Pressure Sensor Product Variations

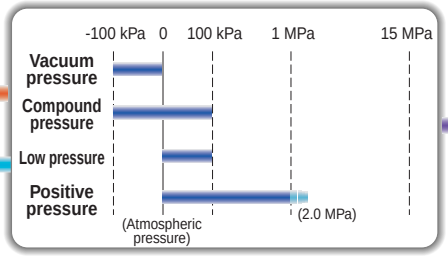
Applicable fluids

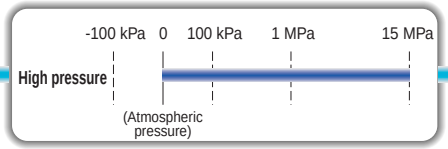
For Gas
Silicon diaphragm
- Air, Nitrogen, Argon, Carbon dioxide

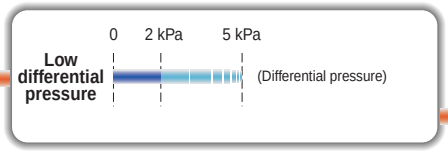
For Gas and Liquid
Stainless steel diaphragm
- Liquids such as water, oil, etc. Air, Nitrogen, Argon, Carbon dioxide
- Anti-corrosiveness, Airtightness

Pressure range

"Pressure range and application examples" Front matters 13 to 15







Product type

Digital
Output type: Switch output / Analog output / Digital display

- Sensor/Display self-contained
- Numerically displays the setting and measurement values.

Switch
Output type

- Sensor only product
- ON/OFF confirmed by LED

Sensor
Output type

- Sensor only product
- Can be connected to a separate monitor.

Monitor
Output type

- Sensor type display
- Numerical control can be placed in a distant location.

Corresponding model

	For Air	For Air/Liquid
Digital	Front matters 9 and 10 • Series Z/ISE30A • Series Z/ISE40A • Series Z/ISE10 • Series ISE70 • Series Z/ISE3	Front matters 9 and 10 • Series Z/ISE80 • Series ISE75 (for high pressure)
Switch	Front matter 10 • Series Z/ISE1 • Series Z/ISE2 • Series PS1000/1100	
Sensor	Front matter 11 • Series PSE530 • Series PSE540 • Series PSE550 (Low differential pressure)	Front matter 11 • Series PSE560
Monitor	Front matter 12 [For 1 ch] • Series PSE300 [For 4 ch] • Series PSE200	

Functions and environment

Front matter 19 **Functions**	Auto shift function Keylock function Peak/Bottom hold function Copy function	Auto preset function Anti-chattering function	Display calibration function Power-saving mode
Front matter 18 **Adaptable to different environments**	Clean room Silicon-free	Copper-free/Fluorine-free Fluorine-free	Grease-free Low density ozone gas

Front matters 9 to 12
Refer to "General Performance Table".

General Performance Table (For Gas)

Model Selection Table

Self-contained Type

Model	ZSE30A(F) ISE30A	ZSE40A(F) ISE40A	ZSE10(F) ISE10	ISE70	ISE75 ISE75H	ZSE80(F) ISE80(H)	ZSE3 ISE3	ZSE1 ISE1	ZSE2 ISE2	ZSP1	PS1000 PS1100	ISE35
Fluid	General pneumatic				General fluids		General pneumatic					
Calibration method	Push-button calibration							Trimmer calibration				Push-button calibration
Set pressure range	–105 to 105 kPa 10 to –105 kPa –0.105 to 1.05 MPa			0 to 1 MPa	0.4 to 10 MPa 0.5 to 15 MPa	–110 to 110 kPa 10 to –111 kPa –0.105 to 1.1 MPa –0.105 to 2.2 MPa	0 to 98 kPa 0 to 0.98 MPa 0 to –101 kPa	0 to 100 kPa 0 to 1 MPa 0 to –101 kPa		–20 to –101 kPa	–0.1 to 0.45 MPa –0.1 to 0.4 MPa	–0.1 to 1 MPa
Power supply voltage	12 to 24 VDC±10% (Ripple ±10% or less)											
Temperature characteristics (25°C reference)	±2% F.S. or less (0 to 50°C)				±3% F.S. or less (0 to 50°C)		±3% F.S. or less (0 to 60°C)				±3% F.S. or less (0 to 60°C)	
Repeatability	±0.2% F.S.±1 digit or less			±0.5% F.S.		±0.2% F.S.±1 digit or less	±1% F.S. or less					
Hysteresis	Hysteresis mode: Variable Window comparator mode: Variable						Hysteresis mode: Variable Window comparator mode: Fixed (3 digits*) * Digit is min. calibration unit.	Variable 1 to 10% Fixed 3% F.S. or less	Fixed 3% F.S. or less	Fixed 0.5 kPa	Fixed 4% F.S.	Hysteresis mode: Variable Window comparator mode: Variable
Output	NPN/PNP open collector Analog voltage output Analog current output		NPN/PNP open collector Analog voltage output	1 setting NPN/PNP 2 settings NPN/PNP open collector PNP open collector		NPN/PNP open collector Analog voltage output Analog current output	NPN open collector Analog voltage output	NPN/PNP open collector Analog voltage output	NPN/PNP open collector	NPN open collector	2-wire type	NPN/PNP open collector
Display (Resolution)	2-color display (0.1%)		1-color display (0.1%)	2-color display (1%)		2-color display (0.1%)	1-color display (1%)					2-color display (1%)
Enclosure	IP40	IP65	IP40	IP67		IP65	IP40				IP40	
Note	Panel mounting possible Selectable pressure unit Anti-chattering function Display calibration function Power-saving mode Copy function	Panel mounting possible Selectable pressure unit Anti-chattering function Auto shift function Power-saving mode Copy function	Panel mounting possible DIN rail moutable Selectable pressure unit Anti-chattering function Display calibration function Power-saving mode Copy function	Selectable pressure unit Anti-chattering function Display calibration function		R thread, URJ, TSJ Panel mounting possible Selectable pressure unit Anti-chattering function Auto shift function Display calibration function Eco mode	For use with ZX ejector Self-diagnostic function Failure diagnostic output function Peak hold Bottom hold	For use with ZM ejector	For use with ZX or ZR ejector	Small diameter nozzles Suction verification For use with ZX ejector		Modular type mountable Series ARM10/11 mountable Selectable pressure unit Anti-chattering function Power-saving mode
Page	P.3	P.19	P.41	P.55		P.67	Best Pneumatics No.6				P.87	P.108

General Performance Table (For Gas and Liquid)

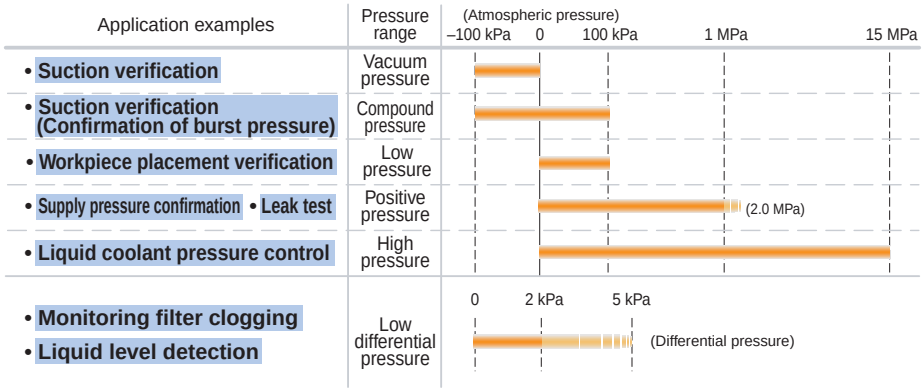
Model Selection Table — Sensor

Model	PSE53□	PSE54□	PSE550	PSE56□
				
Fluid	General pneumatic		General pneumatic	General fluids
Calibration method				
Set pressure range	0 to 1 MPa 0 to –101 kPa 0 to 101 kPa –101 to 101 kPa	0 to 1 MPa 0 to –101 kPa –100 to 100 kPa	0 to 2 kPa	0 to 1 MPa 0 to –101 kPa –100 to 100 kPa 0 to 500 kPa
Power supply voltage	12 to 24 VDC±10% (Ripple ±10% or less)			
Temperature characteristics (25°C reference)	±2% F.S. or less (0 to 50°C)		±3% F.S. or less (0 to 50°C)	±2% F.S. or less (0 to 50°C) ±3%F.S. or less (–10 to 60°C)
Repeatability	±1% F.S. or less	±0.2% F.S. or less	±0.3% F.S. or less	±0.2% F.S. or less
Hysteresis				
Output	Analog voltage output		Analog voltage output Analog current output	
Display (Resolution)				
Enclosure	IP40		IP40	IP65
Note				
Page	P.120	P.123	P.126	P.129

Model Selection Table — Controller

Model	PSE200	PSE300
		
Sensor input amount	4 inputs	1 input
Calibration method	Push-button calibration	
Set pressure range	–0.1 to 1 MPa 10 to –101 kPa –101 to 101 kPa –10 to 100 kPa	–0.1 to 1 MPa 10 to –101 kPa –101 to 101 kPa –10 to 100 kPa –50 to 500 kPa –0.2 to 2 kPa
Power supply voltage	12 to 24 VDC±10% (Ripple ±10% or less)	
Temperature characteristics (25°C reference)	±0.5% F.S. or less (0 to 50°C)	
Repeatability	±0.1% F.S. ±1 digit or less	±0.1% F.S. or less
Hysteresis	Hysteresis mode: Variable Window comparator mode: Fixed (3 digits)	Hysteresis mode: Variable Window comparator mode: Variable
Output	NPN/PNP open collector 1 CH: 2 outputs 2 to 4 CH: 1 output	NPN/PNP open collector 2 outputs Analog voltage output Analog current output
Display (Resolution)	1-color display (0.1%)	2-color display (0.1%)
Enclosure	Front only IP65 The rest IP40	IP40
Note	Panel mounting possible Auto shift function Display calibration function Anti-chattering function Channel to channel copy function Selectable pressure unit	Panel mounting possible DIN rail mountable Auto shift function Display calibration function Anti-chattering function Selectable pressure unit Current input possible
Page	P.132	P.138

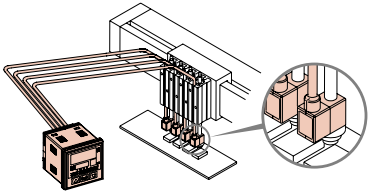
Pressure Range and Application Examples



Suction Verification

Sensor installed close to a pad
(No. 1)

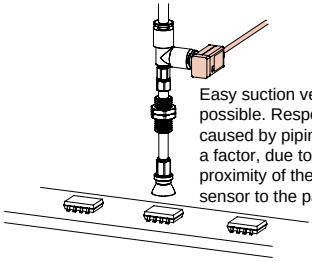
Series PSE54□+PSE200



Due to the small size, the sensor can be installed close to a pad.
Calibration is easy with the auto preset function.

Sensor installed close to a pad
(No. 2)

Series PS1100

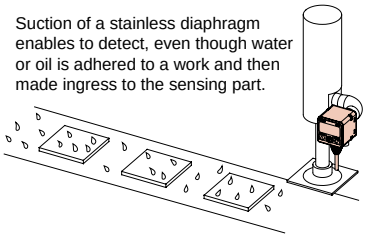


Easy suction verification is possible. Response delays caused by piping will not be a factor, due to the close proximity of the sensor to the pad.

Suction verification of work pieces containing moisture

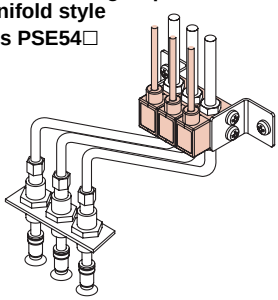
Series ZSE80F

Suction of a stainless diaphragm enables to detect, even though water or oil is adhered to a work and then made ingress to the sensing part.



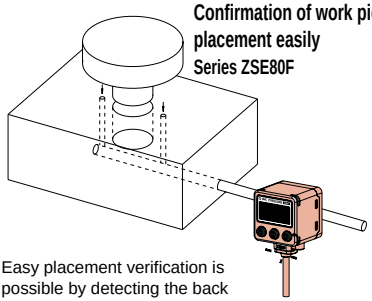
Installation of a group of sensors in a manifold style

Series PSE54□



Placement Verification

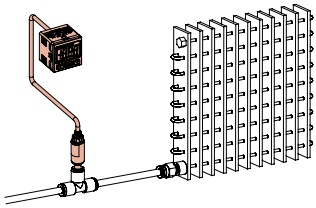
Confirmation of work pieces placement easily
Series ZSE80F



Easy placement verification is possible by detecting the back pressure at the nozzle.

Leak Test

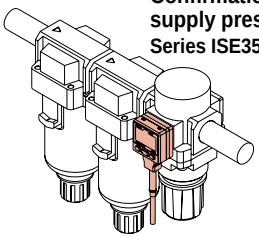
Inspection of a radiator
Series PSE532+PSE300



A low pressure sensor (PSE532-□) is used to detect minute differences. The auto shift function reduces the influence of fluctuations in the supply pressure.

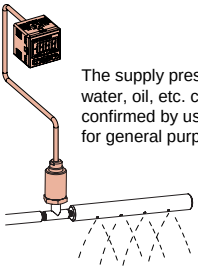
Supply Pressure Confirmation

Confirmation of airline supply pressure
Series ISE35



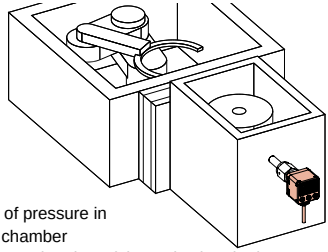
The line pressure can be adjusted by monitoring the digital readout which provides a visual verification of the operating pressure. The output can be programmed to respond to supply pressure drops, etc.

Confirmation of supply pressure of cleaning lines
Series PSE560+PSE300



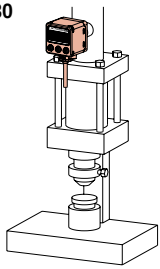
The supply pressure of water, oil, etc. can be confirmed by using a sensor for general purpose fluids.

Confirmation of atmospheric pressure for a load lock chamber
Series ZSE80F



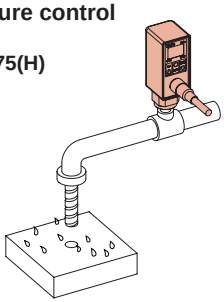
Verification of pressure in a load lock chamber (vacuum spare chamber of the main chamber)

Confirmation of working pressure of hydraulic cylinder
Series ISE80



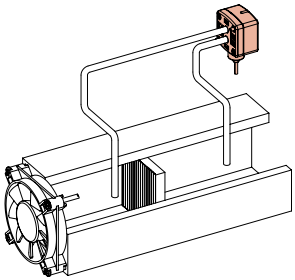
Liquid Coolant Pressure Control

Liquid pressure control of a gun drill
Series ISE70/75(H)



Monitoring Filter Clogging

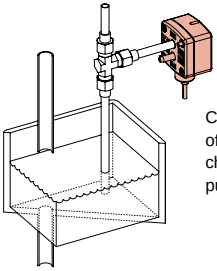
Series PSE550



The filtration and replacement periods can be controlled by monitoring the clogging of the filter.

Liquid Level Detection

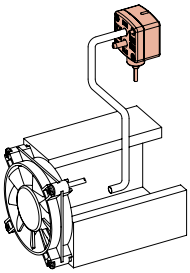
Series PSE550



Can detect the level of a liquid through changes in the purge pressure.

Air Flow Control

Series PSE550



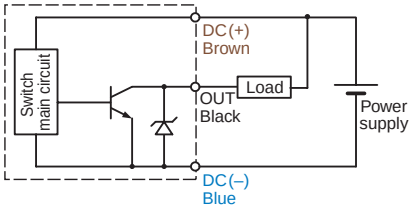
Can monitor the air flow in the duct and control air blasts.

Output Type

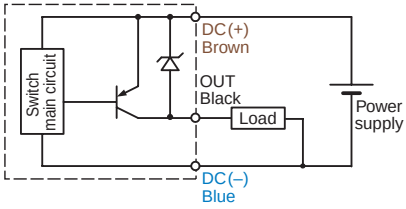
Switch output (ON/OFF output)

• Detects when the limit value exceeds the set value and generates an output for a switch.

NPN output type



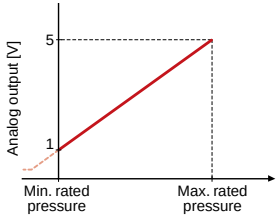
PNP output type



Analog output

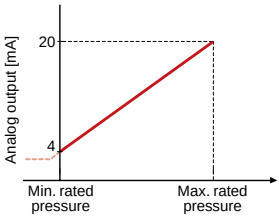
• Outputs voltage and current proportional to pressure.

Voltage output (1 to 5 VDC) type



Current output (4 to 20 mA DC) type

Effective for long distance transmission (10 m or more).



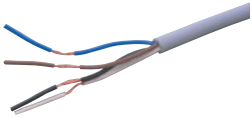
Wiring Specifications

Cable end option

Standard

Pre-solder

Half-stripped



Made to Order

We can provide the cable with a connector from the shown manufacturers. (Tyco Electronics Japan G.K., Molex Japan Co., Ltd., J.S.T. Mfg. Co., Ltd., HIROSE ELECTRIC CO., LTD., Sumitomo 3M Limited, etc.)

Pre-wired

Made to Order

We will prepare the cable with a M8 or M12 connector.

M8 connector

M12 connector

Available with 2 to 4-wire sensors.
(5-wire sensors can be used without using 1 wire.)

Cable length

Standard

0.6 m, 2 m, and 3 m

Made to Order

Available up to 10 m.

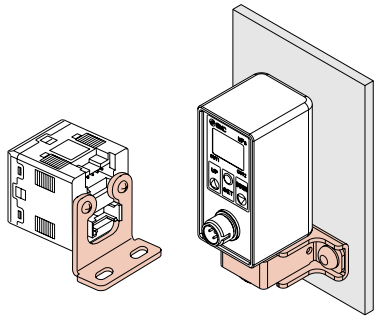
Flexible cable

Made to Order

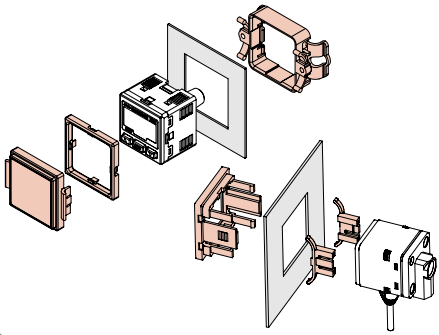
The flexible cables (robot cable) are suited for applications having excessive movement or bends.

Type of Mounting

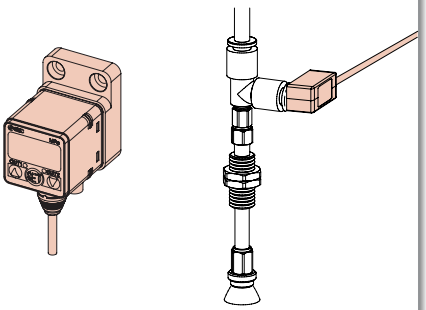
Bracket



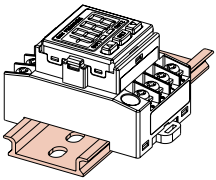
Panel mount adapter



Direct mount



DIN rail



Type of Piping

Fittings

Steel piping is available with PT thread (R thread/Rc thread), NPT thread, NPTF thread, PF thread (G thread), TSJ thread, URJ thread, and M thread.

Compatible with 1/8 or 1/4 inch port size, but not with M thread.

M thread is available with 3 mm or 5 mm.

One-touch fittings/Plug-in reducer

One-touch fittings

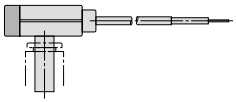
Straight and elbow types are available in mm and inch diameter.

Straight type

Elbow type

Plug-in reducer

Compatible with the smaller size ø4, ø6.
Can be connected with One-touch fitting directly.
Easy handling. Maintenance is good.



Adaptable to Different Environments

Clean room — Series 10-

Application
- To prevent particles from entering a clean room.

Details
- After inspection, blowing with a high purity air (Cleanliness class: ISO class 5) is performed inside of a clean environment.
- Packaging consists of an antistatic protection bag, which is double packaged before being shipped.
- Grease-free for the wetted parts' seals.

Copper-free, Fluorine-free — Series 20-

Application
- Suitable in environments where copper ions are not permitted. For example, CRT manufacturing or front-end semiconductor manufacturing process equipment.

Details
- Application of material which does not include copper in wetted parts (or electroless nickel plating treatment).

Grease-free — Made to Order

Application
- Suitable in environments where oils are not permitted. For example, in a nitrogen or oxygen supply line.

Details
- Any components which include oil are not used. (e.g. NBR coated with oil, etc.)
- No grease is used in the product assembly. (Grease-free)

Silicon-free — Made to Order

Application
- Suitable in environments where siloxane, the gas emitted from silicon, is not permitted.

Details
- Any components which contain silicon are not used.
- Since a pressure sensor with a silicon diaphragm is not permitted, one with a stainless steel diaphragm is used.

Fluorine-free — Made to Order

Application
- Suitable in environments where fluorine based resins are not permitted.

Details
- Fluorine based greases are not used.
- FKM is not used for the seals.

Low density ozone gas compatible — Made to Order

Application
- Suitable in environments where low density ozone gas is generated.

Details
- HNBR or FKM is used for the seals.
- Sensor unit and resin materials are the same as those used for standard products.

Functions

Auto shift function

Summary

- Function to correct the pressure setting of the switch output when there is a pressure fluctuation in the main line.
- For example, when the main line pressure increases by 50 kPa, at the time of auto shift signal input, the pressure setting will be increased by 50 kPa, accordingly.

Application

- The solution of the supply pressure fluctuation during the suction verification.

Auto preset function

Summary

- Function to automatically optimize the setting for the suction verification.

Application

- To easily setup the suction verification.

Display calibration function

Summary

- Function to prevent inconsistent output values and to allow the adjustment of the display values.

Application

- When multiple sensors are used, the differences among the units can be eliminated and the displayed valves for each sensor can be adjusted to read the same.

Keylock function

Summary

- Function to prevent the changing of settings other than those for normal key operations.

Application

- For preventing a malfunction due to unauthorised changes in setup.

Anti-chattering function

Summary

- Function to prevent detection of any momentary pressure fluctuation. Averages the pressure values detected during the response time, which is set by the user.

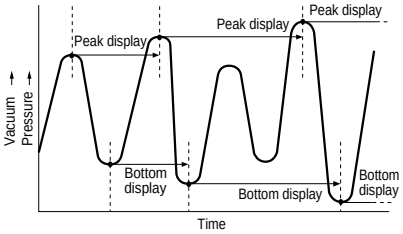
Application

- For preventing a momentary fluctuation in the main line pressure from being detected as an abnormal pressure during the actuator's or ejector's operation.

Peak/Bottom hold function

Summary

- Function to detect and display the fluctuating pressure peak (maximum value) and bottom (minimum value).



Application

- For confirming the maximum or minimum pressure being measured.

Power-saving mode

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.)

Copy function

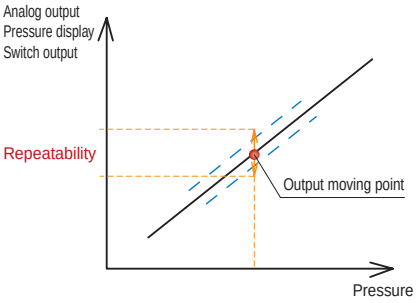
The settings of the master sensor can be copied to the slave sensors. It is to reduce the time taken for setting and prevent the input of wrong values.

Can copy to up to 10 switches simultaneously. (Maximum transmission distance 4 m)

Accuracy

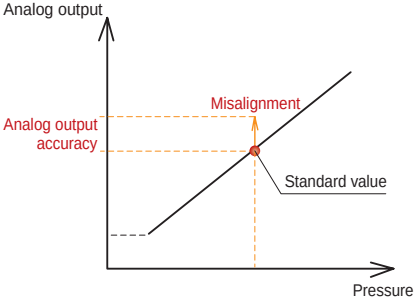
Repeatability

This graph shows the repeatability of an analog output, pressure display and a switch (ON-OFF) output's moving point. The pressure is increased or decreased under normal temperature (25°C).



Analog output accuracy

This graph shows the difference between the analog output voltage (current) standard value versus the input pressure, at a normal temperature (25°C).



Glossary of Terms

UL/CSA standards

UL and CSA standards have been applied in North America (U.S.A. and Canada) symbolizing safety of electrical products, and are defined to mainly prevent danger from an electrical shock or fire, resulting from trouble with the electrical products. The power supply of the SI unit is 24 VDC, which does not meet the voltage requirement for the electrical shock category. However, measures against a fire hazard have been taken.
Some SI units are **UL/CSA** certified. (Use the UL approved products for DC power supply combinations. Refer to each product's operation manuals for details.)

CE marking

CE marked products or equipment that are imported to countries that are EU members must conform to the EC directives.
SMC products are subject to either or both the low power voltage directive (regarding electrical safety) and the EMC directive (regarding noise conformity).
The operating voltage of the sensors is 24 VDC, therefore it is not subjected to the low voltage directive (50 to 1000 VAC or 75 to 1500 VDC).
The sensors undergo EMC testing by a third party and bears the **CE marking** (self-declaration).
Since the product is a component which is ultimately integrated into the user's equipment machine or facility, the user must confirm that the product conforms to the EC directive.

Enclosure

The **enclosure** is rated according to the IP (International Protection) standards (IEC 60529) which defines protection against dust or water.

IP40: Is not protected against the water intrusion, even though a wire exceeding 1.0 mm in diameter can not enter.

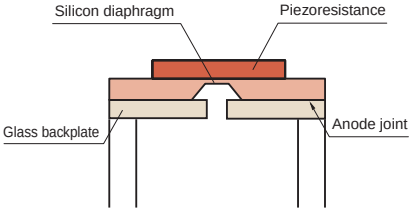
IP65: Powdered dust cannot enter the enclosure and the enclosure is not affected by water sprayed from all directions.

IP67: Powdered dust cannot enter the enclosure, as well as water, even though the enclosure is immersed in water with a specified pressure and time.

Working Principle of Pressure Sensors

Silicon diaphragm pressure sensor

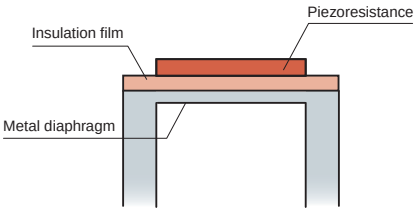
- The piezoresistive bridge circuit is formed on the single crystal silicon diaphragm.
- If a pressure is applied, the diaphragm will deflect and the piezoresistive value will change.
- The changes in the resistance values are output for detection.



Silicon diaphragm sensor construction

Stainless steel diaphragm pressure sensor

- The insulation film and piezoresistive bridge circuit are formed on the stainless steel diaphragm.
- If a pressure is applied, the diaphragm will deflect and the piezoresistive value will change.
- The changes in the resistance values are output for detection.



Stainless steel diaphragm sensor construction

Pressure Type

- There are two types of pressures: The Gauge Pressure, and Absolute Pressure. The gauge pressure is based on the atmospheric pressure. Whereas the absolute pressure is based on the absolute vacuum. (The gauge pressure will change in accordance with the atmospheric pressure change.)
- All of our products are made based on the gauge pressure.