OPERATION MANUAL

PILOT OPERATED 4-WAY SOLENOID VALVES
SERIES VFS6000

SUB-PLATE TYPE
 TABLE OF CONTENTS

1. SPECIFICATIONS ................................................................. 1
   1) Standard Specifications ............................................. 1
   2) Model Specifications ................................................ 2

2. MODEL IDENTIFICATION ...................................................... 2
   1) VALVE MODEL IDENTIFICATION .................................... 2

3. INDICATOR LIGHT SURGE SUPPRESSOR .................................... 3

4. REPLACEMENT AND REMOVAL ............................................... 3

5. CONNECTION OF LEAD WIRES ............................................... 4
   1) DIN Terminal Board Type .......................................... 4
   2) Plug-in type ........................................................ 4
   3) Non plug-in Type ................................................... 5

6. INSTALLATION ............................................................... 5

7. PIPING ............................................................................. 5

8. ENVIRONMENTAL CONDITIONS .............................................. 6

9. LUBRICANTS .................................................................... 6

10. MAINTENANCE .................................................................. 6

11. TROUBLE AND REMEDY ...................................................... 7
    1) Location the source of trouble ................................... 7
    2) TROUBLESHOOTING ................................................. 8
    3) REMEDY ................................................................ 8
1. SPECIFICATIONS

1) Standard Specifications

<table>
<thead>
<tr>
<th>MEDIA</th>
<th>Air, inert gases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. operating pressure MPa (kgf/cm²)</td>
<td>1.0 (10.2)</td>
</tr>
<tr>
<td>Min. operating pressure MPa (kgf/cm²)</td>
<td>0.1 (1.0)</td>
</tr>
<tr>
<td>Proof pressure MPa (kgf/cm²)</td>
<td>1.5 (15.3)</td>
</tr>
<tr>
<td>Ambient and operating fluid temperature, °C</td>
<td>(Note 1) -10〜+60</td>
</tr>
<tr>
<td>Lubrication</td>
<td>(Note 2) Unnecessary</td>
</tr>
<tr>
<td>Protection</td>
<td>Dust-proof</td>
</tr>
<tr>
<td>Pilot valve manual operation</td>
<td>Non-lock push type (Flush type)</td>
</tr>
<tr>
<td>Rated voltage of coil</td>
<td>100VAC, 200VAC, 50/60Hz 24VDC</td>
</tr>
<tr>
<td>Allowable voltage fluctuation, %</td>
<td>-15〜+10 (at rated voltage)</td>
</tr>
<tr>
<td>Classification of coil insulation</td>
<td>class B or equivalent (130°C)</td>
</tr>
<tr>
<td>Apparent power, VA (Power consumption, W)</td>
<td>AC</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC</td>
</tr>
</tbody>
</table>

Note 1) In low temperature applications, use dry air.

2) When supplying oil, use turbine oil Class 1 (ISO VG32 or equivalent).
2) Model Specifications

<table>
<thead>
<tr>
<th>Valve Functions</th>
<th>Model</th>
<th>Port size</th>
<th>Eff.Area,mm (CV Factor)</th>
<th>1) Max. Operating Frequency, CPM</th>
<th>2) Response Time, ms</th>
<th>3) Weight, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-position single solenoid</td>
<td>VFS61**</td>
<td>Rc(PT) 3/4 Rc(PT) 1</td>
<td>162(9.0) 180(10.0)</td>
<td>180</td>
<td>160max</td>
<td>2.50</td>
</tr>
<tr>
<td>2-position double solenoid</td>
<td>VFS62**</td>
<td>Rc(PT) 3/4 Rc(PT) 1</td>
<td>162(9.0) 180(10.0)</td>
<td>180</td>
<td>60max</td>
<td>2.75</td>
</tr>
</tbody>
</table>

Note
1) Conforming to JIS B8375-1981 (once a month)
2) Conforming to JIS B8375-1981.
   SUP.press.: 0.5MPa(5.1kgf/cm²), Solenoid:w/o Surge suppressor.
3) Figures in the list are those without a sub-plate.
   for models with a plug-in sub-plate 65kg(Rc3/4), 1.5kg(Rc1) respectively.

2. MODEL IDENTIFICATION
1) VALVE MODEL IDENTIFICATION.

   ![Diagram]

   
   VFS6000 series

   ① Valve functions
   1 2-position single
   2 2-position double

   ② Body type
   0 Plug-in sub-plate
   1 Non plug-in sub-plate

   ③ Body option
   0 Standard
   1 With direct manual

   ④ Method of pilot signal
   None Internal pilot
   *R External pilot
   *Semi-standard

   ⑤ Power source
   1 100 VAC, 50/60 Hz
   2 200 VAC, 50/60 Hz
   *3 110-120 VAC, 50/60 Hz
   *4 220 VAC, 50/60 Hz
   5 24 VDC
   *6 12 VDC
   *7 240 VAC, 50/60 Hz
   *9 others
   *Semi-standard

   ⑥ Electrical entry
   F Conduit terminal
   E Grommet terminal
   D Din type terminal

   ⑦ Option
   None Not provided
   Z W/Indicator light surge suppressor

   ⑧ Port size
   None W/O Sub-plate
   06 Rc(PT) 3/4
   10 Rc(PT) 1

   ⑨ Pipe threads
   None Rc(PT)
   *N NPT
   *T NPTF
   *F G(PF)
   *Semi-standard
3. INDICATOR LIGHT  SURGE SUPPRESSOR

The indicator light surge suppressor can easily be mounted by the circuit board assembly (Part No. VF4000-9A*) to the pin terminal of the terminal board inside body.

The circuit is as follows:
- 100 VAC.VDC or more
- 24 VDC or less

4. REPLACEMENT AND REMOVAL

Remove the bolts (M8x80 4psc.), and extract straight the solenoid valve body from the sub-plate.
Extract straight to avoid problems.

When mounting the solenoid valve body to the base, be sure to insert the pin assembly (male pin side) straight to the receptacle assembly (female pin side).

Replacement of pilot valve

For either plug-in type or non plug-in type pilot valve, replacement can be performed in the same procedure as that of the solenoid valve body.
5. CONNECTION OF LEAD WIRES

1) DIN Terminal Board Type

The male pin terminals of the DIN terminal board are internally connected to the solenoid as shown below; connect the lead wires to the respective terminals of the connector.

Note: No polarity

Applicable insulated cable: Cables of 6.8 to 11.5mm in diameter
Applicable solderless terminals: Three types shown below
1.25Y-3L, 1.25-3.5S, 1.25-4M

Fastening torque of connector: Clamping screws: 6kgf-cm
Terminal screws: 9kgf-cm

2) Plug-in Type (with terminals)

First remove junction cover of the terminal block
(Part No. AXT622-5)

On the terminal block are put the following markings; connect them to the power supply side

<table>
<thead>
<tr>
<th>Marking on terminal block</th>
<th>Solenoid A Side</th>
<th>Solenoid B Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>com</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When the "com" terminal is used, it becomes "+com".
This can easily be attained by inserting special probe C
(Part No. VVF4000-6-2) com between (+) terminals from rear.
3) Non plug-in Type (with terminals)
Remove cover 1, and then connect the lead wires to terminal block 2 inside the body.

6. INSTALLATION
1) The unit can be installed in almost any position. For double-solenoid models, however, be careful so that the spool valve is parallel to the ground.
In applications where vibration is unavoidable, install the unit so that the spool valve is perpendicular to the direction of vibration.
(Do not use this unit in a place where vibration of more than 5G is expected.)

7. PIPING
1) Use a pipe of inside diameter equal to or larger than the nominal diameter.
2) Before piping, thoroughly flush both primary (supply pressure side) and secondary (final controlling element side) pipes to completely clear away dust, scale, and other foreign matters generated during piping job.
3) When wrapping the threads with a teflon sealing tape, leave one to two threads exposed at the tip of the thread and press the tape onto the thread by a finger nail to tightly adhere.
When using a liquid sealing agent, also leave one to two threads and be careful not apply too much agent on the threads.
In no case should the female threads be applied with the agent.
Fastening torque

<table>
<thead>
<tr>
<th>Thread</th>
<th>Proper fastening torque, kgf-cm (N-m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rc(PT)1/8</td>
<td>70-90 (7-9)</td>
</tr>
<tr>
<td>Rc(PT)3/4</td>
<td>280-300 (28-30)</td>
</tr>
<tr>
<td>Rc(PT)1</td>
<td>360-380 (36-38)</td>
</tr>
</tbody>
</table>

Pay utmost attention to design and performance of piping to facilitate removal and installation of the unit in the event of trouble.

8. ENVIRONMENTAL CONDITIONS

1) When the unit is used in a dusty location, protect the rod of the cylinder to prevent dust from entering the secondary side through the rod.

On the EXH port, provision should be made to prevent dust from entering the unit either by installing a silencer to the EXH port or installing an elbow with its open end pointing downward.

2) In applications where installation of the unit in a place exposed to corrosive gas, chemical solution or its vapor, seawater, etc. or where high temperatures more than 60 °C is expected is unavoidable, consult with the manufacturer.

9. LUBRICANTS

1) The unit does not require lubrication. If however, lubrication is required for any reason such as the use of a lubrication-requiring cylinder, install a lubricator (oiler) in the primary side piping to supply atomized oil. Use turbine oil Class 1 (ISO VG32) as a lubricant. Never use spindle oil or machine oil. In low temperature applications, use low temperature lubricant.

Example: Idemitsu Kosan, lubricant for low temperatures,

Daphne Super Hydro 32WR -20 to +60 °C

Turbine oil is higher in viscosity at low temperatures below 0 °C, causing valve trouble.

10. MAINTENANCE

1) This solenoid valve does not require any particular maintenance. If, however, any trouble should occur during operation, refer to the troubleshooting list.

2) The carbon powder generated from an air pressure source (mainly a compressor) and oil contaminants will adhere to the spool, increasing the sliding resistance of the spool and
5. REPLACEMENT AND SPACE FOR REMOVAL.

For replacement of the valve assembly, refer to

SHOOTING.

Corrective action based on the chart in 13. TROUBLE-

Step3 Once the real source of trouble is located, take a

phenomenon.

of the higher probability judging the actual

Step2 Check the possible sources of trouble in the order

(3) Poor Seal?

(2) Buzzing?

(1) Faulty operation?

Step1 What is the phenomenon or trouble?

1. TROUBLES AND REMEDY

The gaskets do not slip.

/all the parts in place. Tighten all the bolts evenly so that

4) When assembling the disassembled parts, be sure to replace

in clean solution.

In so doing, do not immerse the “O” ring attached to the sieve
corrosion.

Clean them in a solution such as trichloroethylene or tri-

extract the spoon and sieve from the valve body, and then

er plate and end cap (in which the return spring is housed),

water generated at an air pressure source. Remove the adapt-

(3) When the spoon and the sieve seize because of the foreign

identification: Number: CP series C555, C49

Reference: A-80

Commercially available compressor lubricants are:

Particulates from entering the inside of the valve, then

Series After a normal filter (AF series) will prevent fine

installation of a mist-separating with finer filtration (AM-

better quality which forms less oxidized substances.

Type of compressor lubricant and use compressor oil with

sieve, causing the spoon to seize. In such a case, check the

air or oil contamination will build up between the spoon and

for a long period of time, the carbon powder condensed in the

the unit is fitted with the SUP. Pressure applied to the unit

In applications where the air with poor quality is used, it

eventually resulting in faulty operation of the valve.

In the event of the spoon may completely seize, pay particu-

In the Worst case, the spoon may completely seize, pay particu-
2) TROUBLESHOOTING

- Faulty operation
  - Check operation of pilot valve
    - Exhausting from pilot EXH port when deenergized
    - Though pilot valve does not shift, main valve will not shift
  - Faulty returning of spool valve
    - Does operate but shift time is long
    - Worn core
    - Foreign matter caught in core

- Buzzing
  - Low line voltage
  - Worn core
  - Foreign matter caught in core

- Leakage
  - Air leaks out of seat packing
  - Air leaks out of cap (pilot EXH port)

- Defective wiring system
  - Insufficient attraction force because of drop in power voltage
  - Broken coil wire
  - Low pilot pressure
  - Seized or frozen spool valve

- Faulty wiring
  - Blown fuse or broken lead wire

3) REMEDY

<table>
<thead>
<tr>
<th>No.</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Re-wire correctly.</td>
</tr>
<tr>
<td>2</td>
<td>Replace parts and correct wiring.</td>
</tr>
<tr>
<td>3</td>
<td>Regulate power voltage.</td>
</tr>
<tr>
<td>4</td>
<td>Regulate pressure so as to fall in operating pressure range.</td>
</tr>
<tr>
<td>5</td>
<td>Replace pilot valve ass'ly.</td>
</tr>
<tr>
<td>6</td>
<td>Disassemble main valve spool and sleeve valve and eliminate dust.</td>
</tr>
<tr>
<td>7</td>
<td>Take countermeasure against freezing.</td>
</tr>
<tr>
<td>8</td>
<td>Take countermeasure against contamination of air source.</td>
</tr>
<tr>
<td>9</td>
<td>Take countermeasure against removing drain.</td>
</tr>
<tr>
<td>10</td>
<td>Fasten mounting bolts.</td>
</tr>
</tbody>
</table>

To users:
If the above remedies do not work, please send the unit back to the supplier for repair or replacement.