

2-Color Display High-Precision Digital Pressure Switch

Series ZSE40A(F)/ISE40A



IP65
compliant

RoHS
compliant

Applicable
fluid

Air, Non-corrosive gas, Non-flammable gas

Can copy to up to 10 switches simultaneously.

The settings of the master sensor (source of copy) can be copied to the slave sensors.

- Reducing setting labor
- Minimizing risk of mistakes in setting

Copy



Slave side



2 units



10 units

Easy handling!



Raised rubber switch
buttons for easy and
comfortable operation

3-step setting



Push

Adjust to the set-value
by the Δ or ∇ button.

Push

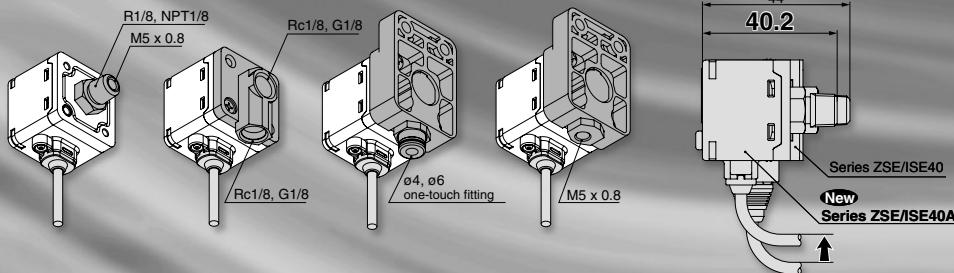
Completion
of setting

2-color display

See abnormal values at a glance.

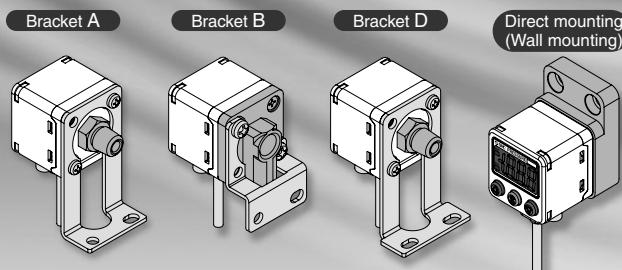


Piping Variations



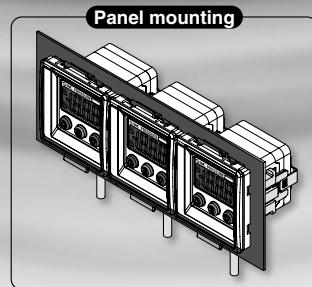
Space-saving

Mounting Variations

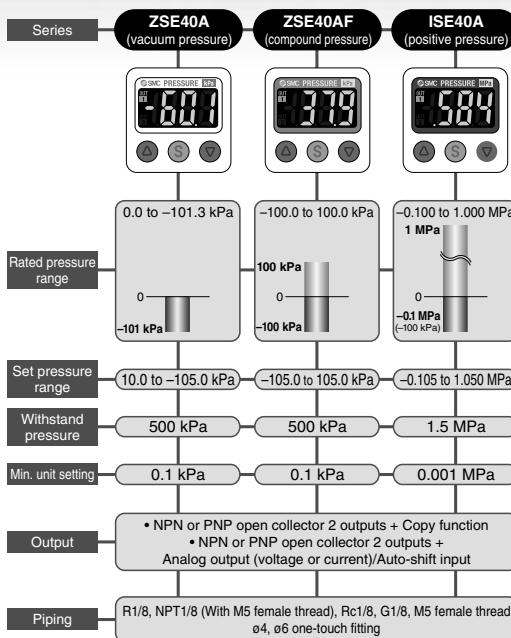


Interchangeable with the ZSE40/ISE40 series for mounting

Panel mounting



Series



Secret code setting function

A function to prevent operation by anyone other than the designated operator while the keys are locked.



An optional 3-digit value is entered.

* The set-value can be checked while the keys are locked.

Power-saving function

The display can be turned off to save the power consumption. (Power consumption reduced by max. 20%)



The value disappears and decimal points start flashing.

Resolution conversion function

The flickering on the display can be eliminated.



1/100
(Only the displayed value is changed, and there is no effect on the accuracy.)



MPa/kPa switching function

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

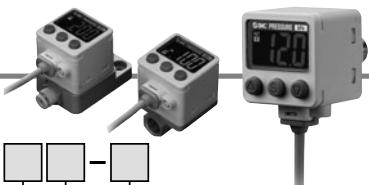


kPa Stick the label (enclosed with the product) of a desired unit seal.

2-Color Display High-Precision Digital Pressure Switch Series ZSE40A(F)/ISE40A



How to Order



Rated pressure range
ISE40A -0.1 to 1.000 MPa

For positive pressure

ISE40A - 01 - X - M

For vacuum/
compound pressure

ZSE40A - 01 - Y - M

Rated pressure range
ZSE40A 0.0 to -101.3 kPa
ZSE40AF -100.0 to 100 kPa

Piping
specifications

01	R1/8 (With M5 female thread)	R1/8, NPT1/8
N01	NPT1/8 (With M5 female thread)	M5 x 0.8
W1	Rc1/8	Rc1/8, G1/8
WF1*	G1/8	Rc1/8, G1/8
M5*	M5 x 0.8 (Female thread)	M5 x 0.8
C4*	ø4 One-touch fitting	ø4, ø6 One-touch fitting
C6*	ø6 One-touch fitting	ø4, ø6 One-touch fitting

* Made to Order

Combination of piping specifications with option 1 and part numbers of options

Description	Symbol	Part no.	Piping					
			01	N01	W1	WF1	M5	C4
Bracket A	A	ZS-24-A	○	○	○	○	×	×
Bracket B	B	ZS-24-B	×	○	○	○	×	×
Bracket D	D	ZS-24-D	○	○	○	○	×	×
Panel mount adapter	E	ZS-35-C	○	○	×	×	×	×
		ZS-35-D	×	○	○	○	○	○
Panel mount adapter + Front protective cover	F	ZS-35-F	○	○	×	×	×	×
		ZS-35-G	×	○	○	○	○	○

Output specifications

R	NPN open collector 2 outputs + Analog voltage/Auto-shift switching
T	PNP open collector 2 outputs + Analog voltage/Auto-shift switching
S	NPN open collector 2 outputs + Analog current/Auto-shift switching
V	PNP open collector 2 outputs + Analog current/Auto-shift switching
X	NPN open collector 2 outputs + Copy function
Y	PNP open collector 2 outputs + Copy function

Options/Part No. When optional parts are required separately, use the following part numbers to place an order.

Part no.	Option
ZS-24-A	Bracket A Mounting screw M3 x 5L, M4 x 5L (2 pcs. for each)
ZS-24-B	Bracket B Mounting screw M4 x 5L (2 pcs.)
ZS-24-D	Bracket D Mounting screw M3 x 5L, M4 x 5L (2 pcs. for each)
ZS-35-C	Panel mount adapter (Piping: For 01/N01)
ZS-35-D	Panel mount adapter (Piping: For W1/WF1/M5/C4/C6)
ZS-35-F	Panel mount adapter + Front protective cover (Piping: For 01/N01)
ZS-35-G	Panel mount adapter + Front protective cover (Piping: For W1/WF1/M5/C4/C6)

Unit specifications

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

Note 1) Under the New Measurement Law, sales of switches with the unit switching function are not allowed for use in Japan.

Note 2) Fixed unit:

For vacuum/compound pressure: kPa
For positive pressure: MPa

* Some options are unavailable depending on the piping specifications. Refer to "Combination of piping specifications with option 1 and part numbers of options".

Series ZSE40A(F)/ISE40A

Specifications

Model	ZSE40A (vacuum pressure)	ZSE40AF (compound pressure)	ISE40A (positive pressure)		
Rated pressure range	0.0 to -101.3 kPa	-100.0 to 100.0 kPa	-0.100 to 1.000 MPa		
Display/Set pressure range	10.0 to -105.0 kPa	-105.0 to 105.0 kPa	-0.105 to 1.050 MPa		
Withstand pressure	500 kPa	500 kPa	1.5 MPa		
Display/Minimum unit setting	0.1 kPa	0.1 kPa	0.001 MPa		
Applicable fluid	Air, Non-corrosive gas, Non-flammable gas				
Power supply voltage	12 to 24 VDC $\pm 10\%$, Ripple (p-p) 10% or less (with power supply polarity protection)				
Current consumption	45 mA or less				
Switch output	NPN or PNP open collector 2 outputs (Selectable)				
Maximum load current	80 mA				
Maximum applied voltage	28 V (at NPN output)				
Residual voltage	1 V or less				
Response time	2.5 ms (with anti-chattering function: 20, 100, 500, 1000, 2000 ms)				
Short circuit protection	Yes				
Repeat accuracy	$\pm 0.2\%$ F.S. ± 1 digit				
Hysteresis	Hysteresis mode Window comparator mode				
	Variable (0 or above) Note 1)				
Analog output	Voltage output Note 2)	Output voltage (Rated pressure range)	1 to 5 V $\pm 2.5\%$ F.S.		
		Linearity	$\pm 1\%$ F.S.		
	Current output Note 3)	Output impedance (Rated pressure range)	Approx. 1 k Ω		
	Current output Note 3)	Output current (Rated pressure range)	4 to 20 mA $\pm 2.5\%$ F.S.		
		Linearity	$\pm 1\%$ 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	$\pm 2\%$ F.S. ± 1 digit (Ambient temperature of 25 $\pm 3^\circ\text{C}$)				
Indicator light	Lights up when output is turned ON. OUT1, OUT2: Orange				
Environment	Enclosure	IP65			
	Operating temperature range	Operating: -5 to 50 $^\circ\text{C}$, Stored: -10 to 60 $^\circ\text{C}$ (No freezing or condensation)			
	Operating humidity range	Operating/Stored: 35 to 85% RH (No condensation)			
	Withstand voltage	1000 VAC for 1 minute between terminals and housing			
	Insulation resistance	50 M Ω or more (500 VDC measured via megohmmeter) between terminals and housing			
	Vibration resistance	10 to 150 Hz at whichever is smaller of 1.5 mm amplitude or 20 m/s ² acceleration, in X, Y, Z directions, for 2 hours each (De-energized)			
	Impact resistance	100 m/s ² in X, Y, Z directions, 3 times each (De-energized)			
Temperature characteristics					
$\pm 2\%$ F.S. (25 $^\circ\text{C}$ reference)					
Lead wire		Oil proof heavy-duty vinyl cable 5 cores ø3.5, 2 m Conductor area: 0.15 mm ² (AWG26) Insulator O.D.: 0.95 mm			
Standards		CE marking, UL (CSA), RoHS compliance			

Note 1) If the applied voltage fluctuates around the set-value, the hysteresis must be set to a value more than the fluctuating width, otherwise chattering will occur.

Note 2) When the analog voltage output is selected, the analog current output cannot be selected.

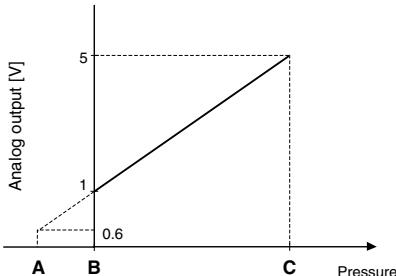
Note 3) When the analog current output is selected, the analog voltage output cannot be selected.

Piping Specifications

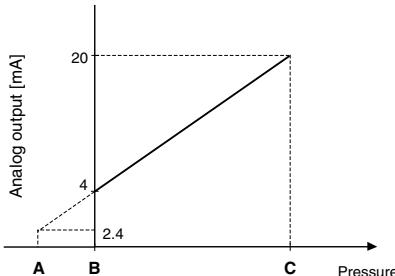
Part no.	01	N01	W1	WF1	M5	C4	C6
Port size	R1/8 (With M5 female thread)	NPT1/8 (With M5 female thread)	Rc1/8	G1/8	M5 x 0.8 female thread	ø4 One-touch fitting	ø6 One-touch fitting
Material of parts in contact with fluid	Sensor pressure receiving area	Silicon					
Piping port	C3602 (Electroless nickel plating) O-ring: HNBR		ZDC2 O-ring: HNBR			ZDC2, POM, Stainless steel 304, C3604 (Electroless nickel plating) O-ring: HNBR	
Weight	78 g	79 g	97 g	104 g	101 g		

Analog Output

Voltage output



Current output



Range	Rated pressure range	A	B	C
For vacuum pressure	0.0 to -101.3 kPa	10.1 kPa	0	-101.3 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

Descriptions

Output (OUT1) display (Orange)

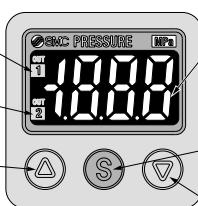
Lights up when OUT1 is turned ON.

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

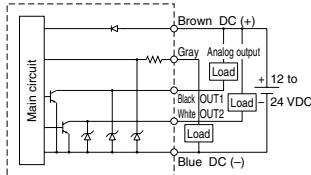
Use this button to select the mode or decrease the ON/OFF set-value. It is also used for switching to the bottom display mode.

Series ZSE40A(F)/ISE40A

Internal Circuits and Wiring Examples

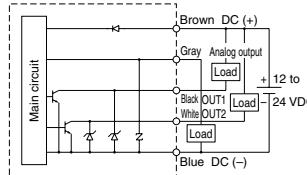
-R

NPN (2 outputs) +
Analog voltage output



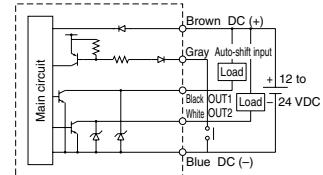
-S

NPN (2 outputs) +
Analog current output



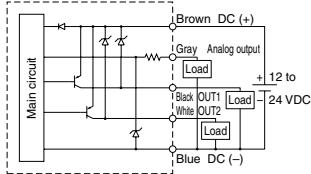
-R/-S

NPN (2 outputs) +
Auto-shift input



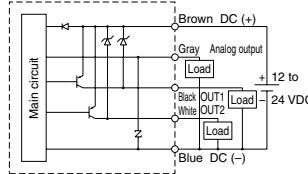
-T

PNP (2 outputs) +
Analog voltage output



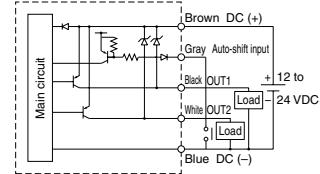
-V

PNP (2 outputs) +
Analog current output



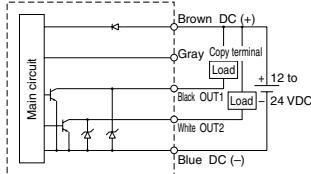
-T/-V

PNP (2 outputs) +
Auto-shift input



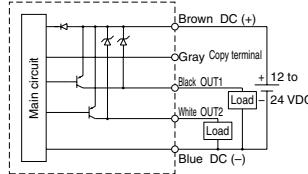
-X

NPN (2 outputs) +
Copy function



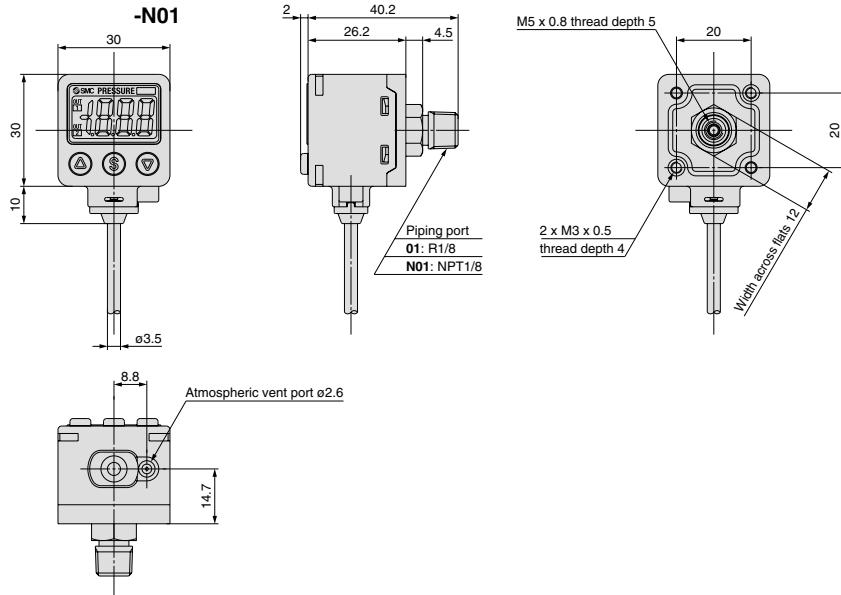
-Y

PNP (2 outputs) +
Copy function



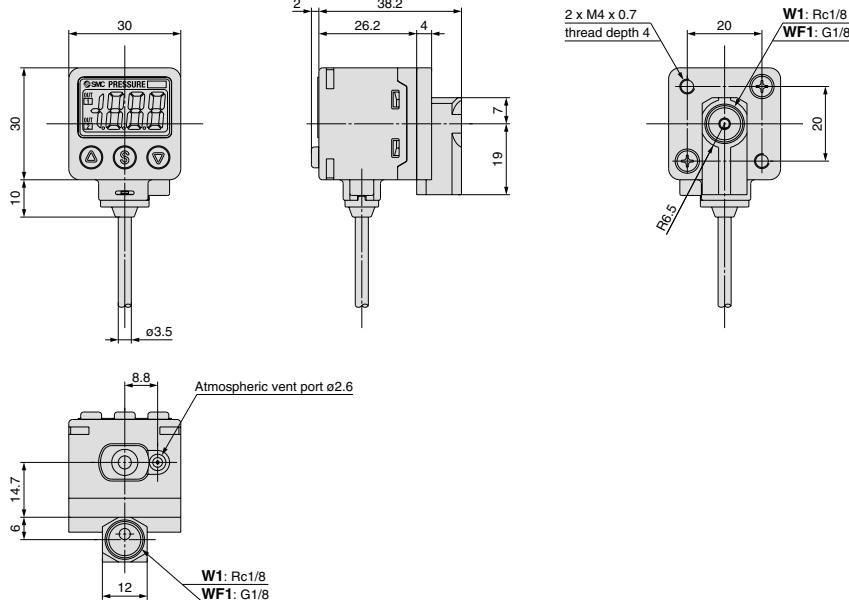
Dimensions (For details about lead wires, refer to the product specifications.)

ZSE40A(F)/ISE40A-01



ZSE40A(F)/ISE40A-W1

-WF1

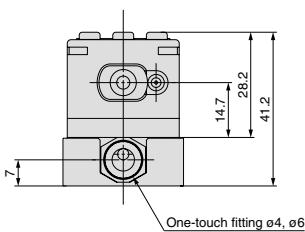
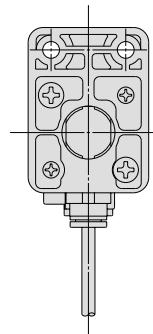
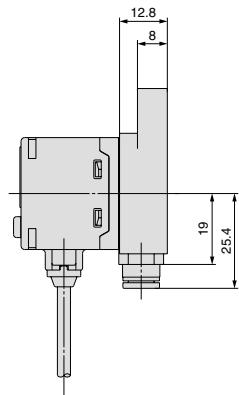
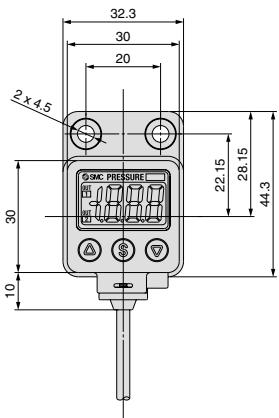


Series ZSE40A(F)/ISE40A

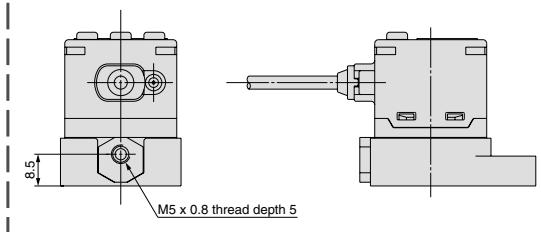
Dimensions (For details about lead wires, refer to the product specifications.)

ZSE40A(F)/ISE40A-C4

-C6



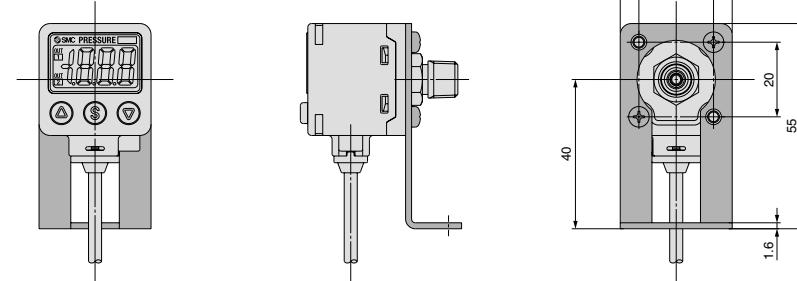
-M5



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

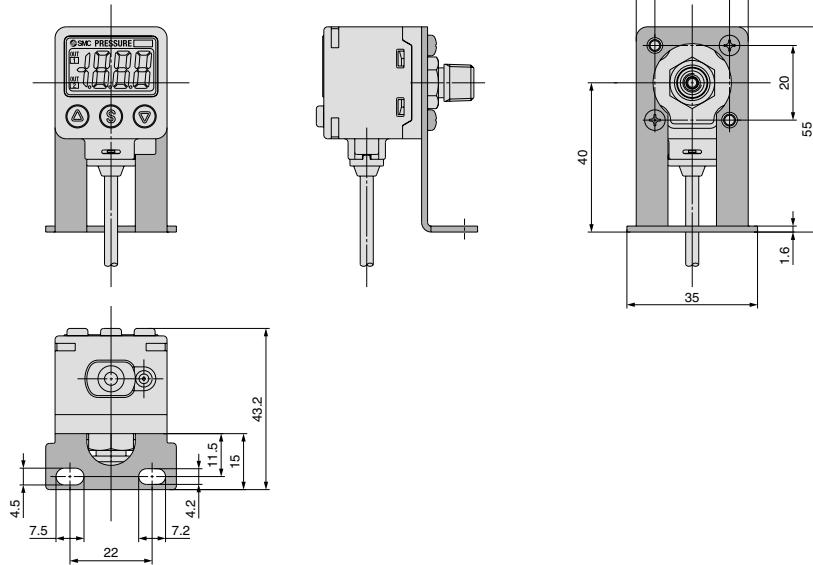
ZSE40A(F)/ISE40A-01-□-□A□
-N01-□-□A□

With bracket



ZSE40A(F)/ISE40A-01-□-□D□
-N01-□-□D□

With bracket

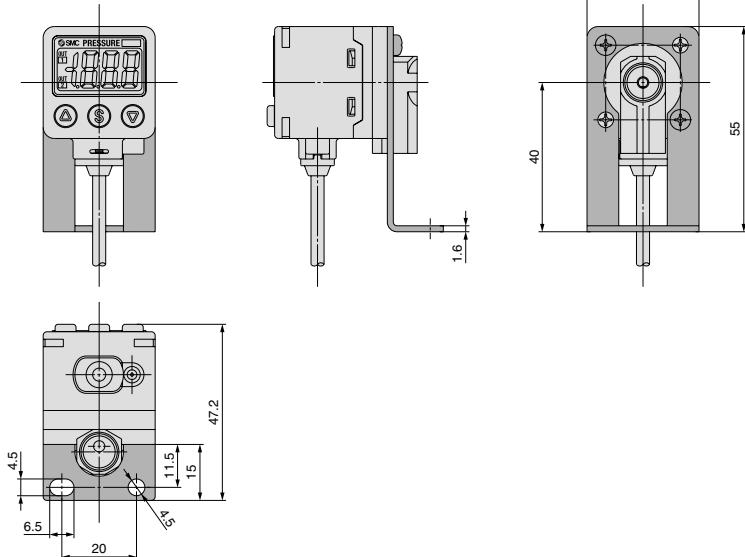


Series ZSE40A(F)/ISE40A

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

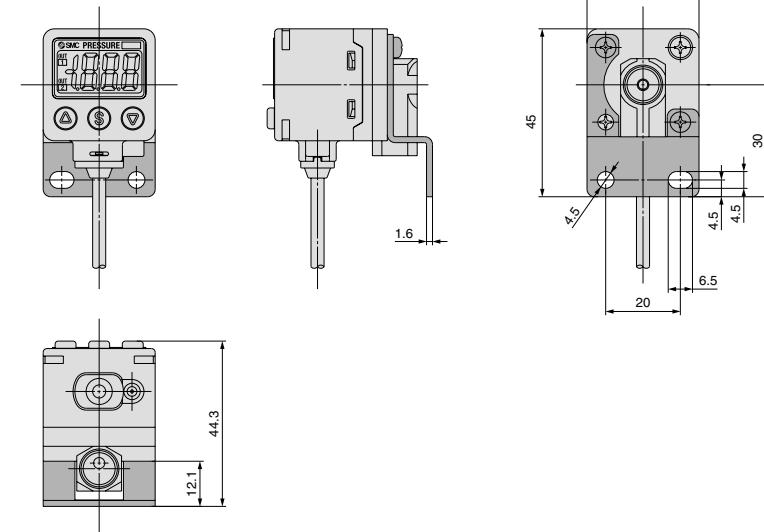
ZSE40A(F)/ISE40A-W1-□-□A□
-WF1-□-□A□

With bracket



ZSE40A(F)/ISE40A-W1-□-□B□
-WF1-□-□B□

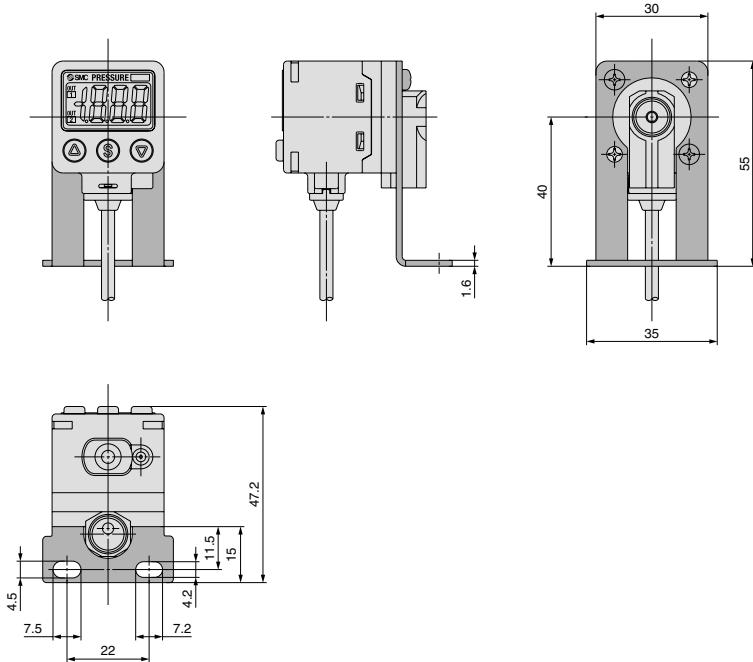
With bracket



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

ZSE40A(F)/ISE40A-W1-□-□D□
-WF1-□-□D□

With bracket



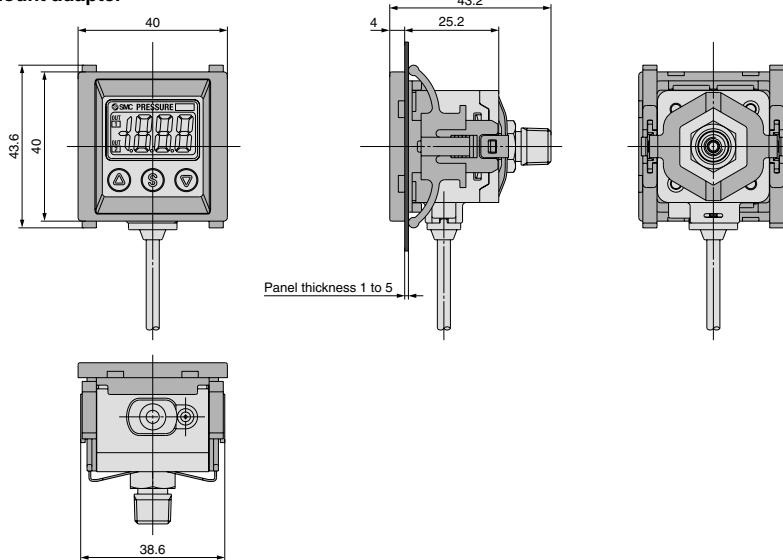
Alphabetical Index	Length Measuring	Static Electricity Elimination Equipment	Reduced-Wiring Fieldbus System	Position Detection Switch	Flow Sensor	Pressure Control	Pressure Sensor
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Series ZSE40A(F)/ISE40A

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

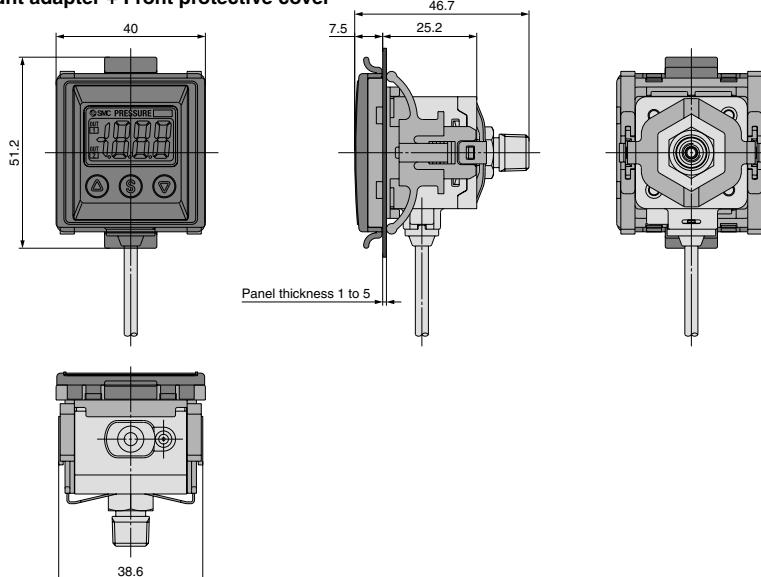
ZSE40A(F)/ISE40A-01-□-□E□
-N01-□-□E□

Panel mount adapter



ZSE40A(F)/ISE40A-01-□-□F□
-N01-□-□F□

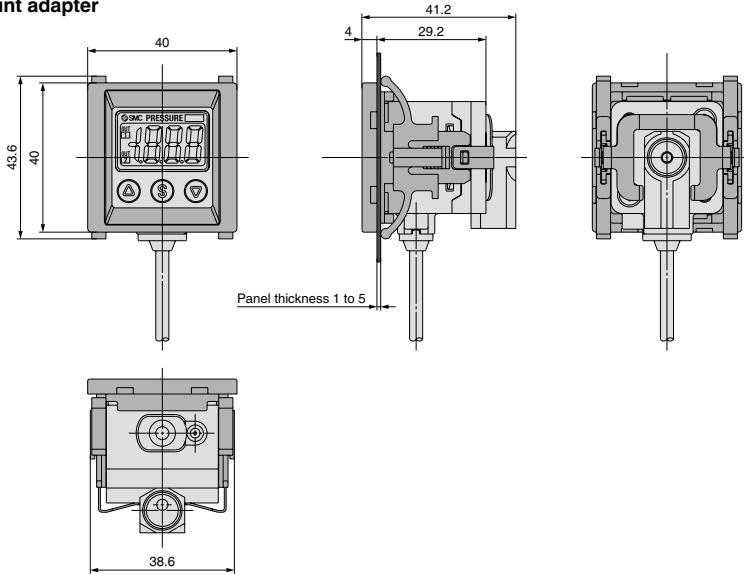
Panel mount adapter + Front protective cover



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

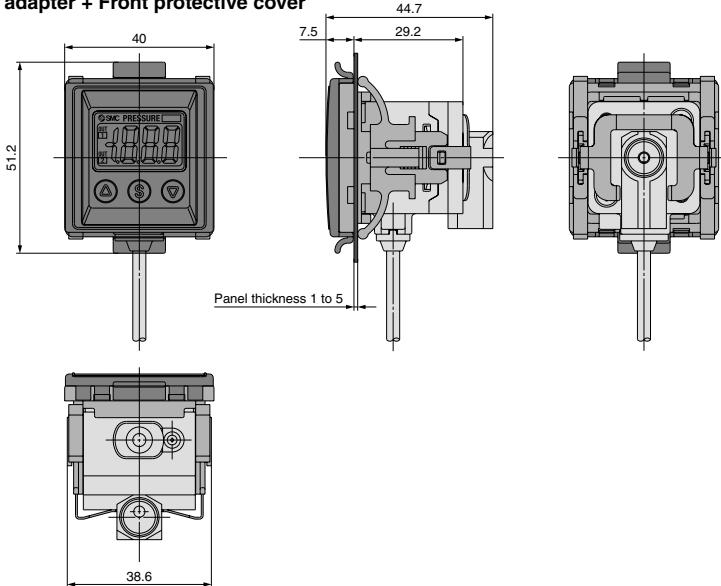
ZSE40A(F)/ISE40A-W1-□-□E□
-WF1-□-□E□

Panel mount adapter



ZSE40A(F)/ISE40A-W1-□-□F□
-WF1-□-□F□

Panel mount adapter + Front protective cover



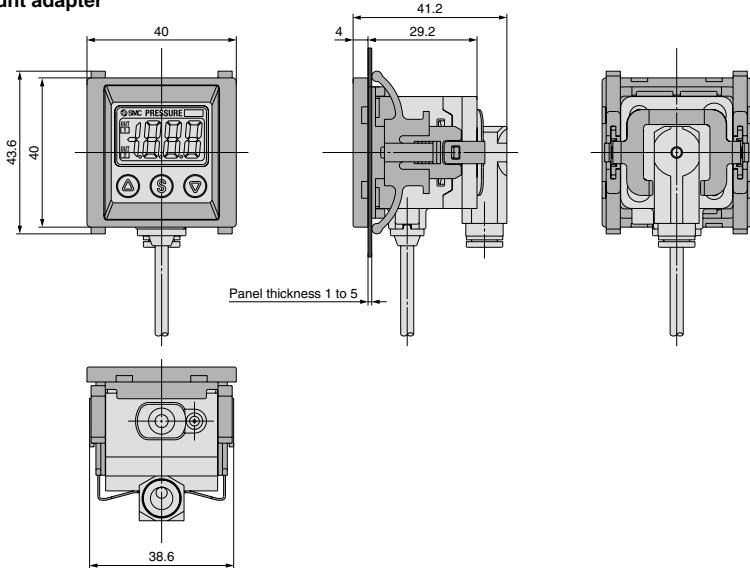
Series ZSE40A(F)/ISE40A

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

ZSE40A(F)/ISE40A-C4-□E□

-C6-□E□

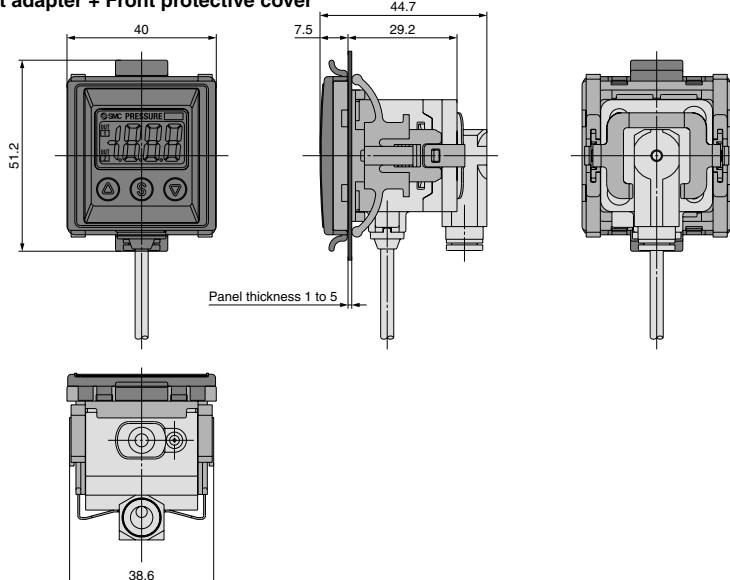
Panel mount adapter



ZSE40A(F)/ISE40A-C4-□F□

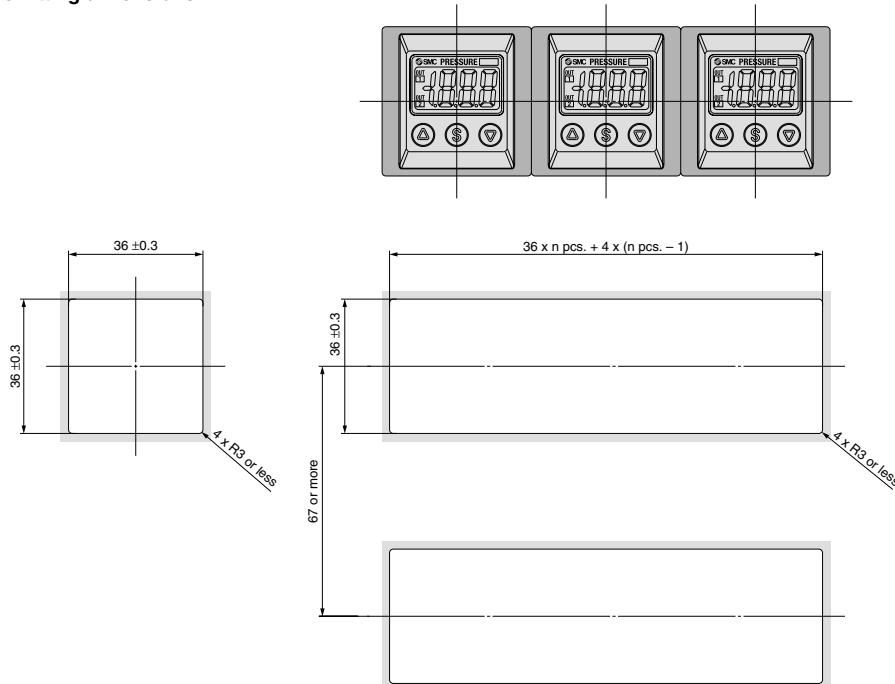
-C6-□F□

Panel mount adapter + Front protective cover



Dimensions

Panel fitting dimensions



Note) This is the minimum value for the piping method 01 or N01.

Take the piping material and tubing into account for design. When the corner is to have radius, it must be R3 or less.

Series ZSE40A(F)/ISE40A

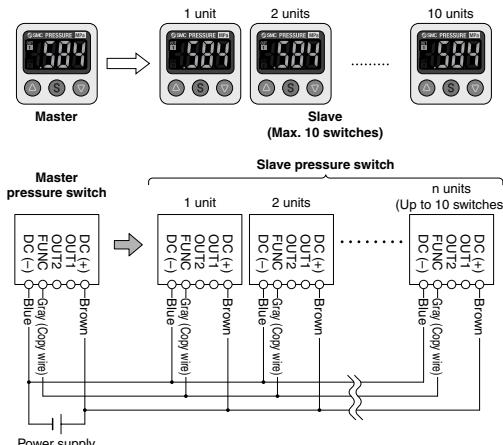
Function Details

A Copy function (F97)

The settings of the master sensor can be copied to the slave sensors, reducing setting labor and minimizing risk of mistakes in setting.

Can copy to up to 10 switches simultaneously.

(Maximum transmission distance 4 m)

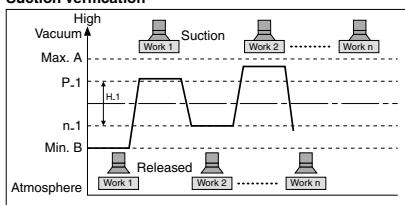


- 1) Wire as shown in the left figure.
- 2) Select the slave switch which is to be the master, and change it into a master using the buttons. (In the default setting, all switches are set as slaves.)
- 3) Press the button of the master switch to start copying.

B Auto-preset function (F4)

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

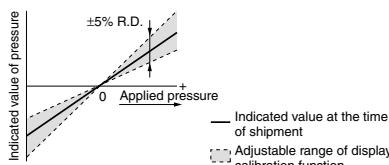


Formula for Obtaining the Set-Value

P_1 or P_2	H_1 or H_2
$P_1 (P_2) = A - (A-B)/4$	$H_1 (H_2) = (A-B)/2$

C Display calibration function (F6)

Fine adjustment of the indicated value of the pressure sensor can be made within the range of $\pm 5\%$ 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 $\pm 7\%$ F.S. of the pressure when ex-factory. (ZSE40AF (for compound pressure) $\pm 3.5\%$ F.S.)

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	Action
Overcurrent error	Er1	Load current of 80 mA or more is applied to the switch output (OUT1).	Eliminate the cause of the over current by turning off the power supply, and then turn on it again.
	Er2	Load current of 80 mA or more is applied to the switch output (OUT2).	
Residual pressure error	Er3	During zero-clear operation, pressure over $\pm 7\%$ F.S. is applied. (ZSE40AF (compound) $\pm 5\%$ F.S.) After 1 second, the mode will reset to measurement mode. $\pm 1\%$ F.S. of the zero-clear range varies between individual products.	Perform zero-clear operation again after restoring the applied pressure to an atmospheric pressure condition.
Applied pressure error	HHH	Supply pressure exceeds the maximum set pressure.	Reset applied pressure to a level within the set pressure range.
	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 about 1 second, the switch returns to the measuring mode.	The controller does not respond to the auto-shift signal. Check the equipment and machinery for this point.
System error	Er0	Internal data error	Turn off the power supply and then turn on it again. If the failure cannot be solved, please contact SMC for investigation.
	Er4		
	Er5		
	Er7		
	Er8		
	Er9		

If the failure cannot be solved after the above instructions are performed, please contact SMC for investigation.

H Anti-chattering function (F3)

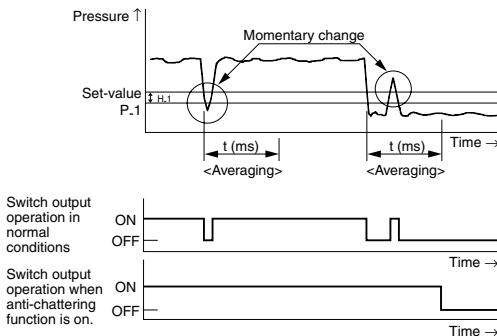
A large bore cylinder or ejector consumes a large volume of air in operation and may experience a temporary drop in the supply pressure. This function prevents detection of such temporary drops in the supply pressure as an error.

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.

Display unit	Pa		Gf		bar		PSI		inHg		mmHg	
	kPa	MPa*	kgf/cm ²	bar	psi	inHg	mmHg					
ZSE40A (vacuum pressure)	0.1	0.001	0.001	0.001	0.01	0.1	1					
ZSE40AF (compound pressure)	0.1	0.001	0.001	0.001	0.02	0.1	1					
ISE40A (positive pressure)	1	0.001	0.01	0.01	0.1	1	101.3					

* The ZSE40A (vacuum pressure) and ZSE40AF (compound pressure) will have different setting and display resolution when the unit is set to MPa.

Series ZSE40A(F)/ISE40A

Function Details

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

J Power-saving mode (F80)

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.)

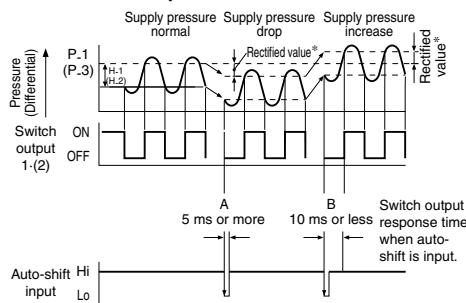
K Setting of secret code (F81)

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.

L Auto-shift function (F5)

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, "oo0" will be displayed for about 1 second, and the pressure value at that point will be saved as a rectified value "L_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	-105.0 to 105.0 kPa	-210 to 210 kPa
Vacuum pressure	10.0 to -105.0 kPa	115.0 to -115.0 kPa
Positive pressure	-0.105 to 1.050 MPa	-1.155 to 1.155 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.



Symbol

-X501**1 Lead wire length 3 m**

It has a lead wire extended to 3 meters.



* Refer to "How to Order" on page 21 for standard specifications.

How to Order**ZSE40A(F)/ISE40A - □ - □ - □ - X501**

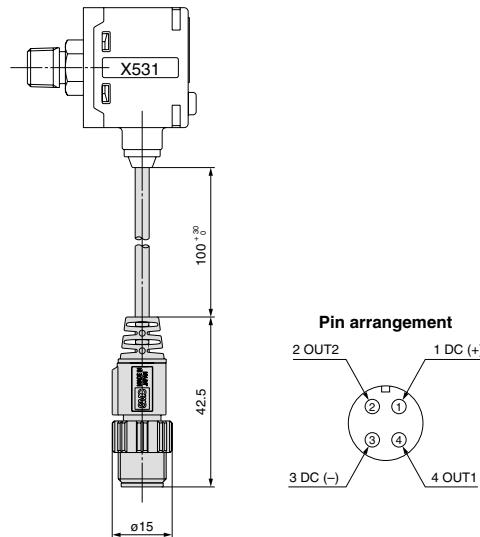
Piping specifications*
 Output specifications*
 Unit specifications/Option*

2 M12 4-pin pre-wired connector (Lead wire length 100 mm)**-X531**

* Refer to "How to Order" on page 21 for standard specifications.

How to Order**ZSE40A(F)/ISE40A - □ - □ - □ - X531**

Piping specifications*
 Unit specifications/Option*
 Output specifications
 X: NPN open collector 2 outputs
 Y: PNP open collector 2 outputs



Pressure Sensor

Pressure Control

Flow Sensor

Position Detection Switch

Reduced-wiring Fieldbus System

Static Electricity Elimination Equipment

Length Measuring

Alphabetical Index



Series ZSE40A(F)/ISE40A Specific Product Precautions 1

Be sure to read before handling.

Refer to back page 1 for Safety Instructions, "Handling Precautions for SMC Products" (M-E03-3) for Pressure Switches Precautions.

Handling

⚠ Caution

1. Do not drop, bump, or apply excessive impacts (100 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 7 to 9 N·m when connecting the pipe to the switch. Exceeding this torque may cause the switch to malfunction.
4. Do not use pressure sensors with corrosive and/or flammable gases or liquids.

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

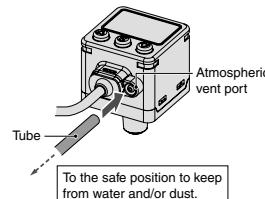
⚠ Warning

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.

Operating Environment

⚠ Caution

1. Do not use the product in a place where it could be splashed by oils or solvents.
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 $\phi 4$ tube (I.D. $\phi 2.5$) 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 tube or close the hole of it. It causes malfunction with the measurement of positive pressure.



* Make sure that the tube is inserted to the end of the atmospheric vent port.

* Use SMC tubing, TU0425. (Material: Polyurethane, Tube O.D. $\phi 4$, I.D. $\phi 2.5$)

3. 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.



Series ZSE40A(F)/ISE40A

Specific Product Precautions 2

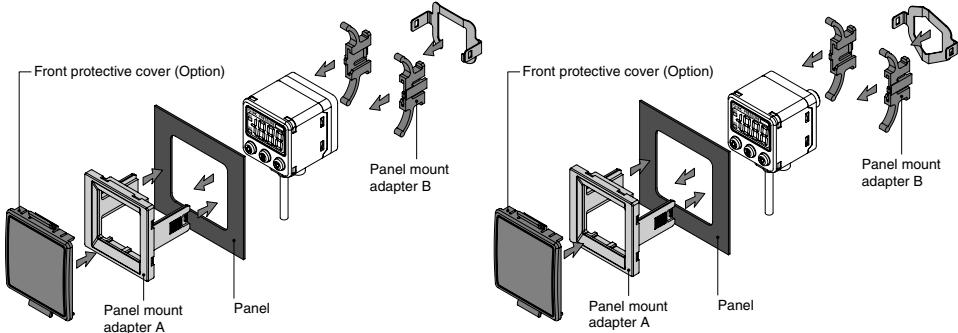
Be sure to read before handling.

Refer to back page 1 for Safety Instructions, "Handling Precautions for SMC Products" (M-E03-3) for Pressure Switches Precautions.

Mounting

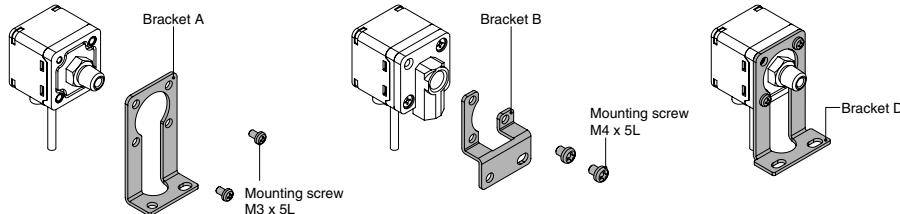
⚠ Caution

1. Mounting with panel mount adapter



2. Mounting with a bracket

Mount a bracket to the using two 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 0.5 to 0.7 N·m for M3 and 1.4 to 1.6 N·m for M4.

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.

