2-Color Display Digital Pressure Switch

ZSE80(F)/ISE80(H) Series

Stainless diaphragm

Oil-free (Single-layer diaphragm structure)

Sensor unit: Stainless steel 630

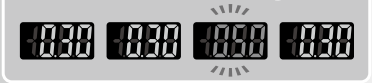
Fitting parts: Stainless steel 304

IP65 compliant

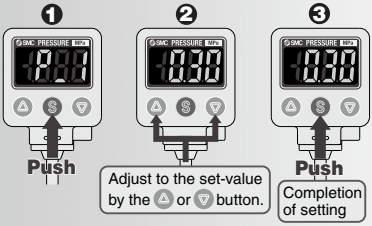
The sensor unit and fitting parts are also applicable to stainless steel 316L.

2-color display

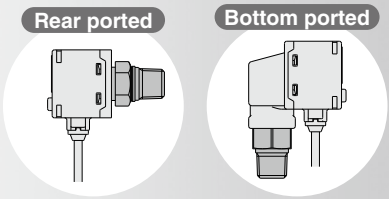
See abnormal values at a glance.



3-step setting



Choice of 2 piping directions



Rated pressure range

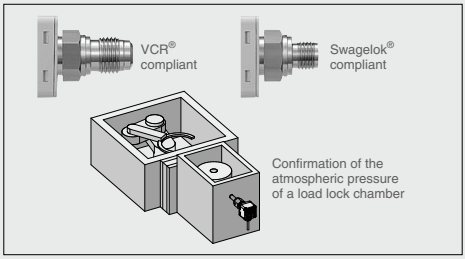
0.0 to –101.0 kPa and –0.100 to 2.00 MPa available as standard

Leakage

1×10^{-10} Pa·m³/s
<VCR®- and Swagelok®-fitting compliant>

1×10^{-5} Pa·m³/s
<Threaded type (R, Rc, NPT, G)>

- Sensor and fitting parts are electron-beam welded.
- Choice of VCR® or Swagelok® fitting is available.

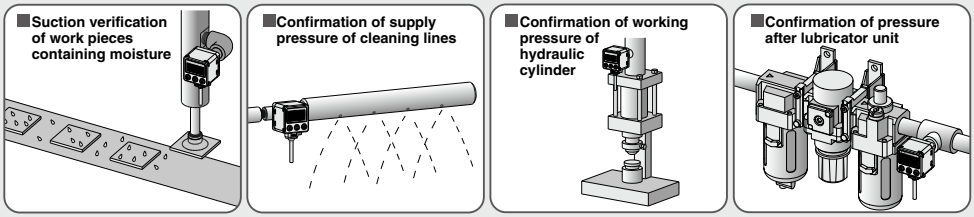


Applicable Fluid Examples

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

- **Water**
- **Hydraulic fluid (JIS-K2213)**
- **Silicon oil (JIS-K2213)**
- **Lubricant (JIS-K6301)**
- **Fluorocarbon**
- **Argon**
- **Carbon dioxide**
- **Air-containing drainage**
- **Nitrogen**

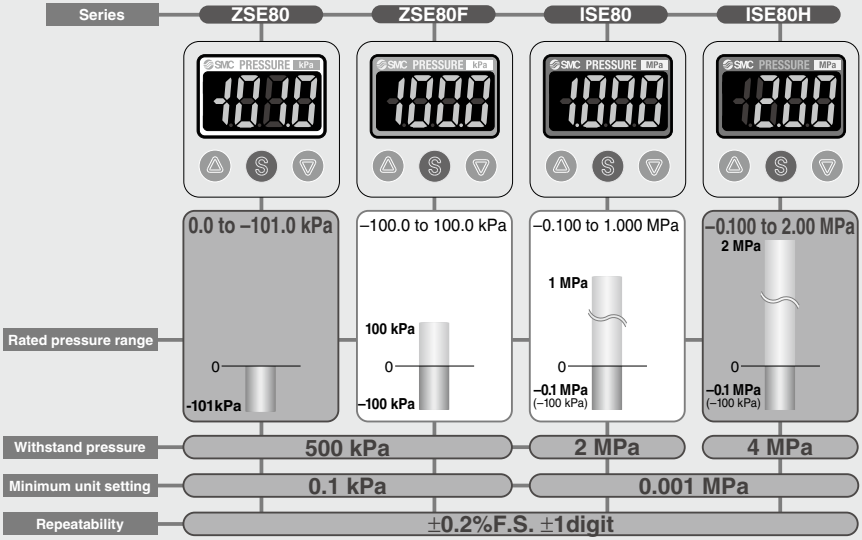
Applications



Restrictor installed fitting type (-X510) Made to Order

A pressure switch that has a restrictor installed in the fitting is available to prevent the sensor from being damaged by water hammer or inertia of the fluid.

Variations



2-color display (LCD)

Can select from 4 indicator patterns of color combinations.

	ON	OFF
❶	Red	Green
❷	Green	Red
❸	Red	Red
❹	Green	Green

Output display

It lights when OUT1 or OUT2 outputs.

Convex rubber button

Convex button is adopted and provides IP65 rating.
Improved maneuverability and operability.

Lead wire length

- 2 m (Standard)
- 3 m (Made to Order)

Piping

Rc1/8 (female threaded) is newly added.

- R1/4 (M5 x 0.8 female threaded)
- NPT1/4 (M5 x 0.8 female threaded)
- G1/4 (M5 x 0.8 female threaded)
- **Rc1/8**
- URJ1/4 (VCR® fitting compliant)
- TSJ1/4 (Swagelok® fitting compliant)

Output

Analog current output is newly added.

- Advantageous when it is wired for a long distance.
- It is resistant against noise.

- NPN open collector 1 output
- PNP open collector 1 output
- NPN open collector 2 outputs
- PNP open collector 2 outputs
- NPN open collector 2 outputs + Analog voltage output/Auto-shift switching
- PNP open collector 2 outputs + Analog voltage output/Auto-shift switching
- NPN open collector 2 outputs + Analog current output/Auto-shift switching
- PNP open collector 2 outputs + Analog current output/Auto-shift switching

■ Secret code setting

This ensures that only authorized persons can operate the switch when the key is locked.

Input an arbitrary 3-digit value.

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

■ Power-saving mode

Turning off the display can save power consumption.
(Power consumption: reduced by up to **18%**)

The numerical value disappears and the decimal points blink.

■ Resolution switching function

It prevents minor variation of the indicated value.

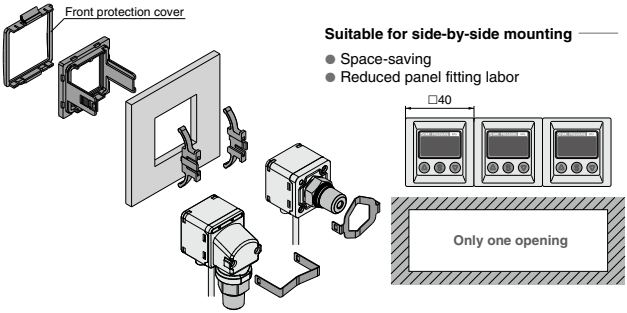
1/1000 1/100

(Only the indicated value changes without changing precision.)

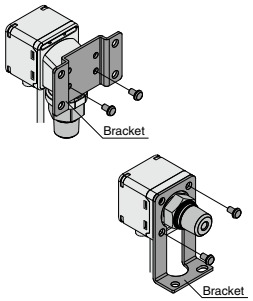
■ MPa/kPa switching function

The indication unit for vacuum, compound pressure and positive pressure can be integrated into either MPa or kPa.

Panel mount



Bracket mount



2-Color Display Digital Pressure Switch For General Fluids

ZSE80/ISE80 Series

How to Order

Rated pressure range

80	–0.1 to 1 MPa
80H	–0.1 to 2 MPa

Made to Order
Refer to Table 1 below.

For positive pressure ISE **80** – **02** □ – **N** – **M** □ □ – □

For vacuum/ compound pressure ZSE **80** – **02** □ – **N** – **M** □ □ – □

Rated pressure range

80	0 to –101 kPa
80F	–100 to 100 kPa

Piping specifications

02	R1/4 (M5 female threaded)
N02	NPT1/4 (M5 female threaded)
F02*	G1/4*1 (M5 female threaded)
C01	Rc1/8
A2	URJ1/4
B2	TSJ1/4

* Not applicable to piping direction "L (Bottom ported)".
* 1 According to ISO 228-1

Piping direction

Nil	Rear ported
L*	Bottom ported

* Not applicable to piping specifications "F02(G1/4)".

Output specifications

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

Unit specifications

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

Note1) Under the New Measurement Law, sales of switches with the unit switching function are not allowed for use in Japan.
Note2) Unit ISE80H : MPa
Others : MPa, kPa

Option 2

Symbol	Operation manual Note)	Calibration certificate Note)
Nil	●	—
Y	—	—
K	●	●
T	—	●

Note) All texts in both English and Japanese

Option 1

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

Note) Rear ported only

Made to Order

Table 1 Made to Order

Symbol	Specifications
-X500 Note 1)	Wetted parts: Stainless steel 316L
-X501	Lead wire length 3 m
-X510	Restrictor installed fitting
-X531 Note 2)	M12 4-pin pre-wired connector
-X555 Note 3)	Rated pressure –100 to 300 kPa

Note 1) Not applicable to the rated pressure range –0.1 to 2 MPa specification. Refer to page 103 for detail.
Note 2) Suitable for output specifications A, B only
Note 3) Suitable for output specifications R, T only

Option

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

Refer to pages 11 and 12 for Pressure Switch Precautions. For details about the Specific Product Precautions, refer to the Operation Manual on the SMC website, http://www.smcworld.com

Specifications

Model			ZSE80 (Vacuum pressure)	ZSE80F (Compound pressure)	ISE80 (Positive pressure)	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
Pressure display range/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 (Gasket: NBR Note 1))			
Applicable fluid			Fluids do not corrode stainless steel 630 and 304 (NBR Note 1))			
Port size			R1/4, NPT1/4, G1/4 Note 2), 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.			
		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.			
		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-clear, Keylock function, Auto-preset, Auto-shift, Display unit switching, Power-saving mode			
Environment	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 terminals and housing			
	Insulation resistance		2 MΩ or more (50 VDC measured via megohmmeter) between terminals and housing			
Temperature characteristics			±3% F.S. (25°C reference, 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, UL/CSA (E216656), RoHS			

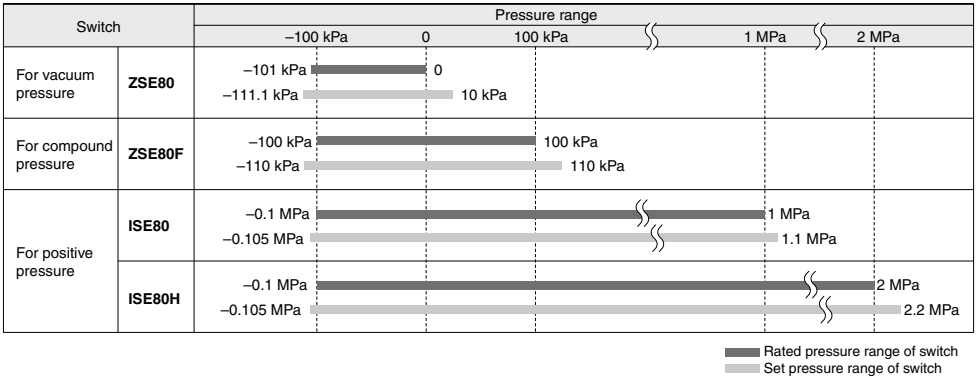
Note 1) When F02(G1/4) is selected.
Note 2) F02(G1/4) is available for rear ported only.

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	

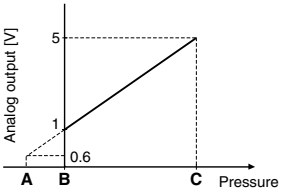
Set Pressure Range and Rated Pressure Range

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.

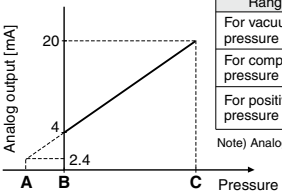


Analog Output

Voltage output



Current output

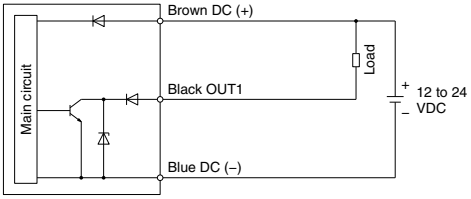


Range	Rated pressure range	A	B	C
For vacuum pressure	0.0 to –101.0 kPa	10.1 kPa	0	–101.0 kPa
For compound pressure	–100.0 to 100.0 kPa	—	–100.0 kPa	100.0 kPa
For positive pressure	–0.100 to 1.000 MPa	–0.100 MPa	0	1.000 MPa
	–0.100 to 2.00 MPa	–0.100 MPa Note)	0	2.00 MPa

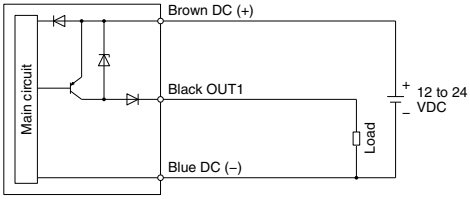
Note) Analog output is 0.8 [V] or 3.2 [mA] at the pressure A.

Internal Circuits and Wiring Examples

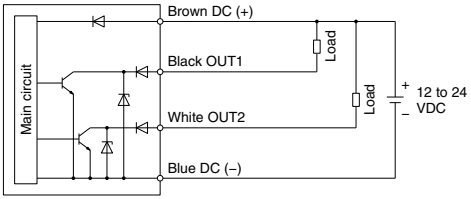
-N
NPN (1 output)



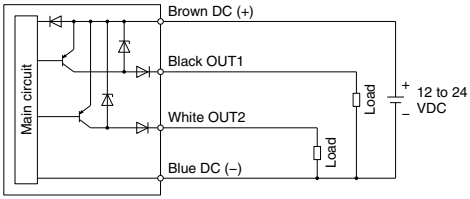
-P
PNP (1 output)



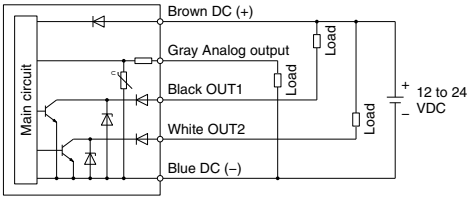
-A
NPN (2 outputs)



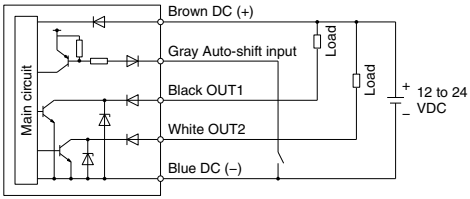
-B
PNP (2 outputs)



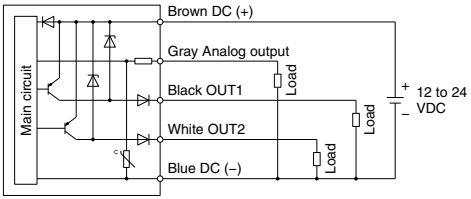
-R/-S
-R: NPN (2 outputs) + Analog voltage output
-S: NPN (2 outputs) + Analog current output



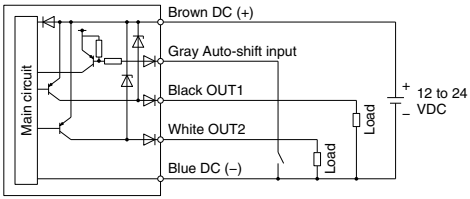
-R/-S
NPN (2 outputs) + Auto-shift input



-T/-V
-T: PNP (2 outputs) + Analog voltage output
-V: PNP (2 outputs) + Analog current output

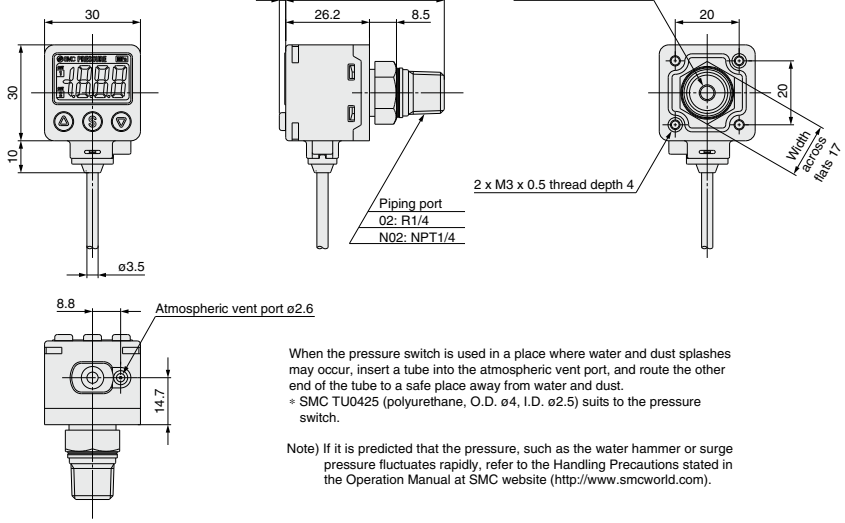


-T/-V
PNP (2 outputs) + Auto-shift input



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

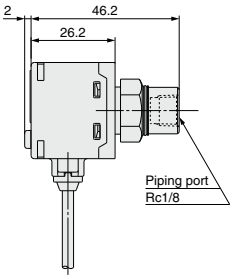
ZSE/ISE8□□- 02 N02 F02 C01 A2 B2



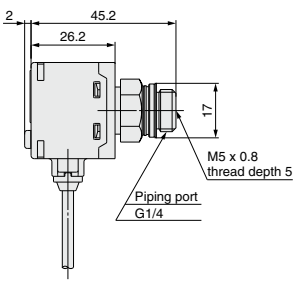
When the pressure switch is used in a place where water and dust splashes may occur, insert a tube into the atmospheric vent port, and route the other end of the tube to a safe place away from water and dust.

* SMC TU0425 (polyurethane, O.D. ø4, I.D. ø2.5) suits to the pressure switch.

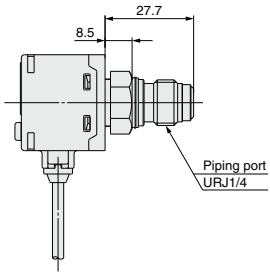
Note) If it is predicted that the pressure, such as the water hammer or surge pressure fluctuates rapidly, refer to the Handling Precautions stated in the Operation Manual at SMC website (http://www.smcworld.com).



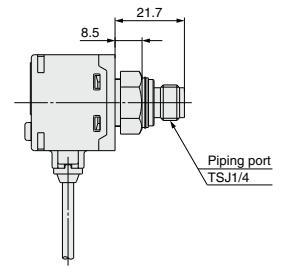
-C01: Rc1/8



-F02: G1/4



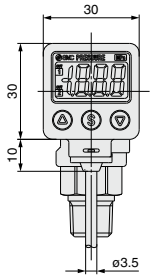
-A2: URJ1/4

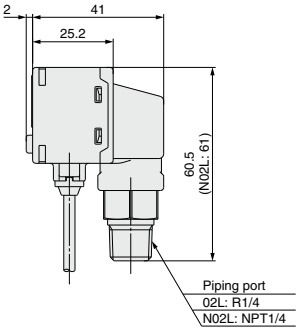


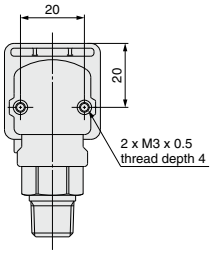
-B2: TSJ1/4

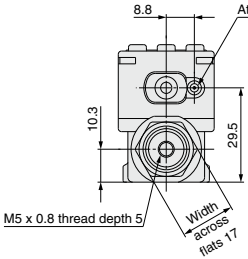
Dimensions (For details about lead wires, refer to the product specifications.)

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









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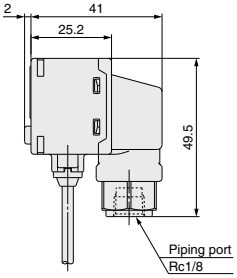
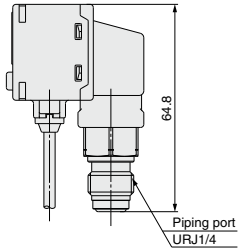
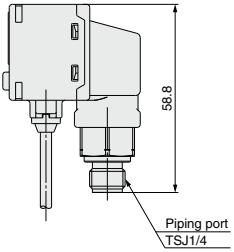


-C01L: Rc1/8



-A2L: URJ1/4

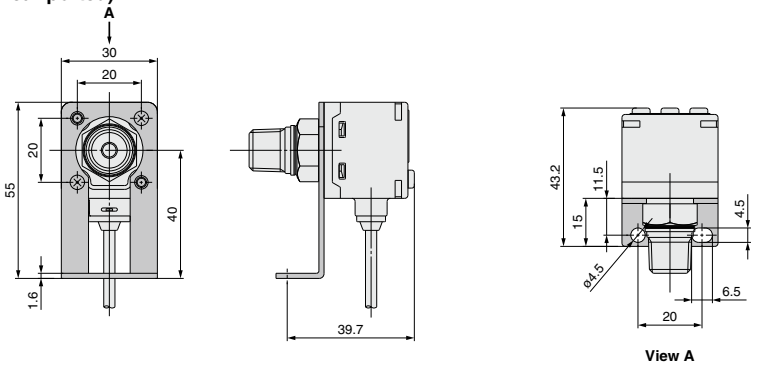


-B2L: TSJ1/4

Dimensions

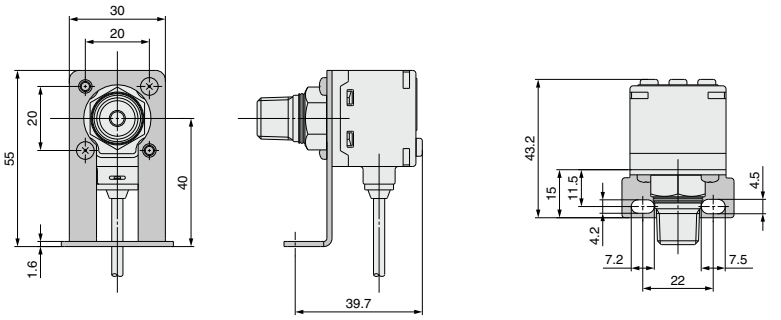
With bracket (Rear ported)

• ZS-24-A

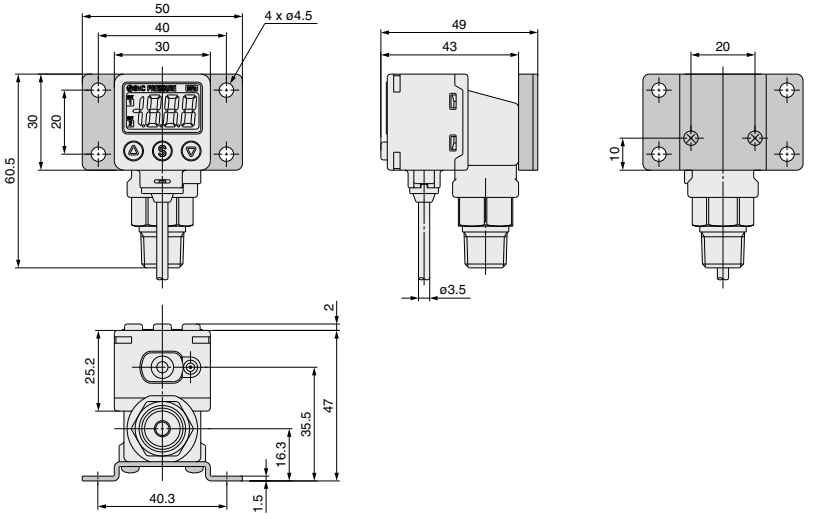


With bracket (Rear ported)

• ZS-24-D

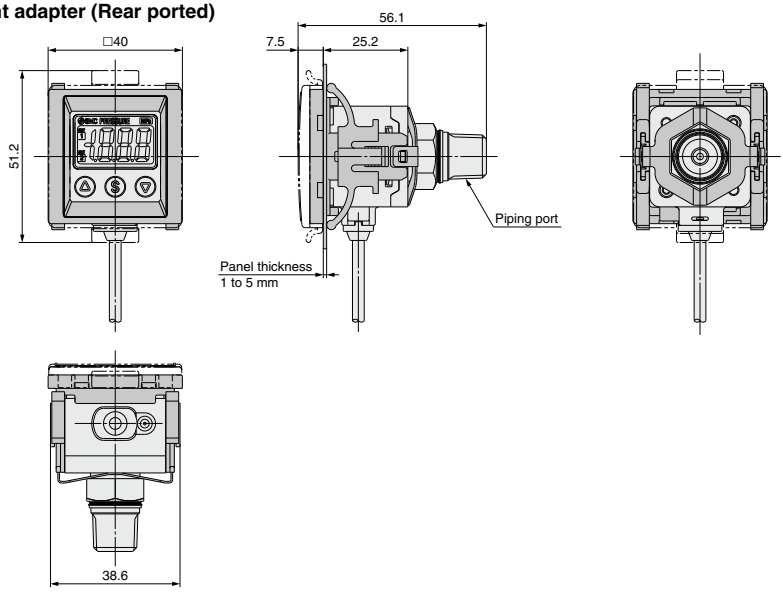


With bracket (Bottom ported)

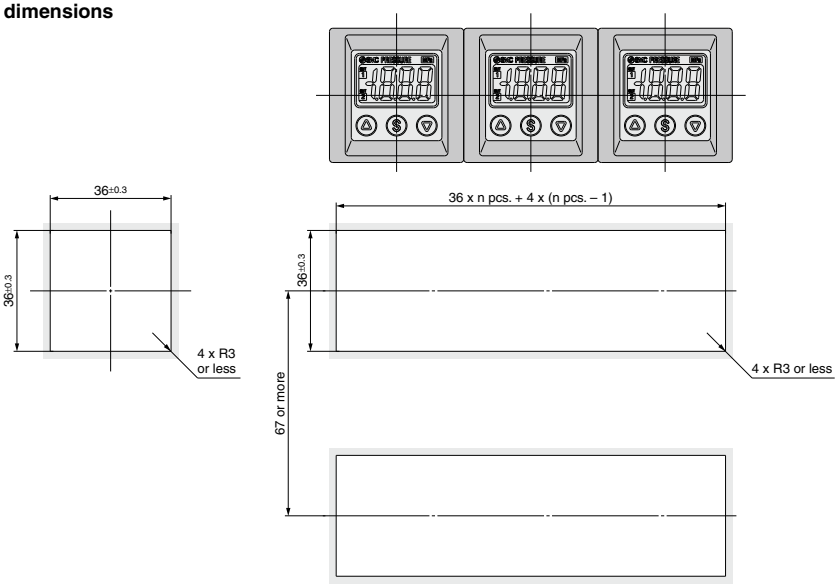


Dimensions

Panel mount adapter (Rear ported)

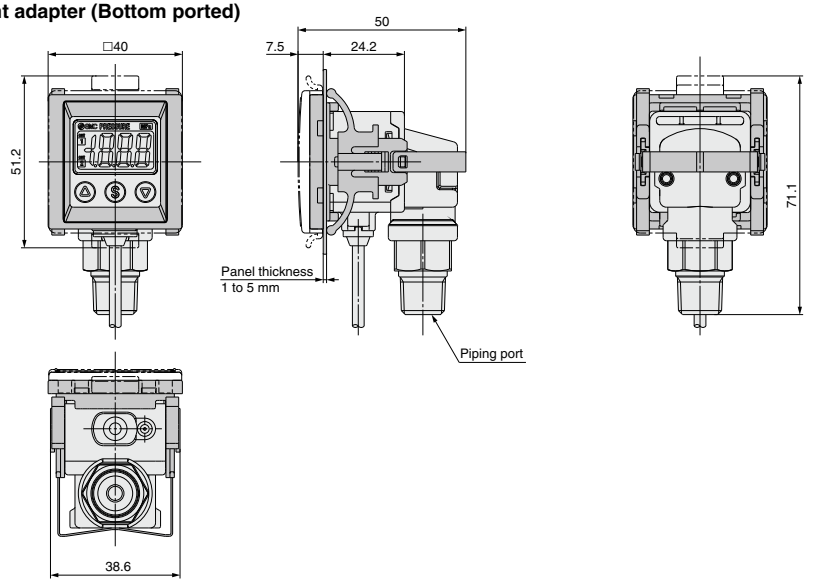


Panel fitting dimensions

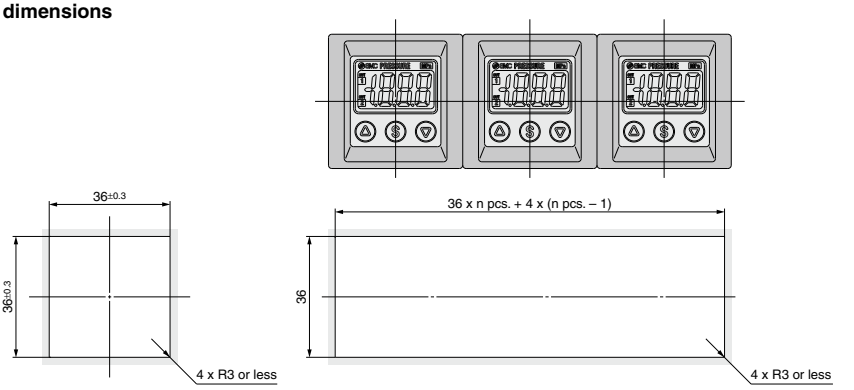


Dimensions

Panel mount adapter (Bottom ported)



Panel fitting dimensions



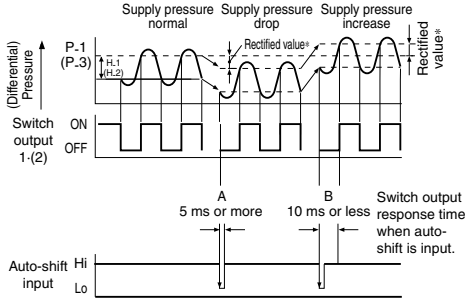
Function Details

The F□ in ( ) shows the function code number. Refer to the Operation Manual for the details of operation procedures and function codes.

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.

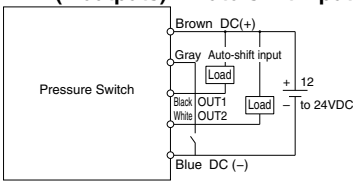
Settable Range for Auto-Shift Input

	Set pressure range	Settable 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

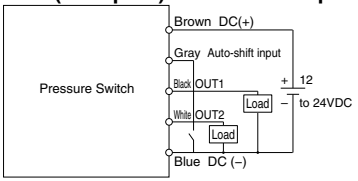
Auto-shift zero

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.

Output specifications: -R/-S
NPN (2 outputs) + Auto-shift input



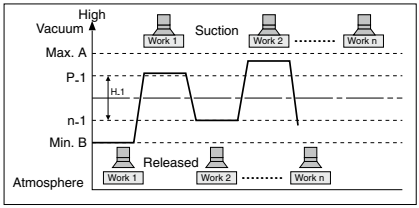
Output specifications: -T/-V
PNP (2 outputs) + Auto-shift input



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

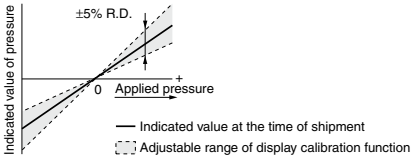


Formula for Obtaining the Set-Value

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 Display calibration function (F7)

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



Note) When the display calibration function is used, the set pressure value may change ±1 digit.

D Peak/Bottom value indication

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 Keylock function

Prevents operation errors such as accidentally changing setting values.

F Zero-clear 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.The indicated value can be adjusted within ±10% F.S. of the pressure when ex-factory.

Function Details

The F□ in ( ) shows the function code number. Refer to the Operation Manual for the details of operation procedures and function codes.

G Error indication function

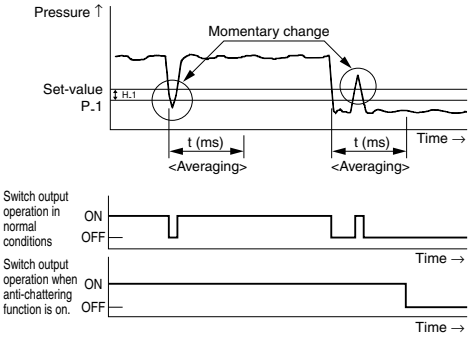
Error name	Error code	Description
Overcurrent error	Er 1	Load current of 80 mA or more is applied to the switch output (OUT1).
	Er2	Load current of 80 mA or more is applied to the switch output (OUT2).
Residual pressure error	Er3	It is still applied with pressure that is ±10% over the atmospheric pressure 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 Display unit switching function (F0)

Display units can be switched with this function.

Pressure range		For compound pressure	For vacuum pressure	For positive pressure	
Model		ZSE80F	ZSE80	ISE80	ISE80H∗
PR	kPa	0.1	0.1	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	—	—

∗ 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 Setting of secret code (F10)

Input an arbitrary 3-digit value.

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

Users can select whether a secret code must be entered to release key lock. At the time of shipment from the factory, it is set such that the secret code is not required.

ZSE80/ISE80 Series
Made to Order 1

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

Made to Order

1 Wetted Parts: Stainless Steel 316L

This pressure switch has better corrosion resistance that uses stainless steel 316L for the wetted parts (pressure sensor and fitting).

How to Order

* Refer to "How to Order" on page 92 for standard specifications.

ZSE80(F)/ISE80– □ – □ – □ –X500

- Piping specifications*
- Output specifications*
- Option*

Note 1) Not applicable to the rated pressure –0.1 to 2 MPa specifications (ISE80H).
Note 2) A restrictor (equivalent to -X510) is installed inside the fitting. (Piping specifications A2(L) and B2(L) are excluded.)

Specifications

Model	ZSE80(F)	ISE80
Withstand pressure	500 kPa	1.5 MPa
Applicable fluid	Liquids and gases do not corrode stainless steel 316L	

Models other than above are the same specifications as standard.

3 Restrictor Installed Fitting

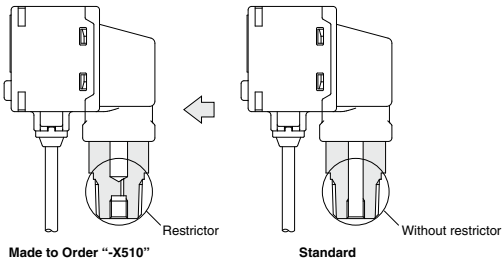
A restrictor is installed inside the fitting in order to improve endurance of water collision with inertia force in the piping when adsorption is broken.

How to Order

* Refer to "How to Order" on page 92 for standard specifications.

ZSE80(F)/ISE80(H)– □ – □ – □ –X510

- Piping specifications*
- Output specifications*
- Option*



Made to Order "-X510" **Standard**

Note 1) Not applicable for piping specifications A2(L) and B2(L).
Note 2) Sometimes does not work for suppression of water hammer effect even if this product is used. Take other measures in such a case.

2 Lead Wire Length 3 m

It has a lead wire extended to 3 meters.

How to Order

* Refer to "How to Order" on page 92 for standard specifications.

ZSE80(F)/ISE80(H)– □ – □ – □ –X501

- Piping specifications*
- Output specifications*
- Option*

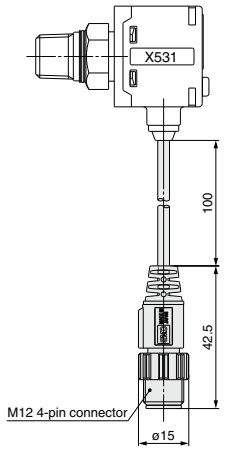
4 M12 4-pin Pre-wired Connector (Lead wire length 100 mm)

How to Order

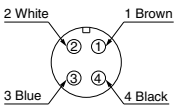
* Refer to "How to Order" on page 92 for standard specifications.

ZSE80(F)/ISE80(H)– □ – □ – □ –X531

- Piping specifications*
- Output specifications
  - **A**: NPN open collector 2 outputs
  - **B**: PNP open collector 2 outputs
- Option*



Connector pin numbers



Pin no.	Pin name
1	DC(+)
2	OUT(2)
3	DC(–)
4	OUT(1)

Made to Order

Symbol
-X555

5 Rated Pressure -100 to 300 kPa

It has an extended pressure range of ZSE80F (compound pressure) to -100 to 300 kPa.

How to Order

∗ Refer to "How to Order" on page 92 for standard specifications.

ZSE80F–□–□–□–X555

Piping specifications∗

Option∗

Output specifications Note)
R: NPN open collector 2 outputs + Analog voltage output/Auto-shift switching
T: PNP open collector 2 outputs + Analog voltage output/Auto-shift switching

Note) The output is applicable to R, T only.

Specifications

Model	**ZSE80F-□-□-□□□-X555**
Rated pressure range	–100 to 300 kPa
Set pressure range	–110 to 330 kPa
Set display resolution	1 kPa
Analog output voltage	1 to 5 V ±3% F.S. Linearity: 1.5% F.S.
Display accuracy	± 3% F.S. ±1 digit (Ambient temperature of 25 ±3°C)

Models other than above are the same specifications as standard.

Unit switching function

Pressure unit		Set display resolution	Rated pressure range	Set pressure range	Settable Range for Auto-Shift Input
PA	**kPa**	1	–100 to 300	–110 to 330	–440 to 440
	MPa	0.001	–0.100 to 0.300	–0.110 to 0.330	–0.440 to 0.440
GF	**kgf/cm²**	0.01	–1.02 to 3.06	–1.12 to 3.37	–4.49 to 4.49
bAr	**bar**	0.01	–1.00 to 3.00	–1.10 to 3.30	–4.40 to 4.40
PSi	**psi**	0.1	–14.5 to 43.5	–16.0 to 47.9	–63.9 to 63.9
inH	**inHg**	0.1	–29.5 to 88.5	–32.5 to 97.4	–129.9 to 129.9
mmH	**mmHg**	1	–750 to 2250	–825 to 1999∗	–1999 to 1999∗

∗ The setting or display over the range of ±1999 is not available when mmHg is selected.