2-Color Display Digital Pressure Switch For General Fluids

Series 10-ZSE80/10-ISE80

How to Order

Rated pressure range

80	–0.1 to 1 MPa
80H	–0.1 to 2 MPa

Clean Series

Made to Order
Refer to Table 1 below.

For positive pressure 10- ISE 80 - 02 □ - N - M □ □ - □

For vacuum/ compound pressure 10- ZSE 80 - 02 □ - N - M □ □ - □

Rated pressure range

80	0 to –101 kPa
80F	–100 to 100 kPa

Piping

02	R1/4 (M5 female threaded)
N02	NPT1/4 (M5 female threaded)
F02*	G1/4 (M5 female threaded)
C01	Rc1/8
A2	URJ1/4
B2	TSJ1/4

* Piping direction "L" (bottom ported) is not available.

Piping direction

Nil	Rear ported
L*	Bottom ported

* Piping specification "F2" (G 1/4) is not available.

Input/Output

N	NPN open collector 1 output
P	PNP open collector 1 output
A	NPN open collector 2 outputs
B	PNP open collector 2 outputs
R	NPN open collector 2 outputs + Analog voltage output/Auto-shift switching
T	PNP open collector 2 outputs + Analog voltage output/Auto-shift switching
S	NPN open collector 2 outputs + Analog current output/Auto-shift switching
V	PNP open collector 2 outputs + Analog current output/Auto-shift switching

Option 1

Nil	With unit display Note 1) switching function
M	Fixed SI unit Note 2)
P	Initial value psi

Note 1) Under the New Measurement Law, sales of switches with the unit switching function have not been allowed for use in Japan.
Note 2) Fixed unit 10-ISE80H : MPa
Others : MPa, kPa

Option 3

Symbol	Operating manual Note)	Calibration certificate
Nil	● (Booklet)	—
Y	—	—
K	● (Booklet)	●
T	—	●

Note) All texts in both English and Japanese

Option 2

Nil	None
A	With bracket 10-ZS-24-A (Rear ported) 10-ZS-35-A (Bottom ported)
B	With bracket Note) 10-ZS-24-D
C	Panel mount 10-ZS-35-B 10-ZS-35-C Rear ported / Bottom ported
D	Panel mount + Front protection cover 10-ZS-35-E 10-ZS-35-F Rear ported / Bottom ported

Note) Rear ported only

Made to Order

Table 1 Made to Order

Symbol	Specifications
-X501	Lead wire length 3 m

Note) Refer to page 12 for detail.

Option

Option	Piping direction	Part no.
Bracket	Rear ported	10-ZS-24-A
	Rear ported	10-ZS-24-D
	Bottom ported	10-ZS-35-A
Panel mount	Rear ported	10-ZS-35-C
	Bottom ported	10-ZS-35-B
Panel mount + Front protection cover	Rear ported	10-ZS-35-F
	Bottom ported	10-ZS-35-E

⚠Caution

This product is 10-ZSE80/ISE80 series blown with air and double packed in a Class M3.5 (ISO Class 5) clean room.

Specifications

Model			10-ZSE80 (Vacuum pressure)	10-ZSE80F (Compound pressure)	10-ISE80 (Positive pressure)	10-ISE80H (Positive pressure)
Rated pressure range			0.0 to –101.0 kPa	–100.0 to 100.0 kPa	–0.100 to 1.000 MPa	–0.100 to 2.00 MPa
Indication/Set pressure range			10.0 to –111.1 kPa	–110.0 to 110.0 kPa	–0.105 to 1.100 MPa	–0.105 to 2.20 MPa
Withstand pressure			500 kPa		2 MPa	4 MPa
Wetted parts material			Pressure sensor: Stainless steel 630, Fitting: Stainless steel 304			
Applicable fluid			Fluids do not corrode stainless steel 630 and 304			
Port size			R1/4, NPT1/4, G1/4*, URJ1/4, TSJ1/4, Rc1/8 Piping direction: Rear/Bottom			
Power supply voltage			12 to 24 VDC ±10%, Ripple (p-p) 10% or less (with power supply polarity protection)			
Current consumption			45 mA or less			
Switch output			NPN 1 output, NPN 2 outputs, PNP 1 output, PNP 2 outputs			
	Maximum load current		80 mA			
	Maximum load voltage		28 V (at NPN output)			
	Residual voltage		1 V or less (with load current of 80 mA)			
	Response time		2.5 ms (with anti-chattering function: 20, 100, 500, 1000, 2000 ms)			
	Short circuit protection		Yes			
Repeatability			±0.2% F.S. ±1 digit			
Hysteresis	**Hysteresis mode**		Variable (0 or above)			
	Window comparator mode					
Analog output	**Voltage output**	**Output voltage (Rated pressure range)**	1 to 5 V ±2.5% F.S.		0.6 to 5 V ±2.5% F.S.	0.8 to 5 V ±2.5% F.S.
		Linearity	±1% F.S. or less			
		Output impedance	Approx. 1 kΩ			
	Current output	**Output current (Rated pressure range)**	4 to 20 mA ±2.5% F.S.		2.4 to 20 mA ±2.5% F.S.	3.2 to 20 mA ±2.5% F.S.
		Linearity	±1% F.S. or less			
		Load impedance	Maximum load impedance: 300 Ω (Power supply voltage 12 V) 600 Ω (Power supply voltage 24 V) Minimum load impedance: 50 Ω			
Auto-shift input			Non-voltage input (Reed or Solid state), Low level: 0.4 V or less, 5 ms or longer input			
Display			3 1/2-digit, 7-segment, 2-color LCD (Red/Green)			
Display accuracy			±2% F.S. ±1 digit (Ambient temperature of 25 ±3°C)			
Indicator light			Lights up when output is turned ON. OUT1, OUT2: Orange			
Function			Anti-chattering, Zero-out, Key lock function, Auto-preset, Auto-shift, Unit display switching, Power-saving mode			
Environment resistance	**Enclosure**		IP65			
	Operating temperature range		Operating: 0 to 50°C, Stored: –10 to 60°C (No freezing or condensation)			
	Operating humidity range		Operating/Stored: 35 to 85% RH (No condensation)			
	Withstand voltage		250 VAC for 1 minute between live parts and case			
	Insulation resistance		2 MΩ or more between live parts and case (at 50 VDC Mega)			
Temperature characteristics			±3% F.S. (Based on 25°C, within operating temperature range)			
Lead wire			Oilproof heavy-duty vinyl cable, 3 cores (N.P) ø3.5, 2 m 4 cores (A.B) Conductor area: 0.15 mm² (AWG26) 5 cores (R.T.S.V) Insulator O.D.: 0.95 mm			
Standards			CE marking, UL/CSA, RoHS compliance			

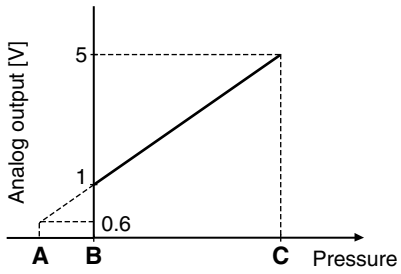
∗ G1/4 is available for rear ported only.

Piping Specifications

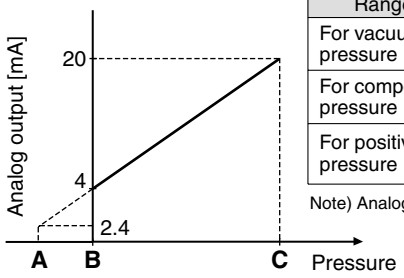
Model	02	N02	F02	C01	A2	B2
Port size	R1/4	NPT1/4	G1/4	Rc1/8	URJ1/4	TSJ1/4
Weight (Bottom ported)	117 g	118 g	—	114 g	120 g	111 g
Weight (Rear ported)	89 g	90 g	86 g	86 g	92 g	83 g
Leakage	1 x 10^{-5} Pa·m³/s				1 x 10^{-10} Pa·m³/s	

Analog Output

Voltage output



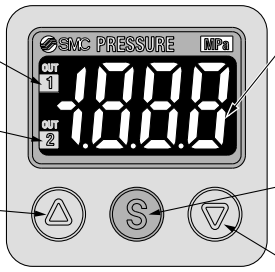
Current output



Range	Rated pressure range	A	B	C
For vacuum pressure	0.0 to −101.0 kPa	10.1 kPa	0	−101.0 kPa
For compound pressure	−100.0 to 100.0 kPa	—	−100.0 kPa	100.0 kPa
For positive pressure	−0.100 to 1.000 MPa	−0.100 MPa	0	1.000 MPa
	−0.100 to 2.00 MPa	−0.100 MPa Note)	0	2.00 MPa

Note) Analog output is 0.8 [V] or 3.2 [mA] at the pressure A.

Descriptions



Output (OUT1) display (Orange)

Lights up when OUT1 is turned ON.

Output (OUT2) display (Orange)

Lights up when OUT2 is turned ON.

△ button

Use this button to select the mode or increase the ON/OFF set-value.
It is also used for switching to the peak display mode.

LCD

Displays the current pressure, set mode, selected display unit, and error code. Always use red or green display; or switch between green and red according to the output. Four different display settings are available.

SET button

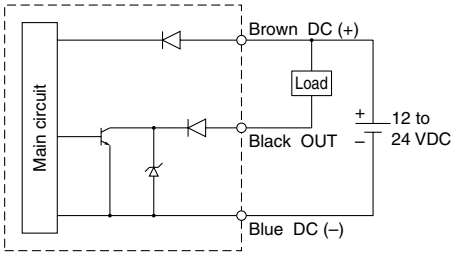
Use this button to change the mode or confirm the set-value.

▽ button

Use this button to select the mode or decrease the ON/OFF set-value.
It is also used for switching to the bottom display mode.

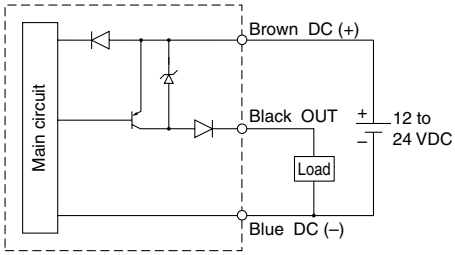
Internal Circuits and Wiring Examples

-N
NPN (1 output)



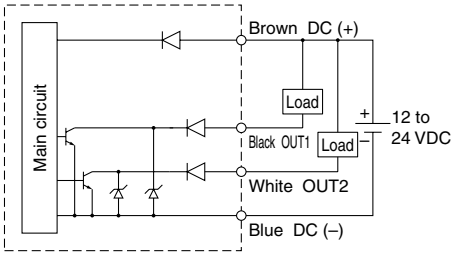
Max. 28V, 80 mA
Residual voltage 1 V or less

-P
PNP (1 output)



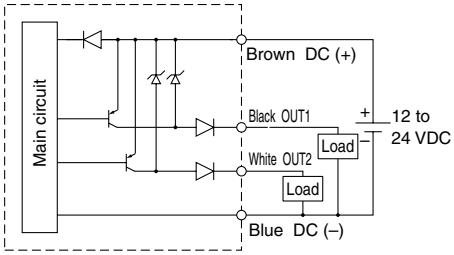
Max. 80 mA
Residual voltage 1 V or less

-A
NPN (2 outputs)



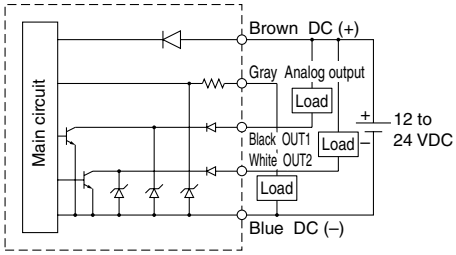
Max. 28V, 80 mA
Residual voltage 1 V or less

-B
PNP (2 outputs)



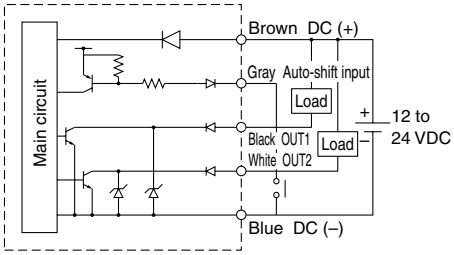
Max. 80 mA
Residual voltage 1 V or less

-R
**NPN (2 outputs) +
Analog voltage output**



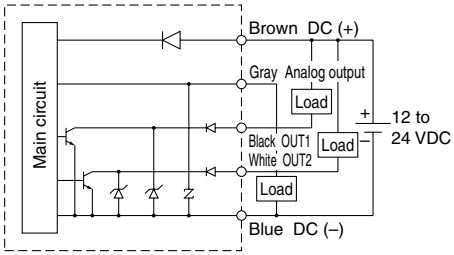
Max. 28V, 80 mA
Residual voltage 1 V or less

-R/-S
**NPN (2 outputs) +
Auto-shift input**



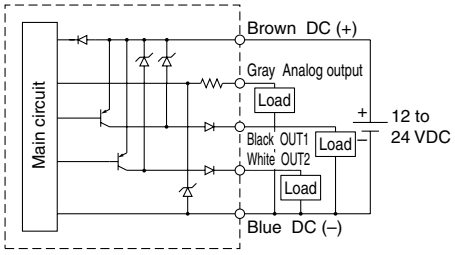
Max. 28V, 80 mA
Residual voltage 1 V or less

-S
**NPN (2 outputs) +
Analog current output**



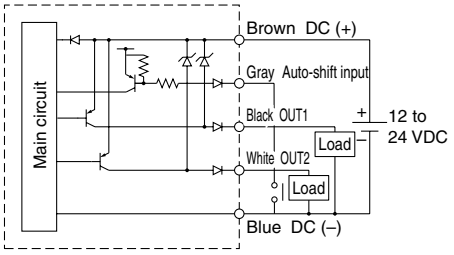
Max. 28V, 80 mA
Residual voltage 1 V or less

-T
**PNP (2 outputs) +
Analog voltage output**



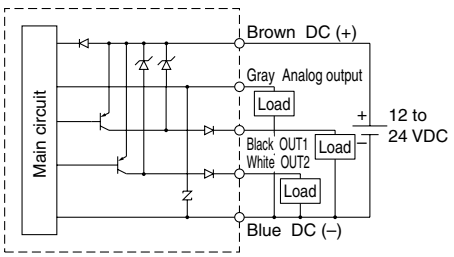
Max. 80 mA
Residual voltage 1 V or less

-T/-V
**PNP (2 outputs) +
Auto-shift input**



Max. 80 mA
Residual voltage 1 V or less

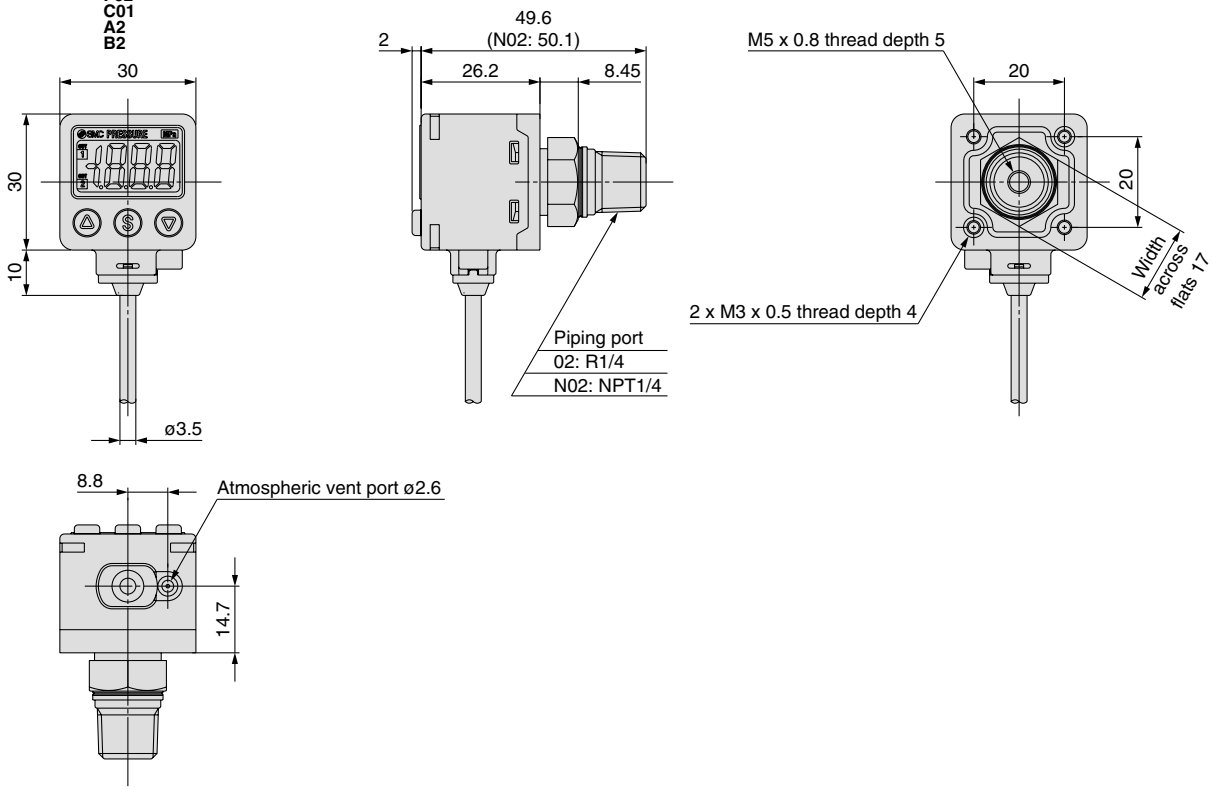
-V
**PNP (2 outputs) +
Analog current output**

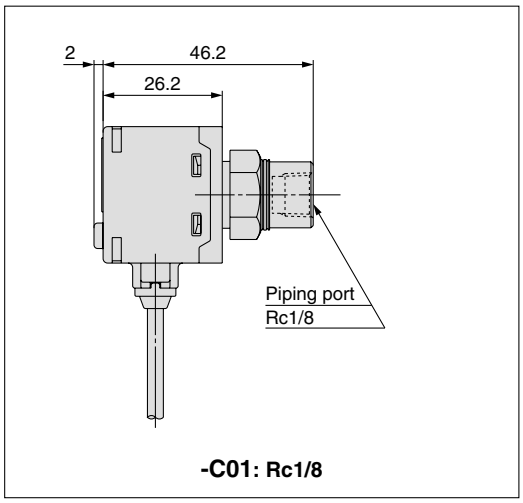


Max. 80 mA
Residual voltage 1 V or less

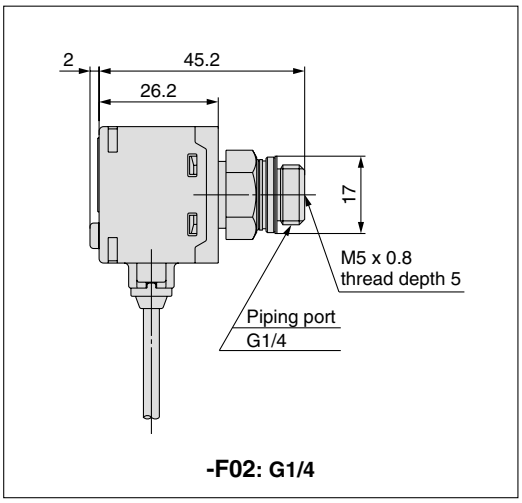
Dimensions (For details about lead wires, refer to the product specifications.)

10-ZSE/10-ISE8□□-02 N02 F02 C01 A2 B2

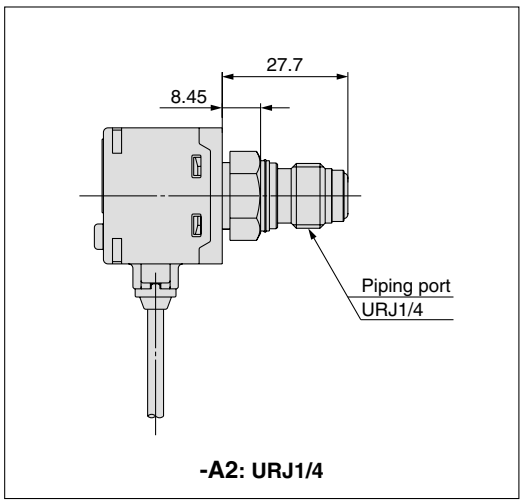




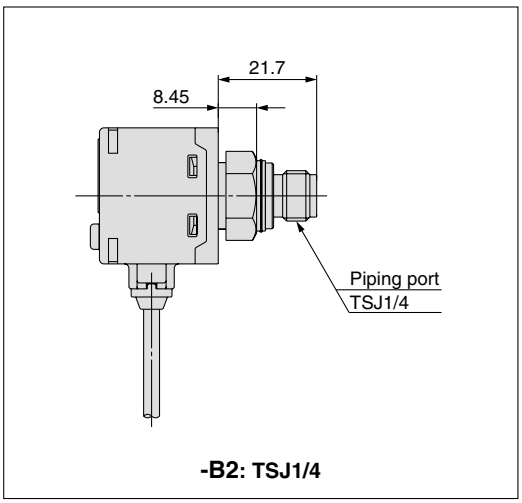
-C01: Rc1/8



-F02: G1/4



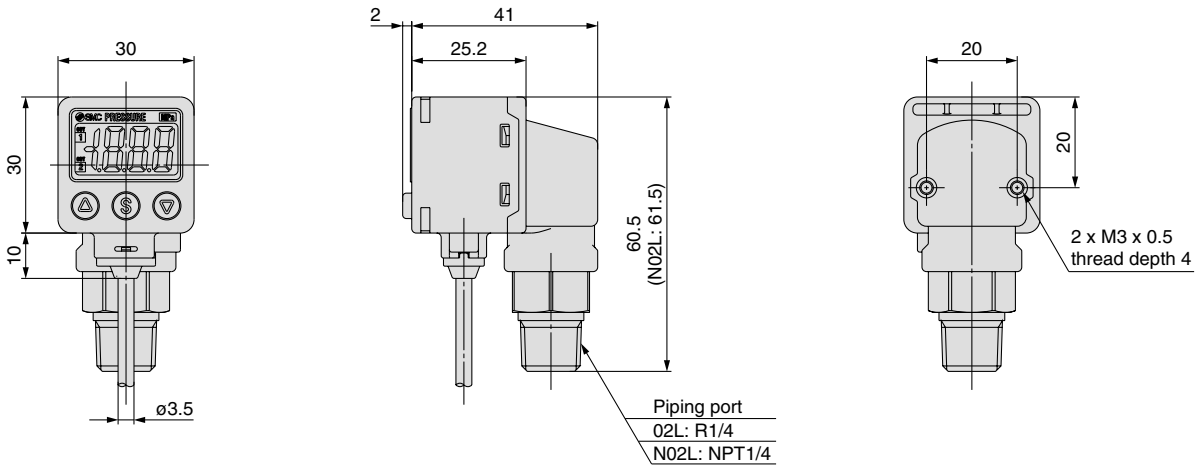
-A2: URJ1/4

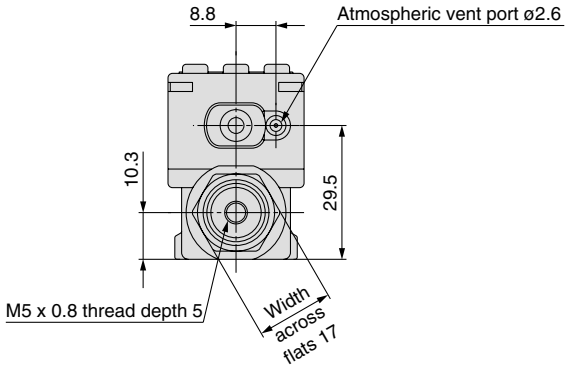


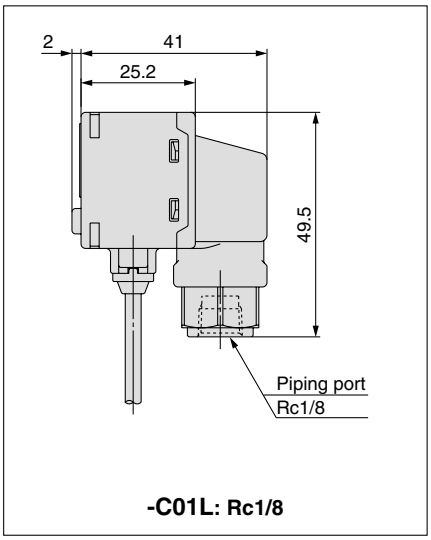
-B2: TSJ1/4

Dimensions (For details about lead wires, refer to the product specifications.)

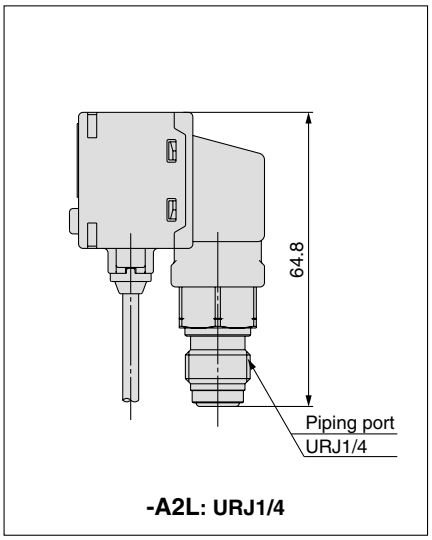
10-ZSE/10-ISE8□□-02L N02L C01L A2L B2L



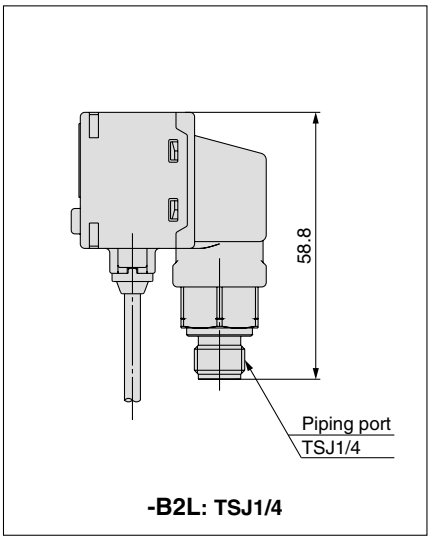




-C01L: Rc1/8



-A2L: URJ1/4

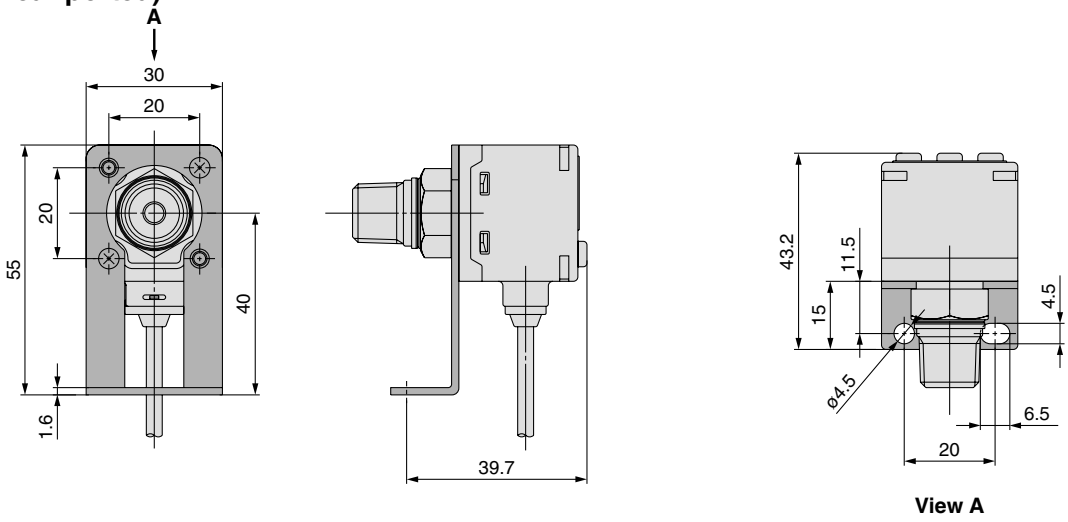


-B2L: TSJ1/4

Dimensions (For details about lead wires, refer to the product specifications.)

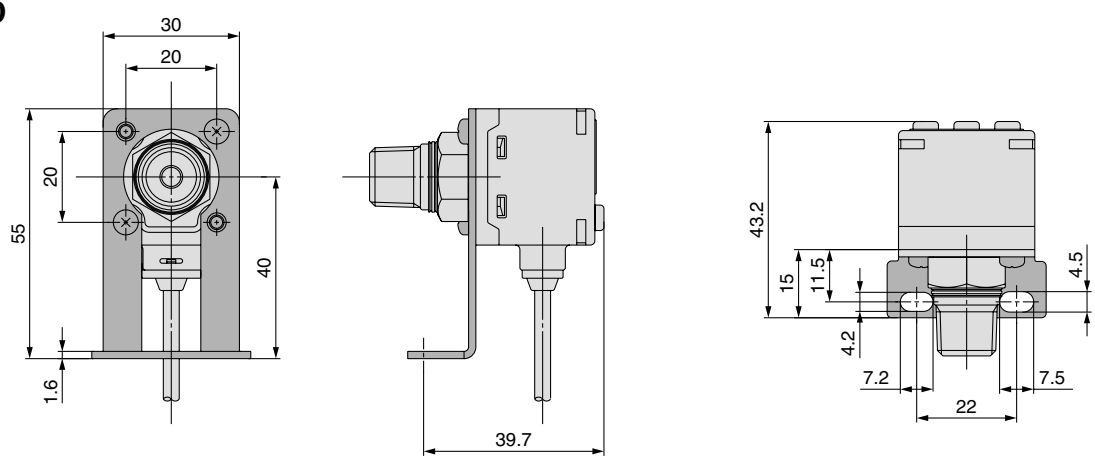
With bracket (Rear ported)

• **10-ZS-24-A**

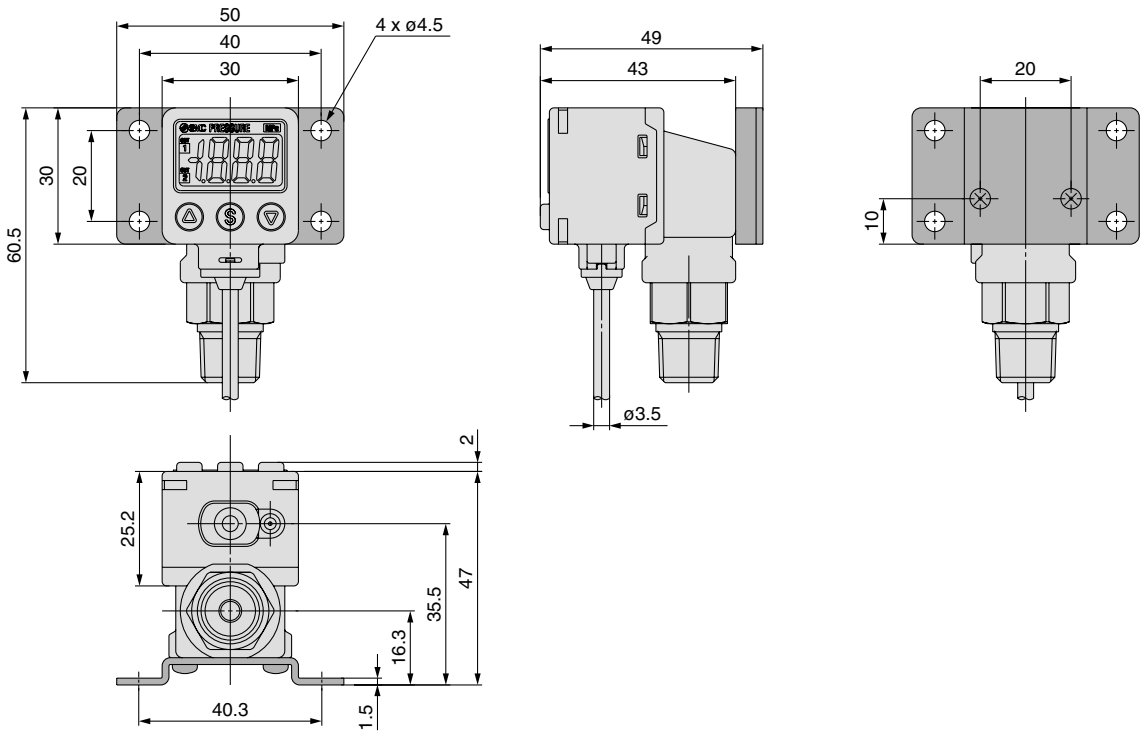


With bracket (Rear ported)

• **10-ZS-24-D**

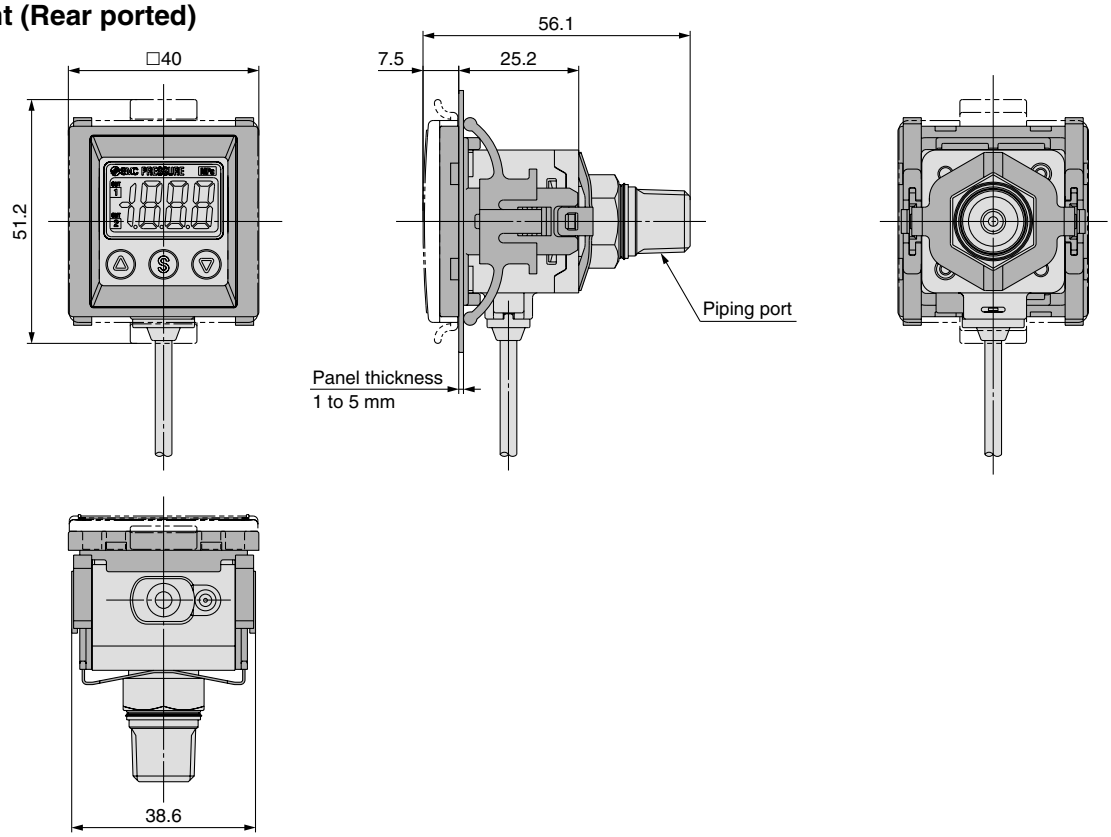


With bracket (Bottom ported)

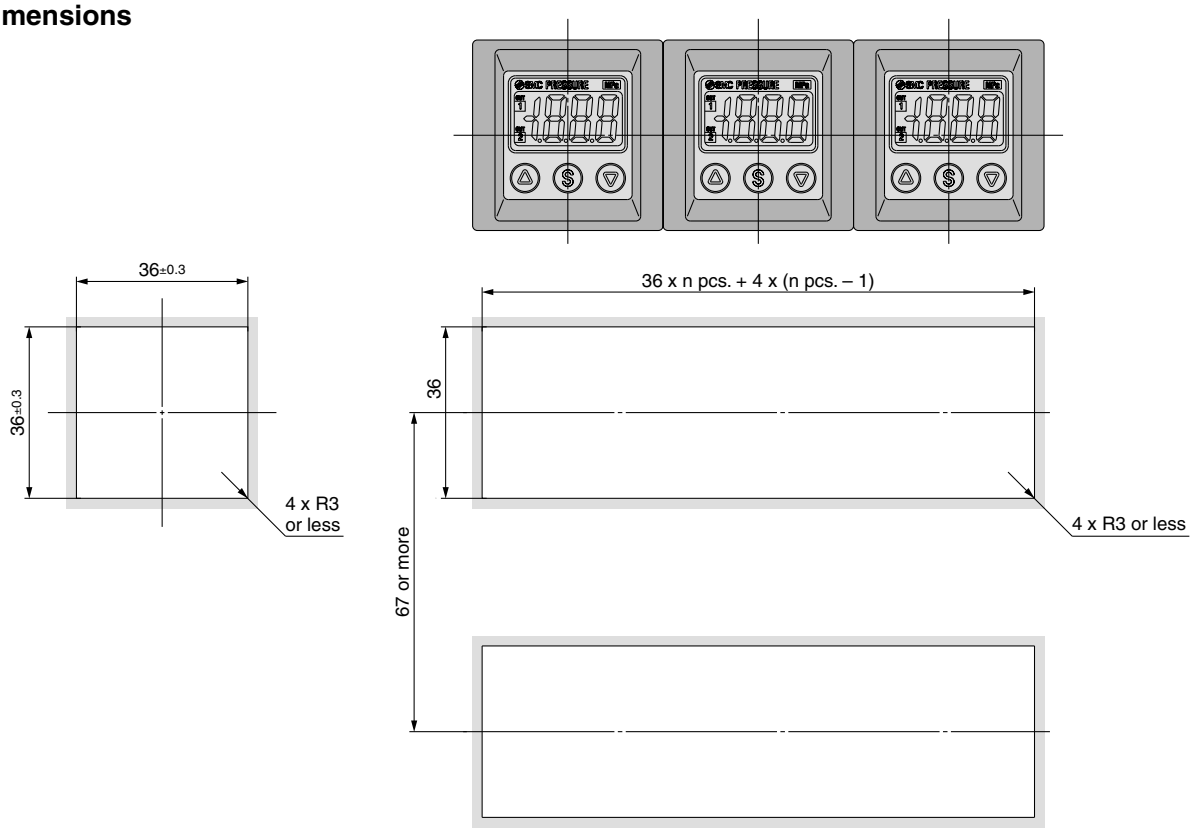


Dimensions (For details about lead wires, refer to the product specifications.)

Panel mount (Rear ported)

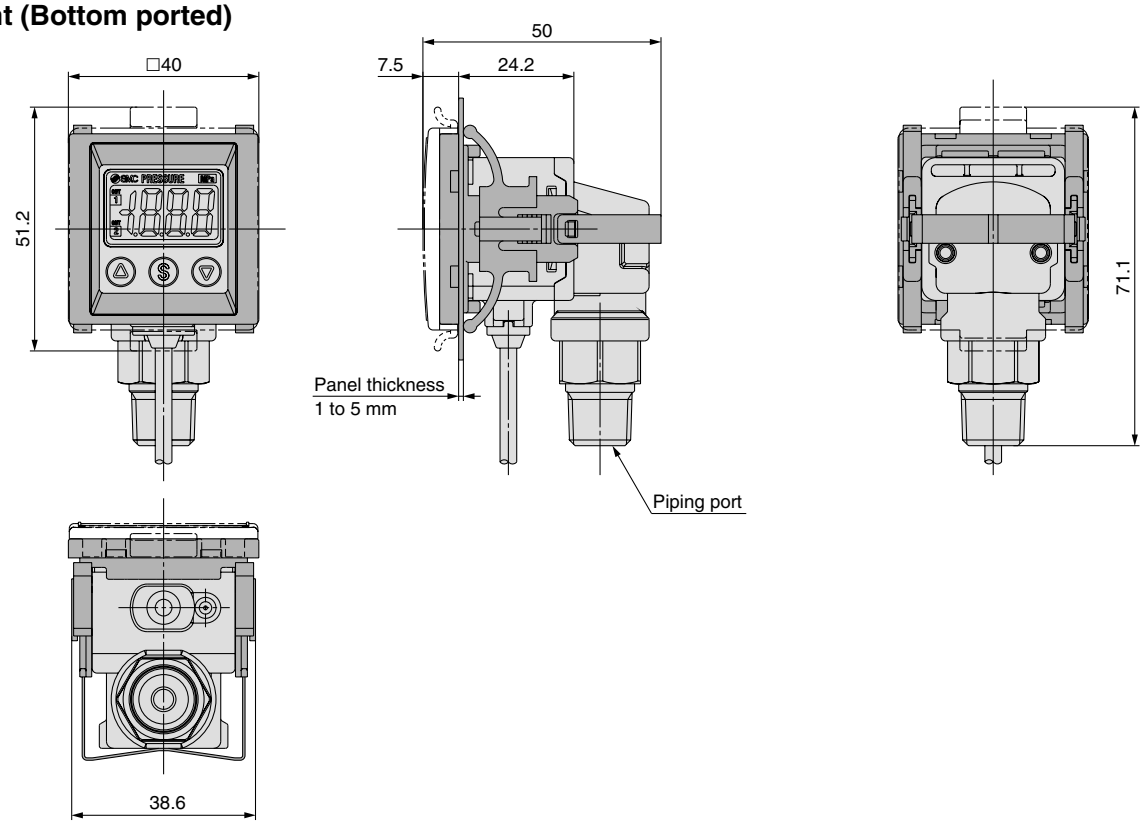


Panel-cut dimensions

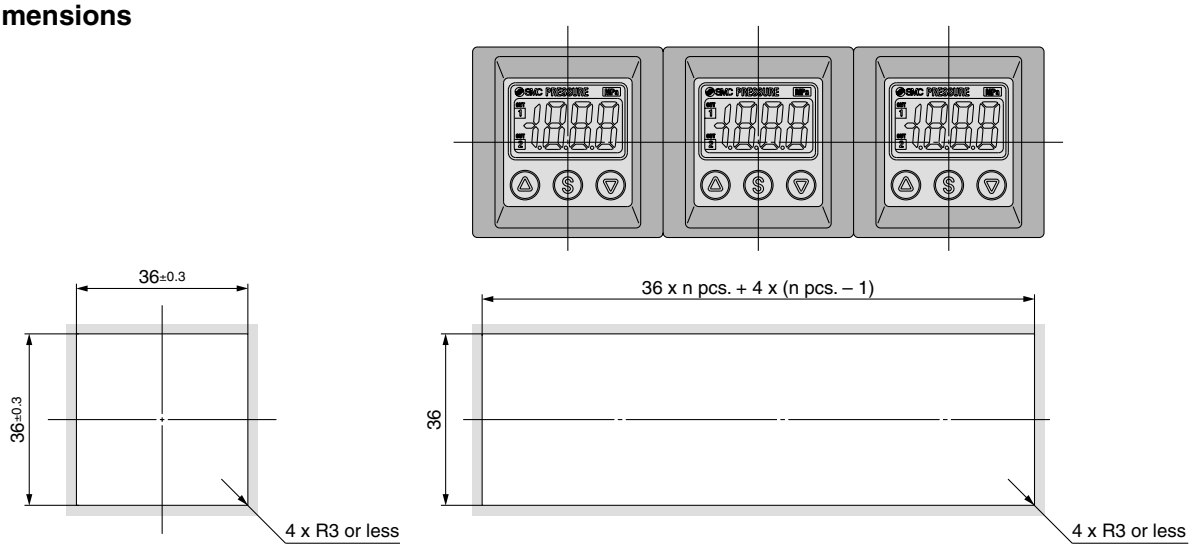


Dimensions (For details about lead wires, refer to the product specifications.)

Panel mount (Bottom ported)



Panel-cut dimensions



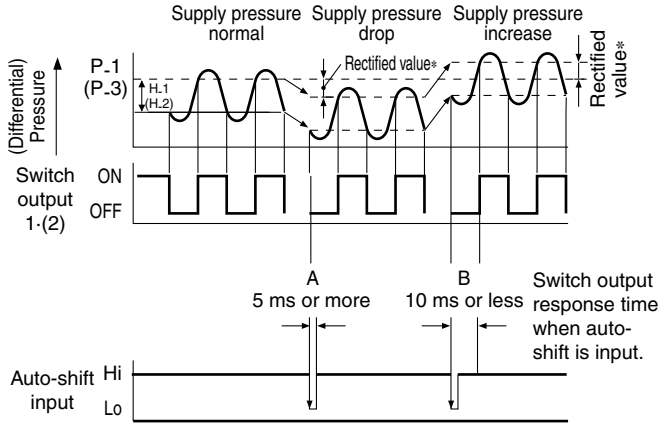
F□ in brackets stand for the function codes. Refer to the operating manual for how to operate and function codes in detail.

Function Details

A Auto-shift function (F4)

When there are large fluctuations in the supply pressure, the switch may fail to operate correctly. The auto-shift function compensates such supply pressure fluctuations. It measures the pressure at the time of auto-shift signal input and uses it as the reference pressure to correct the set-value on the switch.

Set-value correction by auto-shift function



* Rectified value
When the auto-shift is selected, "ooo" will be displayed for approximately 1 second, and the pressure value at that point will be saved as a rectified value "C_5". Based on the saved rectified values, the set-value Note) of "P_1", "H_1", "P_2", and "H_2" will likewise be rectified.

Note) When an output is reversed, "n_1", "H_1", "n_2", "H_2" will be rectified.

Possible Set Range for Auto-Shift Input

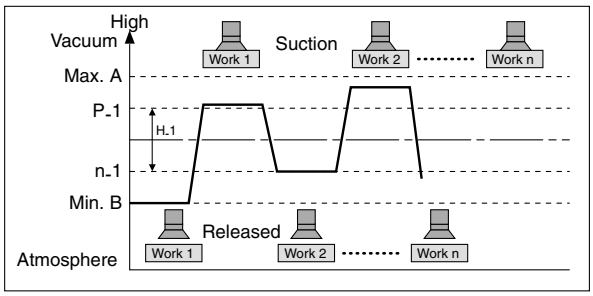
	Regulating pressure range	Possible set range
Compound pressure	–110.0 to 110.0 kPa	–220 to 220 kPa
Vacuum pressure	10.0 to –111.0 kPa	121.0 to –121.0 kPa
Positive pressure	–0.105 to 1.100 MPa	–1.205 to 1.205 MPa
	–0.105 to 2.20 MPa	–2.31 to 2.31 MPa

Auto-shift zero
The basic function of auto-shift zero is the same as the function for auto-shift. Also, it corrects values on the display, based on a pressure value of 0, when the auto-shift is selected.

B Auto-preset function (F8)

Auto-preset function, when selected in the initial setting, calculates and stores the set-value from the measured pressure.
The optimum set-value is determined automatically by repeating vacuum and break with the target workpiece several times.

Suction Verification

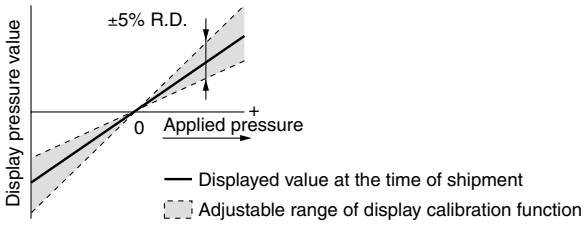


Formula for Obtaining the Set-Value

P_1 or P_2	H_1 or H_2
P_1 (P_2) = A – (A-B)/4 n_1 (n_2) = B + (A-B)/4	H_1 (H_2) = (A-B)/2

C Precision indicator setting function (F7)

Fine adjustment of the indicated value can be made within the range of ±5% of the read value. The scattering of the indicated value can be eliminated.



Note) When the precision indicator setting function is used, the set pressure value may change ±1 digit.

D Peak and bottom display function

This function constantly detects and updates the maximum (minimum) value and allows to hold the maximum (minimum) pressure value.
When the ▲ ▼ buttons are simultaneously pressed for 1 second or longer, while "holding", the hold value will be reset.

E Key lock function

This function prevents incorrect operations such as accidentally changing the set-value.

F Zero-out function

This function clears and resets the zero value on the display of measured pressure.
For the pressure switch with analog output, the analog output shifts according to the indication. A displayed value can be adjusted within ±10% F.S. of the pressure when ex-factory.

Function Details

G Error indication function

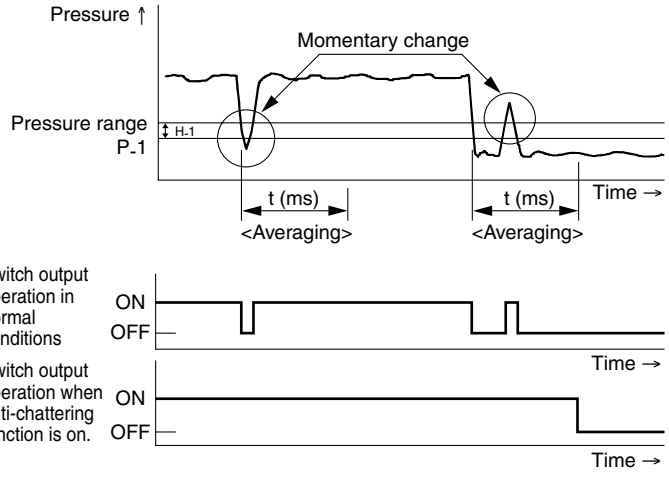
Error name	Error code	Description
Overcurrent error	Er1	Load current of switch output (OUT1) exceeds 80 mA.
	Er2	Load current of switch output (OUT2) exceeds 80 mA.
Residual pressure error	Er3	It is still applied with pressure that is ±10% over the atmospheric pressure and the upper limit of the rated pressure range when it is cleared to zero. ∗ After displaying the error code for 1 second, the switch automatically returns to the measuring mode. Due to individual product differences, the setting range varies ±1 digits.
Applied pressure error	HHH	Supply pressure exceeds the maximum set pressure.
	LLL	Supply pressure is below the minimum set pressure.
Auto-shift error	or	The value measured at the time of auto-shift input is outside the set pressure range. ∗ After displaying the error code for one second, the switch returns to the measuring mode.
System error	Er0	Internal data error
	Er4	Internal data error
	Er7	Internal data error

H Anti-chattering function (F3)

A large bore cylinder or ejector consumes a large volume of air in operation and may experience a temporary drop in the supply pressure. This function prevents detection of such temporary drops in the supply pressure as an error.

Available response time settings
20 ms, 100 ms, 500 ms, 1000 ms, 2000 ms

<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.



I Unit display switching function (F0)

Display units can be switched with this function.

Pressure range		For compound pressure	For vacuum pressure	For positive pressure	
Applicable pressure sensor		**10-ZSE80F**	**10-ZSE80**	**10-ISE80**	**10-ISE80H**∗
Set pressure range		–110 to 110 kPa	10 to –111 kPa	–0.1 to 1.1 MPa	–0.1 to 2.2 MPa
PA	kPa	0.1	0.1	1	1
	MPa	0.001	0.001	0.001	0.001
GF	kgf/cm²	0.001	0.001	0.01	0.01
bAr	bar	0.001	0.001	0.01	0.01
PSI	psi	0.02	0.02	0.1	1
inH	inHg	0.1	0.1	—	—
mmH	mmHg	1	1	—	—

∗ 10-ISE80H: Does not indicate the last digit when the pressure is 2.000 MPa or higher.

J Power-saving mode (F9)

The numerical value disappears and the decimal points blink.

Power-saving mode can be selected.
It shifts to the power-saving mode without button operation for 30 seconds. It is set to the normal mode (Power-saving mode is OFF.) when ex-factory. (Decimal points and operation indicator light (only when the switch output is turned ON.) blink in the power-saving mode.)

K Secret code setting (F10)

Input an arbitrary three-digit value.

∗ The set-value can be confirmed when the key is locked.

It can be set whether code number input is required or not when key is locked. It is set to input no code number when ex-factory.

Made to Order

Please contact SMC for detailed dimensions, specifications, and lead times.

Made to Order

Symbol

Lead wire length 3 m — -X501

It has a lead wire extended to 3 meters.

How to Order

∗ Refer to How to Order on page 1 for standard specifications.

10-ZSE80(F)/10-ISE80(H) − □ − □ − □ − X501

- Piping*
- Output*
- Option*

Series 10-ZSE80/10-ISE80
Specific Product Precautions 1

Be sure to read this before handling.
Refer to "Handling Precautions for SMC Products" (M-E03-3) for Safety Instructions and Pressure Switches Precautions.

Handling

⚠ Warning

1. Do not use pressure sensors with corrosive and/or flammable gases or liquids.

⚠ Caution

1. Do not drop, bump, or apply excessive impacts (980 m/s^2) while handling. Although the body of the sensor may not be damaged, the internal parts of the sensor could be damaged and lead to a malfunction.
2. The tensile strength of the cord is 49 N. Applying a greater pulling force on it can cause a malfunction. When handling, hold the body of the sensor—do not dangle it from the cord.
3. Do not exceed the screw-in torque of 13.6 N·m when connecting the pipe to the switch. Exceeding these values may cause the switch to malfunction.

Connection

⚠ Caution

1. Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output.
2. Connections should be done while the power is turned off.
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 other lines.
4. If a commercial switching regulator is used, make sure that the F.G. terminal is grounded.

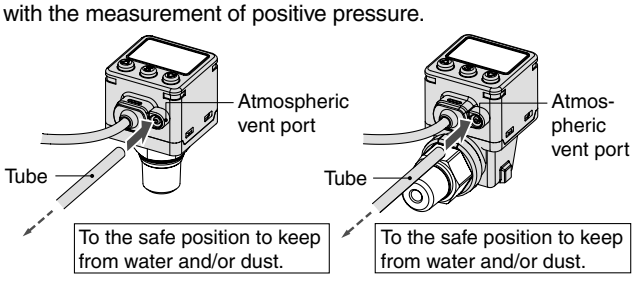
Operating Environment

⚠ Warning

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

⚠ Caution

1. Do not use this product in an environment that gives oil or solvent splash over it.
2. When this pressure switch is used in a place where water and dust splash on, water and dust may enter inside the switch through the atmospheric vent port. Insert a ø4 tube (I.D. ø2.5) into the atmospheric vent port, and bring piping of the opposite side up to the safe position to keep it from water and dust. Do not bend the tubing or close the hole of it. It causes malfunction with the measurement of positive pressure.



∗ Make sure that the tubing is inserted to the end of the atmospheric vent port.
∗ Use SMC tubing, TU0425 (Material: Polyurethane, Tubing O.D. ø4, I.D. ø2.5).

Operating Environment

⚠ Caution

3. Some fluids may generate static electricity when resin piping is used for piping. Take measures against static electricity with equipment when this switch is used in connection with resin piping. Also, the ground should be separate from that of the units that generate strong electromagnetic noise or high frequency, otherwise, the switch can be damaged by static electricity.

Pressure Source

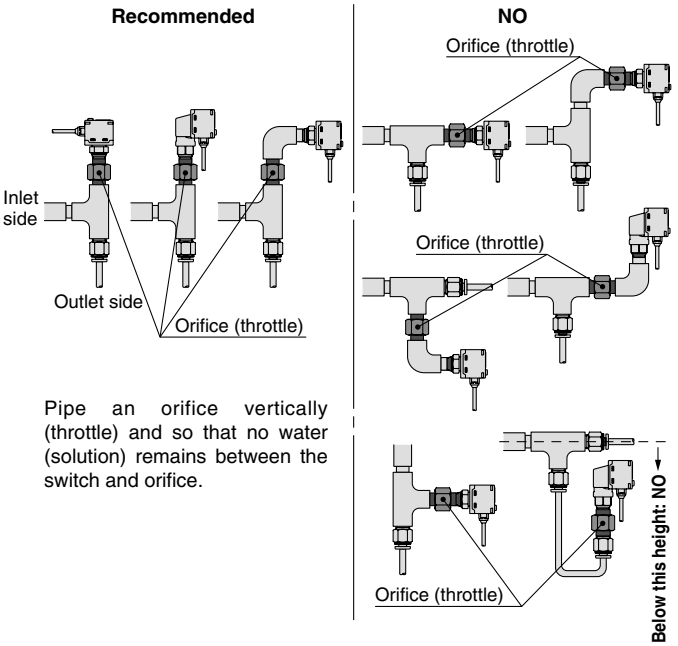
⚠ Warning

1. Use of poisonous and deleterious substance, corrosive or flammable fluid.
The materials used for the pressure sensor and the fitting of this switch are stainless steel 630, stainless steel 304 and stainless steel 316L (made to order). Do not use fluids such as **poisonous, deleterious substance and corrosive fluid**.
The switch is not protected against explosion. Do not use it with **flammable gas and fluid**, either.

2. Fluid compatibility
The fluid contact areas are stainless steel 630 (pressure sensor), stainless steel 304 (fitting), stainless steel 316L (pressure sensor, fittings, made to order). Use fluid that will not corrode the materials.
(For corrosiveness of fluid, consult with the manufacturer of the fluid.)

⚠ Caution

1. Intrusion of water and drain
A pressure sensor of stainless steel diaphragm is used for this switch. The pressure sensor of this switch can be damaged by the rush inertia of water when the drain contained in water and air collide with the pressure sensor when vacuum is broken after vacuum adsorption is confirmed, and it may cause malfunction with the pressure indication. If there is a possibility of water or drainage getting in, narrow the diameter of the piping to the pressure switch, or make an orifice in the middle of the piping as shown below. Extra attention is needed when the rear surface piping type model is used.



Pipe an orifice vertically (throttle) and so that no water (solution) remains between the switch and orifice.

Series 10-ZSE80/10-ISE80
Specific Product Precautions 2

Be sure to read this before handling.
Refer to "Handling Precautions for SMC Products" (M-E03-3) for Safety Instructions and Pressure Switches Precautions.

Pressure Source

⚠ Caution

2. Withstand pressure

When liquid fluid is used, rapid pressure change can be generated such as water hammer and surge pressure when a valve is turned ON/OFF.
Install a dumper or an absorber or an accumulator as a countermeasure according to necessity.
It may damage the pressure sensor or the switch if pressure over the proof pressure is applied even for a second.

<Piping specifications A2(L), B2(L)>

Helium leakage test

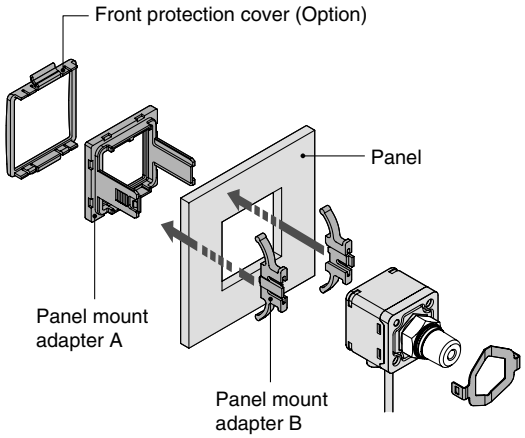
Helium leakage test is conducted on the welding parts. Use a ferrule by Swagelok (Swagelok® fittings) as the TSJ fittings and packing, ground, etc. by Swagelok (VCR® fittings) as the URJ fittings. If a ferrule, packing or ground by other manufacturers are to be used, conduct helium leakage test before using those products.

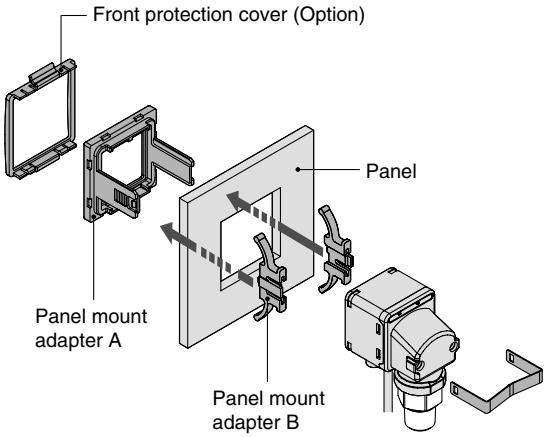
∗ Swagelok® and VCR® are registered trademarks of Swagelok Company.

Mounting

⚠ Caution

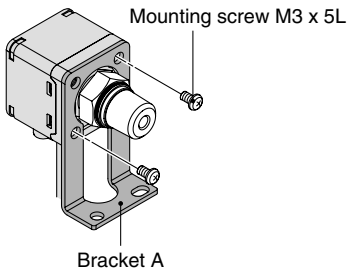
1. Mounting with panel mount adapter

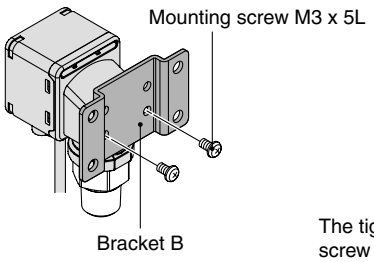




2. Mounting with brackets

Mount a bracket to the using two M3 x 5L mounting screws and install on piping. 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.

Specific Product Precautions 3

Be sure to read this before handling.
Refer to "Handling Precautions for SMC Products" (M-E03-3) for Safety Instructions and Pressure Switches Precautions.

Set Pressure Range and Rated Pressure Range

⚠ Caution

Set the pressure within the rated pressure range.
The set pressure range is the range of pressure that is possible in setting.
The rated pressure range is the range of pressure that satisfies the specifications (accuracy, linearity, etc.) on the switch.
Although it is possible to set a value outside the rated pressure range, the specifications will not be guaranteed even if the value stays within the set pressure range.

Switch		Pressure range
For vacuum pressure	**10-ZSE80**	–101 kPa to 0; –111 kPa to 10 kPa
For compound pressure	**10-ZSE80F**	–100 kPa to 100 kPa; –110 kPa to 110 kPa
For positive pressure	**10-ISE80**	–0.1 MPa to 1 MPa; –0.105 MPa to 1.1 MPa
	10-ISE80H	–0.1 MPa to 2 MPa; –0.105 MPa to 2.2 MPa