Digital Pressure Switch

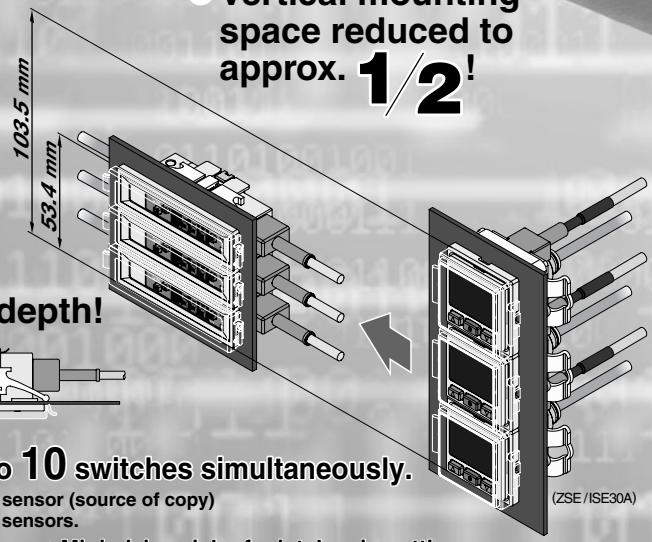
Series ZSE10(F)/ISE10

CE c UL us RoHS compliant

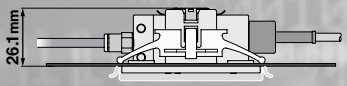
Low profile **9.8 mm**

(Actual size)

Vertical mounting space reduced to approx. 1/2!



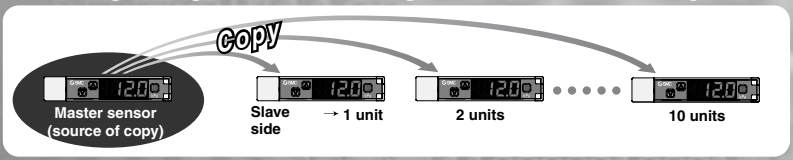
Reduced in depth!



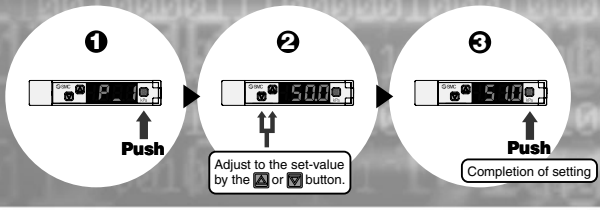
Can copy to up to 10 switches simultaneously.

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



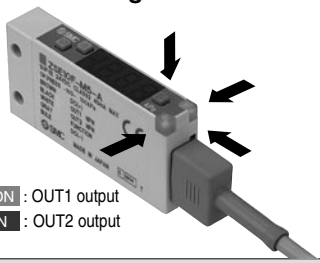
3-step setting



Improved visibility from multiple directions

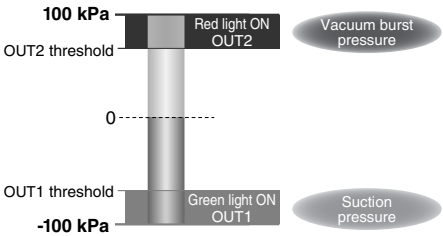
The vacuum suction and burst pressure can be checked at a glance by indicator lights.

Multi-angle indicator



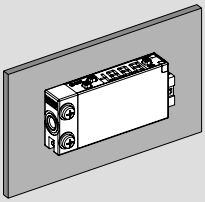
Green light ON : OUT1 output
Red light ON : OUT2 output

<Application example>



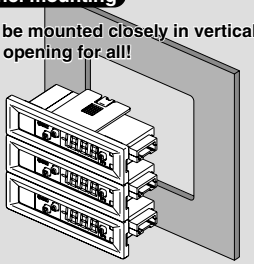
Mounting

Direct mounting

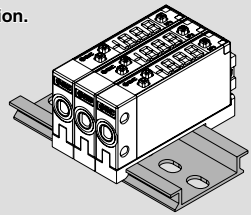


Panel mounting

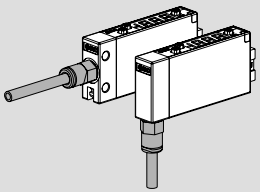
Can be mounted closely in vertical direction.
One opening for all!



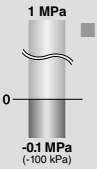
DIN rail mounting



Piping is possible from two directions.



Pressure range of the positive pressure type expanded to vacuum area.



- Rated pressure range: –0.100 to 1.000 MPa

Standardized 2-output type.

- NPN or PNP open collector 2 outputs
- NPN or PNP open collector 1 output + Analog output (1 to 5 V)

Series	ZSE10 (vacuum pressure)	ZSE10F (compound pressure)	ISE10 (positive pressure)
			
Rated pressure range	0.0 to -101.0 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 NPN or PNP open collector 1 output + Analog output (voltage)		

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.)

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

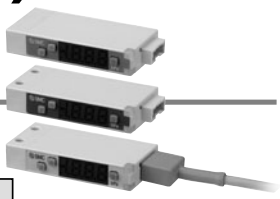
The display can be turned off to save the power consumption.

The value disappears and decimal points start flashing.

(Power consumption reduced by up to 20%)

SMC

Digital Pressure Switch
Series ZSE10(F)/ISE10



How to Order

Rated pressure range

ISE10	–0.100 to 1.000 MPa

For positive pressure **ISE10 – M5 – A – M** ☐☐☐

For vacuum/ compound pressure **ZSE10 – M5 – B – M** ☐☐☐

Rated pressure range

ZSE10	0.0 to –101.0 kPa
ZSE10F	–100.0 to 100 kPa

Piping specifications

M5	M5 female thread/Side ported (Piping port)
M5R	M5 female thread/Rear ported (Piping port)
01*	R1/8/Side ported (R1/8 Piping adapter)
N01*	NPT1/8/Side ported (NPT1/8 Piping adapter)

* Made to Order

Output specifications

A	NPN open collector 2 outputs
B	PNP open collector 2 outputs
C*	NPN open collector 1 output + Analog voltage
E*	PNP open collector 1 output + Analog voltage

* Made to Order

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

Option 3

Symbol	Calibration certificate
Nil	—
K	○

Option 2

Nil	None
D Note 3)	Panel mount adapter + Front protective cover
R Note 4)	DIN rail adapter Note 5)

Note 3) Not available for piping specifications of 01 and N01.
Note 4) Not available for piping specifications of M5R, 01 and N01.
Note 5) The DIN rail needs to be prepared by the customer.

Option 1

Nil	Without lead wire
G	Lead wire with connector (Lead wire length: 2 m) With connector cover

Options/Part No.

When optional parts are required separately, use the following part numbers to place an order.

Part no.	Option
ZS-39-5G	Lead wire with connector (with connector cover) (5 cores, 2 m)
ZS-39-B	Panel mount adapter
ZS-39-D	Panel mount adapter + Front protective cover
ZS-39-R	DIN rail adapter

Part no.	Option
ZS-39-01	Front protective cover
ZS-39-N1*	R1/8 piping adapter
ZS-39-N2*	NPT1/8 piping adapter

* Made to Order

Specifications

Model			ZSE10 (vacuum pressure)	ZSE10F (compound pressure)	ISE10 (positive pressure)
Rated pressure range			0.0 to –101.0 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
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			40 mA or less		
Switch output			NPN or PNP open collector 2 outputs (Selectable)		
	Maximum load current		80 mA		
	Maximum applied voltage		28 V (With NPN output)		
	Residual voltage		2 V or less (With load current of 80 mA)		
	Response time		2.5 ms or less (Response time selections 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)		
	Window comparator mode				
Analog output	Voltage output	Output voltage (Rated pressure range)	1 to 5 V ±2.5% F.S.		0.6 to 5 V ±2.5% F.S.
		Linearity	±1% F.S.		
		Output impedance	Approx. 1 kΩ		
Display			3 1/2 digit, 7-segment indicator, 1-color display (Red)		
Display accuracy			±2% F.S. ±1 digit (at 25°C ±3°C ambient temperature)		
Indicator light			Lights up when output is turned ON. OUT1: Green OUT2: Red		
Environment	Enclosure		IP40		
	Operating temperature range		Operating: –5 to 50°C, Stored: –10 to 60°C (No freezing or condensation)		
	Operating humidity range		Operating and 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		
	Vibration resistance		10 to 150 Hz, at the smaller of amplitude 1.5 mm or 20 m/s^2 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			±2% F.S. (at 25°C in an operating range of –5 to 50°C)		
Lead wire			Oil-resistant vinyl cabtire cable 5 cores, Cross section: 0.15 mm^2 (AWG26) Insulator O.D.: 1.0 mm		
Standards			Compliant with CE Marking, UL (CSA) and RoHS compliant		

Note) 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.

Piping Specifications

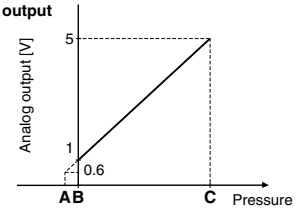
Model		M5	M5R	01	N01
Port size		M5 x 0.8 (Side ported)	M5 x 0.8 (Rear ported)	R1/8 (Side ported)	NPT1/8 (Side ported)
Wetted part material	Sensor pressure receiving area	Sensor pressure receiving area: Silicon			
	Piping port	C3604 (Electroless nickel plating) O-ring: HNBR			
Weight	With lead wire with connector (5 cores, 2 m)	55 g		63 g	
	Without lead wire with connector	15 g		23 g	

Function (Details ⇒ Pages 50 and 51)

Copy function	The settings of the master pressure switch can be copied to the slave pressure switches.
Auto-preset function	This function is to calculate a rough set-value automatically based on the on-going operation.
Display calibration function	The scattering of the indicated value can be eliminated.
Peak display function	Can retain the maximum pressure value displayed during measurement.
Bottom display function	Can retain the minimum pressure value displayed during measurement.
Keylock function (Selectable secret code)	Key operation can be locked to prevent any incorrect function of the operation switch.
Zero-clear function	The pressure display can be set at zero when the pressure is open to the atmosphere.
Anti-chattering function	Prevents possible malfunction due to sudden fluctuations in the primary pressure by adjusting the response time.
Display unit switching function	Can convert the display value.
Power-saving mode	Reduces power consumption.
Display resolution conversion function	Changes the display resolution from the default value 1000 to 100. The flickering on the display can be eliminated.
kPa⇔MPa conversion function	The unit can be changed between kPa and MPa.

Analog Output

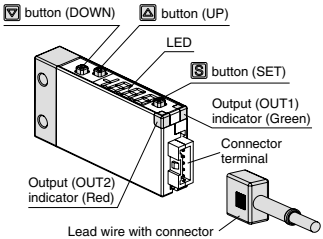
Voltage output



Range	Rated pressure range	A	B	C
For vacuum pressure	0.0 to –101.0 kPa	—	0	–101 kPa
For compound pressure	–100.0 to 100.0 kPa	—	–100 kPa	100 kPa
For positive pressure	–0.100 to 1.000 MPa	–0.1 MPa	0	1 MPa

Descriptions

Output (OUT1) indicator (Green)	Lights up when switch output (OUT1) is turned ON.
Output (OUT2) indicator (Red)	Lights up when switch output (OUT2) is turned ON.
LED	Displays the current pressure, set mode, and error code.
▲ button (UP)	Use this button to select the mode or increase the ON/OFF set-value.
	Use this button to switch to the peak display mode.
▼ button (DOWN)	Use this button to select the mode or decrease the ON/OFF set-value.
	Use this button to switch to the bottom display mode.
S button (SET)	Use this button to change the mode or finalize the set-value.



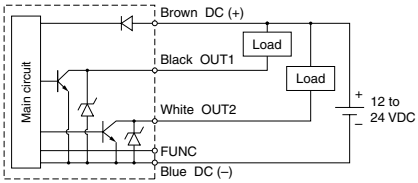
Internal Circuits and Wiring Examples

ZSE10(F)/ISE10 –□–■–□□□□

Output specifications

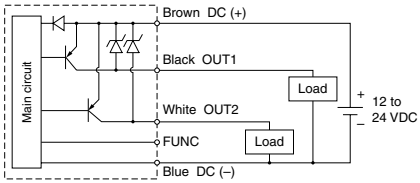
A

NPN (2 outputs)



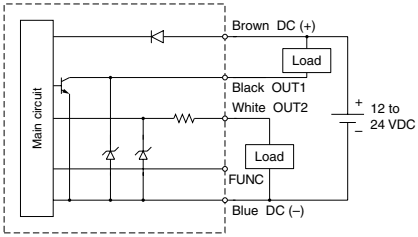
B

PNP (2 outputs)



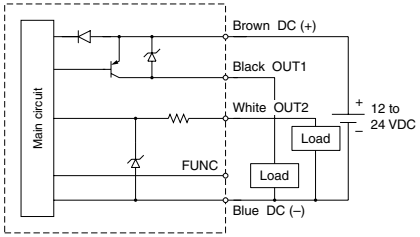
C

NPN (1 output) + Analog voltage output



E

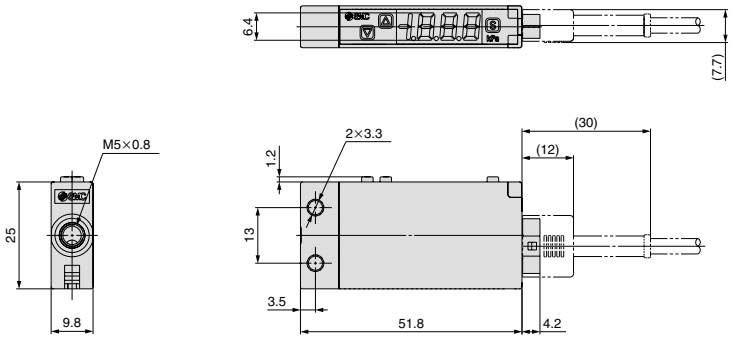
PNP (1 output) + Analog voltage output



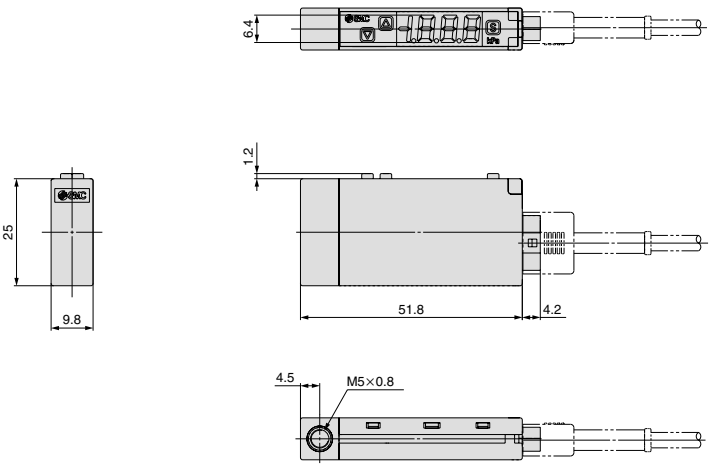
∗ The FUNC terminal is connected when using the copy function. (Refer to "Copy function" on page 50.)

Dimensions

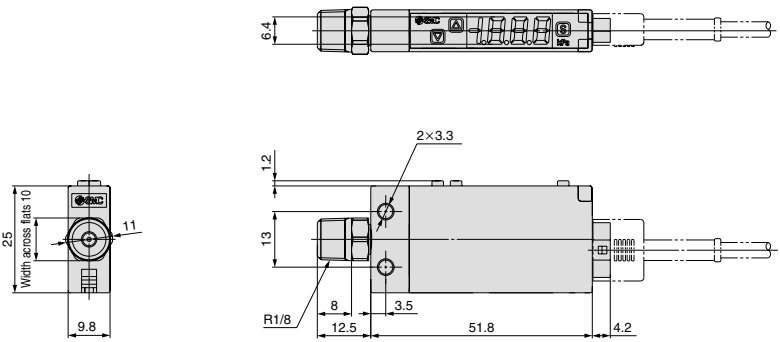
ZSE10(F)/ISE10−M5−□−□□□□



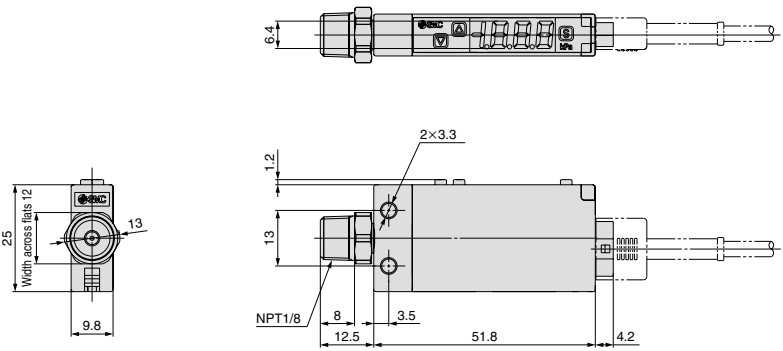
ZSE10(F)/ISE10−M5R−□−□□□□



ZSE10(F)/ISE10−**01**−□−□□□□



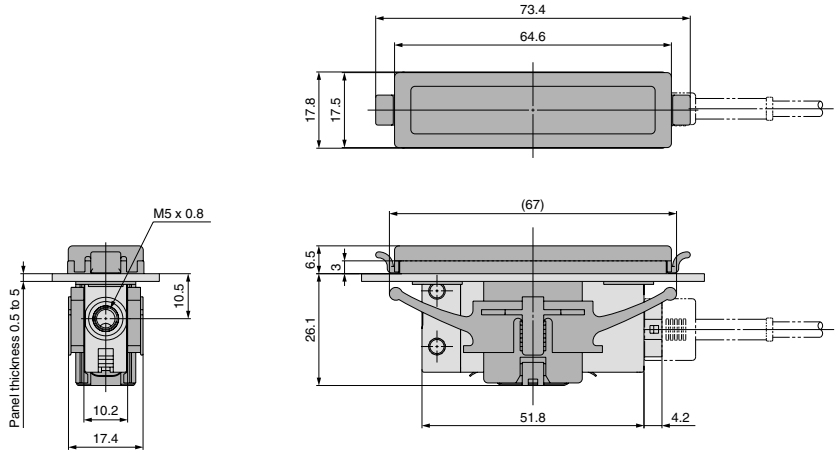
ZSE10(F)/ISE10−**N01**−□−□□□□



Dimensions

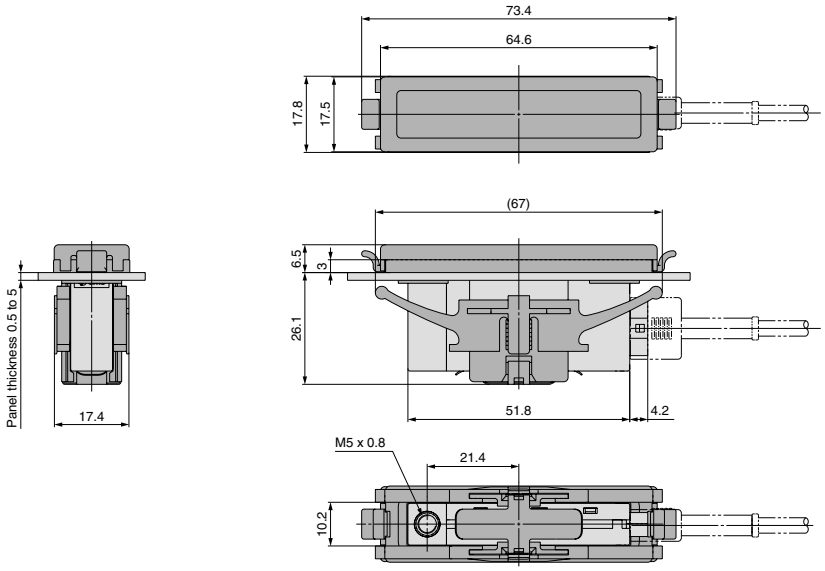
ZSE10(F)/ISE10−M5−□−□□D□

Panel mount adapter + Front protective cover

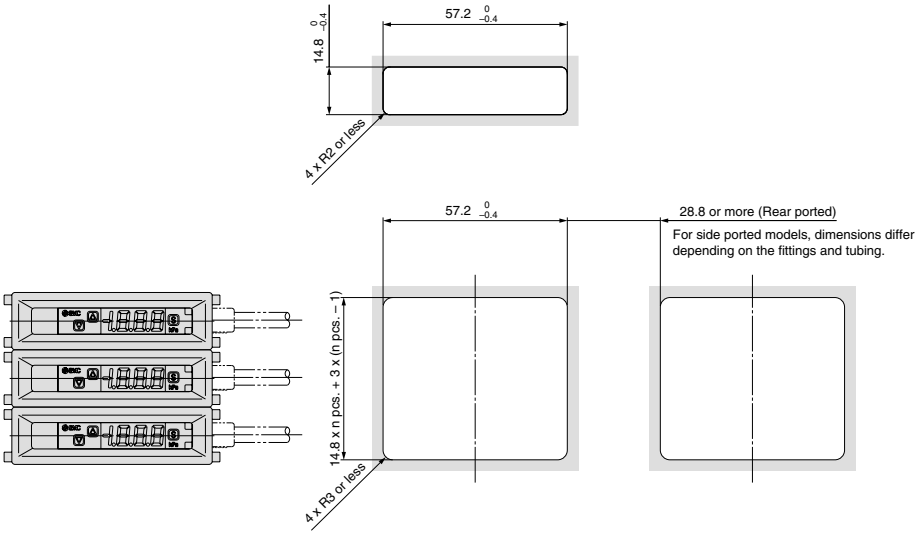


ZSE10(F)/ISE10−M5R−□−□□D□

Panel mount adapter + Front protective cover



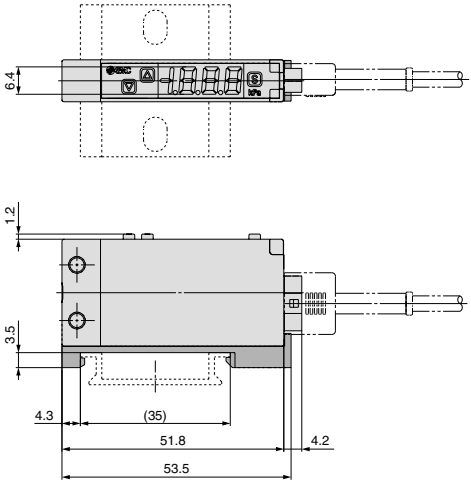
Panel fitting dimensions



ZSE10(F)/ISE10−M5−□−□□R□

With DIN rail

The DIN rail needs to be prepared by the customer.

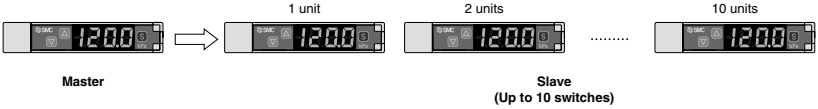


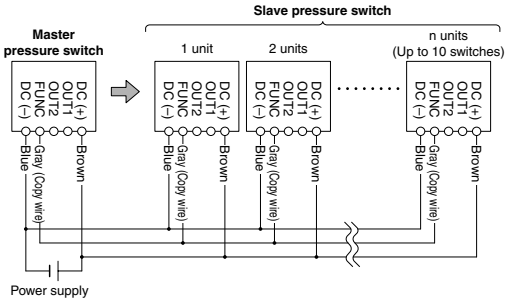
Function Details

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)



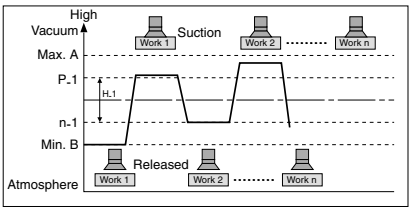


1) Connect the power supply and copy line as shown in the left figure.
2) Select the slave switch which is to be the master, and change it into a master using the buttons. (In the default setting, all switches are set as slaves.)
3) Press the S button of the master switch to start copying.

B Auto-preset function (F5)

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

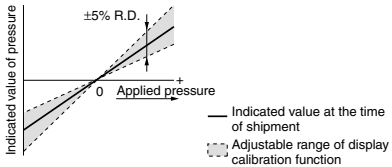


Formula for Obtaining the Set-Value

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. (ZSE10F (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).	
Zero-clear error	Er3	During zero-clear operation, pressure over ±7% F.S. is applied. (ZSE10F (compound) ±3.5% F.S.) After 1 s, 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.	
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		

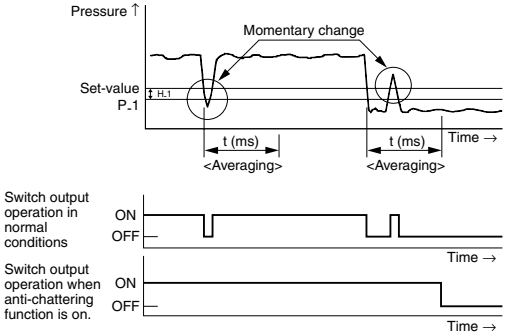
If the failure cannot be solved after the above instructions are performed, please contact SMC for investigation.

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 / Min. unit setting	PA		GF	bAr	PSi	inH	mmH
	kPa	MPa*	kgf/cm²	bar	psi	inHg	mmHg
ZSE10 (vacuum pressure)	0.1	0.001	0.001	0.001	0.01	0.1	1
ZSE10F (compound pressure)	0.1	0.001	0.001	0.001	0.02	0.1	1
ISE10 (positive pressure)	1	0.001	0.01	0.01	0.1		

* The ZSE10 (vacuum pressure) and ZSE10F (compound pressure) will have different setting and display resolution when the unit is set to MPa.

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.

Series ZSE10(F)/ISE10
Specific Product Precautions 1

Be sure to read before handling.
Refer to back page 1 for Safety Instructions and Handling Precautions for SMC Products (M-E03-3) for Precautions.

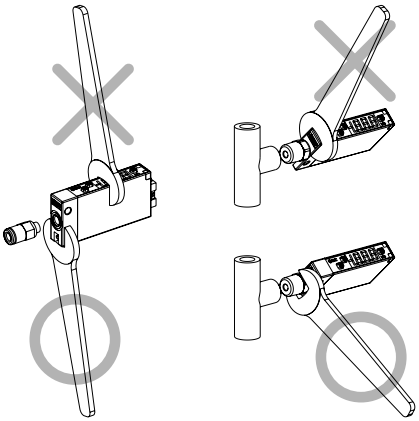
Handling

⚠ Warning

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

⚠ Caution

1. Do not drop, bump, or apply excessive impacts (100 m/s²) 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 35 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. Avoid repeatedly bending or stretching lead wires. If the lead wires are routed in such a way that repetitive bending stress or tensile strength is applied, it may cause them to break. When the lead wire is moving, secure it near the switch of the unit. The minimum bending radius is approximately R40 to 60 mm or more. Consult with SMC for details.
4. Do not exceed the screw-in torque of 1 N·m or less for the M5 female thread type after tightening approximately 1/6 of a turn, and 7 to 9 N·m for R1/8 and NPT1/8 type. Exceeding this value can damage the product. Also, the wrench should be applied to the metal part integrated with piping (connected attachment). Applying the wrench to other parts may lead to damage to the product.



M5 female thread type　　R1/8, NPT1/8 type

5. Allow a sufficient margin of tube length in piping in order to prevent application of torsional, tensile or moment load to the tubes and fittings.
6. When a brand of tubing other than SMC is used, make sure that the tolerance of the tube's O.D. satisfies the following specifications.
   1) Nylon tubing: within ±0.1 mm
   2) Soft nylon tubing: within ±0.1 mm
   3) Polyurethane tubing: within +0.15 mm, within –0.2 mm
7. The applicable fluids are air, non-corrosive gas and non-flammable gas. Consult with SMC if the switch is to be used with other types of fluids.

Connection

⚠ Caution

1. Incorrect wiring can damage the switch and cause a malfunction or erroneous switch output. Connections should be done while the power is turned off.
2. Do not attempt to insert or pull the connector when the power is on. A switch output malfunction may occur.
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 power source is used, make sure that the F.G. terminal is grounded.

Operating Environment

⚠ Warning

1. Our pressure switches do not have an explosion proof rating. Never use in the presence of an explosive gas as this may cause a serious explosion.

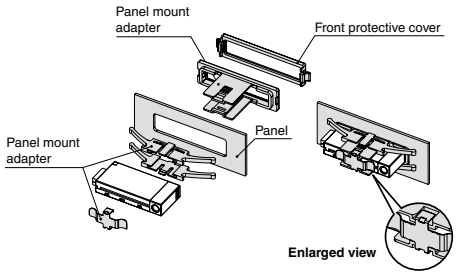
⚠ Caution

1. Our pressure switches are CE marked; however, they are not equipped with surge protection against lightning. Lightning surge countermeasures should be applied directly to system components as necessary.
2. Do not use in an environment where static electricity can cause problems, otherwise system failure or malfunction may result.

Mounting

⚠ Caution

1. Mounting with panel mount adapter



Specific Product Precautions 2

Be sure to read before handling.
Refer to back page 1 for Safety Instructions and Handling Precautions for SMC Products (M-E03-3) for Precautions.

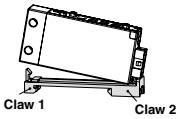
Mounting

⚠ Caution

2. Removal and mounting of DIN rail

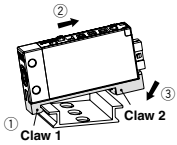
- It is necessary to prepare a DIN rail adapter for the mounting of the DIN rail.
- Take care not to bend the claws of the DIN rail adapter when mounting.

Mounting of DIN rail adapter



Engage **claw 1** of the product with the upper part of the DIN rail and press it downward, then fit **claw 2** of the product horizontally until it clicks.

Mounting of DIN rail

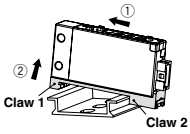


Engage **claw 1** of the product with the DIN rail as indicated by ① and pull it to the direction ②, and then fit **claw 2** of the product horizontally until it clicks.

- We recommend using an end plate available from the manufacturers shown on the right for mounting onto the DIN rail. For the handling and other detailed information about the end plate, contact the manufacturer directly.

Manufacturer	Model
OMRON Corp.	PFP-M
IDEC Corp.	BNL6

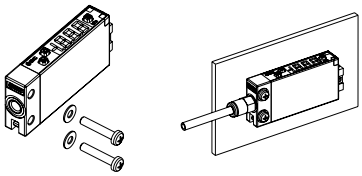
Removal of DIN rail



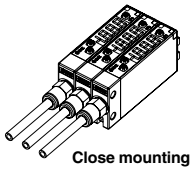
Move to the direction ①, and remove **claw 1** as indicated by ②.

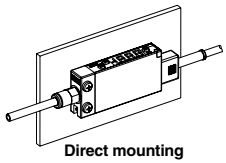
3. Mounting of screws

- The tightening torque of the M3 mounting screw must be 0.5 to 0.7 N·m.
- Do not apply force to the body of the product by mounting. This may lead to damage to the product.
- Mount the product on a flat, even surface. Mounting on an uneven surface can damage the case.



- For piping specifications of 01 and N01, close mounting cannot be applied because of interference between fittings.
- For direct mounting or close mounting, select the fitting with a wrench flat and øD of 10 mm or less.


Close mounting


Direct mounting

Recommended fittings

■ One-touch mini Hexagon socket head male connector:
KJS04-M5 (Tubing O.D. ø4, Connection thread M5 x 0.8)

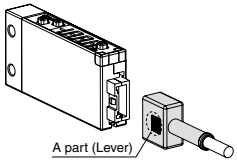
■ One-touch fitting Hexagon socket head male connector:
KQ2S04-M5 (Tubing O.D. ø4, Connection thread M5 x 0.8)

- When selecting other fittings, check that there is no interference with surrounding equipment and enough space for maintenance. (For the details of the fittings, refer to SMC Best Pneumatics No. 6.)

Connection/Removal of Connector

⚠ Caution

- To connect the connector, insert it straight while pinching the lever, and then push the lever into the jack of the housing and lock it.
- To remove the connector, pull it straight out while applying pressure with your thumb to the A part (lever) and unhooking it from the jack.

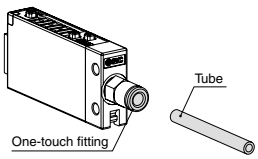


- Do not attempt to insert or pull the connector when the power is on. A switch output malfunction may occur.

Piping

⚠ Caution

- Cut the tube perpendicularly.
- Hold the tube and insert it into the One-touch fitting carefully and securely all the way to the bottom.



Specific Product Precautions 3

Be sure to read before handling.
Refer to back page 1 for Safety Instructions and Handling Precautions for SMC Products (M-E03-3) for Precautions.

Set Pressure Range and Rated Pressure Range

⚠ Caution

Set the pressure within the rated pressure range.

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