High Precision, Digital Pressure Switch For General Fluids

Series ZSE50/60F/ISE50/60

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

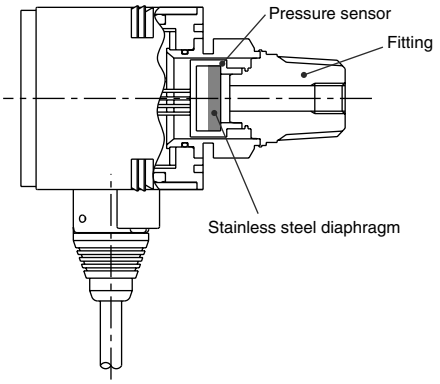
The stainless steel diaphragm prevents direct contact between sensor and measured fluid.

- 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.

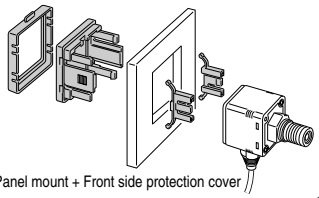
- ZSE50F / ISE50 1×10^{-5} Pa·m³/s
- ZSE60F / ISE60 1×10^{-10} Pa·m³/s



Enclosure **IP65**

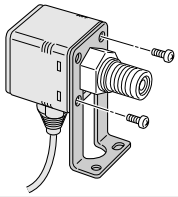
Option

Panel mount



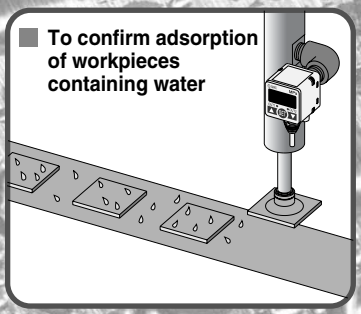
Panel mount + Front side protection cover

With bracket

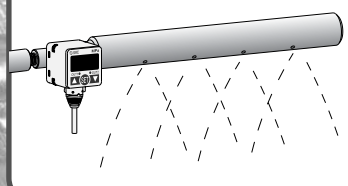


Application examples

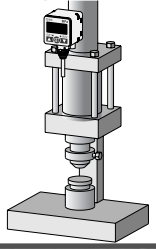
To confirm adsorption of workpieces containing water



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 ±0.2% 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: 2.5 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.

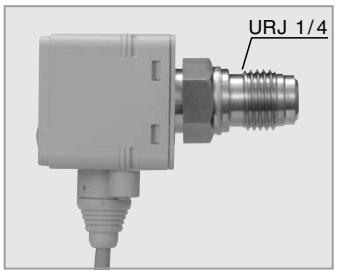
- **Key lock function**
- **Peak and bottom display function**
- **Zero out function**

Series ZSE60F/ISE60

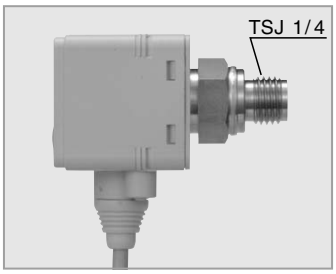
Special fitting types are used in semiconductor production equipment (Metal gasket seal fittings)

■ Leak rate: 1 x 10^{-10} Pa·m³/s

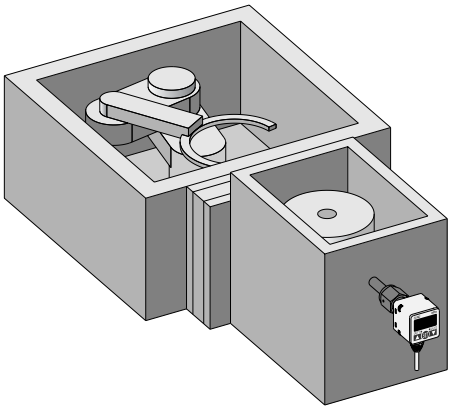
■ ZSE/ISE60(F)-A2



■ ZSE/ISE60(F)-B2



■ Confirmation of atmospheric pressure of load lock



Variations

		ZSE50F	ISE50	ZSE60F	ISE60
Model		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 x 10^{-5} Pa·m³/s		1 x 10^{-10} Pa·m³/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	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

* Option

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

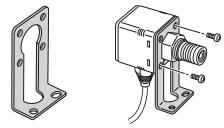
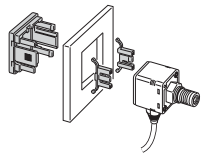
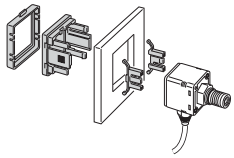
* Option

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

L	3 m

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 

Unit specification

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

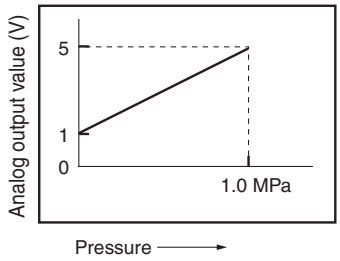
Note 1) Under the New Measurement Law, which has been in effect since October, 1999, sales of switches with the unit conversion function have not been allowed for use in Japan.

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

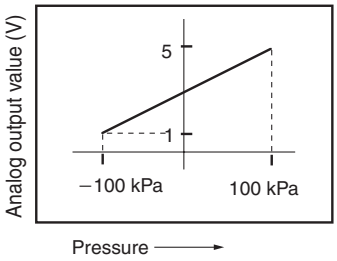
Analog Output

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	

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 Note 1)		kPa	0.1	—
		MPa	—	0.001
		kgf/cm²	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) Note 4)	
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 Note 2)			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 Note 3)			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/s², whichever is smaller	
	Shock resistance		980 m/s² in X, Y, Z directions 3 times each (Not energized)	
Temperature characteristics			±3% F.S. or less of measured pressure at 25°C in temperature range of 0 to 50°C	
Wetted material			Pressure receiving area: Stainless steel 630, Fittings: Stainless steel 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 (0.15 mm²)	
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

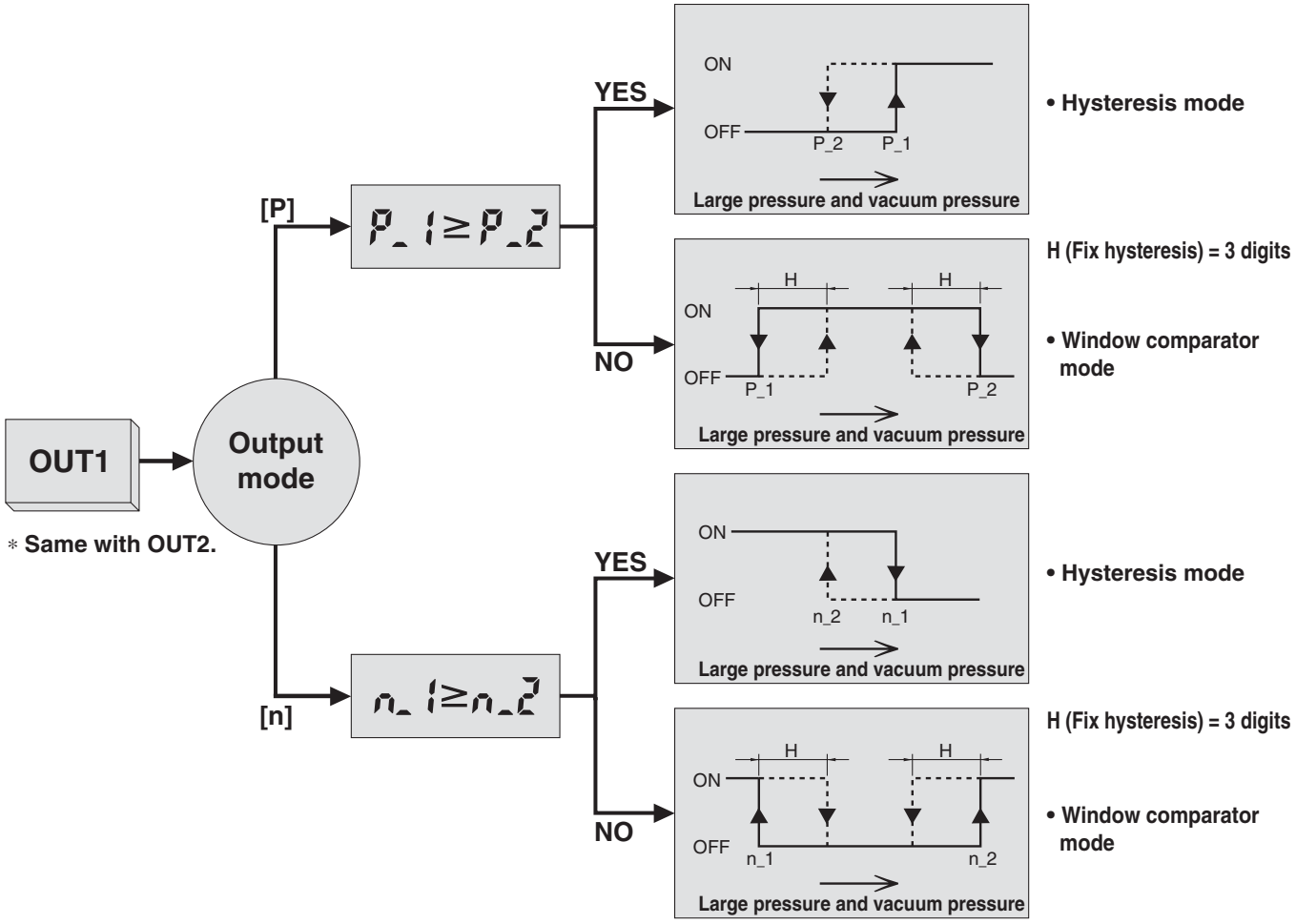
Function

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 Note 1)	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) Note 1)	Can convert the display value (for overseas use only).	

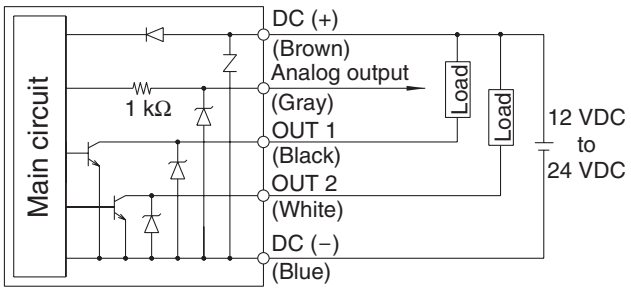
Note 1) Select and order by specifying the types and models.

Output Method

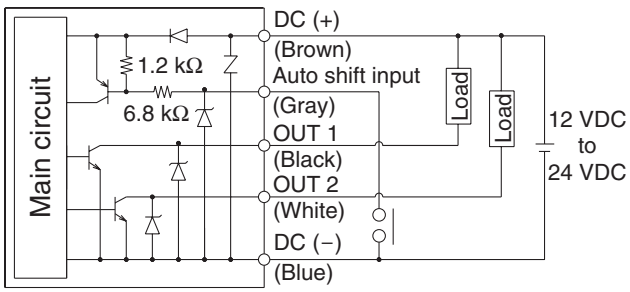


Example of Internal Circuit and Wiring

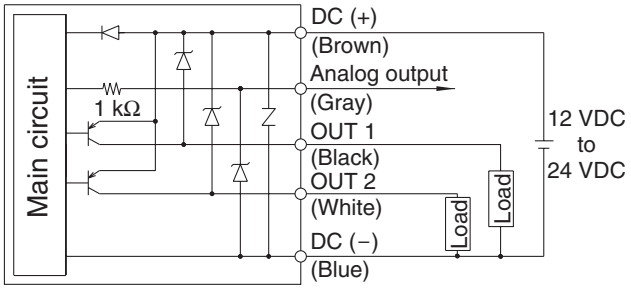
ZSE $\frac{50}{60}$ F/ISE $\frac{50}{60}$ -□-22(L)-(M)
With analog output



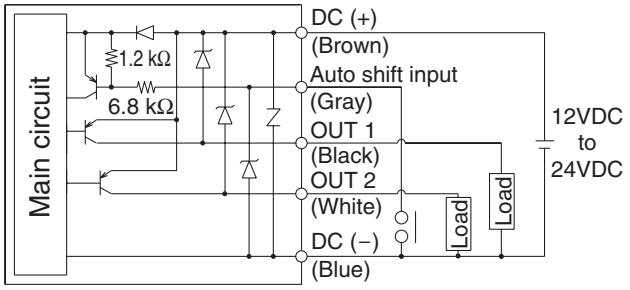
ZSE $\frac{50}{60}$ F/ISE $\frac{50}{60}$ -□-30(L)-(M)
With auto shift input



ZSE $\frac{50}{60}$ F/ISE $\frac{50}{60}$ -□-62(L)-(M)
With analog output



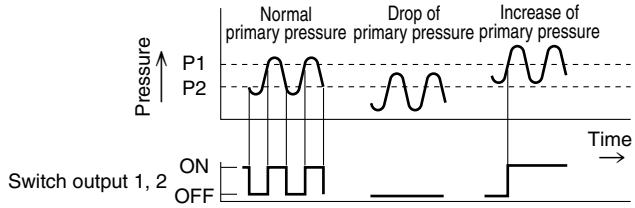
ZSE $\frac{50}{60}$ F/ISE $\frac{50}{60}$ -□-70(L)-(M)
With auto shift input



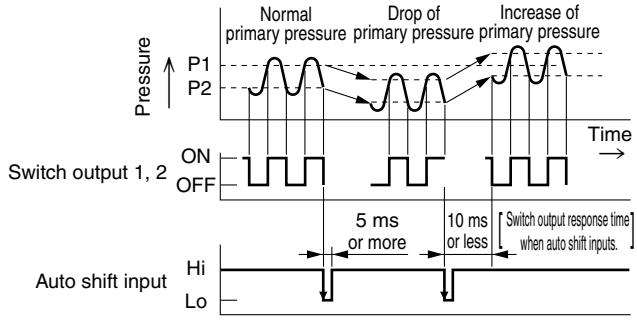
Auto Shift Function

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 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.

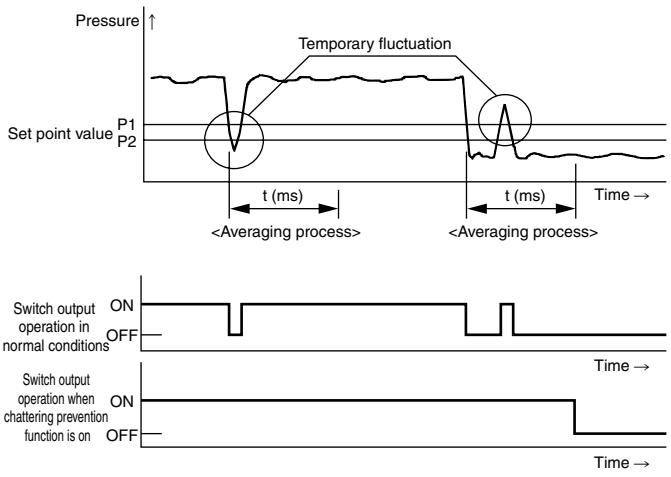
The possible set range for types with auto shift function is as follows:

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.



Description

Take the following measures when an error occurs.

Error description		LCD display	Condition	Solution
Over current error	OUT 1	Er 1	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: [±0.071 MPa or more with ISE50/60 ±7.1 kPa or more with ZSE50F/60F] ∗ 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	

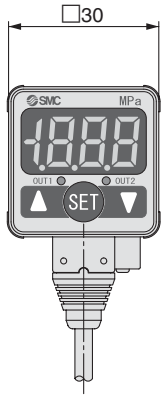
∗ The upper limits and lower limits are shown in the table below.

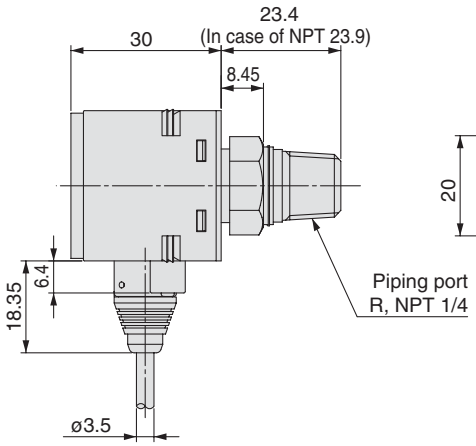
	Regulating pressure range	Lower limit	Upper limit
Compound pressure	–100.0 to 100.0 kPa	–100.0 kPa	100.0 kPa
Positive pressure	–0.100 to 1.000 MPa	–0.100 MPa	1.000 MPa

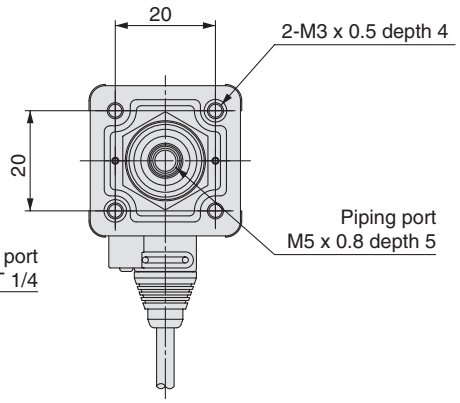
	With auto shift function		
	Regulating pressure range	Lower limit	Upper limit
Compound pressure	–100.0 to 100.0 kPa	–100.0 kPa	100.0 kPa
Positive pressure	–1.000 to 1.000 MPa	–1.000 MPa	1.000 MPa

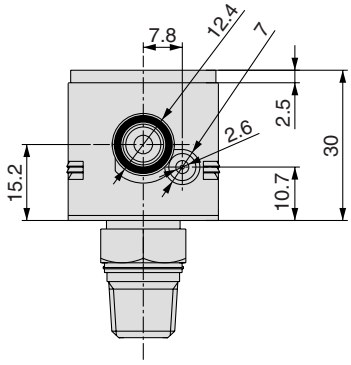
Dimensions

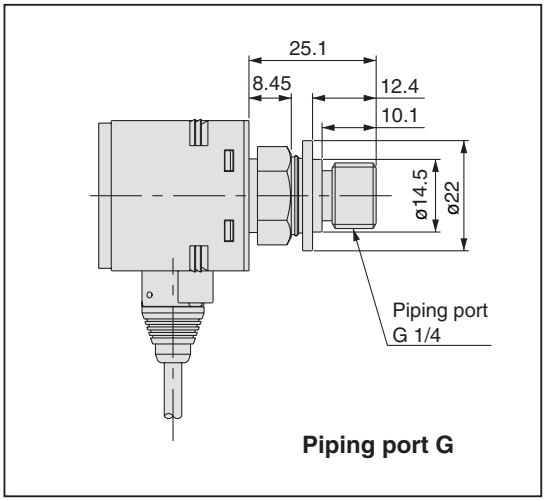
ZSE50F/ISE50-$^{02}_{T2}$ $^{}_{G2}$





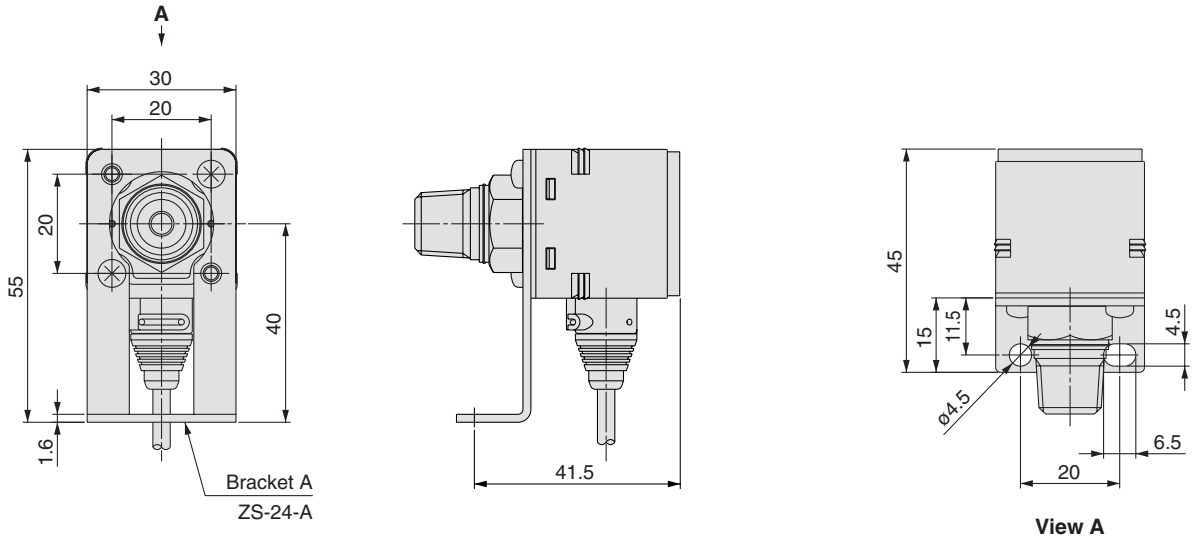




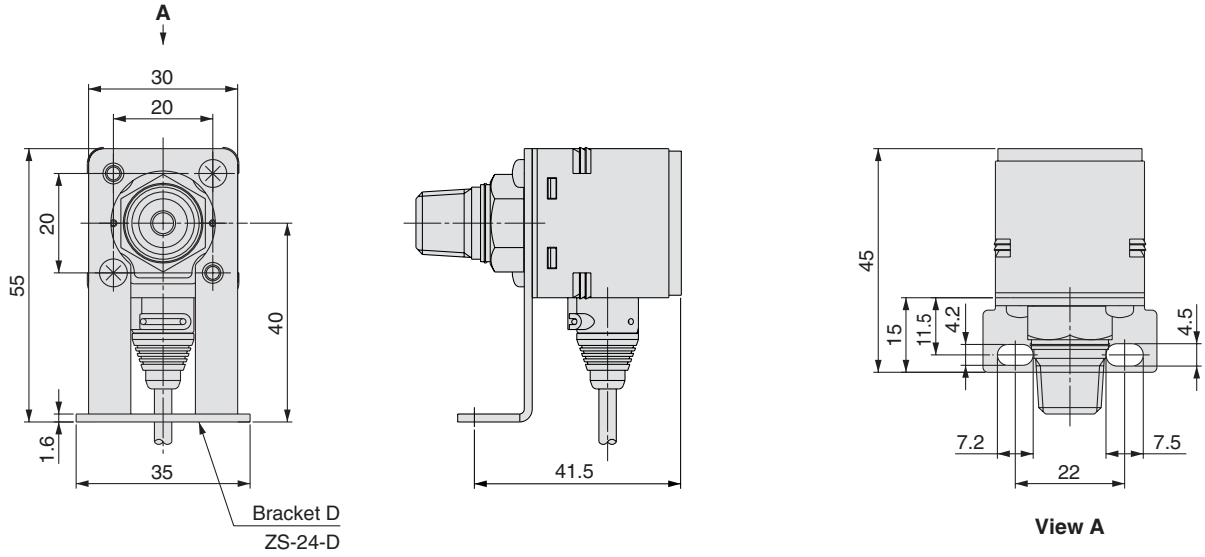


Dimensions

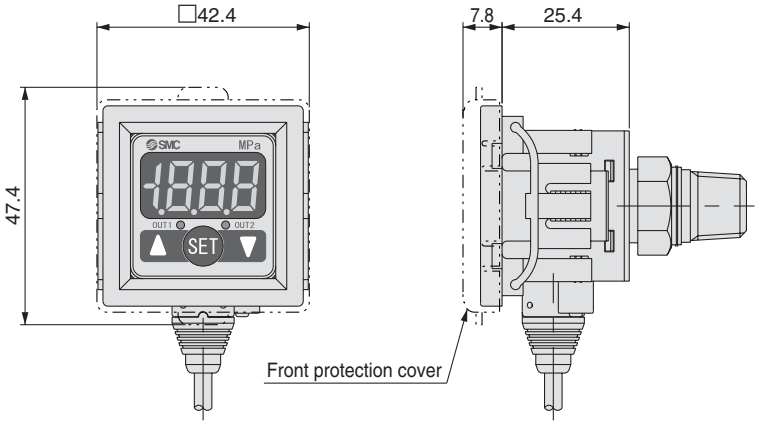
Bracket A



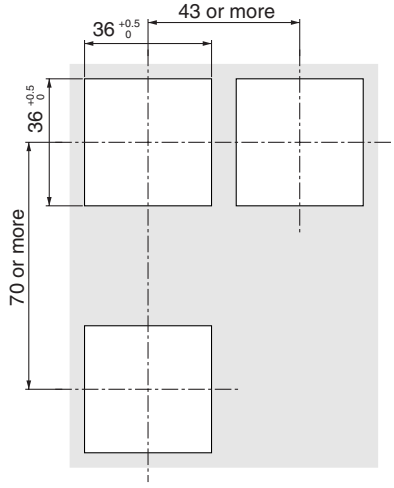
Bracket D



Panel mount



Cutting dimensions for panel mounting



The thickness of the panel is to 3.2 mm.

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

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

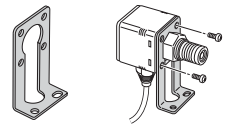
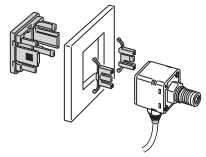
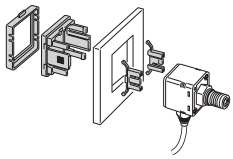
* Option

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

L	3 m

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 

Unit specifications

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

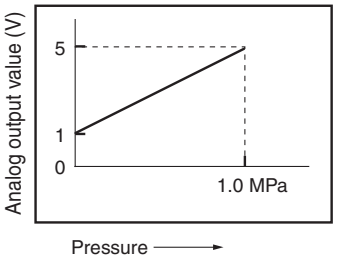
Note 1) Under the New Measurement Law, which has been in effect since October, 1999, sales of switches with the unit conversion function have not been allowed for use in Japan.

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

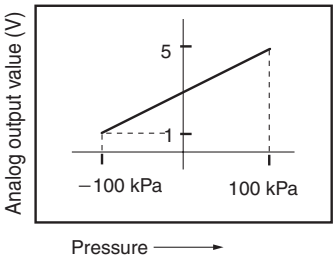
Analog Output

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	

Specifications

			ZSE60F (Compound pressure)	**ISE60** (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 Note 1)		kPa	0.1	s
		MPa	—	0.001
		kgf/cm²	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) Note 4)	
Response time			2.5 ms or less (With chattering prevention 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 (Ambient temperature of 25 ±3°C)	
Indicator light			Green LED (OUT1: Light up when ON), Red LED (OUT2: Light up when ON)	
Analog output Note 2)			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 Note 3)			No-voltage input (Solid state switch or reed switch), 5 ms or longer input	
Environment 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)	
	With stand voltage		250 VAC for 1 min, between all lead wires and enclosure	
	Insulation resistance		2 MΩ or more (at 50VDC) between all lead wires and enclosure	
	Vibration resistance		10 to 500 Hz with 1.5 mm amplitude or 98 m/s², whichever is smaller	
	Shock resistance		980 m/s² in X, Y, Z directions 3 times each (Not energized)	
Temperature characteristics			±3% F.S. or less of measured pressure at 25°C in temperature range of 0 to 50°C	
Wetted material			Pressure receiving area: Stainless steel 630, Fittings: Stainless steel 304	
Port size			A2: URJ 1/4 B2: TSJ 1/4	
Lead wire			5-wire oil proof heavy-duty cord (0.15 mm²)	
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

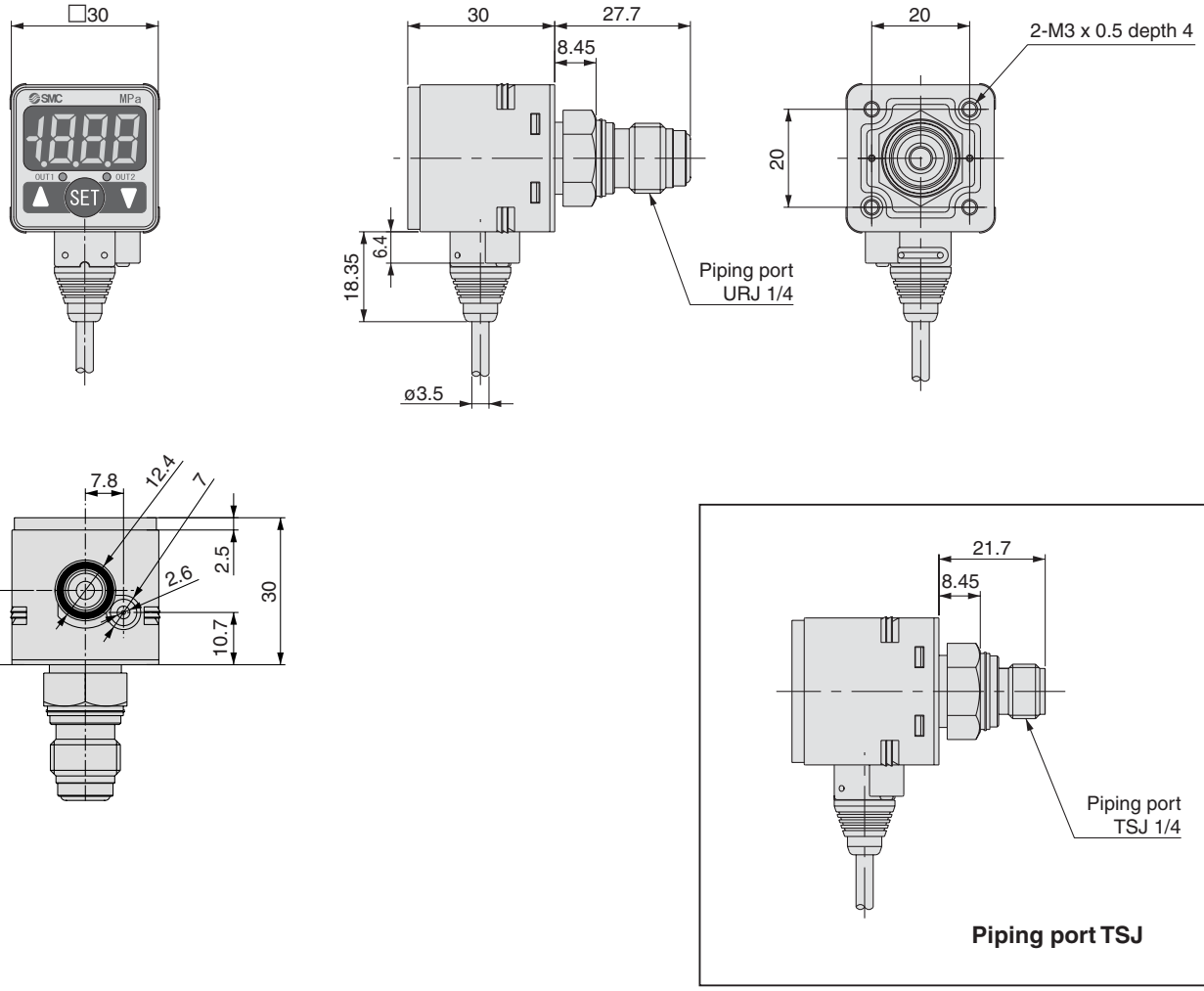
Various additional functions are available for easy measurement, switch operation and check of measured values suitable for the conditions of the measured fluid.

Auto shift function Note 1)	Can correct the pressure set point value of switch output according to fluctuation 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 function (For overseas use) Note 1)	Can convert the display value (For overseas use only).	

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

Dimensions

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

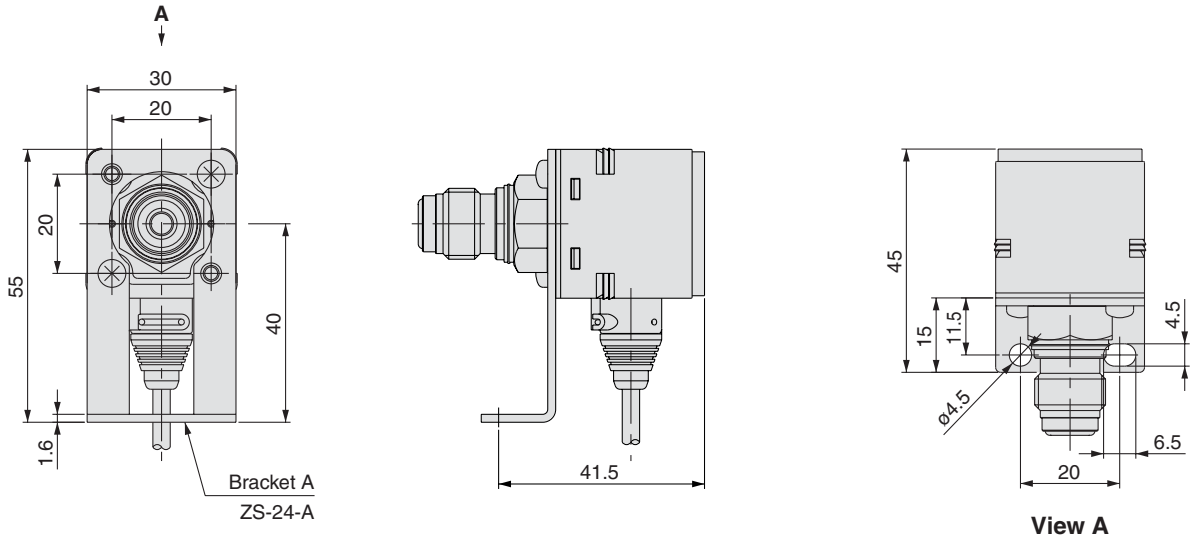


The following items are identical with those of Series ZSE50F/ISE50.

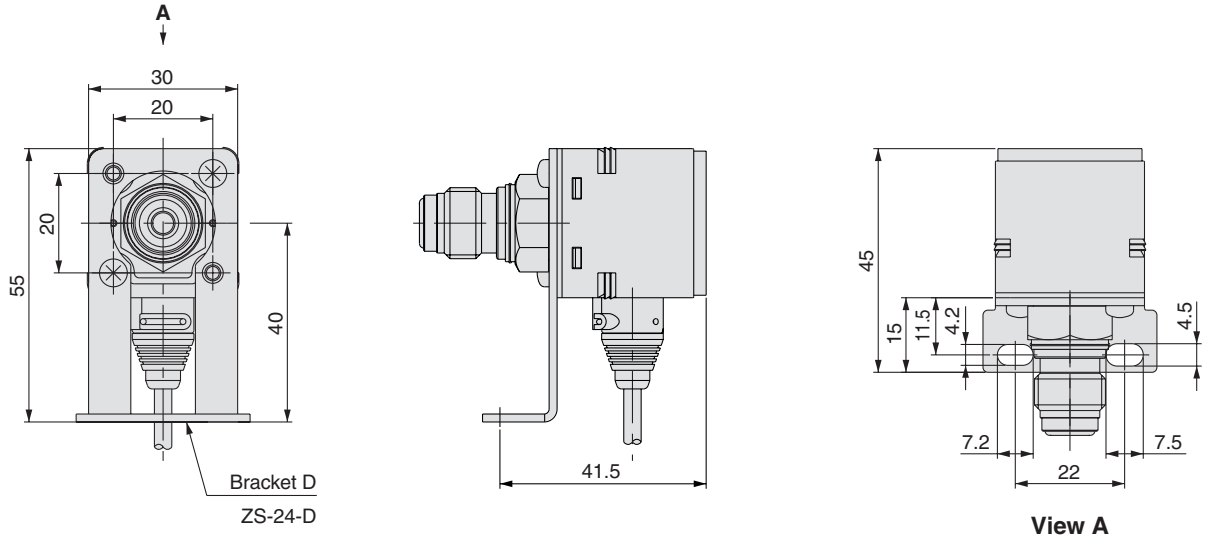
Item	Reference page
Output type	16-2-30
Example of internal circuit and wiring	16-2-31
Auto shift function, Anti-chattering function	16-2-32
Measures to be taken when error occurs	16-2-33

Dimensions

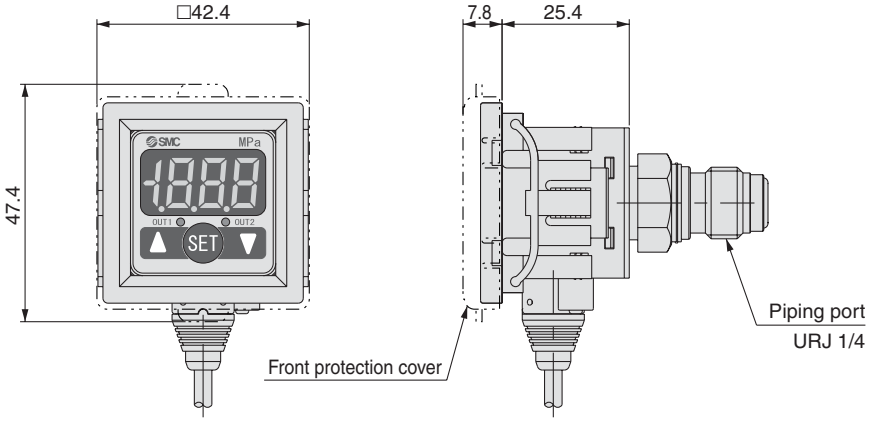
Bracket A



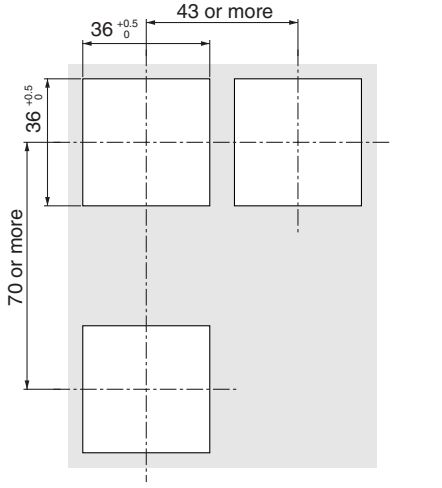
Bracket D



Panel mount

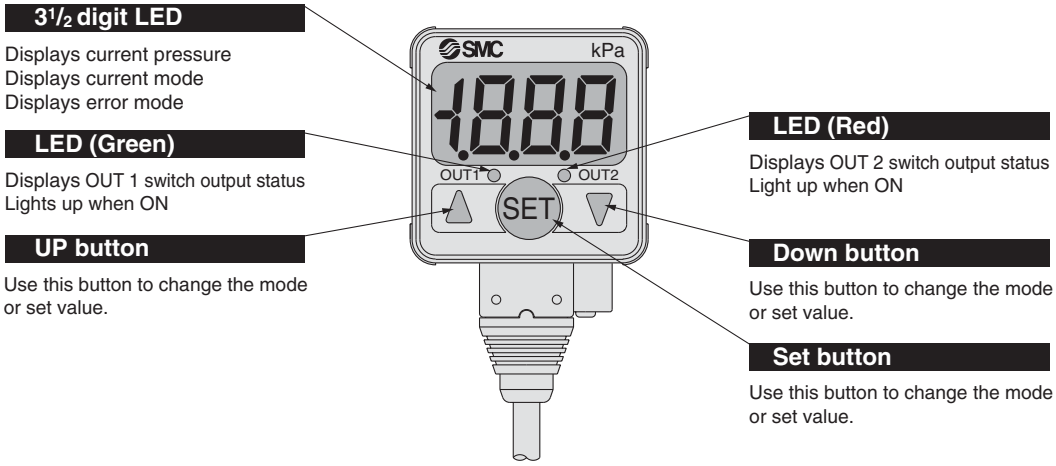


Cutting dimensions for panel mounting



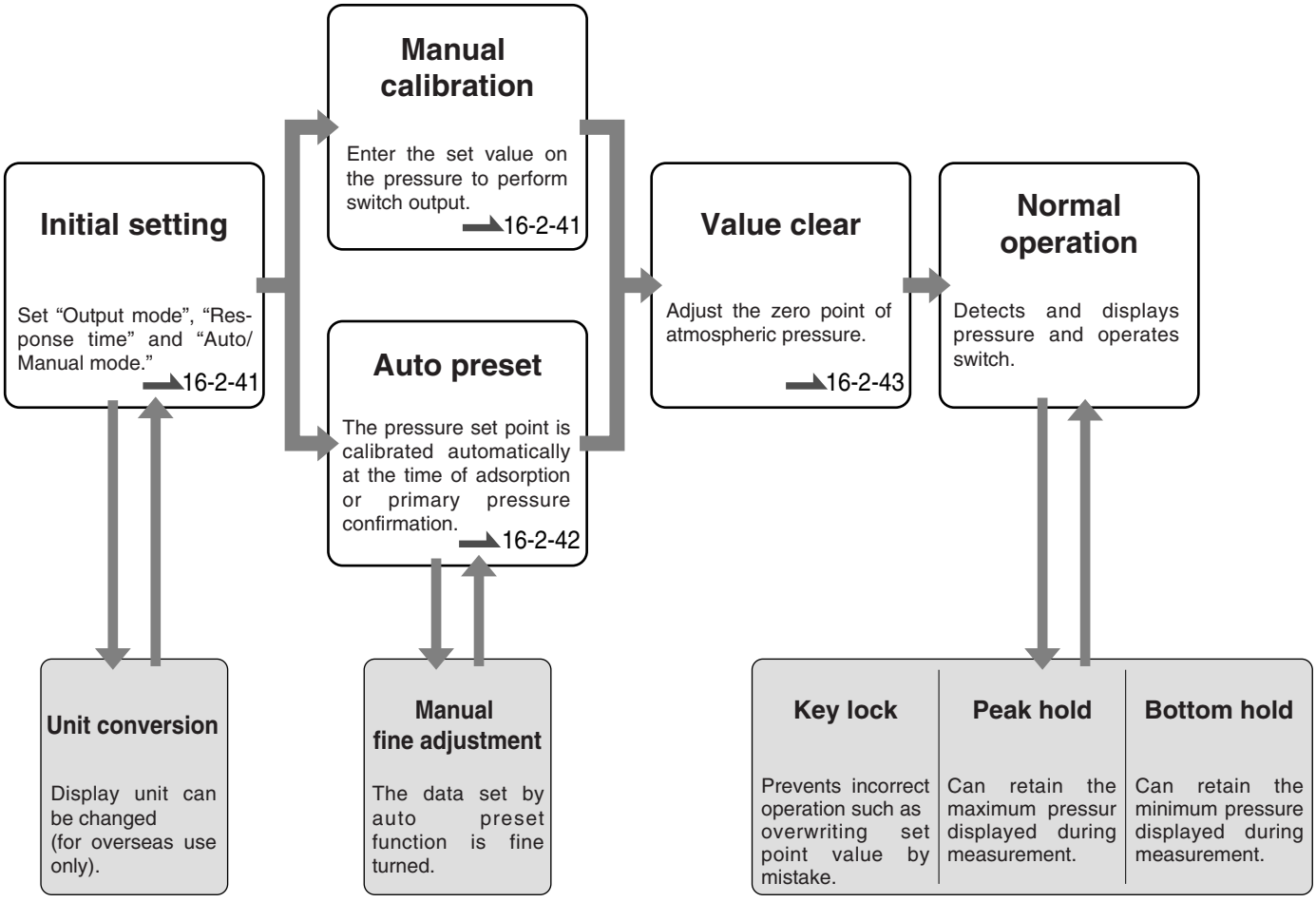
The thickness of the panel is to 3.2 mm.

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)

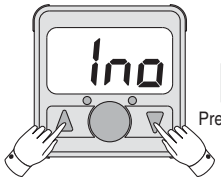
Initial setting

1. Initial setting mode

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

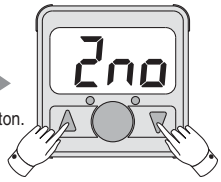
Unit specifications:	In case of types with unit conversion function, refer to "Unit setting (for overseas use)" on page 16-2-43.

2. OUT1 output mode selection



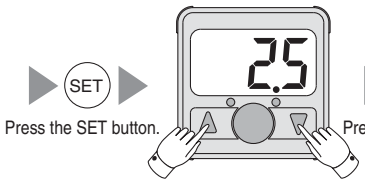
Select the "output mode" of OUT1 with ▲ or ▼ button.
"1no": Normally open mode,
"1nC": Normally closed mode

3. OUT2 output mode selection



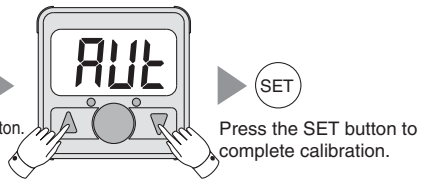
Select the "output mode" of OUT2 with ▲ or ▼ button.
"2no": Normally open mode,
"2nC": Normally closed mode

4. Response time selection



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

5. Auto/Manual setting



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

Please refer to "Chattering prevention function" on page 16-2-43.

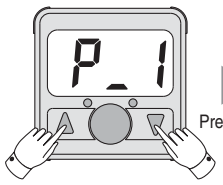
Manual pressure setting

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

1. Manual setting mode

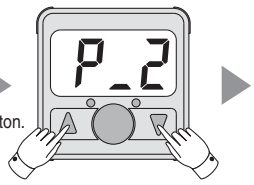
Select the manual setting mode as the initial setting mode. Press the SET button and hold it unit "P_1" or "n_1" appears on the display.

2. OUT1 (1) output set point value input



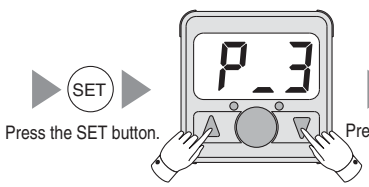
▲ button: Increases the set point value.
▼ button: Decrease the set point value.
"P_1" or "n_1" and the set point value light up alternately.

3. OUT1 (2) output set point value input



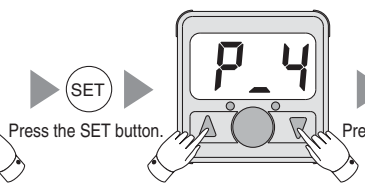
▲ button: Increases the set point value.
▼ button: Decrease the set point value.
"P_2" or "n_2" and the set point value light up alternately.

4. OUT2 (1) output set point value input



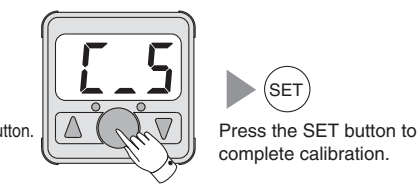
▲button: Increases the set point value.
▼button: Decrease the set point value.
"P_3" or "n_3" and the set point value light up alternately.

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

SET

Press the SET button.

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

SET

Press the SET button.

Change the vacuum nozzle or other conditions of the workpiece 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

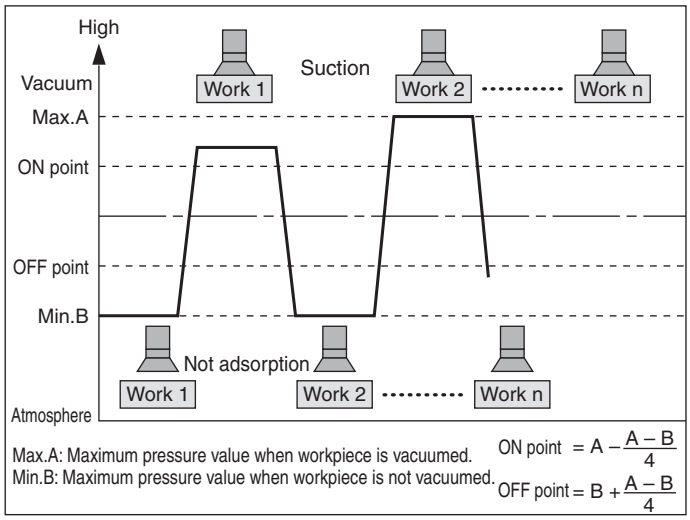
SET

Press the SET button.

SET

Press the SET button to complete calibration.

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



Max.A: Maximum pressure value when workpiece is vacuumed.
Min.B: Maximum pressure value when workpiece is not vacuumed.

$$\text{ON point} = A - \frac{A - B}{4}$$

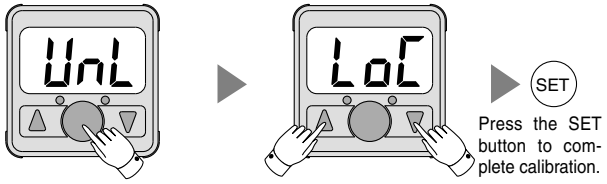
$$\text{OFF point} = B + \frac{A - B}{4}$$

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

Key lock function

Can prevent incorrect operation of operation buttons on the switch front.

Key lock start

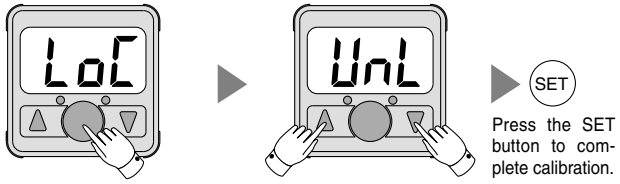


Press the SET button at least 2 seconds. Release it when the display turns to "UnL".

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 "LoC".

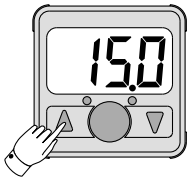
Change the display to "UnL" with the ▲ or ▼ button.

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.

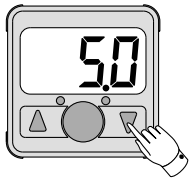
Peak hold



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

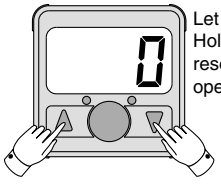


Press the ▲ button at least for 1 second during pressure display to enter the bottom display mode. The displayed value will blink. To return, press the ▼ button again at least for 1 second.

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 reset the display value to zero. After resetting, the operation returns to the measurement mode.

Unit conversion (for overseas use)

Only for ZSE $\frac{50}{60}$ F/ISE $\frac{50}{60}$ -□-□(L)

Unit selection

OUT1 output mode selection

Press the SET button.

Goes to 2. OUT1 output mode selection in Initial Setting on page 16-2-41.

Set the unit with the ▲or ▼button.

- PF : kPa or MPa
- CF : kgf/cm²
- bAr : bar
- PSI : psi
- inH : inHg Note 1)
- mmH : mmHg Note 1)

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

Series ZSE50/60F/ISE50/60
Pressure Switch Precautions
Be sure to read before handling.

Handling

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

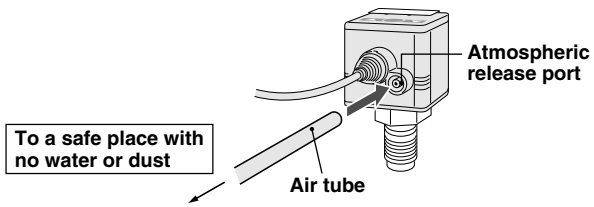
Connection

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

Operating Environment

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

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



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

Pressure Source

⚠ Warning
1. Use of toxic, corrosive or flammable gas.

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

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

2. Fluid compatibility

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 with the manufacturer of the fluid.)

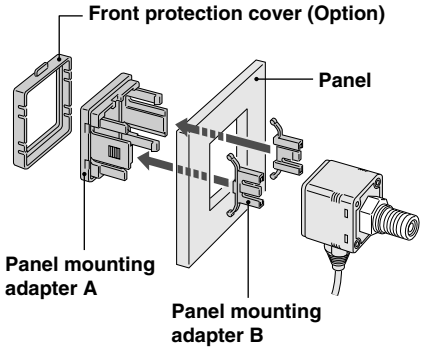
<ZSE60F/ISE60>

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.

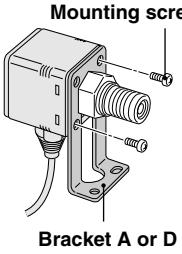
Mounting Method

⚠ 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 0.98 N·m or less.

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 labels 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--General rules relating to 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. The expected performance and safety assurance will be the responsibility of the person who has determined the compatibility of the system. This person should continuously review the suitability of all items specified, referring to the latest catalog information with a view to giving due consideration to any possibility of equipment failure when configuring a system.

2. Only trained personnel should operate pneumatically operated machinery and equipment.

Compressed air can be dangerous if an operator is unfamiliar with it. 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 once measures to prevent falling or runaway of the driver objects have been confirmed.
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.

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, clutch and brake circuits in press applications, or safety equipment.
3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.

Common Precautions

Be sure to read before handling.
For detailed precautions on every series, refer to main text.

Selection

⚠ Warning

1. Confirm the specifications.

Products represented in this catalog are designed for use in compressed air appllications only (including vacuum), unless otherwise indicated.
Do not use the product outside their design parameters.
Please contact SMC when using the products in applications other than compressed air (including vacuum).

Mounting

⚠ Warning

1. Instruction manual

Install the products and operate them only after reading the instruction manual carefully and understanding its contents. Also keep the manual where it can be referred to as necessary.

2. Securing the space for maintenance

When installing the products, please allow access for maintenance.

3. Tightening torque

When installing the products, please follow the listed torque specifications.

Piping

⚠ Caution

1. Before piping

Make sure that all debris, cutting oil, dust, etc, are removed from the piping.

2. Wrapping of pipe tape

When screwing piping or fittings into ports, ensure that chips from the pipe threads or sealing material do not get inside the piping. Also, when the pipe tape is used, leave 1.5 to 2 thread ridges exposed at the end of the threads.

Air Supply

⚠ Warning

1. Operating fluid

Please consult with SMC when using the product in applications other than compressed air (including vacuum).
Regarding products for general fluid, please ask SMC about applicable fluids.

2. Install an air dryer, aftercooler, etc.

Excessive condensate in a compressed air system may cause valves and other pneumatic equipment to malfunction.
Installation of an air dryer, after cooler etc. is recommended.

3. Drain flushing

If condensate in the drain bowl is not emptied on a regular basis, the bowl will over flow and allow the condensate to enter the compressed air lines.
If the drain bowl is difficult to check and remove, it is recommended that a drain bowl with the auto-drain option be installed.
For compressed air quality, refer to “Air Preparation Equipment” catalog.

4. Use clean air

If the compressed air supply is contaminated with chemicals, cynthetic materials, corrosive gas, etc., it may lead to break down or malfunction.

Operating Environment

⚠ Warning

1. Do not use in environments where the product is directly exposed to corrosive gases, chemicals, salt water, water or steam.

2. Do not expose the product to direct sunlight for an extended period of time.

3. Do not use in a place subject to heavy vibrations and/or shocks.

4. Do not mount the product in locations where it is exposed to radiant heat.

Maintenance

⚠ Warning

1. Maintenance procedures are outlined in the operation manual.

Not following proper procedures could cause the product to malfunction and could lead to damage to the equipment or machine.

2. Maintenance work

If handled improperly, compressed air can be dangerous.
Assembly, handling and repair of pneumatic systems should be performed by qualified personnel only.

3. Drain flushing

Remove drainage from air filters regularly. (Refer to the specifications.)

4. Shut-down before maintenance

Before attempting any kind of maintenance make sure the supply pressure is shut of and all residual air pressure is released from the system to be worked on.

5. Start-up after maintenance and inspection

Apply operating pressure and power to the equipment and check for proper operation and possible air leaks. If operation is abnormal, please verify product set-up parameters.

6. Do not make any modifications to be product.

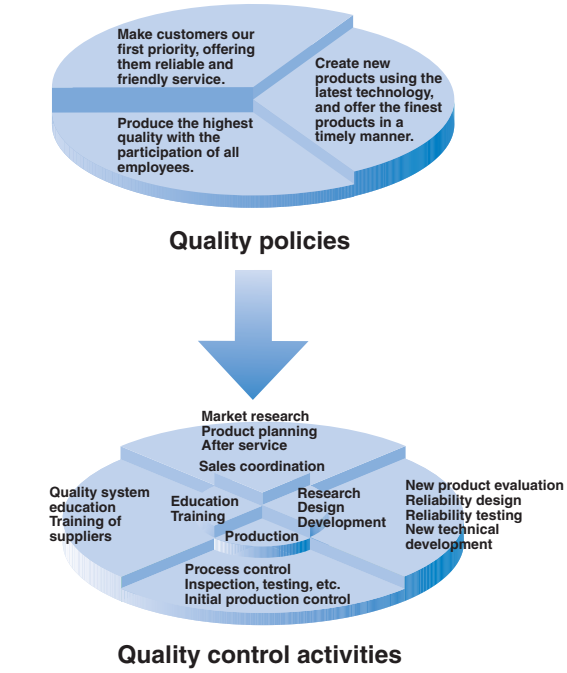
Do not take the product apart.

Quality Assurance Information (ISO 9001, ISO 14001)

Reliable quality of products in the global market

To enable our customers throughout the world to use our products with even greater confidence, SMC has obtained certification for international standards “ISO 9001” and “ISO 14001”, and created a complete structure for quality assurance and environmental controls. SMC products pursue to meet its customers’ expectations while also considering company’s contribution in society.

SMC’s quality control system



Quality management system

ISO 9001

This is an international standard for quality control and quality assurance. SMC has obtained a large number of certifications in Japan and overseas, providing assurance to our customers throughout the world.



Environmental management system

ISO 14001

This is an international standard related to environmental management systems and environmental inspections. While promoting environmentally friendly automation technology, SMC is also making diligent efforts to preserve the environment.



SMC Product Conforming to Inter

SMC products complying with EN/ISO, CSA/UL standards are supporting

CE Mark

The CE mark indicates that machines and components meet essential requirements of all the EC Directives applied.
It has been obligatory to apply CE marks indicating conformity with EC Directives when machines and components are exported to the member Nations of the EU.
Once “A manufacturer himself” declares a product to be safe by means of CE marking (declaration of conformity by manufacturer), free distribution inside the member Nations of the EU is permissible.

■ CE Mark

SMC provides CE marking to products to which EMC and Low Voltage Directives have been applied, in accordance with CETOP (European hydraulics and pneumatics committee) guide lines.

■ As of February 1998, the following 18 countries will be obliged to conform to CE mark legislation

Iceland, Ireland, United Kingdom, Italy, Austria, Netherlands, Greece, Liechtenstein, Sweden, Spain, Denmark, Germany, Norway, Finland, France, Belgium, Portugal, Luxembourg

■ EC Directives and Pneumatic Components

• Machinery Directive

The Machinery Directive contains essential health and safety requirements for machinery, as applied to industrial machines e.g. machine tools, injection molding machines and automatic machines. Pneumatic equipment is not specified in Machinery Directive. However, the use of SMC products that are certified as conforming to EN Standards, allows customers to simplify preparation work of the Technical Construction File required for a Declaration of Conformity.

• Electromagnetic Compatibility (EMC) Directive

The EMC Directive specifies electromagnetic compatibility. Equipment which may generate electromagnetic interference or whose function may be compromised by electromagnetic interference is required to be immune to electromagnetic affects (EMS/immunity) without emitting excessive electromagnetic affects (EMI/emission).

• Low Voltage Directive

This directive is applied to products, which operate above 50 VAC to 1000 VAC and 75 VDC to 1500 VDC operating voltage, and require electrical safety measures to be introduced.

• Simple Pressure Vessels Directive

This directive is applied to welded vessels whose maximum operating pressure (PS) and volume of vessel (V) exceed 50 bar/L. Such vessels require EC type examination and then CE marking.

national Standards

you to comply with EC directives and CSA/UL standards.

Mark of compliance for CSA/UL

Mark of compliance for CSA

NRTL /C

■ CSA Standards & UL Standards

UL and CSA standards have been applied in North America (U.S.A. and Canada) symbolizing safety of electric products, and are defined to mainly prevent danger from electric shock or fire, resulting from trouble with electric products. Both UL and CSA standards are acknowledged in North America as the first class certifying body. They have a long experience and ability for issuing product safety certificate. Products approved by CSA or UL standards are accepted in most states and governments beyond question.
Since CSA is a test certifying body as the National Recognized Testing Laboratory (NRTL) within the jurisdiction of Occupational Safety and Health Administration (OSHA), SMC was tested for compliance with CSA Standards and UL Standards at the same time and was approved for compliance with the two Standards. The above CSA NRTL/C logo is described on a product label in order to indicate that the product is approved by CSA and UL Standards.

■ TSSA (MCCR) Registration Products

TSSA is the regulation in Ontario State, Canada. The products that the operating pressure is more than 5 psi (0.03 MPa) and the piping size is bigger than 1 inch. fall into the scope of TSSA regulation.

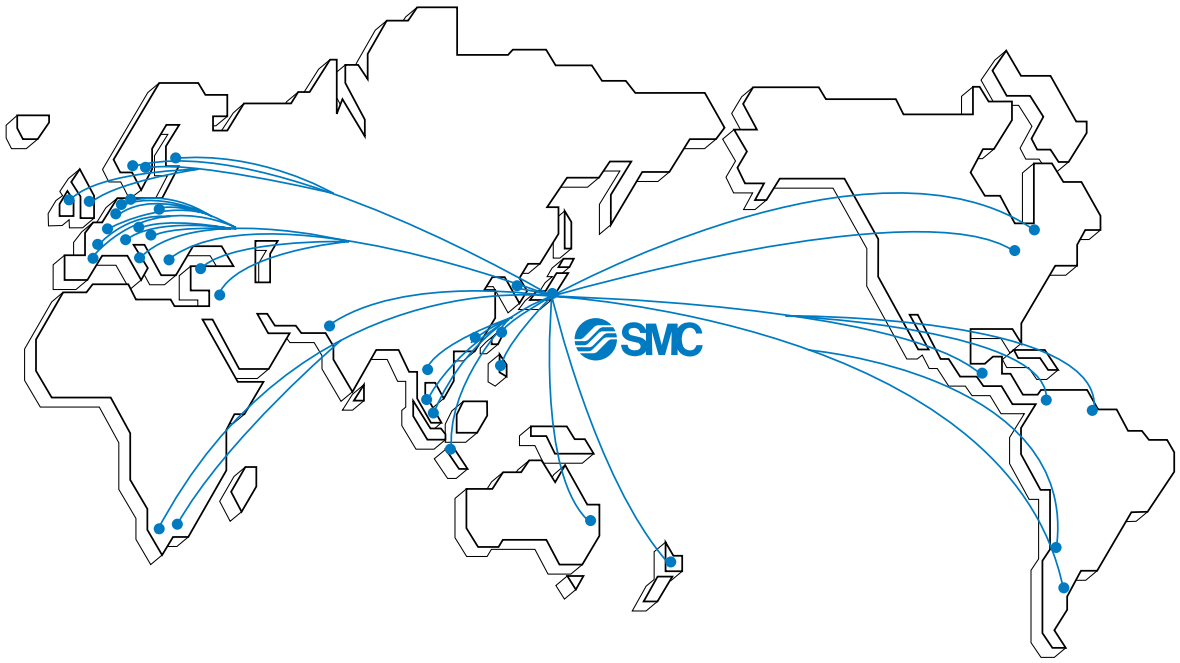
Products conforming to CE Standard

With CE symbol for simple visual recognition

In this catalog each accredited product series is indicated with a CE mark symbol. However, in some cases, every available models may not meet CE compliance. Please visit our web site for the latest selection of available models with CE mark.

http://www.smcworld.com

SMC's Global Service Network



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