

# High-Precision Digital Pressure Switch for General Fluids

## Series ZSE50F/60F/ISE50/60



### Pressure detection for a wide range of fluids.

Enclosure IP65



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 measure hydraulic pressure

Argon

Air containing drain

Ammonia

Carbon dioxide

Nitrogen

Water

- To measure low-quality air, containing drain
- Leakage test with nitrogen

#### Using of stainless steel diaphragm

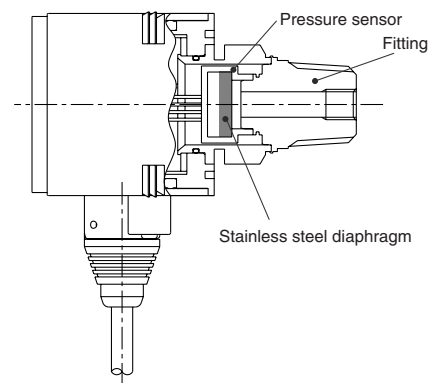
The stainless steel diaphragm prevents direct contact between sensor and measured fluid.

- Pressured areas ..... Stainless steel 630
- Fittings ..... Stainless steel 304

#### Extremely low leakage

Sensor and fittings are electron-beam welded. Leakage is kept at the lowest level by using VCR® and Swedgelok® fittings.

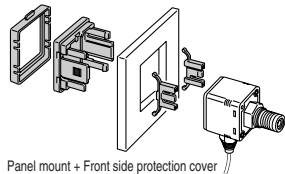
- ZSE50F / ISE50  $1 \times 10^{-5} \text{Pa}\cdot\text{m}^3/\text{s}$
- ZSE60F / ISE60  $1 \times 10^{-10} \text{Pa}\cdot\text{m}^3/\text{s}$



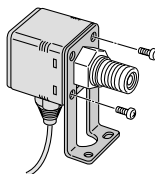
\* VCR® and Swagelok® are trademarks of Swagelok Company.

Option

■ Panel mount

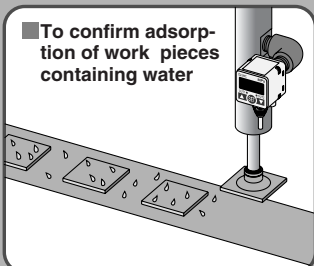


■ With bracket

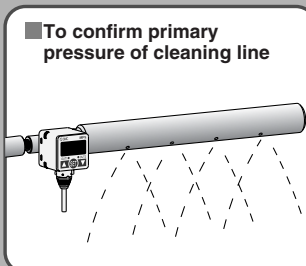


Application examples

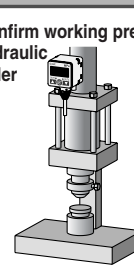
■ To confirm adsorption of work pieces containing water



■ To confirm primary pressure of cleaning line



■ To confirm working pressure of hydraulic cylinder



Note) When vacuum is released, take precautions to avoid water collision with rush inertia. (An adapter with throttle (ZS-31-X175, X186) is available to prevent water collision with rush inertia.) (Refer to "Infiltration of water and drainage" on page 761 for details.)

ZSE  
ISE  
ZSP  
PS  
ISA  
PSE  
IS  
ISG  
ZSM

# High precision and high resolution

**Compound pressure** 1/2000(0.1 kPa)

**Positive pressure** 1/1000(0.001 MPa)

**Repeatability**  $\pm 0.2\%F.S.$   $\pm 1$ digit 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, 24ms, 192ms, 768ms or less

### Auto shift function

Pressure detection is not affected by fluctuations in primary pressure.

### Auto preset function

Automatic pressure setting is possible. Saves time for setting operation.

- Key lock function
- Peak and bottom display function
- Zero out function

## Series ZSE60F/ISE60

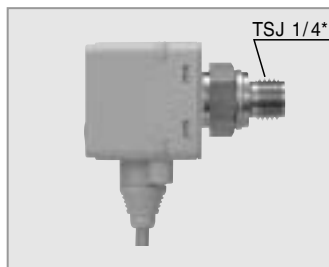
Special fitting types are used in semiconductor production equipment (metal gasket seal fittings)

- Leak rate:  $1 \times 10^{-10} \text{Pa} \cdot \text{m}^3/\text{s}$

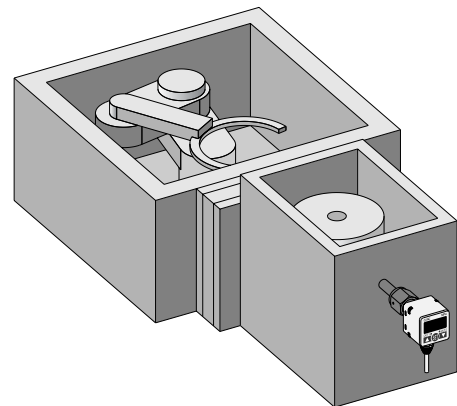
■ ZSE60F/ISE60-A2



■ ZSE60F/ISE60-B2



■ Confirmation of atmospheric pressure of load lock



## Variations

| Model                |               | ZSE50F   | ISE50 | ZSE60F  | ISE60  |
|----------------------|---------------|--|-------|---|--|
|                      |               | Standard thread type                                   |       |   | Special fittings for the semiconductor industry (metal gasket seal fittings) |
| Port size            |               | R 1/4 · NPT 1/4 · G 1/4 (with M5 male thread)          |       | URJ 1/4 · TSJ 1/4*                                      |  |
| Leak rate            |               | $1 \times 10^{-5} \text{Pa} \cdot \text{m}^3/\text{s}$ |       | $1 \times 10^{-10} \text{Pa} \cdot \text{m}^3/\text{s}$ |  |
| Rated pressure range |               | 100 kPa  | 1 MPa | 100 kPa   | 1 MPa  |
|                      |               | 0  | 0     | 0   | 0  |
|                      |               | -100 kPa   |       | -100 kPa  |  |
| Output               | Switch output | 2 outputs NPN or PNP                                   |       |   |  |
|                      | Analog output | Output voltage 1 to 5 V                                |       |   |  |

\* Refer to Glossary of Terms/Technical Information on pages 878 and 879 for URJ 1/4 and TSJ 1/4.

# High-Precision Digital Pressure Switch for General Fluids



## 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   |

\* Optional

#### Input/output specifications

|     |  |
|-----|--|
| 22  | NPN open collector 2 output + Analog output    |
| 30  | NPN open collector 2 output + Auto shift input |
| 62* | PNP open collector 2 output + Analog output    |
| 70* | PNP open collector 2 output + Auto shift input |

\* Optional

Note) Auto shift input is used for the auto shift function.  
For more information, please refer to Auto Shift Function on page 752.

#### Lead wire length

|   |     |
|---|-----|
| L | 3 m |
|---|-----|

#### Option

|     |   |
|-----|---|
| Nil | None  |
| A   | Bracket A<br>   |
| D   | Bracket D<br>Refer to the dimensions for the difference between brackets A and D. |
| E   | Panel mount<br>   |
| F   | Panel mount + Front protection cover<br>  |

ZSE  
ISE

ZSP

PS

ISA

PSE

IS

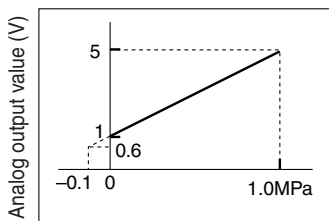
ISG

ZSM

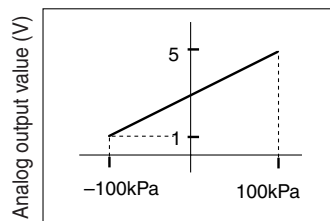
### Analog output

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

#### Series ISE50



#### Series ZSE50F



#### Option

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

| Option                               | Part no.   | Qty. | Note                           |
|--------------------------------------|------------|------|--------------------------------|
| Bracket A                            | ZS-24-A    | 1    | With 2 pcs. of mounting screws |
| Bracket D                            | ZS-24-D    | 1    | With 2 pcs. of mounting screws |
| Panel mount                          | ZS-24-E    | 1    |                                |
| Panel mount + Front protection cover | ZS-24-F    | 1    |                                |
| Adapter with throttle Rc1/4          | ZS-31-X175 | 1    |                                |
| Adapter with throttle NPT1/4         | ZS-31-X186 | 1    |                                |

#### Unit specification

|     |                                 |
|-----|---------------------------------|
| Nil | With unit switching function    |
| M   | Fixed SI unit <sup>(Note)</sup> |

Note) Fixed units:

For compound pressure : KPa  
For positive pressure : MPa

# Series ZSE50F/ISE50

## Specifications

|                                     |                           | ZSE50F (Compound pressure)  | ISE50 (Positive pressure)   |
|-------------------------------------|---------------------------|---|---|
| Rated pressure range                |                           | -100.0 to 100.0 kPa   | 0.000 to 1.000 MPa  |
| Regulating pressure range           |                           | -100.0 to 100.0 kPa   | -0.100 to 1.000 MPa   |
| Extended analog output range        |                           | —   | -0.100 to 0 MPa   |
| Proof pressure                      |                           | 500 kPa   | 1.5 MPa   |
| Setting/Display resolution          | kPa                       | 0.1   | —   |
|                                     | MPa                       | —   | 0.001   |
| Fluid                               |                           | Fluid or air that will not corrode stainless steel 630 and 304  |   |
| Power supply voltage                |                           | 12 to 24 VDC, Ripple (p-p) 10% or less (With power supply polarity protection)  |   |
| Current consumption                 |                           | 55 mA or less   |   |
| Switch output                       |                           | NPN or PNP open collector output 2 output   |   |
|                                     | Max. load current         | 80 mA   |   |
|                                     | Max. applied voltage      | 30 V (With NPN output)  |   |
|                                     | Residual voltage          | 1 V or less (With load current 80 mA)   |   |
|                                     | Response time             | 2.5 ms or less (Response time selections with chattering prevention function: 24 ms, 192 ms and 768 ms)   |   |
|                                     | Short circuit protection  | With short circuit protection   |   |
| Repeatability                       |                           | ±0.2% F.S. ±1 digit or less   | ±0.3% F.S. ±1 digit or less   |
| Hysteresis                          | Hysteresis mode           | Variable (0 or above)   |   |
|                                     | Window comparator mode    | Fix (3 digits)  |   |
| Display                             |                           | 3 1/2-digit, 7 segment indicator (Sampling frequency: 5 times/sec.)   |   |
| Display accuracy                    |                           | ±2% F.S. ±1 digit or less (With ambient temperature of 25°C)  |   |
| Indication light                    |                           | Green LED (OUT1: Lights when ON), Red LED (OUT2: Lights when ON)  |   |
| Analog output <sup>Note 1)</sup>    |                           | Output voltage: 1 to 5 V ±5% F.S. or less<br>(In rated pressure range)<br>Linearity: ±1% F.S. or less<br>Output impedance: Approx. 1 kΩ                 | Output voltage: 1 to 5 V ±2.5% F.S. or less<br>(In rated pressure range)<br>0.6 to 1 V ±5% F.S. or less<br>(in extended analog output range)<br>Linearity: ±1% F.S. or less<br>Output impedance: Approx. 1 kΩ |
| Auto shift input <sup>Note 2)</sup> |                           | No-voltage input (solid state switch or reed switch), input 5 ms or more  |   |
| Environmental 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 condensation)   |   |
|                                     | Withstand voltage         | 250 VAC for 1 min, between live parts and case  |   |
|                                     | Insulation resistance     | 2 MΩ or more (at 50 VDC) between live parts and case  |   |
|                                     | Vibration resistance      | 10 to 500 Hz at the smaller of amplitude 1.5 mm or acceleration 98 m/s <sup>2</sup> 2 hours each in direction of X, Y and Z respectively (De-energized) |   |
|                                     | Shock resistance          | 980 m/s <sup>2</sup> in X, Y, Z directions 3 times each (De-energized)  |   |
| Temperature characteristics         |                           | ±3% F.S. or less (At 25°C in standard)  |   |
| Port size                           |                           | O2: R1/4, M5 x 0.8 T2: NPT1/4, M5 x 0.8   |   |
| Wetted material                     |                           | Pressure receiving area: Stainless steel 630, Fittings: Stainless steel 304   |   |
| Lead wire                           |                           | Oil-resistant vinyl cabtire cable 5 cores, ø3.5, Cross section: 0.15 mm <sup>2</sup> , Insulator O.D.: 0.97 mm  |   |
| Mass                                |                           | Approx. 120 g (Each including 3 m lead wire)  |   |
| Standard                            |                           | Compliant with CE marking   |   |

Note 1) In case of ZSE50F/ISE50-□-<sup>22</sup>/<sub>62</sub>

Note 2) In case of ZSE50F/ISE50-□-<sup>30</sup>/<sub>70</sub>

Note

The possible set ranges for types with auto shift function are as follows:

| Model                                   | Regulating pressure range |
|---|---------------------------|
| ZSE50F-□- <sup>30</sup> / <sub>70</sub> | -100.0 to 100.0 kPa       |
| ISE50-□- <sup>30</sup> / <sub>70</sub>  | -1.000 to 1.000 MPa       |

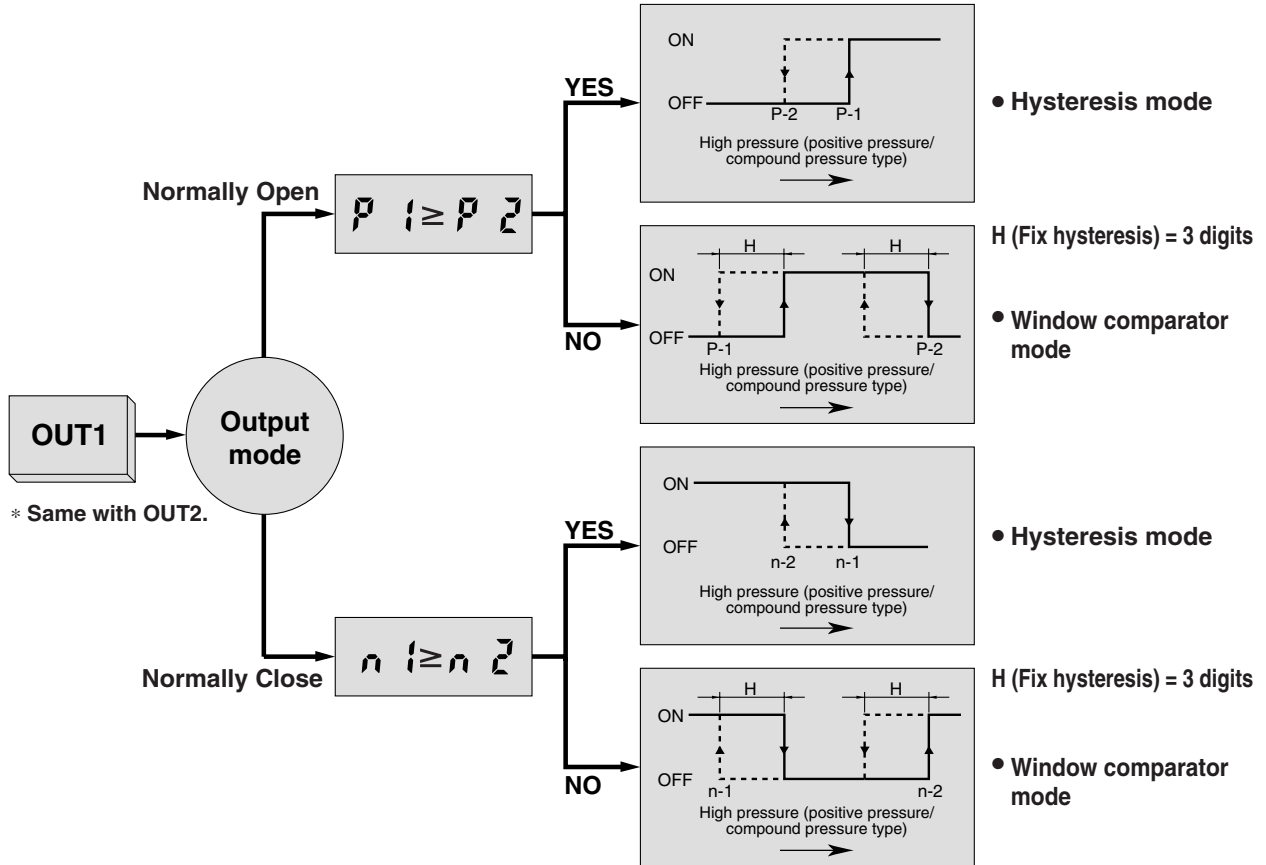
## Function

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 <sup>Note 1)</sup> | Can correct the pressure set point value of switch output according to fluctuations 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                      | Key operation can be locked to prevent incorrect operation on the operation switch.                          |
| 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 <sup>Note 1)</sup>     | Can convert the display value.   |

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

**Output Method**

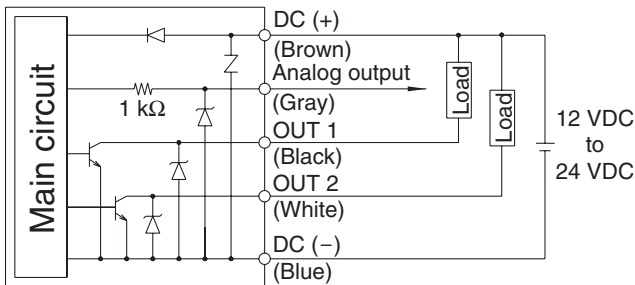


Note) When in hysteresis mode and window comparator mode, setting is determined automatically by comparing the small and large set pressure values P1, P2 (n1, n2).

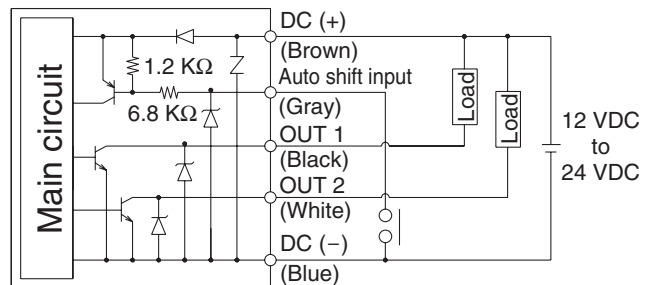
|     |
|-----|
| ZSE |
| ISE |
| ZSP |
| PS  |
| ISA |
| PSE |
| IS  |
| ISG |
| ZSM |

**Example of Internal Circuit and Wiring**

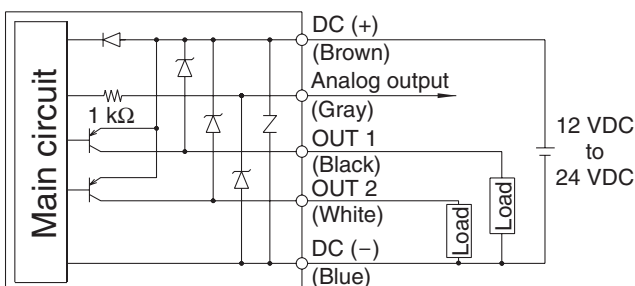
**ZSE<sup>50</sup><sub>60</sub> F/ISE<sup>50</sup><sub>60</sub> -□-22(L)-(M)**  
With analog output



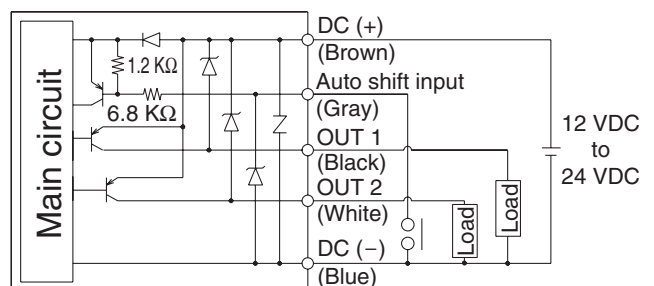
**ZSE<sup>50</sup><sub>60</sub> F/ISE<sup>50</sup><sub>60</sub> -□-30(L)-(M)**  
With auto shift input



**ZSE<sup>50</sup><sub>60</sub> F/ISE<sup>50</sup><sub>60</sub> -□-62(L)-(M)**  
With analog output



**ZSE<sup>50</sup><sub>60</sub> F/ISE<sup>50</sup><sub>60</sub> -□-70(L)-(M)**  
With auto shift input



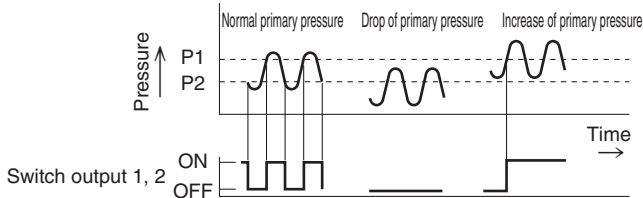
# Series ZSE50F/ISE50

## 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.

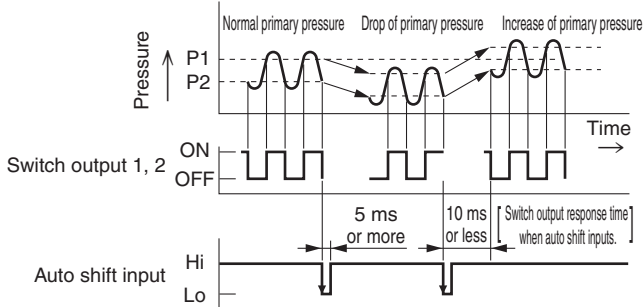
### When auto shift is not used:

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 (No electrical pressure input). 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 input 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:

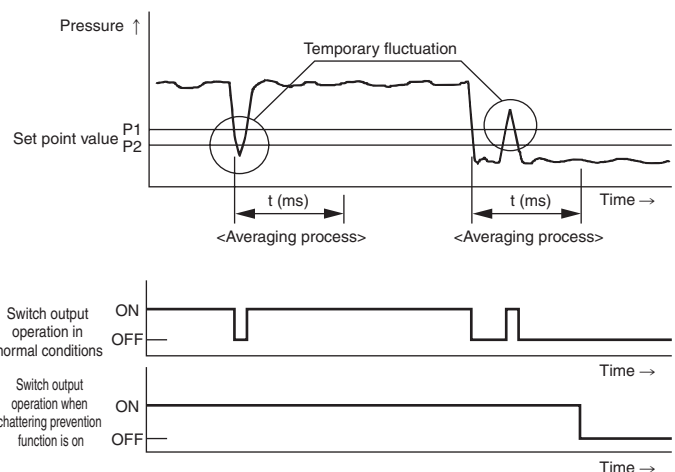
| Model                                  | Regulating pressure range |
|--|---------------------------|
| ZSE50F-□ <sup>30</sup> / <sub>70</sub> | -100.0 to 100.0 kPa       |
| ZSE60F-□ <sup>30</sup> / <sub>70</sub> |                           |
| ISE50-□ <sup>30</sup> / <sub>70</sub>  | -1.000 to 1.000 MPa       |
| ISE60-□ <sup>30</sup> / <sub>70</sub>  |                           |

## Anti-chattering Function

A large bore cylinder or ejector consumes a large amount of air in operation and may experience 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.



## Error Function

Take the following measures when an error occurs.

| Error description       |       | LCD display | Condition  | Solution   |
|-------------------------|-------|-------------|--|--|
| Over current error      | OUT 1 | Er1         | Load current of switch output is more than 80 mA.  | Shut off the power supply. After eliminating the output factor that caused the excess current, turn the power supply back on.  |
|                         | OUT 2 | Er2         |  |  |
| Residual pressure error |       | Er3         | Pressure is applied during the zero out operation as follows:<br>$\left[ \begin{array}{l} \pm 0.071 \text{ MPa or more with ISE50/60} \\ \pm 7.1 \text{ kPa or more with ZSE50F/60F} \end{array} \right]$<br>* After displaying for 3 seconds, it will return to the measuring mode. | Bring the pressure back to atmospheric pressure and try using the zero out function.   |
| Applied pressure error  |       | ---         | Supply pressure exceeds the maximum regulating pressure.   | Reduce/Increase supply pressure to within the regulating pressure range.   |
|                         |       | ----        | Supply pressure is below the minimum regulating pressure.  |  |
| Auto shift error        |       | UUU         | The value is above the upper limit of the set pressure<br>* After displaying this message for about 1 second, the switch returns to the measurement mode.  | 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. |
|                         |       | LLL         | The value is below the upper limit of the set pressure<br>* After displaying this message for about 1 second, the switch returns to the measurement mode.  |  |
| System error            |       | Er4         | Internal data error  | Shut off the power supply. Turn the power supply back on. If the power should not come back on, please contact SMC for an inspection.                                    |
|                         |       | Er6         | Internal data error  |  |
|                         |       | Er7         | Internal data error  |  |
|                         |       | Er8         | Internal data error  |  |

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

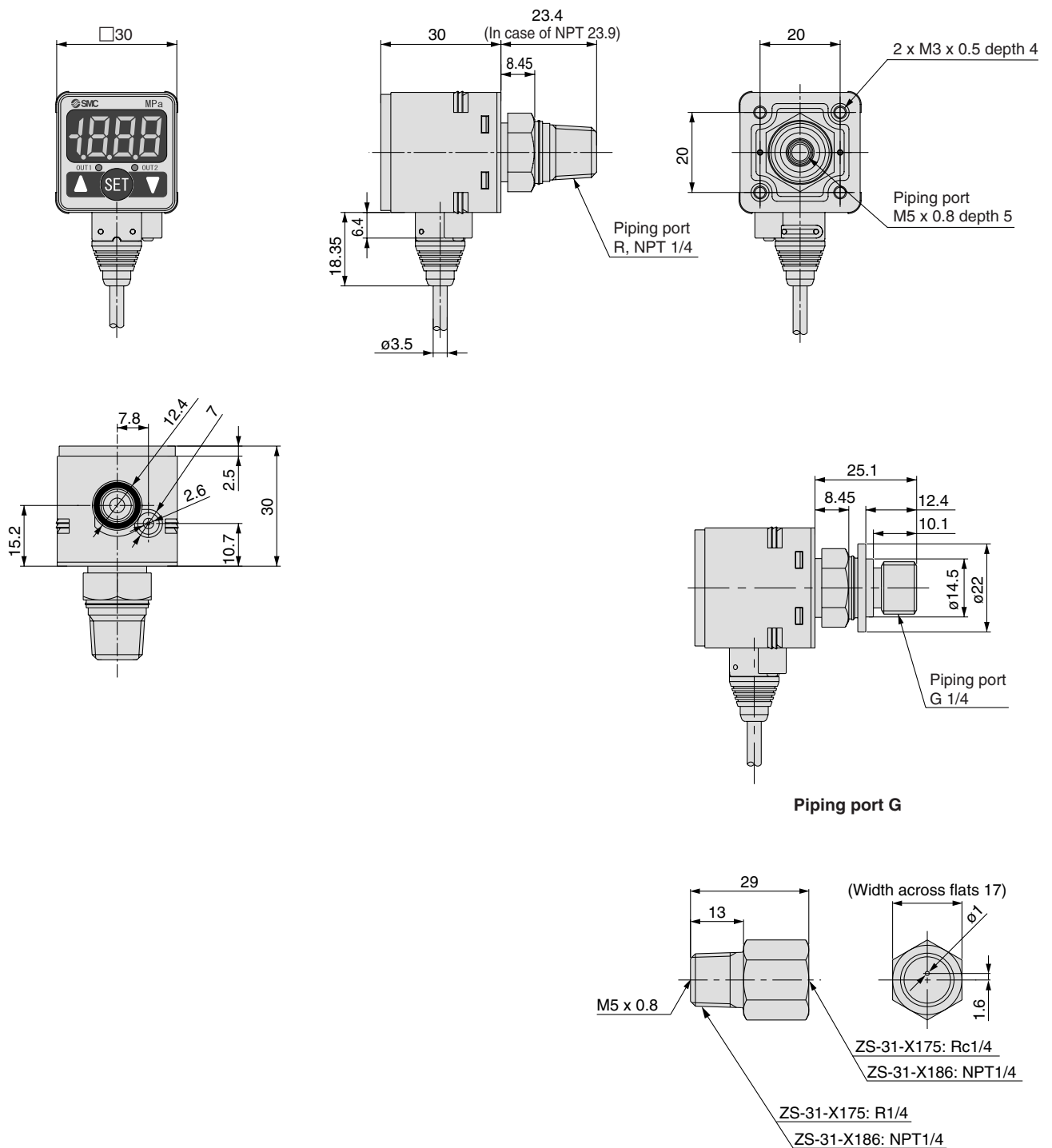
|                          | Regulating pressure range | Lower limit | Upper limit |
|--------------------------|---------------------------|-------------|-------------|
| Compound pressure        | -100.0 to 100.0 kPa       | -100.0 kPa  | 100.0 kPa   |
| Positive pressure        | -0.100 to 1.000 MPa       | -0.100 MPa  | 1.000 MPa   |
| With auto shift function |                           |             |             |
|                          | Regulating pressure range | Lower limit | Upper limit |
| Compound pressure        | -100.0 to 100.0 kPa       | -100.0 kPa  | 100.0 kPa   |
| Positive pressure        | -1.000 to 1.000 MPa       | -1.000 MPa  | 1.000 MPa   |

ZSE  
ISE  
ZSP  
PS  
ISA  
PSE  
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ISG  
ZSM

# Series ZSE50F/ISE50

## Dimensions

ZSE50F/ISE50-  
02  
T2  
G2



Piping port G

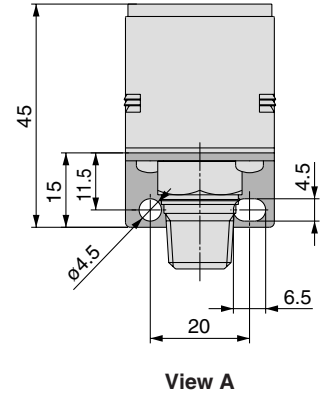
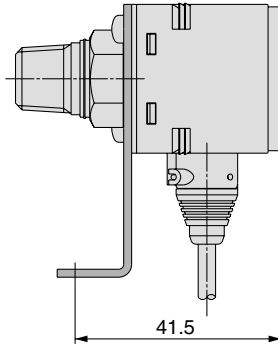
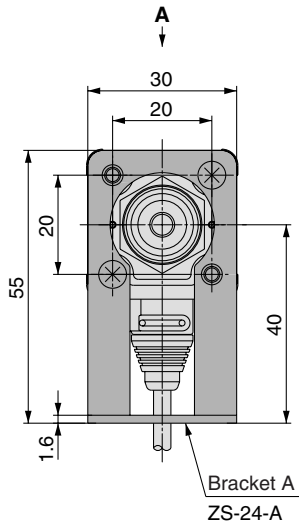
Adapter with throttle

\* Refer to "Infiltration of water and drainage" on page 761 for details.

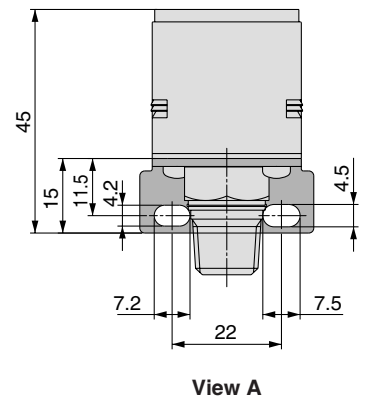
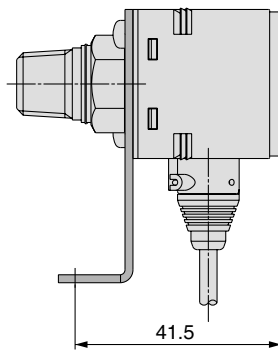
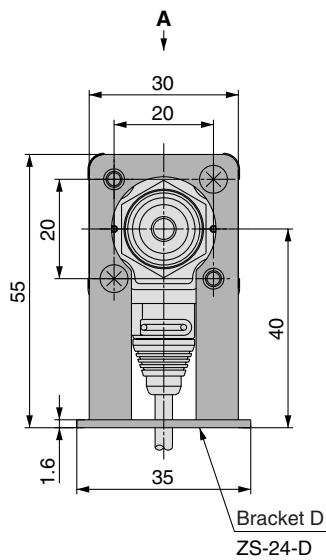


**Dimensions**

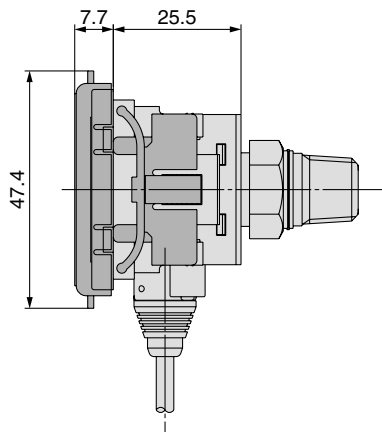
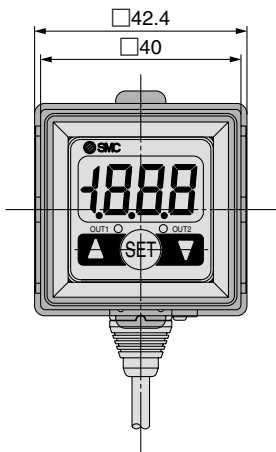
**Bracket A**



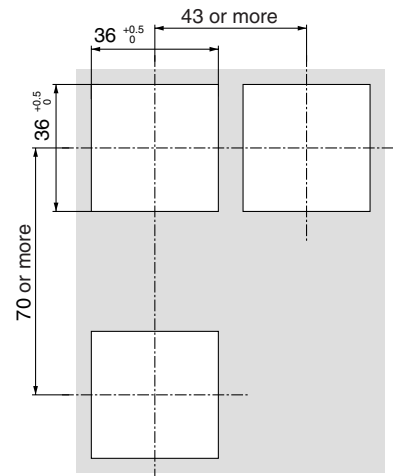
**Bracket D**



**Panel mount + Front protection cover**



**Cutting dimensions for panel mounting**



The thickness of the panel is 1 to 3.2 mm.

- ZSE
- ISE
- ZSP
- PS
- ISA
- PSE
- IS
- ISG
- ZSM

# High-Precision Digital Pressure Switch for General Fluids



## Series ZSE60F/ISE60



### How to Order

For positive pressure

ISE60 - A2 - 22 L - M

For compound pressure

ZSE60 F - A2 - 22 L - M

#### Piping specifications

|           |  |
|-----------|--|
| <b>A2</b> | URJ 1/4*, Piping in the backward direction |
| <b>B2</b> | TSJ 1/4*, Piping in the backward direction |

\* URJ 1/4 and TSJ 1/4 are special fittings for semiconductor manufacturing equipment.  
Refer to Glossary of Terms/Technical Information on pages 878 and 879 for details.

#### Input/output specifications

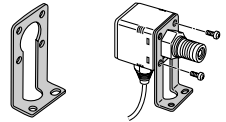
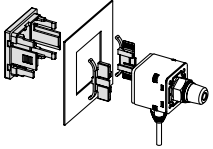
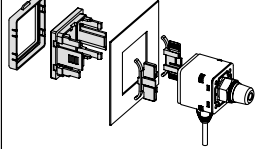
|             |  |
|-------------|--|
| <b>22</b>   | NPN open collector 2 output + Analog output    |
| <b>30</b>   | NPN open collector 2 output + Auto shift input |
| <b>* 62</b> | PNP open collector 2 output + Analog output    |
| <b>* 70</b> | PNP open collector 2 output + Auto shift input |

\* Optional  
Note) Auto shift input is used for the auto shift function.  
For more information, please refer to Auto Shift Function on page 752.

#### Lead wire length

|          |     |
|----------|-----|
| <b>L</b> | 3 m |
|----------|-----|

#### Option

|            |   |
|------------|---|
| <b>Nil</b> | None  |
| <b>A</b>   | Bracket A<br>                             |
| <b>D</b>   | Bracket D<br>Refer to the dimensions for the difference between brackets A and D.   |
| <b>E</b>   | Panel mount<br>                          |
| <b>F</b>   | Panel mount + Front protection cover<br> |

#### Unit specification

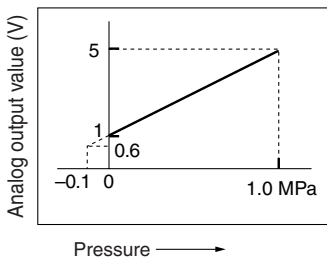
|            |                                 |
|------------|---------------------------------|
| <b>Nil</b> | With unit switching function    |
| <b>M</b>   | Fixed SI unit <sup>(Note)</sup> |

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

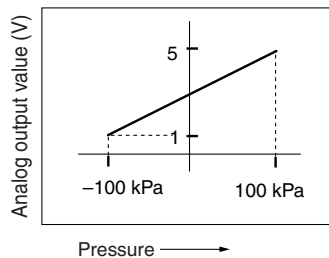
### Analog output

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

#### Series ISE60



#### Series ZSE60F



#### Option

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

| Option                               | Part no. | Qty. | Note                           |
|--------------------------------------|----------|------|--------------------------------|
| Bracket A                            | ZS-24-A  | 1    | With 2 pcs. of mounting screws |
| Bracket D                            | ZS-24-D  | 1    | With 2 pcs. of mounting screws |
| Panel mount                          | ZS-24-E  | 1    |                                |
| Panel mount + Front protection cover | ZS-24-F  | 1    |                                |

# High-Precision Digital Pressure Switch for General Fluids **Series ZSE60F/ISE60**

## Specifications

| Model                               |                           | ZSE60F (Compound pressure)  | ISE60 (Positive pressure)   |
|-------------------------------------|---------------------------|---|---|
| Rated pressure range                |                           | -100.0 to 100.0 kPa   | 0.000 to 1.000 MPa  |
| Set pressure range                  |                           | -100.0 to 100.0 kPa   | -0.100 to 1.000 MPa   |
| Extended analog output range        |                           | —   | -0.100 to 0 MPa   |
| Proof pressure                      |                           | 500 kPa   | 1.5 MPa   |
| Setting/Display resolution          | kPa                       | 0.1   | —   |
|                                     | MPa                       | —   | 0.001   |
| Fluid                               |                           | Fluid or air that will not corrode stainless steel 630 and 304  |   |
| Power supply voltage                |                           | 12 to 24 VDC, Ripple (p-p) 10% or less (With power supply polarity protection)  |   |
| Current consumption                 |                           | 55 mA or less   |   |
| Switch output                       |                           | NPN or PNP open collector output 2 output   |   |
|                                     | Max. load current         | 80 mA   |   |
|                                     | Max. applied voltage      | 30 V (With NPN output)  |   |
|                                     | Residual voltage          | 1 V or less (With load current 80 mA)   |   |
|                                     | Response time             | 2.5 ms or less (Response time selections with chattering prevention function: 24 ms, 192 ms and 768 ms)   |   |
|                                     | Short circuit protection  | With short circuit protection   |   |
| Repeatability                       |                           | ±0.2% F.S. ±1 digit or less   | ±0.3% F.S. ±1 digit or less   |
| Hysteresis                          | Hysteresis mode           | Variable (0 or above)   |   |
|                                     | Window comparator mode    | Fix (3 digits)  |   |
| Display                             |                           | 3 1/2-digit, 7 segment indicator (Sampling frequency: 5 times/sec.)   |   |
| Display accuracy                    |                           | ±2% F.S. ±1 digit or less (With ambient temperature of 25°C)  |   |
| Indication light                    |                           | Green LED (OUT1: Lights when ON), Red LED (OUT2: Lights when ON)  |   |
| Analog output <sup>Note 1)</sup>    |                           | Output voltage: 1 to 5 V ±5% F.S. or less<br>(In rated pressure range)<br>Linearity: ±1% F.S. or less<br>Output impedance: Approx. 1 kΩ                 | Output voltage: 1 to 5 V ±2.5% F.S. or less<br>(In rated pressure range)<br>0.6 to 1 V ±5% F.S. or less<br>(in extended analog output range)<br>Linearity: ±1% F.S. or less<br>Output impedance: Approx. 1 kΩ |
| Auto shift input <sup>Note 2)</sup> |                           | No-voltage input (solid state switch or reed switch), input 5 ms or more  |   |
| Environmental 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 condensation)   |   |
|                                     | Withstand voltage         | 250 VAC for 1 min, between live parts and case  |   |
|                                     | Insulation resistance     | 2 MΩ or more (at 50 VDC) between live parts and case  |   |
|                                     | Vibration resistance      | 10 to 500 Hz at the smaller of amplitude 1.5 mm or acceleration 98 m/s <sup>2</sup> 2 hours each in direction of X, Y and Z respectively (De-energized) |   |
| Shock resistance                    |                           | 980 m/s <sup>2</sup> in X, Y, Z directions 3 times each (De-energized)  |   |
| Temperature characteristics         |                           | ±3% F.S. or less (At 25°C in standard)  |   |
| Port size                           |                           | A2: URJ1/4 B2: TSJ1/4   |   |
| Wetted material                     |                           | Pressure receiving area: Stainless steel 630, Fittings: Stainless steel 304   |   |
| Lead wire                           |                           | Oil-resistant cabtire cord 5 cores, ø3.5, Cross section: 0.15 mm <sup>2</sup> , Conductor O.D.: 0.97 mm   |   |
| Mass                                |                           | Approx. 120 g (Each including 3 m lead wire)  |   |
| Standard                            |                           | Compliant with CE marking   |   |

Note 1) In case of ZSE60F/ISE60-□-<sup>22</sup>/<sub>62</sub>

Note 2) In case of ZSE60F/ISE60-□-<sup>30</sup>/<sub>70</sub>

Note

The possible set ranges for types with auto shift function are as follows:

| Model                                   | Regulating pressure range |
|---|---------------------------|
| ZSE60F-□- <sup>30</sup> / <sub>70</sub> | -100.0 to 100.0 kPa       |
| ISE60-□- <sup>30</sup> / <sub>70</sub>  | -1.000 to 1.000 MPa       |

## Function

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

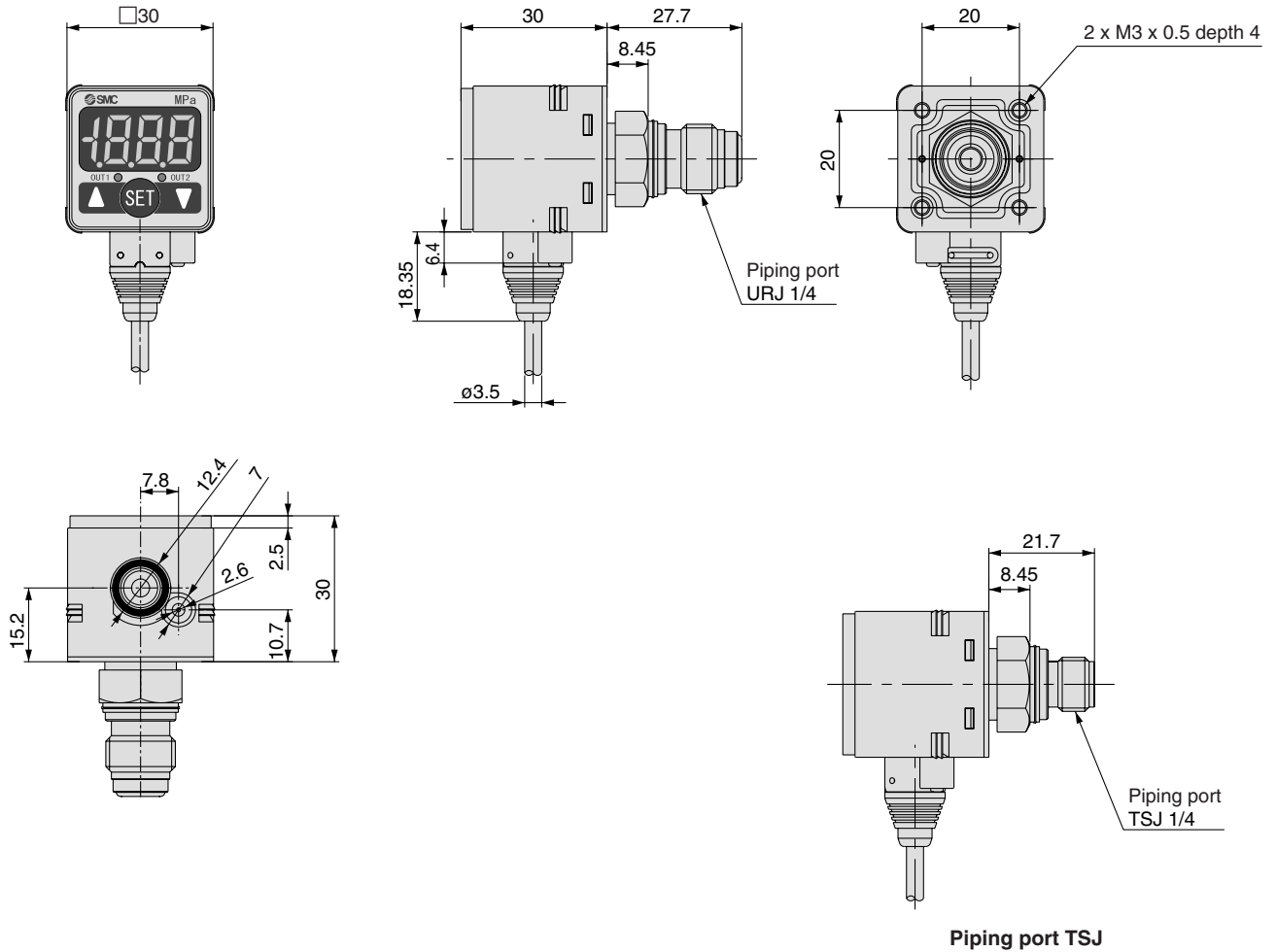
|  |  |
|--|--|
| Auto shift function <sup>Note 1)</sup> | Can correct the pressure set point value of switch output according to fluctuations in the primary pressure. |
| Anti-chattering function               | Prevents malfunction due to sudden fluctuations in the primary pressure by adjusting the response time.      |
| Key lock function                      | Key operation can be locked to prevent incorrect operation on the operation switch.                          |
| 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 <sup>Note 1)</sup>     | Can convert the display value.   |

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

# Series ZSE60F/ISE60

## Dimensions

ZSE60F/ISE60-<sup>A2</sup><sub>B2</sub>

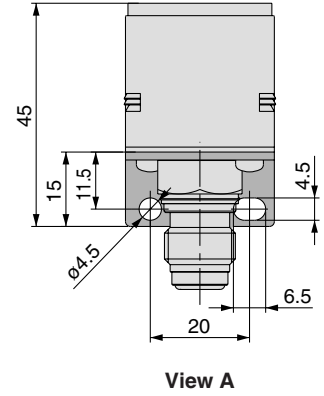
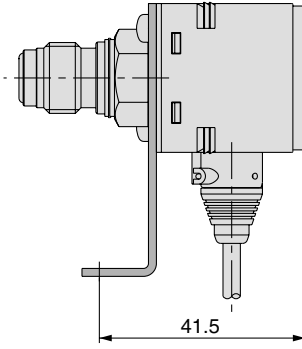
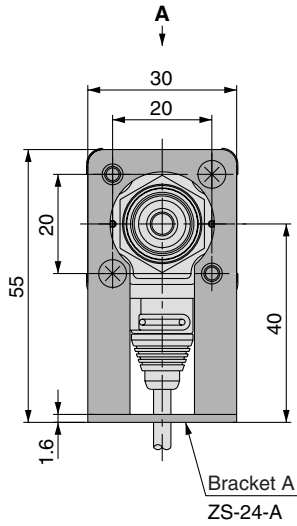


The following items are identical with those of series ZSE50F/ISE50.

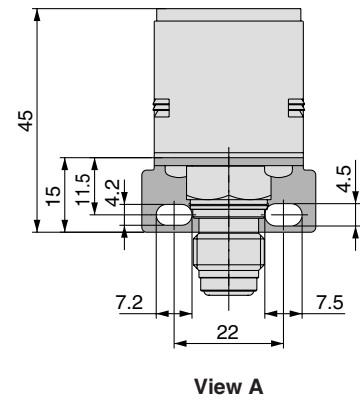
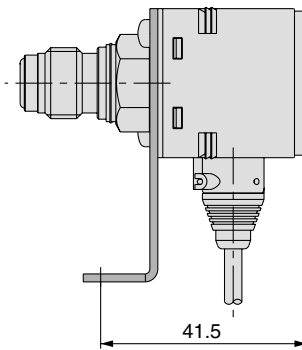
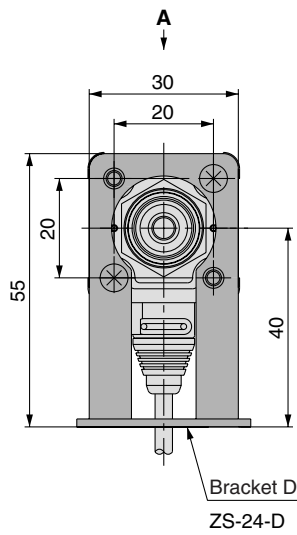
| Item  | Reference page |
|---|----------------|
| Output type   | 751            |
| Example of internal circuit and wiring              | 751            |
| Auto shift function, Chattering prevention function | 752            |
| Measures to be taken when error occurs              | 753            |

**Dimensions**

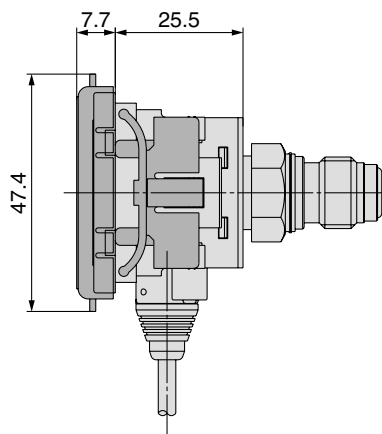
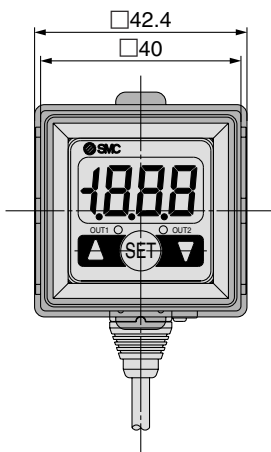
**Bracket A**



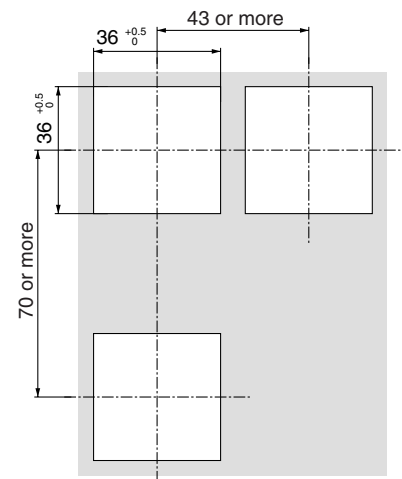
**Bracket D**



**Panel mount + Front protection cover**



**Cutting dimensions for panel mounting**

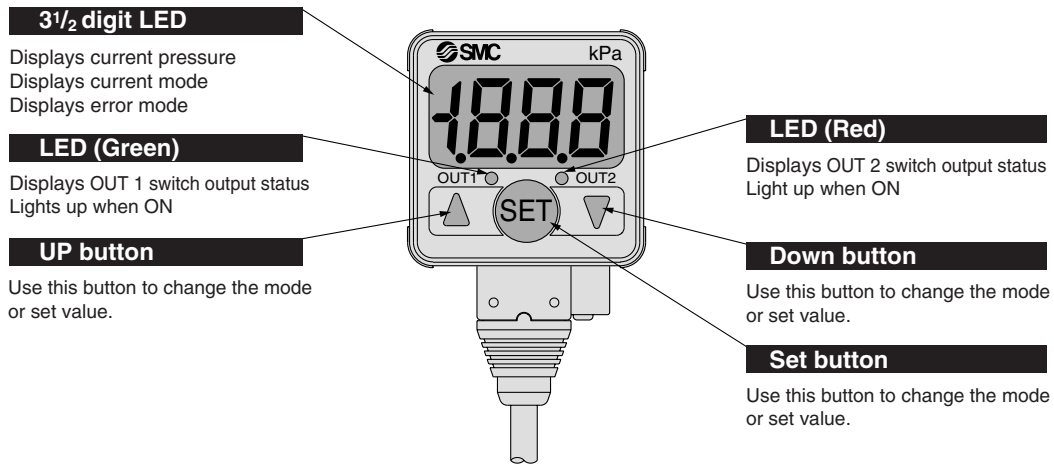


The thickness of the panel is 1 to 3.2 mm.

- ZSE
- ISE
- ZSP
- PS
- ISA
- PSE
- IS
- ISG
- ZSM

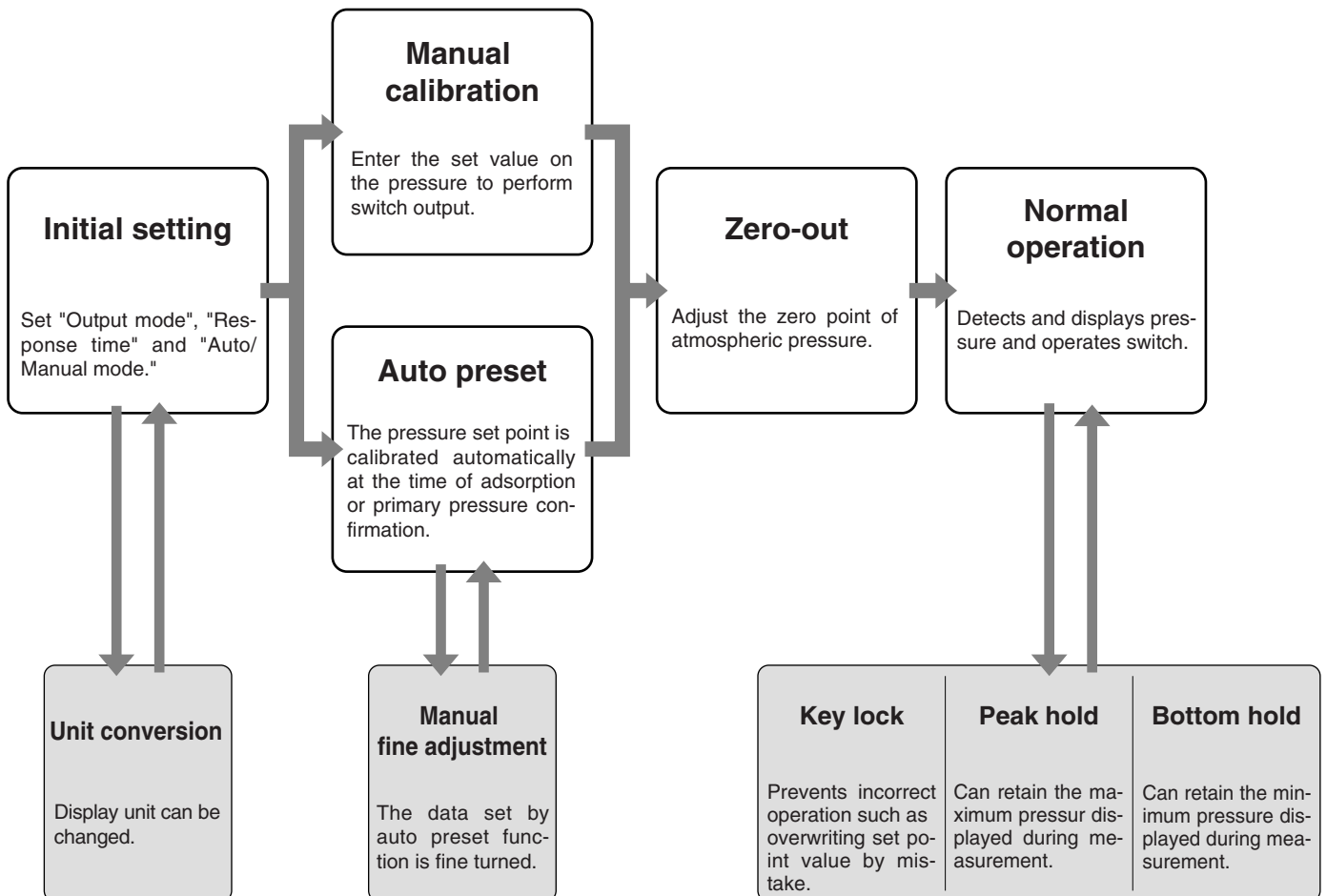
# Series ZSE50F/60F, ISE50/60

## Description (Common to ZSE50F/ISE50 and ZSE60F/ISE60)



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

### Calibration procedure





# Series ZSE50F/60F, ISE50/60 Pressure Switch Precautions 1

Be sure to read before handling. Refer to front matters 58 and 59 for Safety Instructions and pages 687 to 691 for Pressure Switch Precautions.

## Handling

### Warning

1. Do not drop, or apply excessive impact (980 m/s<sup>2</sup>) 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.

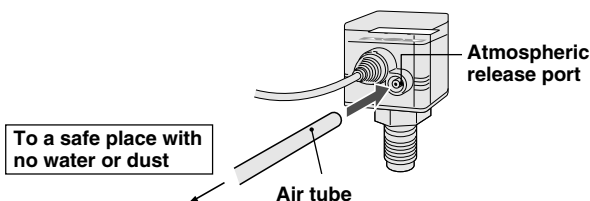
## Operating Environment

### 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  $\phi 4$  tube (I.D.:  $\phi 2.5$ ) 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.:  $\phi 4$ , I.D.:  $\phi 2.5$ ) as the air tube.

## Operating Environment

### Caution

3. When resin piping is used, depending on the fluid, static electricity may occur. When connecting the switch and sensor, please take adequate anti-static electricity measures on the equipment side, and do not use with a grounding that is shared with equipment that generates strong electromagnetic noise or high-frequency waves. This can result in a switch or sensor being damaged by static electricity.

## Pressure Source

### Warning

#### 1. Use of toxic, deleterious, corrosive or flammable fluid.

The materials of the pressure sensor and fittings on the switch are stainless steel 630 and stainless steel 304. Do not use **toxic, deleterious or corrosive fluid**.

The switch is not protected against explosion. Do not use it with flammable gas or fluid, either.

#### 2. Compatible fluid

The fluid contact areas are stainless steel 630 (pressure sensor) or stainless steel 304 (fittings). Use fluid that will not corrode the materials.

(For corrosiveness of fluid, consult the manufacturer of the fluid.)

#### 3. Infiltration of water and drainage

The pressure sensor of this switch adapts stainless diaphragm that would not be damaged by water. However, the pressure sensor might be damaged when condensate included in water and air may collide with the sensor due to its rush inertia, which occurs when vacuum is released after absorption is confirmed.

In the above case, make an orifice in the middle or mount the external adapter with throttle (ZS-31-X175, Z186) to the fitting.

#### 4. Withstand pressure

When fluid is liquid, excessive pressure fluctuation such as a water hammer or surge pressure occurs when the valve is ON/OFF.

If needed, install a damper, absorber or accumulator to prevent the pressure fluctuation. When pressure over the withstand pressure is applied even for a short period of time, it may damage the pressure sensor or switch.

#### <ZSE60F/ISE60>

##### Helium leakage test

Helium leakage test is conducted on the welding parts. Use a ferrule by Swagelok (Swagelok® fittings) as the TSJ fittings and packing, ground, etc. by Swagelok (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.

\* Swagelok® and VCR® are trademarks of Swagelok Company.

ZSE  
ISE  
ZSP  
PS  
ISA  
PSE  
IS  
ISG  
ZSM



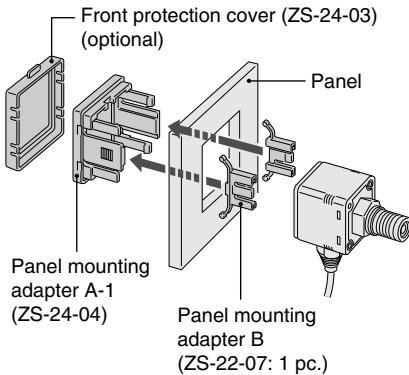
# Series ZSE50F/60F, ISE50/60 Pressure Switch Precautions 2

Be sure to read before handling. Refer to front matters 58 and 59 for Safety Instructions and pages 687 to 691 for Pressure Switch Precautions.

## Mounting Method

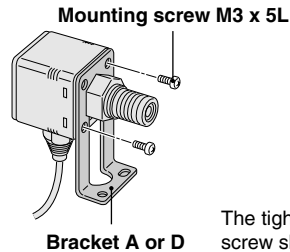
### ⚠ Caution

#### 1. Mounting with panel mount adapter



#### 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.



The tightening torque for bracket mounting screw should be 0.98 N·m or less.

## Regulating pressure range and rated pressure range

### ⚠ Caution

#### Set the pressure within the rated pressure range.

The regulating pressure range is the range of pressure that is possible in setting.

The rated pressure range is the range of pressure that satisfies the specifications (accuracy, linearity, etc.) on the sensor.

Although it is possible to set a value outside the rated pressure range, the specifications will not be guaranteed even if the value stays within the regulating pressure range.

| Switch  | Pressure range         |   |         |         |       |
|---|------------------------|---|---------|---------|-------|
|   | -100 kPa               | 0 | 100 kPa | 500 kPa | 1 MPa |
| For compound pressure<br><b>ZSE50F</b><br><b>ZSE60F</b> | -100 kPa               |   | 100 kPa |         |       |
|   | -100 kPa               |   | 100 kPa |         |       |
| For positive pressure<br><b>ISE50</b><br><b>ISE60</b>   |                        | 0 |         |         | 1 MPa |
|   | -100 kPa<br>(-0.1 MPa) |   |         |         | 1 MPa |

Rated pressure range of switch  
 Regulating pressure range of switch