2-Color Display High-Precision Digital Pressure Switch

Series ZSE40A(F)/ISE40A

RoHS IP65

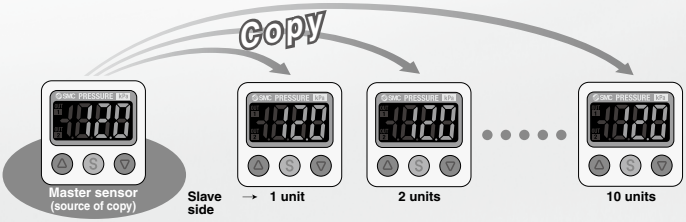
New
M8 connector type

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.

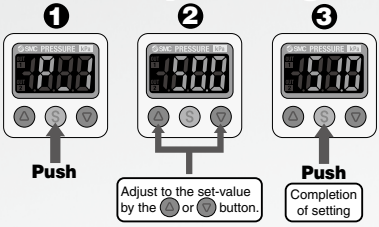
- **Reducing setting labor**
- **Minimizing risk of mistakes in setting**



Easy handling!

Raised rubber switch buttons for easy and comfortable operation

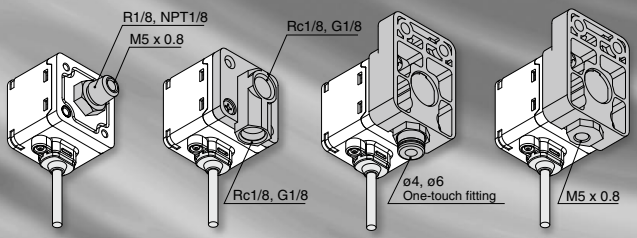
3-step setting



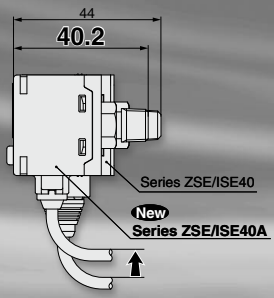
2-color display

See abnormal values at a glance.

Piping Variations

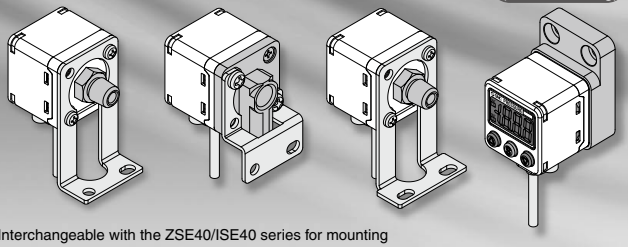


Space-saving

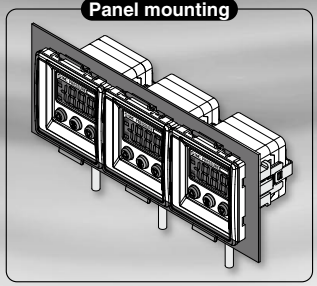


Mounting Variations

Bracket A | Bracket B | Bracket D | Direct mounting (Wall mounting)



Panel mounting



Interchangeable with the ZSE40/ISE40 series for mounting

Series

Series	ZSE40A (vacuum pressure)	ZSE40AF (compound pressure)	ISE40A (positive pressure)
Rated pressure range	0.0 to –101.3 kPa (0 / –101 kPa)	–100.0 to 100.0 kPa (100 kPa / 0 / –100 kPa)	–0.100 to 1.000 MPa (1 MPa / 0 / –0.1 MPa (–100 kPa))
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
Min. unit setting	0.1 kPa	0.1 kPa	0.001 MPa
Output	• NPN or PNP open collector 2 outputs (with copy function) • NPN or PNP open collector 2 outputs + Analog output (voltage or current)/Auto-shift input		
Piping	R1/8, NPT1/8 (With M5 female thread), Rc1/8, G1/8, M5 female thread ø4, ø6 One-touch fitting		

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.

1/1000 | 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.

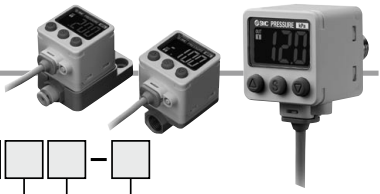
Stick the label (enclosed with the product) of a desired unit seal.

SMC

2-Color Display High-Precision Digital Pressure Switch

Series ZSE40A(F)/ISE40A

RoHS



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; M5 x 0.8
N01	NPT1/8 (With M5 female thread)	
W1	Rc1/8	Rc1/8, G1/8; Rc1/8, G1/8
WF1*	G1/8*1	
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	

* Made to Order
* Conforming to ISO228-1.

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

Option 1			Piping						
Description	Symbol	Part no.	01	N01	W1	WF1	M5	C4	C6
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

X	NPN open collector 2 outputs (with copy function)
Y	PNP open collector 2 outputs (with copy function)
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

Options 1/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

Nil	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) Unit: kPa, MPa

Made to Order

Symbol	Specifications/Description
X501	Lead wire length 3 m
X531	M12 4-pin pre-wired connector (Lead wire length 100 mm)

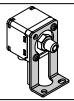
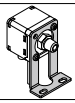
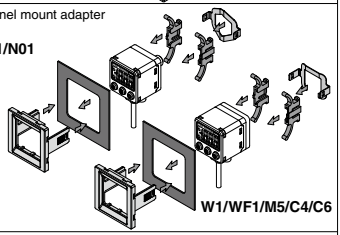
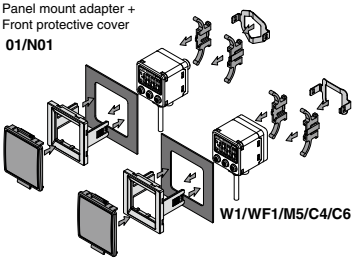
Refer to page 799 for details.

Option 2

Symbol	Calibration certificate Note)
Nil	—
K	○

Note) All texts in both English and Japanese

Option 1*

Nil	None
A	Bracket A 
B	Bracket B
D	Bracket D 
E	Panel mount adapter  01/N01 W1/WF1/M5/C4/C6
F	Panel mount adapter + Front protective cover  01/N01 W1/WF1/M5/C4/C6

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

How to Order [For M8 (3 pins) connector]

Rated pressure range

ISE40A	−0.1 to 1.000 MPa

For positive pressure **ISE40A** − **01** − **N** − **M** **L** □ □

For vacuum **ZSE40A** − **01** − **N** − **M** **L** □ □

Rated pressure range

ZSE40A	0.0 to −101.3 kPa

Piping specifications

01	R1/8 (M5 female threaded)
N01	NPT1/8 (M5 female threaded)

Output specifications

N	NPN open collector 1 output
P	PNP open collector 1 output

Unit specifications

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

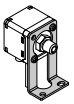
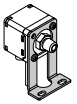
Note 1) Under the New Measurement Law, Unit specifications sales of switches with the unit switching function are not allowed for use in Japan.
Note 2) Unit kPa, MPa

Option 2

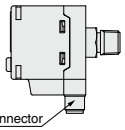
Symbol	Operation manual Note)	Calibration certificate Note)
Nil	●	—
Y	—	—
K	●	●
T	—	●

Note) All texts in both English and Japanese

Option 1

Nil	None
A	Bracket A 
D	Bracket D 

M8 connector type∗

L	

∗ No lead wires are connected.

Options 1/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-D	Bracket D Mounting screw M3 x 5L, M4 x 5L (2 pcs. for each)

For details about the Pressure Switch Precautions, refer to pages 763 and 764. For details about the Specific Product Precautions, refer to the Operation Manual at SMC website.

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 ±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 1 output or 2 outputs		
	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			±0.2% F.S. ±1 digit		
Hysteresis	Hysteresis mode		Variable (0 or above) Note 1)		
	Window comparator mode				
Analog output	Voltage output Note 2)	Output voltage (Rated pressure range)	1 to 5 V ±2.5% F.S.		0.6 to 5 V ±2.5% F.S.
		Linearity	±1% F.S.		
		Output impedance	Approx. 1 kΩ		
	Current output Note 3)	Output current (Rated pressure range)	4 to 20 mA ±2.5% F.S.		2.4 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		
Environment	Enclosure		IP65		
	Operating temperature range Note 4)		Operating: –5 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		1000 VAC for 1 minute between terminals and housing		
	Insulation resistance		50 MΩ or more (500 VDC measured via megohmmeter) between terminals and housing		
Temperature characteristics			±2% F.S. (25°C reference)		
Lead wire			Oilproof 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, UL/CSA (E216656), RoHS		

Note 1) If the applied pressure 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.
Note 4) UL temperature rating: The maximum ambient temperature is 50°C.

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, NBR	
Weight		78 g	79 g	97 g		104 g	101 g	
	M8 connector	45 g	46 g	–			–	

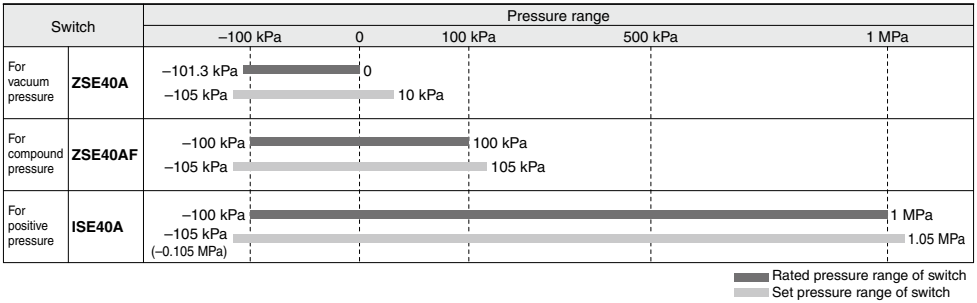
Set Pressure Range and Rated Pressure Range

Set the pressure within the rated pressure range.

The set pressure range is the range of pressure that is possible in setting.

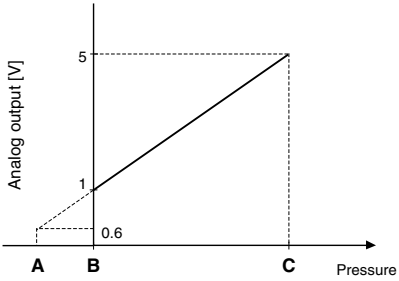
The rated pressure range is the range of pressure that satisfies the specifications (accuracy, linearity, etc.) on the switch.

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.

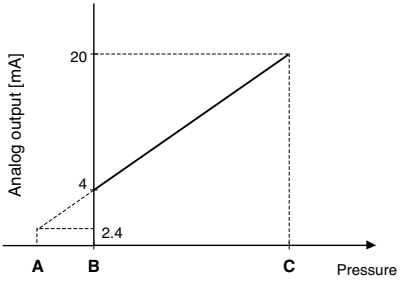


Analog Output

Voltage output



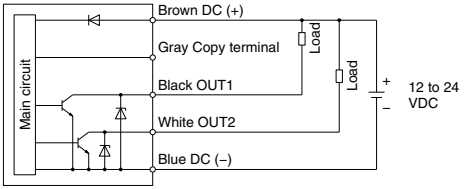
Current output



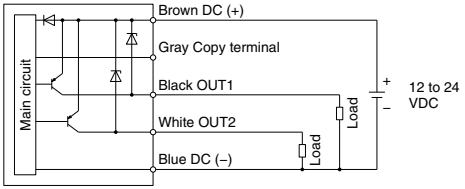
Range	Rated pressure range	A	B	C
For vacuum pressure	0.0 to –101.3 kPa	10.1 kPa	0	–101.3 kPa
For compound pressure	–100.0 to 100.0 kPa	—	–100.0 kPa	100.0 kPa
For positive pressure	–0.100 to 1.000 MPa	–0.100 MPa	0	1.000 MPa

Internal Circuits and Wiring Examples

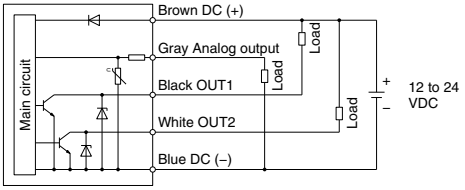
-X
NPN (2 outputs) + Copy function



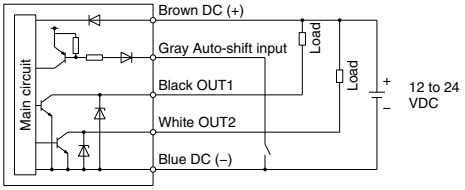
-Y
PNP (2 outputs) + Copy function



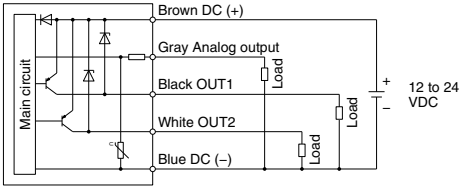
-R/-S
-R: NPN (2 outputs) + Analog voltage output
-S: NPN (2 outputs) + Analog current output



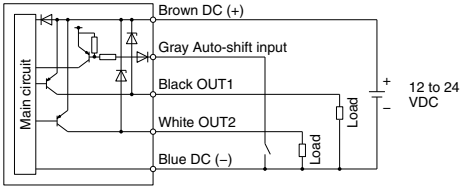
-R/-S
NPN (2 outputs) + Auto-shift input



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

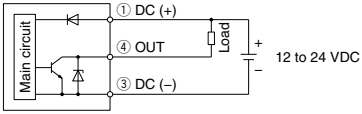


-T/-V
PNP (2 outputs) + Auto-shift input

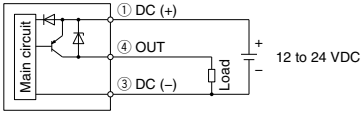


For M8 connector, 3 pins

-N
NPN (1 output)

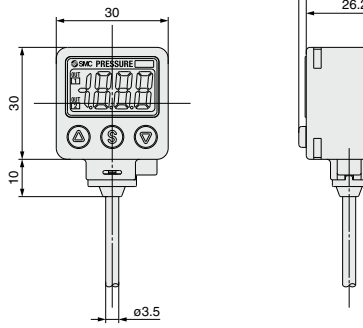


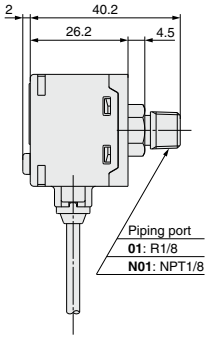
-P
PNP (1 output)

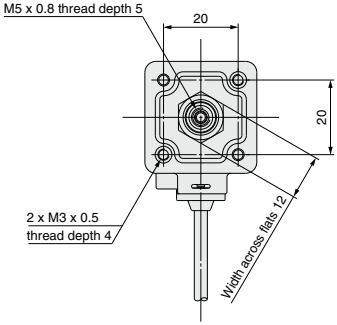


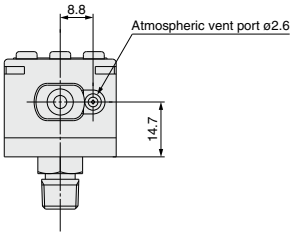
Dimensions (For details about lead wires, refer to the product specifications.)

ZSE40A(F)/ISE40A-01
-N01



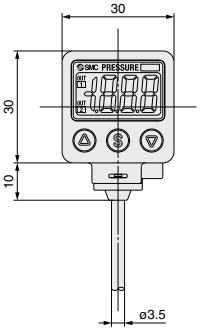


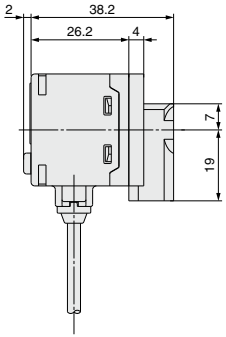


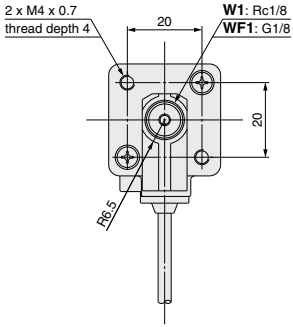


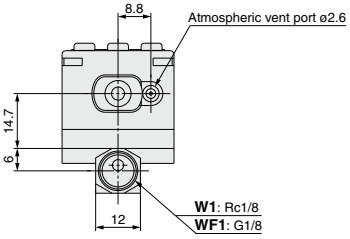
When the pressure switch is used in a place where water and dust splashes may occur, insert a tube into the atmospheric vent port, and route the other end of the tube to a safe place away from water and dust.
* SMC TU0425 (polyurethane, O.D. ø4, I.D. ø2.5) suits to the pressure switch.

ZSE40A(F)/ISE40A-W1
-WF1





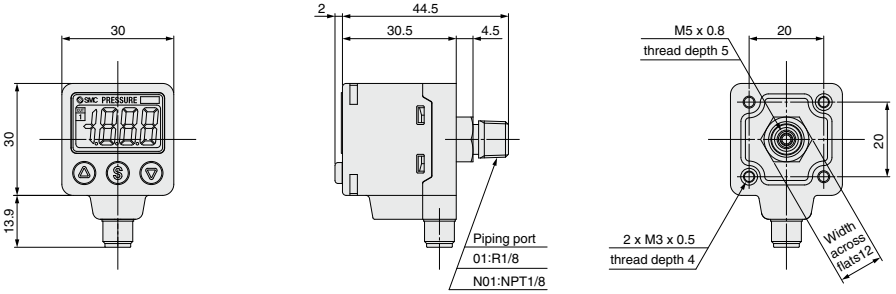


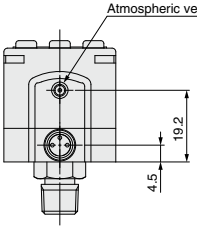


When the pressure switch is used in a place where water and dust splashes may occur, insert a tube into the atmospheric vent port, and route the other end of the tube to a safe place away from water and dust.
* SMC TU0425 (polyurethane, O.D. ø4, I.D. ø2.5) suits to the pressure switch.

Dimensions/For M8 (3-pin) connector

ZSE40A/ISE40A-01-□-□L
-N01-□-□L



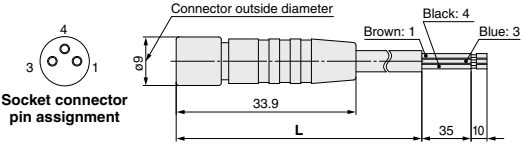


When the pressure switch is used in a place where water and dust splashes may occur, insert a tube into the atmospheric vent port, and route the other end of the tube to a safe place away from water and dust.
∗ SMC TU0425 (polyurethane, O.D. ø4, I.D. ø2.5) suits to the pressure switch.

Body side plug connector pin assignment

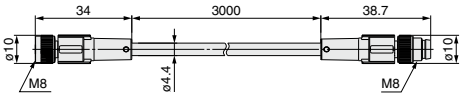
1	DC(+)
3	DC(–)
4	OUT

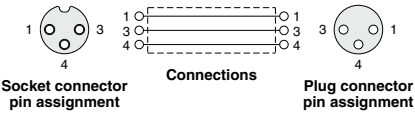
M8 (3-pin) cable with connector
V100-49-1-□



Cable length(**L**)	Part no.
300 mm	V100-49-1-1
500 mm	V100-49-1-2
1000 mm	V100-49-1-3
2000 mm	V100-49-1-4
5000 mm	V100-49-1-7

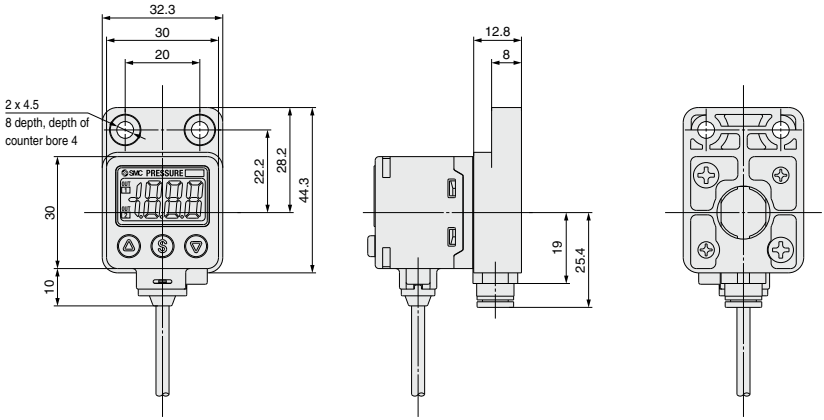
PCA-1557772

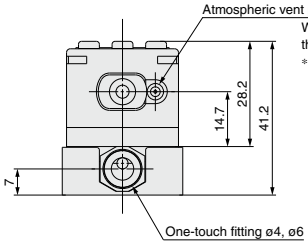




Dimensions (For details about lead wires, refer to the product specifications.)

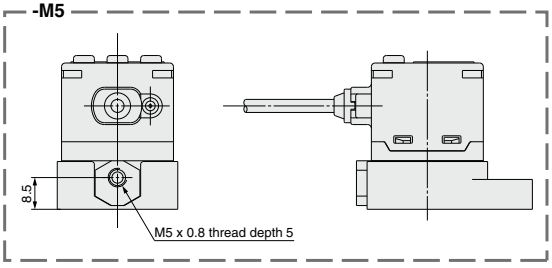
ZSE40A(F)/ISE40A-C4
-C6





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.

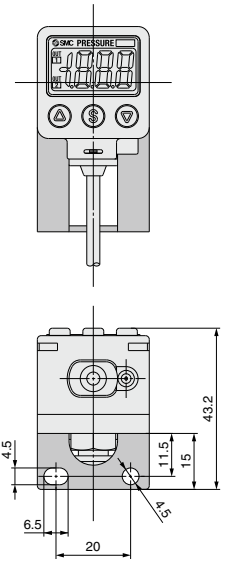
-M5

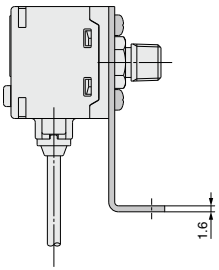


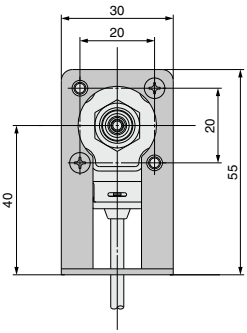
Dimensions (For details about lead wires, refer to the product specifications.)

ZSE40A(F)/ISE40A-01-□-□A□
-N01-□-□A□

With bracket A

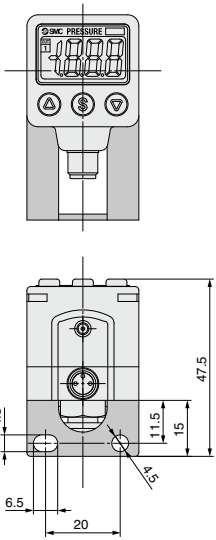


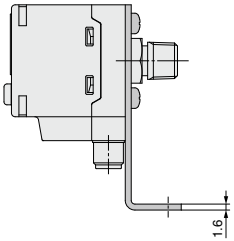


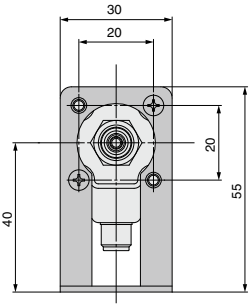


For M8 (3-pin) connector
ZSE40A/ISE40A-01-□-□LA
-N01-□-□LA

With bracket A



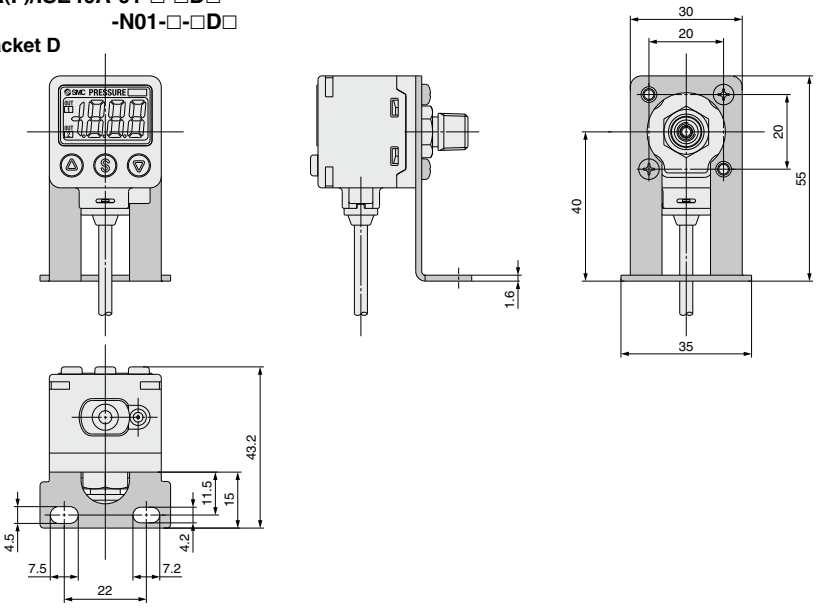




Dimensions (For details about lead wires, refer to the product specifications.)

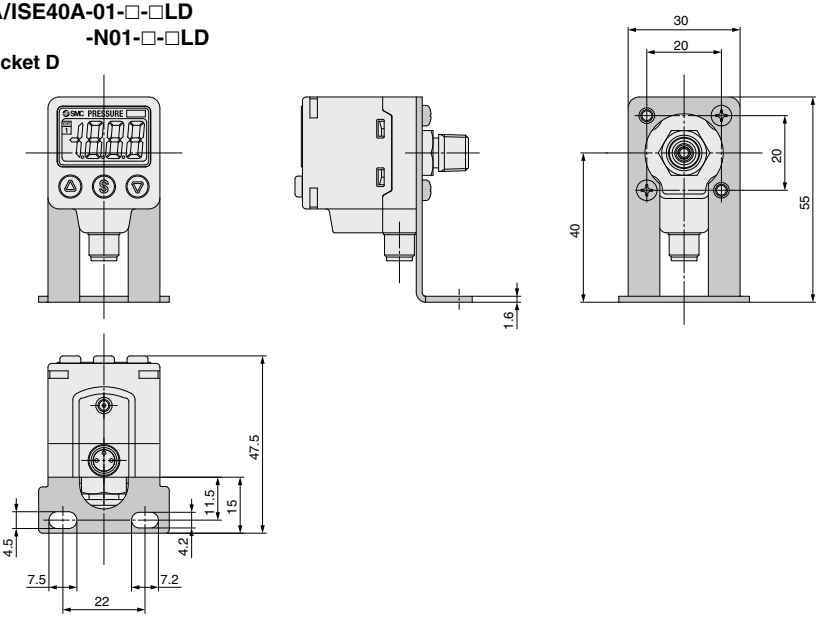
ZSE40A(F)/ISE40A-01-□-□D□
-N01-□-□D□

With bracket D



For M8 (3-pin) connector
ZSE40A/ISE40A-01-□-□LD
-N01-□-□LD

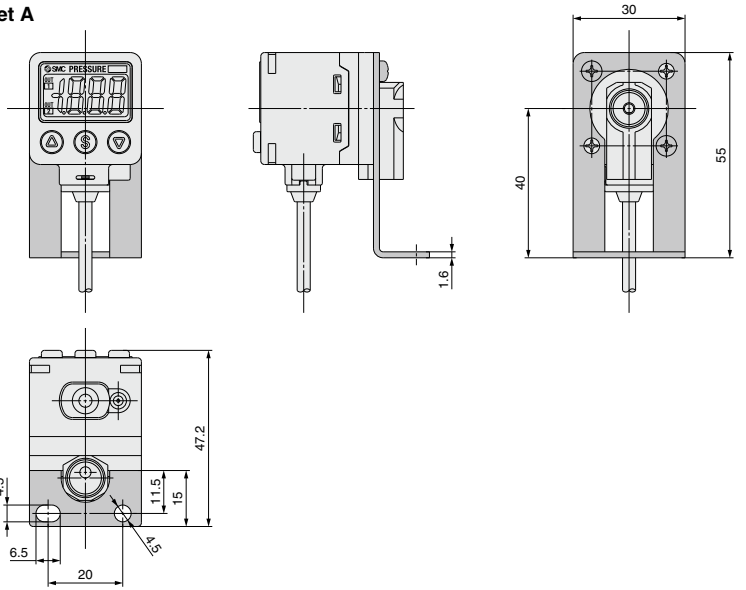
With bracket D



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

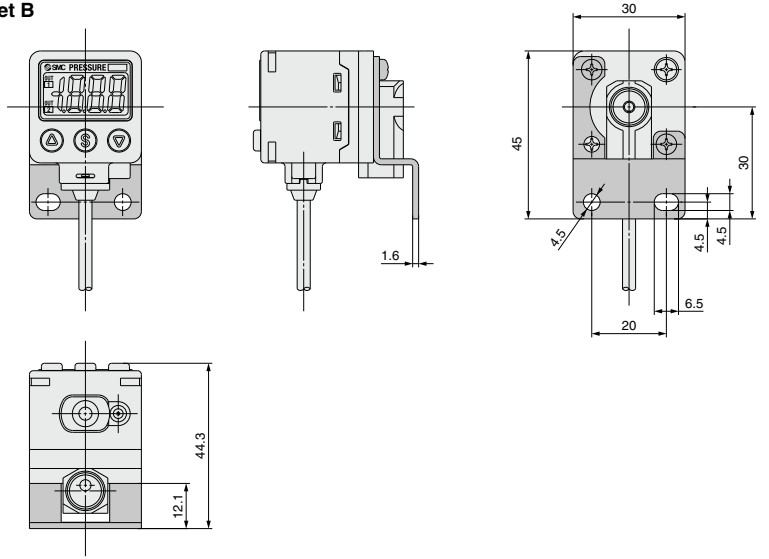
ZSE40A(F)/ISE40A-W1-□-□A□
-WF1-□-□A□

With bracket A



ZSE40A(F)/ISE40A-W1-□-□B□
-WF1-□-□B□

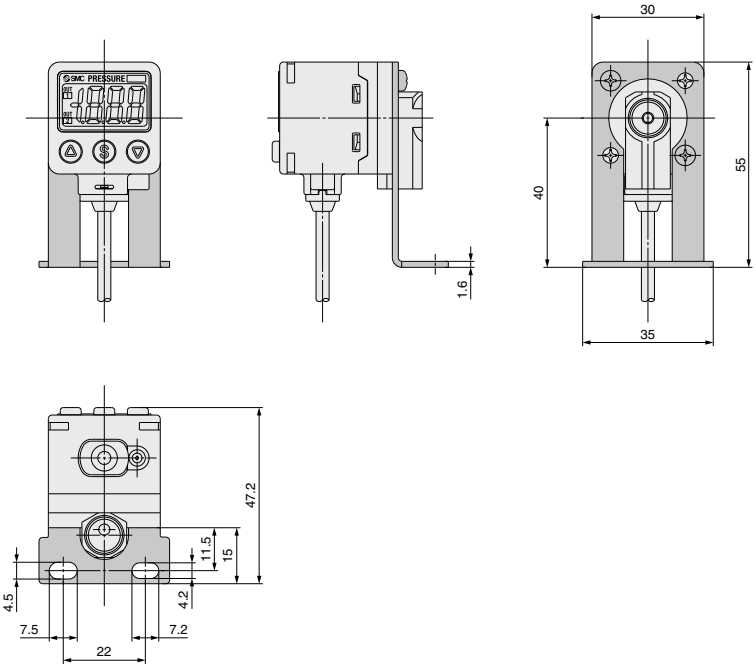
With bracket B



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

ZSE40A(F)/ISE40A-W1-□-□D□
-WF1-□-□D□

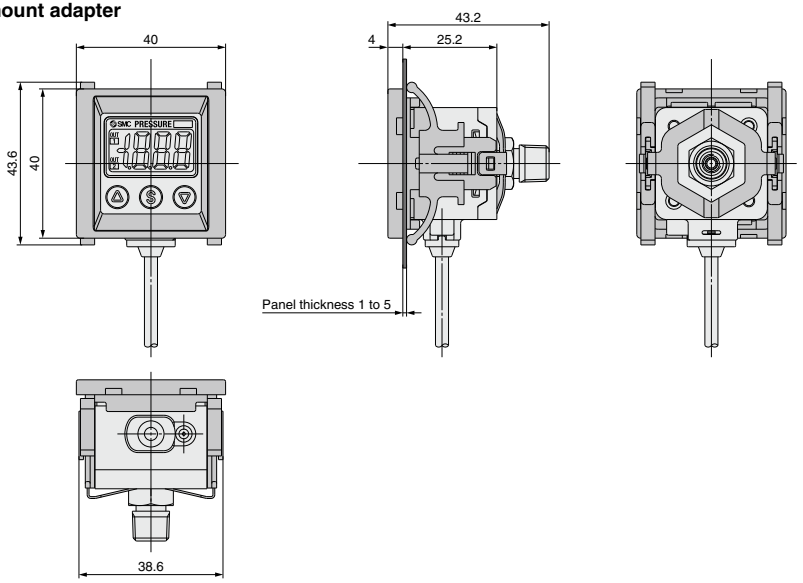
With bracket D



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

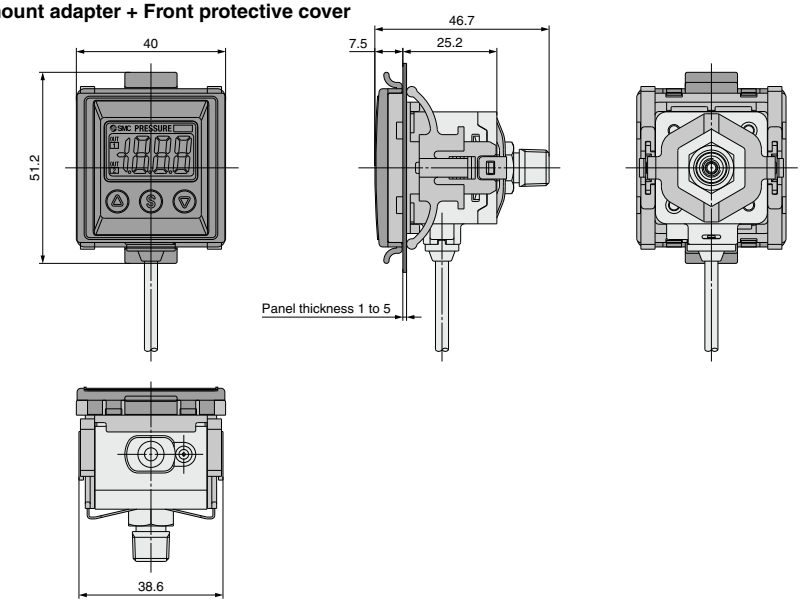
ZSE40A(F)/ISE40A-01-□-□E□
-N01-□-□E□

Panel mount adapter



ZSE40A(F)/ISE40A-01-□-□F□
-N01-□-□F□

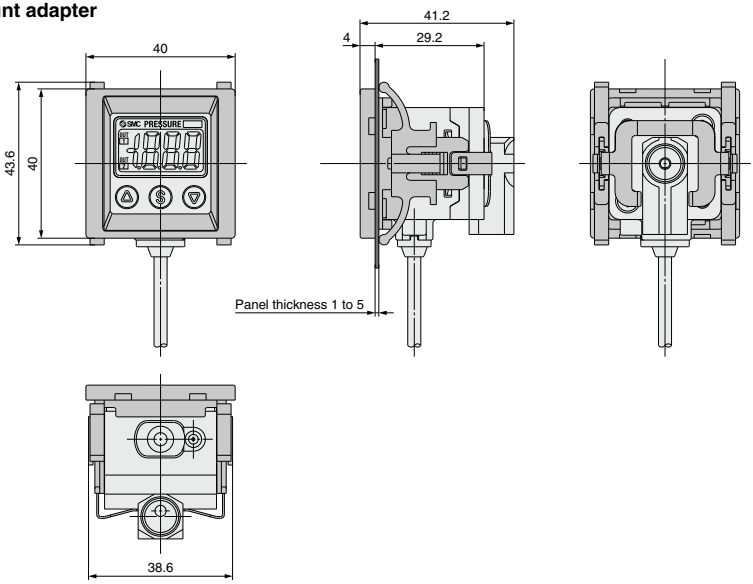
Panel mount adapter + Front protective cover



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

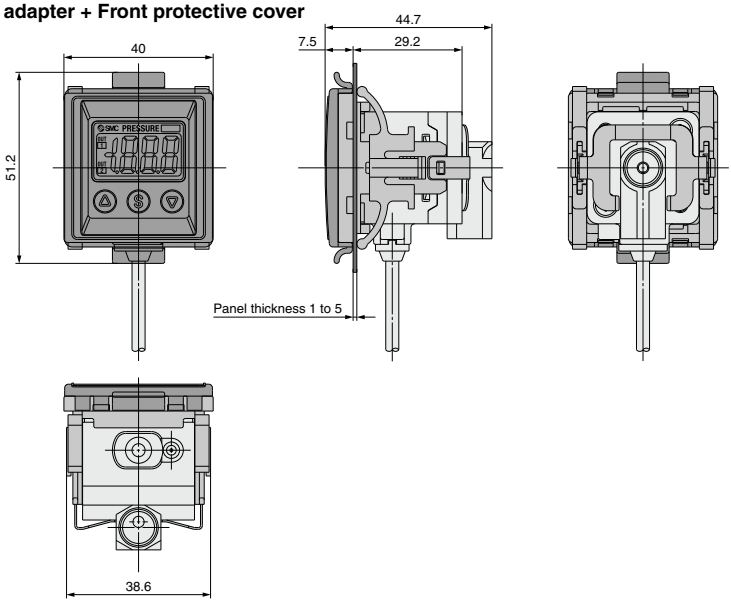
ZSE40A(F)/ISE40A-W1-□-□E□
-WF1-□-□E□

Panel mount adapter



ZSE40A(F)/ISE40A-W1-□-□F□
-WF1-□-□F□

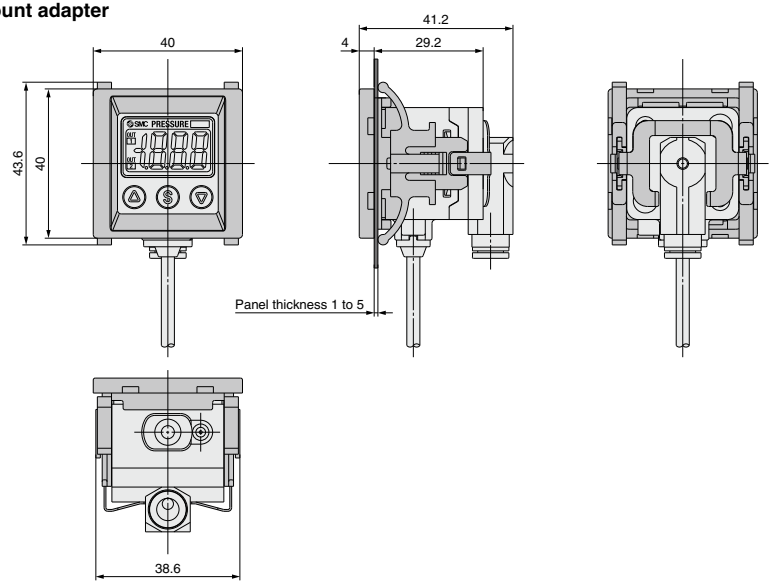
Panel mount adapter + Front protective cover



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

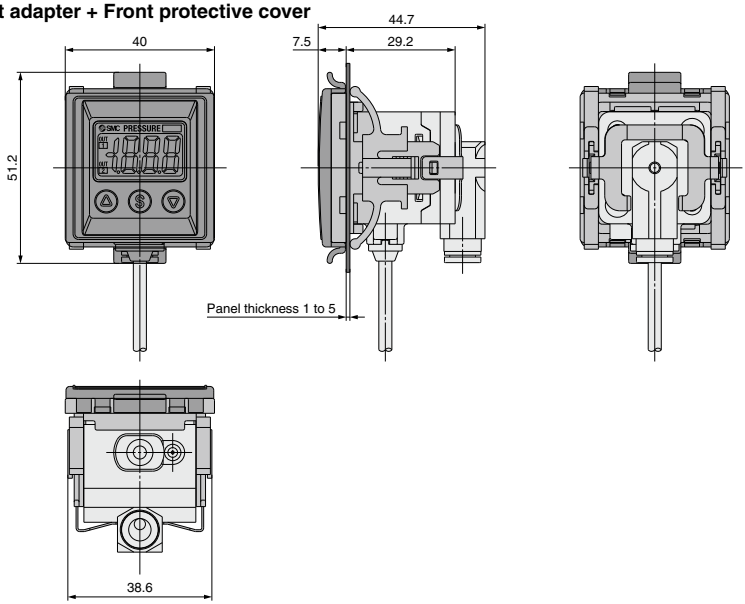
ZSE40A(F)/ISE40A-C4-□E□
-C6-□E□

Panel mount adapter



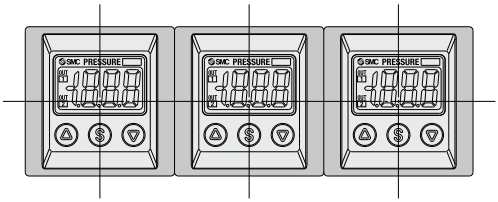
ZSE40A(F)/ISE40A-C4-□F□
-C6-□F□

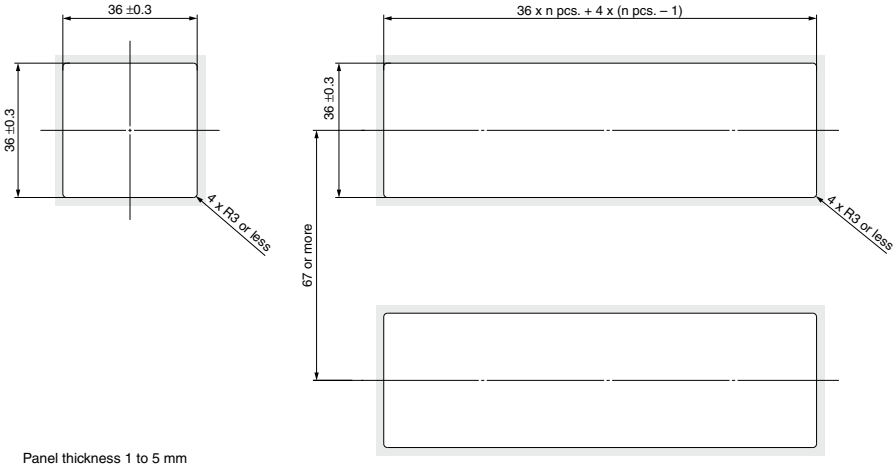
Panel mount adapter + Front protective cover



Dimensions

Panel fitting dimensions





Panel thickness 1 to 5 mm

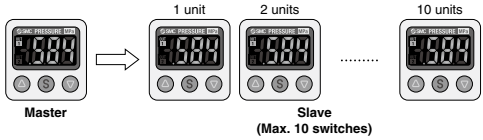
Note) This is the minimum value for the piping method 01 or N01.
Take the piping material and tubing into account for design. When the corner is to have radius, it must be R3 or less.

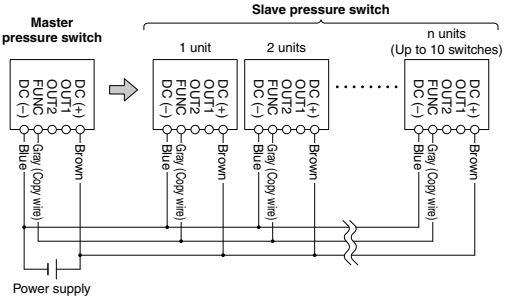
Function Details

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

A 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)



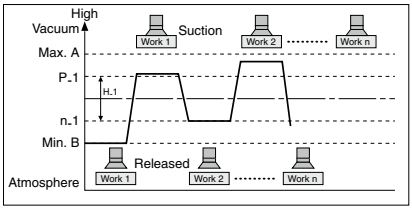


1) Wire as shown in the left figure.
2) Select the slave switch which is to be the master, and change it into a master using the buttons. (In the default setting, all switches are set as slaves.)
3) Press the Ⓢ button of the master switch to start copying.

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

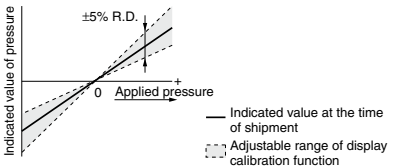


Formula for Obtaining the Set-Value

P_1 or P_2	H_1 or H_2
P_1 (P_2) = A – (A-B)/4 n_1 (n_2) = B + (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 ±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 ±7% F.S. of the pressure when ex-factory. (ZSE40AF (for compound pressure) ±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	Er 1	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 ±7% F.S. is applied. (ZSE40AF (compound) ±3.5% F.S.) After 1 second, the mode will reset to measurement mode. ±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		
	Er6		
	Er7		
	Er8		
	Er9		

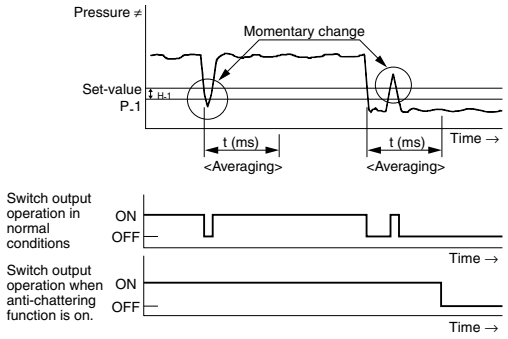
If the failure cannot be solved after the above instructions are performed, please contact SMC for investigation.

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 / Minimum unit setting	PR kPa	PR MPa∗	GF kgf/cm²	bAr bar	PSI psi	inH inHg	mmH 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		

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

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.)

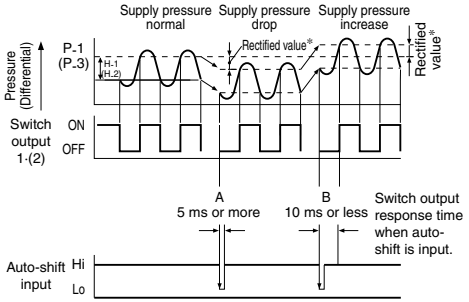
K Setting of secret code (F81)

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, "ooo" will be displayed for about 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.

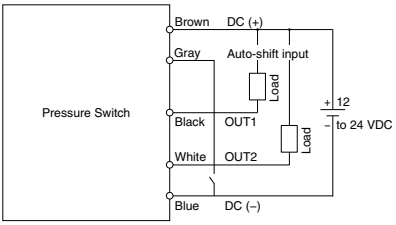
Settable Range for Auto-Shift Input

	Set pressure range	Settable range
Compound pressure	–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

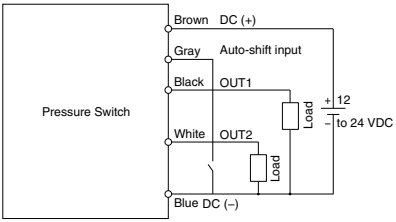
Auto-shift zero
The basic function of auto-shift zero is the same as the function for auto-shift. Also, it corrects values on the display, based on a pressure value of "0", when the auto-shift is selected.

Connection example of auto-shift function

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



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



Made to Order

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

Made to Order

Symbol **-X501**

1 Lead Wire Length 3 m

It has a lead wire extended to 3 meters.

How to Order

∗ Refer to "How to Order" on page 781 for standard specifications.

ZSE40A(F)/ISE40A – □ – □ – □ – X501

- Piping specifications∗
- Output specifications∗
- Unit specifications/Option∗

Symbol **-X531**

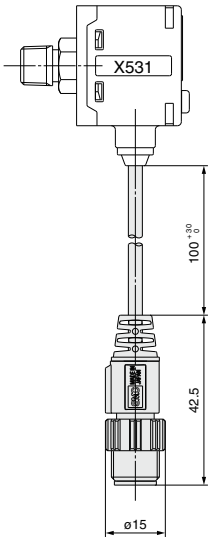
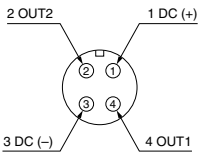
2 M12 4-pin Pre-wired Connector (Lead wire length 100 mm)

How to Order

∗ Refer to "How to Order" on page 781 for standard specifications.

ZSE40A(F)/ISE40A – □ – □ – □ – X531

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



Pin arrangement