

For General Fluids

High Precision Digital Pressure Switch

Series ***ZSE⁵⁰₆₀F/ISE⁵⁰₆₀***



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 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

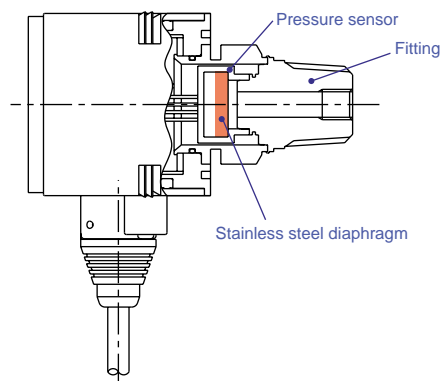
The stainless steel diaphragm prevents direct contact between sensor and measured fluid.

- Liquid and gas contact areas SUS630
- Fittings SUS304

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

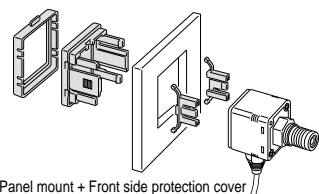


Enclosure

IP65

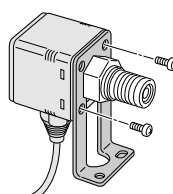
Option

■ Panel mount



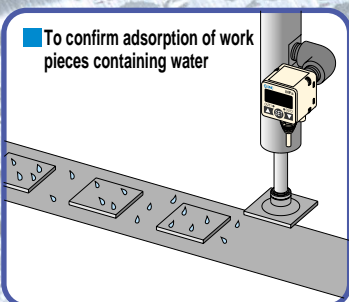
Panel mount + Front side protection cover

■ With bracket

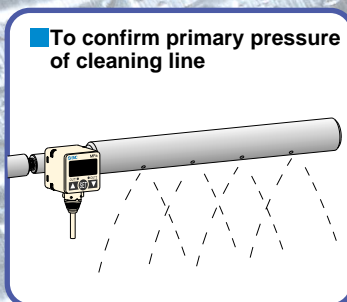


Application examples

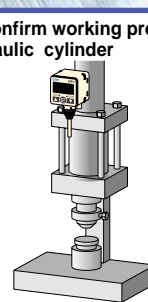
■ To confirm adsorption of work pieces containing water



■ To confirm primary pressure of cleaning line



■ To confirm working pressure of hydraulic cylinder



High precision and high resolution

Compound pressure 1/2000 (0.1kPa)

Positive pressure 1/1000 (0.001MPa)

Repeatability $\pm 0.2\% \text{F.S.}$ ± 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 (default), 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

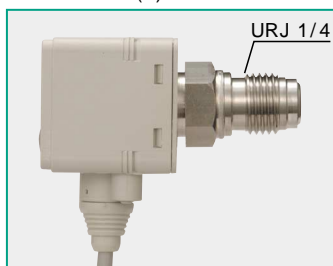
• Zero out function

Series ZSE60F/ISE60

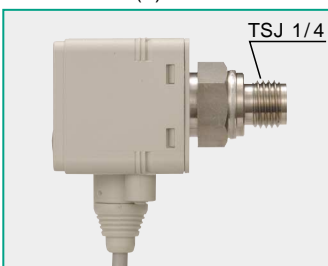
Special fitting types are used in semiconductor production equipment (metal gasket seal fittings)

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

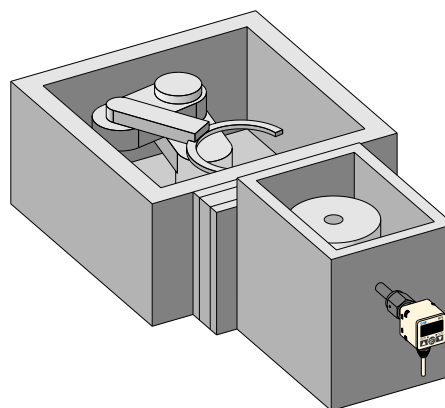
■ ZSE/ISE60(F)-A2



■ ZSE/ISE60(F)-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		100kPa 0 -100kPa	1MPa 0	100kPa 0 -100kPa	1MPa 0
Output	Switch output	2 outputs NPN or PNP			
	Analog output	Output voltage 1 to 5V			

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

*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

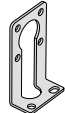
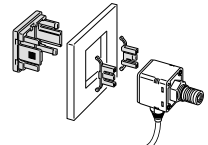
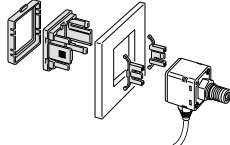
*Optional

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

Lead wire length

L	3m
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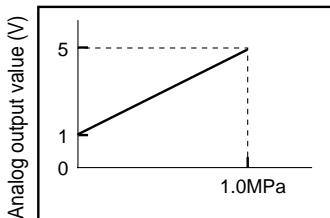
Option

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

Analog output

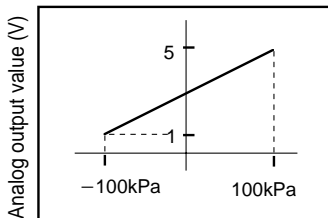
Suitable model: **ZSE50F/ISE50-□-22/62(L)-(M)**

Series ISE50



Pressure →

Series ZSE50F



Pressure →

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	

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

		ZSE50F (Compound pressure)	ISE50 (Positive pressure)
Rated pressure range		−100 to 100kPa	0.000 to 1.000MPa
Operating pressure range and regulating pressure range		−100 to 100kPa	−0.100 to 1.000MPa
Proof pressure		500kPa	1.5MPa
Setting/Display resolution <small>Note 1)</small>	kPa	0.1	—
	MPa	—	0.001
	kgf/cm ²	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 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	Hysteresis mode	Variable (0 or above)	
	Window comparator mode	Fix (3 digits) <small>Note 4)</small>	
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 <small>Note 2)</small>		Output voltage: 1 to 5V ±5% F.S. or less	Output voltage: 1 to 5V ±2.5% F.S. or less
Auto shift input <small>Note 3)</small>		No-voltage input (solid state switch or reed switch), input 5ms 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	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/s ² , whichever is smaller	
	Shock resistance	980m/s ² 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 SUS 630, Fittings: Stainless steel SUS 304	
Port size		02: R 1/4, M5 x 0.8 T2: NPT 1/4, M5 x 0.8	
Lead wire		5 wire oil proof heavy duty cable (0.15mm ²)	
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 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 ±0.01psi 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 100.0kPa	−100.0 to 100.0kPa
−0.1 to 1.000MPa	−1.000 to 1.000MPa

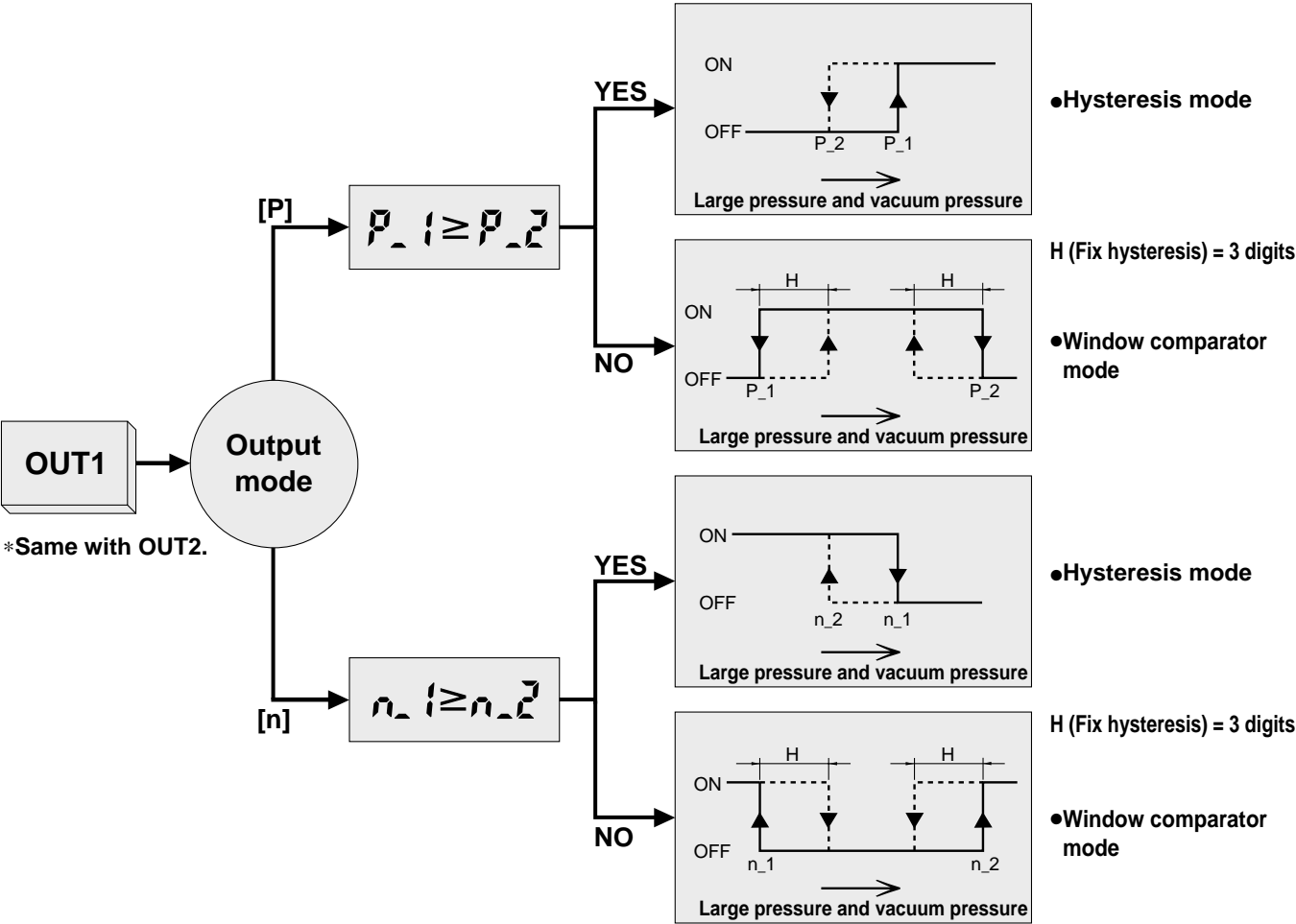
Function

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.	Page 5
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.	Page 16
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).	

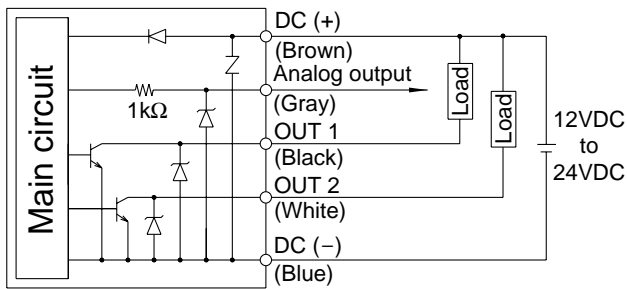
Note 1) Select and order by specifying the types and models.

Output Method

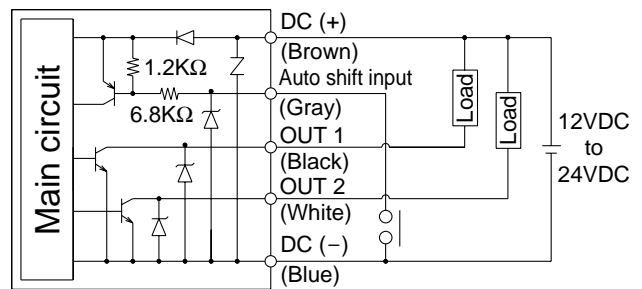


Example of Internal Circuit and Wiring

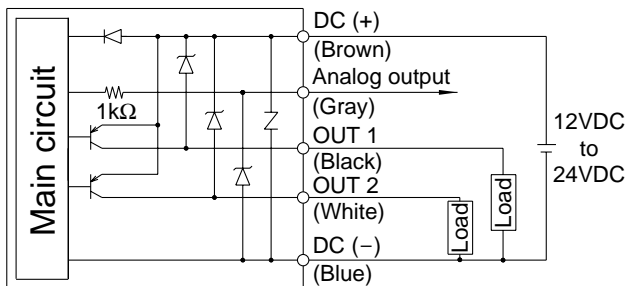
ZSE₅₀⁵⁰ F/ISE₆₀⁵⁰ -□-22(L)-(M)
With analog output



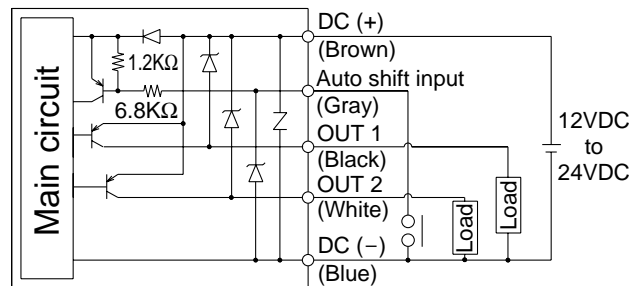
ZSE₅₀⁵⁰ F/ISE₆₀⁵⁰ -□-30(L)-(M)
With auto shift input



ZSE₅₀⁵⁰ F/ISE₆₀⁵⁰ -□-62(L)-(M)
With analog output



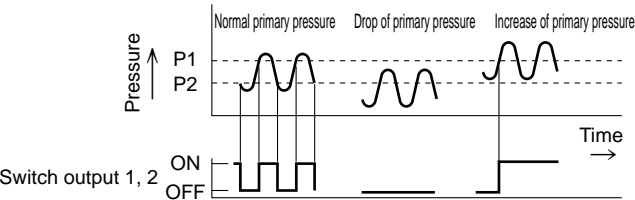
ZSE₅₀⁵⁰ F/ISE₆₀⁵⁰ -□-70(L)-(M)
With auto shift input



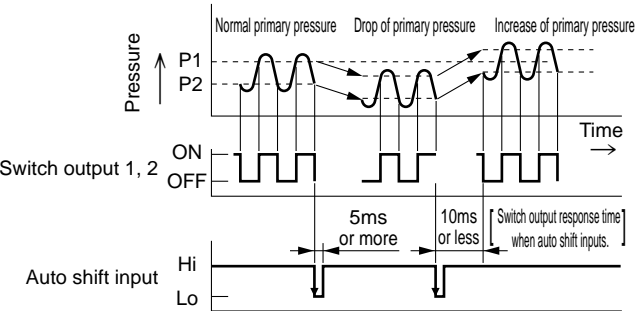
Auto Shift Function

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 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.

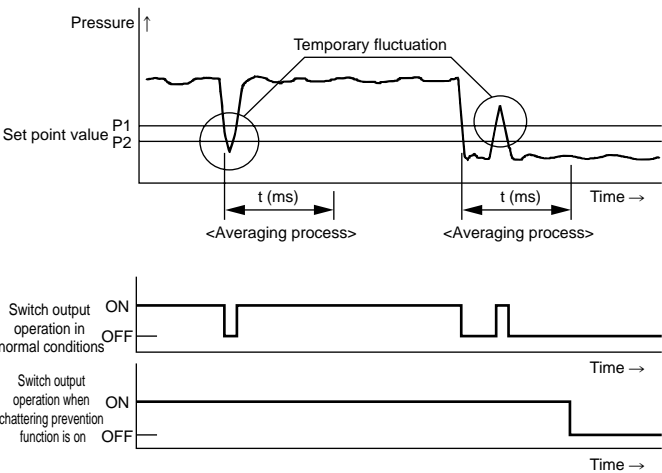
The possible set range for types with auto shift function is as follows:

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

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.



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 80mA.	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.

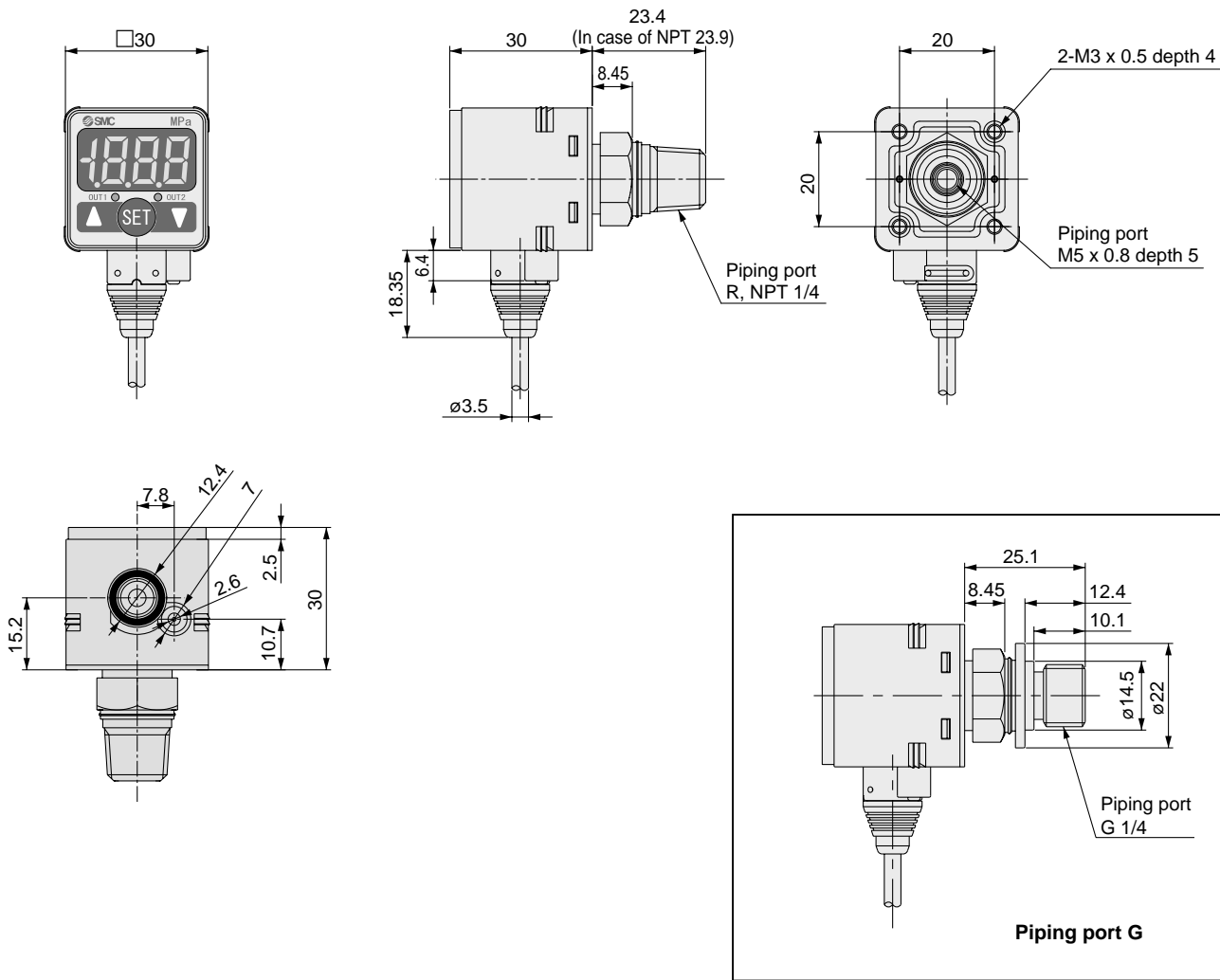
	Regulating pressure range	Lower limit	Upper limit
Compound pressure	−100.0 to 100.0kPa	−100.0kPa	100.0kPa
Positive pressure	−0.100 to 1.000MPa	−0.100MPa	1.000MPa

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

Series **ZSE50F/ISE50**

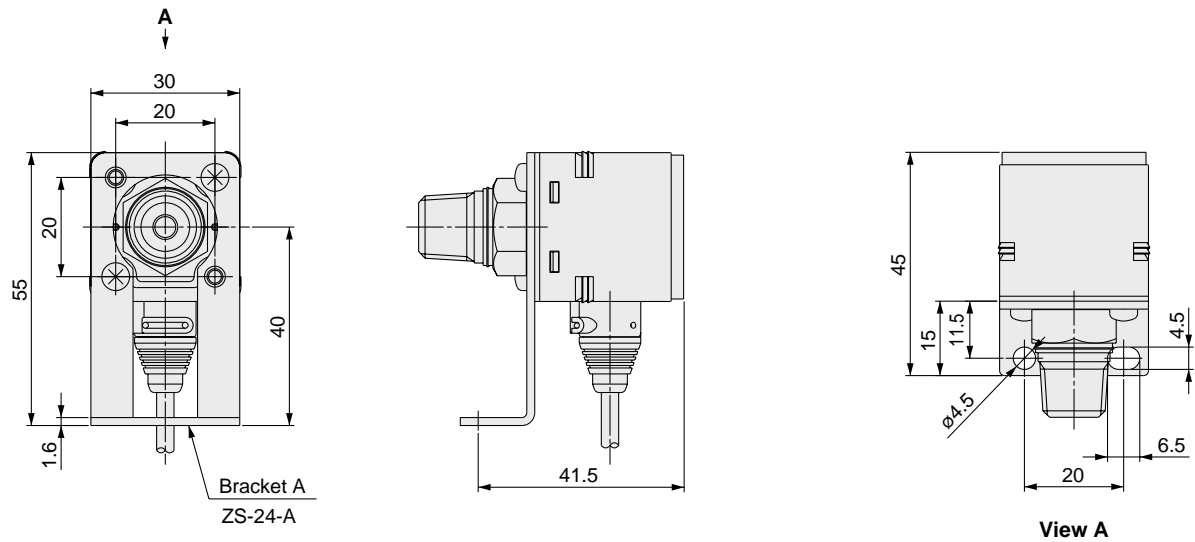
Dimensions

ZSE50F/ISE50-
02
T2
G2

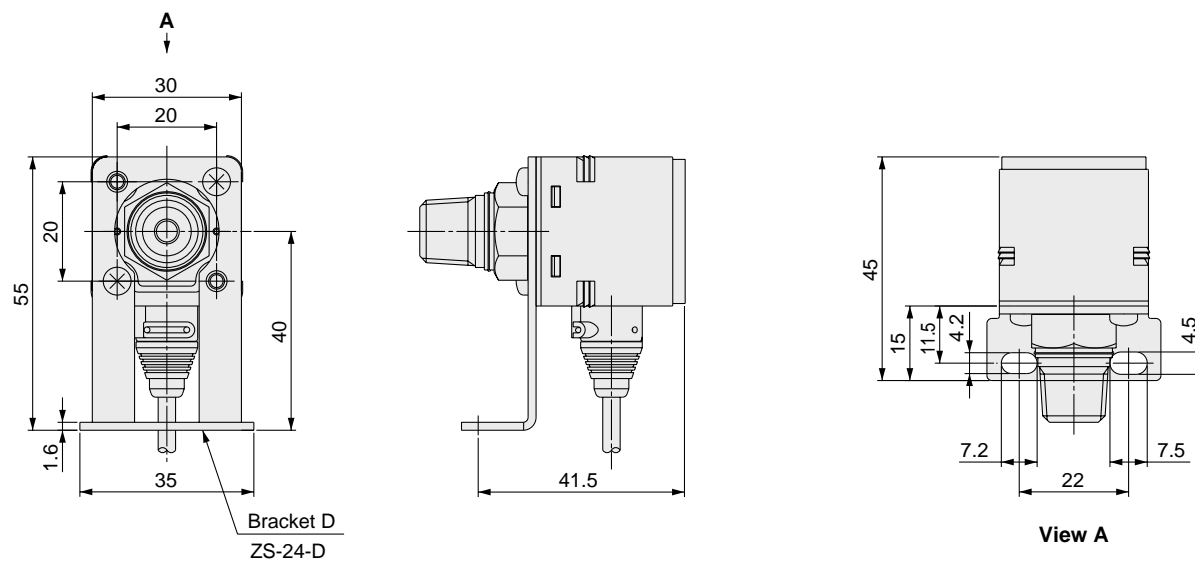


Dimensions

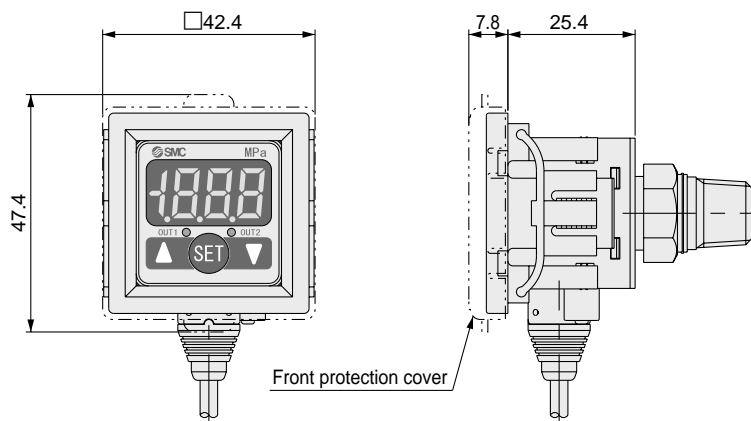
Bracket A



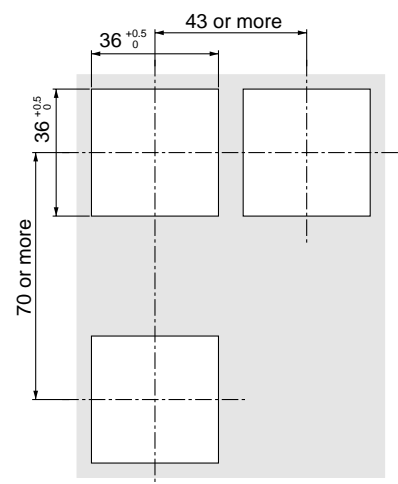
Bracket D



Panel mount



Cutting dimensions for panel mounting



The thickness of the panel is to 3.2mm.

For General Fluids High Precision Digital Pressure Switch 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

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

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

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

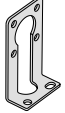
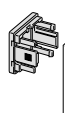
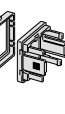
*Optional

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

Lead wire length

L	3m
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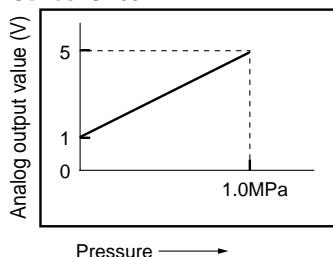
Option

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

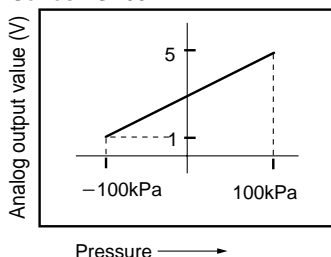
Analog output

Suitable mode: **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	

Unit specification

Nil	With unit switching function ^{Note 1)}
M	Fixed SI unit ^{Note 2)}

Note1) 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

		ZSE60F (Compound pressure)	ISE60 (Positive pressure)
Rated pressure range		–100 to 100kPa	0.000 to 1.000MPa
Operating pressure range and regulating pressure range		–100 to 100kPa	–0.100 to 1.000MPa
Proof pressure		500kPa	1.5MPa
Setting/Display resolution <small>Note 1)</small>	kPa	0.1	–
	MPa	–	0.001
	kgf/cm ²	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 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	Hysteresis mode	Variable (0 or above)	
	Window comparator mode	Fix (3 digits) <small>Note 4)</small>	
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 (Ambient temperature of 25 ±3°C)	
Indication light		Green LED (OUT1: Light up when ON), Red LED (OUT2: Light up when ON)	
Analog output <small>Note 2)</small>		Output voltage: 1 to 5V ±5% F.S. or less	Output voltage: 1 to 5V ±2.5% F.S. or less
Auto shift input <small>Note 3)</small>		No-voltage input (solid state switch or reed switch), 5ms or longer input	
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/s ² , whichever is smaller	
	Shock resistance	980m/s ² 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 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 (0.15mm ²)	
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 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 ±0.01psi 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 100.0kPa	–100.0 to 100.0kPa
–0.1 to 1.000MPa	–1.000 to 1.000MPa

Function

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

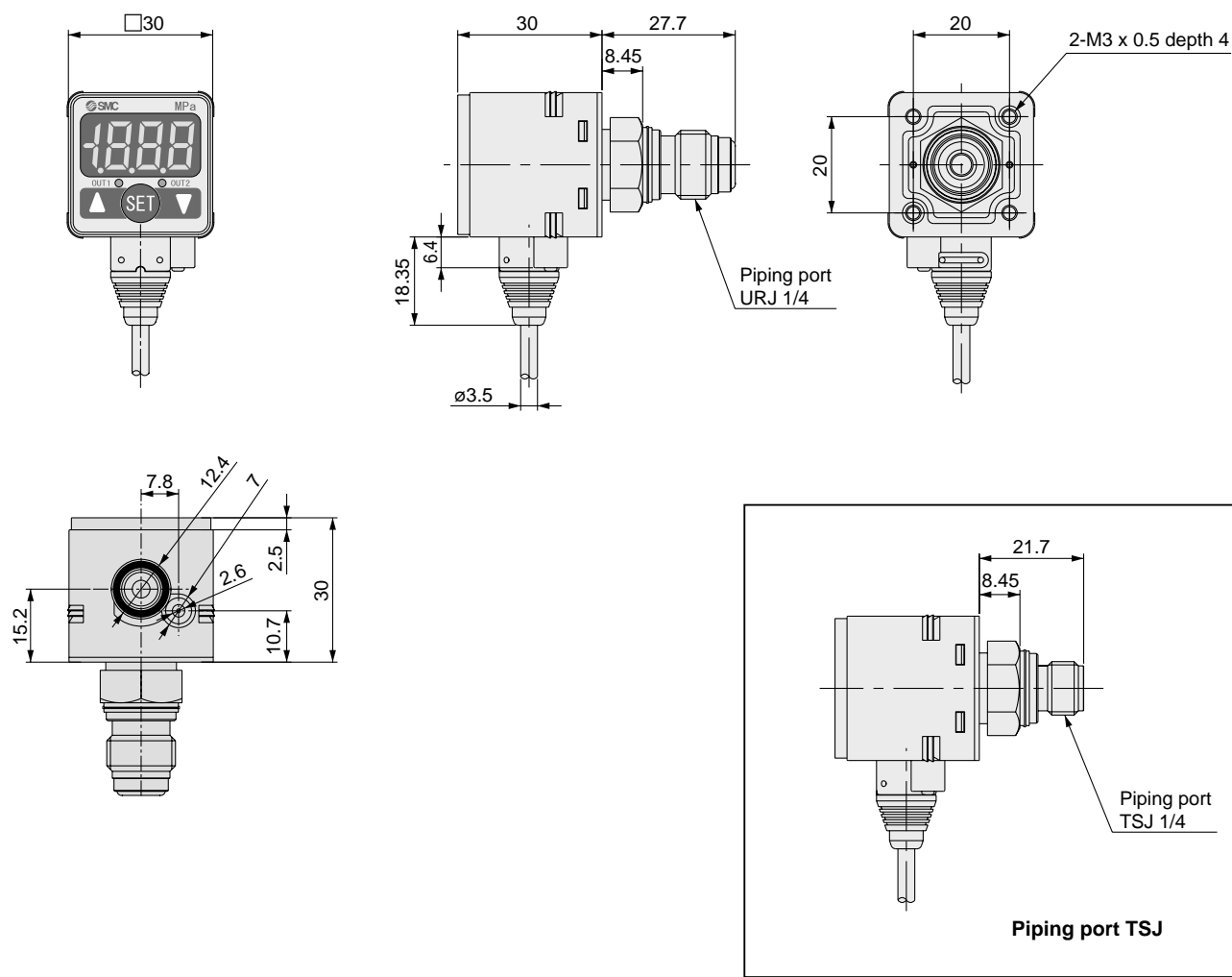
Auto shift function <small>Note 1)</small>	Can correct the pressure set point value of switch output according to fluctuation in the primary pressure.	Page 5
Anti-chattering function	Prevents malfunction due to sudden fluctuations in the primary pressure by adjusting the response time.	
Key lock function	The key board operation can be locked to prevent incorrect operation on the operation switch.	Page 16
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) <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 **ZSE60F/ISE60**

Dimensions

ZSE60F/ISE60-^{A2}
^{B2}

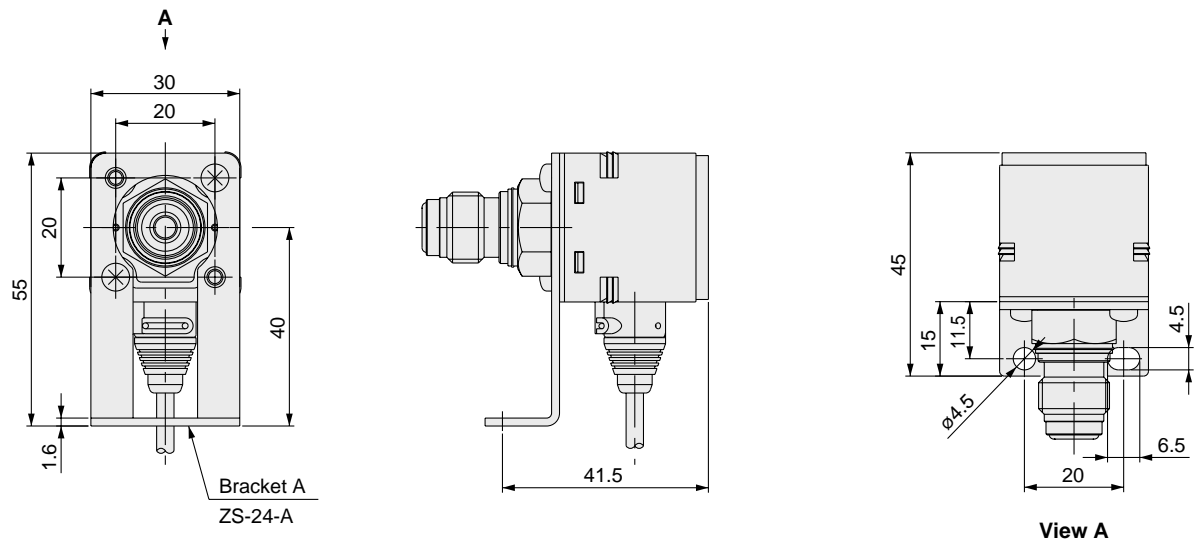


The following items are identical with those of series ZSE50F/ISE50.

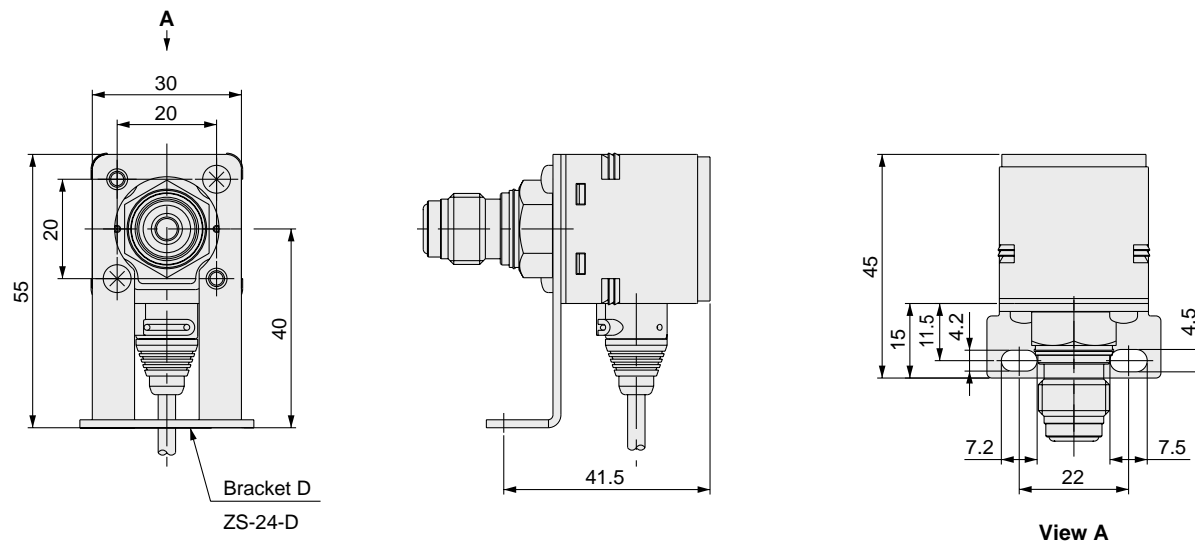
Item	Reference page
Output type	3
Example of internal circuit and wiring	4
Auto shift function, Chattering prevention function	5
Measures to be taken when error occurs	6

Dimensions

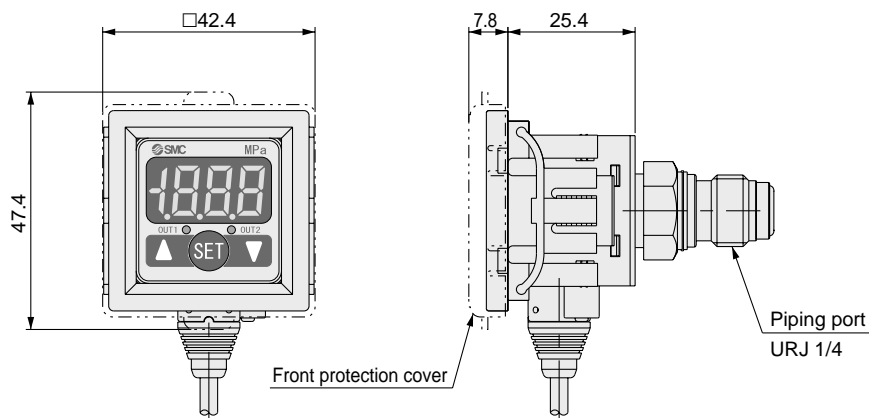
Bracket A



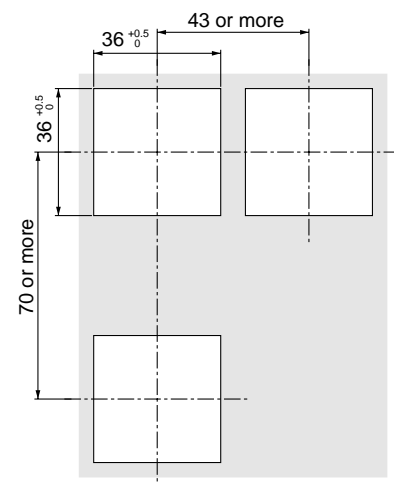
Bracket D



Panel mount

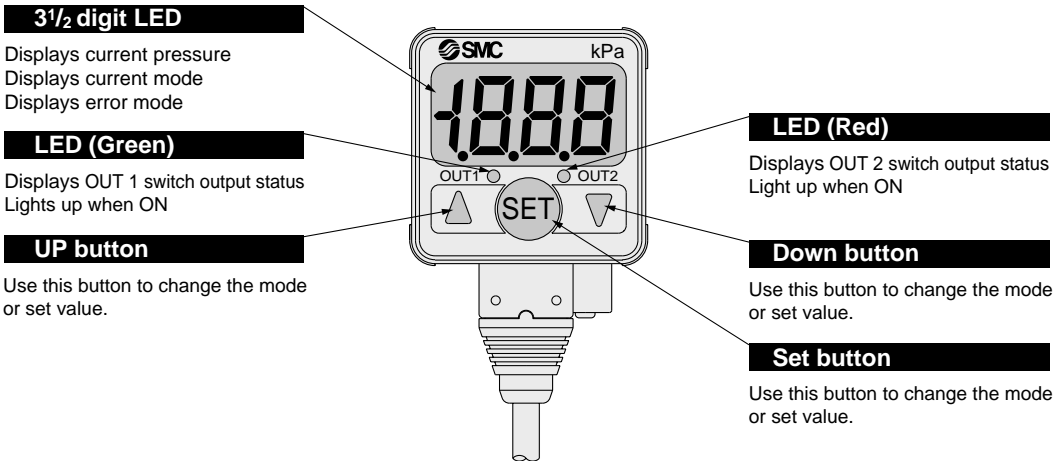


Cutting dimensions for panel mounting



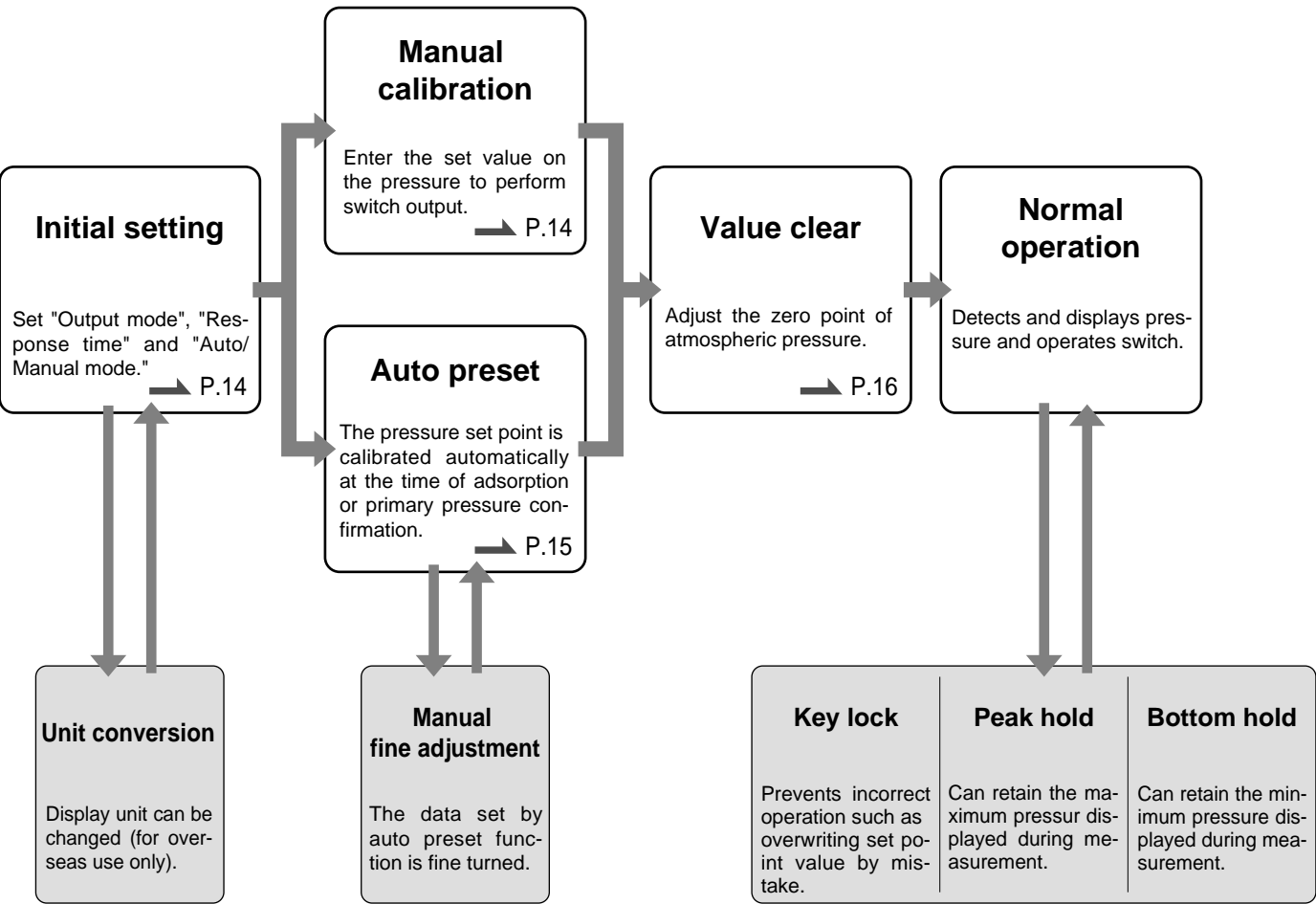
The thickness of the panel is to 3.2mm.

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



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

Calibration procedure



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

Initial setting

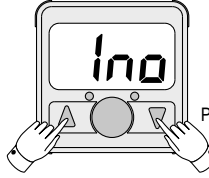
1. Initial setting mode



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

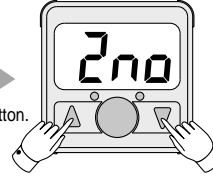
Unit specifications: unit conversion function, refer to "Unit setting (for overseas use)" on P.16.

2. OUT1 output mode selection



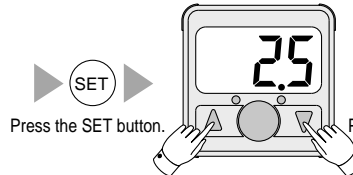
Select the "output mode" of OUT1 with ▲ or ▼ button.
"1no": Normally open mode,
"1nC": Normally closed mode

3. OUT2 output mode selection



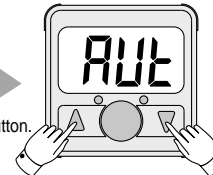
Select the "output mode" of OUT2 with ▲ or ▼ button.
"2no": Normally open mode,
"2nC": Normally closed mode

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.
"RUE": Auto preset mode,
"nRn": Manual calibration mode.

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

Manual pressure setting

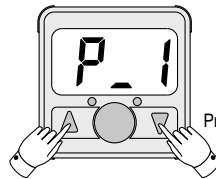
The output method is determined by the pressure set point value.

1. Manual setting mode



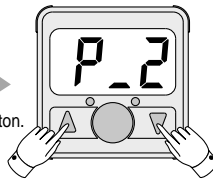
Select the manual setting mode as the initial setting mode. Press the SET button and hold it until "P_1" or "n_1" appears on the display.

2. OUT1 (1) output set point value input



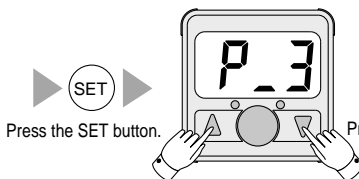
▲ button : Increases the set point value.
▼ button : Decrease the set point value.
"P_1" or "n_1" and the set point value light up alternately.

3. OUT1 (2) output set point value input



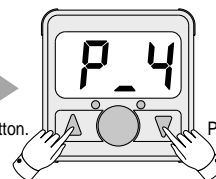
▲ button : Increases the set point value.
▼ button : Decrease the set point value.
"P_2" or "n_2" and the set point value light up alternately.

4. OUT2 (1) output set point value input



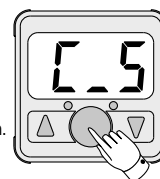
▲ button: Increases the set point value.
▼ button: Decrease the set point value.
"P_3" or "n_3" and the set point value light up alternately.

5. OUT2 (2) output set point value input



▲ 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.

6. Auto shift input display



"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



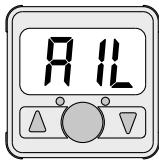
Select auto preset mode as the initial setting mode. Press the SET button and hold it until "RP1" appears on the display.

2. Preparation of auto preset



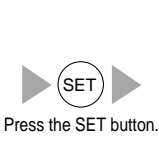
Prepare the equipment to be set while "RP1" is displayed. If OUT1 setting is not required, press ▲ the ▼ and buttons simultaneously to skip to "RP2".

3. OUT1 auto preset



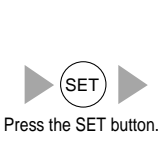
Repeat vacuum and break several times while "AIL" is displayed. The optimum set point value is determined automatically.

4. Preparation of auto preset

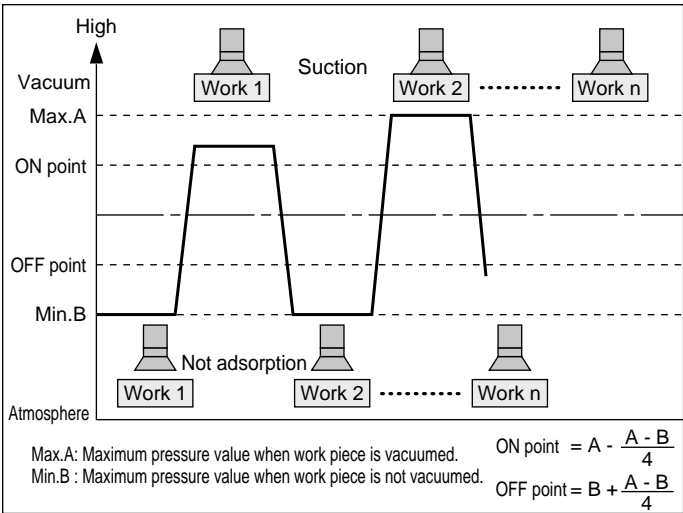
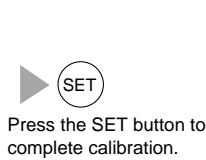


Change the vacuum nozzle or other conditions of the work piece and supply vacuum pressure. If OUT2 setting is not required, press the ▲ and ▼ buttons simultaneously to skip to the measurement mode.

5. OUT2 auto preset



Repeat vacuum and break several times while "AIL" is displayed. The optimum set point value is determined automatically.



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

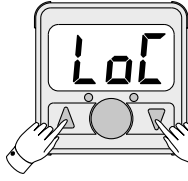
Key lock function

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 "LoC".



Change the display to "LoC" with the ▲ or ▼ button.

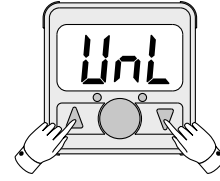


Press the SET button to complete calibration.

Key lock cancel



Press the SET button at least 4 seconds. Release it when the display turns to "UnL".

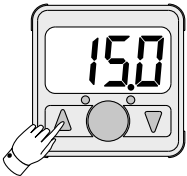


Press the SET button to complete calibration.

Peak/Bottom hold function

Can retain the maximum pressure value displayed (peak value) and minimum pressure value displayed (bottom value) during measurement.

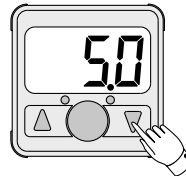
Peak hold



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.

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

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.

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

Zero out

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

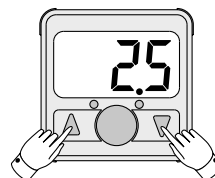


Let the supply pressure open to the atmosphere. Hold both ▲ and ▼ buttons simultaneously to re-set the display value to zero. After resetting, the operation returns to the measurement mode.

Unit setting (for overseas use)

Only for ZSE⁵⁰₆₀ F/ISE⁵⁰₆₀ -□-□(L)

Unit selection



Press the SET button.

Set the unit with the ▲ or ▼ button.

PF : kPa or MPa

GF : kgf/cm²

bRr : bar

PS : psi

inH : inHg (Note 1)

mmH : mmHg (Note 1)

Note1) Calibration is available with series ZSE50 and ZSE60.

OUT1 output mode selection

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



Series **ZSE⁵⁰₆₀F/ISE⁵⁰₆₀**

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.



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.

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.

Nominal thread size	Proper tightening torque N·m
M5	1/6 rotation after tightening by hand
R 1/4, NPT 1/4, G 1/4, URJ 1/4, TSJ 1/4	13.6N·m

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.

Wiring

Warning

1. Confirm the colors and terminal numbers of cords when wiring.

Incorrect wiring can cause the switch to be damaged and malfunction. Verify the colors 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.

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.



Digital 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.

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.

$$\begin{array}{rcl} \text{Supply} & - & \text{Internal voltage} \\ \text{voltage} & & \text{drop of switch} \end{array} > \text{Minimum operating} \\ & & \text{voltage of load}$$

⚠ 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.

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° 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.



Series **ZSE⁵⁰₆₀F/ISE⁵⁰₆₀**

Pressure Switch Precautions 1

Be sure to read before handling. Refer to pages 17 through 19 for safety instructions and pressure switch common precautions.

Handling

⚠ Warning

1. Do not drop, or apply excessive impact (980m/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 49N. 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.

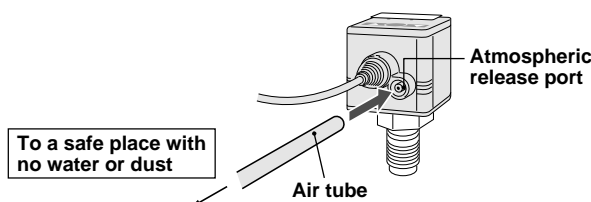
Operating Environment

⚠ 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 $\varnothing 4$ tube (with inside diameter of $\varnothing 2.5$) 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.: $\varnothing 4$, I.D.: $\varnothing 2.5$) 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.)

<ZSE60F/ISE60>

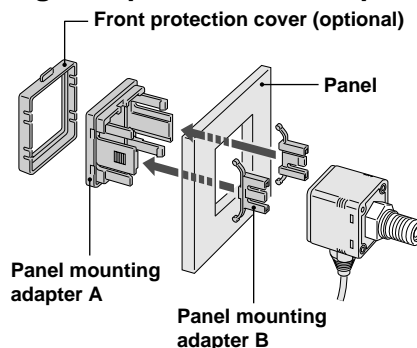
Helium leakage test

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

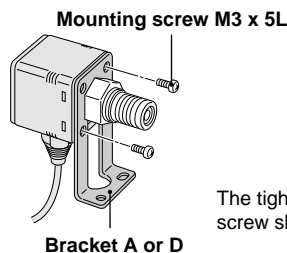
⚠ Caution

1. Mounting with panel mount adapter



2. Mounting with brackets

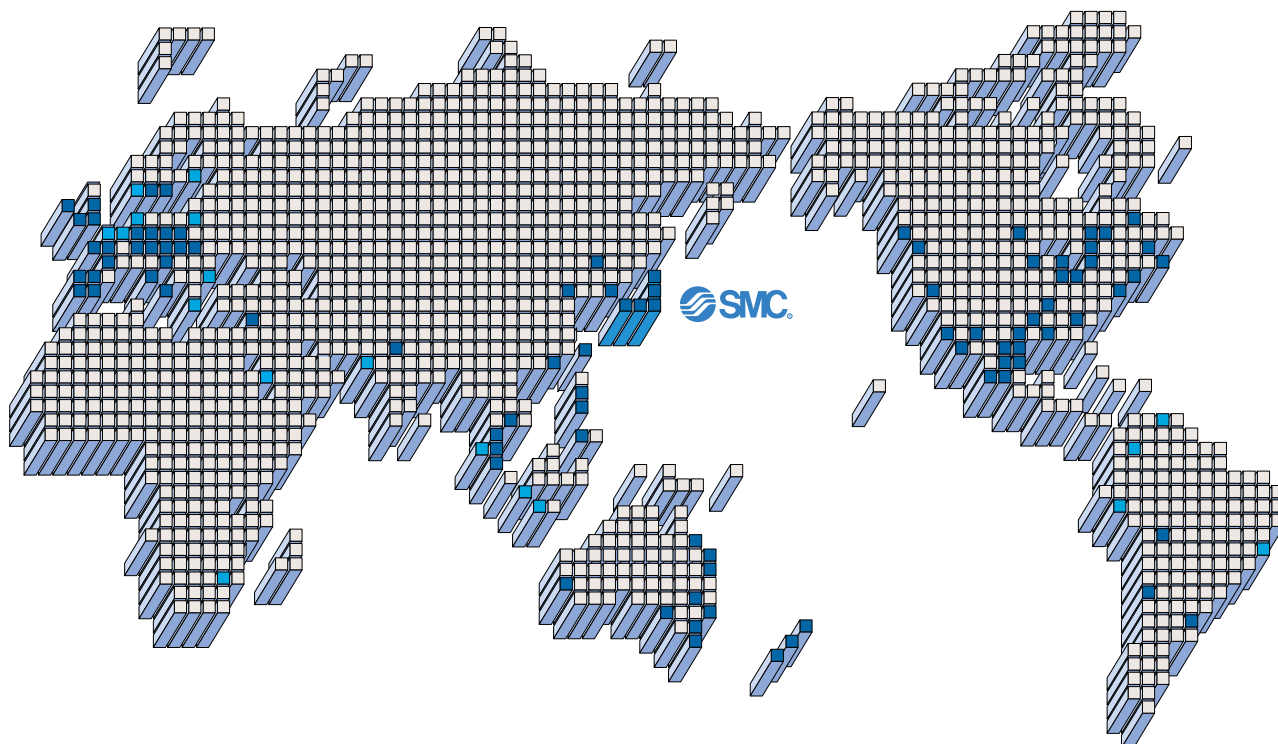
Mount a bracket to the using two M3 x 5L mounting screws and install on piping with a hexagon socket cap screws. The switch can be installed horizontally depending on the installation location.



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



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