PILOT OPERATED SOLENOID VALVE

K20 SERIES

Metal Seal/Sub-base Mounting Type
K20 SERIES

PILOT OPERATED SOLENOID VALVE・METAL SEAL TYPE

Setting a world-famous standard quality the “ISO 9000” is rapidly gaining popularity. Total system and individual product assurance of quality is now increasingly demanded. To carry out unattended operation of FA equipment over long periods, it is necessary to further upgrade the reliability and stability of FA equipment rather than placing emphasis on improving its accuracy and speed. K Series solenoid valves have been developed with a priority on “High quality and reliability”.

Reliable design assuring stable operation.

Our world-renowned miniature solenoid flap valve characteristic of Zero sliding resistance, is used as a pilot operator. The main valve incorporates KURODA’s uniquely designed lapped sleeve and spool with a high degree of hardness and low friction.
Safety design for prevention against environmental pollution.

K Series solenoid valves conform to "IP (International Protection Grade) 65" to provide protection against dust and water and can be used in any areas (outdoors) where it may be exposed to splashing water, oil etc., with the exception of direct sunlight. Plastic component parts are made of slow burning material equivalent to V0 grade of UL94 to prevent fire hazards from welding spatters.

Protective housing
The IEC (International Electrotechnical Commission) pub.529 indicates applicable environmental conditions using a Property Mark "IP" (International Protection) and a 2-digit figure following the IP mark.

IP65 : Housing designed for proof against dust and direct water from all directions. Test is performed in accordance with JIS C0920 as follows:
- Sprinkling water at 12.5 l/min using a ø6.3mm test nozzle.
- Sprinkling water from a distance of 3m for 3 minutes.

Bipolar type
As the DC model is of bipolar type despite incorporating a indicator light, polarity does not matter. So the solenoid valve is free from problems encountered from mis-wiring.

Friendly design
Sufficient capability to drive any cylinder of up to ø100 by using effective area of 18mm² (Cv 1).

Sizing

<table>
<thead>
<tr>
<th>Cylinder bore size (mm)</th>
<th>Cylinder speed (mm/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ø40</td>
<td>0 200 400 600 800 1000</td>
</tr>
<tr>
<td>ø50</td>
<td>0 200 400 600 800 1000</td>
</tr>
<tr>
<td>ø63</td>
<td>0 200 400 600 800 1000</td>
</tr>
<tr>
<td>ø80</td>
<td>0 200 400 600 800 1000</td>
</tr>
<tr>
<td>ø100</td>
<td>0 200 400 600 800 1000</td>
</tr>
</tbody>
</table>

(Note) As cylinder speed varies according to piping and other components in the circuit, use these values as guide for selection.

High pressure model
High pressure model that can withstand 1.6 MPa (16.3 kgf/cm²) is available on request. Standard model can withstand up to 1 MPa (10.2 kgf/cm²).

Multi-purpose function
Solenoid valve designed with a balanced spool works as (common) external pilot system so that compressed air can be supplied from any port to provide multi-purpose functions.

Port size
In addition to standard port size Rc threaded (tapered pipe thread), G thread (parallel pipe thread), NPT and NPTF threaded models are available on request.

Manifold blocking indicator
Where P and R ports are blocked, they can be clearly identified by blocking module color, making it easy to check manifold specifications.
5-PORT PILOT OPERATED SOLENOID VALVE/METAL SEAL
K20P SERIES
Sub-base model

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Unit</th>
<th>K20PS25</th>
<th>K20PD25</th>
<th>K20PD35</th>
<th>K20PE35</th>
<th>K20PO35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid</td>
<td></td>
<td>Non-lubricated/lubricated air</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port size</td>
<td>mm²</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating ambient temperature</td>
<td>°C</td>
<td>−5~50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating humidity</td>
<td>%</td>
<td>Below 85 RH</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure range</td>
<td>MPa(kgf/cm²)</td>
<td>0.15<del>0.8(1.5</del>8.2)</td>
<td>−0.1<del>1(10Torr</del>10.2) for external pilot operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum frequency</td>
<td>cycle/min</td>
<td>700</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>AC</td>
<td>ON s</td>
<td>0.025</td>
<td>0.02</td>
<td>0.025</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF s</td>
<td>0.02</td>
<td></td>
<td></td>
<td>0.045</td>
</tr>
<tr>
<td></td>
<td>DC</td>
<td>ON s</td>
<td>0.03</td>
<td>0.02</td>
<td>0.02</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF s</td>
<td>0.02</td>
<td></td>
<td></td>
<td>0.035</td>
</tr>
<tr>
<td>Pilot air exhaust</td>
<td></td>
<td>Captured exhaust</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection grade</td>
<td></td>
<td>IP65</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>No base</td>
<td>g</td>
<td>220</td>
<td>315</td>
<td>425</td>
<td></td>
</tr>
<tr>
<td></td>
<td>With sub-base</td>
<td>g</td>
<td>395</td>
<td>490</td>
<td>600</td>
<td></td>
</tr>
</tbody>
</table>

(Note) Pressure range of external pilot supply : 0.15~0.8MPa(1.5~8.2kgf/cm²)

ELECTRICAL SPECIFICATIONS

| Rated voltage | V | AC100/110, 200/220 DC24 |
| Permissible voltage fluctuation | V | AC90~120, 180~240 DC20.4~26.4 |
| Rated frequency | Hz | 50/60 |
| AC solenoid power consumption | 50Hz VA | 3.3 |
|                      | 60Hz VA | 2.2 |
| Inrush AC solenoid power consumption | 50Hz VA | 4.3 |
|                      | 60Hz VA | 3.4 |
| DC solenoid power consumption | W | 2 |
| Insulation grade | JIS grade B |
| Withstand voltage | V | AC1800V for 1 minute, DC1200V for 1 minute |
| Wiring | DIN connector |
PILOT OPERATED SOLENOID VALVE/K20P Series

ORDERING INSTRUCTIONS

<table>
<thead>
<tr>
<th>Model No.</th>
<th>100 DP L</th>
<th>02 B Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>K20PS25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K20PD25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K20PD35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K20PE35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K20PO35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≡K20PP35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **Voltage**
   - 100 AC100V/110V
   - 200 AC200V/220V
   - D24 DC24

2. **Wiring**
   - DP DIN connector (With indicator light and surge suppressor)
   - D DIN connector (With surge suppressor)
   - Q Without DIN connector (With surge suppressor)

3. **Manual override**
   - No mark (Standard)
   - L With locking button

4. **Port size**
   - NB Without sub-base
   - 02 Rc½
   - C3 G½
   - N2 NPT½
   - F2 NPT½
   - G1 G½
   - N1 NPT½
   - F1 NPT¾

5. **Special specifications**
   - Z External pilot, captured pilot exhaust

6. **Port**
   - No mark (Standard/Sub-base)
   - B Bottom ported

(Note) 01, G1, N1, F1: Only for bottom ported

SPARE PARTS

**Sub-base**
- Standard (Side piping) [K20P-SB-02]
- External pilot [K20P-SB-01B]

**Base gasket** K20P-G

**Body mounting screw set** K20P-SB

**DIN connector**
- Standard (Without indicator light) [K20-D]
- With indicator [K20-01B]

MADE TO ORDER

- **Threads other than Rc thread**
  - G, NPT, NPTF

- **Bottom ported**
  - Port size for bottom ported: Rc½, G½, NPT½, NPTF½
  - For bottom ported, plugged side ports: G½
  - P, A, B, R1 and R2 ports on side surface are plugged. Pilot exhaust port (Y) is provided on side.
  - For external pilot type, external pilot port (X) is provided on side.

- **External pilot**
  - External pilot port (X) is provided on side for all models including bottom ported.

- **Locking manual override**
- **Special voltage**
  - For specific voltage other than rated voltage, contact KURODA.

- **Cylinder halfway stopping solenoid valve/K20PP35**
  - Rubber seal, 3-position, all port blocked type solenoid valve. It has same configuration as K20PO35. For detailed information, contact KURODA.
CONSTRUCTIONS
K20PD35, K20PE35, K20PO35

MAIN PARTS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body</td>
<td>Aluminium alloy</td>
</tr>
<tr>
<td>2</td>
<td>Spool</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>3</td>
<td>Piston</td>
<td>Resin</td>
</tr>
<tr>
<td>4</td>
<td>Manual override</td>
<td>Resin</td>
</tr>
<tr>
<td>5</td>
<td>End cover</td>
<td>Resin</td>
</tr>
<tr>
<td>6</td>
<td>Pilot operator</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Detent</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Return spring S</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>9</td>
<td>Return spring 3P</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>10</td>
<td>Spring retainer</td>
<td>Resin</td>
</tr>
<tr>
<td>11</td>
<td>Sub-base</td>
<td>Aluminium alloy</td>
</tr>
<tr>
<td>12</td>
<td>Base gasket</td>
<td>NBR</td>
</tr>
</tbody>
</table>
PILOT OPERATED SOLENOID VALVE/K20P Series

DIMENSIONS
K20PD25

(Unit: mm)

B port : Re 1/4

A port : Re 1/4

Y port : Re 1/4

2 - φ4.6

Manual override

R2 port : Re 1/4

R1 port : Re 1/4

P port : Re 1/4

X port : Re 1/4

B type (Bottom ported)

Z type (External pilot)
PILOT OPERATED SOLENOID VALVE/K20P Series

DIMENSIONS
K20PD35, K20PE35, K20PO35, K20PP35 (Made to order)

(Unit: mm)

Z type (External pilot)

B type (Bottom ported)

A port: Rc1/4

Y port: Rc1/4

B port: Rc1/4

R2 port: Rc1/4

R1 port: Rc1/4

P port: Rc1/4

KURODA
# INDIVIDUAL WIRING TYPE MANIFOLD

**MFO-K20P**

Split type

<table>
<thead>
<tr>
<th>MFSO-K20P</th>
<th>Common P, common R (End ported) Captured pilot exhaust A &amp; B ports on side</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFB-K20P</td>
<td>Common P, common R (End ported) Captured pilot exhaust A &amp; B ports on bottom</td>
</tr>
</tbody>
</table>

---

## ORDERING INSTRUCTIONS

<table>
<thead>
<tr>
<th>Manifold</th>
<th>Mountable solenoid valve models</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFS 8 K20P 02</td>
<td>K20PS25 100 DP L NB</td>
</tr>
</tbody>
</table>

1. **Type of manifold**
   - MFS: Common P, common R (End ported) Captured pilot exhaust A & B ports on side
   - MFB: Common P, common R (End ported) Captured pilot exhaust A & B ports on bottom

2. **Special specifications**
   - No mark: Internal pilot (Standard)
   - X: Common external pilot

3. **Number of stations**
   - 2: 2 station
   - 20: 20 station

<table>
<thead>
<tr>
<th>MFS</th>
<th>A &amp; B port P &amp; R port</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>Rc 1/4</td>
</tr>
<tr>
<td>G2</td>
<td>G 1/4</td>
</tr>
<tr>
<td>N2</td>
<td>NPT 1/4</td>
</tr>
<tr>
<td>F2</td>
<td>NPTF 1/4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MFB</th>
<th>A &amp; B port P &amp; R port</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>Rc 1/4</td>
</tr>
<tr>
<td>G1</td>
<td>G 1/4</td>
</tr>
<tr>
<td>N2</td>
<td>NPT 1/4</td>
</tr>
<tr>
<td>F2</td>
<td>NPTF 1/4</td>
</tr>
</tbody>
</table>

4. **Mountable solenoid valve models**
   - K20PS25
   - K20PD25
   - K20PD35
   - K20PE35
   - K20PO35
   - K20PP35

5. **Port size**
   - NB: Without sub-base

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- 100 AC 100/110V
- 200 AC 200/220V
- D24 DC 24V

6. **Wiring**
   - DP: DIN connector (With indicator light and surge suppressor)
   - D: DIN connector (With surge suppressor)
   - Q: Without DIN connector (With surge suppressor)

7. **Manual override**
   - No mark: Standard (Non-locking)
   - L: With locking button

---

*Made to order*
## INDIVIDUAL WIRING TYPE MANIFOLD

### MANIFOLD SPECIFICATIONS

<table>
<thead>
<tr>
<th></th>
<th>MFSC-K20P</th>
<th>MFBO-K20P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of manifold</strong></td>
<td>Common P, common R (End ported) Captured pilot exhaust A &amp; B ports on side</td>
<td>Common P, common R (End ported) Captured pilot exhaust A &amp; B ports on bottom</td>
</tr>
<tr>
<td><strong>Fluid</strong></td>
<td>Non-lubricated/lubricated air</td>
<td></td>
</tr>
<tr>
<td><strong>Operating temperature range</strong></td>
<td>−5~50°C</td>
<td></td>
</tr>
<tr>
<td><strong>Pressure range</strong></td>
<td>0.15<del>0.8MPa(1.5</del>8.2kbf/cm²)</td>
<td>−0.1~1MPa(10Tor−10.2kbf/cm²) For external pilot operation</td>
</tr>
<tr>
<td><strong>Port size</strong></td>
<td>P, R port Rc⅔, G⅔, NPT⅔, NPTF⅔</td>
<td>Rc⅔, G⅔, NPT⅔, NPTF⅔</td>
</tr>
<tr>
<td></td>
<td>A, B port</td>
<td>Rc⅔, G⅔, NPT⅔, NPTF⅔</td>
</tr>
<tr>
<td></td>
<td>Y port</td>
<td>Rc⅔, G⅔, NPT⅔, NPTF⅔</td>
</tr>
<tr>
<td></td>
<td>X port</td>
<td>Rc⅔, G⅔, NPT⅔, NPTF⅔</td>
</tr>
<tr>
<td><strong>Number of stations</strong></td>
<td>2~20 station</td>
<td></td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td>Direct mount</td>
<td></td>
</tr>
<tr>
<td><strong>Mountable solenoid valve</strong></td>
<td>K20PS25 (2-position/single solenoid)</td>
<td>K20PD25 (2-position/double solenoid)</td>
</tr>
<tr>
<td></td>
<td>K20PD35 (3-position/center, all ports blocked)</td>
<td>K20PE35 (3-position/center, cyl. ports open to exhaust)</td>
</tr>
<tr>
<td></td>
<td>K20PC35 (3-position/center, all ports open to pressure)</td>
<td>K20PP35 (3-position/center, all ports blocked/rubber seal)</td>
</tr>
<tr>
<td><strong>Option</strong></td>
<td>Individual supply spacer (K20P-IS-O)</td>
<td>Individual exhaust spacer (K20P-IE-O)</td>
</tr>
<tr>
<td></td>
<td>Blank plate (K20P-BP)</td>
<td></td>
</tr>
</tbody>
</table>

*(Note)*: Made to order  
Pressure range of external pilot supply: 0.25~0.7MPa(2.5~7.1kbf/cm²)

### BOTTOM PORTED

Manifold MFBO-K20P has cylinder ports A and B on bottom in ordinary cases. However, P, R1 and R2 on bottom are available upon request. For your specific requirements, contact KURODA.
INDIVIDUAL WIRING TYPE MANIFOLD

MANIFOLD BLOCK

Manifold

Tie rod A

Body F

Part No. K20-MF-F

End block

Right base F

Plug

Tie rod B

Connecting screw

Left base F

Part No. K20-MF-T

Blocking module set

- Standard
  K20-BPS
  Manifold gasket R
  Identification color (Black)

- P port block
  K20-BPP
  Identification color (Red)

- R port block
  K20-BPR
  Identification color (Yellow)

- P, R port block
  K20-BPA
  Identification color (Blue)

Blank plate set

K20P-BP

Blank plate set screw

Blank plate

Base gasket
INDIVIDUAL WIRING TYPE MANIFOLD

DIMENSIONS
MFSC-K20P, MFBO-K20P

(Unit: mm)

K20PS25
K20PD25
K20PD35, K20PE35, K20PO35
Blank plate

X type (External pilot)

Bottom ported
SAFETY PRECAUTIONS

The following safety precautions are provided to prevent damage and danger to personnel and to provide instructions on the correct usage of this product. These precautions are classified into 3 categories; "CAUTION", "WARNING" and "DANGER" according to the degree of possible injury or damage and the degree of impendence of such injury or damage.

Be sure to comply with all precautions along with JIS B8370*(1) and ISO 4414*(2), as they include important content regarding safety.

**CAUTION**
- Indicates a potentially hazardous situation which may arise due to improper handling or operation and could result in personal injury or property-damage-only accidents.

**WARNING**
- Indicates a potentially hazardous situation which may arise due to improper handling or operation and could result in serious personal injury or death.

**DANGER**
- Indicates an impending hazardous situation which may arise due to improper handling or operation and could result in serious personal injury or death.

*(1) JIS B8370 : General Rules for Pneumatic Systems
*(2) ISO 4414 : Pneumatic fluid power—Recommendations for the application of equipment to transmission and control systems

**WARNING**

● The applicability of pneumatic equipment to the intended system should be judged by the pneumatic system designer or the personnel who determined specifications for such system.

As operating conditions for products contained in this catalog are diversified, the applicability of pneumatic equipment to the intended system should be determined by the pneumatic system designer or the personnel who determined specifications for such system after conducting an analysis or testing as necessary.

The system designer shall be responsible for assuring the intended system performance and safety.

Before making a system, the system designer should thoroughly examine all specifications for such a system and also take into consideration the possibility of any trouble with the equipment.

● The pneumatic equipment should be handled by persons who have sufficient knowledge and rich experience.

Improper handling of compressed air will result in danger.

Assembling, operation and maintenance of machinery using pneumatic equipment should be performed by persons who have sufficient knowledge and rich experience.

● Never operate machinery nor remove the equipment until safety is assured.

- Before checking or servicing machinery and equipment, be sure to check that steps for prevention of dropping or runway of the driven component have been completely taken.
- When removing the equipment, make sure that the above-mentioned safety measures have been done beforehand.

Then turn off air supply and power to the system and purge compressed air in the system.

- When restarting machinery and equipment, check that proper prevention of malfunction has been provided for and then restart carefully.

● When using the pneumatic equipment in the following conditions or environments, take the proper safety measures and consult KURODA beforehand.

- Conditions and environments other than specified and outdoor use.
- Applications to nuclear power equipment, railroads, aircraft, vehicles, medical equipment, equipment connected with food and drink, amusement facilities and safety devices such as emergency interruption devices, clutch/brake circuits for a press and the likes.
- Applications which require extreme safety and will also greatly affect men and property.
Technical precaution

⚠️ WARNING

- **Driving an actuator**
  When driving an actuator such as a cylinder etc. by means of a solenoid valve, take proper measures to prevent hazards which may be caused by the actuator.

- **Influence of back pressure when used with manifold**
  When using a solenoid valve mounted on a manifold, take the necessary precautions to prevent the malfunction of the actuator from back pressure.
  When there is the possibility of such malfunction, take proper measures.

- **Holding pressure (and vacuum)**
  As solenoid valve operation may sometimes involve an air leak, it cannot be used for holding pressure (and vacuum) in a pressure vessel.

- **Solenoid valves cannot be used as emergency cutout valves.**
  Solenoid valves contained in this catalogue are not designed as safety valves such as emergency cutout valves etc.
  When safety valves are required, select other solenoid valves intended for such exclusive use.

- **Keeping space for maintenance**
  Keep space for maintenance and inspection.

- **Releasing residual pressure**
  Be sure to provide a residual pressure releasing function in the pneumatic circuit to facilitate maintenance and inspection.

- **Using in a vacuum**
  When using a solenoid valve as a vacuum selector valve, take the proper measures to prevent the suction of dust and foreign matter from the pad and exhaust port.

How to select

⚠️ WARNING

- **Check specifications**
  Products contained in this catalogue are designed for use only in pneumatic systems (and vacuum systems).
  Avoid using them in pressures or temperatures outside the range of the specifications, otherwise a breakdown or faulty operation may result.
  When using fluids (and vacuum) other than compressed air, contact KURODA beforehand.
Be sure to read the following precautions before use.

Environmental conditions

**WARNING**
- Avoid using the valve in an atmosphere where corrosive gas, chemicals, seawater, water or vapor are permeating.
- When the valve is used at low temperature of less than 5 °C, it may be frozen.
  Use it in dry air passed through an air dryer.

Quality of air

**CAUTION**
- Use a filter with filtration of 5μm or fine. Using a coalescing filter or mist cleaner in combination with the filter will improve the quality of air.
- Take sufficient care of the filter drain. Drain can be removed by passing through an air dryer.
- If sludge contained in the compressor oil enters the valve the pneumatic equipment may sometimes go wrong. In this case, it is recommended to use compressor oil (NISSEKI FAIRCRAO A68, IDEMITSU DAPHONUSUPER CS 68) or take a sludge prevention using an coalescing filter or mist cleaner in combination.

Piping

**CAUTION**
- Thoroughly flush the inside of pipes before piping.
- When screwing the pipe and fitting, use care to prevent thread cutting and sealants from entering the pipe and fitting.
- When taping the sealant, do so as shown below:

  ![Piping diagram](image)

  Leave space of about 2 thread turns.

  ![Good](image) ![No good](image)

  When screwing, seal or tape enters equipment, causing air leak.

<table>
<thead>
<tr>
<th>Port size</th>
<th>Torque N·m(kgf·cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R6/4</td>
<td>7<del>10(70</del>100)</td>
</tr>
<tr>
<td>R6/4</td>
<td>13<del>15(130</del>150)</td>
</tr>
</tbody>
</table>

Lubrication

**CAUTION**
- No lubrication is recommended.
- When lubrication is apple, use #1 turbine oil (ISO VG32).
- Do not use spindle oil and machine oil. Otherwise, the seal and packing may be damaged.

Pressure supply (For external pilot type)

**WARNING**
- Supply pressure to external pilot valve from port X. (Port Y is pilot valve exhaust port.)
- To cut the pressure supply and exhaust air, do so for the main valve first and then for the external pilot valve.

Air exhaust

**WARNING**
- As this solenoid valve is so constructed that exhaust air from pilot valve and exhaust air from valve are collected at port R, use care that exhaust air is not extremely choked. Otherwise, it may cause a malfunction.
- When operating 5 or more solenoid valves simultaneously on a manifold of 10 or more stations, piping both sides of port P and R ports. (For common external pilot type, also open port Y.) (Standard manifold is designed to open both sides.)
Be sure to read the following precautions before use.

**Leak current**

⚠️ CAUTION

When OR circuit is used to protect the contact, leak current from OR circuit is flowing. If this leak current increases, it may cause a malfunction.

Reduce leak current to less than 1 mA.

![Leak current diagram]

**Energizing duration**

⚠️ WARNING

- The valve is designed to be energized by frequent pulse signal, if your application requires continuously energizing for long time, consult KURODA representative.
- Do not energize both solenoid simultaneously on double solenoid valve to avoid malfunction.
- For 2-position double solenoid valve, energize it for more than 20ms for complete shifting and keeping the position by detent mechanism.

**Manual override**

⚠️ CAUTION

- Non locking type (Standard)
  Push manual rod (blue) with sharp-pointed tool, and the valve will be energized just like when solenoid is turned on.

- Locking type/locking button (Made to order)
  Push locking button (red) with slotted screw driver, and valve is energized just like when solenoid is turned on.
  When locking button is rotated 90° while depressed, valve is locked to hold it in energized state.

**Mounting**

⚠️ CAUTION

Valve can be mounted at any position. However, take care that no shocks nor vibrations are directly applied to valve body.

For double solenoid or 3-position solenoid valve, mount so that main valve (spool) is horizontal.

**Wiring of DIN connector**

⚠️ CAUTION

Before wiring, be sure to turn off power supply.

Connect wire to terminal 1 and terminal 2 on the built-in terminal base. When making the connection, put H-sleeve on the stripped wire end and clamp it with the end face of terminal screw.

(Note) · Avoid fixing with a terminal screw head.
  · avoid using Y-terminals and eye-terminals.

![Wiring diagram]

<table>
<thead>
<tr>
<th>Type</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>H0.5/13</td>
<td>0495.0 0.5mm²(AWG22)</td>
</tr>
<tr>
<td>H0.75/13</td>
<td>0496.0 0.75mm²(AWG22)</td>
</tr>
<tr>
<td>H1.0/13</td>
<td>0497.0 1.0mm²(AWG22)</td>
</tr>
</tbody>
</table>

H-sleeve : Made by Japan Widemylar
Clamping torque of terminal screw : 0.5N·m(5kgf·cm)

**Maintenance**

⚠️ CAUTION

Before carrying out any maintenance service, disconnect power supply, close the shut off valve on supply line and exhaust remaining air from the pneumatic line beforehand.
Precautions

Replacing solenoid valve

Dismounting
- Loosen mounting screw of solenoid valve body and pull valve body out straight.

Mounting
- When mounting solenoid valve, adjust it to pin position of body and tighten with mounting screw.
- Solenoid valve mounting screw clamping torque: M4X40 & 3N-m(30kgf-cm)

Port identification

Port mark
Piping port marks such as P1, A14 conforming to JIS and ISO are given in the respective piping port positions.

<table>
<thead>
<tr>
<th>JIS</th>
<th>ISO</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>1</td>
<td>Supply port</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Cylinder port</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>Cylinder port</td>
</tr>
<tr>
<td>R1</td>
<td>5</td>
<td>Exhaust port</td>
</tr>
<tr>
<td>R2</td>
<td>3</td>
<td>Exhaust port</td>
</tr>
</tbody>
</table>

Type of port thread
- Type of port thread is marked on the sub-base by the following abbreviation.

<table>
<thead>
<tr>
<th>Abbrev.</th>
<th>Type of thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Rc</td>
</tr>
<tr>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>N</td>
<td>NPT</td>
</tr>
<tr>
<td>F</td>
<td>NPTF</td>
</tr>
</tbody>
</table>

Air muffer

Equip air muffer (SL-1 or SL-2L) to exhaust port (R1, R2) and pilot exhaust port (Y) to decrease exhaust noise from solenoid valve and to prevent from entering dust and dirt from the outside.

Wiring for solenoid

Wiring of the K20P Series is performed using a DIN connector.
- A surge suppressor is incorporated in the solenoid.
- Without DIN connector (Q)
- DIN connector with indicator light (DF)
- DIN connector (D)

Internal circuit of solenoid with indicator light & surge suppressor

For AC

For DC

As DC model is of bipolar type, polarity (plus and minus) does not matter.
Be sure to read the following precautions before use.

**Indicator light and surge suppressor**

Indicator light is mounted on terminal base within DIN connector so that power ON-OFF status can be checked through transparent cover. Surge suppressor is incorporated in solenoid.

**Flow rate**

Flow rate can be calculated from the following formula:

For values in the sonic velocity zone, find out from the attached table.

\[
Q = 22.7 \times S \times X / P_X (P_X - P_L) \times \sqrt{\frac{P_L}{P_X}}
\]

\[
Q = 22.2 \times S \times X / P_X (P_X - P_L) \times \sqrt{\frac{P_L}{P_X}}
\]

\[
Q = 113 \times S \times P_X \times \sqrt{\frac{P_L}{P_X}}
\]

\[
Q = 111.1 \times S \times P_X \times \sqrt{\frac{P_L}{P_X}}
\]

- **Q**: Flow rate  \( \ell / \text{min} \)
- **S**: Effective area of orifice  \( \text{mm}^2 \)
- **P_X**: Pressure on upper stream  \( \text{MPa abs}[\text{kgf/cm}^2] \)
- **P_L**: Pressure on down stream  \( \text{MPa abs}[\text{kgf/cm}^2] \)
- **T_H**: Absolute temperature on upper stream  \( \text{K} \)

(Note) Absolute pressure (MPa) = Supply pressure + 0.101 (MPa)

(Supplied pressure (kgf/cm²) = Supply pressure + 1.033 (kgf/cm²))

**Sonic velocity zone (at 20°C)**

- Effective area (mm²)
  
  \( (\text{When the value of effective area is } \times 10^{-1} \text{ or } \times 10^0 \text{ multiply the same figure by the flow rate.}) \)

**Cable connector**

- Cover mounting screw
- Rubber ring
- Washer
- Ground nut
- Terminal base
- Gasket

Cable type: Cable outside diameter 6~7mm
Cover mounting screw clamping torque: 0.3N·m (3kgf·cm)

**Changing cable connector set position**

For K20P Series, remove cover from terminal base and turn cable connector 180°.
△ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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