



## Installation & Maintenance Manual

### Digital Pressure Switch

#### Series ISE80(H)/ZSE80(F)



### Safety Instructions

- This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.
- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- These instructions indicate the level of potential hazard by label of DANGER, WARNING or CAUTION, followed by important safety information which must be carefully followed.
- To ensure safety of personnel and equipment the safety instructions in this manual and the product catalogue must be observed, along with other relevant safety practices.

	<b>DANGER</b>	In extreme conditions, there is a possible result of serious injury or loss of life.
	<b>WARNING</b>	If instructions are not followed there is a possibility of serious injury or loss of life.
	<b>CAUTION</b>	If instructions are not followed there is a possibility of injury or equipment damage.

### WARNING

- Do not disassemble, modify (including change of printed circuit board) or repair the product.**  
An injury or product failure may result.
- Do not operate the product beyond the specification range.**  
Fire, malfunction or equipment damage may result. Use the product only after confirming the specifications.
- Do not use the product in the presence of flammable, explosive or corrosive gas.**  
Fire, explosion or corrosion may result. This product does not have an explosion proof construction.
- When using the product as part of an interlocking system:**
  - Provide a double interlocking system, for example a mechanical system.
  - Check the product regularly to ensure proper operation.
- Before performing maintenance, be sure of the following:**
  - Turn off the power supply.
  - Stop the air supply, exhaust the residual pressure and verify the release of air from the system.

### CAUTION

- Always perform a system check after maintenance.**  
Do not use the product if any error occurs.  
Safety cannot be assured if caused by un-intentional malfunction.
- Provide grounding to ensure correct operation and to improve noise resistance of the product.**  
This product should be individually grounded using a short cable.

### Safety Instructions (continued)

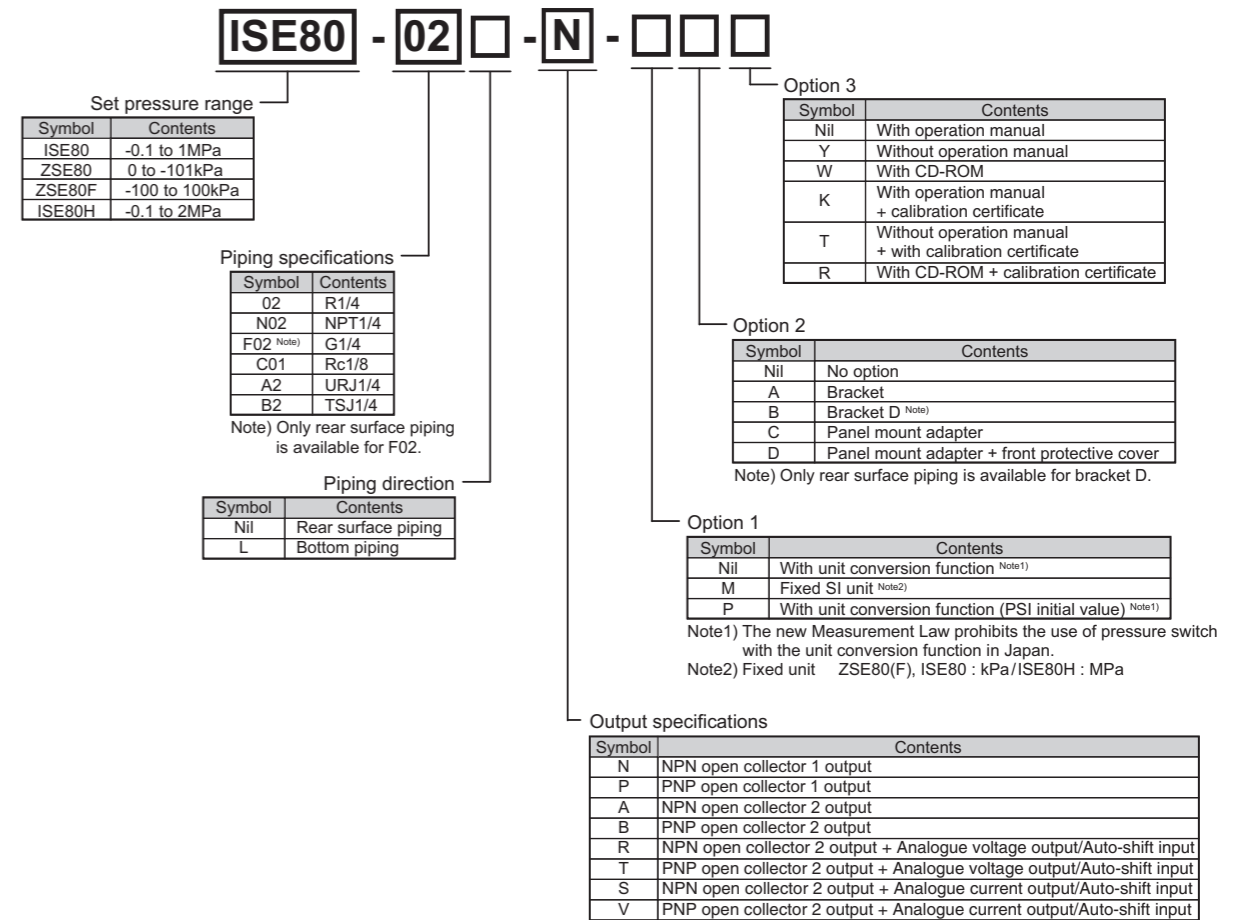
#### NOTE

Follow the instructions given below when handling the pressure switch. Otherwise, the pressure switch may be damaged or may fail, thereby resulting in malfunction.

- Make sure to use the pressure switch within the specified voltage range.
- Make sure to use the pressure switch within the operating pressure range.
- Input data to the pressure switch is not deleted even if the power supply is cut.
- Allow space for maintenance around the product.
- Never mount the pressure switch in a place that will be used as a foothold during piping.
- If foreign material is possible in the fluid, install a filter or mist separator on the inlet of the pressure switch to avoid failure and malfunction.
- Do not drop or bump, or apply excess impact to the product (490mm/s<sup>2</sup>).
- Do not pull the lead wire forcefully, or lift the pressure switch by pulling the lead wire. (Tensile force 49N or less).
- Mount the pressure switch using the correct tightening torque.
- For piping of the pressure switch, hold the piping with a spanner on the metal part of the piping (Piping attachment).
- Install the pressure switch after eliminating dust from the piping by cleaning with a blast of air to avoid failure and malfunction.
- Avoid repeatedly bending or stretching the lead wire.
- Wire correctly.
- Do not wire while the power is ON.
- Do not route the wire in the same place as power cables or high voltage cables.
- Confirm proper insulation of wiring.
- Wire as short as possible to avoid the effect of noise and surge.
- Do not short-circuit the load. It can cause failure and malfunction.
- Use operating fluid which does not corrode the part in contact with fluid which is made of SUS630 (for sensing part) or SUS304 (for fitting part). (Compatibility between fluid and material can be checked by contact to fluid supplier.)
- Never use the pressure switch with toxic, destructive or corrosive fluid because materials of sensing part and fitting part is SUS630 and SUS304 respectively. For details of suitable fluids, refer to the MSDS "Material Safety Data Sheet". Also, as the pressure switch is not explosion proof, the use of combustible gas is not permitted.

- Do not use in an area where magnetic field is generated to avoid malfunction of the pressure switch.
- Do not use in an area containing oil or chemicals.
- Do not apply heat cycle to the pressure switch.
- Do not use in an area where surges are generated.
- Do not use a load which generates surge voltage.
- Consider the operating environment according to endosure IP rating.
- Do not mount the pressure switch where vibration (98m/s<sup>2</sup> or less) and impact (490m/s<sup>2</sup> or less) exist to avoid failure and malfunction.
- Operation under low temperature (5°C or less) can cause damage or operation failure due to frozen moisture in the fluid or air.
- Do not press the set buttons with a sharp pointed object.
- Although the pressure switch uses a stainless steel diaphragm pressure sensor, any condensate contained in the fluid during vacuum release may collide with the pressure sensor, and the inertia force of the condensate may cause damage to the pressure sensor.  
In this case, the display of the pressure may not be correct.  
If condensate is possible, please make the piping diameter to the pressure switch thin, or put an orifice in the middle of the piping. Extra attention should be taken when rear piping is used.
- The use of a resin piping can cause static electricity depending on the fluid.  
Therefore, when connecting the pressure switch, take appropriate measures against static electricity, and separate the grounding for the pressure switch from the grounding for other equipment which may generate a strong electromagnetic noise or high frequency.  
Otherwise, static electricity may damage the pressure switch.
- Avoid foreign matters such as wiring chips from entering the pressure switch.
- Maintenance and inspection should be performed periodically.
- Do not poke inside a piping port with a sharp object.
- Do not touch the LCD display during operation.
- Only the pressure switch with UL mark on the body is UL approved product.
- The pressure switch is not equipped with surge protection against lightning.
- The pressure switch will not operate for 3 sec. after power is supplied. (Display colour depends on the set value.)
- Displayed analogue output may fluctuate by 2 to 3% for 10 minutes after supplying the power to the pressure switch.

### Model Indication Method



### Specification

Model No.	ISE80 (Positive pressure)	ISE80H (Positive pressure)	ZSE80 (Vacuum)	ZSE80F (Compound)
Rated pressure range	-0.1 to 1MPa	-0.1 to 2MPa	0 to -101kPa	-100 to 100kPa
Set pressure range	-0.105 to 1.1MPa	-0.105 to 2.2MPa	10 to -111kPa	-110 to 110kPa
Withstand pressure	2MPa	4MPa	500kPa	
Setting and display resolution	0.001MPa	0.001MPa (to 1.999MPa) 0.01MPa (2.00 to 2.20MPa)	0.1kPa	
Port material	Pressure sensor: SUS630 Fitting: SUS304			
Fluid	Fluid which has no corrosive effect on SUS630, SUS304			
Connection port	R1/4, NPT1/4, G1/4 *1, URJ1/4, TSJ1/4, Rc1/8 Piping direction: Rear or Bottom			
Power supply voltage	12 to 24VDC ± 10%, ripple(p-p)10% or less (Protected against reverse connection)			
Current consumption	45mA or less			
Switch output	NPN 1 output	NPN 2 output	PNP 1 output	PNP 2 output
Max. load current	80mA			
Max. applied voltage	28V (NPN output)			
Residual voltage	1V or less (@ 80mA load current)			
Response time	2.5ms (With anti-chatter function: 20, 100, 500, 1000, 2000ms selectable)			
Output protection	Short circuit protection			
Repeatability	± 0.2%F.S. ± 1 digit			
Hysteresis	Hysteresis mode	0 to variable		
	Window comparator mode			
Display method	3 1/2 digits, 7-segment display, Dual-colour display (red/green)			
Display accuracy	± 2%F.S. ± 1 digit or less (ambient temperature 25 ± 3°C)			
Indicator	OUT1/OUT2: ON when LED is ON (Orange)			
Auto-shift input *2	Non-Voltage input (reed or solid state), Low level 0.4V or less, input times 5ms or more			

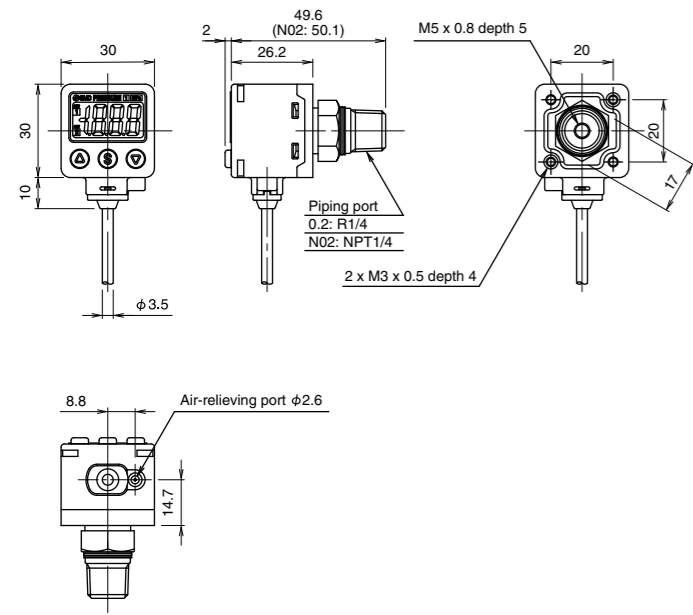
Model No.	ISE80 (Positive pressure)	ISE80H (Positive pressure)	ZSE80 (Vacuum)	ZSE80F (Compound)
Analogue output	Output Voltage	0.6 to 5V ± 2.5%F.S. Linearity: ± 1%F.S.	0.8 to 5V ± 2.5%F.S. Linearity: ± 1%F.S.	1 to 5V ± 2.5%F.S. Linearity: ± 1%F.S.
	Output impedance	Approx. 1k Ω		
	Output Current	2.4 to 20mA ± 2.5%F.S. Linearity: ± 1%F.S.	3.2 to 20mA ± 2.5%F.S. Linearity: ± 1%F.S.	4 to 20mA ± 2.5%F.S. Linearity: ± 1%F.S.
	Load impedance	Max. load impedance: 300 Ω (@ power supply voltage of 12VDC) 600 Ω (@ power supply voltage of 24VDC) Min. load impedance: 50 Ω		
Functions	Anti-chatter function, Zero clear, Key lock, Auto-preset, Display unit conversion, Power saving mode, Auto-shift			
Environment	Enclosure	IP65 (IEC60529)		
	Ambient temperature	Operation: 0 to 50°C, Storage: -10 to 60°C (No condensation or freezing)		
	Ambient humidity	Operation, Storage: 35 to 85% R.H. (No condensation)		
	Withstand voltage	250VAC, 1 minute Between wires and case		
	Insulation resistance	2M Ω or more at 500VDC Between wire and case		
	Vibration proof	10 to 150Hz smaller one 1.5mm or 20m/s <sup>2</sup> double amplitude each in directions of X, Y and Z for 2 hours (De-energizing)		
Impact proof	100m/s <sup>2</sup> 3 times each in directions of X, Y and Z respectively (De-energizing)			
Temperature characteristic	± 3%F.S. (25°C Ambient temperature range)			
Lead wire	Oil resistance vinyl cabtyre cable 3 cores (N.P) φ 3.5 2m 4 cores (A.B) Sectional area of conductor 0.15 mm <sup>2</sup> (AWG26) 5 cores (R.T.S.V) Outside diameter of insulator: 0.95mm			
Standard	CE UL/CSA RoHS			

\*1) G1/4 is connected to the back only.

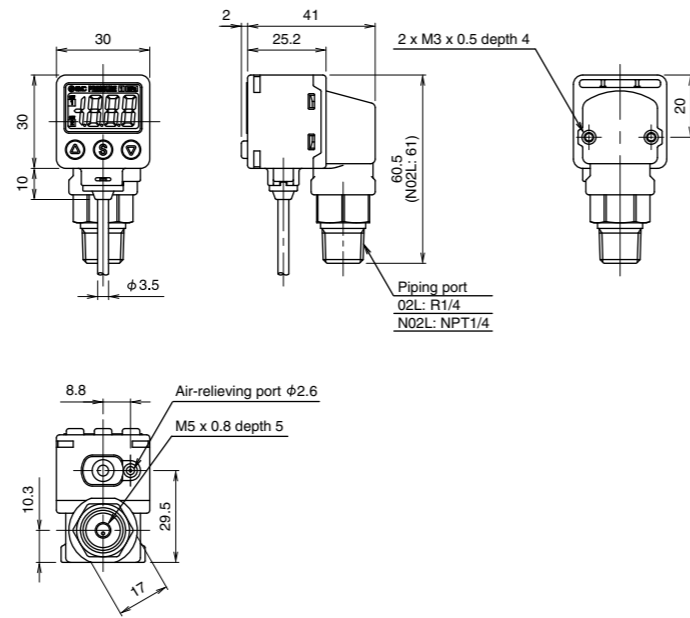
\*2) Auto-shift input is not applied when Analogue output type is selected.  
And Analogue output is not applied when Auto-shift input type is selected.

Outline with Dimensions (mm)

ZSE/ISE80-\*



ZSE/ISE80-\*L

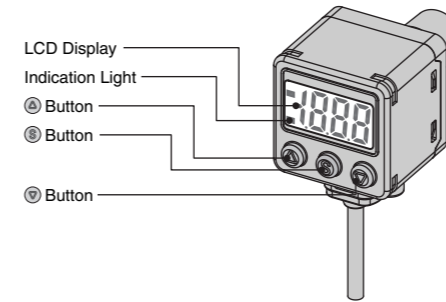


Names and Functions of Individual Parts

Main Unit

Indication light (Orange LED) : Displays switch operation condition.  
 LCD display : Displays the current status of pressure, setting mode, selected indication unit and error code. Four display modes can be selected: display always in red or green only, or changing from green to red linked to output.

- Ⓐ button : Alters the mode or increases ON/OFF set value. Press this button to change to the peak display mode.
- Ⓑ button : Alters the mode or decreases ON/OFF set value. Press this button to change to the bottom display mode.
- Ⓒ button : Press this button to change to either mode and to set a set value.



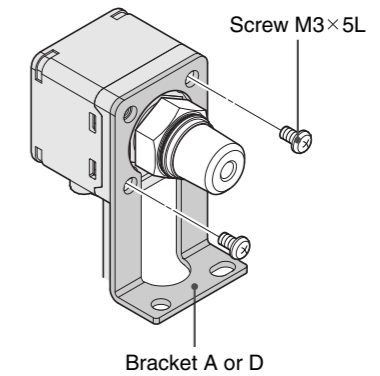
Mounting and Installation (continued)

Mounting

- Mount the optional bracket and panel mount adapter to the pressure switch.
- When the pressure switch is to be mounted in a place where water and dust splashes occur, insert a tube (O.D φ 4, I.D φ 2.5) into the air-relieving port of the pressure switch.

Mounting with bracket

- Fix the bracket to the pressure switch with the set screws M3 × 5L (2 pcs.) supplied.
- Apply a tightening torque of 0.98N·m or less.

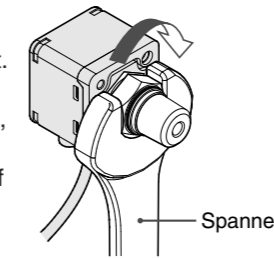


Mounting and Installation

Installation

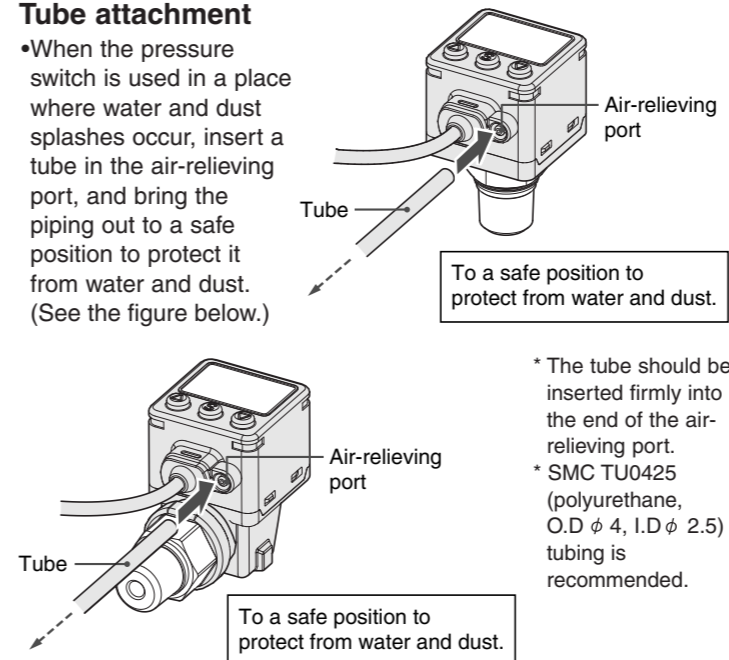
Piping

- Connect suitable piping with mating port.
- In order to connect the hexagon socket head plug or fitting on the pressure port, hold the hexagon part of the pressure port and fix. Apply a tightening torque of 13.6N·m or less.

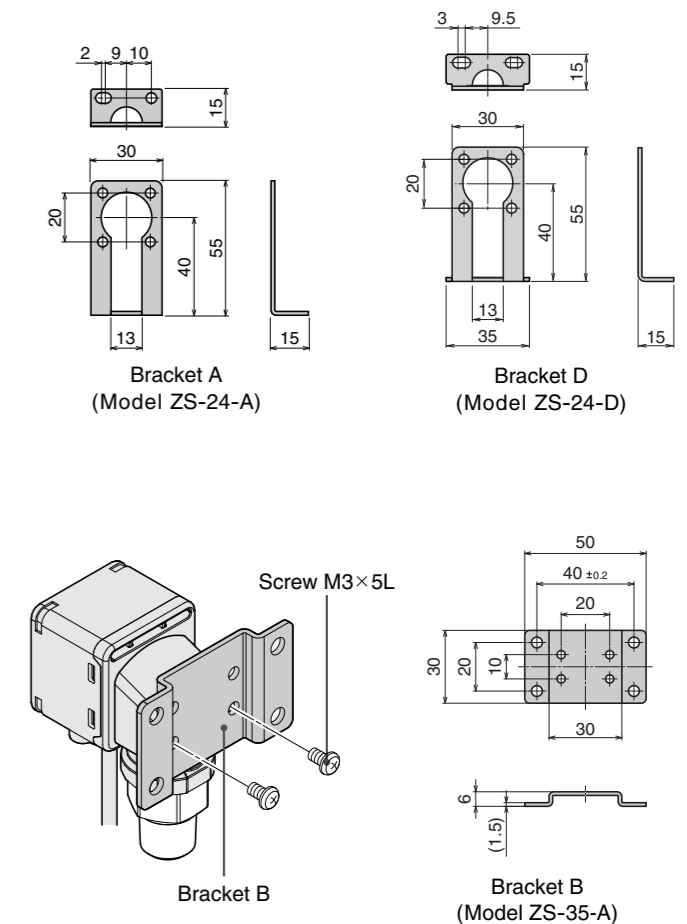
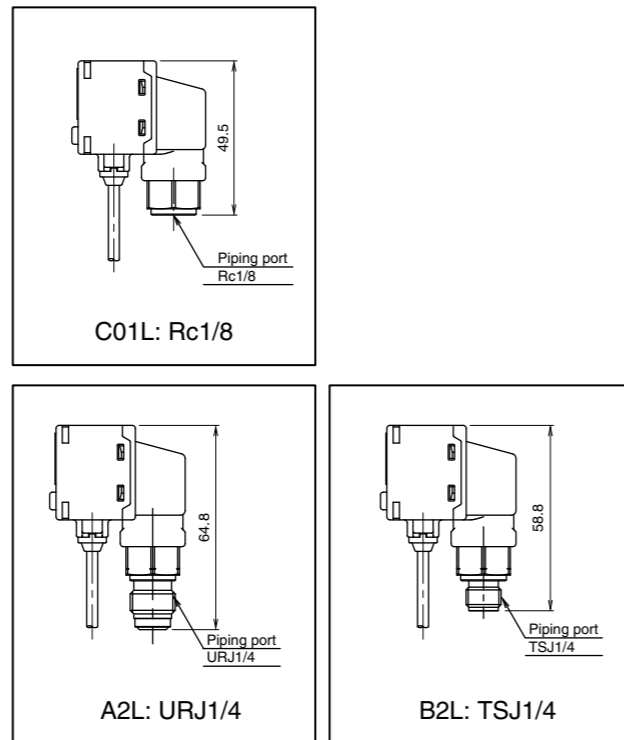
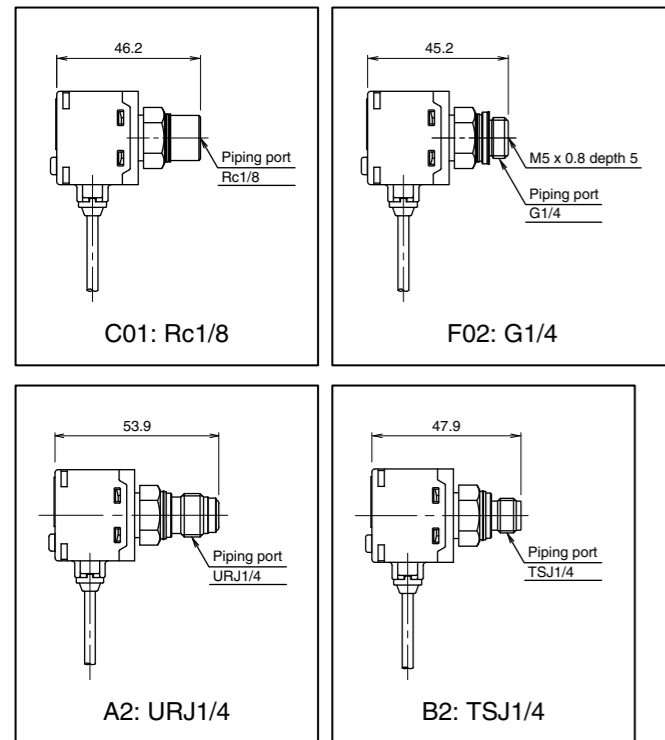


Tube attachment

- When the pressure switch is used in a place where water and dust splashes occur, insert a tube in the air-relieving port, and bring the piping out to a safe position to protect it from water and dust. (See the figure below.)



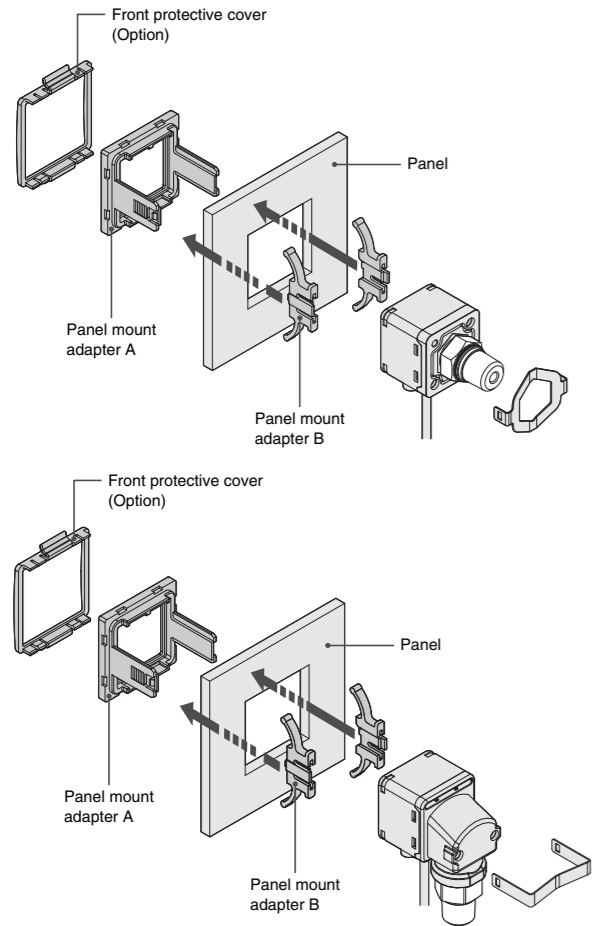
\* The tube should be inserted firmly into the end of the air-relieving port.  
 \* SMC TU0425 (polyurethane, O.D φ 4, I.D φ 2.5) tubing is recommended.



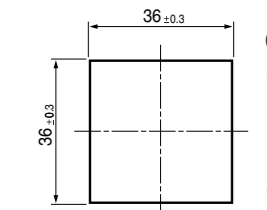


**Mounting and Installation (continued)**

**Mounting with panel mount adapter**



**Panel cutout dimension**



**Options**

- Panel mount adapter (Panel mount adapter A and B included)  
Model : ZS-35-B (Bottom piping)  
ZS-35-C (Rear surface piping)
- Panel mount adapter (with front protective cover)  
Model : ZS-35-E (Bottom piping)  
ZS-35-F (Rear surface piping)

Panel Thickness 1 to 5mm

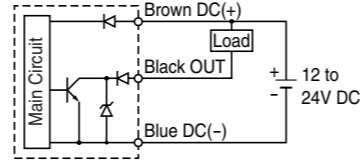
**Wiring**

**Connection**

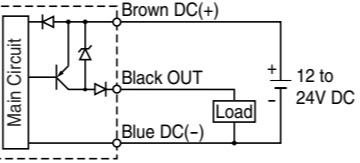
- Make wiring connection with the power off.
- Use a separate route for the wires to the pressure switch. Malfunction due to noise may occur if wire is installed in the same route as that of power or high-voltage cable.
- Be sure to ground terminal FG when using a switch-mode power supply obtained on the market. When the switch-mode power supply is connected to the pressure switch, switching noise will be superimposed and product specification can no longer be met. This can be prevented by inserting a noise filter, such as a line noise filter and ferrite core, between the switch-mode power supply and the pressure switch, or by using a series power supply instead of the switch-mode power supply.

**Mounting and Installation (continued)**

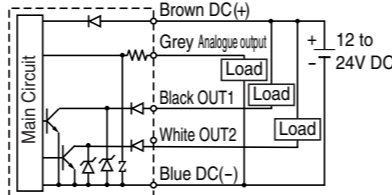
**-N**  
NPN open collector output type  
Max. 28V, 80mA  
Residual voltage 1V or less



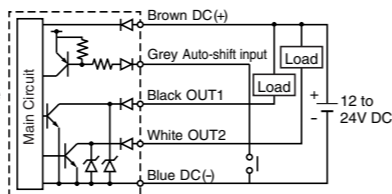
**-P**  
PNP open collector output type  
Max. 80mA  
Residual voltage 1V or less



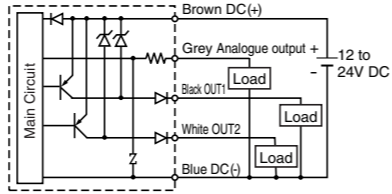
**-S/-R**  
(Analogue output mode)  
Switch output  
NPN open collector output type  
2 output  
Max. 28V, 80mA  
Residual voltage 1V or less  
R : Analogue output 1 to 5V  
Output impedance 1kΩ  
S : Analogue output 4 to 20mA  
Max. load impedance  
Power supply voltage 12V : 300Ω  
Power supply voltage 24V : 600Ω  
Min. load impedance 50Ω



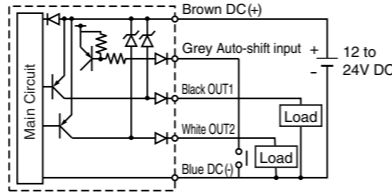
**-S/-R**  
(Auto-shift input mode)  
With auto-shift switch output  
NPN open collector output type  
2 output  
Max. 28V, 80mA  
Residual voltage 1V or less



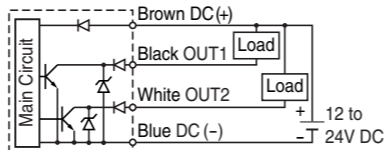
**-V/-T**  
(Analogue output mode)  
Switch output  
PNP open collector output type  
2 output  
Max. 80mA  
Residual voltage 1V or less  
T : Analogue output 1 to 5V  
Output impedance 1kΩ  
V : Analogue output 4 to 20mA  
Max. load impedance  
Power supply voltage 12V : 300Ω  
Power supply voltage 24V : 600Ω  
Min. load impedance 50Ω



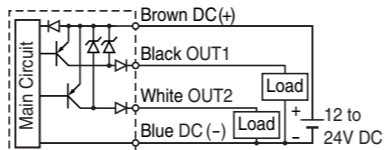
**-V/-T**  
(Auto-shift input mode)  
With auto-shift switch output  
PNP open collector output type  
2 output  
Max. 80mA  
Residual voltage 1V or less



**-A**  
NPN 2 output type  
Max. 28V, 80mA  
Residual voltage 1V or less



**-B**  
PNP 2 output type  
Max. 80mA  
Residual voltage 1V or less



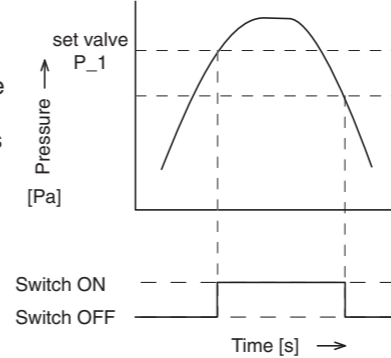
**Pressure Setting**

Set ON point of the pressure switch.

**Operation (Hysteresis mode)**

When the pressure exceeds the setting point, the pressure switch will be turned on. When the pressure falls below the set point by hysteresis or more, the pressure switch will be turned off.

The default setting of the pressure switch is adjusted to be turned on at the midpoint between atmospheric pressure and upper limit of rated pressure range, and turned off when the pressure decreases by 5% of the span between atmospheric pressure and upper limit of rated pressure range. To change this setting, refer to setting of function. If the operation shown below does not cause any problem, keep the settings.



<How to operate> Note : The pressure switch will also output during setting.

1 Press the button once in measurement mode.

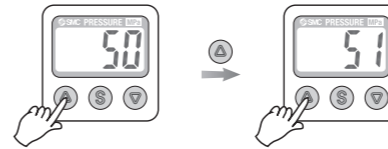


2 [P\_1] and set value are displayed in turn.

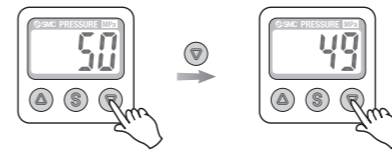


3 Press the or button to change the set value. The button is for increase and the button is for decrease.

• Press the button once to increase by one digit, and press it continuously to keep increasing.



• Press the button once to decrease by one digit, and press it continuously to keep decreasing.



4 Press the button to finish the setting. If 2 output specification is selected, [P\_2] and set value are displayed.

Note) If the button is pressed for 2 sec. or longer, the setting is fixed and measurement mode returns.

The pressure switch moves within a set pressure range (from P1L to P1H) in window comparator mode. Set P1L (switch lower limit) and P1H (switch upper limit) with the setting procedure above. (For the change to Window comparator mode refer to setting of function)

Zero clear of display  
Display is reset to zero when and buttons are pressed simultaneously for 1 sec..  
For the first operation, perform zero clear without pressure supply.

**Setting of Function**

**Default setting**

The following default settings are provided. To change settings, enter function selection mode.

• [F 1] Parameter setting of OUT1 → See subsection "[F 1] Setting of OUT1".

Item	Explanation	Default setting
Output mode	Selects hysteresis mode or window comparator mode.	Hysteresis mode
Reversed output	Selects reversed output.	Normal output
Pressure setting	Sets ON point of the switch output.	Midpoint value between atmospheric pressure and upper limit of rated pressure
Hysteresis	Chattering can be prevented by setting hysteresis.	5% of the span between atmospheric pressure and upper limit of rated pressure
Display colour	Selects the display colour.	ON: Green OFF: Red

• [F 2] Parameter setting of OUT2 → See subsection "[F 2] Setting of OUT2".

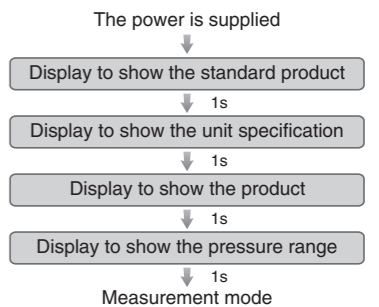
Same setting as [F 1] OUT1. Display colour is linked to the setting of OUT1, and no parameter needs to be selected.

Item	Explanation	Default setting
[F 0] Unit conversion function	See subsection "[F 0] Unit selection function".	ISE : MPa ZSE : kPa Option1="P" : psi
[F 3] Setting of response time	See subsection "[F 3] Setting of response time".	2.5ms
[F 4] Select analogue output/auto-shift input	See subsection "[F 4] Select analogue output/auto-shift input".	Analogue output

**Measurement mode**

The measurement mode is the condition where the pressure is detected and indicated, and the pressure switch function is operating.

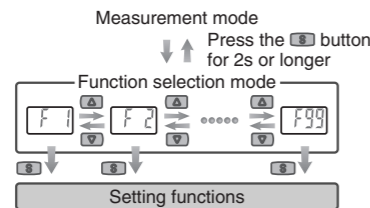
This is the basic mode and is moved to another mode for setting change and other function setting depending on purpose.



Setting of Function (continued)

Function selection mode

In measurement mode, press the button for 2 sec. or longer to display [F 0]. Select the display of function setting to be changed, [F□□]. Press the button for 2 sec. or longer in function selection mode to return to measurement mode.



Note) Some functions are not available depending on part number. All functions are displayed with [F□□] and followed with function description. If a function is not available for specified type, the function is displayed as [-.-].

[F 0] Unit conversion function

This function is available for unit selectable type. The unit that can be displayed is different depending on the pressure range. (Display in kPa and MPa is available in ISE80/ZSE80(F) series if unit conversion function is not installed.)

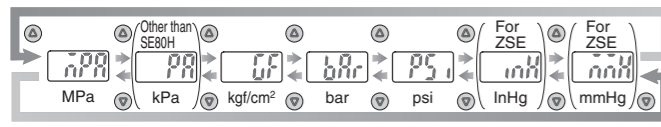
<Operation>

Press the button or button in function selection mode to display [F 0].

Press the button Moves on to unit conversion function

Select Indication Unit

Press the button or button to select the indication unit.



Press the button to set Return to function selection mode

Setting of [F 0] unit conversion function completed

[F 1] Setting of OUT1

Set output method of OUT1. Output turns on when the pressure exceeds the set value. The set value is the midpoint between atmospheric pressure and upper limit of rated pressure range. Display colour depends on OUT1 output condition. As default, display is green when output is turned on. Display is red when output is turned off.

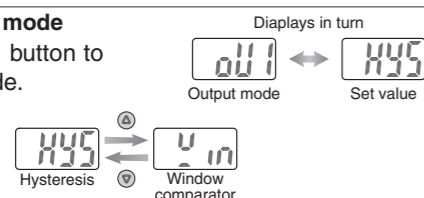
<Operation>

Press the button or button in function selection mode to display [F 1].

Press the button Moves on to setting of output mode

Setting of output mode

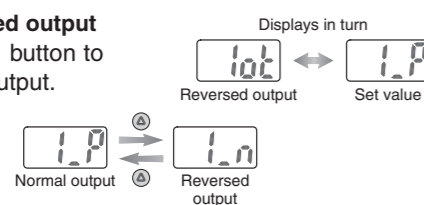
Press the button or button to select output mode.



Press the button to set Moves on to setting of reversed output

Setting of reversed output

Press the button or button to select reversed output.



Press the button to set Moves on to setting of pressure

Setting of pressure

Set pressure based on setting procedure of pressure setting.

"P" changes to "n" when reverse output is selected.

([P\_1] → [n\_1])

Hysteresis mode : [P\_1]

Window comparator mode : [P1L][P1H]

Press the button to set Moves on to setting of hysteresis

Setting of hysteresis

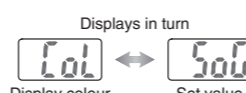
Press the button or button to select hysteresis.



Press the button to set Moves on to setting of display colour

Setting of display colour

Press the button or button to select display colour.



Press the button to set Return to function selection mode

Setting of [F 1] operation of OUT1 completed

Note 1) Selected parameter become effective after pressing button.  
Note 2) After having setting effective by the button, it is possible to move to measurement mode by pressing the button again.

[F 2] Setting of OUT2

Set output method of OUT2. Display colour depends on OUT1 output, and is not set with this function.

<Operation>

Press the button or button in function selection mode to display [F 2].

Press the button Moves on to setting of output mode

Set based on [F 1] Operation of OUT1 (See subsection "[F 1] Setting of OUT1).

[F 3] Setting of response time (Chattering prevention function)

Select the response time of the switch output. Output chattering is prevented by setting the response time.

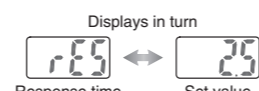
<Operation>

Press the button or button in function selection mode to display [F 3].

Press the button Moves on to setting of response time

Setting of response time

Press the button or button to select response time.



Press the button to set Return to function selection mode

Setting of [F 3] response time completed

[F 4] Setting of analogue output/auto-shift input

Auto-shift function

This function is only available for models with analogue output/auto-shift.

Auto-shift : Function to perform output to relative change referring to the pressure when signal is input.

Auto-shift zero : Function to perform output to relative change and clear the display value to zero referring to the pressure when signal is input.

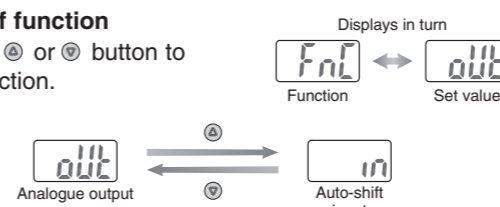
<Operation>

Press the button or button in function selection mode to display [F 2].

Press the button Moves on to setting of function

Setting of function

Press the button or button to select function.

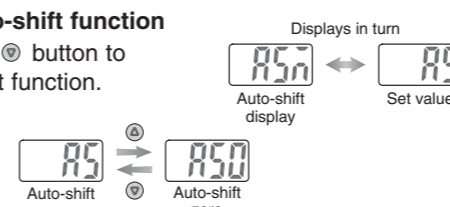


Returns to function selection mode when analogue output is selected

Moves on to auto-shift function setting when auto-shift input is selected (to be continued)

Setting of auto-shift function

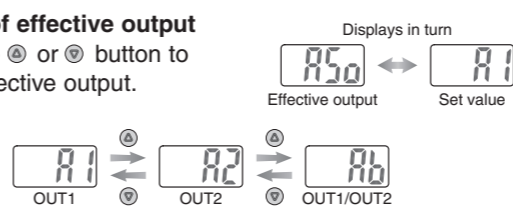
Press the button or button to select auto-shift function.



Press the button to set Moves on to setting of effective output

Setting of effective output

Press the button or button to select effective output.



Press the button to set Return to function selection mode

Setting of [F 4] analogue output/auto-shift input completed

Error Indication

Error indication function

This function is to display error location and content when a problem or an error occurs.

Error Name	Error Display	Error Nature	Troubleshooting Method
Over current Error	Er1 Er2	A load current of switch output of 80mA or more is flowing.	Turn the power off and remove the output factor for the over current. Then turn the power on.
Residual Pressure Error	Er3	During zero clear operation, pressure over 10% of the span between atmospheric pressure and upper limit of rated pressure is applied. In 1 sec., the mode will reset to the measurement mode. 1 digit of the zero clear range changes with individual product differences.	Perform zero clear operation again after restoring the applied pressure to an atmospheric pressure condition.
Pressurizing Error	XXX	Pressure exceeding the high limit of the set pressure range is applied.	Reset applied pressure to a level within the set pressure range.
	LLL	Pressure exceeding the low limit of the set pressure range is applied.	
Auto-Shift Error	or	The measured pressure at auto-shift input exceeds the set pressure range. * After 1 sec., measurement mode returns automatically.	Auto-shift input is restricted by connected equipment and machine. Check the connected equipment and machine.
System Error	Er4 Er6 Er7 Er0	Displayed in the case of an internal data error.	Turn the power off and turn it on again. If resetting fails, an investigation by SMC will be required.

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