop.) | 1. Plunger a'ssy or valve seat is stuck with foreign substances or get damaged.          | 1. Disassemble the product and remove foreign substances. Replace the valve complete set (or the upper parts complete set) with a new one if any damage is observed.                     |
|                                                          | 2. Plunger a'ssy is stuck with foreign substances in the piping.                         | 2. Disassemble the product and remove foreign substances. Make sure that the sliding action is smooth.                                                                                   |
|                                                          | 3. Inlet/outlet of the product is installed in the opposite direction of the fluid flow. | 3. Reinstall the product correctly.                                                                                                                                                      |
|                                                          | 4. Bypass stop valve is kept open.                                                       | 4. Close the bypass stop valve.                                                                                                                                                          |
|                                                          | 5. The differential pressure is less than 0.03 MPa when the coil is set sideways.        | 5. Adjust the differential pressure to be 0.03 MPa or more. If the minimum differential pressure is not obtained, install the product to a horizontal piping with the coil faced upward. |
|                                                          | For Model DP-100, DP-100F, DP-100-D or DP-100F-D, see *2.                                |                                                                                                                                                                                          |
|                                                          | For Model DP-100-C or DP-100F-C, see *1.                                                 |                                                                                                                                                                                          |
| The product vibrates.                                    | 1. There is a constricted part of piping just in front of the inlet of the product.      | 1. See 22 and 23 in "Caution" for "4. Installation".                                                                                                                                     |
|                                                          | 2. Gas is commingled in the liquid. (When the applied fluid is liquid.)                  | 2. Avoid commingling of gas.                                                                                                                                                             |

| Trouble                       | Cause                                                                                                  | Remedy                                                                                                                                                                                             |
|-------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Abnormal sound is heard.      | 1. Hexagon nut clamping the coil is loosened.                                                          | 1. Retighten the nut with the specified torque 15N·m.                                                                                                                                              |
|                               | 2. Foreign substances exist on the internal surface of the pipe or at the top surface of plunger assy. | 2. Disassemble the product and remove foreign substances.<br>If the foreign substances cannot be removed, replace the cover complete set and valve complete set (or the upper parts complete set). |
|                               | 3. Fluid pressure exceeds the specified working pressure.                                              | 3. Adjust the fluid pressure to the appropriate level.                                                                                                                                             |
|                               | 4. Voltage applied to the coil is not proper.                                                          | 4. Check the voltage.                                                                                                                                                                              |
| External leakage is observed. | 1. Pipe is loosened.                                                                                   | 1. Replace the cover complete set (or the upper parts complete set).                                                                                                                               |
|                               | 2. Hexagon head bolt is loosened.                                                                      | 2. Retighten it with the specified torque.                                                                                                                                                         |
|                               | 3. Cover gasket is damaged.                                                                            | 3. Replace the cover gasket.                                                                                                                                                                       |

|    | Cause                                                                                                                              | Remedy                                                                                                                                                                   |
|----|------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *1 | No electric conduction (trouble with electric circuit).                                                                            | Check the power supply and voltage.                                                                                                                                      |
|    | Wires of coil not bound proper for the applied voltage.                                                                            | Wire the coil properly for the applied voltage. If the trouble still exists, replace the coil with new one.                                                              |
|    | Voltage fluctuates widely.                                                                                                         | Adjust the electric circuit to regulate the voltage within the allowable fluctuation.                                                                                    |
|    | Coil specifications do not match with the applied voltage.                                                                         | Replace the coil with new one proper for the applied voltage.                                                                                                            |
|    | Coil burned out with abnormal temperature rise caused by use in high ambient temperature condition or in insulated condition, etc. | Use the product in ambient temperature lower than that indicated in "1. Specifications". Additionally, do not insulate the coil. Under such condition, replace the coil. |
| *2 | Electricity is kept conducted.                                                                                                     | Check the power supply.                                                                                                                                                  |

## 6.5 Disassembly (See "7. Exploded Drawing.")

1. Loosen the hexagon nut (nominal size: 19 mm) on the top of the coil and remove the coil. Pay attention not to lose the small parts such as washers and O-ring.
2. Loosen the hexagon bolts by 2 to 3 mm and check that no residual pressure is detected.

### ■ Nominal size of hexagon bolt

| Nominal size of the product  | 10A-20A | 25A-32A | 40A-65A |
|------------------------------|---------|---------|---------|
| Nominal size of hexagon bolt | 10 mm   | 13 mm   | 17 mm   |

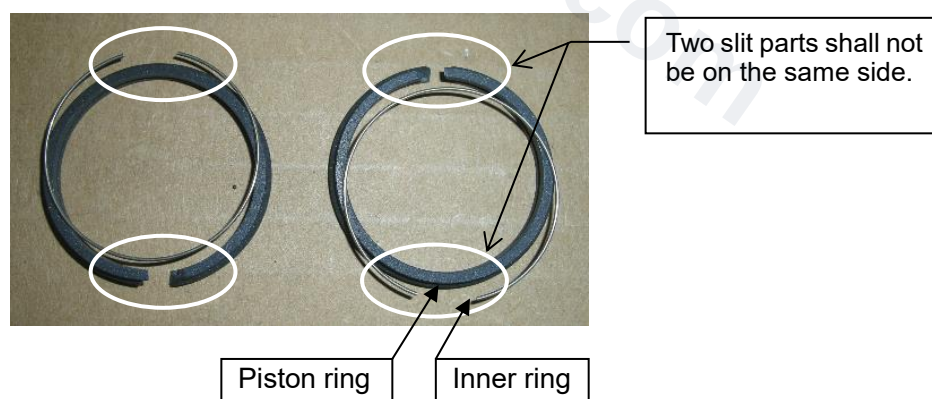
3. a. DP-100, DP-100F, DP-100-D, DP-100F-D  
Remove the hexagon bolts and the cover complete set and then take off the valve complete set and the kick spring.  
b. DP-100-C, DP-100F-C  
Remove the hexagon bolts and the upper parts complete set.
4. Pay attention not to have the disassembled parts damaged, deformed or lost.
5. Reassemble the parts in the reverse order of disassembly. Replace the gasket at the time of reassembly.

### (1) Attachment of piston rings and inner rings to the valve

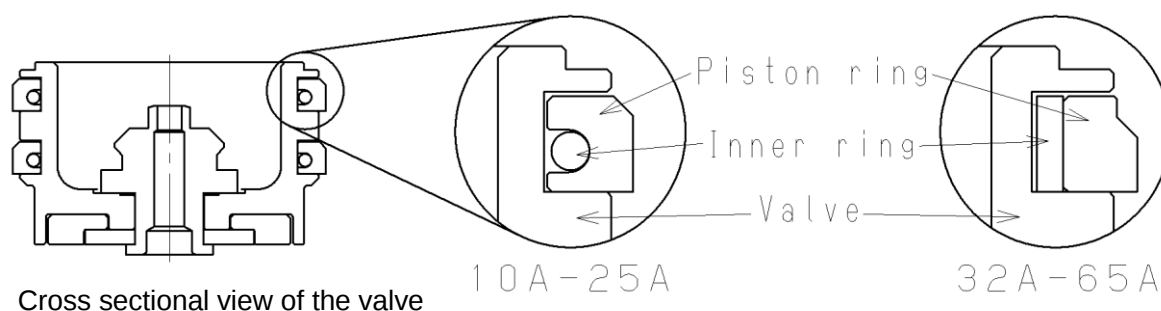
#### ⚠ Caution

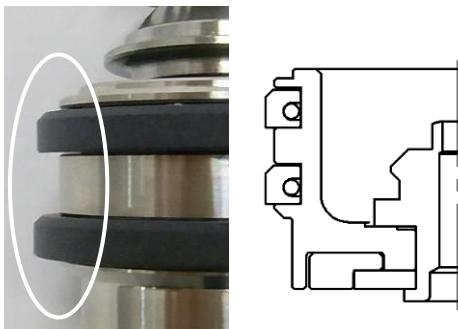
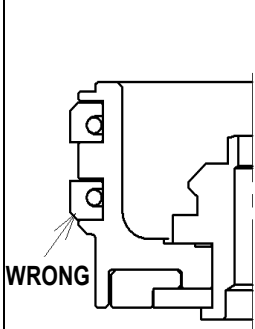
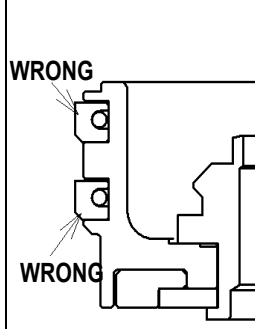
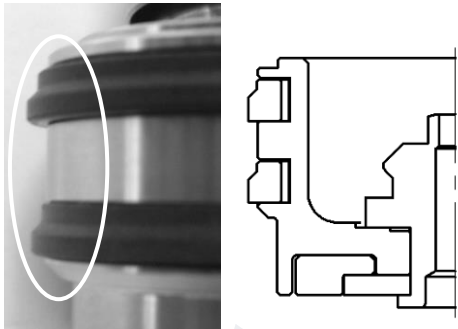
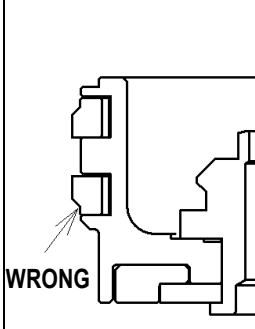
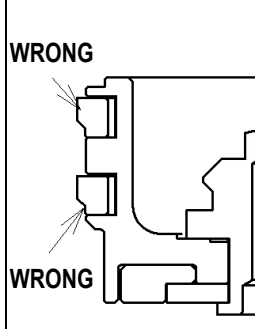
Since the piston ring and inner ring have installation direction, install them as below. Incorrect installation may cause operation trouble.

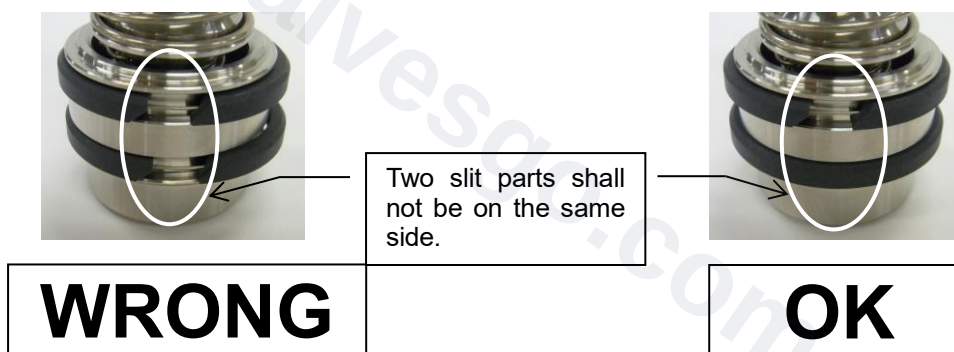
Put the piston ring and the inner ring at positions in which the slit part of each ring is placed on the opposite side.



Attach piston rings and inner rings to the valve with checking the top and bottom sides of the piston rings. Place the inner ring at inside of the piston ring. The piston rings shall be attached in a way that the slit part of each ring is not on the same side.



| Nominal size | OK                                                                                | WRONG<br>Lower ring is placed upside down.                                         | WRONG<br>Both rings are placed upside down.                                         |
|--------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 10-25A       |  |  |  |
| 32-65A       |  |  |  |



## (2) Tightening the hexagon bolts

Fasten the cover complete set to the body with hexagon bolts, using the torque specified below. Be sure to evenly tighten each hexagon bolt.

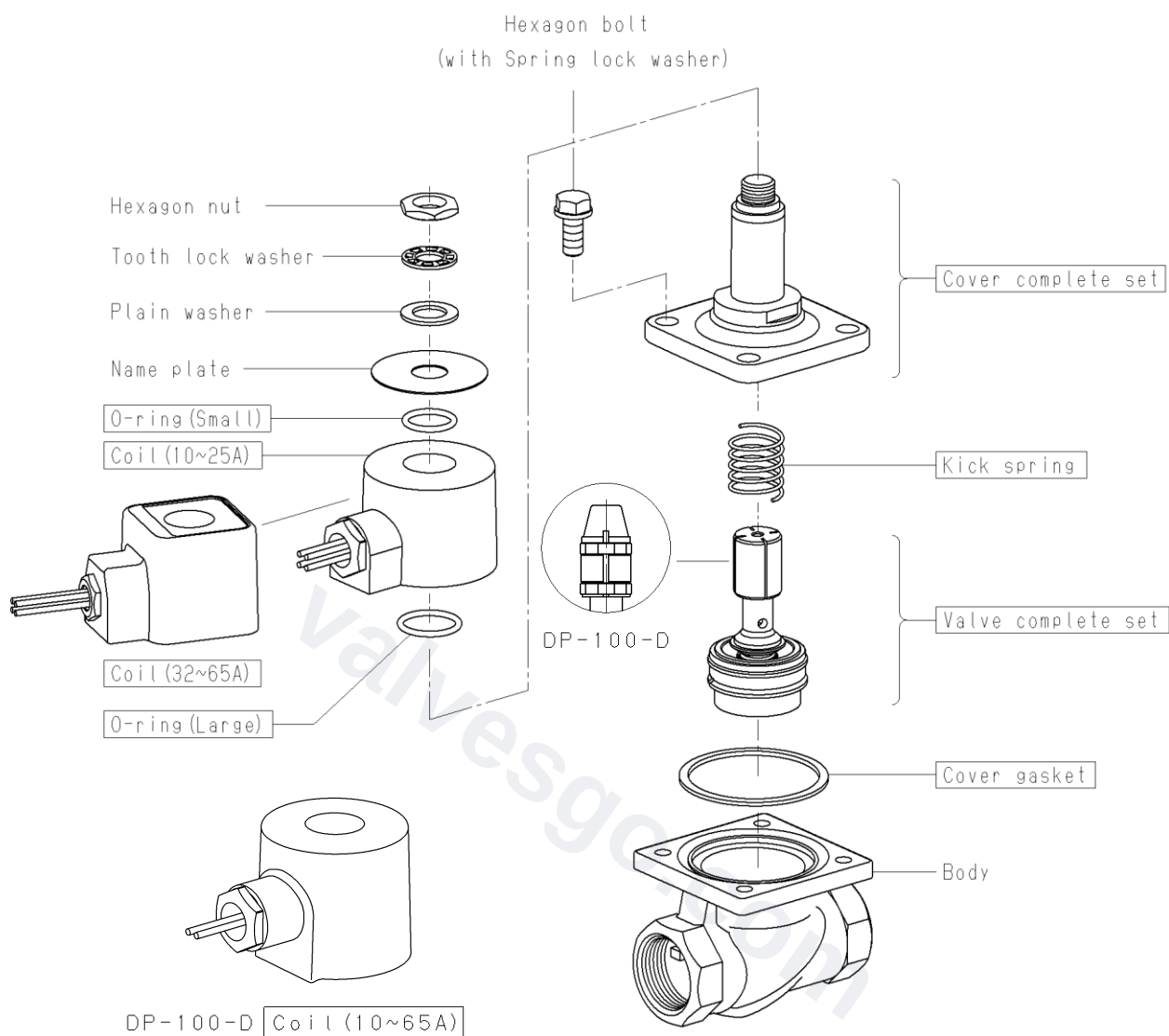
\* Apply lubricant agent (Recommendation: SOLVEST No.110 paste, STT Inc.) to the threaded area.

### ■ Tightening torque

| Nominal size | Tightening torque (N·m) |
|--------------|-------------------------|
| 10-15A       | 8                       |
| 20A          | 10                      |
| 25A          | 16                      |
| 32A          | 23                      |
| 40-65A       | 30                      |

## 7. Exploded Drawing

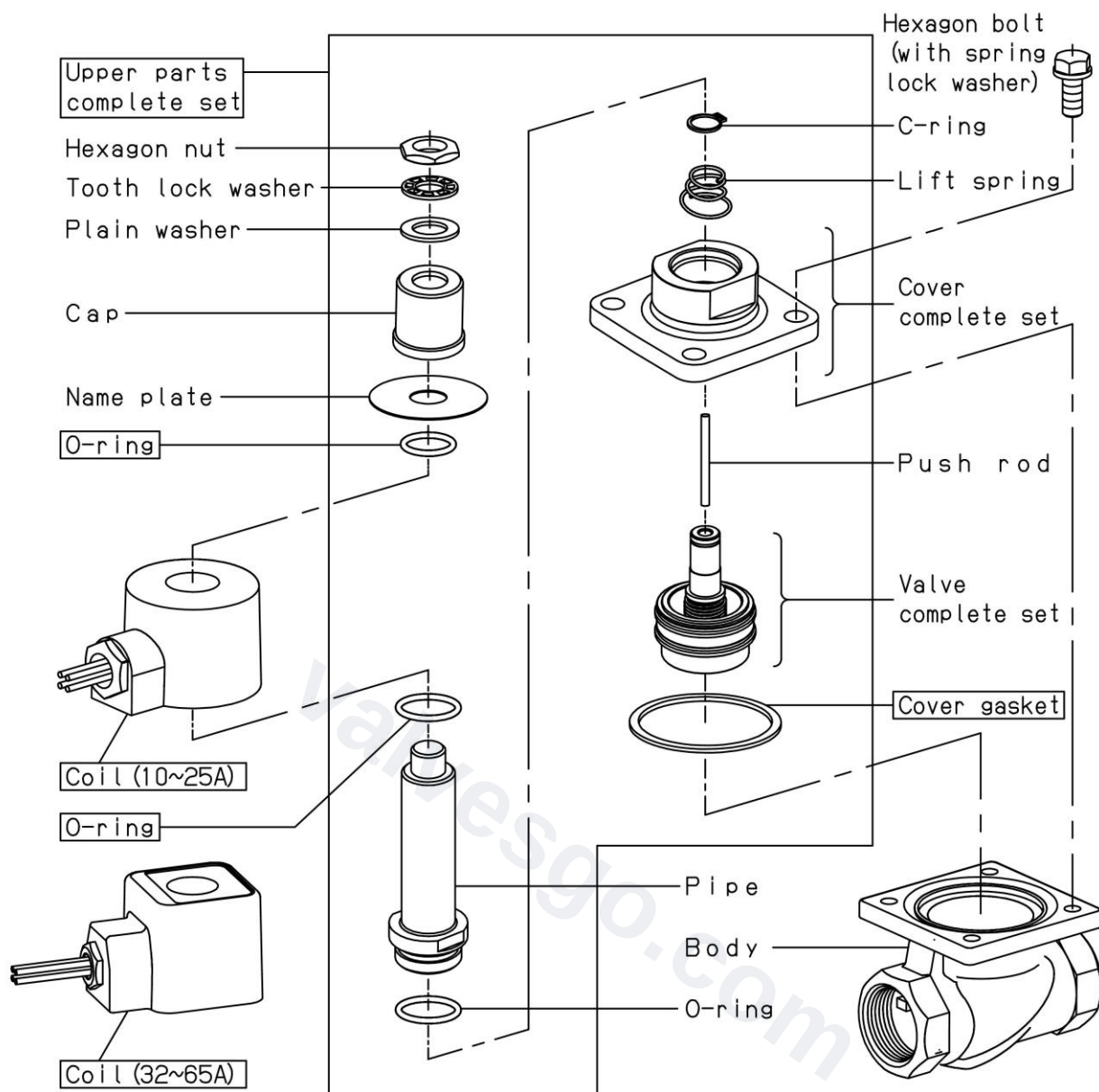
- DP-100, DP-100-D  
(Flanged type is available as DP-100F and DP-100F-D.)



The parts name shown in the rectangle boxes are available as consumable supply.

\* Apply lubricant agent (Recommendation: SOLVEST No.110 paste, STT Inc.) to the threaded area.

- DP-100-C  
(Flanged type is available as DP-100F-C.)



The parts name shown in the rectangle boxes are available as consumable supply.

\* Apply lubricant agent (Recommendation: SOLVEST No.110 paste, STT Inc.) to the threaded area.

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## Warranty Information

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1. Limited warranty

This product has been manufactured using highly-advanced techniques and subjected to strict quality control. Please be sure to use the product in accordance with instructions on the manual and the label attached to it.

Yoshitake warrants the product to be free from any defects in material and workmanship under normal usage for a period of one year from the date of receipt by the original user, but no longer than 24 months from the date of shipment from Yoshitake's factory.

2. Parts supply after product discontinuation

This product may be subject to discontinuation or change for improvement without any prior notice. After the discontinuation of the product, Yoshitake supplies the repair parts for 5 years otherwise individually agreed.

3. This warranty does not cover the damage due to any of below:

- (1) Valve seat leakage or malfunction caused by foreign substances inside piping.
- (2) Improper handling or misuse.
- (3) Improper supply conditions such as abnormal water pressure/quality.
- (4) Water scale or freezing.
- (5) Trouble with power/air supply.
- (6) Any alteration made by other than Yoshitake.
- (7) Use under severe conditions deviating from the design specifications (e.g. in case of corrosion due to outdoor use).
- (8) Fire, flood, earthquake, thunder and other natural disasters.
- (9) Consumable parts such as O-ring, gasket, diaphragm and etc.

Yoshitake is not liable for any damage or loss caused by malfunction or defect of the product.

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