

# High Precision, Digital Pressure Switch For General Fluids Series **ZSE<sup>50</sup><sub>60</sub>**/**F/ISE<sup>50</sup><sub>60</sub>**



ZSE<sup>50</sup><sub>60</sub>  
ISE<sup>50</sup><sub>60</sub>

PSE

ZSE<sup>50</sup><sub>60</sub>

PS

ZSE<sup>50</sup><sub>60</sub>

ZSP

ISA2

IS<sup>50</sup><sub>60</sub>

ZSM

PF2<sup>50</sup><sub>60</sub>

IF<sup>50</sup><sub>60</sub>

Data

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 workpiece with water on the surface, e.g. wet LCD glass plate
- To measure hydraulic pressure

Argon

Air containing drain

Ammonia

Freon

Carbon dioxide

Nitrogen

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

## Using of stainless steel diaphragm

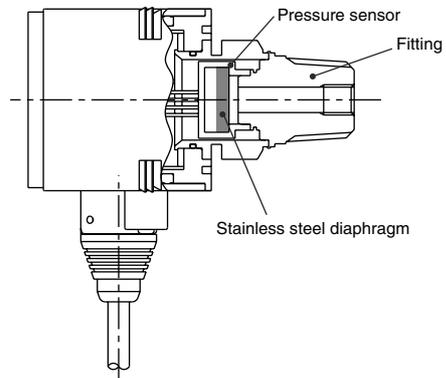
The stainless steel diaphragm prevents direct contact between sensor and measured fluid.

- Liquid and gas contact 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.

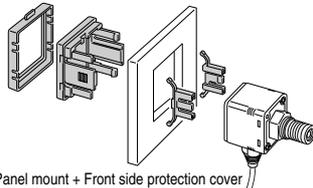
- ZSE50F / ISE50  $1 \times 10^{-5} \text{ Pa}\cdot\text{m}^3/\text{s}$
- ZSE60F / ISE60  $1 \times 10^{-10} \text{ Pa}\cdot\text{m}^3/\text{s}$



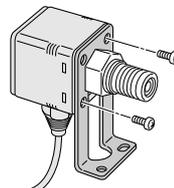
Enclosure **IP65**

Option

■ Panel mount

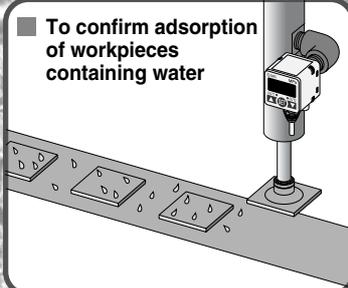


■ With bracket

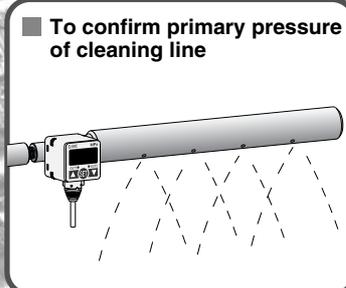


Application examples

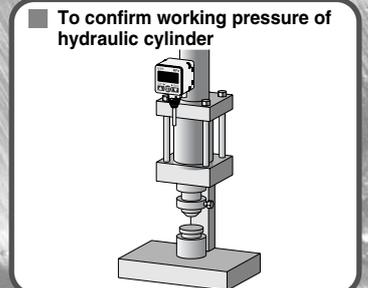
■ To confirm adsorption of workpieces containing water



■ To confirm primary pressure of cleaning line



■ To confirm working pressure of hydraulic cylinder



# 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: 2.5 ms (default), 24 ms, 192 ms, 768 ms 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

ZSE□  
ISE□

PSE

ZSE<sub>1</sub>SE3

PS

ZSE<sub>2</sub>

ZSP

ISA2

IS□

ZSM

PF2□

IF□

Data

## Series ZSE60F/ISE60

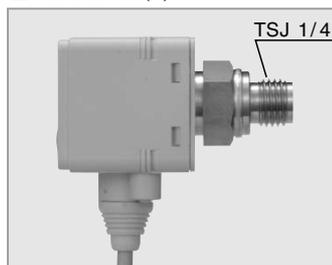
Special fitting types are used in semiconductor production equipment (Metal gasket seal fittings)

- Leak rate:  $1 \times 10^{-10}$  Pa·m<sup>3</sup>/s

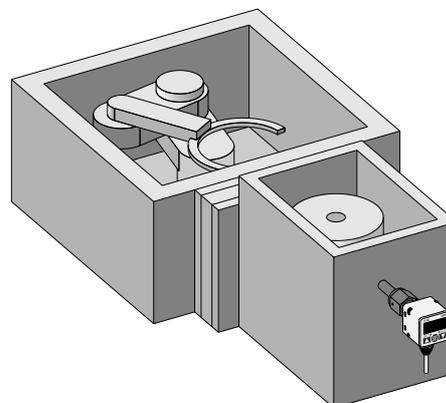
■ ZSE/ISE60(F)-A2



■ ZSE/ISE60(F)-B2



■ Confirmation of atmospheric pressure of load lock



Variations

Model	ZSE50F	ISE50	ZSE60F	ISE60
	Port size	Standard thread type		Special fittings for the semiconductor industry (Metal gasket seal fittings)
Leak rate	$1 \times 10^{-5}$ Pa·m <sup>3</sup> /s		$1 \times 10^{-10}$ Pa·m <sup>3</sup> /s	
Rated pressure range	100 kPa 0 -100 kPa	1MPa 0	100 kPa 0 -100 kPa	1 MPa 0
Output	Switch output	2 outputs NPN or PNP		
	Analog output	Output voltage 1 to 5 V		

# High Precision, Digital Pressure Switch For General Fluids Series ZSE50F/ISE50

## How to Order



For positive pressure

ISE50



For compound pressure

ZSE50 F



### Piping specifications

<b>02</b>	R 1/4 (M5 with female screw), Piping in backward direction
<b>T2</b>	NPT 1/4 (M5 with female screw), Piping in backward direction
<b>G2*</b>	G 1/4 (M5 with female screw), Piping in backward direction

\* Option

### 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

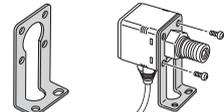
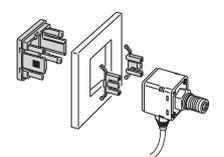
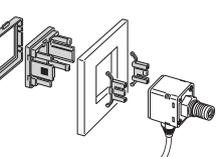
\* Option

Note) Auto shift input is used for the auto shift function.  
For more information, please refer to "Auto Shift Function" on page 16-2-32.

### Lead wire length

<b>L</b>	3 m
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### Option

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

### Unit specification

<b>Nil</b>	With unit switching function <sup>Note 1)</sup>
<b>M</b>	Fixed SI unit <sup>Note 2)</sup>

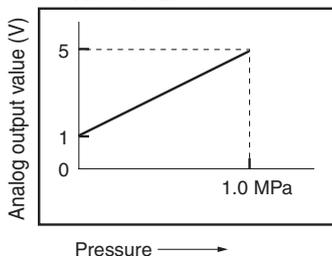
Note 1) Under the New Measurement Law, which has been in effect since October, 1999, sales of switches with the unit conversion function have not been allowed for use in Japan.

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

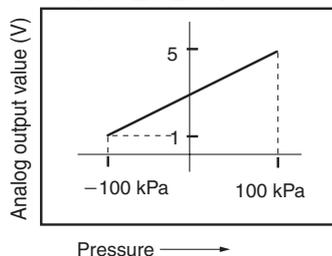
## Analog Output

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	

# High Precision, Digital Pressure Switch for General Fluids Series ZSE50F/ISE50

## Specifications

		ZSE50F (Compound pressure)	ISE50 (Positive pressure)
Rated pressure range		-100 to 100 kPa	0.000 to 1.000 MPa
Operating pressure range and regulating pressure range		-100 to 100 kPa	-0.100 to 1.000 MPa
Proof pressure		500 kPa	1.5 MPa
Setting/Display resolution <small>Note 1)</small>	kPa	0.1	—
	MPa	—	0.001
	kgf/cm <sup>2</sup>	0.001	0.01
	bar	0.001	0.01
	psi	0.02	0.1
	mmHg	1	—
	inHg	0.1	—
Fluid		Fluid that will not corrode stainless steel 630 and 304	
Power supply voltage		12 to 24 VDC, Ripple (p-p) 10% or less	
Current consumption		55 mA or less (With no load)	
Switch output		NPN or PNP 2 output (Max. applied voltage 30 V (NPN), Max. load current 80 mA)	
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) <small>Note 4)</small>	
Response time		2.5 ms or less (With anti-chattering function: 24 ms, 192 ms, 768 ms or less)	
Output short circuit protection		Yes	
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)	
Indicator light		Green LED (OUT1: Light up when ON), Red LED (OUT2: Lights up when ON)	
Analog output <small>Note 2)</small>		Output voltage: 1 to 5 V ±5% F.S. or less	Output voltage: 1 to 5 V ±2.5% F.S. or less
Auto shift input <small>Note 3)</small>		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 (No condensation or freezing)	
	Ambient humidity range	Operating and stored: 35 to 85% RH (No condensation)	
	Withstand voltage	250 VAC for 1 min, between all lead wires and enclosure	
	Insulation resistance	2 MΩ or more (at 50 VDC) between all lead wires and enclosure	
	Vibration resistance	10 to 500 Hz with 1.5 mm amplitude or 98 m/s <sup>2</sup> , whichever is smaller	
	Shock resistance	980 m/s <sup>2</sup> 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	
Wetted material		Pressure receiving area: Stainless steel 630, Fittings: Stainless steel 304	
Port size		O2: R 1/4, M5 x 0.8 T2: NPT 1/4, M5 x 0.8	
Lead wire		5-wire oil proof heavy-duty cable (0.15 mm <sup>2</sup> )	
Weight		Approx. 120 g (Each including 3 m 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 analog 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 ±0.01 psi in psi display.

Note)

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

Regulating pressure range	Possible set range
-100.0 to 100.0 kPa	-100.0 to 100.0 kPa
-0.1 to 1.000 MPa	-1.000 to 1.000 MPa

## Function

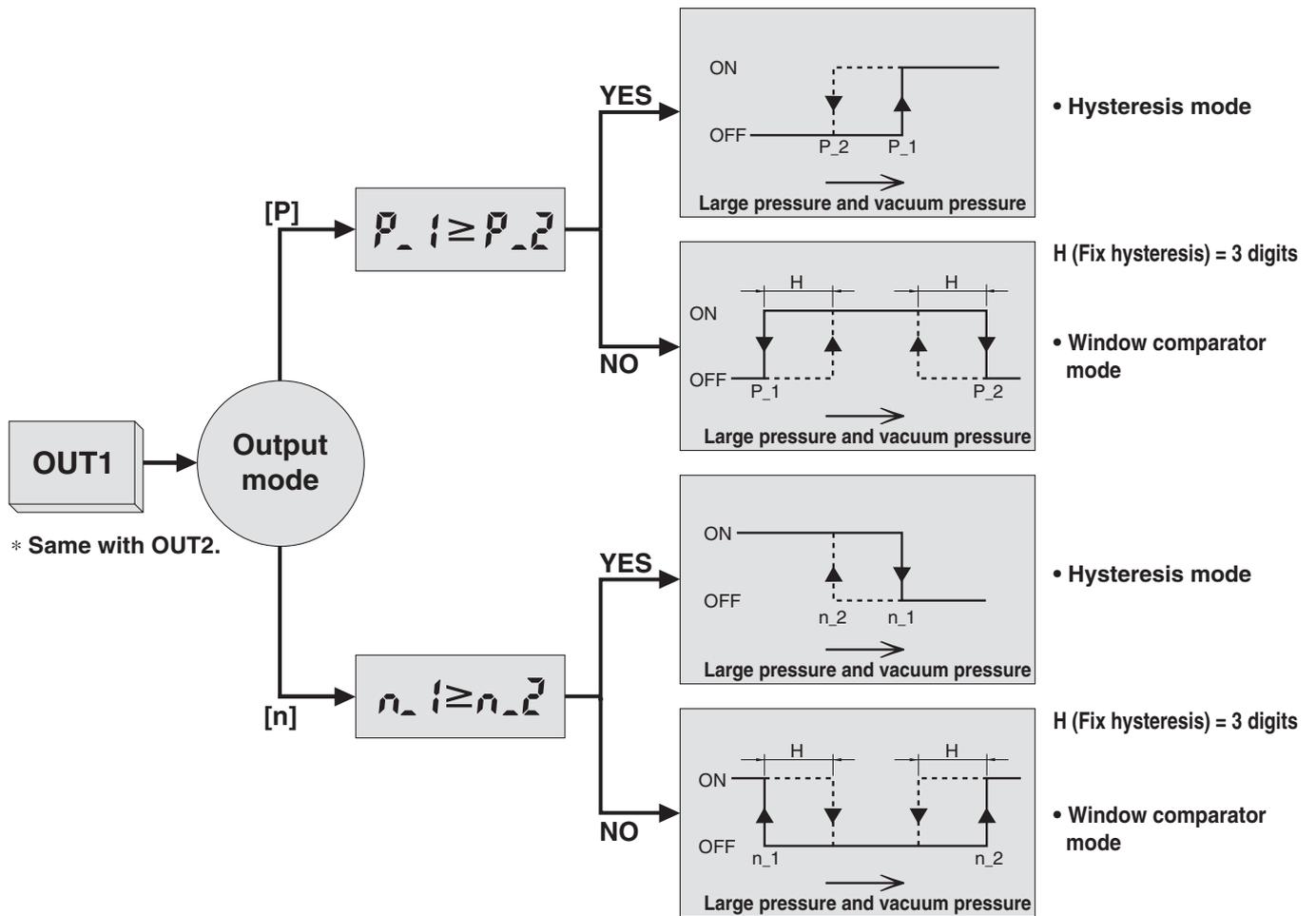
Various additional functions are available for easy measurement, switch operation and check of measured values suitable for the conditions of the measured fluid.

Auto shift function <small>Note 1)</small>	Can correct the pressure set point value of switch output according to fluctuations in the primary pressure.	16-2-32
Anti-chattering function	Prevents malfunction due to sudden fluctuations in the primary pressure by adjusting the response time.	
Key lock function	The key board operation can be locked to prevent incorrect operation on the operation switch.	16-2-43
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 (for overseas use) <small>Note 1)</small>	Can convert the display value (for overseas use only).	

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

# Series ZSE50F/ISE50

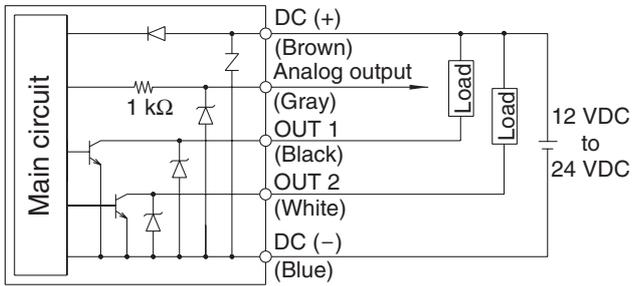
## Output Method



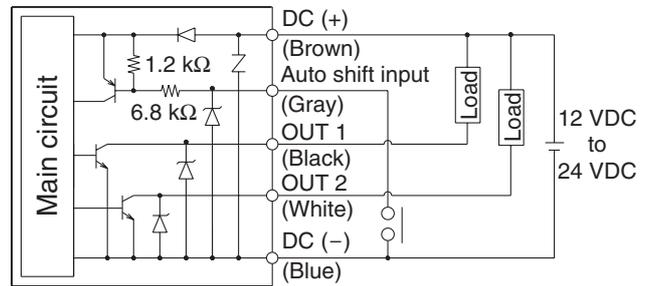
# High Precision, Digital Pressure Switch for General Fluids Series ZSE50F/ISE50

## Example of Internal Circuit and Wiring

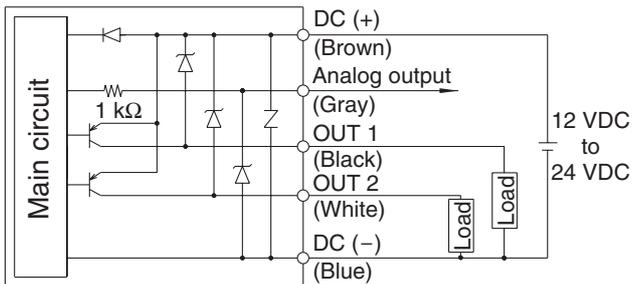
**ZSE<sub>60</sub><sup>50</sup> F/ISE<sub>60</sub><sup>50</sup> -□-22(L)-(M)**  
With analog output



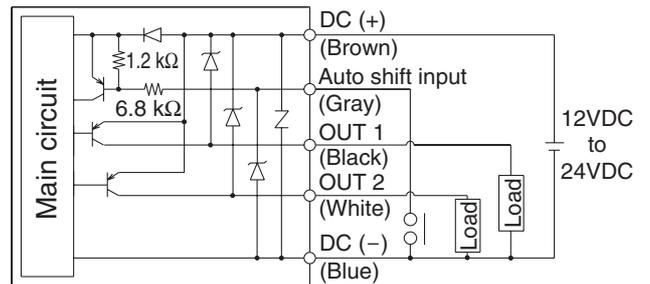
**ZSE<sub>60</sub><sup>50</sup> F/ISE<sub>60</sub><sup>50</sup> -□-30(L)-(M)**  
With auto shift input



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



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



- ZSE□
- ISE□
- PSE
- ZSE3
- PS
- ZSE<sub>1</sub><sup>2</sup>
- ZSP
- ISA2
- IS□
- ZSM
- PF2□
- IF□
- Data

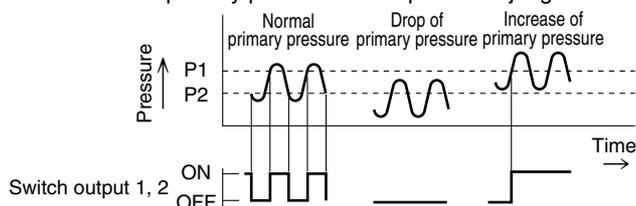
# Series ZSE50F/ISE50

## 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.

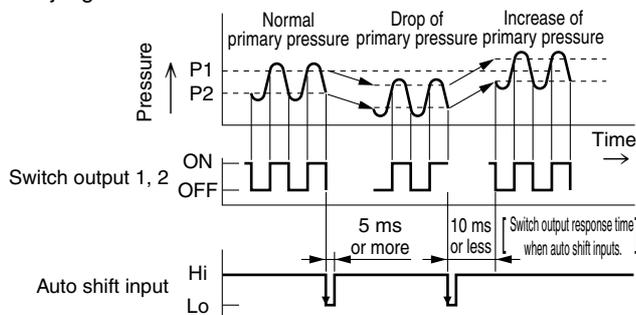
### When auto shift is not used:

Fluctuations in the primary pressure interrupt correct judgement.



### 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 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:

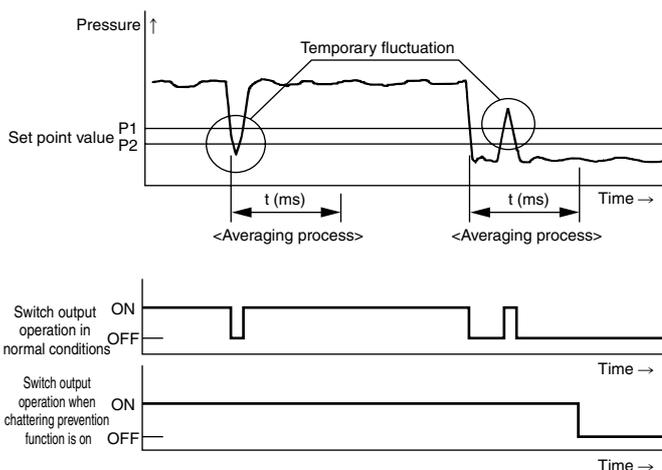
Regulating pressure range	The possible set range for types with auto shift function
-100.0 to 100.0 kPa	-100.0 to 100.0 kPa
-0.1 to 1.000 MPa	-1.000 to 1.000 MPa

## 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.



# High Precision, Digital Pressure Switch for General Fluids Series ZSE50F/ISE50

## Description

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: $\left[ \begin{array}{l} \pm 0.071 \text{ MPa or more with ISE50/60} \\ \pm 7.1 \text{ kPa or more with ZSE50F/60F} \end{array} \right]$ * 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 * After displaying this message for about 1 seconds, 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 * After displaying this message for about 1 seconds, 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□

PSE

ZSE3  
|SE3

PS

ZSE1  
|SE2

ZSP

ISA2

IS□

ZSM

PF2□

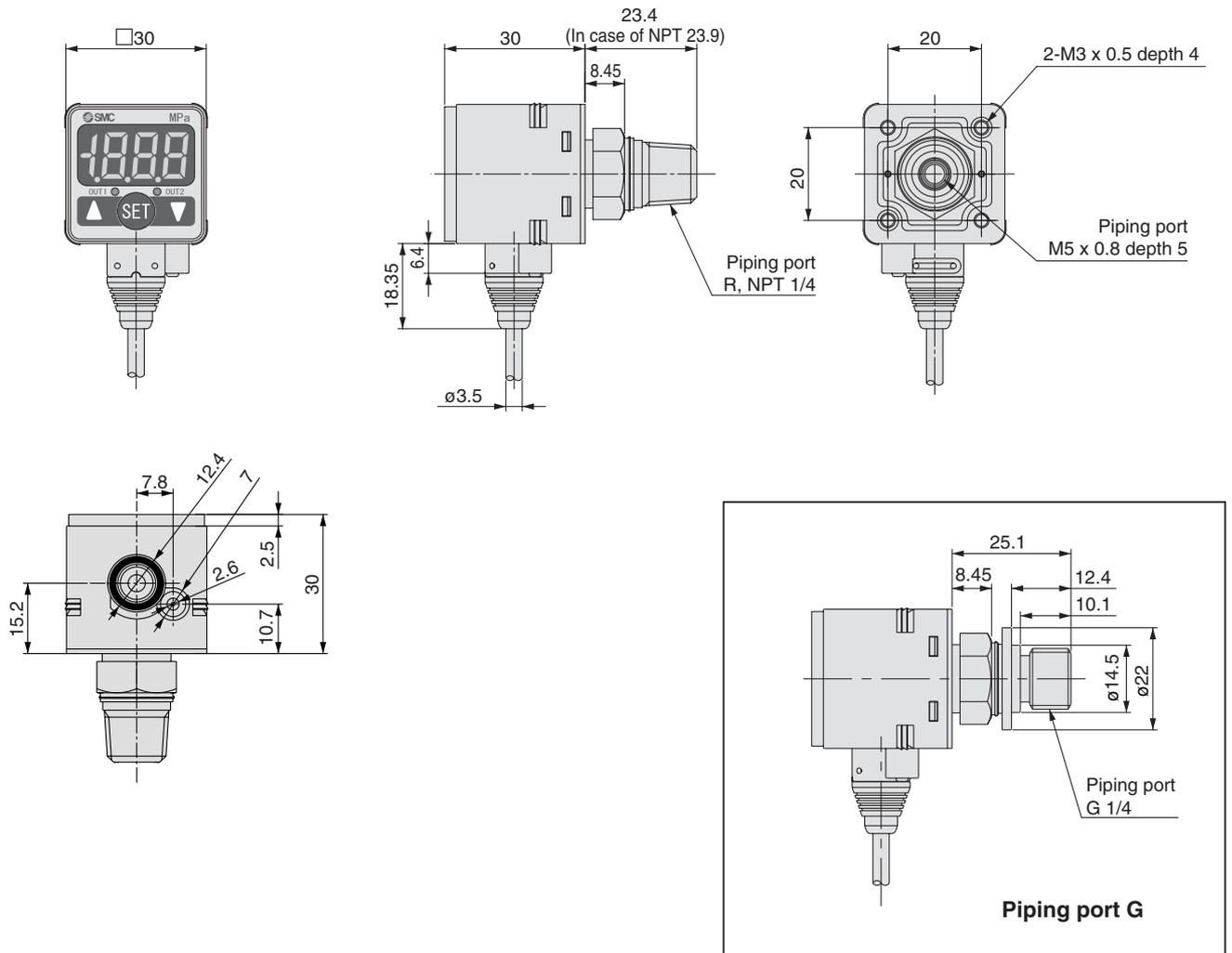
IF□

Data

# Series ZSE50F/ISE50

## Dimensions

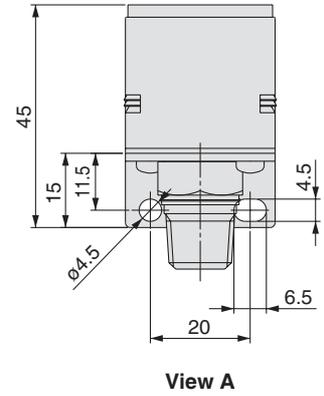
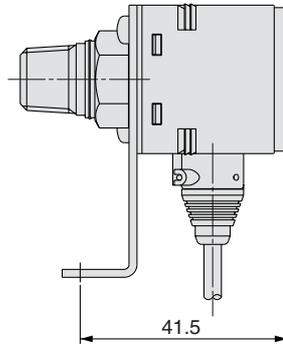
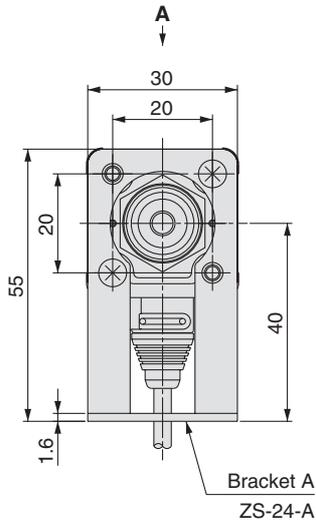
ZSE50F/ISE50-  
02  
T2  
G2



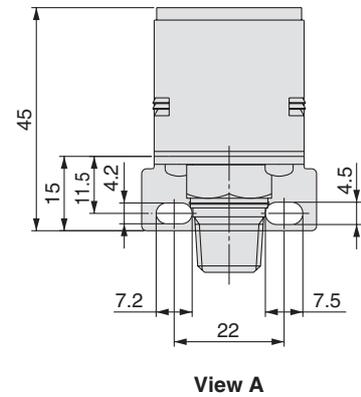
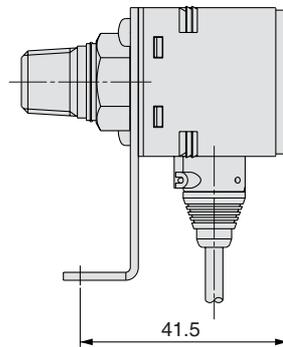
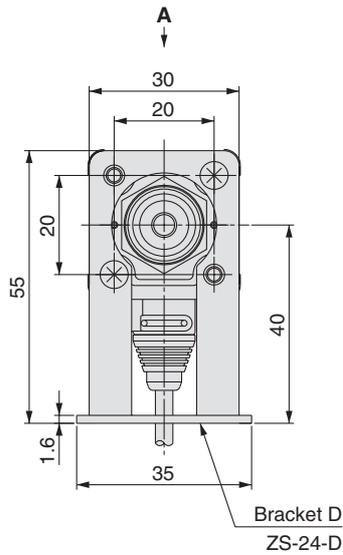
# High Precision, Digital Pressure Switch for General Fluids Series ZSE50F/ISE50

## Dimensions

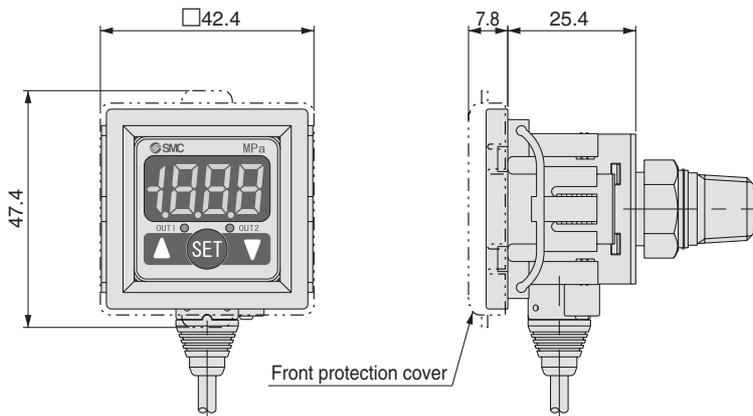
### Bracket A



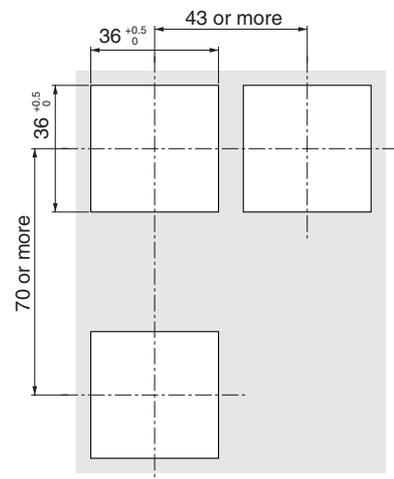
### Bracket D



### Panel mount



### Cutting dimensions for panel mounting



The thickness of the panel is to 3.2 mm.

- ZSE□
- ISE□
- PSE
- ZSE3
- PS
- ZSE1
- ZSE2
- ZSP
- ISA2
- IS□
- ZSM
- PF2□
- IF□
- Data