High precision/High resolution pressure switch. Applicable for pressure detection with a wide range of fluids, by using a stainless steel diaphragm.
Pressure detection for a wide range of fluids.

- Hydraulic fluid (JIS-K2213)
- Silicon oil (JIS-K2213)
- Lubricating oil (JIS-K6301)
- Fluoro carbon

- To confirm absorption of work piece with water on the surface, e.g. wet LCD glass plate
- To confirm primary pressure of cleaning line
- To confirm working pressure of hydraulic cylinder

Using of stainless steel diaphragm
The stainless steel diaphragm prevents direct contact between sensor and measured fluid.
- Liquid and gas contact areas — SUS630
- Fittings ———————————— SUS304

Extremely low leakage
Sensor and fittings are electron-beam welded. Leakage is kept at the lowest level by using VCR® and Swagelock® fittings.
- ZSE50F / ISE50  $1 \times 10^{-5}$Pa·m$^3$/s
- ZSE60F / ISE60  $1 \times 10^{-10}$Pa·m$^3$/s

IP65

- Panel mount + Front side protection cover
- With bracket

Enclosure Option Application examples

Features 1
High precision and high resolution

Compound pressure 1/2000 (0.1kPa)
Positive pressure 1/1000 (0.001MPa)
Repeatability ±0.2%F.S. ±1digit or less

Variety of functions

Anti-chattering function
Prevents erroneous operation due to sudden fluctuations in primary pressure, by allowing the response time to be changed.
- Selectable response times: 2.5ms (default), 24ms, 192ms, 768ms or less

Auto preset function
Automatic pressure setting is possible. Saves time for setting operation.
- Key lock function
- Peak and bottom display function
- Zero out function

Auto shift function
Pressure detection is not affected by fluctuations in primary pressure.

Series ZSE60F/ISE60
Special fitting types are used in semiconductor production equipment (metal gasket seal fittings)
- Leak rate: $1 \times 10^{-10}$ Pa·m³/s
- ZSE/ISE60(F)-A2
- ZSE/ISE60(F)-B2

Variations

<table>
<thead>
<tr>
<th>Model</th>
<th>ZSE50F</th>
<th>ISE50</th>
<th>ZSE60F</th>
<th>ISE60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard thread type</td>
<td>ZSE50F</td>
<td>ISE50</td>
<td>ZSE60F</td>
<td>ISE60</td>
</tr>
<tr>
<td>Port size</td>
<td>R 1/4-NPT 1/4-G 1/4 (with M5 male thread)</td>
<td>URJ 1/4-TSJ 1/4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leak rate</td>
<td>$1 \times 10^{-5}$ Pa·m³/s</td>
<td>$1 \times 10^{-10}$ Pa·m³/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated pressure range</td>
<td>100kPa</td>
<td>1MPa</td>
<td>100kPa</td>
<td>1MPa</td>
</tr>
<tr>
<td>Output</td>
<td>Switch output</td>
<td>2 outputs NPN or PNP</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Analog output</td>
<td>Output voltage 1 to 5V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For General Fluids
High Precision Digital Pressure Switch
Series ZSE50F/ISE50

How to Order

For positive pressure
ISE50 02 22 L M

For compound pressure
ZSE50 F 02 22 L M

Piping specifications
- 02: R 1/4 (M5 with female screw), Piping in backward direction
- T2: NPT 1/4 (M5 with female screw), Piping in backward direction
- G2: G 1/4 (M5 with female screw), Piping in backward direction

Input/output specifications
- 22: NPN open collector 2 output + Analogue output
- 30: NPN open collector 2 output + Auto shift input
- 62: PNP open collector 2 output + Analogue output
- 70: PNP open collector 2 output + Auto shift input

Note: Auto shift input is used for the auto shift function. For more information, please refer to Auto Shift Function on page 5.

Lead wire length
L 3m

Analogue output
Suitable model: ZSE50F/ISE50-□-22/62(L)-(M)

Series ISE50

<table>
<thead>
<tr>
<th>Pressure (MPa)</th>
<th>Analog output value (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>5</td>
</tr>
</tbody>
</table>

Series ZSE50F

<table>
<thead>
<tr>
<th>Pressure (kPa)</th>
<th>Analog output value (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 100</td>
<td>5</td>
</tr>
</tbody>
</table>

Lead wire length
L 3m

Option
When option parts are required separately, use the following part numbers to place an order.

<table>
<thead>
<tr>
<th>Option</th>
<th>Part no.</th>
<th>Qty.</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bracket A</td>
<td>ZS-24-A</td>
<td>1</td>
<td>With 2 pcs. of mounting screws</td>
</tr>
<tr>
<td>Bracket D</td>
<td>ZS-24-D</td>
<td>1</td>
<td>With 2 pcs. of mounting screws</td>
</tr>
<tr>
<td>Panel mount</td>
<td>ZS-24-E</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Panel mount + Front protection cover</td>
<td>ZS-24-F</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Unit specification
- Nil: With unit switching function
- M: Fixed SI unit

Note 1) Under the New Measurement Law, which has been in effect since October, 1999, sales of switches with the unit conversion function have not been allowed for use in Japan.

Note 2) Fixed units:
- For compound pressure: kPa
- For positive pressure: MPa
### Specifications

<table>
<thead>
<tr>
<th>Function</th>
<th>ZSE50F (Compound pressure)</th>
<th>ISE50 (Positive pressure)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated pressure range</strong></td>
<td>–100 to 100kPa</td>
<td>0.000 to 1.000MPa</td>
</tr>
<tr>
<td><strong>Operating pressure range and regulating pressure range</strong></td>
<td>–100 to 100kPa</td>
<td>–0.100 to 1.000MPa</td>
</tr>
<tr>
<td><strong>Proof pressure</strong></td>
<td>500kPa</td>
<td>1.5MPa</td>
</tr>
<tr>
<td><strong>Setting/Display resolution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kPa</td>
<td>0.1</td>
<td>—</td>
</tr>
<tr>
<td>MPa</td>
<td>—</td>
<td>0.001</td>
</tr>
<tr>
<td>kgf/cm²</td>
<td>0.001</td>
<td>0.01</td>
</tr>
<tr>
<td>bar</td>
<td>0.001</td>
<td>0.01</td>
</tr>
<tr>
<td>psi</td>
<td>0.02</td>
<td>0.1</td>
</tr>
<tr>
<td>mmHg</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>inHg</td>
<td>0.1</td>
<td>—</td>
</tr>
</tbody>
</table>

**Possible set ranges**

### Fluid
Fluid that will not corrode stainless steel SUS 630 and 304

### Power supply voltage
12 to 24VDC, Ripple (p-p) 10% or less

### Current consumption
55mA or less (With no load)

### Switch output
NPN or PNP 2 output (Max. applied voltage 30V (NPN), Max. load current 80mA)

### Repeatability
±0.2% F.S. ±1 digit or less ±0.3% F.S. ±1 digit or less

### Hysteresis mode
Variable (0 or above)

### Window comparator mode
Fix (3 digits)

### Response time
2.5ms or less (with chattering prevention function: 24ms, 192ms, 768ms or less)

### Output short circuit protection
With short circuit protection

### Display
3 1/2 digit LED display (Sampling frequency: 5 times/sec)

### Display accuracy
±2% F.S. ±1 digit or less (With ambient temperature of 25 ±3°C)

### Indication light
Green LED (OUT1: Light up when ON), Red LED (OUT2: Lights up when ON)

### Analog output
Output voltage: 1 to 5V ±5% F.S. or less Output voltage: 1 to 5V ±2.5% F.S. or less

### Auto shift input
No-voltage input (solid state switch or reed switch), input 5ms or more

### Enclosure
IP65

### Ambient temperature range
Operating: 0 to 50°C, Stored: –10 to 60°C (With no condensation or freezing)

### Ambient humidity range
Operating and stored: 35 to 85% RH (With no condensation)

### Withstand voltage
250VAC for 1 min, between all lead wires and enclosure

### Insulation resistance
2MΩ or more (at 50VDC) between all lead wires and enclosure

### Vibration resistance
10 to 500Hz with 1.5mm amplitude or 98m/s², whichever is smaller

### Shock resistance
980m/s² in X, Y, Z directions 3 times each (Not energized)

### Temperature characteristics
±3% F.S. or less of measured pressure at 25°C in temperature range of 0 to 50°C

### Fluid contact material
Pressure receiving area: Stainless steel SUS 630, Fittings: Stainless steel SUS 304

### Port size
02: R 1/4, M5  T2: NPT 1/4, M5  G02: G1/4, M5

### Lead wire
5 wire oil proof heavy duty cable (0.15mm²)

### Weight
Approx. 120g (Each including 3m lead wire)

### Environmental resistance

<table>
<thead>
<tr>
<th>Fluid contact material</th>
<th>Pressure receiving area: Stainless steel SUS 630, Fittings: Stainless steel SUS 304</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port size</td>
<td>02: R 1/4, M5  T2: NPT 1/4, M5  G02: G1/4, M5</td>
</tr>
<tr>
<td>Lead wire</td>
<td>5 wire oil proof heavy duty cable (0.15mm²)</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 120g (Each including 3m lead wire)</td>
</tr>
</tbody>
</table>

---

**Function**

Various additional functions are available for easy measurement, switch operation and check of measured values suitable for the conditions of the measured fluid.

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auto shift function</strong></td>
<td>Can correct the pressure set point value of switch output according to fluctuations in the primary pressure.</td>
</tr>
<tr>
<td><strong>Anti-chattering function</strong></td>
<td>Prevents malfunction due to sudden fluctuations in the primary pressure by adjusting the response time.</td>
</tr>
<tr>
<td><strong>Key lock function</strong></td>
<td>The keys can be locked to prevent incorrect operation.</td>
</tr>
<tr>
<td><strong>Peak hold function</strong></td>
<td>Can retain the maximum pressure value displayed during measurement.</td>
</tr>
<tr>
<td><strong>Bottom hold function</strong></td>
<td>Can retain the minimum pressure value displayed during measurement.</td>
</tr>
<tr>
<td><strong>Zero out function</strong></td>
<td>The pressure display can be set at zero when the pressure is open to the atmosphere.</td>
</tr>
<tr>
<td><strong>Unit conversion (for overseas use)</strong></td>
<td>Can convert the display value.</td>
</tr>
</tbody>
</table>

Note 1: In case of types with unit conversion function, (Types without unit conversion function are fixed to the SI units (KPa or MPa).)

Note 2: When a type with analogue output is selected.

Note 3: When a type with auto shift is selected.

Note 4: 0.03 to 0.04 psi in psi display.

Note 5: Value clear ±0.01psi in psi display.

Note 1) Select and order by specifying the types and models.
Output Method

Series ZSE50F/ISE50

Output mode

OUT1

• Hysteresis mode

Large pressure and vacuum pressure

H (Fix hysteresis) = 3 digits

Window comparator mode

Hysteresis mode

Window comparator mode

Large pressure and vacuum pressure

Large pressure and vacuum pressure

Large pressure and vacuum pressure

Large pressure and vacuum pressure

[<p>]<p>
P_{1} \geq P_{2}

NO

YES

[P]

[<n>]<n>
n_{1} \geq n_{2}

NO

YES

<n>}

Same with OUT2.
**For General Fluids**

**High Precision Digital Pressure Switch**  
*Series ZSE50F/ISE50*

---

### Example of Internal Circuit and Wiring

**ZSE F/ISE □□□□□□□□(M)**

*With analog output*

- **Main circuit**
  - DC (+) (Brown)
  - Analog output (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 1kΩ

- **Load**
  - 12VDC to 24VDC

---

**ZSE F/ISE □□□□□□□□(M)**

*With auto shift input*

- **Main circuit**
  - DC (+) (Brown)
  - Auto shift input (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 12VDC to 24VDC

---

**Example of Internal Circuit and Wiring**

**ZSE F/ISE □□□□□□□□(M)**

*With analog output*

- **Main circuit**
  - DC (+) (Brown)
  - Analog output (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 1kΩ

- **Load**
  - 12VDC to 24VDC

---

**ZSE F/ISE □□□□□□□□(M)**

*With auto shift input*

- **Main circuit**
  - DC (+) (Brown)
  - Auto shift input (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 12VDC to 24VDC

---

**Example of Internal Circuit and Wiring**

**ZSE F/ISE □□□□□□□□(M)**

*With analog output*

- **Main circuit**
  - DC (+) (Brown)
  - Analog output (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 1kΩ

- **Load**
  - 12VDC to 24VDC

---

**ZSE F/ISE □□□□□□□□(M)**

*With auto shift input*

- **Main circuit**
  - DC (+) (Brown)
  - Auto shift input (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 12VDC to 24VDC

---

**Example of Internal Circuit and Wiring**

**ZSE F/ISE □□□□□□□□(M)**

*With analog output*

- **Main circuit**
  - DC (+) (Brown)
  - Analog output (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 1kΩ

- **Load**
  - 12VDC to 24VDC

---

**ZSE F/ISE □□□□□□□□(M)**

*With auto shift input*

- **Main circuit**
  - DC (+) (Brown)
  - Auto shift input (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 12VDC to 24VDC

---

**Example of Internal Circuit and Wiring**

**ZSE F/ISE □□□□□□□□(M)**

*With analog output*

- **Main circuit**
  - DC (+) (Brown)
  - Analog output (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 1kΩ

- **Load**
  - 12VDC to 24VDC

---

**ZSE F/ISE □□□□□□□□(M)**

*With auto shift input*

- **Main circuit**
  - DC (+) (Brown)
  - Auto shift input (Gray)
  - OUT 1 (Black)
  - OUT 2 (White)
  - DC (−) (Blue)

- **Load**
  - 12VDC to 24VDC
Auto Shift Function

This function uses the measured pressure at the time of auto shift input as the reference pressure value and corrects the set point values “P_1” and “P_2” of switch output 1 and “P_3” and “P_4” of switch output 2. “P_1” to “P_4” correspond to “n_1” to “n_4” in case of normally closed circuit.

When auto shift is not used:
Fluctuations in the primary pressure interrupt correct judgment.

When auto shift is used:
When the primary pressure changes, set the auto shift function to Lo. The pressure value at this point will be saved as the reference value to correct the pressure set point values in order to make correct judgments.

Auto shift function conditions and explanation
• Keep the pressure constant at least for 5 ms after the last transition signal of auto shift input.
• At the time of auto shift input, the display unit displays “ooo” for about 1 second. The pressure value at this time is saved as the correction value “C_5”.
• The set point values “P_1” to “P_4” or “n_1” to “n_4” are corrected based on the saved correction values.
• The time between the auto shift input and start of switch output is 10 ms or less.
• If the set point value corrected by auto shift input falls out of the possible set range, the correction value is not saved. The display will show “UUU” if the set point value is above the upper limit and “LLL” if it is below the lower limit.
• The correction value “C_5” set by auto shift function disappears when the power is turned off.
• The correction value “C_5” for the auto shift function is reset to zero (the initial value) when the power is turned on again.

*The correction value is not stored on the EEPROM.

The possible set range for types with auto shift function is as follows:

<table>
<thead>
<tr>
<th>Regulating pressure range</th>
<th>The possible set range for types with auto shift function</th>
</tr>
</thead>
<tbody>
<tr>
<td>–100.0 to 100.0kPa</td>
<td>–100.0 to 100.0kPa</td>
</tr>
<tr>
<td>–0.1 to 1.000MPa</td>
<td>–1.000 to 1.000MPa</td>
</tr>
</tbody>
</table>

Anti-chattering Function

A large bore cylinder or ejector consumes a large amount of air in operation and may cause a temporary drop in the primary pressure. This function prevents detection of such temporary drops in primary pressure as abnormal pressure.

*Principle*
This function averages pressure values measured during the response time set by the user and then compares the average pressure value with the pressure set point value to output the result on the switch.
## Description

Take the following measures when an error occurs.

<table>
<thead>
<tr>
<th>Error description</th>
<th>LCD display</th>
<th>Condition</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over current error</td>
<td>OUT 1: Er 1</td>
<td>Load current of switch output is more than 80mA.</td>
<td>Shut off the power supply. After eliminating the output factor that caused the over current, turn the power supply back on.</td>
</tr>
<tr>
<td></td>
<td>OUT 2: Er 2</td>
<td>Pressure is applied during the zero out operation as follows: $\pm 0.071$MPa or more with ISE50/60, $\pm 7.1$kPa or more with ZSE50F/60F.</td>
<td>Bring the pressure back to atmospheric pressure and try using the zero out function.</td>
</tr>
<tr>
<td>Residual pressure error</td>
<td>Er 3</td>
<td>Pressure is applied during the zero out operation as follows: $\pm 0.071$MPa or more with ISE50/60, $\pm 7.1$kPa or more with ZSE50F/60F.</td>
<td>Bring the pressure back to atmospheric pressure and try using the zero out function.</td>
</tr>
<tr>
<td>Applied pressure error</td>
<td>- - -</td>
<td>Supply pressure exceeds the maximum regulating pressure.</td>
<td>Reduce/Increase supply pressure to within the regulating pressure range.</td>
</tr>
<tr>
<td>Auto shift error</td>
<td>UUU</td>
<td>The value is above the upper limit of the set pressure. After displaying this message for about 1 seconds, the switch returns to the measurement mode.</td>
<td>Set the pressure again so that the sum of the applied pressure and pressure set point value at the time of auto shift input will not fall out of the set pressure range.</td>
</tr>
<tr>
<td></td>
<td>LLL</td>
<td>The value is below the upper limit of the set pressure. After displaying this message for about 1 seconds, the switch returns to the measurement mode.</td>
<td>Set the pressure again so that the sum of the applied pressure and pressure set point value at the time of auto shift input will not fall out of the set pressure range.</td>
</tr>
<tr>
<td>System error</td>
<td>Er 4</td>
<td>Internal data error</td>
<td>Shut off the power supply. Turn the power supply back on. If the switch does not come back to a normal operation, please contact SMC for an inspection.</td>
</tr>
<tr>
<td></td>
<td>Er 6</td>
<td>Internal data error</td>
<td>Shut off the power supply. Turn the power supply back on. If the switch does not come back to a normal operation, please contact SMC for an inspection.</td>
</tr>
<tr>
<td></td>
<td>Er 7</td>
<td>Internal data error</td>
<td>Shut off the power supply. Turn the power supply back on. If the switch does not come back to a normal operation, please contact SMC for an inspection.</td>
</tr>
<tr>
<td></td>
<td>Er 8</td>
<td>Internal data error</td>
<td>Shut off the power supply. Turn the power supply back on. If the switch does not come back to a normal operation, please contact SMC for an inspection.</td>
</tr>
</tbody>
</table>

*The upper limits and lower limits are shown in the table below.*

<table>
<thead>
<tr>
<th>Compound pressure</th>
<th>Lower limit</th>
<th>Upper limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-100.0$ to $100.0$kPa</td>
<td>$-100.0$kPa</td>
<td>$100.0$kPa</td>
</tr>
<tr>
<td>Positive pressure</td>
<td>$-0.100$ to $1.000$MPa</td>
<td>$-0.100$MPa</td>
</tr>
<tr>
<td><strong>With auto shift function</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compound pressure</td>
<td>Lower limit</td>
<td>Upper limit</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>$-100.0$ to $100.0$kPa</td>
<td>$-100.0$kPa</td>
<td>$100.0$kPa</td>
</tr>
<tr>
<td>Positive pressure</td>
<td>$-1.000$ to $1.000$MPa</td>
<td>$-1.000$MPa</td>
</tr>
</tbody>
</table>
Dimensions

Bracket A

Bracket D

Panel mount

Cutting dimensions for panel mounting

Applicable panel thickness is 1 to 3.2mm.
For General Fluids
High Precision Digital Pressure Switch

Series ZSE60F/ISE60

How to Order

For positive pressure
ISE60

For compound pressure
ZSE60 F

Analogue output

Suitable mode: ZSE60F/ISE60-□-22/62(L)-(M)

Series ISE60

Analog output value (V)

Pressure

Series ZSE60F

Analog output value (V)

Pressure

Option

When option parts are required separately, use the following part numbers to place an order.

<table>
<thead>
<tr>
<th>Option</th>
<th>Part no.</th>
<th>Qty.</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bracket A</td>
<td>ZS–24–A</td>
<td>1</td>
<td>With 2 pcs. of mounting screws</td>
</tr>
<tr>
<td>Bracket D</td>
<td>ZS–24–D</td>
<td>1</td>
<td>With 2 pcs. of mounting screws</td>
</tr>
<tr>
<td>Panel mount</td>
<td>ZS–24–E</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Panel mount + Front protection cover</td>
<td>ZS–24–F</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Input/output specifications

22 NPN open collector 2 output + Analogue output
30 NPN open collector 2 output + Auto shift input
62 PNP open collector 2 output + Analogue output
70 PNP open collector 2 output + Auto shift input

Note) Auto shift input is used for the auto shift function. For more information, please refer to Auto Shift Function on page 5.

Piping specifications

A2 URJ 1/4", Piping in the backward direction
B2 TSJ 1/4", Piping in the backward direction

Note) URJ 1/4 and TSJ 1/4 are special fittings for semiconductor manufacturing equipment.

Lead wire length

L 3m

Unit specification

Nil With unit switching function (Note 1)
M Fixed SI unit (Note 2)

Note 1) Under the New Measurement Law, which has been in effect since October, 1999, sales of switches with the unit conversion function have not been allowed for use in Japan.

Note 2) Fixed units:
For compound pressure: KPa
For positive pressure: MPa
Specifications

<table>
<thead>
<tr>
<th>Setting/Display resolution</th>
<th>ZSE60F (Compound pressure)</th>
<th>ISE60 (Positive pressure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated pressure range</td>
<td>–100 to 100kPa</td>
<td>0.000 to 1.000MPa</td>
</tr>
<tr>
<td>Operating pressure range</td>
<td>–100 to 100kPa</td>
<td>–0.10 to 1.000MPa</td>
</tr>
<tr>
<td>Proof pressure</td>
<td>500kPa</td>
<td>1.5MPa</td>
</tr>
<tr>
<td>Fluid</td>
<td>Fluid that will not corrode stainless steel SUS 630 and 304</td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24VDC, Ripple (p-p) 10% or less</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>55mA or less (With no load)</td>
<td></td>
</tr>
<tr>
<td>Switch output</td>
<td>NPN or PNP 2 output (Max. applied voltage 30V (NPN), Max. load current 80mA)</td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>±0.2% F.S. ±1 digit or less</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>Variable (0 or above)</td>
<td></td>
</tr>
<tr>
<td>Window comparator mode</td>
<td>Fix (3 digits)</td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>2.5ms or less (With chattering prevention function: 24ms, 192ms, 768ms or less)</td>
<td></td>
</tr>
<tr>
<td>Output short circuit protection</td>
<td>With short circuit protection</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>3 1/2 digit LED display (Sampling frequency: 5 times / sec)</td>
<td></td>
</tr>
<tr>
<td>Display accuracy</td>
<td>±2% F.S. ±1 digit or less (Ambient temperature of 25 ±3°C)</td>
<td></td>
</tr>
<tr>
<td>Indication light</td>
<td>Green LED (OUT1: Light up when ON), Red LED (OUT2: Light up when ON)</td>
<td></td>
</tr>
<tr>
<td>Analog output</td>
<td>Output voltage: 1 to 5V ±5% F.S. or less</td>
<td></td>
</tr>
<tr>
<td>Auto shift input</td>
<td>No-voltage input (solid state switch or reed switch), 5ms or longer input</td>
<td></td>
</tr>
</tbody>
</table>

Environment resistance

- **Enclosure**: IP65
- **Ambient temperature range**: Operating: 0 to 50°C, Stored: –10 to 60°C (With no condensation or freezing)
- **Ambient humidity range**: Operating and stored: 35 to 85% RH (With no)
- **With stand voltage**: 250VAC for 1 min, between all lead wires and enclosure
- **Insulation resistance**: 2MΩ or more (at 50VDC) between all lead wires and enclosure
- **Vibration resistance**: 10 to 500Hz with 1.5mm amplitude or 98m/s², whichever is smaller
- **Shock resistance**: 980m/s² in X, Y, Z directions 3 times each (Not energized)

Temperature characteristics

±3% F.S. or less of measured pressure at 25°C in temperature range of 0 to 50°C

Fluid contact material

Pressure receiving area: Stainless steel SUS 630; Fittings: Stainless steel SUS 304

Port size

A2: URJ 1/4  B2: TSJ 1/4

Lead wire

5 wire oil proof heavy duty cable (0.15mm²)

Weight

Approx. 120g (Each including 3m lead wire)

Note 1) In case of types with unit conversion function, (Types without unit conversion function are fixed to the SI units (KPa or MPa).)

Note 2) When a type with analogue output is selected.

Note 3) When a type with auto shift is selected.

Note 4) Value clear ±0.01psi in psi display.

Note 5) Value clear ±0.01psi in psi display.

Function

Various additional functions are available for easy measurement, switch operation and check of measured values suitable for the conditions of the measured fluid.

- **Auto shift function**
  - Can correct the pressure set point value of switch output according to fluctuation in the primary pressure.

- **Anti-chattering function**
  - Prevents malfunction due to sudden fluctuations in the primary pressure by adjusting the response time.

- **Key lock function**
  - The key can be locked to prevent incorrect operation.

- **Peak hold function**
  - Can retain the maximum pressure value displayed during measurement.

- **Bottom hold function**
  - Can retain the minimum pressure value displayed during measurement.

- **Zero out function**
  - The pressure display can be set at zero when the pressure is open to the atmosphere.

- **Unit conversion function (For overseas use)**
  - Can convert the display value (For overseas use only).

Note 1) Select and order by specifying the types and models.
**Series ZSE60F/ISE60**

**Dimensions**

ZSE60F/ISE60- A2 B2

The following items are identical with those of series ZSE50F/ISE50.

<table>
<thead>
<tr>
<th>Item</th>
<th>Reference page</th>
</tr>
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<tbody>
<tr>
<td>Output type</td>
<td>3</td>
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<tr>
<td>Example of internal circuit and wiring</td>
<td>4</td>
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<tr>
<td>Auto shift function, Chattering prevention function</td>
<td>5</td>
</tr>
<tr>
<td>Measures to be taken when error occurs</td>
<td>6</td>
</tr>
</tbody>
</table>

Piping port TSJ

Piping port URJ 1/4

2xM3 depth 4

Dimensions

Piping port

20 20 20

8.45 30 27.7

1.85 6.4 8.45

21.7 8.45 30

ø3.5
For General Fluids
High Precision Digital Pressure Switch  Series ZSE60F/ISE60

Dimensions

Bracket A

Bracket D

Panel mount

Cutting dimensions for panel mounting

The thickness of the panel is to 3.2mm.
Description (Common to ZSE50F/ISE50 and ZSE60F/ISE60)

3½ digit LED
Displays current pressure
Displays current mode
Displays error mode

LED (Green)
Displays OUT 1 switch output status
Lights up when ON

UP button
Use this button to change the mode or set value.

Down button
Use this button to change the mode or set value.

Set button
Use this button to change the mode or set value.

Setting (Common to ZSE50F/ISE50 and ZSE60F/ISE60)

Calibration procedure

Initial setting
Set "Output mode", "Response time" and "Auto/Manual mode."

Auto preset
The pressure set point is calibrated automatically at the time of adsorption or primary pressure confirmation.

Manual calibration
Enter the set value on the pressure to perform switch output.

Value clear
Adjust the zero point of atmospheric pressure.

Normal operation
Detects and displays pressure and operates switch.

Unit conversion
Display unit can be changed.

Manual fine adjustment
The data set by auto preset function is fine tuned.

Key lock
Prevents incorrect operation such as overwriting set point value by mistake.

Peak hold
Can retain the maximum pressure displayed during measurement.

Bottom hold
Can retain the minimum pressure displayed during measurement.
Setting (Common to ZSE50F/ISE50 and ZSE60F/ISE60)

Initial setting

1. Initial setting mode

Press the SET button at least 2 seconds. Release it when the display turns to "1no".

Unit: In case of types with specifications: unit conversion function, refer to "Unit setting (for overseas use)" on P.16.

2. OUT1 output mode selection

Select the "output mode" of OUT1 with ▲ or ▼ button.
"1no": Normally open mode,
"1nC": Normally closed mode

3. OUT2 output mode selection

Select the "output mode" of OUT2 with ▲ or ▼ button.
"2no": Normally open mode,
"2nC": Normally closed mode

4. Response time selection

Set the response time with ▲ or ▼ button.
(Select from "2.5: 2.5ms," "24: 2.4ms,
"192: 192 ms," and "768: 768ms."

5. Auto / Manual setting

Select the auto preset mode or manual calibration mode with the ▲ or ▼ button.
"RU": Auto preset mode,
"rIn": Manual calibration mode.

Please refer to "Chattering prevention function" on page 5.

Manual pressure setting

The output method is determined by the pressure set point value.

1. Manual setting mode

Select the manual setting mode as the initial setting mode. Press the SET button and hold it until "P_1" or "n_1" appears on the display.

▲ button: Increases the set point value.
▼ button: Decrease the set point value.
"P_1" or "n_1" and the set point value light up alternately.

2. OUT1 (1) output set point value input

3. OUT1 (2) output set point value input

4. OUT2 (1) output set point value input

5. OUT2 (2) output set point value input

6. Auto shift input display

▲ button: Increases the set point value.
▼ button: Decrease the set point value.
"P_3" or "n_3" and the set point value light up alternately.

▲ button: Increases the set point value.
▼ button: Decrease the set point value.
"P_4" or "n_4" and the set point value light up alternately.

"C_5" and the correction value light up alternately. In case there has been no auto shift input, zero is displayed.

Auto shift input is displayed only if auto shift is supported by the I/O specifications (-30/-70). It is not displayed in case of types with analog output (-22/-62).
Setting (Common to ZSE50F/ISE50 and ZSE60F/ISE60)

Auto preset (Example: Adsorption Confirmation)

1. Auto preset mode
   - Select auto preset mode as the initial setting mode. Press the SET button and hold it until "RP1" appears on the display.

2. Preparation of auto preset
   - Prepare the equipment to be set while "RP1" is displayed. If OUT1 setting is not required, press ▲ the ▼ buttons simultaneously to skip to "RP2".

3. OUT1 auto preset
   - Repeat vacuum and break several times while "AIL" is displayed. The optimum set point value is determined automatically.

4. Preparation of auto preset
   - Change the vacuum nozzle or other conditions of the work piece and supply vacuum pressure. If OUT2 setting is not required, press the ▲ and ▼ buttons simultaneously to skip to the measurement mode.

5. OUT2 auto preset
   - Repeat vacuum and break several times while "AIL" is displayed. The optimum set point value is determined automatically.

---

**Diagram:**

- High Vacuum
- Max.A: Maximum pressure value when work piece is vacuumed.
- ON point
- OFF point
- Min.B: Maximum pressure value when work piece is not vacuumed.
- Atmosphere
- Work 1
- Work 2
- Work n
- Suction

**Formulas:**

ON point = \( A - \frac{A - B}{4} \)

OFF point = \( B + \frac{A - B}{4} \)
Setting (Common to ZSE50F/ISE50 and ZSE60F/ISE60)

Key lock function
Can prevent incorrect operation of operation buttons on the switch front.

Key lock start
Press the SET button at least 2 seconds. Release it when the display turns to “UnL”.

Key lock cancel
Press the SET button at least 4 seconds. Release it when the display turns to “Loc”.

Peak/Bottom hold function
Can retain the maximum pressure value displayed (peak value) and minimum pressure value displayed (bottom value) during measurement.

Peak hold
Press the ▲ button at least for 1 second during pressure display to enter the bottom display mode. The displayed value will blink. To return, press the ▼ button again at least for 1 second.

Bottom hold
Press the ▲ button at least for 1 second during pressure display to enter the bottom display mode. The displayed value will blink. To return, press the ▼ button again at least for 1 second.

Zero out
The displayed value can be calibrated at zero if the measured pressure is in the range of ±70 increments of atmospheric pressure.

Unit setting (for overseas use)
Only for ZSE-□□F/ISE-□□-(L)

Unit selection
Set the unit with the ▲ or ▼ button.
- kPa or MPa
- kgf/cm²
- bar
- psi
- inHg
- mmHg

OUT1 output mode selection
Goes to 2. OUT1 output mode selection in Initial Setup on page 14.

Note)
Press the ▲ button at least for 1 second during pressure display to enter the bottom display mode. The displayed value will blink. To return, press the ▼ button again at least for 1 second.

Note 1)
There is no apparent difference between peak display and bottom display.

Note)
There is no apparent difference between peak display and bottom display.

Note 1)
Calibration is available with series ZSE50 and ZSE60.
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "Caution", "Warning" or "Danger". To ensure safety, be sure to observe ISO 4414 Note 1), JIS B 8370 Note 2) and other safety practices.

⚠️ Caution : Operator error could result in injury or equipment damage.

⚠️ Warning : Operator error could result in serious injury or loss of life.

⚠️ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

Note 1) ISO 4414: Pneumatic fluid power – Recommendations for the application of equipment to transmission and control systems

Note 2) JIS B 8370: General Rules for Pneumatic Equipment

⚠️ Warning

1. The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications. Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after analysis and/or tests to meet your specific requirements.

2. Only trained personnel should operate pneumatically operated machinery and equipment. Compressed air can be dangerous if handled incorrectly. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.
   1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.
   2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.
   3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc. (Bleed air into the system gradually to create back pressure.)

4. Contact SMC if the product is to be used in any of the following conditions:
   1. Conditions and environments beyond the given specifications, or if product is used outdoors.
   2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency stop circuits, press applications, or safety equipment.
   3. An application which has the possibility of having negative effects on people, property, or animals, and therefore requires special safety analysis.
Series ZSE F/ISE

Pressure Switch Precautions

Be sure to read before handling. Refer to pages 17 through 19 for safety instructions and pressure switch precautions, and to page 20 for specific product precautions.

Design and Selection

⚠️ Warning

1. Operate the switch only within the specified voltage.
   Use of the switch outside the range of the specified voltage can cause not only malfunction and damage to the switch but also electric shocks and fire.

2. Do not exceed the maximum allowable load specification.
   A load exceeding the maximum load specification can cause damage to the switch or shorten its operating life.

3. Do not use a load that generates surge voltage.
   Although surge protection is installed in the circuit at the output side of the switch, damage may still occur if a surge is applied repeatedly. When a surge generating load such as a relay or solenoid is directly driven, use a type of switch with a built-in surge absorbing element.

4. The fluid compatibility varies among products. Be sure to confirm the specifications.
   The switch does not have an explosion proof rating. To prevent a possible fire hazard, do not use with flammable gases or fluids.

5. Operate the switch within the regulating pressure range and maximum operating pressure.
   Malfunction can occur if the pressure sensor is used outside the regulating pressure range, and the sensor may be permanently damaged if used at a pressure that is above the maximum operating pressure.

Wiring

⚠️ Warning

1. Confirm the colours and terminal numbers of cords when wiring.
   Incorrect wiring can cause the switch to be damaged and malfunction. Verify the colours and terminal number in the instruction manual when wiring.

2. Avoid repeatedly bending or stretching lead wires.
   Repeatedly applying bending stress or stretching force to the lead wire will cause it to break. If you believe the lead wire is damaged and likely to cause malfunctions, replace it.

3. Confirm proper insulation of wiring.
   Make sure that there is no faulty wiring insulation (contact with other circuits, ground fault, improper insulation between terminals, etc.). Damage may occur due to excess current flow into a switch.

Mounting

⚠️ Warning

1. If the equipment is not operating properly, do not continue to use it.
   Connect air and power after installation, repairs, or modifications, and verify proper installation. The switch should be checked for proper operation and possible leaks.

2. Mount switches using the proper tightening torque.
   When a switch is tightened beyond the specified tightening torque, the mounting screws, mounting bracket, or switch may be damaged. On the other hand, tightening below the specified tightening torque may cause the installation screws to come loose during operation.

<table>
<thead>
<tr>
<th>Nominal thread size</th>
<th>Proper tightening torque N·m</th>
</tr>
</thead>
<tbody>
<tr>
<td>M5</td>
<td>1/6 rotation after tightening by hand</td>
</tr>
<tr>
<td>R 1/4, NPT 1/4, G 1/4, URF 1/4, TSJ 1/4</td>
<td>13.6N·m</td>
</tr>
</tbody>
</table>

3. Apply wrench only to the metal part of the main housing when installing the pressure switch onto the system piping.
   Do not apply a wrench to the resin part as this may damage the switch.

Operating Environment

⚠️ Warning

1. Never use in the presence of explosive gases.
   The switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

Maintenance

⚠️ Warning

1. Perform periodic inspections to ensure proper operation of the switch.
   Unexpected malfunctions or incorrect operation may cause possible danger.

2. Take precautions when using the switch for an interlock circuit.
   When a pressure switch is used for an interlock circuit, devise a multiple interlock system to prevent trouble or malfunctioning. Verify the operation of the switch and interlock function on a regular basis.
Selection

⚠️ Warning

1. Monitor the internal voltage drop of the switch.
   When operating below a specified voltage, it is possible that the load may be ineffective even though the pressure switch function is normal. Therefore, the formula below should be satisfied after confirming the minimum operating voltage of the load.
   \[
   \text{Supply voltage} - \text{Internal voltage drop of switch} > \text{Minimum operating voltage of load}
   \]

⚠️ Caution

1. Data of the digital pressure switch will be stored even after the power is turned off.
   Input data (set pressure, etc.) will be stored in EEPROM so that the data will not be lost after the pressure switch is turned off. (Data will be stored for up to 100,000 hours after the power is turned off.)

Mounting

⚠️ Warning

1. Operation
   Refer to the instruction manual for the operation of the digital pressure switch.

2. Pressure port
   Do not introduce any wire or similar object to a pressure port as this may damage the pressure sensor and cause a malfunction.

Wiring

⚠️ Warning

1. Do not wire conjunction with power lines or high voltage lines.
   Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Control circuit including the switches may malfunction due to noise from these other lines.

2. Do not allow loads to short circuit.
   Although digital pressure switches indicate excess current error if loads are short circuited, all incorrect wiring connections cannot be protected. Take precautions to avoid incorrect wiring. As for other pressure switches, the switches will be instantly damaged if loads are short circuited. Take special care to avoid reverse wiring between the brown power supply line and the black output line.

3. Connect a DC (-) wire (blue) as close as possible to the DC power supply GND terminal.
   Connecting the power supply away from the GND terminal can cause malfunctions due to noise from devices that are connected to the GND terminal.

4. Do not attempt to insert or pull the pressure sensor or its connector when the power is on.

⚠️ Caution

1. Cleaning of the switch body.
   Wipe off dirt with soft cloth. If dirt does not come off easily, use a neutral detergent diluted with water to dampen a soft cloth. Wipe the switch only after squeezing the excess water out of the dampened cloth. Then finish off by wiping with a dry cloth afterwards.

Pressure Source

⚠️ Warning

1. Use the switch within the specified fluid and ambient temperature range.
   Ambient and fluid temperature operation is as follows:
   - Digital pressure switches: 0°C to 50°C
   Take measures to prevent moisture from freezing in circuits when below 5°C, since this may cause damage to the O-ring and lead to a malfunction. The installation of an air dryer is recommended for eliminating condensate and moisture. Never use the switch in an environment where there are drastic temperature changes even when these temperatures are operated within the specified temperature range.

2. Compound pressure switch
   Although application of a momentary pressure around 0.5 MPa will not affect the performance (at the time of vacuum break), be careful to not to apply constant pressure of 0.2 MPa or more.

Operating Environment

⚠️ Warning

1. Do not use in an area where surges are generated.
   When there are units that generate a large amount of surge in the area around pressure switches (e.g., solenoid type lifters, high frequency induction furnaces, motors), this may cause deterioration or damage to the switches’ internal circuitry. Avoid and protect against sources of surge generation and crossed lines.

Maintenance

⚠️ Caution

1. Cleaning of the switch body.
   Wipe off dirt with soft cloth. If dirt does not come off easily, use a neutral detergent diluted with water to dampen a soft cloth. Wipe the switch only after squeezing the excess water out of the dampened cloth. Then finish off by wiping with a dry cloth afterwards.
**Handling**

⚠️ Warning
1. Do not drop, or apply excessive impact (980 m/s²) while handling. Although the body of the sensor may not be damaged, the internal parts of the sensor could be damaged and lead to a malfunction.
2. The tensile strength of the cord is 49 N. Applying a greater pulling force on it can cause a malfunction. When handling, hold the body of the sensor — do not dangle it from the cord.
3. Do not exceed the screw-in torque of 13.6 N·m when installing piping. Exceeding this value may cause malfunctioning of the sensor.
4. Do not use pressure sensors with corrosive and/or flammable gases or liquids.

**Connection**

⚠️ Warning
1. Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output.
2. Turn off the power before connecting the wires.
3. Wire separately from power lines and high voltage lines, avoiding wiring in the same conduit with these lines. Malfunctions may occur due to noise from these lines.
4. If a commercial switching regulator is used, make sure that the F.G. terminal is grounded.

**Operating Environment**

⚠️ Warning
1. Our pressure switches are CE marked; however, they are not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.
2. Our pressure switches do not have an explosion proof rating. Never use it in the presence of an explosive gas as this may cause a serious explosion.

⚠️ Caution
1. Do not use in an environment with spattering liquid of oil or solvent.
2. In an environment where the body of the switch is exposed to water or dust, there is possibility of water or dust invasion of the switch through the atmospheric release port. Insert a ø4 tube (with inside diameter of ø2.5) into the atmospheric release port and pipe the other end to a place with no spattering water or other liquid. Do not fold or clog the tube or the pressure cannot be measured properly.

*Confirm that the air tube is inserted to the bottom of the atmospheric release port.
*Use SMC TU0425 (Material: Polyurethane, O.D.: ø4, I.D.: ø2.5) as the air tube.

**Pressure Source**

⚠️ Warning
1. Use of toxic, corrosive or flammable gas.
   The materials of the pressure sensor and fittings on the switch are SUS630 and SUS304. Do not use toxic or corrosive gas.
   The switch is not protected against explosion. Do not use it with flammable gas, either.
2. Compatible fluid
   The fluid contact areas are SUS630 (pressure sensor) or SUS304 (fittings). Use fluid that will not corrode the materials. (For corrosiveness of fluid, consult the manufacturer of the fluid.)

 QFont: <ZSE60F/ISE60>
Helium leakage test
Helium leakage test is conducted on the welding parts. Use a ferrule a ferrule by (Swagelok® fittings) as the TSJ fittings and packing, ground, etc. by Cajon (VCR® fittings) as the URJ fittings. If a ferrule, packing or ground by other manufacturers are to be used, conduct helium leakage test before using those products.

**Mounting Method**

1. Mounting with panel mount adapter
   ![Diagram of panel mounting adapter]
   
   Front protection cover (optional)
   
   Panel mounting adapter A
   
   Panel mounting adapter B

2. Mounting with brackets
   Mount a bracket to the using two M3 x 5L mounting screws and install on piping with a hexagon socket cap screws. The switch can be installed horizontally depending on the installation location.

   Mounting screw M3 x 5L
   
   Bracket A or D
   
   The tightening torque for bracket mounting screw should be 0.98 N·m or less.