Pressure Detection Equipment

For Gas

For Gas and Liquid

Monitor (Controller)

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Pressure Sensor Product Variations

Applicable fluids

For Gas
Silicon diaphragm
- Air, Nitrogen, Argon, Carbon dioxide

For Gas and Liquid
Stainless steel diaphragm
- Liquids such as water, oil, etc. Air, Nitrogen, Argon, Carbon dioxide
- Anti-corrosiveness, Airtightness

Pressure range

For Gas
Vacuum pressure
-100 kPa 0 100 kPa 1 MPa 15 MPa
Compound pressure
(Differential pressure)
Low pressure
Low pressure
Positive pressure
(Atmospheric pressure)
High pressure
(Differential pressure)

“Pressure range and application examples” Pages 138 to 140

Product type

Digital
Output type
Switch
Output type
Sensor
Output type
Monitor
Output type

Corresponding model

For Air
For Air/Liquid

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Series Z/ISE30
Series Z/ISE40
Series ISE70
Series Z/ISE3
(for high pressure)

Series Z/ISE1
Series Z/ISE2
Series PS1000/1100

Series PSE530
Series PSE540
Series PSE300
Series PSE60

Series Z/ISE30
Series Z/ISE40
Series Z/ISE50
Series Z/ISE60
Series Z/ISE75

Series Z/ISE60
Series Z/ISE80
Series Z/ISE50
Series Z/ISE60
Series Z/ISE50

Series Z/ISE3
Series Z/ISE80
Series Z/ISE50
Series Z/ISE60
Series Z/ISE50

Functions and environment

Functions
- Auto shift function
- Auto preset function
- Display calibration function
- Key lock function
- Anti-chattering function
- Peak/Bottom hold function

For Adaptable to different environments
- Clean room
- Copper free/Fluorine free
- Oil free
- Low density ozone gas compatible

Refer to “General Performance Table”
### General Performance Table (For Gas)

#### Model Selection Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Fluid</th>
<th>Calibration method</th>
<th>Set pressure range</th>
<th>Power supply voltage</th>
<th>Temperature characteristics (based on 25°C)</th>
<th>Repeatability</th>
<th>Hysteresis</th>
<th>Output</th>
<th>Display (Resolution)</th>
<th>Enclosure</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZSE30</td>
<td>General pneumatic</td>
<td>Push-button calibration</td>
<td>-101 to 101 kPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±2% F.S. or less (0 to 50°C)</td>
<td>±0.2% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>2-color LCD display (0.1%)</td>
<td>IP40</td>
<td></td>
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<tr>
<td>ZSE40</td>
<td>General fluids</td>
<td>Push-button calibration</td>
<td>-100 to 100 kPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±0.5% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>2-color LCD display (1%)</td>
<td>IP65</td>
<td></td>
</tr>
<tr>
<td>ISE30</td>
<td>General pneumatic</td>
<td>Push-button calibration</td>
<td>0 to 1 MPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±0.2% F.S. ±1 digit or less</td>
<td>Hysteresis mode: Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>LED display (0.1%)</td>
<td>IP67</td>
<td></td>
</tr>
<tr>
<td>ISE40</td>
<td>General fluids</td>
<td>Push-button calibration</td>
<td>0.4 to 10 MPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±1% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>LED display (0.1%)</td>
<td>IP65</td>
<td></td>
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<tr>
<td>ISE70</td>
<td>General pneumatic</td>
<td>Push-button calibration</td>
<td>-110 to 110 kPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±0.2% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>2-color LCD display (0.1%)</td>
<td>IP40</td>
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<td>ISE75</td>
<td>General fluids</td>
<td>Push-button calibration</td>
<td>0.5 to 15 MPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±0.2% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>2-color LCD display (1%)</td>
<td>IP67</td>
<td></td>
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<tr>
<td>ZSE60(H)</td>
<td>General pneumatic</td>
<td>Trimmer calibration</td>
<td>-100 to 100 kPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±1% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>LED display (1%)</td>
<td>IP40</td>
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<tr>
<td>ISE50</td>
<td>General fluids</td>
<td>Trimmer calibration</td>
<td>-101 to 101 kPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±1% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>LCD display (1%)</td>
<td>IP65</td>
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#### Model Selection Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Fluid</th>
<th>Calibration method</th>
<th>Set pressure range</th>
<th>Power supply voltage</th>
<th>Temperature characteristics (based on 25°C)</th>
<th>Repeatability</th>
<th>Hysteresis</th>
<th>Output</th>
<th>Display (Resolution)</th>
<th>Enclosure</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZSE3</td>
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<td>Push-button calibration</td>
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<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±2% F.S. or less (0 to 50°C)</td>
<td>±0.2% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>2-color LCD display (0.1%)</td>
<td>IP40</td>
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<td>ZSE1</td>
<td>General fluids</td>
<td>Push-button calibration</td>
<td>-100 to 100 kPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±0.5% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>2-color LCD display (1%)</td>
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<tr>
<td>ISE3</td>
<td>General pneumatic</td>
<td>Push-button calibration</td>
<td>0 to 1 MPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±0.2% F.S. ±1 digit or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>LED display (0.1%)</td>
<td>IP67</td>
<td></td>
</tr>
<tr>
<td>ISE1</td>
<td>General fluids</td>
<td>Push-button calibration</td>
<td>0.4 to 10 MPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±1% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>LED display (0.1%)</td>
<td>IP65</td>
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<tr>
<td>ISE2</td>
<td>General pneumatic</td>
<td>Push-button calibration</td>
<td>-110 to 110 kPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±0.2% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>2-color LCD display (0.1%)</td>
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<tr>
<td>ZSP1</td>
<td>General fluids</td>
<td>Push-button calibration</td>
<td>0 to 10 MPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±0.2% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>2-color LCD display (1%)</td>
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<td></td>
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<tr>
<td>PS1100</td>
<td>General pneumatic</td>
<td>Push-button calibration</td>
<td>-100 to 100 kPa</td>
<td>12 to 24 VDC &lt; 10% (Ripple ±10% or less)</td>
<td>±3% F.S. or less (0 to 60°C)</td>
<td>±0.2% F.S. or less</td>
<td>Variable Window Comparator mode: Variable</td>
<td>NPN/NPN open collector</td>
<td>LED display (1%)</td>
<td>IP40</td>
<td></td>
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</table>
### General Performance Table (For Gas and Liquid)

#### Model Selection Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Fluid</th>
<th>Calibration method</th>
<th>Set pressure range</th>
<th>Power supply voltage</th>
<th>Temperature characteristics (based on 25°C)</th>
<th>Repeatability</th>
<th>Hysteresis</th>
<th>Output</th>
<th>Display (Resolution)</th>
<th>Enclosure</th>
<th>Note</th>
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</thead>
<tbody>
<tr>
<td>PSE53</td>
<td>General pneumatic</td>
<td></td>
<td>0 to 1 MPa 0 to −101 kPa 0 to 101 kPa</td>
<td>12 to 24 VDC±10% (Ripple ±10% or less)</td>
<td>±2% F.S. or less (0 to 50°C)</td>
<td>±1% F.S. or less</td>
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<td>Analog voltage output</td>
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<td>IP40</td>
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<tr>
<td>PSE54</td>
<td>General pneumatic</td>
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<td>0 to 1 MPa 0 to −101 kPa −101 to 100 kPa</td>
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<td>±3% F.S. or less (0 to 50°C)</td>
<td>±0.2% F.S. or less</td>
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<td>Analog voltage output</td>
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<td>IP40</td>
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<td>PSE550</td>
<td>General fluids</td>
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<td>0 to 2 kPa 0 to −101 kPa −100 to 100 kPa</td>
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<td>±2% F.S. or less (0 to 50°C)</td>
<td>±0.3% F.S. or less</td>
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<td>Analog current output</td>
<td></td>
<td>IP65</td>
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<tr>
<td>PSE56</td>
<td>General fluids</td>
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<td>0 to 1 MPa 0 to −101 kPa 0 to 500 kPa</td>
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<td>±3% F.S. or less (−10 to 60°C)</td>
<td>±0.2% F.S. or less</td>
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</table>

#### General Performance Table (For Gas and Liquid)

<table>
<thead>
<tr>
<th>Model</th>
<th>Category</th>
<th>Fluid</th>
<th>Calibration method</th>
<th>Set pressure range</th>
<th>Power supply voltage</th>
<th>Temperature characteristics (based on 25°C)</th>
<th>Repeatability</th>
<th>Hysteresis</th>
<th>Output</th>
<th>Display (Resolution)</th>
<th>Enclosure</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSE53</td>
<td>General</td>
<td>PSE54 General</td>
<td></td>
<td>0 to 1 MPa 0 to −101 kPa 0 to 101 kPa</td>
<td>12 to 24 VDC±10% (Ripple ±10% or less)</td>
<td>±2% F.S. or less (0 to 50°C)</td>
<td>±1% F.S. or less</td>
<td></td>
<td>Analog voltage output</td>
<td></td>
<td>IP40</td>
<td></td>
</tr>
<tr>
<td>PSE56</td>
<td>General</td>
<td>General fluids</td>
<td></td>
<td>0 to 1 MPa 0 to −101 kPa 0 to 500 kPa</td>
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<td>±3% F.S. or less (−10 to 60°C)</td>
<td>±0.2% F.S. or less</td>
<td></td>
<td></td>
<td></td>
<td>IP65</td>
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</tbody>
</table>

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## Model Selection Table

### Monitor (Controller)

<table>
<thead>
<tr>
<th>Model</th>
<th>PSE200</th>
<th>PSE300</th>
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<tr>
<td>Sensor input amount</td>
<td>4 inputs</td>
<td>1 input</td>
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<tr>
<td>Calibration method</td>
<td>Push-button calibration</td>
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<tr>
<td>Set pressure range</td>
<td>-0.1 to 1 MPa</td>
<td>-0.1 to 1 MPa</td>
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<tr>
<td></td>
<td>10 to -101 kPa</td>
<td>10 to -101 kPa</td>
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<td></td>
<td>-101 to 101 kPa</td>
<td>-101 to 101 kPa</td>
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<tr>
<td></td>
<td>-10 to 100 kPa</td>
<td>-10 to 100 kPa</td>
</tr>
<tr>
<td></td>
<td>-50 to 500 kPa</td>
<td>-0.2 to 2 kPa</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC±10% (Ripple ±10% or less)</td>
<td></td>
</tr>
<tr>
<td>Temperature characteristics (based on 25°C)</td>
<td>±0.5% F.S. or less</td>
<td>±0.1% F.S. or less</td>
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<tr>
<td></td>
<td>(0 to 50°C)</td>
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<tr>
<td>Repeatability</td>
<td>±0.1% F.S.</td>
<td>±0.1% F.S. or less</td>
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<td>±1 digit or less</td>
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<tr>
<td>Hysteresis</td>
<td></td>
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<tr>
<td></td>
<td>Hysteresis mode: Variable</td>
<td>Hysteresis mode: Variable</td>
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<td></td>
<td>Window comparator mode: Fixed (3 digits)</td>
<td>Window comparator mode: Variable</td>
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<tr>
<td>Output</td>
<td>NPN/PNP open collector</td>
<td>NPN/PNP open collector</td>
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<td></td>
<td>1 CH: 2 outputs</td>
<td>2 outputs</td>
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<td></td>
<td>2 to 4 CH: 1 output</td>
<td>Analog voltage output</td>
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<tr>
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<td>Analog current output</td>
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<tr>
<td>Display (Resolution)</td>
<td>Single-color LCD display (0.1%)</td>
<td>2-color LCD display (0.1%)</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Front only IP65</td>
<td>IP40</td>
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<td>The rest IP40</td>
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<tr>
<td>Note</td>
<td>Panel mounting possible</td>
<td>Panel mounting possible</td>
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<tr>
<td></td>
<td>Auto shift function</td>
<td>DIN rail mountable</td>
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<td></td>
<td>Display calibration function</td>
<td>Auto shift function</td>
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<td></td>
<td>Anti-chattering function</td>
<td>Display calibration function</td>
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<td></td>
<td>Copy function</td>
<td>Anti-chattering function</td>
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<tr>
<td></td>
<td>Selectable pressure unit</td>
<td>Selectable pressure unit</td>
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</table>
Pressure Range and Application Examples

<table>
<thead>
<tr>
<th>Application examples</th>
<th>Pressure range (Atmospheric pressure)</th>
<th>100 kPa</th>
<th>0</th>
<th>100 kPa</th>
<th>1 MPa</th>
<th>15 MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Absorption confirmation</td>
<td>Vacuum pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Absorption confirmation (confirmation of release pressure)</td>
<td>Compound pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Workpiece placement verification</td>
<td>Low pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Supply pressure confirmation • Leak test</td>
<td>Positive pressure</td>
<td></td>
<td></td>
<td>(1.6 MPa)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Liquid coolant pressure control</td>
<td>High pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Monitoring filter clogging</td>
<td>Low differential pressure</td>
<td>0</td>
<td>2 kPa</td>
<td>5 kPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Level detection of a liquid</td>
<td>(Differential pressure)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Absorption Confirmation

Sensor installed close to a pad (No. 1)

Due to the small size, the sensor can be installed close to a pad. Calibration is easy with the auto preset function.

Absorption confirmation of a workpiece absorbed with moisture

Absorption of a stainless diaphragm enables to detect, even though water or oil is adhered to a work and then made ingress to the sensing part.

Sensor installed close to a pad (No. 2)

Pad absorption can be confirmed easily. Response delays caused by piping will not be a factor, due to the close proximity of the sensor to the pad.

Installation of a group of sensors in a manifold style
Placement Verification

Confirmation of a workpiece presence simply

The presence of a workpiece is confirmed by detecting the back pressure at the nozzle.

Leak Test

Inspection of a radiator

A low pressure sensor (PSE532-□) is used to detect minute differences. The auto shift function reduces the influence of fluctuations in the supply pressure.

Supply Pressure Confirmation

Confirmation of airline supply pressure

The line pressure can be adjusted by monitoring the digital readout which provides a visual verification of the operating pressure. The output can be programmed to respond to supply pressure drops, etc.

Confirmation of supply pressure in washing line

The supply pressure of water, oil, etc. can be confirmed by using a sensor for general purpose fluids.

Confirmation of atmospheric pressure for a load lock chamber

Verification of pressure in a load lock chamber (vacuum spare chamber of the main chamber)

Verifies caulking by a hydraulic cylinder
Liquid Coolant Pressure Control

The filtration and replacement periods can be controlled by monitoring the clogging of the filter.

Liquid pressure control of a gun drill

Monitoring Filter Clogging

The filtration and replacement periods can be controlled by monitoring the clogging of the filter.

Level Detection of a Liquid

Can detect the level of a liquid through changes in the purge pressure.

Air Flow Control

Can monitor the air flow in the duct and control air blasts.

Series PSE550

Can monitor the air flow in the duct and control air blasts.
Output Type

Switch output (ON/OFF output)
• Detects when the limit value exceeds the set value and generates an output for a switch.

- NPN output type

- PNP output type

Analog output
• The voltage, and current output are in proportion to the pressure.

- Voltage output (1 to 5 VDC) type

- Current output (4 to 20 mA DC) type
  Effective for long distance transmission (more than 10 m).

Wiring Specifications

Cable end option
- Standard
  Tinned
  Half-stripped

- Made to Order
  We can provide the cable with a connector from the shown manufacturers. (Tyco Electronics AMP K.K., Molex, J.S.T. Mfg. Co., Ltd., Hirose Electric Co., Ltd., 3M, etc.)

Pre-wired
Made to Order
We will prepare the cable with a M8 or M12 connector.

- M8 connector
- M12 connector

Flexible cable
Made to Order
The flexible cables (robot cable) are suited for applications having excessive movement or bends.
**Type of Mounting**

**Bracket**
- Direct mount

**Panel mount**

**Direct mount**

**Type of Piping**

**Fittings**
- Steel piping is available with PT thread (R thread/Rc thread), NPT thread, NPTF thread, PF thread (G thread), TSJ thread, URJ thread, and M thread.
- Compatible with 1/8 or 1/4 inch port size, but not with M thread.
- M thread is available with 3 mm or 5 mm.

**One-touch fittings/Plug-in reducer**

**One-touch fittings**
- Straight and elbow fittings are available in mm and inch diameter.

**Plug-in reducer**
- Compatible with the smaller size ø4, ø6.
- Can be connected with One-touch fitting directly.
- Easy handling. Maintenance is good.
Adaptable to Different Environments

Clean room Series 10-
- **Application**
  - To prevent particles from entering a clean room.
- **Details**
  - After inspection, blowing with a high purity air (Clean/Class 100) is performed inside of a clean environment.
  - Packaging consists of an antistatic protection bag, which is double packaged before being shipped.
  - Grease free for the wetted parts' seals

Copper free, Fluorine free Series 20-
- **Application**
  - Suitable in environments where copper ions are not allowed. For example, CRT manufacturing or front-end semiconductor manufacturing process equipment.
- **Details**
  - Application of material which does not include copper in wetted parts (or electroless nickel plated treatment).

Oil free Made to Order
- **Application**
  - Suitable in environments where oils are not allowed. For example, in a nitrogen or oxygen supply line.
- **Details**
  - Any components which include oil are not used.
    (e.g. NBR coated with oil, etc.)
  - No grease is used in the product assembly. (Grease free)

Silicon free Made to Order
- **Application**
  - Suitable in environments where siloxane, the gas emitted from silicon, is not permitted.
- **Details**
  - Any components which contain silicon are not used.
  - Since a pressure sensor with a silicon diaphragm is not permitted, one with a stainless steel diaphragm is used.

Fluorine free Made to Order
- **Application**
  - Suitable in environments where fluorine based resins can not be used.
- **Details**
  - Fluorine based greases are not used.
  - FKM is not used for the seals.

Low density ozone gas compatible Made to Order
- **Application**
  - Suitable in environments where low density ozone gas is generated.
- **Details**
  - FKM is used for the seals.
  - Sensor parts and resin materials are the same as those used for standard products.
Functions

Auto shift function

- **Summary**
  Function to correct the pressure setting of the switch output when there is a pressure fluctuation in the main line.
  For example, when the main line pressure increases by 50 kPa, at the time of auto shift signal input, the pressure setting will be increased by 50 kPa, accordingly.

- **Application**
  For compensating for the main line pressure fluctuation during absorption confirmation.

Auto preset function

- **Summary**
  Function to automatically optimize the setting for absorption confirmation.

- **Application**
  To easily setup the absorption confirmation.

Display calibration function

- **Summary**
  Function to prevent inconsistent output values and to allow the adjustment of the display values.

- **Application**
  When multiple sensors are used, the differences among the units can be eliminated and the displayed values for each sensor can be adjusted to read the same.

Key lock function

- **Summary**
  Function to prevent the changing of settings other than those for normal key operations.

- **Application**
  For preventing a malfunction due to unauthorised changes in set-up.

Anti-chattering function

- **Summary**
  Function to prevent detection of any momentary pressure fluctuation. Averages the pressure values detected during the response time, which is set by the user.
  - **Response time**
    Selectable from 20 ms, 160 ms, 640 ms, or 1280 ms.

- **Application**
  For preventing a momentary fluctuation in the main line pressure from being detected as an abnormal pressure during the actuator’s or ejector’s operation.

Peak/Bottom hold function

- **Summary**
  Function to detect and display the fluctuating pressure peak (maximum value) and bottom (minimum value).

- **Application**
  - For confirming the maximum or minimum pressure being measured.
### Glossary of Terms

#### UL/CSA standards

UL and CSA standards have been applied in North America (U.S.A. and Canada) symbolizing safety of electrical products, and are defined to mainly prevent danger from an electrical shock or fire, resulting from trouble with the electrical products. The power supply of the SI unit is 24 V DC, which does not meet the voltage requirement for the electrical shock category. However, measures against a fire hazard have been taken. Some SI units are UL/CSA certified.

#### CE marking

CE marked products or equipment that are imported to countries that are EU members must conform to the EC directives. SMC products are subject to either or both the low power voltage directive (regarding electrical safety) and the EMC directive (regarding noise conformity). The operating voltage of the sensors is 24 V DC, therefore it is not subjected to the low voltage directive (50 to 1000 V AC or 75 to 1500 V DC). The sensors undergo EMC testing by a third party and bears the CE marking (self-declaration). Since the product is a component which is ultimately integrated into the user's equipment machine or facility, the user must confirm that the product conforms to the EC directive.

#### Enclosure

The enclosure is rated according to the IP (International Protection) standards (IEC60529) which defines protection against dust or water.

- **IP40**: Is not protected against the water intrusion, even though a wire exceeding 1.0 mm in diameter can not enter.
- **IP65**: Powdered dust cannot enter the enclosure and the enclosure is not affected by water sprayed from all directions.
- **IP67**: Powdered dust cannot enter the enclosure, as well as water, even though the enclosure is immersed in water with a specified pressure and time.

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**Accuracy**

**Repeatability**

This graph shows the repeatability of an analog output, pressure display and a switch (ON-OFF) output’s moving point. The pressure is increased or decreased under normal temperature (25°C).

![Graph showing repeatability](image)

**Analog output accuracy**

This graph shows the difference between the analog output voltage (current) standard value versus the input pressure, at a normal temperature (25°C).

![Graph showing analog output accuracy](image)
### Working Principle of Pressure Sensors

**Silicon diaphragm pressure sensor**
- The diffused piezoresistive gauge is formed like four bridges on a monocrystal silicon plate.
- The silicon plate consists of the diaphragm. If a pressure is applied, the diaphragm will deform.
- Changes in the resistance values of the piezoresistive element, which is caused by the surface strain generated by the diaphragm deformation, are detected and used as an output.

**Stainless steel diaphragm pressure sensor**
- The bridge circuit is formed during the construction of the insulation film, electric pole film and resistance film on the stainless steel diaphragm.
- If a pressure is applied, the diaphragm will deflect and the resistance value of the strain gauge will change.
- The changes in the resistance values are output for detection.

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### Pressure Type
- There are two types of pressures: The Gauge Pressure, and Absolute Pressure. The gauge pressure is based on the atmospheric pressure. Whereas the absolute pressure is based on the absolute vacuum. (The gauge pressure will change in accordance with the atmospheric pressure change.)
- All of our products are made based on the gauge pressure.

- **Gauge pressure**
  - Positive pressure
  - Compound pressure: $-100$ kPa
  - Vacuum pressure: $-100$ kPa

- **Absolute pressure**
  - Normal pressure: 0 kPa
  - Pressure above the atmospheric pressure
  - Pressure ranging below/above the atmospheric pressure
  - Pressure below the atmospheric pressure
  - Pressure based on the absolute vacuum

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