**Series IP8**

**Electro-Pneumatic Positioner/Smart Positioner**
(Lever type/Rotary type)

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**Dustproof / Waterproof**
Passed by external organization on JIS F8007 (conforms to IEC 60529) IP65

- A centralized exhaust system employs the combination of the check valve and the labyrinth effect enhancing both dustproof and waterproof performance.

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**Monitoring function**

- **Electro-Pneumatic Positioner**
  - Opening current transmission analog (4 to 20 mA DC) continuous output

- **Smart Positioner**
  - Alarm point output function (2 points)
  - Analog (4 to 20 mA DC) continuous output

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**With external scale plate (Rotary type, Bottom mounting)**

- **External scale plate**
  - Improved visibility of opening indicator

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**Body with LCD window**

(Smart Positioner)

- **Internal opening indicator plate**
- **Opening indicator plate inside body**

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**With internal opening indicator plate**

- **Electro-Pneumatic Positioner**
  - TIIS explosion-proof construction (Exd II BT5)

- **Smart Positioner**
  - ATEX intrinsically safe explosion-proof construction (2G Ex ia II CT4/T5/T6)

---

**Explosion-proof construction**

<table>
<thead>
<tr>
<th>Electro-Pneumatic Positioner</th>
<th>Smart Positioner</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIIS explosion-proof construction (Exd II BT5)</td>
<td>ATEX intrinsically safe explosion-proof construction (2G Ex ia II CT4/T5/T6)</td>
</tr>
</tbody>
</table>

---

**With external scale plate (Rotary type, Bottom mounting)**

- **External scale plate**
  - Improved visibility of opening indicator

---

**Electro-Pneumatic Positioner**

- Universal mechanically controlled type

- **Series IP8000/8100**

- **IP8000** (Lever type)
- **IP8100** (Rotary type)

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**Smart Positioner**

- Electronically controlled easy-adjustment transmitting type

- **Series IP8001/8101**

- **IP8001** (Lever type)
- **IP8101** (Rotary type)
Smart Positioner
Series IP8001/8101

Built-in microcomputer and sensor allows easy remote parameter change and monitoring.

- Internal push button for easy setting of various parameters (Refer to parameter list)
- Zero point/span adjustment easier than with previous mechanical positioners

Parameter List

<table>
<thead>
<tr>
<th>Notes</th>
<th>No</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Positive operation/reverse operation setting</td>
<td>Change operation direction with regard to input signal Change to internal components, piping not possible</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Split range setting</td>
<td>Change range of input signal</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Preferred zero point/span adjustment setting</td>
<td>Change actuator stroke range with regard to input signal</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Forced full close/full open setting</td>
<td>To ensure valve closure, force actuator opening to be 0% or 100% with a preferred input signal.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Valve characteristic setting</td>
<td>Select from these 6 valve characteristics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Linear characteristic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Equality % characteristic (2 kinds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Quick open characteristic (2 kinds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>User preferred point setting (11 points)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>PID constant setting</td>
<td>Change PID constant</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Calibration setting</td>
<td>Zero point/span adjustment, Auto PID constant setting, input signal display value calibration, etc.</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Alarm 1 output setting</td>
<td>Set upper/lower stroke limits for actuator from which alarm is output</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Alarm 2 output setting</td>
<td>Set increase/decrease direction for 4 to 20 mA DC output with regard to actuator stroke</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Analog (4 to 20 mA DC) output setting</td>
<td></td>
</tr>
</tbody>
</table>

Full Output Functions

Selecting models with output functions by model selection selects with alarm point output function (2 points) and analog (4 to 20 mA DC) continuous output function. This will allow remote detection of operating abnormalities.

Control State Display

Positioning, deviation, and input value are displayed (numerically) on the internal LCD, allowing visual verification of the control state.

Display example

| P  | 50.0 | Input value (%) | 60.0 | Deviation (%) | 10.0 |

Handles 2-line Input for Existing Equipment

Control furnished with conventional 2-line input signal (4 to 20 mA DC) not requiring separate power source.

HART Transmission Function

HART transmission function can be designated by model selection. Allows remote monitoring and setting change of positioner.

Intercompatible Installation

Dimensions of mounting parts same as previous mechanical series IP6000/IP8000 Electro-Pneumatic Positioner. External feedback lever and fork lever-type fitting for joining actuator and positioner are therefore also the same.

Energy Saving Product

Lever-type features 60% reduced air flow consumption compared with IP8000.
**Electro-Pneumatic Positioner**

*(Lever type/Rotary type)*

**Series IP8000/8100**

- Enclosure: JISF8007 IP65 (conforms to IEC 60529)
- Monitoring function (Opening current transmission 4 to 20 mA DC, Accessory J, JR)
- Explosion-proof construction/Electro-pneumatic positioner: TIIS explosion-proof construction (Exd II BT5), ATEX intrinsically safe explosion-proof construction (II 2G Ex ib II CT5/T6)

### How to Order

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Option</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>L</td>
<td>Low temperature (-40 to 60°C)</td>
<td>—</td>
</tr>
<tr>
<td>W</td>
<td>With internal opening indicator plate</td>
<td>—</td>
</tr>
</tbody>
</table>

**ATEX directive compliance and connection**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Pressure gauge</th>
<th>Construction Note 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>X14</td>
<td>0: None</td>
<td>No terminal box</td>
</tr>
<tr>
<td></td>
<td>1: 0.2 MPa</td>
<td>With terminal box (Exd II BT5) TIIS (Japan) explosion-proof item</td>
</tr>
<tr>
<td></td>
<td>2: 0.3 MPa</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3: 1.0 MPa</td>
<td></td>
</tr>
</tbody>
</table>

**Accessories**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Accessories</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>None (Standard)</td>
<td>—</td>
</tr>
<tr>
<td>A</td>
<td>ø0.7 Output restriction with pilot valve Note 3</td>
<td>—</td>
</tr>
<tr>
<td>B</td>
<td>ø1.0 Output restriction with pilot valve Note 3</td>
<td>—</td>
</tr>
<tr>
<td>C</td>
<td>Fork lever-type fitting M Note 6</td>
<td>—</td>
</tr>
<tr>
<td>D</td>
<td>Fork lever-type fitting S Note 6</td>
<td>—</td>
</tr>
<tr>
<td>E</td>
<td>For stroke 35 to 100 mm with lever unit Note 6</td>
<td>—</td>
</tr>
<tr>
<td>F</td>
<td>For stroke 50 to 140 mm with lever unit Note 6</td>
<td>—</td>
</tr>
<tr>
<td>G</td>
<td>Compensation spring (A) Note 7</td>
<td>—</td>
</tr>
<tr>
<td>H</td>
<td>With external scale plate Note 8</td>
<td>—</td>
</tr>
<tr>
<td>J</td>
<td>With opening current transmission (4 to 20 mA DC) Positive operation Note 9</td>
<td>—</td>
</tr>
<tr>
<td>JR</td>
<td>With opening current transmission (4 to 20 mA DC) Reverse operation Note 9</td>
<td>—</td>
</tr>
</tbody>
</table>

**Connection**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Air</th>
<th>Electric</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Rc1/4</td>
<td>G1/2</td>
<td>—</td>
</tr>
<tr>
<td>M</td>
<td>Rc1/4</td>
<td>M20 x 1.5</td>
<td>—</td>
</tr>
<tr>
<td>N</td>
<td>Rc1/4</td>
<td>1/2NPT</td>
<td>—</td>
</tr>
<tr>
<td>1</td>
<td>1/4NPT</td>
<td>G1/2</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>1/4NPT</td>
<td>M20 x 1.5</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td>1/4NPT</td>
<td>1/2NPT</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td>G1/4</td>
<td>G1/2</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td>G1/4</td>
<td>M20 x 1.5</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td>G1/4</td>
<td>1/2NPT</td>
<td>—</td>
</tr>
</tbody>
</table>

**Note 1)** For construction No.1 (with terminal box), the ambient and fluid temperatures are as follows:
- Exd II BT5 — –20 to 60°C
- Non-explosion proof (non hazardous locations only) — –20 to 80°C
- The positioner body is Exd II BT5 labeled.

**Note 2)** If two or more accessories are required, the part numbers should be made according to alphabetical order. (ex. IP8000-010-AG)

**Note 3)** “A” is applied to approx 90cm³-capacity actuator.

**Note 4)** Fork lever-type fitting MX (Connection thread: M6 x 1) for IP8100-00-0-X14.

**Note 5)** Fork lever-type fitting SX (Connection thread: M6 x 1) for IP8100-00-0-X14.

**Note 6)** Standard lever is not attached.

**Note 7)** It is to be used together with “A” or “B” when tending to overshoot by the use of “A” or “B”.

**Note 8)** For side mounting, select a model with internal opening indicator plate (IP8100-00-00-X14 for standard type, X14-W for ATEX intrinsically safe explosion-proof type).

**Note 9)** Symbol J/JR is with terminal box, non-explosion proof specification. Select 1 for Construction. Positive operation signifies clockwise rotational direction by the main actuator shaft when positioner cover is viewed from the front.

**Note 10)** Combination of L and W is not available.
Smart Positioner (Lever type/Rotary type)

Series IP8001/8101

- Auto calibration
- Enclosure: JISF8007 IP65 (conforms to IEC 60529)
- Explosion-proof construction/ATEX intrinsically safe explosion-proof construction
  (II 1G Ex ia II CT4/T5/T6)
- HART transmission function
- Monitoring function

How to Order

Specifications

- ATEX directive compliance
  - 52 ATEX directive category 1 intrinsically safe explosion-proof item

ATEX temperature

<table>
<thead>
<tr>
<th>Symbol</th>
<th>ATEX temperature</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>T4</td>
<td>IP8001 IP8101</td>
</tr>
<tr>
<td></td>
<td>T6</td>
<td></td>
</tr>
<tr>
<td>T5/T6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CE marking

- Nil
- Q CE marked product

Connection

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Air</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Rc1/4 G1/2</td>
<td></td>
</tr>
<tr>
<td>M [Note]</td>
<td>Rc1/4 M20 x 1.5</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Rc1/4 1/2NPT</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1/4NPT G1/2</td>
<td></td>
</tr>
<tr>
<td>2 [Note]</td>
<td>1/4NPT M20 x 1.5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1/4NPT 1/2NPT</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>G1/4 G1/2</td>
<td></td>
</tr>
<tr>
<td>5 [Note]</td>
<td>G1/4 M20 x 1.5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>G1/4 1/2NPT</td>
<td></td>
</tr>
</tbody>
</table>

Note: When the symbol is M, 2, or 5 for 52-ATEX directive items, a blue cable gland is included with the electrical connection.

Accessories [Note 1]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Accessories</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>None (Standard)</td>
<td>IP8001 IP8101</td>
</tr>
<tr>
<td>C</td>
<td>Fork lever-type fitting M</td>
<td>——</td>
</tr>
<tr>
<td>D</td>
<td>Fork lever-type fitting S</td>
<td>——</td>
</tr>
<tr>
<td>E</td>
<td>For stroke 35 to 100 mm with lever unit [Note 2]</td>
<td>——</td>
</tr>
<tr>
<td>F</td>
<td>For stroke 50 to 140 mm with lever unit [Note 2]</td>
<td>——</td>
</tr>
<tr>
<td>H</td>
<td>With external scale plate [Note 3]</td>
<td>——</td>
</tr>
<tr>
<td>W</td>
<td>Body with LCD window</td>
<td>——</td>
</tr>
</tbody>
</table>

Note 1) If two or more accessories are required, the part numbers should be given in alphabetical order. (ex. IP8010-010-CH)

Note 2) Standard lever is not attached.

Note 3) For side mounting, select "W" and check the control position by viewing the LCD display value.

Press gauge

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Pressure gauge Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.2 MPa IP8001 IP8101</td>
</tr>
<tr>
<td>2</td>
<td>0.3 MPa IP8001 IP8101</td>
</tr>
<tr>
<td>3</td>
<td>1.0 MPa IP8001 IP8101</td>
</tr>
</tbody>
</table>

0 Basic type

2 With output function (Analog (4 to 20 mA DC) output + Alarm output x 2)

3 With HART transmission function

Type

- Lever type IP8001
- Rotary type IP8101

001 Smart lever type

101 Smart rotary type

[Option]
Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>IP8000</th>
<th>IP8100</th>
<th>IP8001</th>
<th>IP8010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Electro-Pneumatic Positioner</td>
<td>Smart Positioner</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lever type lever feedback</td>
<td>Rotary type cam feedback</td>
<td>Lever type</td>
<td>Rotary type</td>
</tr>
<tr>
<td></td>
<td>Single action</td>
<td>Double action</td>
<td>Single action</td>
<td>Double action</td>
</tr>
<tr>
<td>Input current</td>
<td>4 to 20 mA DC (Standard)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. operating current</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>3.85 mA DC or more</td>
</tr>
<tr>
<td>Intra-terminal voltage</td>
<td>—</td>
<td>—</td>
<td>12 V DC (equivalent to 600 Ω input resistance, at 20 mA DC)</td>
<td></td>
</tr>
<tr>
<td>Max. supplied power</td>
<td>—</td>
<td>—</td>
<td>1 W (Imax: 100 mA DC, Vmax: 28 V DC)</td>
<td></td>
</tr>
<tr>
<td>Input resistance</td>
<td>235 ±15 Ω (4 to 20 mA DC)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Supply air pressure</td>
<td>0.14 to 0.7 MPa</td>
<td>—</td>
<td>—</td>
<td>0.3 to 0.7 MPa</td>
</tr>
<tr>
<td>Standard stroke</td>
<td>—</td>
<td>—</td>
<td>0 to 85 mm (Allowable deflection range 10 to 30°)</td>
<td>60 to 100°</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>60 to 100°</td>
<td>60 to 100°</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Within 0.1% F.S.</td>
<td>Within 0.5% F.S.</td>
<td>Within 0.2% F.S.</td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>Within ±1% F.S.</td>
<td>Within ±2% F.S.</td>
<td>Within ±1% F.S.</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>Within 0.75% F.S.</td>
<td>Within 1% F.S.</td>
<td>Within 0.5% F.S.</td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>Within ±0.5% F.S.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coefficient of temperature</td>
<td>Within 0.1% F.S./°C</td>
<td>Within 0.05% F.S./°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply pressure fluctuation</td>
<td>Within 0.3% F.S./0.01 MPa</td>
<td>—</td>
<td>Note 5)</td>
<td></td>
</tr>
<tr>
<td>Output flow</td>
<td>80 L/min (ANR) or more (SUP = 0.14 MPa)</td>
<td>200 L/min (ANR) or more (SUP = 0.4 MPa)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Air consumption</td>
<td>5 L/min (ANR) or less (SUP = 0.14 MPa)</td>
<td>2 L/min (ANR) or less (SUP = 0.14 MPa)</td>
<td>11 L/min (ANR) or less (SUP = 0.4 MPa)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 L/min (ANR) or less (SUP = 0.4 MPa)</td>
<td>4 L/min (ANR) or less (SUP = 0.4 MPa)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ATEX intrinsically safe explosion-proof: –20 to 80°C (T5)</td>
<td>–20 to 60°C (T6)</td>
<td>–20 to 60°C (T6)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>–40 to 60°C (T6)</td>
<td>–40 to 60°C (T6)</td>
<td>–40 to 80°C (T6)</td>
<td></td>
</tr>
<tr>
<td>Explosion proof construction</td>
<td>ATEX intrinsically safe explosion-proof construction (Exd II CT5)</td>
<td>ATEX intrinsically safe explosion-proof construction (Exd II CT5)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ATEX intrinsically safe explosion-proof construction (Exd II CT5)</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ATEX intrinsically safe explosion-proof construction (Exd II CT6)</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Exterior covering enclosure</td>
<td>JISF8007, IP65 (conforms to IEC Pub.60529)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission method</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>HART transmission</td>
</tr>
<tr>
<td>Air connection port</td>
<td>Rc 1/4 female thread, NPT 1/4 female thread, G 1/4 female thread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical connection port</td>
<td>G 1/2 female thread, M20 x 1.5 female thread, NPT 1/4 female thread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material/coating</td>
<td>Aluminum diecast body/baking finish with denatured epoxy resin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>2.4 kg (Without terminal box)/2.6 kg (With terminal box)</td>
<td></td>
<td></td>
<td>2.6 kg</td>
</tr>
</tbody>
</table>

Note 1) Specification values are given at normal temperature (20°C).
Note 2) 1/2 Split range (Standard)
Note 3) Stroke adjustment: 0 to 60°, 0 to 100°
Note 4) Characteristics relating to accuracy differ depending on combination with other constituent loop equipment, such as positioners and actuators.
Note 5) While there is no output changes due to pressure fluctuations, when the pressure supply setting is changed following calibration, once again adjust balance current and perform calibration.
Note 6) (ANR) indicates JIS B0120 standard air.
Note 7) Model selection required for explosion proof construction and HART transmission.
Note 8) For IP66 compliant products, refer to pages 25 to 28.
Note 9) Thread type can be specified by model selection.

Optional Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>IP8100-0-1-JJR (Non-explosion proof)</th>
<th>IP8001-0-1-JJR (Non-explosion proof)</th>
<th>52-IP8001-0-1-JJR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Electro-Pneumatic Positioner</td>
<td>Smart Positioner</td>
<td></td>
</tr>
<tr>
<td>Wiring</td>
<td>2-line</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Output signal</td>
<td>4 to 20 mA DC</td>
<td>10 to 28 V DC</td>
<td>—</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 35 V DC</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Load resistance</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±2% F.S. or less Note 1)</td>
<td>±0.5% F.S. or less Note 2)</td>
<td>—</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>Within 1% F.S.</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alarm output 1, 2</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Wiring</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Applicable standards</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Load resistance</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alarm OFF (Leakage current)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Response time</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Note 1) Indicates analog output accuracy with respect to actuator angle.
Note 2) Indicates analog output accuracy with respect to LCD display position value (P value).
**Accessory/Option**

**Pilot valve with output restriction (IP8000/8100)**

In general, mounting on a small-size actuator may cause hunting. For prevention, a pilot valve with a built-in output restriction is available. The restriction is removable.

<table>
<thead>
<tr>
<th>Actuator capacity</th>
<th>Orifice size</th>
<th>Part number</th>
<th>Pilot unit part number</th>
<th>Model selection accessory</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 cm³</td>
<td>φ0.7</td>
<td>P36801080</td>
<td>P565010-18</td>
<td>A</td>
</tr>
<tr>
<td>180 cm³</td>
<td>φ1</td>
<td>P36801081</td>
<td>P565010-19</td>
<td>B</td>
</tr>
</tbody>
</table>

Note) Output orifice not required for Smart Positioner regardless of actuator capacity.

**External feedback lever (IP8000/8001)**

Different feedback levers are available dependent upon valve strokes. Order according to the valve stroke.

<table>
<thead>
<tr>
<th>Stroke</th>
<th>Unit number</th>
<th>Size M</th>
<th>Size N</th>
<th>Model selection accessory</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 85 mm</td>
<td>P368010-20</td>
<td>125</td>
<td>150</td>
<td>Standard accessory</td>
</tr>
<tr>
<td>35 to 100 mm</td>
<td>P368010-21</td>
<td>110</td>
<td>195</td>
<td>E</td>
</tr>
<tr>
<td>50 to 140 mm</td>
<td>P368010-22</td>
<td>110</td>
<td>275</td>
<td>F</td>
</tr>
<tr>
<td>6 to 12 mm</td>
<td>P368010-26</td>
<td>75</td>
<td>75</td>
<td>Available as special order</td>
</tr>
</tbody>
</table>

**Fork lever-type fittings (IP8100/8101)**

2 kinds of rotary type IP8100/8101 fork lever-type fittings, that differ by installation dimensions dependent on bracket installation method, and 2 kinds of installation portion thread sizes, are available.

When installing on the side surface, using fork lever assembly M provides interchangeability with the installation dimensions of SMC IP610 positioner. When installing on the rear surface, using fork lever assembly S also provides interchangeability with the installation dimensions of SMC IP610 positioner.

<table>
<thead>
<tr>
<th>Part name</th>
<th>Unit number</th>
<th>Installation portion thread size</th>
<th>Model selection accessory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fork lever assembly M</td>
<td>P368010-24</td>
<td>M8 x 1.25</td>
<td>C</td>
</tr>
<tr>
<td>Fork lever assembly S</td>
<td>P368010-25</td>
<td>M6 x 1</td>
<td>D</td>
</tr>
<tr>
<td>Fork lever assembly MX</td>
<td>P368010-36</td>
<td>M6 x 1</td>
<td>C (NOS)</td>
</tr>
<tr>
<td>Fork lever assembly SX</td>
<td>P368010-37</td>
<td>M6 x 1</td>
<td>D (NOS)</td>
</tr>
</tbody>
</table>

Note) Installation portion thread size is M6 x 1 for IP8100-0-00-X14 when accessory C or D are selected.

**Resin connector (Non-explosion proof specification)**

Optional cable connectors are available for different cable sizes. These are not for explosion proof applications. Recommended for use with indoor applications.

<table>
<thead>
<tr>
<th>Part name</th>
<th>Part number</th>
<th>Suited cable outer diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resin-made cable clamp unit (A)</td>
<td>P368010-26</td>
<td>ø7 to ø9</td>
</tr>
<tr>
<td>Resin-made cable clamp unit (B)</td>
<td>P368010-27</td>
<td>ø9 to ø11</td>
</tr>
</tbody>
</table>
**Series IP8**

**Exploded View**

**IP8000**

- (1) Pilot valve unit
- (2) Base seal
- (3) Cover seal
- Terminal joint unit (No terminal box)
- Body unit
- Body cover unit
- Feedback spring
- Mini-terminal unit (No terminal box)
- Span adjusting unit
- Torque motor unit
- Feedback shaft assembly
- Feedback lever unit

**Replacement Parts (Common for IP8000/8100)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>IP8000/8100</strong></td>
</tr>
<tr>
<td>1</td>
<td>Pilot valve unit</td>
<td>P565010-7</td>
</tr>
<tr>
<td>2</td>
<td>Base seal</td>
<td>P56501012-3</td>
</tr>
<tr>
<td>3</td>
<td>Cover seal</td>
<td>P56501013</td>
</tr>
</tbody>
</table>

**IP8101**

- (1) Pilot valve unit
- (2) Base seal
- (3) Cover seal
- Double joint unit
- Lead wire guard
- Terminal joint unit
- Body unit
- Body cover unit
- Balance spring unit
- Base unit
- Base bracket unit
- Potentiometer unit
- Feedback shaft unit
- Fork pin unit
- Fork lever assembly
- Torque motor unit

**Replacement Parts (Common for IP8001/8101)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>IP8001</strong></td>
</tr>
<tr>
<td>1</td>
<td>Pilot valve unit</td>
<td>P565010-322</td>
</tr>
<tr>
<td>2</td>
<td>Base seal</td>
<td>P56501012-3</td>
</tr>
<tr>
<td>3</td>
<td>Cover seal</td>
<td>P56501013</td>
</tr>
</tbody>
</table>
**Piping**  
Note: When the input signal is discontinued, the pressure of OUT1 decreases, and the pressure of OUT2 increases.

### IP8000/Lever type

<table>
<thead>
<tr>
<th></th>
<th>Single action</th>
<th>Double action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive operation</strong></td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td>When the input signal is increased, the stem moves as allow mark.</td>
<td>When the input signal is increased, the stem moves as allow mark. (Positive valve operation by its reverse operation mode)</td>
<td>When the input signal is increased, the cylinder rod moves as allow mark.</td>
</tr>
<tr>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
<td><img src="image5" alt="Diagram" /></td>
</tr>
<tr>
<td>OUT1 is plugged.</td>
<td>OUT1 is plugged.</td>
<td>OUT2 is plugged.</td>
</tr>
<tr>
<td><strong>Reverse operation</strong></td>
<td><img src="image6" alt="Diagram" /></td>
<td><img src="image7" alt="Diagram" /></td>
</tr>
<tr>
<td>When the input signal is increased, the stem moves as allow mark. (Reverse valve operation by its positive operation mode)</td>
<td>When the input signal is increased, the stem moves as allow mark.</td>
<td>When the input signal is increased, the cylinder rod moves as allow mark.</td>
</tr>
<tr>
<td><img src="image8" alt="Diagram" /></td>
<td><img src="image9" alt="Diagram" /></td>
<td><img src="image10" alt="Diagram" /></td>
</tr>
<tr>
<td>OUT1 is plugged.</td>
<td>OUT2 is plugged.</td>
<td>OUT2 is plugged.</td>
</tr>
</tbody>
</table>

### IP8100/Rotary type

<table>
<thead>
<tr>
<th></th>
<th>Single action</th>
<th>Double action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive operation</strong></td>
<td><img src="image11" alt="Diagram" /></td>
<td><img src="image12" alt="Diagram" /></td>
</tr>
<tr>
<td>When the input signal is increased, the actuator shaft rotates in a clockwise direction.</td>
<td>When the input signal is increased, the actuator shaft rotates in a clockwise direction. (Positive valve operation by its reverse operation mode)</td>
<td>When the input signal is increased, the actuator shaft rotates in a clockwise direction.</td>
</tr>
<tr>
<td><img src="image13" alt="Diagram" /></td>
<td><img src="image14" alt="Diagram" /></td>
<td><img src="image15" alt="Diagram" /></td>
</tr>
<tr>
<td>OUT1 is plugged.</td>
<td>OUT1 is plugged.</td>
<td>OUT2 is plugged.</td>
</tr>
<tr>
<td><strong>Reverse operation</strong></td>
<td><img src="image16" alt="Diagram" /></td>
<td><img src="image17" alt="Diagram" /></td>
</tr>
<tr>
<td>When the input signal is increased, the actuator shaft rotates in a counter clockwise direction. (Reverse valve operation by its positive operation mode)</td>
<td>When the input signal is increased, the actuator shaft rotates in a counter clockwise direction.</td>
<td>When the input signal is increased, the actuator shaft rotates in a counter clockwise direction.</td>
</tr>
<tr>
<td><img src="image18" alt="Diagram" /></td>
<td><img src="image19" alt="Diagram" /></td>
<td><img src="image20" alt="Diagram" /></td>
</tr>
<tr>
<td>OUT1 is plugged.</td>
<td>OUT2 is plugged.</td>
<td>OUT2 is plugged.</td>
</tr>
</tbody>
</table>
### Piping

Note) When the input signal is discontinued, the pressure of OUT1 decreases, and the pressure of OUT2 increases. Caution is also similarly required when changing the control direction in parameter mode.

<table>
<thead>
<tr>
<th>IP8001/Lever type</th>
<th>Single action</th>
<th>Double action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive operation</strong></td>
<td>When the input signal is increased, the stem moves as allow mark.</td>
<td>When the input signal is increased, the stem moves as allow mark. (Positive valve operation by its reverse operation mode)</td>
</tr>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td>OUT1 is plugged.</td>
<td>OUT2 is plugged.</td>
<td>OUT1 is plugged.</td>
</tr>
</tbody>
</table>

| **Reverse operation** | When the input signal is increased, the stem moves as allow mark. (Reverse valve operation by its positive operation mode) | When the input signal is increased, the stem moves as allow mark. | When the input signal is increased, the cylinder rod moves as allow mark. |
| ![Diagram](image4) | ![Diagram](image5) | ![Diagram](image6) |
| OUT1 is plugged. | OUT2 is plugged. |

<table>
<thead>
<tr>
<th>IP8101/Rotary type</th>
<th>Single action</th>
<th>Double action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive operation</strong></td>
<td>When the input signal is increased, the actuator shaft rotates in a clockwise direction.</td>
<td>When the input signal is increased, the actuator shaft rotates in a clockwise direction. (Positive valve operation by its reverse operation mode)</td>
</tr>
<tr>
<td><img src="image7" alt="Diagram" /></td>
<td><img src="image8" alt="Diagram" /></td>
<td><img src="image9" alt="Diagram" /></td>
</tr>
<tr>
<td>OUT2 is plugged.</td>
<td>OUT1 is plugged.</td>
<td></td>
</tr>
</tbody>
</table>

| **Reverse operation** | When the input signal is increased, the actuator shaft rotates in a counter clockwise direction. (Reverse valve operation by its positive operation mode) | When the input signal is increased, the actuator shaft rotates in a counter clockwise direction. | When the input signal is increased, the actuator shaft rotates in a counter clockwise direction. |
| ![Diagram](image10) | ![Diagram](image11) | ![Diagram](image12) |
| OUT1 is plugged. | OUT2 is plugged. |
Installation

IP8000/8001 (Lever type)

1. Create brackets that are appropriate for the positioner and diaphragm valve mounting methods, and affix it firmly using the mounting hole on the side or rear surface.

2. The feedback lever that detects the displacement of valve stems should be mounted at a position so that the lever is at right angles to the valve stem for an input current of 50%. The figure is the configuration viewed from the front.

3. Brackets for lever type positioners, which are compliant with NAMUR and DIN/IEC 60534-6-1 are now available.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bracket (NAMUR compliant) single unit</td>
<td>INI-224-0-56</td>
</tr>
</tbody>
</table>

IP8100/8101 (Rotary type)

1. The positioner should be mounted so that the feedback shaft is aligned with the shaft of the rotary actuator.

2. The feedback lever that detects the displacement of valve stems should be mounted at a position so that the lever is at right angles to the valve stem for an input current of 50%. The figure is the configuration viewed from the front.

3. Brackets for lever type positioners, which are compliant with NAMUR and DIN/IEC 60534-6-1 are now available.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bracket (NAMUR compliant) single unit</td>
<td>INI-224-0-56</td>
</tr>
</tbody>
</table>
**Principle of Operation**

**IP8000/Lever type**

When the input current increases, (11) the plate spring of (12) the torque motor will work as a pivot, (13) armature will receive a counter clockwise torque, (4) the counter weight will be pushed to the left, the clearance between (6) the nozzle and (5) the flapper will increase, and the nozzle back pressure will decrease. Consequently, (7) the exhaust valve of (1) the pilot valve moves to the right, the output pressure of OUT1 increases and (15) the diaphragm moves downwards. The motion of (15) the diaphragm acts on (10) the feedback spring through (8) the feedback lever, (14) the transmission lever and (9) the span adjustment lever to rest at the balance position generated by the input current. (2) The gain suppression spring is for direct feedback of the motion of (7) the exhaust valve to (4) the counter weight to increase the stability of the loop. The zero point should be adjusted by change of (3) the zero adjustment spring tension.

**Single action positive operation**

**Block diagram**

For reverse position, exchange the shaft of the span adjusting lever to the opposite side. The span adjusting screw faces upward in this condition. (See "Piping")
IP8100/Rotary type

When the input current increases, (12) the plate spring of (13) the torque motor will work as a pivot, (14) armature will receive a counter-clockwise torque, (4) the counter weight will be pushed to the left and the clearance between (6) the nozzle and (5) the flapper will increase, and the nozzle back pressure will decrease. Consequently, (7) the exhaust valve of (1) the pilot valve moves to the right, the output pressure of OUT1 increases that of OUT2 decreases and (16) the rotary actuator moves. The motion of (16) the actuator acts on (10) the feedback spring through (11) the feedback shaft, (8) the cam, (9) the span adjustment lever and (15) transmission lever to rest at the balance position generated by the input current. (8) the cam is set on the DA surface and operates positively while (16) the oscillating actuator shaft rotates in a clockwise direction when the input signal is increased. (2) The gain suppression spring is for direct feedback of the motion of (7) the exhaust valve to (4) the counter weight to increase the stability of the loop. The zero point should be adjusted by change of (3) the zero adjustment spring tension.

Double action positive operation

For reverse position, set by turning over the cam and reversing connections of outlets OUT1 and OUT2.

Block diagram
**Principle of Operation**

**IP8001/Lever type**

When the input current increases, the electrical current inside (12) the torque motor coil will change through (8) the plate’s input process, operation process and output process, and (13) the armature will oscillate, with (11) the plate spring as its base. As a result, the clearance between (6) the nozzle and (5) the flapper will increase, and the nozzle back pressure will decrease. Consequently, (7) the exhaust valve of (1) the pilot valve moves to the right, the output pressure of OUT1 increases and causes (15) the diaphragm valve to move. The motion of (15) the diaphragm valve is transmitted to the displacement output process of (8) the board through (14) the feedback lever, (10) the feedback shaft and (9) angle sensor, and the calculated output position will match the input current.

**Single action positive operation**

![Block diagram](image)

**Block diagram**

19
IP8101/Rotary type

When the input current increases, the electrical current inside (12) the torque motor coil will change through (8) the plate's input process, operation process and output process, and (13) the armature will oscillate, with (11) the plate spring as its base. As a result, the clearance between (6) the nozzle and (5) the flapper will increase, and the nozzle back pressure will decrease. Consequently, (7) the exhaust valve of (1) the pilot valve moves to the right, the output pressure of OUT1 increases and causes the output pressure of OUT2 to decrease, causing (14) the oscillating actuator to move. The motion of (14) the oscillating actuator is transmitted to the fork lever-type fitting, (10) the feedback shaft (9) angle sensor, and the displacement output process of (8) the board, and output position will match the input current.

Double action positive operation

Block diagram
Dimensions/IP8000 (Lever type)

IP8000-0□0 (Without terminal box)

With optional resin cable clamp
Applicable cable O. D. ø7 to ø9: P368010-26
Applicable cable O. D. ø9 to ø11: P368010-27

IP8000-0□1 (With terminal box)
Dimensions/IP8100 (Rotary type)

IP8100-0□0 (Without terminal box)

With optional resin cable clamp
Applicable cable O. D. ø7 to ø9: P368010-26
Applicable cable O. D. ø9 to ø11: P368010-27

IP8100-0□1 (With terminal box)

Mounting with the fork lever joint (Option)
Dimensions inside ( ) are for fork lever joint S.
Dimensions/IP8001 (Lever type)

**IP8001-0C3**

OUT2.1/4 (Rc, NPT, G)
With plug

OUT1.1/4 (Rc, NPT, G)
SUP.1/4 (Rc, NPT, G)

1/2 (G, NPT), M20
Electric conduit

With optional resin cable clamp
Applicable cable O. D. ø6 to ø12
(Only supplied when the M20 is selected for intrinsically safe explosion proof products)

**-W**

OUT2.1/4 (Rc, NPT, G)
With plug

OUT1.1/4 (Rc, NPT, G)
SUP.1/4 (Rc, NPT, G)

2 x 1/2 (G, NPT), M20
Electric conduit

Resin cable gland
Applicable cable O. D. ø6 to ø12
(Only supplied when the M20 is selected for intrinsically safe explosion proof products)

 rejoined text

**Note:** The accessory body cover for LCD with viewing pane can be selected irrespective of specifications.
Dimensions/IP8101 (Rotary type)

IP8101\(-\text{W}\)

OUT2.1/4 (Rc, NPT, G)

1/2 (G, NPT), M20

Electric conduit

With optional resin cable clamp

Applicable cable O. D. ø7 to ø9: P368010-26

Applicable cable O. D. ø9.1 to ø11: P368010-27

OUT1.1/4 (Rc, NPT, G)

SUP.1/4 (Rc, NPT, G)

Resin cable gland

Applicable cable O. D. ø6 to ø12

(Only supplied when the M20 is selected for intrinsically safe explosion proof products)

2 x 1/2 (G, NPT), M20

Electric conduit

2 x 1/2 (G, NPT), M20

Electric conduit

2 x M8 x 1.25 depth 12

Female thread for rear mounting

2 x M8 x 1.25 depth 12

Female thread for side mounting

2 x 1/2 (G, NPT), M20

Electric conduit

Resin cable gland

Not) The accessory body cover for LCD with viewing pane can be selected irrespective of specifications.

At accessory "H": (with external scale plate)

Positioner body

Holding spring

Fork pin unit

Fork lever joint

M8 x 12.5 or M6 x 1

Actuator main shaft

Mounting with the fork lever joint (Option)

Dimensions inside ( ) are for fork lever joint S.

At accessory "H": (with external scale plate)
**Electro-Pneumatic Positioner (Lever type/Rotary type)**

**Made to Order**

Please contact SMC for detailed dimensions, specifications, and lead times.

---

### 1 Exterior Covering Enclosure: JISF8007 IP66 (Conforms to IEC60529)

* Same as the standard, other than the IP66 compliant protective cover.

### How to Order

**IP8000/Lever type**

**IP8000 - 0**

- **Pressure gauge** (SUP, OUT1)
- **Construction**
  - 0: None (With non-explosive proof connector)
  - 1: 0.2 MPa
  - 2: 0.3 MPa
  - 3: 1.0 MPa
- **Accessories**
  - Nil
  - A: ø0.7 Output restriction with pilot valve
  - B: ø1.0 Output restriction with pilot valve
  - E: For stroke 35 to 100 mm with lever unit (Standard lever is not attached.)
  - F: For stroke 50 to 140 mm with lever unit (Standard lever is not attached.)
  - G: Compensation spring (A) (It is mounted to the body as a replacement of the standard compensation spring.)
- **Connection**
  - 0: None
  - 1: 1/4NPT G1/2
  - 2: 1/4NPT M20 x 1.5
  - 3: 1/4NPT 1/2NPT
  - 4: G1/4 G1/2
  - 5: G1/4 M20 x 1.5
  - 6: G1/4 1/2NPT
- **CE marking**
  - Q: CE marked product

**IP8100/Rotary type**

**IP8100 - 0**

- **Pressure gauge** (SUP, OUT1)
- **Construction**
  - 0: None (With non-explosive proof connector)
  - 1: 0.2 MPa
  - 2: 0.3 MPa
  - 3: 1.0 MPa
- **Accessories**
  - Nil
  - A: ø0.7 Output restriction with pilot valve
  - B: ø1.0 Output restriction with pilot valve
  - C: Fork lever assembly M
  - D: Fork lever assembly S
  - G: Compensation spring (A) (It is mounted to the body as a replacement of the standard compensation spring.)
  - H: With external scale plate
  - J: With opening current transmission (4 to 20 mA DC, with terminal box, non-explosion proof/Positive operation)
  - JR: With opening current transmission (4 to 20 mA DC, with terminal box, non-explosion proof/Reverse operation)
- **Connection**
  - 0: None
  - 1: 1/4NPT G1/2
  - 2: 1/4NPT M20 x 1.5
  - 3: 1/4NPT 1/2NPT
  - 4: G1/4 G1/2
  - 5: G1/4 M20 x 1.5
  - 6: G1/4 1/2NPT
- **CE marking**
  - Q: CE marked product

---

Note 1) If two or more accessories are required, the part numbers should be given in alphabetical order.

Note 2) If 1 is selected for Construction, M, N, 2, 3, 5, 6 cannot be selected for Connection.

---

### How to Order

**IP8000/Lever type**

- **IP8000 X310 0 P**

**Accessories**

- Nil
- A: ø0.7 Output restriction with pilot valve
- B: ø1.0 Output restriction with pilot valve
- E: For stroke 35 to 100 mm with lever unit (Standard lever is not attached.)
- F: For stroke 50 to 140 mm with lever unit (Standard lever is not attached.)
- G: Compensation spring (A) (It is mounted to the body as a replacement of the standard compensation spring.)

**Connection**

- 0: None
- 1: 1/4NPT G1/2
- 2: 1/4NPT M20 x 1.5
- 3: 1/4NPT 1/2NPT
- 4: G1/4 G1/2
- 5: G1/4 M20 x 1.5
- 6: G1/4 1/2NPT

**CE marking**

- Q: CE marked product

---

### How to Order

**IP8100/Rotary type**

- **IP8100 X310 0 P**

**Accessories**

- Nil
- A: ø0.7 Output restriction with pilot valve
- B: ø1.0 Output restriction with pilot valve
- C: Fork lever assembly M
- D: Fork lever assembly S
- G: Compensation spring (A) (It is mounted to the body as a replacement of the standard compensation spring.)
- H: With external scale plate
- J: With opening current transmission (4 to 20 mA DC, with terminal box, non-explosion proof/Positive operation)
- JR: With opening current transmission (4 to 20 mA DC, with terminal box, non-explosion proof/Reverse operation)

**Connection**

- 0: None
- 1: 1/4NPT G1/2
- 2: 1/4NPT M20 x 1.5
- 3: 1/4NPT 1/2NPT
- 4: G1/4 G1/2
- 5: G1/4 M20 x 1.5
- 6: G1/4 1/2NPT

**CE marking**

- Q: CE marked product

---

Note 1) If two or more accessories are required, the part numbers should be given in alphabetical order.

Note 2) Symbol JR is with terminal box, non-explosion proof specification. Select 1 for Construction.

Note 3) If 1 is selected for Construction, M, N, 2, 3, 5, 6 cannot be selected for Connection.
**Dimensions**

**P8000-X310-P**

![Diagram of P8000-X310-P]

**IP8100-X310-P**

![Diagram of IP8100-X310-P]

*Shapes of parts other than the IP66 compliant protective cover are the same as the standard product. When the terminal box is not provided, refer to the external dimensions of the standard product for dimensions and shapes of the electric wiring parts.*
### Exterior Covering Enclosure: JISF8007 IP66 (Conforms to IEC60529)

- Same as the standard, other than the IP66 compliant protective cover.

### How to Order

#### IP8001/Lever type

<table>
<thead>
<tr>
<th>Series</th>
<th>IP8001</th>
<th>X405</th>
<th>P</th>
</tr>
</thead>
</table>

- **Pressure gauge**
  - 1: 0.2 MPa
  - 2: 0.3 MPa
  - 3: 1.0 MPa

- **Accessories**
  - E: For stroke 35 to 100 mm with lever unit (Standard lever is not attached.)
  - F: For stroke 50 to 140 mm with lever unit (Standard lever is not attached.)
  - W: Body with LCD window

- **Connection**
  - Air
  - Electric

- **CE marking**
  - Nil
  - —
  - Q: CE marked product

#### IP8101/ Rotary type

<table>
<thead>
<tr>
<th>Series</th>
<th>IP8101</th>
<th>X405</th>
<th>P</th>
</tr>
</thead>
</table>

- **Pressure gauge**
  - 1: 0.2 MPa
  - 2: 0.3 MPa
  - 3: 1.0 MPa

- **Accessories**
  - C: Fork lever-type fitting M
  - D: Fork lever-type fitting S
  - H: With external scale plate
  - W: Body with LCD window

- **Connection**
  - Air
  - Electric

- **CE marking**
  - Nil
  - —
  - Q: CE marked product

### Table

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATEX directive compliance</td>
<td>52</td>
</tr>
<tr>
<td>ATEX directive category</td>
<td>1</td>
</tr>
<tr>
<td>Intrinsically safe explosion proof (ATEX)</td>
<td>4</td>
</tr>
<tr>
<td>+ Output function + HART transmission</td>
<td></td>
</tr>
<tr>
<td>IP8001</td>
<td>X405</td>
</tr>
<tr>
<td>IP8101</td>
<td>X405</td>
</tr>
</tbody>
</table>

- **Note 1)** If two or more accessories are required, the part numbers should be given in alphabetical order.
- **Note 2)** If a connecting port is M20 × 1.5, a blue cable gland is included.
**Dimensions**

**IP8001-X405-P**

OUT1.1/4 (Rc, G, NPT)
With plug

1/2 (G, NPT), M20 x 1.5
Electrical connection

With optional resin cable clamp
Applicable cable O.D. ø7 to ø9: P368010-26
Applicable cable O.D. ø9.1 to ø11: P368010-27

**IP66 compliant protective cover**

**IP8101-X405-P**

OUT1.1/4 (Rc, G, NPT)

1/2 (G, NPT), M20 x 1.5
Electrical connection

With optional resin cable clamp
Applicable cable O.D. ø7 to ø9: P368010-26
Applicable cable O.D. ø9.1 to ø11: P368010-27

**IP66 compliant protective cover**

*Shapes of parts other than the IP66 compliant protective cover are the same as the standard product. When the terminal box is not provided, refer to the external dimensions of the standard product for dimensions and shapes of the electric wiring parts.*
**Technical data**

**Explosion proof**

1. **TIIS explosion-proof construction**
   The electro-pneumatic positioner IP8000/8100 becomes explosion proof, as certified by TIIS, according to the model selected. The explosion-proof grade has the following approval: Exd II BT5. Take extra care when handling the positioner as explosion-proof equipment.

   **To use as Exd II BT5**
   A) **Pressure-proof packing**
   As shown below in the chart, use “Cable gland” (Option).
   B) **Metal piping**
   Attach the sealant fitting bracket near the cable port.
   (For details, refer to “The guideline on electric equipment explosion proof” published by the Technology Institution of Industrial Safety).

2. **ATEX Intrinsically safe explosion-proof construction**
   Pneumatic positioners IP8000/8100 and IP8001/8101 Smart Positioners are ATEX compliant, intrinsically safe and explosion proof, as certified by KEMA, the accreditation body for explosion-proof products. Take extra care when handling these explosion-proof products.

   In regards to explosion-proof grades,
   The Pneumatic Positioner IP8m00 meets II 2G Ex ib II CT5/T6, and
   The Smart Positioner IP8m01 meets the II 1G Ex ia II CT4/T5/T6.
   Check the positioner’s specifications and explosion-proof grades and use in the most optimal environment.

   **Wiring**
   When using the positioner as an intrinsically safe explosion-proof product, always set up a barrier in a safe environment, and perform each positioner's wiring through the barrier. Simultaneously, use the provided cable gland (M20 x 1.5) as the extension for the lead wire. If a connecting port other than M20 x 1.5 is selected, the cable gland will not be provided, so use a cable gland with the same or greater explosion-proof grades than this positioner.

   **Barrier**
   Connect the barrier as shown in the diagram below. Moreover, the user must select a barrier that is suitable for each function, based on the ATEX intrinsically safe explosion-proof parameters (current circuit). For IP8001/8101 type smart positioners, use a linear resistant type barrier that is based on the explosion-proof parameters.

   **Barrier connection diagram**

   Moreover, at SMC, the barriers listed in the chart below are used to check operations. To purchase, please contact PEPPER + FUCHS Inc. (Germany).

   **Recommended barriers**

   **HART transmission**
   With smart positioners IP8001/8101, the user can operate the positioner using buttons and change parameter settings by viewing the LCD display (shown the right). Furthermore, depending on the model selected, the same button operation and parameter settings, and monitoring is possible from a remote location via HART transmission.

   The table below lists an example of applications that are compatible with smart positioner IP8001/8101. Application selection must be made by the user. Please contact Emerson Process Management for further details.

   **HART transmission compatible application**
Series IP8
Electro-Pneumatic Positioner/Smart Positioner
Specific Product Precautions 1
Be sure to read this before handling.

⚠️ Warning
1. Do not operate the positioner outside the specified range as this may cause problems. (Refer to the specifications.)
2. Design the system to include a safety circuit to avoid the risk of danger should the positioner suffer failure.
3. Be sure that exterior lead-in wiring to the terminal box is based on the guidelines for explosion-protection of manufactured electric equipment when being used as a flame proof, explosion proof construction.
4. Do not remove terminal cover in a hazardous location while the power is on.
5. Covers for the terminal and body should be in place while operating.
6. When using as an intrinsically safe explosion-proof product, do not wire in a hazardous location while the power is on.

⚠️ Caution
1. As the positioner contains extra-fine orifices such as restrictor and nozzle, if drain or dust is present in the supply pressure line, malfunction (*1) may result. In addition to an air filter (SMC Series AF), it is recommended to use a mist separator (SMC Series AM, AFM) and a micro mist separator (SMC Series AMD, AFD). Also, refer to “SMC Air Preparation System” for air quality.
2. Never use a lubricator, as this can cause a malfunction (*1).
3. Do not use compressed air containing chemicals, organic solvents, salinity or corrosive gases, as this may cause malfunction.
4. When operating below the freezing point, protect the positioner from freezing.

For Users

⚠️ Caution
1. Assemble, operate and maintain the positioners after reading the operation manual thoroughly and understanding the content.

Handling

⚠️ Caution
1. Avoid excessive vibration or impact to the positioner body and any excessive force to the armature, as these actions may cause damage to the product. Handle carefully while transporting and operating.
2. If being used in a place where vibration occurs, using a binding band is recommended to prevent broken wires because of the vibration.
3. When exposed to possible moisture invasion, please take the necessary measures. For example, if the positioner is left on-site for long periods, a plug should be put in the piping port and a body cover unit fitted to avoid water penetration.
4. Keep magnetic field off the positioner, as this affects its characteristics.

Air Supply

⚠️ Caution
1. As the positioner contains extra-fine orifices such as restrictor and nozzle, if drain or dust is present in the supply pressure line, malfunction (*1) may result. In addition to an air filter (SMC Series AF), it is recommended to use a mist separator (SMC Series AM, AFM) and a micro mist separator (SMC Series AMD, AFD). Also, refer to “SMC Air Preparation System” for air quality.
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For Users

1. Assemble, operate and maintain the positioners after reading the operation manual thoroughly and understanding the content.
Operating Environment

⚠️ Caution

1. Do not operate in locations with an atmosphere of corrosive gases, chemicals, seawater, or where these substances will adhere to the regulator.

2. Do not operate out of the indicated operation temperature range as this may cause damage to electronic parts and seal materials to deteriorate.

3. Do not operate in locations where excessive vibration or impact occurs.

4. If the body cover is being installed in a place where the body cover is exposed to direct sunlight, the use of a standard body cover without the LCD window is recommended.

Maintenance

⚠️ Caution

4. When performing inspections, demounting the positioner, or replacing the elements with the positioner still in its mounted position, first, stop the compressed air, then exhaust the residual pressure before undertaking operation.

5. Should the restrictor become clogged with carbon particles, etc., demount automatic/manual change-over screw (with built-in restrictor) and clean it using a ø0.2 wire.

6. Apply just a small amount of grease set by SMC to the sliding parts (O-ring and exhaust valve) when disassembling a pilot valve unit. Replacing the valve unit every three years is recommended.

7. Check for air leakage from pipes that pass compressed air and connecting parts.

⚠️ Warning

1. After installation, repair or disassembly, connect compressed air and conduct tests to confirm appropriate function and leakage.

Do not use the positioner when noise from the bleeder sounds louder compared with the initial state, or when it does not operate normally. If these occur, check immediately if assembled and mounted correctly.

Never modify electrical construction to maintain explosion-proof construction.

⚠️ Caution

1. Confirm whether the compressed air is clean.

Dust, oil, or moisture mixed within the equipment may result in malfunction and positioner problems. Perform periodic inspection of the air preparation equipment to ensure clean air is always supplied.

2. Improper handling of compressed air is dangerous. Not only observing the product specifications, but also replacement of elements and other maintenance activities should be conducted by personnel having sufficient knowledge and experience pertaining to instrumentation equipment.

3. Perform annual inspections of the positioner.

Replace badly damaged seals and units such as diaphragm and O-ring during the inspection.

When used in tough environmental and/or service conditions such as seaside locations, replacements should be undertaken more frequently.

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