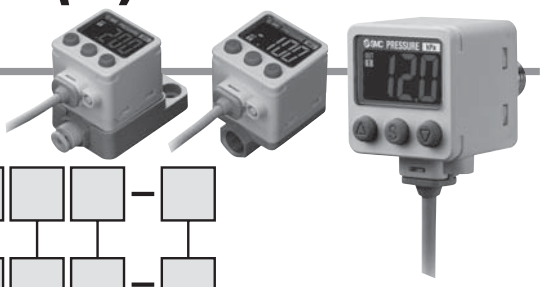
2-Color Display High Precision Digital Pressure Switch

Series 10-ZSE40A(F)/10-ISE40A



How to Order

Clean Series

Rated pressure range

ISE40A	–0.1 to 1.000 MPa

For positive pressure: 10 – ISE40A – 01 – X – M □ □ – □

For vacuum/compound pressure: 10 – 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	
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

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	10-ZS-24-A	○	○	○	○	×	×	×
Bracket B	B	10-ZS-24-B	×	×	○	○	×	×	×
Bracket D	D	10-ZS-24-D	○	○	○	○	×	×	×
Panel mount adapter	E	10-ZS-35-C	○	○	×	×	×	×	×
		10-ZS-35-D	×	×	○	○	○	○	○
Panel mount adapter + Front protective cover	F	10-ZS-35-F	○	○	×	×	×	×	×
		10-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
10-ZS-24-A	Bracket A With 2 mounting screws each of M3 x 5L, M4 x 5L
10-ZS-24-B	Bracket B With 2 mounting screws M4 x 5L
10-ZS-24-D	Bracket D With 2 mounting screws each of M3 x 5L, M4 x 5L
10-ZS-35-C	Panel mount adapter (Piping: For 01/N01)
10-ZS-35-D	Panel mount adapter (Piping: For W1/WF1/M5/C4/C6)
10-ZS-35-F	Panel mount adapter + Front protective cover (Piping: For 01/N01)
10-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) Fixed unit:
For vacuum/compound pressure: kPa
For positive pressure: MPa

Made to Order

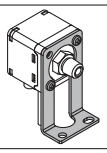
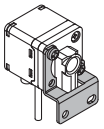
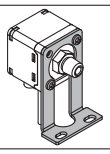
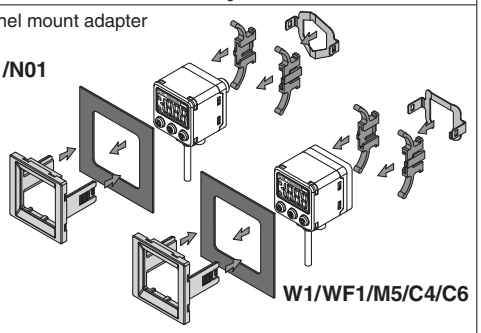
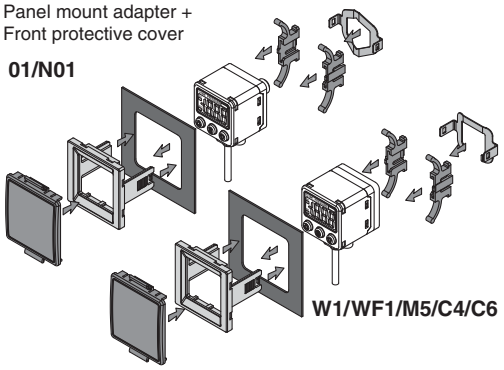
Symbol	Specifications/Description
X501	Lead wire length 3 m

Refer to page 17 for details.

Option 2

Symbol	Calibration certificate
Nil	—
K	○

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".

⚠Caution

This product is 10-ZSE40A(F)/ISE40A series blown with air and double packed in a Class M3.5 (ISO Class 5) clean room.

Specifications

Model			10-ZSE40A (vacuum pressure)	10-ZSE40AF (compound pressure)	10-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 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			±0.2% F.S. ±1 digit		
Hysteresis	Hysteresis mode		Variable (0 or above) Note 1)		
	Window comparator mode				
Analog output	Note 2) Voltage output	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. or less		
		Output impedance	Approx. 1 kΩ		
	Note 3) Current output	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. or less		
		Load impedance	Maximum load impedance: 300 Ω (Power supply voltage 12 V) 600 Ω (Power supply voltage 24 V) Minimum load impedance: 50 Ω		
Auto-shift input			Non-voltage input (Reed or Solid state), Low level: 0.4 V or less, 5 ms or longer input		
Display			3 1/2-digit, 7-segment, 2-color LCD (Red/Green)		
Display accuracy			±2% F.S. ±1 digit (Ambient temperature of 25 ±3°C)		
Indicator light			Lights up when output is turned ON. OUT1, OUT2: Orange		
Environment resistance	Enclosure		IP65		
	Operating temperature range		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 live parts and case		
	Insulation resistance		50 MΩ or more between live parts and case (at 500 VDC Mega)		
Temperature characteristics			±2% F.S. (Based on 25°C)		
Lead wire			Oilproof heavy-duty vinyl cable ø3.5, 2 m Conductor area: 0.15 mm^2 (AWG26) Insulator O.D.: 0.95 mm		
Standards			CE marking, UL (CSA), RoHS compliance		

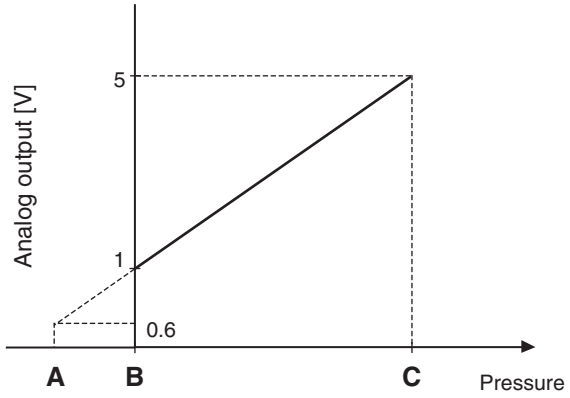
Note 1) If the applied voltage fluctuates around the set-value, the hysteresis must be set to a value more than the fluctuating width, otherwise chattering will occur.
Note 2) When the analog voltage output is selected, the analog current output cannot be selected.
Note 3) When the analog current output is selected, the analog voltage output cannot be selected.

Piping Specifications

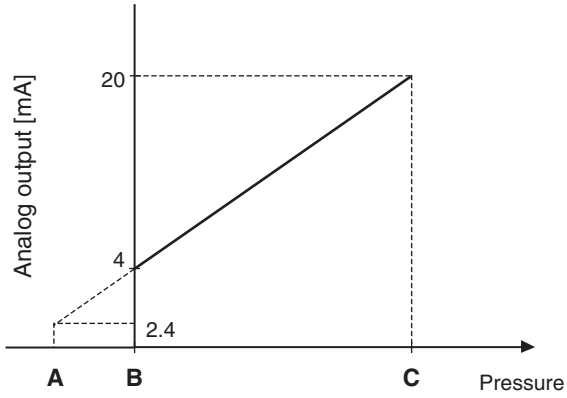
Part no.		01	N01	W1	WF1	M5	C4	C6
Port size		R1/8 (With M5 female thread)	NPT1/8 (With M5 female thread)	Rc1/8	G1/8	M5 x 0.8 female thread	ø4 one-touch fitting	ø6 one-touch fitting
Material of parts in contact with fluid	Sensor pressure receiving area	Silicon						
	Piping port	C3602 (Electroless nickel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

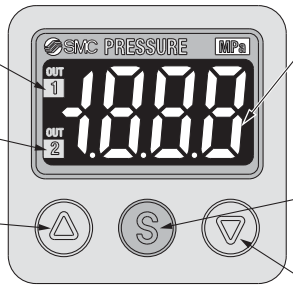
Lights up when OUT1 is turned ON.

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

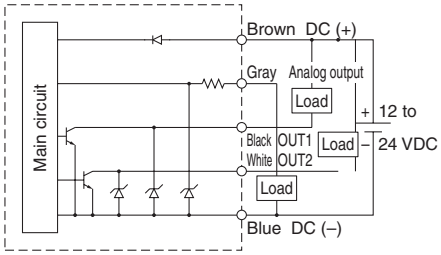
Use this button to change the mode or confirm the set-value.

▽ 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.

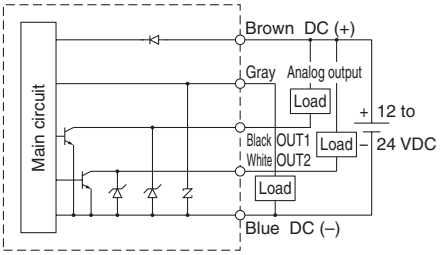
Internal Circuits and Wiring Examples

-R
NPN (2 outputs) + Analog voltage output



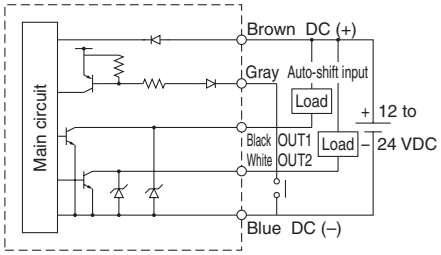
Max. 28 V, 80 mA
Residual voltage 1 V or less

-S
NPN (2 outputs) + Analog current output



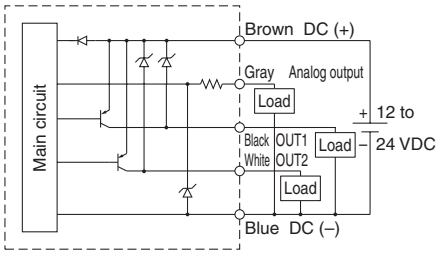
Max. 28 V, 80 mA
Residual voltage 1 V or less

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



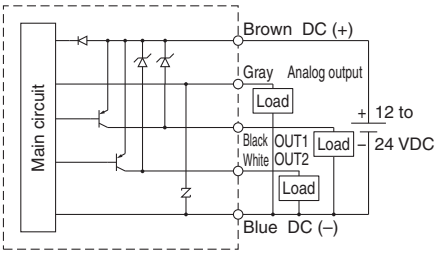
Max. 28 V, 80 mA
Residual voltage 1 V or less

-T
PNP (2 outputs) + Analog voltage output



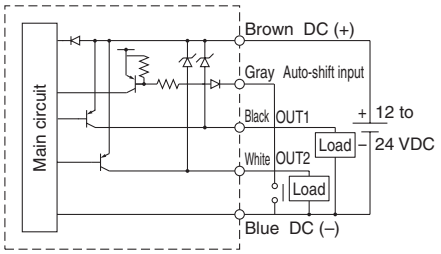
Max. 80 mA
Residual voltage 1 V or less

-V
PNP (2 outputs) + Analog current output



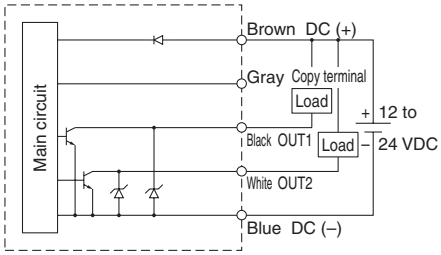
Max. 80 mA
Residual voltage 1 V or less

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



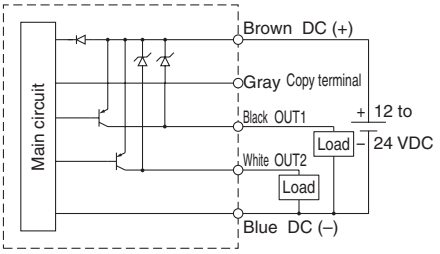
Max. 80 mA
Residual voltage 1 V or less

-X
NPN (2 outputs) + Copy function



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

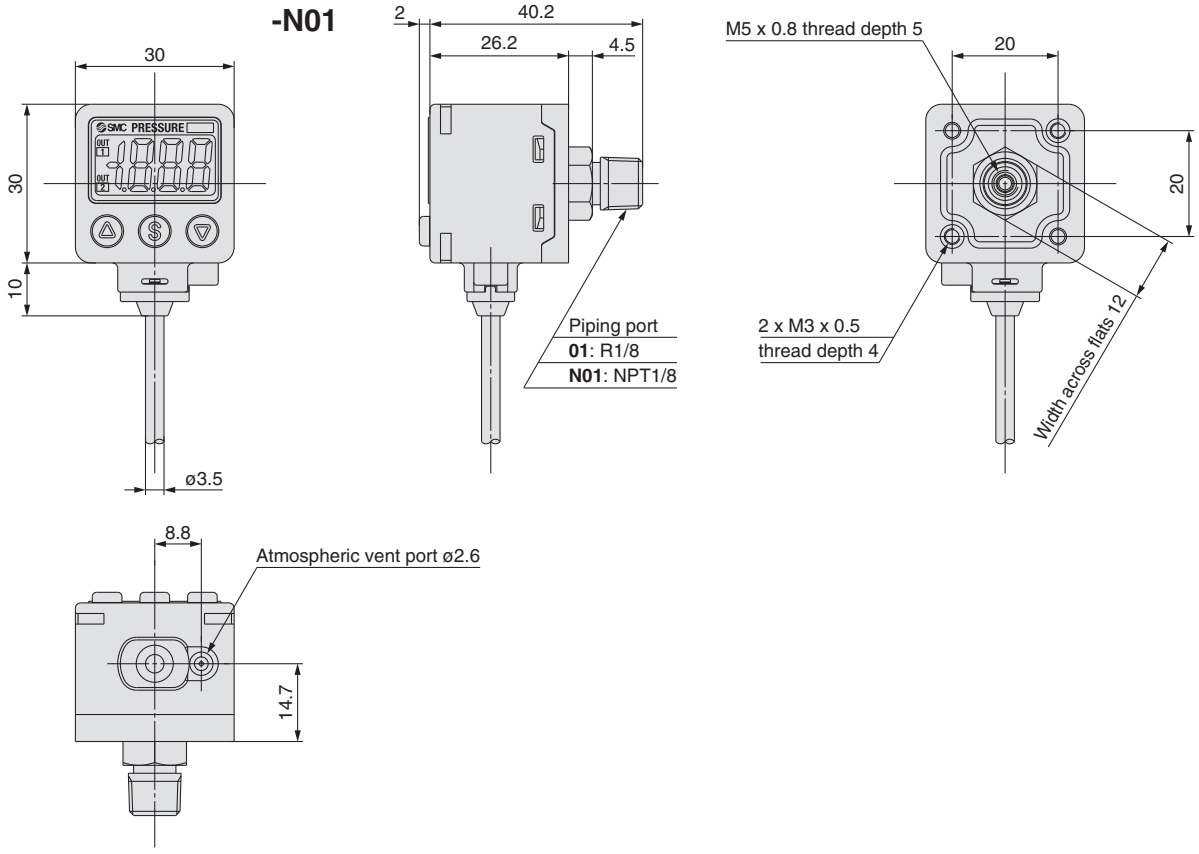
-Y
PNP (2 outputs) + Copy function



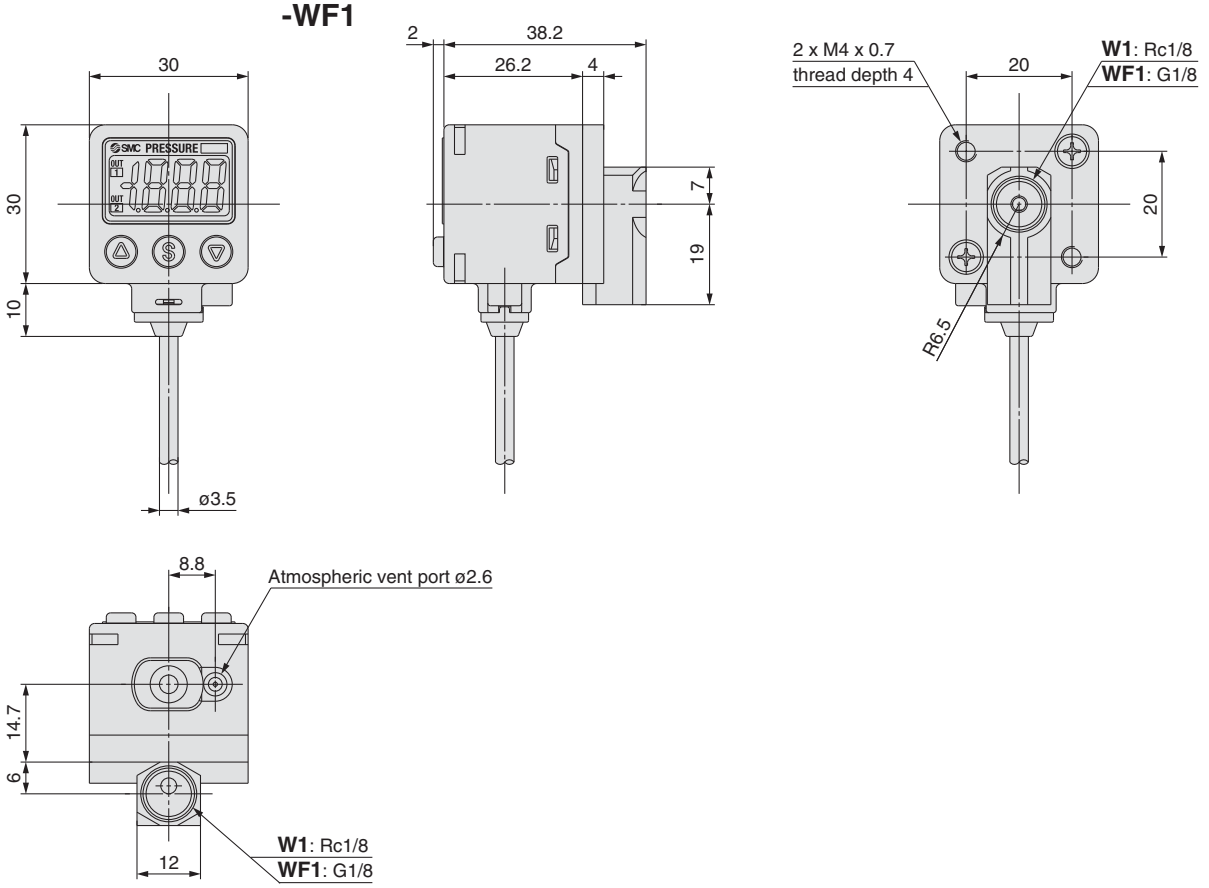
Max. 80 mA
Residual voltage 1 V or less

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

10-ZSE40A(F)/10-ISE40A-01
-N01

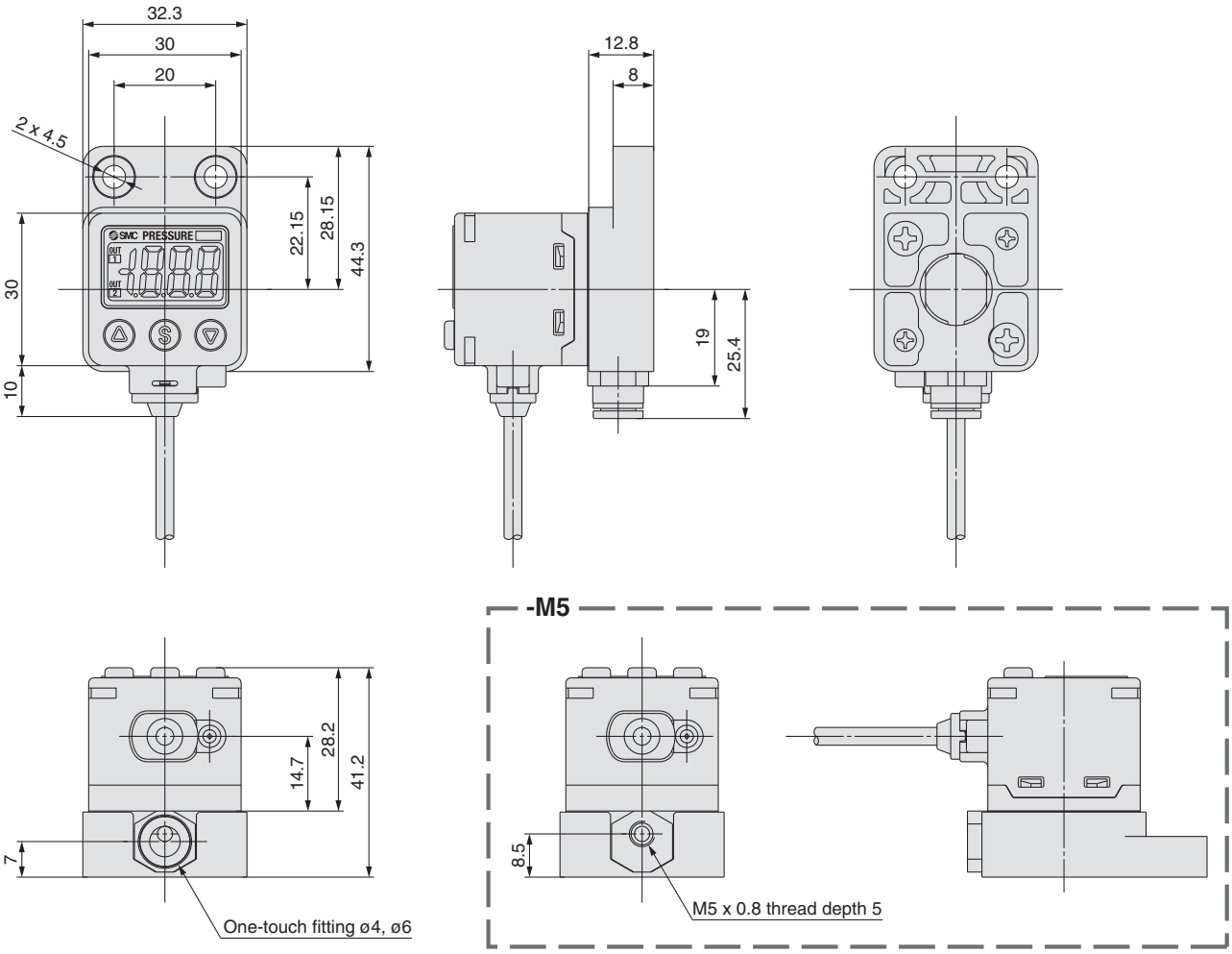


10-ZSE40A(F)/10-ISE40A-W1
-WF1



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

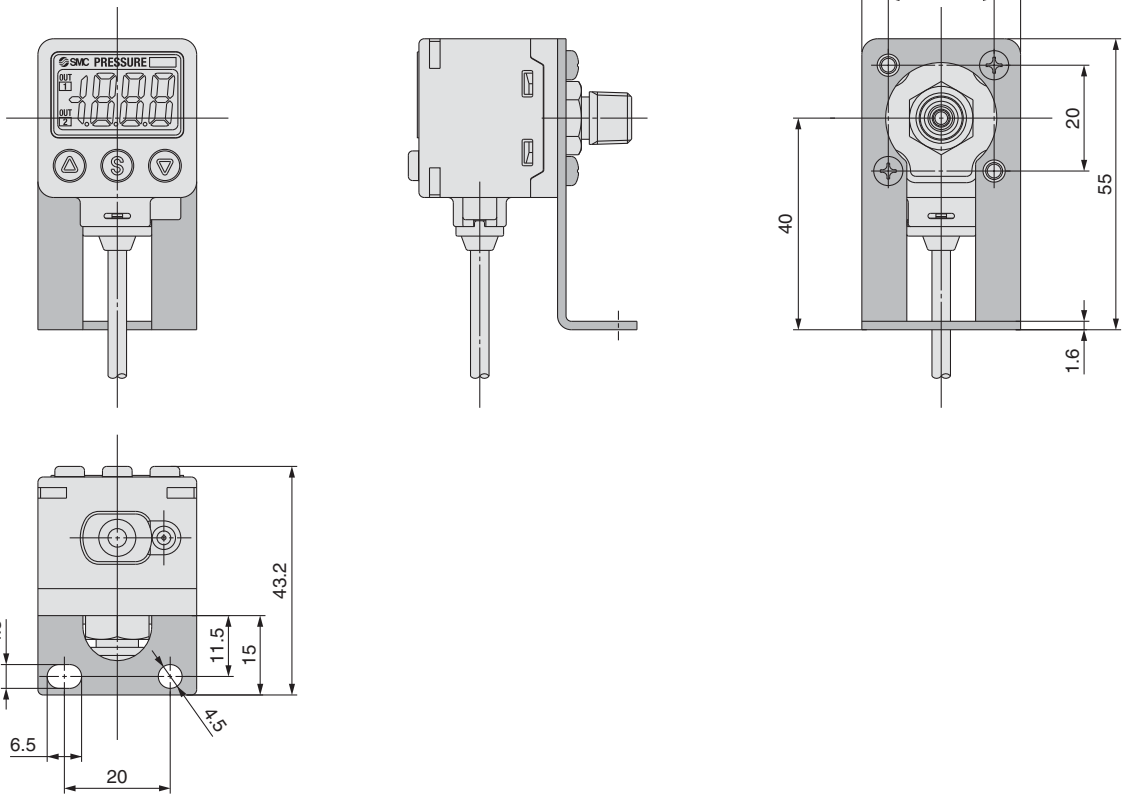
10-ZSE40A(F)/10-ISE40A-C4
-C6



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

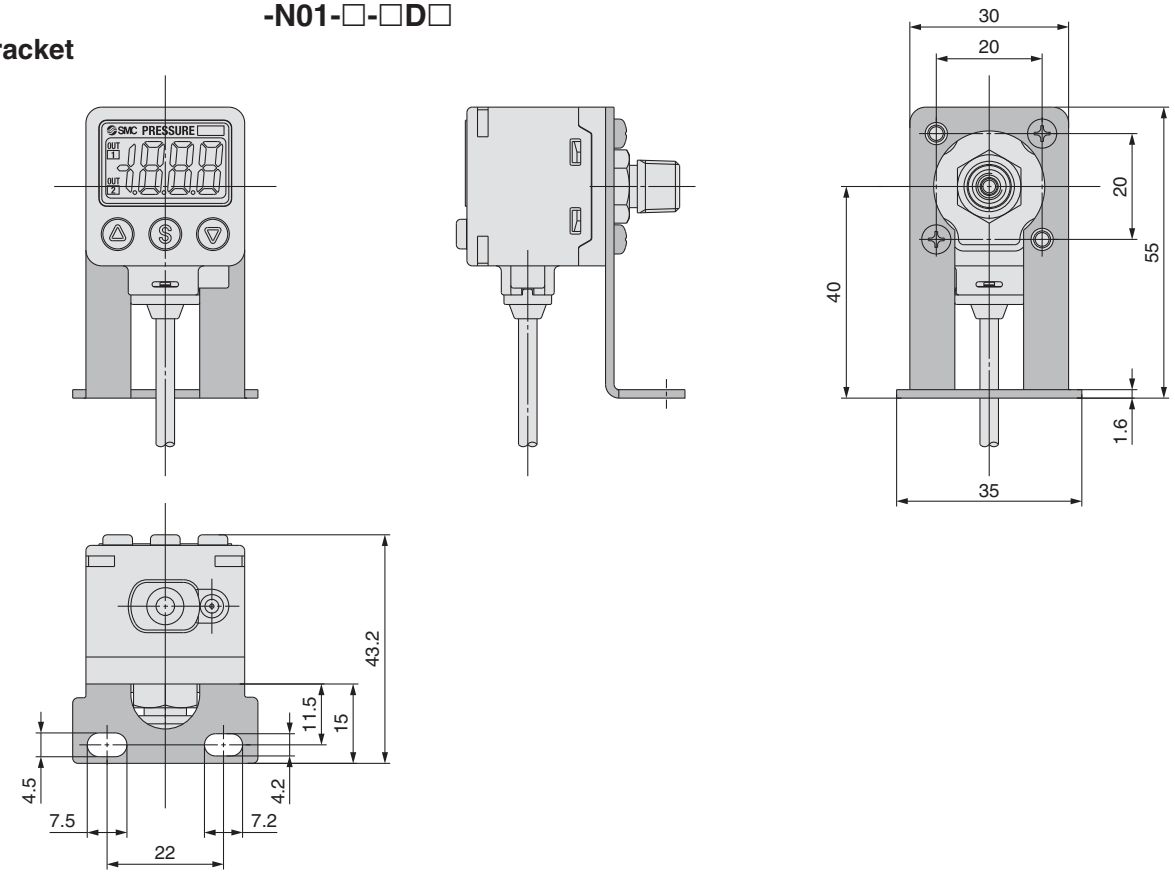
10-ZSE40A(F)/10-ISE40A-01-□-□A□
-N01-□-□A□

With bracket



10-ZSE40A(F)/10-ISE40A-01-□-□D□
-N01-□-□D□

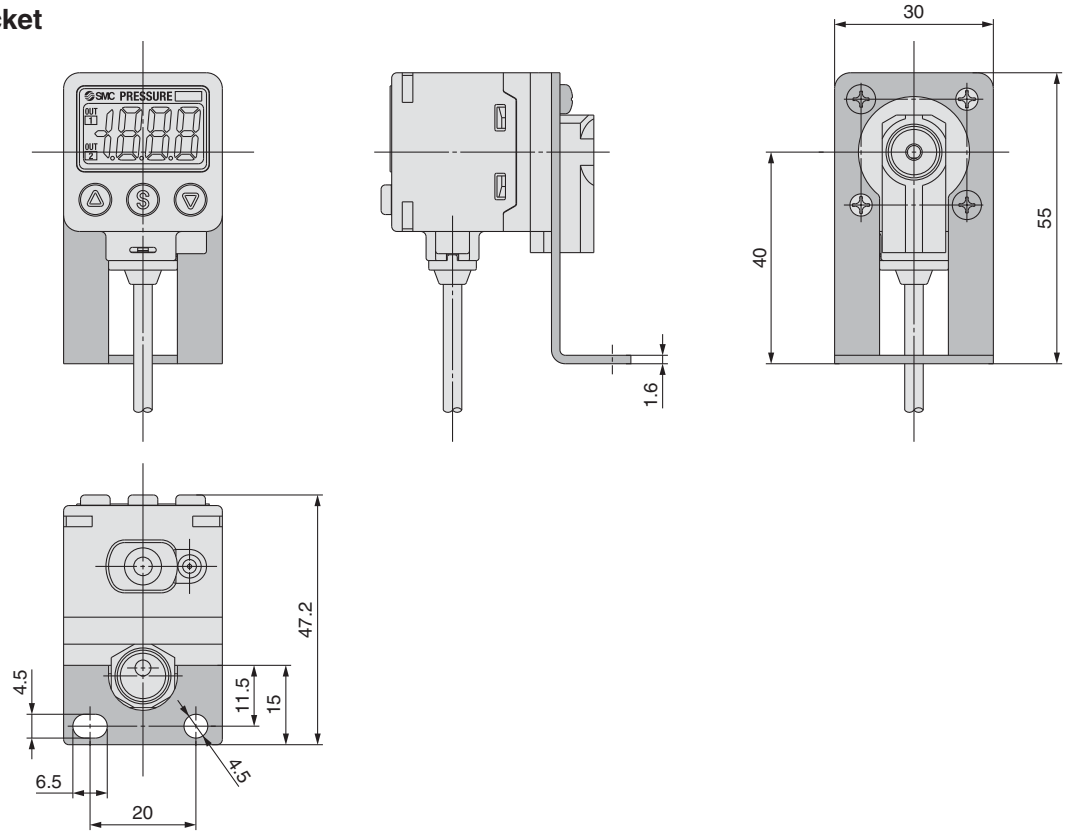
With bracket



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

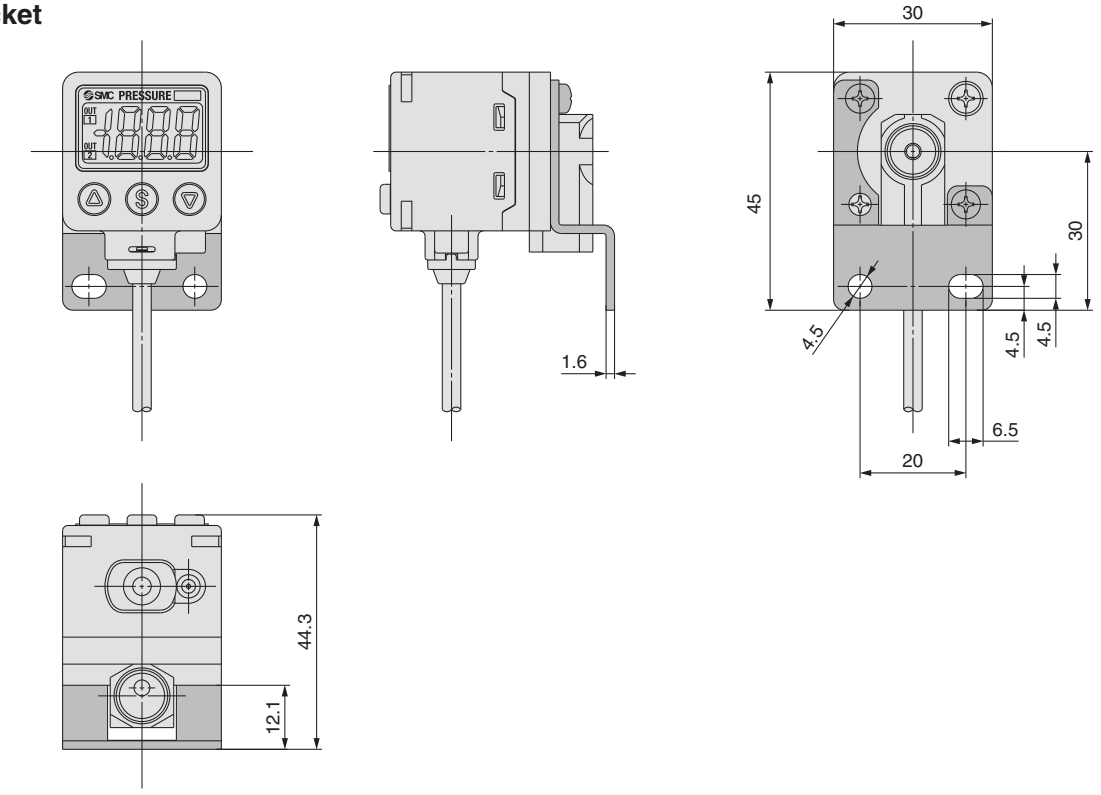
10-ZSE40A(F)/10-ISE40A-W1-□-□A□
-WF1-□-□A□

With bracket



10-ZSE40A(F)/10-ISE40A-W1-□-□B□
-WF1-□-□B□

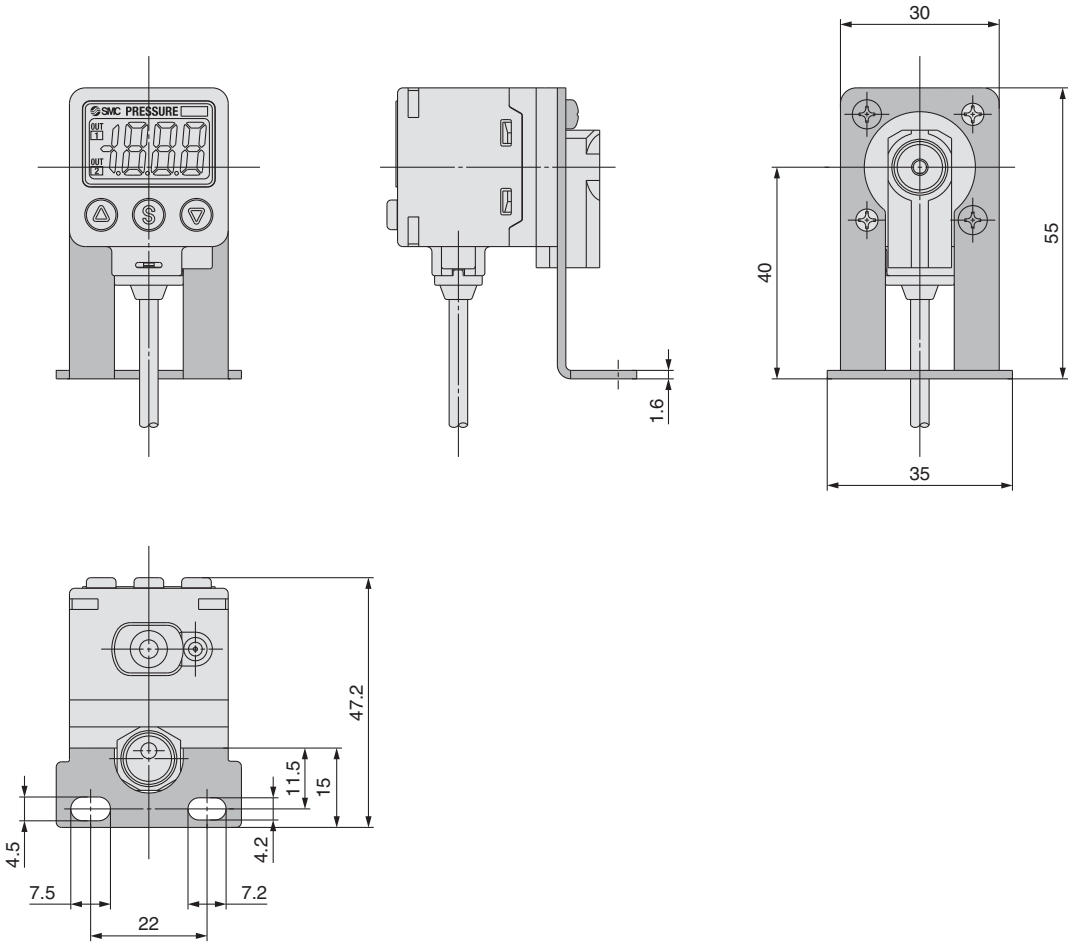
With bracket



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

10-ZSE40A(F)/10-ISE40A-W1-□-□D□
-WF1-□-□D□

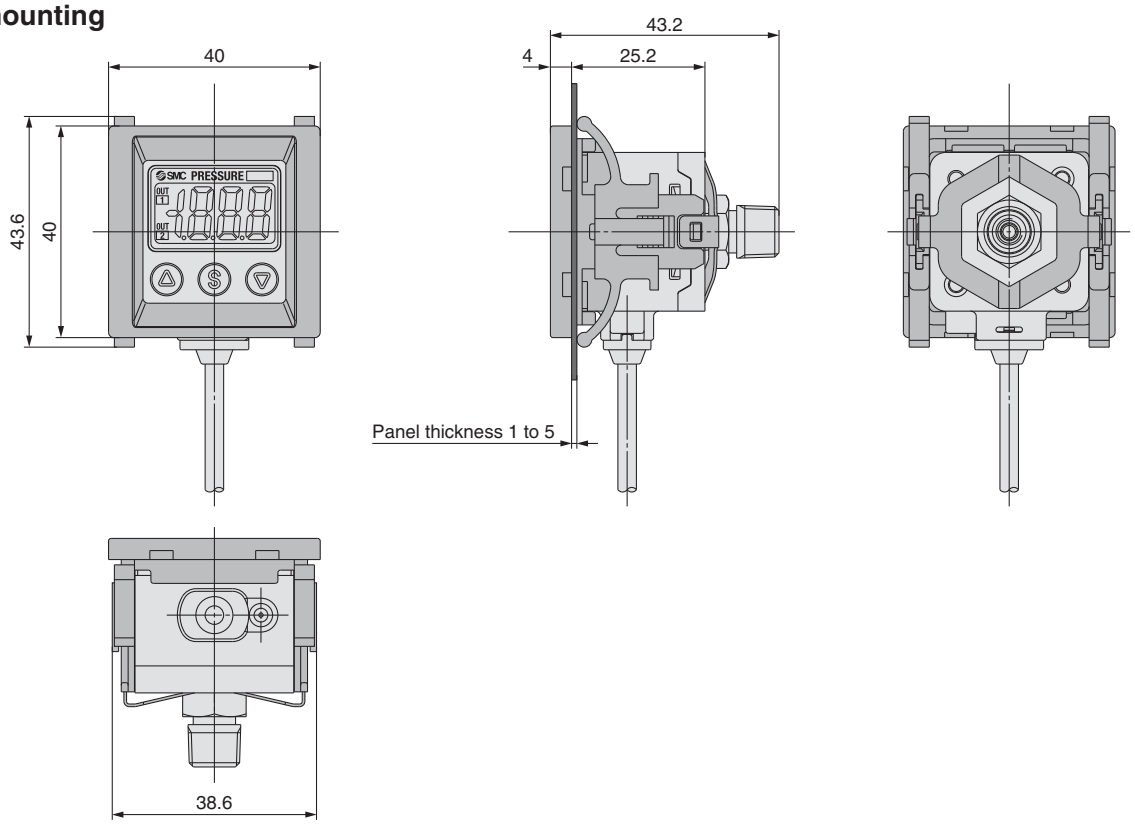
With bracket



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

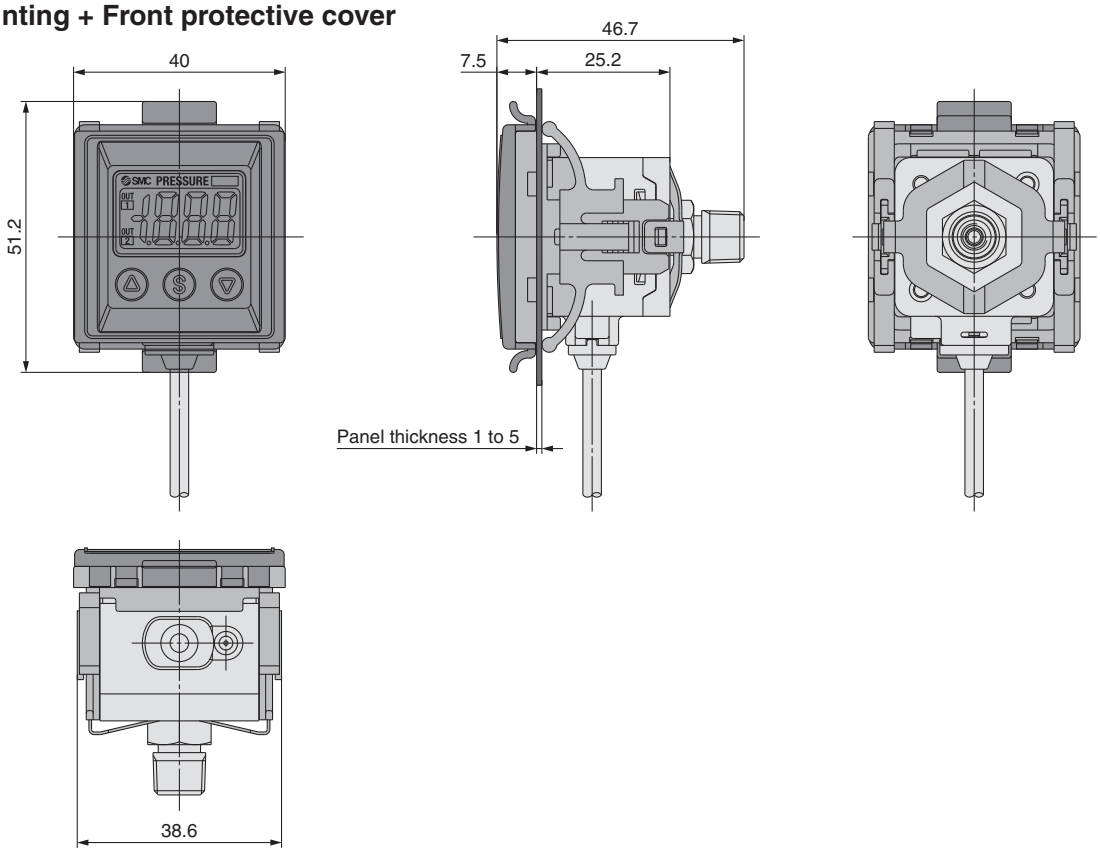
10-ZSE40A(F)/10-ISE40A-01-□-□E□
A-N01-□-□E□

Panel mounting



10-ZSE40A(F)/10-ISE40A-01-□-□F□
-N01-□-□F□

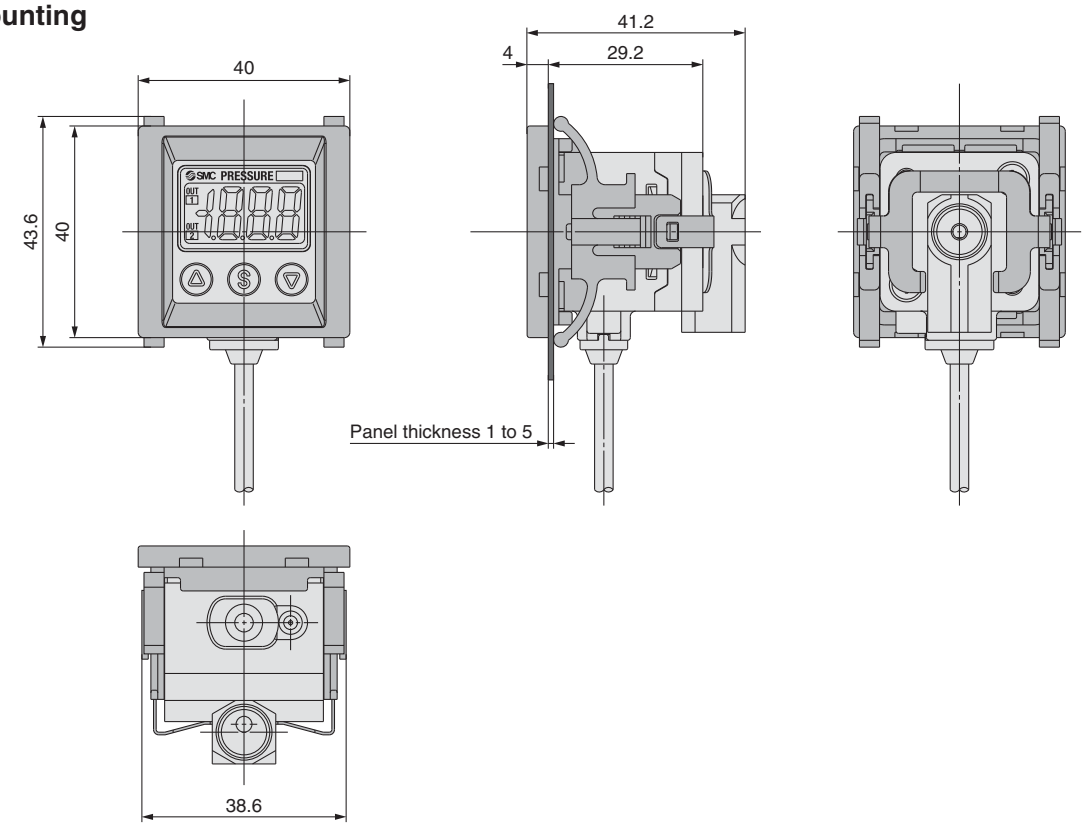
Panel mounting + Front protective cover



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

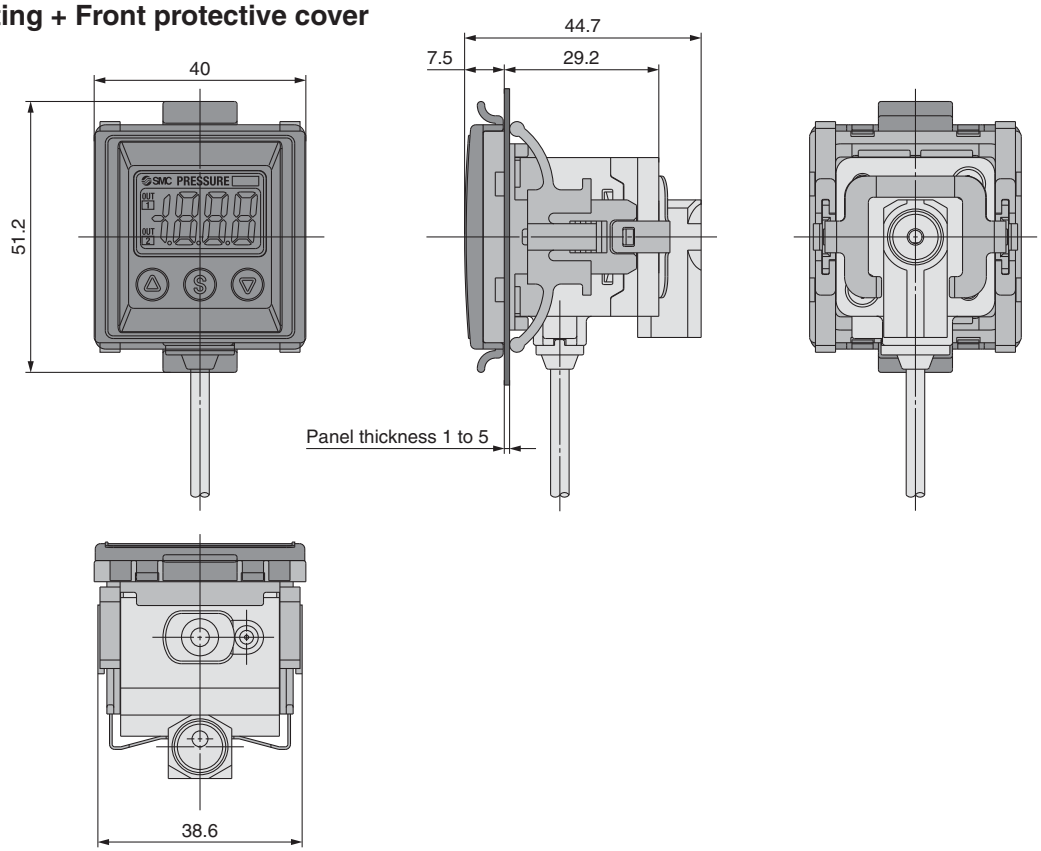
10-ZSE40A(F)/10-ISE40A-W1-□-□E□
-WF1-□-□E□

Panel mounting



10-ZSE40A(F)/10-ISE40A-W1-□-□F□
-WF1-□-□F□

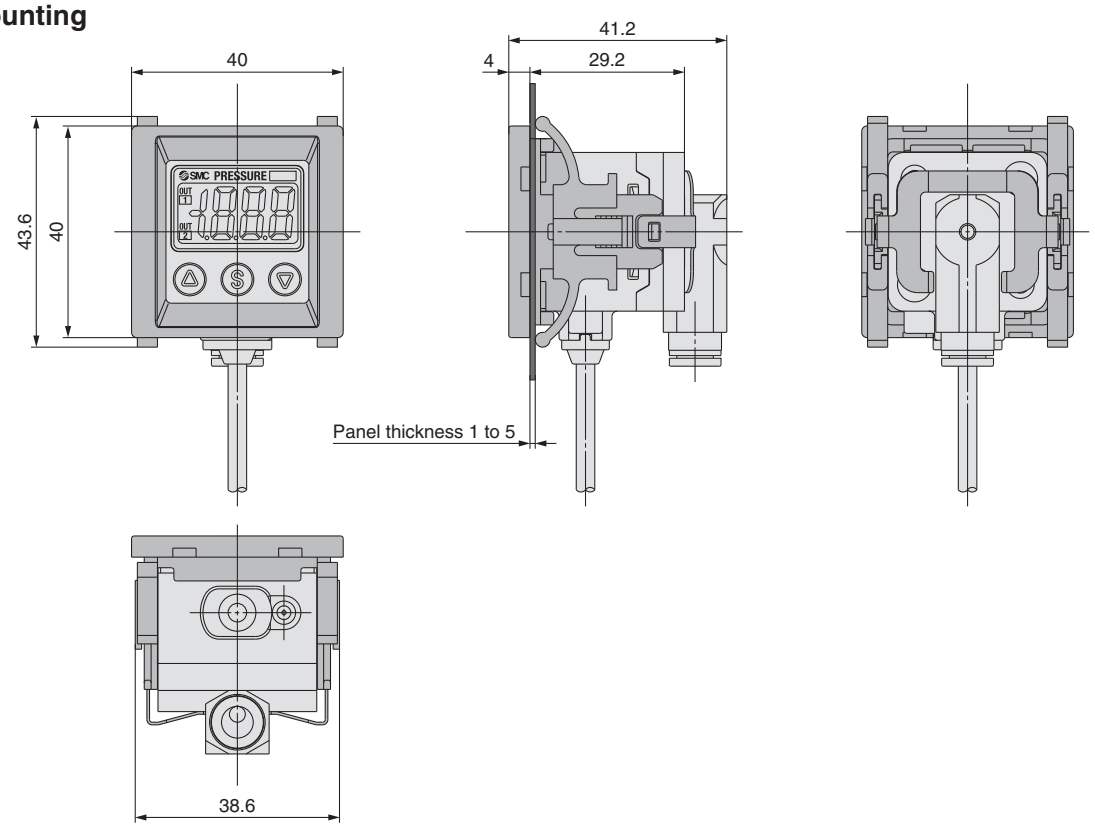
Panel mounting + Front protective cover



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

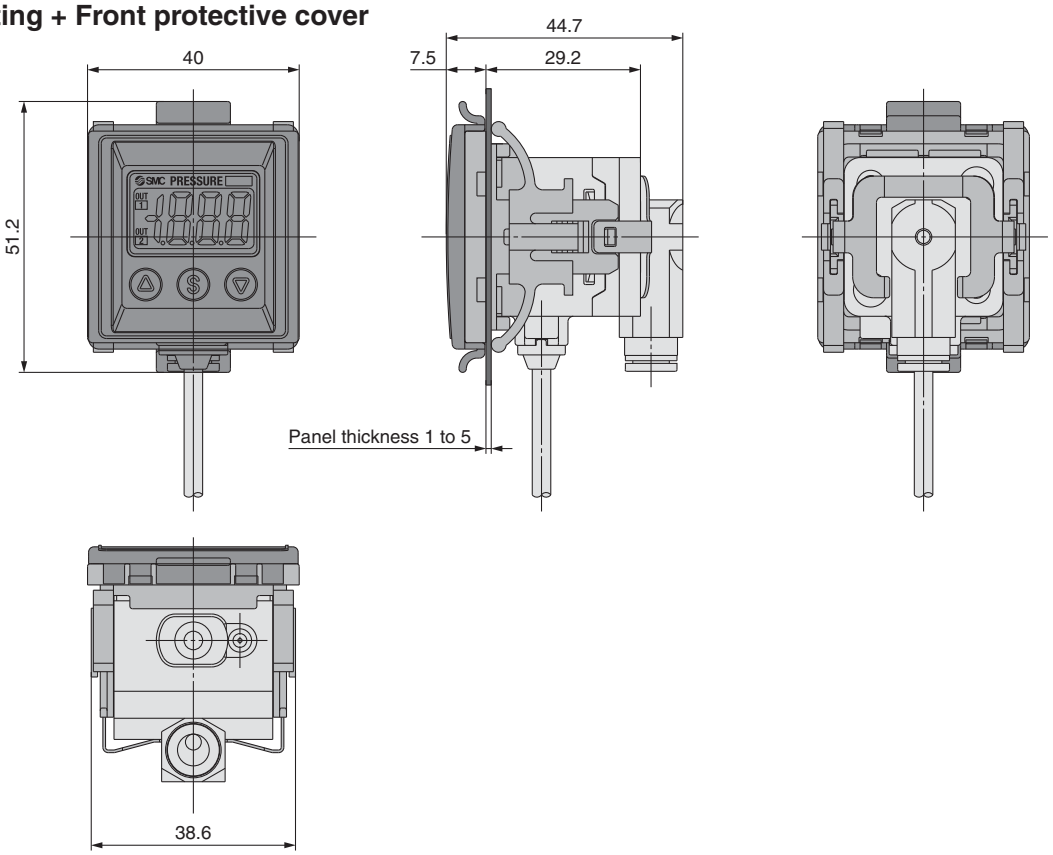
10-ZSE40A(F)/10-ISE40A-C4-□E□
-C6-□E□

Panel mounting



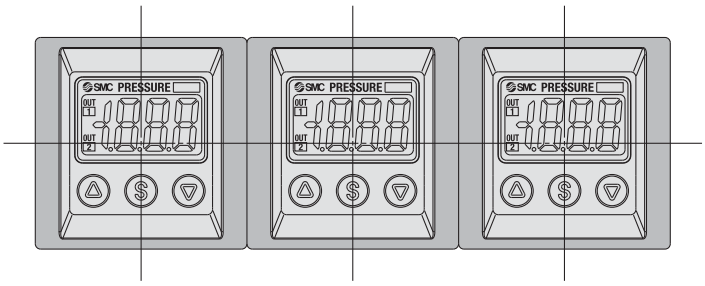
10-ZSE40A(F)/10-ISE40A-C4-□F□
-C6-□F□

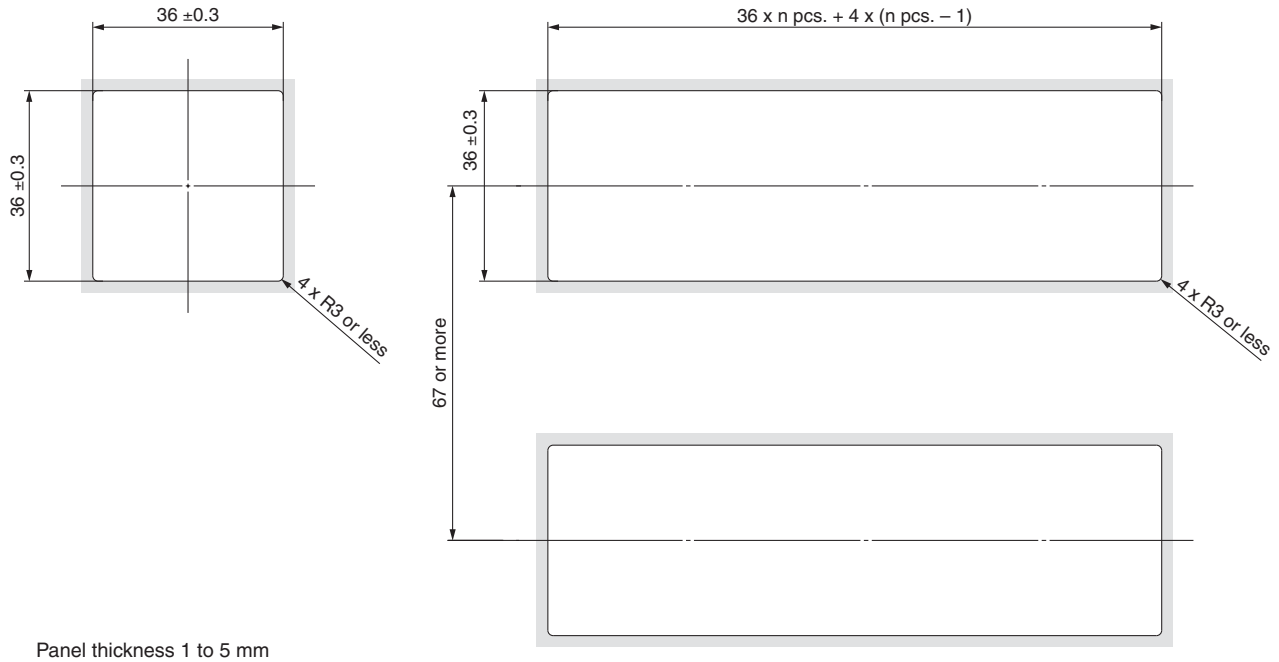
Panel mounting + Front protective cover



Dimensions

Panel fitting dimensions





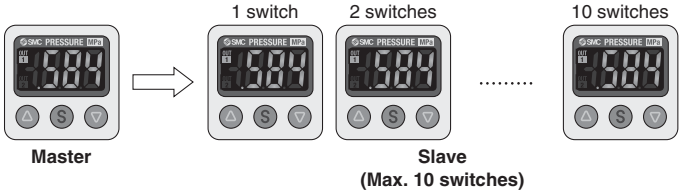
Panel thickness 1 to 5 mm

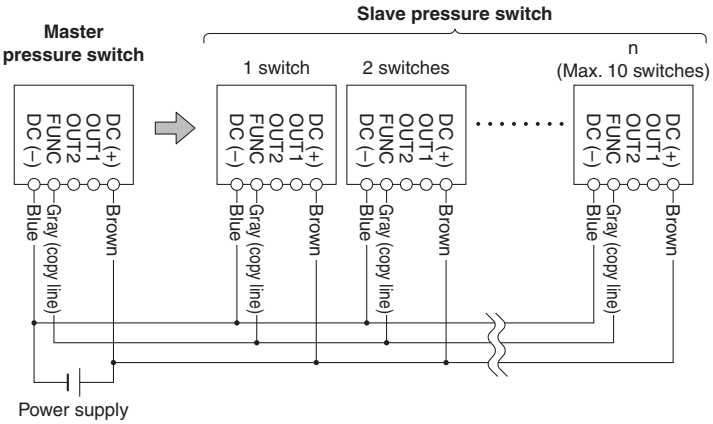
Note) This is the minimum value for the piping method 01 or N01.
Take the piping material and tubing into account for design. When the corner is to have radius, it must be R3 or less.

Function Details

A Copy function (F97)

The settings of the master pressure switch can be copied to the slave pressure switches.
This can reduce the labor for setting and prevent the entry of incorrect set-values.
The set-value can be copied to up to 10 switches simultaneously.
(Maximum communication distance 4 m)



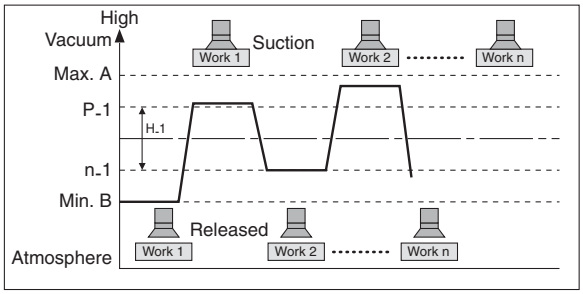


1) Wire as shown in the left figure.
2) Select the slave switch which is to be the master, and change it into a master using the buttons. (In the default setting, all switches are set as slaves.)
3) Press the (S) button of the master switch to start copying.

B Auto-preset function (F 4)

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 work piece several times.

Suction Verification

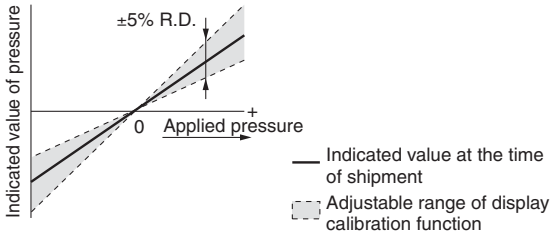


Formula for Obtaining the Set-Value

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 (F 6)

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 and bottom display function

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

E Key lock function

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

F Zero-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	Remedy
Overcurrent error	Er 1	Load current of switch output (OUT1) exceeds 80 mA.	Turn the power off and remove the output factor for the overcurrent. Then, turn the power on.
	Er2	Load current of switch output (OUT2) exceeds 80 mA.	
Residual pressure error	Er3	During zero-clear operation, pressure over ±7% F.S. is applied. (10-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	ar	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 the power off and turn it on again. If the failure cannot be solved, ask SMC for repair.
	Er4		
	Er6		
	Er7		
	Er8		
	Er9		

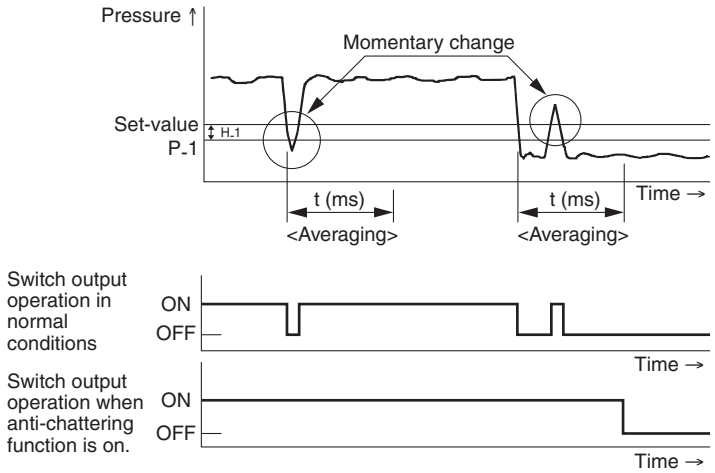
If the above remedy cannot recover the operation, ask SMC for repair.

H Anti-chattering function (F 3)

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 (F 0)

Display units can be switched with this function.

Display unit / Minimum unit setting	PA		GF	bAr	PSI	inH	mmH
	kPa	MPa*	kgf/cm²	bar	psi	inHg	mmHg
10-ZSE40A (vacuum pressure)	0.1	0.001	0.001	0.001	0.01	0.1	1
10-ZSE40AF (compound pressure)	0.1	0.001	0.001	0.001	0.02	0.1	1
10-ISE40A (positive pressure)	1	0.001	0.01	0.01	0.1		

∗ The 10-ZSE40A (vacuum pressure) and 10-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.)

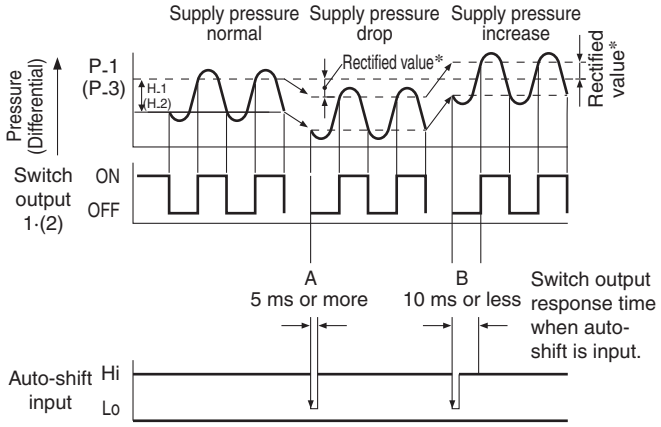
K Secret code setting (F81)

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

L Auto-shift function (F 5)

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.

Possible Set Range for Auto-Shift Input

	Regulating pressure range	Possible set 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.

Made to Order

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

Made to Order

Symbol

1 Lead wire length 3 m -X501

It has a lead wire extended to 3 meters.

How to Order

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

10-ZSE40A(F)/10-ISE40A – □ – □ – □ – X501

- **Piping specifications***
- **Output specifications***
- **Option***