



Operation Manual

PRODUCT NAME

Digital Pressure Switch

MODEL / Series / Product Number

ZSE40A(F)
ISE40A

SMC Corporation

Table of Contents

Safety Instructions	2
Model Indication and how to order	8
Summary of Product parts	10
Definition and terminology	11
Mounting and Installation	14
Installation	14
Piping	15
Wiring	18
Pressure Setting	20
Measurement mode	20
Setting of Function	22
Function selection mode	22
Default setting	22
F0 Unit conversion function	24
F1 Setting of OUT1	25
F2 Setting of OUT2	28
F3 Setting of response time	30
F4 Setting of auto-preset	31
F5 Setting of analog output/auto-shift input	33
F6 Setting of fine adjustment of display value	35
F11 Setting of display resolution	36
F80 Setting of power saving mode	37
F81 Setting of security code	38
Special function setting	39
F90 Setting of all functions	39
F97 Selection of copy function	41
F98 Check of output	43
F99 Reset to the default setting	45
Other Settings	46
Maintenance	49
If the security code is forgotten	50
Troubleshooting	51
Specification	59
Specifications	59
Dimensions	61

Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution", "Warning" or "Danger". They are all important notes for safety and must be followed in addition to International standards (ISO/IEC)*¹⁾ and other safety regulations.

- *1) ISO 4414: Pneumatic fluid power -- General rules relating to systems
ISO 4413: Hydraulic fluid power -- General rules relating to systems
IEC 60204-1: Safety of machinery -- Electrical equipment of machines (Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots -Safety.
etc.

	Caution :	CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	Warning :	WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	Danger :	DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

Caution

The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered.*2)
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Operator

- ◆ This operation manual is intended for those who have knowledge of machinery using pneumatic equipment, and have sufficient knowledge of assembly, operation and maintenance of such equipment. Only those persons are allowed to perform assembly, operation and maintenance.
- ◆ Read and understand this operation manual carefully before assembling, operating or providing maintenance to the product.

■ Safety Instructions

Warning

- Do not disassemble, modify (including changing the printed circuit board) or repair.
An injury or failure can result.
- Do not operate the product outside of the specifications.
Do not use for flammable or harmful fluids.
Fire, malfunction, or damage to the product can result.
Verify the specifications before use.
- Do not operate in an atmosphere containing flammable or explosive gases.
Fire or an explosion can result.
This product is not designed to be explosion proof.
- Do not use the product in a place where static electricity is a problem.
Otherwise it can cause failure or malfunction of the system.
- If using the product in an interlocking circuit:
 - Provide a double interlocking system, for example a mechanical system
 - Check the product regularly for proper operationOtherwise malfunction can result, causing an accident.
- The following instructions must be followed during maintenance:
 - Turn off the power supply
 - Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenanceOtherwise an injury can result.

Caution

- Do not touch the terminals and connectors while the power is on.
Otherwise electric shock, malfunction or damage to the product can result.
- After maintenance is complete, perform appropriate functional inspections and leak tests.
Stop operation if the equipment does not function properly or there is a leakage of fluid.
When leakage occurs from parts other than the piping, the product might be faulty.
Disconnect the power supply and stop the fluid supply.
Do not apply fluid under leaking conditions.
Safety cannot be assured in the case of unexpected malfunction.

■NOTE

○Follow the instructions given below when designing, selecting and handling the product.

- The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.

*Product specifications

- The direct current power supply to combine should be UL approved as follows.

Circuit (of Class2) which is of maximum 30 Vrms (42.4 V peak) or less, with UL1310 Class2 power supply unit or UL1585 Class2 transformer.

- The Pressure switch is a  approved product only if it has a  mark on the body.
- Use the specified voltage.

Otherwise failure or malfunction can result.

- Do not exceed the specified maximum allowable load.

Otherwise it can cause damage or shorten the lifetime of the Pressure switch.

- Design the product to prevent reverse current when the circuit is opened or the product is forced to operate for operational check.

Reverse current can cause malfunction or damage to the product.

- Input data to the Pressure switch is not deleted, even if the power supply is cut off.

(Writing time: 1,000,000 times, Data duration: 10 years after power off)

- For the details of compressed air quality, refer to ISO 8573-1, 1.1.2 to 1.6.2: 2001.

This can cause operating failure.

If compressed air containing condensate is used, install an air dryer or drain catch before the filter and perform drainage regularly.

If drainage is not performed regularly and condensate enters the secondary side, it can cause operating failure of pneumatic equipment.

If regular drainage is difficult, the use of a filter with an auto drain is recommended.

- Applicable fluid is air, inert gases and incombustible gases.

Do not use a fluid containing chemicals, synthetic oils including organic solvent, salt and corrosive gases. Otherwise, damage to the product and malfunction can result.

Check the details of the specifications before using.

- Use the specified measurement flow rate and operating pressure.

Otherwise it can cause damage to the Pressure switch or inability to measure correctly.

- Reserve a space for maintenance.

Allow sufficient space for maintenance when designing the system.

●Product handling

*Installation

- Tighten to the specified tightening torque.

If the tightening torque is exceeded the mounting screws and brackets may be broken.

If the tightening torque is insufficient, the product can be displaced and loosen the mounting screws.

(Refer to "Mounting and Installation" on page 14.)

- Do not apply excessive stress to the product when it is mounted with a panel mount.

Otherwise damage to the product and disconnection from the panel mount can result.

- Be sure to ground terminal FG when using a commercially available switch-mode power supply.

- Do not drop, hit or apply shock to the Pressure switch.

Otherwise damage to the internal parts can result, causing malfunction.

- Do not pull the lead wire forcefully, not lift the product by pulling the lead wire. (Tensile force 49N or less)
Hold the body when handling to avoid the damage of the Pressure switch which lead to cause the failure and malfunction.
- For piping of the Pressure switch, hold the piping with a spanner on the metal part of the piping (Piping attachment).
Holding other part with spanner leads to damage the Pressure switch.
- Eliminate any dust left in the piping by air blow before connecting the piping to the product.
Otherwise it can cause damage or malfunction.
- Do not insert metal wires or other foreign matter into the pressure measurement port.
It can damage the pressure sensor causing failure or malfunction.
- Never mount a Pressure switch in a location that will be used as a foothold.
The product may be damaged if excessive force is applied by stepping or climbing onto it.
- If the entering of foreign material to the fluid is possible, install and pipe the filter or the mist separator to the inlet to avoid failure and malfunction.

*Wiring

- Do not pull the lead wires.
In particular, never lift a Pressure switch equipped with fitting and piping by holding the lead wires.
Otherwise damage to the internal parts can result, causing malfunction or to be off the connector.
- Avoid repeatedly bending or stretching the lead wire, or placing heavy load on them.
Repetitive bending stress or tensile stress can cause the sheath of the wire to peel off, or breakage of the wire.
If the lead wire can move, fix it near the body of the product.
The recommended bend radius of the lead wire is 6 times the outside diameter of the sheath, or 33 times the outside diameter of the insulation material, whichever is larger.
Replace the damaged lead wire with a new one.
- Wire correctly.
Incorrect wiring can break the Pressure switch.
- Do not perform wiring while the power is on.
Otherwise damage to the internal parts can result, causing malfunction.
- Do not route wires and cables together with power or high voltage cables.
Otherwise the product can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line. Route the wires (piping) of the product separately from power or high voltage cables.
- Confirm proper insulation of wiring.
Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.
- Design the system to prevent reverse current when the product is forced to operate for operational check.
Depending on the circuit used, insulation may not be maintained when operation is forced, allowing reverse current to flow, which can cause malfunction and damage the product.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.
Do not use a cable longer than 10 m.
Wire the DC(-) line(blue) as close as possible to the power supply.
- When analog output is used, install a noise filter (line noise filter, ferrite element, etc.) between the switch-mode power supply and this product.

*Environment

- Do not use the product in an environment that is constantly exposed to the splash of water.
Otherwise failure or malfunction can result. Take measures such as using a cover.
- Do not use the product in an environment where corrosive gases or fluids could be splashed.
Otherwise damage to the product and malfunction can result.
- Do not use in a place where the product could be splashed by oil or chemicals.
If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction, or hardening of the lead wires).
- Do not use in an area where surges are generated.
If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the Pressure switch, this may cause deterioration or breakage of the internal circuit of the Pressure switch. Avoid sources of surge generation and crossed lines.

- Do not use a load which generates surge voltage.
When a surge-generating load such as a relay or solenoid is driven directly, use a Pressure switch with a built-in surge absorbing element.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- This product is CE marked, it may happen that the set value of product is changed by the noise impressed in excess.
- Mount the product in a place that is not exposed to vibration or impact.
Otherwise failure or malfunction can result.
- Prevent foreign matter such as remnant of wires from entering the Pressure switch.
Take proper measures for the remnant not to enter the Pressure switch in order to prevent failure or malfunction.
- Do not use the product in an environment that is exposed to temperature cycle.
Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.
- Do not expose the product to direct sunlight.
If using in a location directly exposed to sunlight, shade the product from the sunlight.
Otherwise failure or malfunction can result.
- Keep within the specified fluid and ambient temperatures range.
The fluid and ambient temperatures should be -5 to 50°C . Operation under low temperature (5°C or less) leads to cause damage or operation failure due to frozen moist in the fluid or air.
Protection against freezing is necessary. Air dryer is recommended for elimination of drain and water.
Avoid sudden temperature change even within specified temperature.
- Do not operate close to a heat source, or in a location exposed to radiant heat.
Otherwise malfunction can result.

*Adjustment and Operation

- Turn the power on after connecting a load.
Otherwise it can cause excess current causing instantaneous breakage of the Pressure switch.
- Do not short-circuit the load.
Although error is displayed when the Pressure switch load is short circuit, generated excess current lead to cause the damage of the Pressure switch.
- Do not press the setting buttons with a sharp pointed object.
It may damage the setting buttons.
- If using the product to detect very small pressure rates, warm up the product for 10 to 15 minutes first.
There will be a drift on the display and the analog output of approximate $\pm 1\%$ immediately after the power supply is turned on.
There will be a drift on the display of approximate 1% immediately after the power supply is turned on.
- Perform settings suitable for the operating conditions.
Incorrect setting can cause operation failure.
For details of each setting, refer to page 20 to 48 of this manual.
- The Pressure switch is compulsory turned off for 4 seconds after power supplied.
For 4 seconds after supplying power, the measurement output is turned off.
- Do not touch the LCD during operation.
The display can vary due to static electricity.

*Maintenance

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.
There is a risk of unexpected malfunction.
- Perform drainage regularly.
If condensate enters the secondary side, it can cause operating failure of pneumatic equipment.
- Do not use solvents such as benzene, thinner etc. to clean the Pressure switch.
They could damage the surface of the body and erase the markings on the body.
Use a soft cloth to remove stains. For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

Model Indication and how to order

ISE40A - **01** - **X** - **M**

Set pressure range

	Symbol	Content
Positive pressure	ISE40A	-0.1 to 1.000 MPa
Vacuum pressure	ZSE40A	0.0 to -101.3 kPa
Compound pressure	ZSE40AF	-100.0 to 100 kPa

Piping specification

Symbol	Content	
01	R1/8 (with M5 female thread)	
N01	NPT1/8 (with M5 female thread)	
W1	Rc1/8	
*WF1	G1/8	
*M5	M5×0.8 (Female thread)	
*C4	One-touch fitting φ4	
*C6	One-touch fitting φ6	

*: Made to Order

Output specification

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

Option 2

Symbol	Calibration certificate
Nil	-
K	○

Option 1 *

Symbol	Content	
Nil	No option	
A	Bracket A	
B	Bracket B	
D	Bracket D	
E	Panel mount adapter	
F	Panel mount adapter + Front protective cover	

*: Depending on the piping specification, this option cannot be selected.
Refer to "Piping specifications/Matrix table for option 1 and number" on page 9.

Unit specification

Symbol	Content
Nil	With unit conversion function *1
M	Fixed SI unit *2
P	With unit conversion function (psi initial value) *1

*: A unit label is attached.

*1: The new Measurement Law prohibits the use of pressure switch with the unit conversion function in Japan.

*2: Fixed unit kPa, MPa

•Piping specifications/Matrix table for option 1 and part number

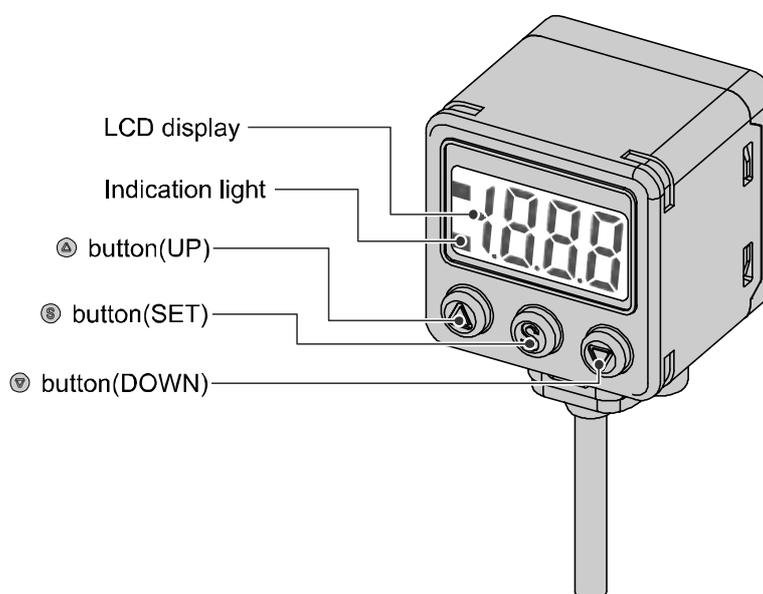
Option 1			Pipng specification						
Description	Symbol	Part number	01	N01	W1	WF1	M5	C4	C6
Bracket A	A	ZS-24-A	O	O	O	O	×	×	×
Bracket B	B	ZS-24-B	×	×	O	O	×	×	×
Bracket D	D	ZS-24-D	O	O	O	O	×	×	×
Panel mount adapter	E	ZS-35-C	O	O	×	×	×	×	×
		ZS-35-D	×	×	O	O	O	O	O
Panel mount adapter + Front protective cover	F	ZS-35-F	O	O	×	×	×	×	×
		ZS-35-G	×	×	O	O	O	O	O

○Option/Part number

Part number	Option
ZS-24-A	Bracket A With 2 mounting screws each of M3 x 5L, M4 x 5L
ZS-24-B	Bracket B With 2 mounting screws M4 x 5L
ZS-24-D	Bracket D With 2 mounting screws each of M3 x 5L, M4 x 5L
ZS-35-C	Panel mount adapter (Piping specification: 01, N01)
ZS-35-D	Panel mount adapter (Piping specification: W1, WF1, M5, C4, C6)
ZS-35-F	Panel mount adapter + Front protective cover (Piping specification: 01, N01)
ZS-35-G	Panel mount adapter + Front protective cover (Piping specification: W1, WF1, M5, C4, C6)

Summary of Product parts

oNames of individual parts



Indication light (Orange LED): Displays the switch operation condition.

LCD display: Displays the current status of pressure, setting mode and error code.

Four display modes can be selected to display always in red or green only, or changing from green to red, red to green according to the output status.

- ▲ button(UP): Selects the mode or increases ON/OFF set value.
Press this button to change to the peak display mode.
- ▼ button(DOWN): Selects the mode or decreases ON/OFF set value.
Press this button to change to the bottom display mode.
- button(SET): Press this button to change to either mode and to set a set value.

■ Definition and terminology

	Terms	Meaning
2	2-color indication	There are two colors to indicate a value, changing in accordance with ON and OFF of the switch output.
7	7-segment indication	When "8" is shown on the display. It is called 7-segment because 8 consists of 7 pieces of "-" (segments)".
A	(Analog) current output	See "Analog output (function)".
	Analog output (function)	Function to output the voltage or current in proportion to the pressure.
	(Analog) voltage output	See "Analog output (function)".
	Auto preset	A function of the Pressure switch to automatically setup pressure just by having equipment hold and release a workpiece via vacuum adsorption. This function is used in an application where vacuum adsorption of a workpiece needs to be confirmed with a Pressure switch.
	Auto shift	A function to correct the set value of the switch output in accordance with the applied pressure in case the switch operation is unstable due to pulsation of applied pressure. This function is used in applications such as vacuum adsorption. The pressure when a signal is externally input is set as a reference value with which the pressure that turns the switch on or off can be shifted.
B	Bottom value indication (mode)	Shows the minimum pressure reached at that moment.
C	Chattering	The phenomenon caused in the switch output type in which the output turns on and off repeatedly at high frequency.
	Chattering-preventing function	A function to delay the response time of switch output in order to prevent chattering.
	Copy function	A function to copy a pressure setting value and function setting (excluding fine adjustment of indication value).
D	Digit (Min. setting unit)	Shows how precisely the pressure can be indicated or set by the digital Pressure switch. When 1 digit= 1 kPa, the pressure is given with an increment of 1 kPa, e.g., 1, 2, 3, ..., 99, 100.
E	Error indication	With the self-diagnosis function given to the Pressure switch, it indicates that there is a failure which could cause a switch failure.
F	Fine adjustment mode	See "Fine adjustment of indicated value".
	Fine adjustment of indicated value	An indicated pressure value can be adjusted within the range of $\pm 5\%$ R.D. ($\pm 5\%$ of the indicated value). It is used if a true pressure value is known or to correct the difference of an indicated value of the measurement equipment nearby that measures the same pressure as the Pressure switch.
	F.S. (full span/full scale)	Abbreviation for full span and full scale; means the maximum fluctuation range of the Pressure switch rated value. For example, when the output voltage is 1 to 5[V], the F.S. will be $5-1=4[V]$. (Reference: $1\%F.S.=4 \times 0.01=0.04[V]$)
	Function selection mode	It is a mode with which each function is set up, and it is a separate menu from the pressure setup. If the setting needs to be changed at factory, "F*", each item can be set up. The items to be set up are: indication color, operation mode, output type, response time, indication resolution, fine adjustment of indicated value, use of auto preset, use of power-saving mode, and use of PIN number.
H	Hysteresis	Difference between the points at which the Pressure switch is turned on and off.
	Hysteresis mode	Refer to "List of output mode" on page 27.
I	Indication accuracy	Shows the deviation between displayed pressure value and the true pressure.

	Terms	Meaning
I	Indication color	The color of the digital display. There are four choices: usually green, usually red, green (off) to red (on), and red (off) to green (on).
	Insulation resistance	Insulation resistance of a product itself. The resistance between an electric circuit and a body.
	Indication resolution	How fine the rated pressure range can be segmented. (Example: If a product for 0 to 1 MPa can indicate pressure by 0.001 MPa, the indication resolution is 1/1000.)
	Indication light	The light that turns on when the switch output is on.
	Indication unit	The unit of pressure used in the display.
K	Key lock (function)	Prohibits a change in the setting of the Pressure switch (locks button operation).
L	Load impedance	See "Max. load impedance".
M	Manual setup	Manual pressure setup without using auto preset. This term is used to discriminate from the pressure setup using auto preset.
	Master Pressure switch	A Pressure switch which copies another Pressure switch's settings when using the copy function.
	Max. applied voltage	The maximum value of applied voltage available to the output line of the NPN output.
	Max. load current	The maximum current available to the output (output line) of the switch output.
	Max. (Min.) load impedance	The maximum (minimum) load (resistance value and impedance) which can be connected to the output (output line) of the analog current output.
	Measurement mode	The condition in which the pressure is being detected and indicated and switch operation is enabled.
	Min. setting unit	Refer to "digit".
N	Normal output	One of the switch output types, and means the operation in which a switch is turned on when pressure equal to the switch output set value or more is detected. In the (hysteresis mode) window comparator mode, it indicates the operation in which a switch is turned on when pressure in the switch output range (n1L to n1H or n2L to n2H) is detected. (Refer to "List of output mode" on page 27.)
	NPN (open collector) (output)	The switch that uses the NPN transistor for output.
O	Operating mode	There are two choices, hysteresis mode and window comparator mode.
	Output impedance	The resistance value of a component between the voltage outputting element and the output line at the output of the analog voltage output. It is indicated as a resistance value which is converted in accordance with the condition in which resistance is directly connected to the voltage output element. There may be an error in the output voltage depending on this output impedance and the input impedance of customers' equipment. (Example: If the Pressure switch with output impedance of 1kΩ is connected to the A/D converter to detect the analog output of 5V, the detected voltage by the A/D converter becomes $5(V) \times 1(M\Omega)/(1(k\Omega) + 1(M\Omega)) = 4.995(V)$, and there is an error of approximate 0.005 V.)
	Output style	The operation theory of the switch output. Either normal output or reversed output can be selected. Refer to "List of output mode" on page 27 for the operation status.
P	Peak value indication (mode)	Shows the maximum pressure reached at that moment.
	Piping-port size	The size of the port on the switch body with which a device and the switch are connected.

	Terms	Meaning
P	PNP (open collector) (output)	The switch that uses the PNP transistor for output.
	Power saving mode	The condition in which the indicated value turns off and current consumption is reduced.
	Pressure-sensing part	A pressure-detecting part of a pressure-detecting element.
	Pressure setting	The setting of pressure to determine the point at which the Pressure switch turns on and off.
	Proof pressure	The pressure beyond which the Pressure switch breaks.
R	Rated pressure range	The pressure range in which the Pressure switch satisfies the specifications. Values over this range can be set if they are within the set pressure range, but cannot assured the specifications to be satisfied.
	R.D.	The value currently displayed. For example, when the displayed value is 1.000, $\pm 5\%$ R.D. will be ± 0.05 , which is $\pm 5\%$ of 1.000, while for a displayed value of 0.800 it will be 0.04.
	Repeatability	Reproducibility of the displayed value for pressure and ON-OFF output operating point when the pressure changes at a temperature of 25 °C.
	Residual voltage	The difference between the ideal ON voltage and the actual voltage when the switch output is on. It depends on present load current and ideally should be "0".
	Resolution	See "Indication resolution".
	Response time	The elapsed time until the ON-OFF output begins working since the pressure supplied for the Pressure switch has reached the set value. Generally, the shorter response time is, the better the performance is.
	Reversed output	One of the switch output types, and means the operation in which a switch is turned on when pressure equal to the switch output set value or less is detected. In the (hysteresis mode) window comparator mode, it indicates the operation in which a switch is turned on when pressure outside the switch output range (n1L to n1H or n2L to n2H) is detected. (Refer to "List of output mode" on page 27.)
	Ripple	A type of chattering.
S	Setting of function	See "Function selection mode".
	Setting pressure range	The pressure range within which switch output can be set.
	Slave Pressure switch	A Pressure switch whose settings are copied when using the copy function.
	Switch output	Alternatively called "ON-OFF output".
U	Unit conversion function	Function to change the unit in which the value of pressure is indicated. Only a product with this function can change the unit. A product with unit-changing function cannot be purchased if it is used within Japan. Pressure is indicated only by SI units in Japan.
W	Wetted part (or part exposed to gas)	That part of the Pressure switch which is in contact with detected fluid such as a pressure sensor, seal, and fitting.
	Window comparator mode	An output type that holds the output when the pressure is within a certain range. (Refer to "List of output mode" on page 27.)
	Withstand voltage	Durability to voltage applied between an electric circuit and a body. A product's durability in withstanding voltage. If more voltage is applied to the product, the product may be broken. (Voltage mentioned here is not power voltage to activate the product.)
Z	Zero clear (function)	Adjusts the displayed pressure value to "0".

Mounting and Installation

■ Installation

○ Mounting

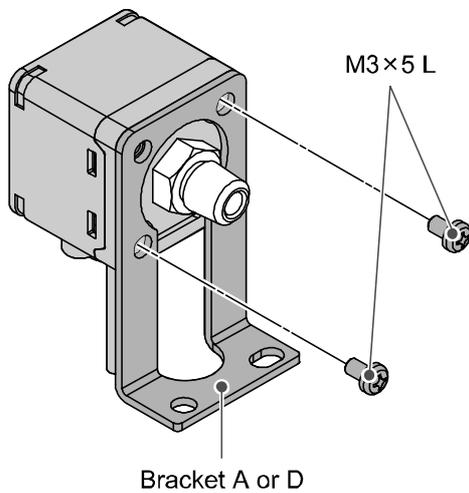
- Mount the optional bracket and panel mount adapter to the Pressure switch.
- When the Pressure switch is to be mounted in a place where water and dust splashes occur, insert a tube (O.D $\phi 4$, I.D $\phi 2.5$) into the air-relieving port of the Pressure switch.
(Refer to "Tube attachment" on page 17.)

○ Mounting with bracket

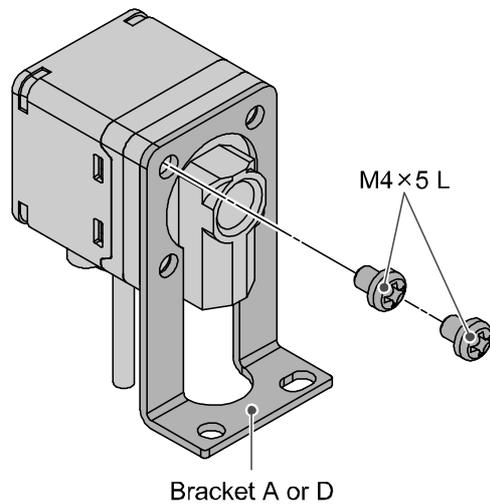
- Fix the bracket to the Pressure switch with the set screws M3 \times 5 L (2 pcs.) or M4 \times 5 L (2 pcs.) supplied.
- Apply a tightening torque of 0.5 to 0.7 Nm for the M3 set screws or 1.4 to 1.6 Nm for the M4 set screws.

- Bracket A or D (Model: ZS-24-A/ZS-24-D)

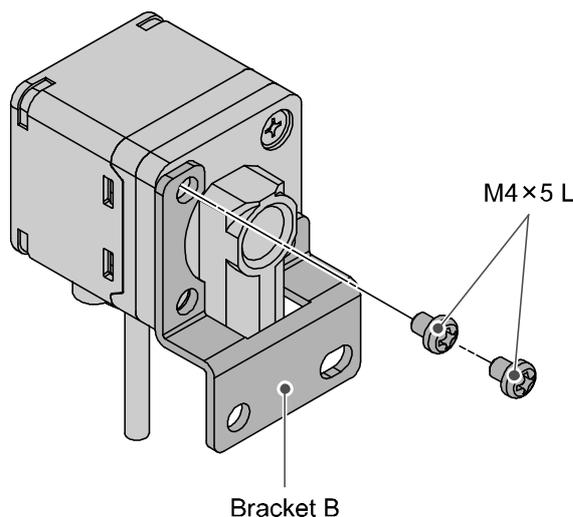
[01/N01 type]



[W1/WF1 type]



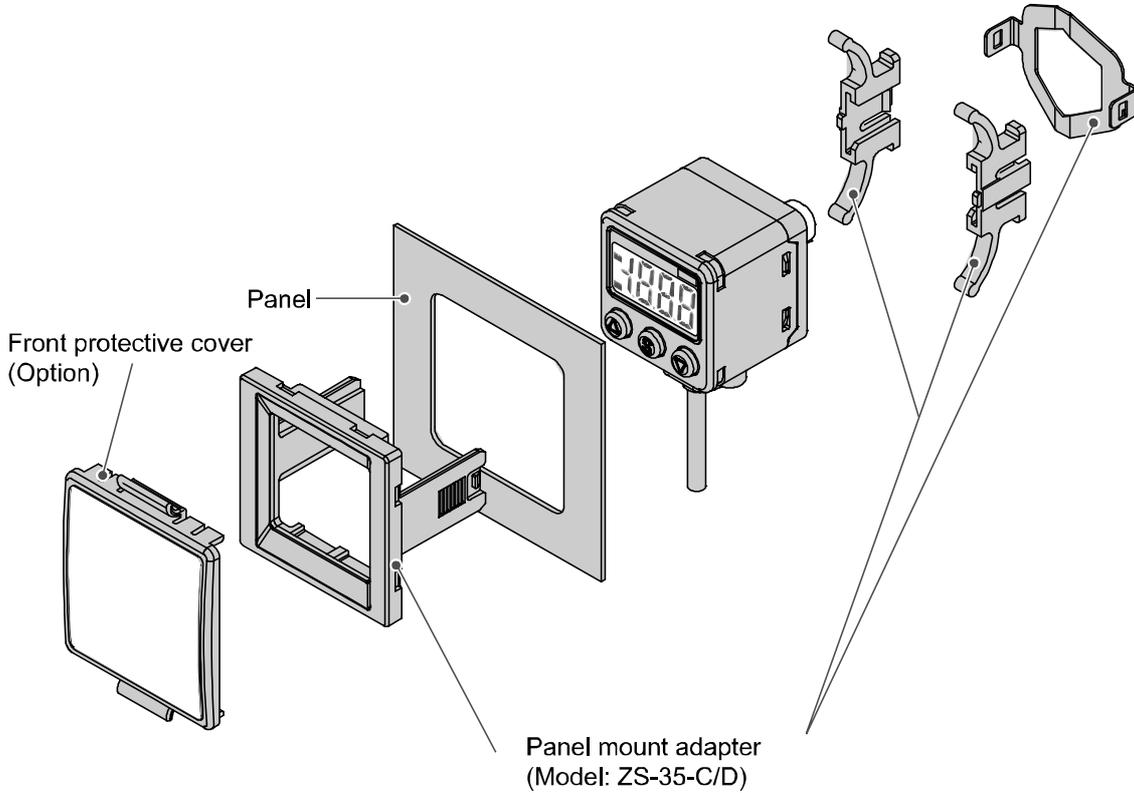
- Bracket B (Model: ZS-24-B)



○ Mounting with panel mount adapter

- Panel mount adapter (Model: ZS-35-C/ZS-35-D)

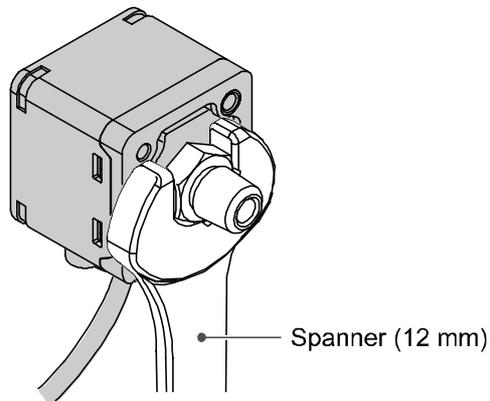
Panel mount adapter + Front protective cover (Model: ZS-35-F/ZS-35-G)



■ Piping

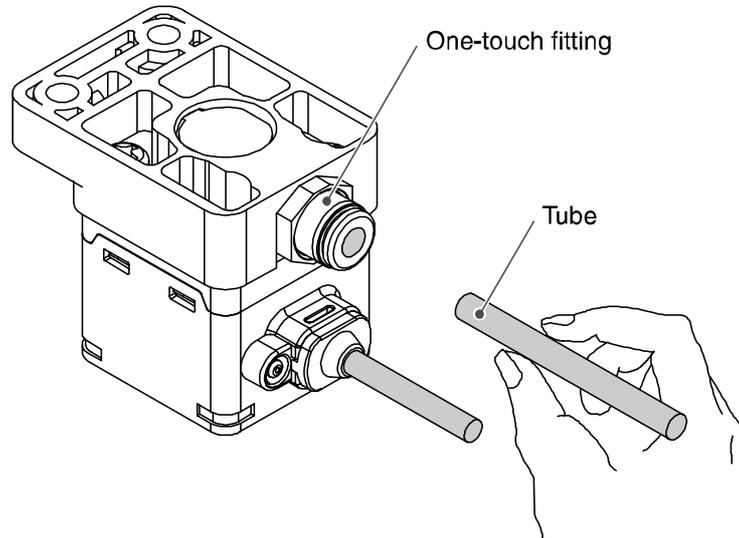
○ Connection using screw type piping

- Connect suitable piping to the mating port.
- Hold the hexagon part of the pressure port and fix. Apply a tightening torque of 7 to 9 Nm. When using an M5 female fitting confirm the fitting specification.



○Connection using One-touch fitting

1. Cut the tube perpendicularly.
2. Hold the tube and insert it into the One-touch fitting slowly until it bottoms out.



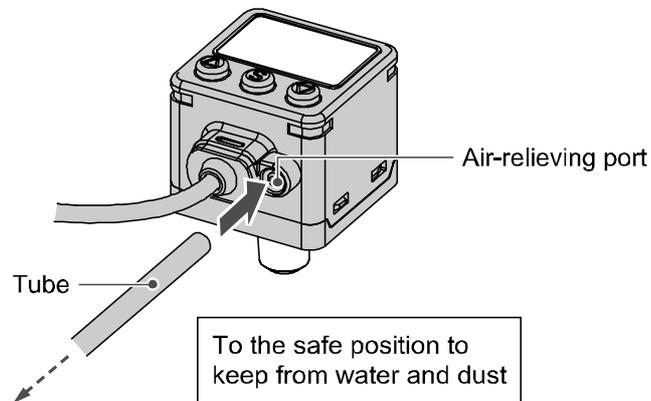
⚠ Warning

■ Do not use the Pressure switch in a place where electrical static charge will be problem.
It can cause the error and breakage of the system.

- Keep a margin for tube length to prevent twist, tensile and moment load from applying to the fitting and tube.
- When using a tube manufactured by another company, check its outside diameter accuracy satisfies the following value.
 - 1) Nylon tube: ± 0.1 mm at maximum
 - 2) Soft nylon tube: ± 0.1 mm at maximum
 - 3) Polyurethane tube: $+0.15$ mm/ -2 mm at maximum

○ Tube attachment

- When this Pressure switch is used in a place where water and dust splashes may occur, insert a tube in the air-relieving port, and bring piping of the opposite side up to the safe position to keep it from water and dust. (See the figure below.)



*: The tube should be inserted to the end of the air-relieving port.

*: SMC TU0425 (polyurethane, O.D $\phi 4$, I.D $\phi 2.5$) is a suitable tubing.

■Wiring

○Internal circuit and wiring example

Z/ISE40A(F)-□-□-□□□

● Output specification

-S/-R

(Analog output mode)

Switch output

NPN open collector output type-2 output

Max. 28 V, 80 mA

Residual voltage 1 V or less

R: Analog output 1 to 5 V

Output impedance 1 k Ω

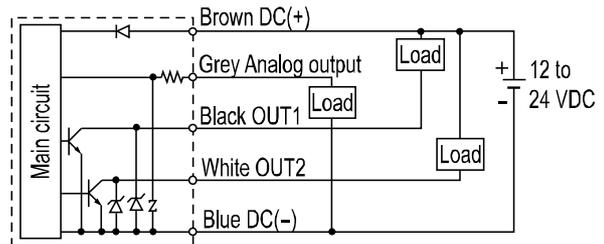
S: Analog output 4 to 20 mA

Max. load impedance

Power supply voltage 12 V: 300 Ω

Power supply voltage 24 V: 600 Ω

Min. load impedance 50 Ω



-S/-R

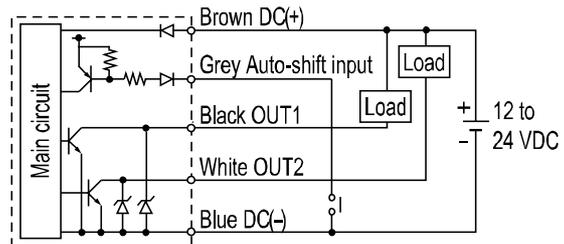
(Auto-shift input mode)

With auto-shift switch output

NPN open collector output type-2 output

Max. 28 V, 80 mA

Residual voltage 1 V or less



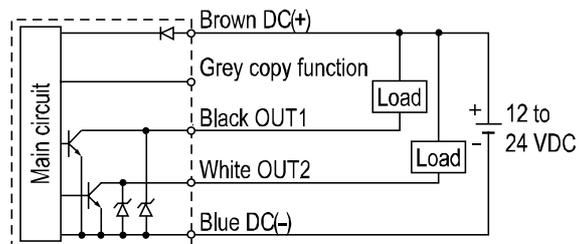
-X

(Copy function switch output)

NPN open collector output type-2 output

Max. 28 V, 80 mA

Residual voltage 1 V or less



-V/-T

(Analog output mode)

Switch output

PNP open collector output type-2 output

Max. 80 mA

Residual voltage 1 V or less

T: Analog output 1 to 5 V

Output impedance 1 k

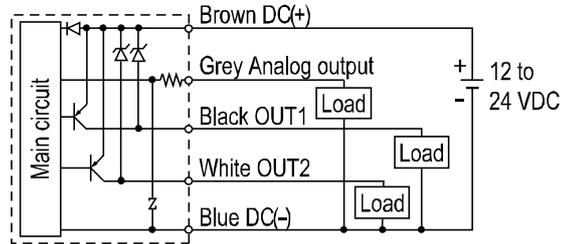
V: Analog output 4 to 20 mA

Max. load impedance

Power supply voltage 12 V: 300 Ω

Power supply voltage 24 V: 600 Ω

Min. load impedance 50 Ω



-V/-T

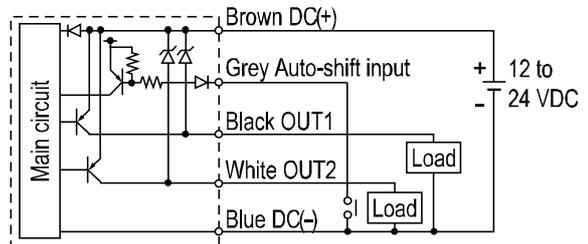
(Auto-shift input mode)

With auto-shift switch output

PNP open collector output type-2 output

Max. 80 mA

Residual voltage 1 V or less



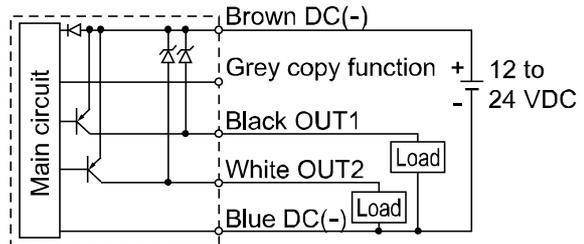
-Y

(Copy function switch output)

PNP open collector output type-2 output

Max. 28 V, 80 mA

Residual voltage 1 V or less

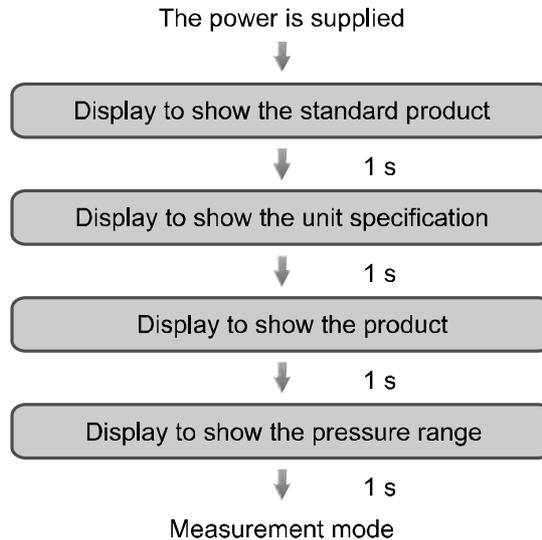


Pressure Setting

■ Measurement mode

The measurement mode is the condition where the pressure is detected and indicated, and the switch function is operating.

This is the basic mode, and other modes should be selected for setting change and other function setting changes.



Set ON and OFF point of the Pressure switch.

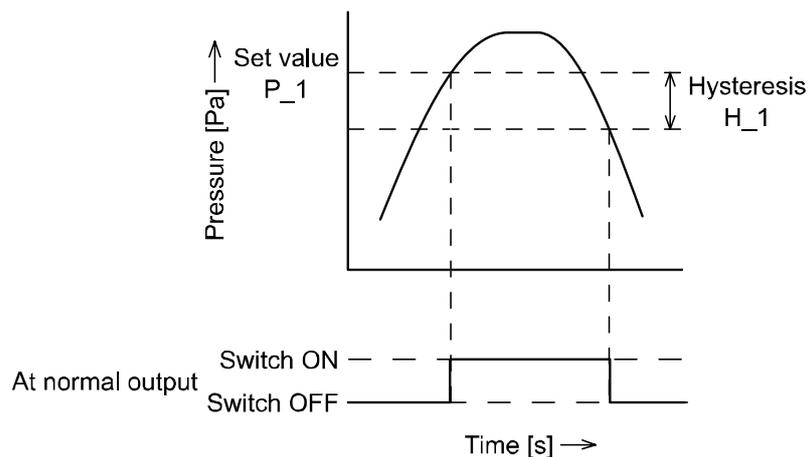
Operation

When the pressure exceeds a set value, the Pressure switch will be turned ON.

When the pressure falls below the set value by the amount of hysteresis or more, the Pressure switch will be turned OFF.

The default setting of the output set value is the center value between the atmospheric pressure and the upper limit of the rated pressure range.

If the operation shown below does not cause any problem, keep this operation setting.



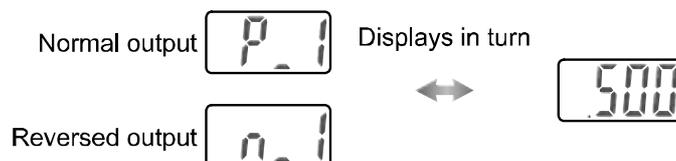
<How to operate>

[Hysteresis mode]

- 1, Press the **(S)** button once in measurement mode.

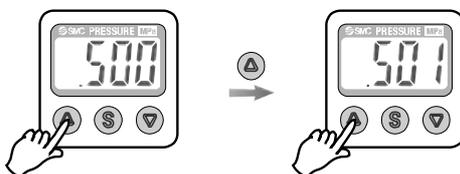


- 2, [P_1] or [n_1] and set value are displayed in turn.

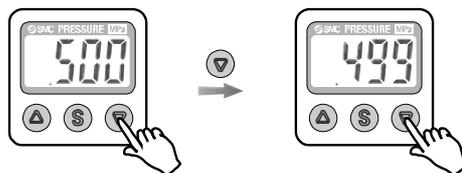


- 3, Press the **(▲)** or **(▼)** button to change the set value.
The **(▲)** button is for increase and the **(▼)** button is for decrease.

- Press the **(▲)** button once to increase by one figure, and press it continuously to keep increasing the set figure.



- Press the **(▼)** button once to decrease by one figure, and press it continuously to keep decreasing the set figure.



- 4, Press the **(S)** button to finish the setting of OUT1.
[P_2] or [n_2] is displayed. Set OUT2 same as OUT1.

The Pressure switch turns on within a set pressure range (from P1L to P1H) during window comparator mode. Set P1L (switch lower limit) and P1H (switch upper limit) with the setting procedure above. When reversed output is selected, [n1L] and [n1H] are displayed.

Zero clear of indication

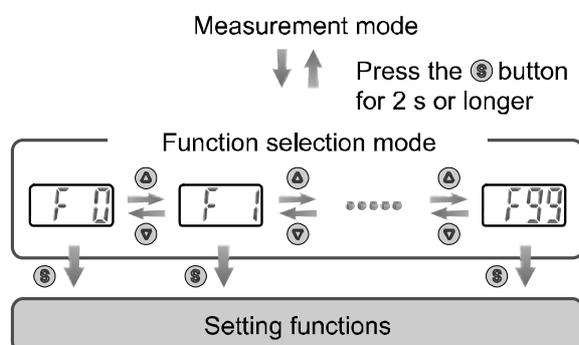
Indication is reset to zero when **(▲)** and **(▼)** buttons are pressed simultaneously for 1 second.
For the first operation, perform zero clear without pressure supply.

Setting of Function

■ Function selection mode

In measurement mode, press the Ⓢ button for 2 seconds or longer to display [F 0]. Show the display of function setting to be changed, [F □□].

Press the Ⓢ button for 2 seconds or longer in function selection mode to return to measurement mode.



*: Some functions are not available depending on part number. If a function is not available for specified type, the function is displayed as [---].

■ Default setting

At the time of shipment, the following settings are provided.

If the setting is acceptable, keep it for use.

To change setting, enter function selection mode.

● [F 0] Unit conversion function ➡ See page 24

Unit specification	Pressure range	Default setting
Nil or M	ISE40A	MPa
	ZSE40A(F)	kPa
P	ISE40A	psi
	ZSE40A(F)	

● [F 1] Parameter setting of OUT1 ➡ See page 25

Item	Explanation	Default setting
Output mode	Selects hysteresis mode, window comparator mode or OFF mode.	Hysteresis mode
Reversed output	Selects reversed output.	Normal output
Pressure setting	Sets ON or OFF point of the switch output	ISE40A: 0.500 MPa ZSE40A: -50.7 kPa ZSE40AF: 50.0 kPa
Hysteresis	Chattering can be prevented by setting hysteresis.	ISE40A: 0.050 MPa ZSE40A: 5.1 kPa ZSE40AF: 5.0 kPa
Display color	Selects the display color.	ON: Green OFF: Red

● [F 2] Parameter setting of OUT2 ➡ See page 28

Same setting as [F 1] OUT1.

At the output mode, Error detection mode can be selected.

Display color is linked to the setting of OUT1, and can not be selected.

•Other parameter setting

Item	Page	Default setting
[F 3] Setting of response time	See page 30	2.5 ms
[F 4] Setting of auto-preset	See page 31	Manual
[F 5] Setting of analog output/auto-shift input	See page 33	Analog output
[F 6] Setting of fine adjustment of display value	See page 35	0%
[F11] Setting of display resolution	See page 36	1000-split
[F80] Setting of power saving mode	See page 37	OFF
[F81] Setting of security code	See page 38	OFF
[F90] Setting of all functions	See page 39	OFF
[F97] Selection of copy function	See page 41	OFF
[F98] Check of output	See page 43	Normal
[F99] Reset to the default setting	See page 45	OFF

■[F 0] Unit conversion function

This function is available for unit selectable type.

The unit that can be displayed is different depending on the pressure range.

(Display in kPa/MPa is available even if unit conversion function is not equipped.)

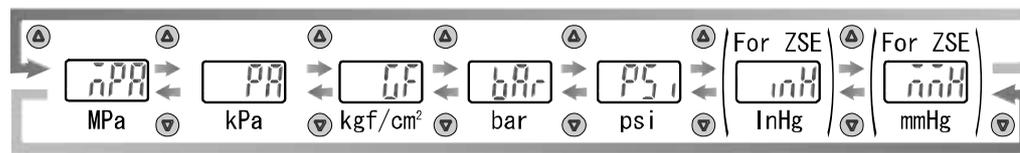
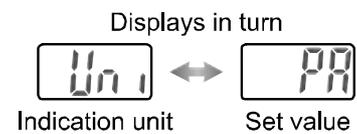
<Operation>

Press the \blacktriangle or \blacktriangledown button in function selection mode to display [F 0].

Press the $\text{\$}$ button. \blacktriangledown Move on to select indication unit.

Select Indication Unit

Press the \blacktriangle or \blacktriangledown button to select the indication unit.



Press the $\text{\$}$ button to set. \blacktriangledown Return to function selection mode.

Setting of [F 0] unit conversion function completed

•Indication unit and minimum. setting unit

Unit	ZSE40AF	ZSE40A	ISE40A
MPa	0.001	0.001	0.001
kPa	0.1	0.1	1
kgf/cm ²	0.001	0.001	0.01
bar	0.001	0.001	0.01
psi	0.02	0.01	0.1
InHg	0.1	0.1	-
mmHg	1	1	-

■[F 1] Setting of OUT1

Set output method of OUT1.

Output turns on when the pressure exceeds the set value. The default setting of output set value is a center value of between atmospheric pressure and upper limit of the rated range.

Display color depends on OUT1 condition. The default setting of display color is as follows, green lights up when output is turned on and red lights up when output is turned off.

For the operation of each setting item, refer to "List of output mode" on page 27.

<Operation>

Press the or button in function selection mode to display [F 1].

Press the button. Move on to setting of output mode.

Setting of output mode

Press the or button to select output mode.

Displays in turn

out

↔

HYS

Output mode Set value

Hysteresis Window comparator OFF

Press the button to set. Move on to setting of reversed output.

Setting of reversed output

Press the or button to select reversed output.

Displays in turn

10t

↔

1P

Reversed output Set value

Normal output Reversed output

Press the button to set. Move on to setting of pressure.

Setting of pressure

Set pressure based on setting procedure on page 21.
 "P" changes to "n" while reverse output is selected. ([P_1] → [n_1])
 Hysteresis mode: [P_1]
 Window comparator mode: [P1L][P1H]

Press the button to set. Move on to setting of hysteresis.

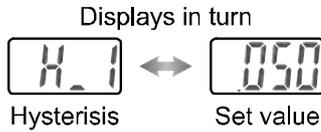
[oFF] (unused) selected.

Press the button to set.

Move on to setting of display color.

Setting of hysteresis

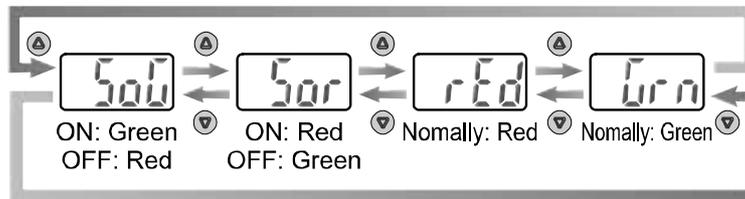
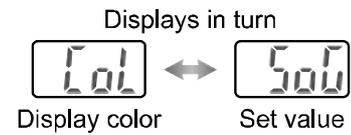
Press the Δ or ∇ button to select hysteresis.



Press the $\$$ button to set. \downarrow Move on to setting of display color.

Setting of display color

Press the Δ or ∇ button to select display color.

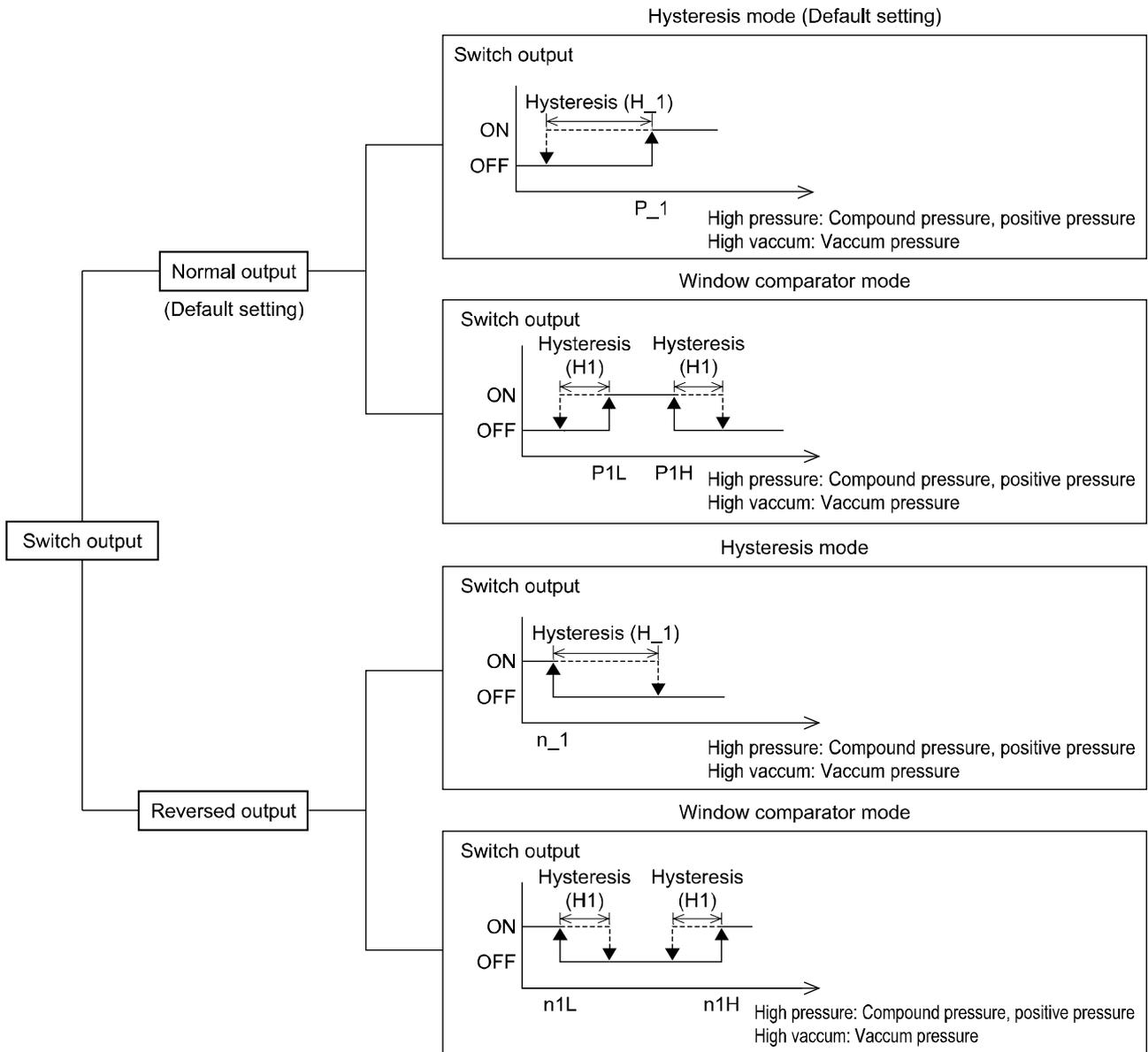


Press the $\$$ button to set. \downarrow Return to function selection mode.

Setting of [F 1] operation of OUT1 completed

- *1: Selected parameter become effective after pressing the $\$$ button.
- *2: After having setting effective by the $\$$ button, it is possible to move to measurement mode by pressing the $\$$ button for 2 seconds or longer.
- *3: Select OFF mode if OUT1 is selected OFF.

•List of output mode



If the point where the switch output is changed is out of the set pressure range due to selection between normal and reversed output, hysteresis is automatically compensated.

*: The above figure shows the operation at OUT1.

For the operation at OUT2, all "1" shown in the above figure is changed to "2". (Ex) $P_{-1} \rightarrow P_{-2}$

■[F 2] Setting of OUT2

Set output method of OUT2.

Displaycolor depends on OUT1, and is not set with this function.

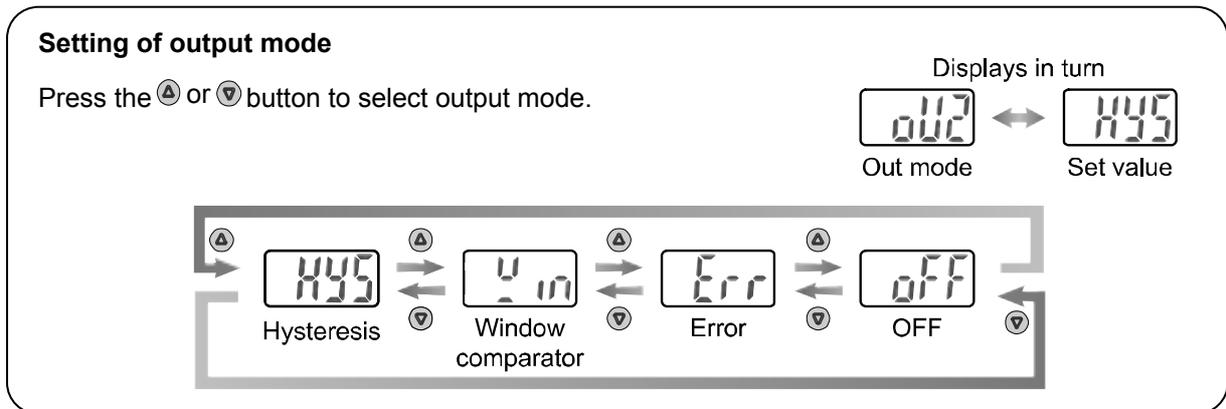
Output turns on when the pressure exceeds the set value. The default setting of output set value is a center value of between atmospheric pressure and upper limit of the rated pressure range.

For the operation of each setting item, refer to "List of output mode" on page 27.

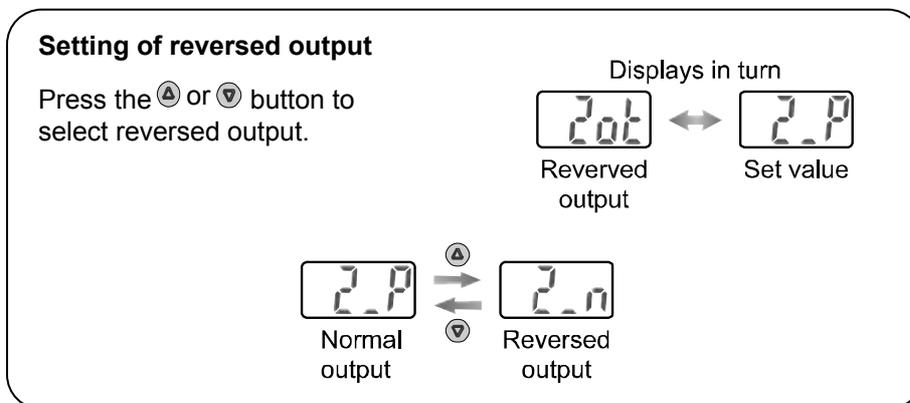
<Operation>

Press the or button in function selection mode to display [F 2].

Press the button. Move on to setting of output mode.



Press the button to set. Move on to setting of reversed output.



Press the button to set.
 Move on to setting of pressure.

Output mode
 [Err] selected.

Press the button to set.

Return to function selection mode. *3

[OFF] (unused)
 selected.

Press the button to set.

Return to function selection mode.

Setting of pressure

Set pressure based on setting procedure on page 21.

"P" changes to "n" while reverse output is selected.

([P_2] → [n_2])

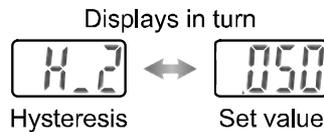
Hysteresis mode: [P_2]

Window comparator mode: [P2L][P2H]

Press the  button to set.  Move on to setting of hysteresis.

Setting of hysteresis

Press the  or  button to select hysteresis.



Press the  button to set.  Return to function selection mode.

Setting of [F 2] operation of OUT2 completed

- *1: Selected parameter become effective after pressing the  button.
- *2: After having setting effective by the  button, it is possible to move to measurement mode by pressing the  button for 2 seconds or longer.
- *3: When "Err" is selected in output mode, after normal and reverse display function, the display will return to [F 2].
When "Err" is displayed except for Er2 and 3, switch output.
- *4: When using with OUT2 turned off, select "OFF" in output mode.

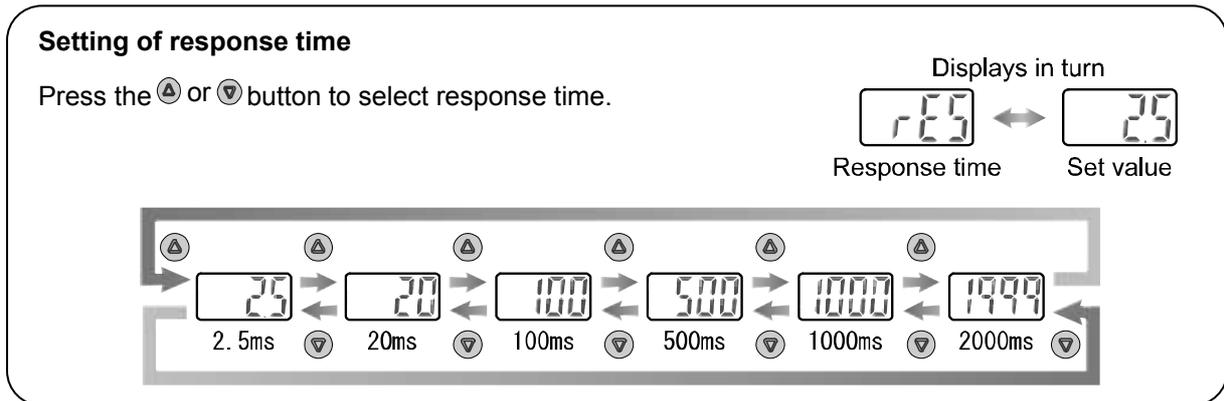
■[F 3] Setting of response time

Select the response time of the switch output.
Output chattering is prevented by setting the response time.

<Operation>

Press the ▲ or ▼ button in function selection mode to display [F 3].

Press the Ⓢ button. ↓ Move on to setting of response time.



Press the Ⓢ button to set. ↓ Return to function selection mode.

Setting of [F 3] response time completed

■[F 4] Setting of auto-preset

When hysteresis mode is selected, this function can calculate a optimum pressure value automatically based on the on-going operation.

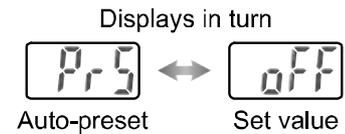
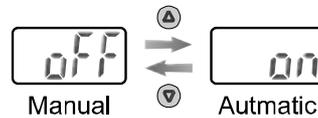
<Operation>

Press the  or  button in function selection mode to display [F 4].

Press the  button.  Move on to setting of auto-preset.

Setting of auto-preset

Press the  or  button to select auto-preset.



Press the  button to set.  Return to function selection mode.

Setting of [F 4] auto-preset completed

Press the  button during measurement mode to set the pressure.

Then press the  button again to change the pressure to set when the display is blinking.

•Auto-preset

When auto-preset is selected in function selection mode, the set pressure can be calculated and memorized from measured value. The set value is automatically optimized by repeating the suction and release of the object for the setting.

1, Selection of auto-preset OUT1

Press the $\text{\textcircled{S}}$ button in measurement mode to display "AP1".
 (If OUT1 does not need to be set, press the $\text{\textcircled{\u25b2}}$ and $\text{\textcircled{\u25bc}}$ buttons simultaneously for 1 second or longer after "AP1" is displayed to move to "AP2".)



Auto-preset is ready

2, Preparation of OUT1 device

Prepare the device for which the pressure of OUT1 is set.

3, Setting of auto-preset value of OUT1

Press the $\text{\textcircled{S}}$ button to display "A1L".
 After measurement starts, operate the device and change the pressure. When the pressure change is detected, "A1H" will appear automatically, and so continue to operate the device repeatedly.
 (If the $\text{\textcircled{\u25b2}}$ and $\text{\textcircled{\u25bc}}$ buttons are pressed simultaneously for 1 second or longer during "A1L" displaying, measurement is stopped and "AP2" will appear.)



Auto-preset is being set

4, Selection of auto-preset OUT2

Press the $\text{\textcircled{S}}$ button to set "P_1" and "H_1" ("n_1" and "H_1" for reverse mode) and display "AP2".
 (If OUT2 does not need to be set, press the $\text{\textcircled{\u25b2}}$ and $\text{\textcircled{\u25bc}}$ buttons simultaneously for 1 second or longer after "AP2" is displayed to move to measurement mode.)

5, Preparation and setting of OUT2 device

Prepare the device for which the pressure of OUT2 is set, and perform the setting of OUT2 in the same manner as that for OUT1.
 After "A2L" is displayed and measurements starts, when the pressure change is detected, "A2H" will appear automatically.
 (If the $\text{\textcircled{\u25b2}}$ and $\text{\textcircled{\u25bc}}$ buttons are pressed simultaneously for 1 second or longer during "A2L" displaying, measurement is stopped and measurement mode returns.)

6, Completion of setting

Press the $\text{\textcircled{S}}$ button to set "P_2" and "H_2" ("n_2" and "H_2" for reverse mode) and complete auto-preset mode. After that, measurement mode returns.

The set values for OUT1 are displayed in auto-preset mode as follows.

•Normal output

$$P_1 = A - (A - B) / 4$$

$$H_1 = (A - B) / 2$$

•Reverse output

$$n_1 = B + (A - B) / 4$$

$$H_1 = (A - B) / 2$$

A = Max. pressure

B = Min. pressure

The display of set values of OUT2 is changed at the number after "_", i.e. "P_2", "n_2" and "H_2".

If this setting is unnecessary, press the $\text{\textcircled{\u25b2}}$ and $\text{\textcircled{\u25bc}}$ buttons simultaneously for 1 second or longer.

■[F 5] Setting of analog output / auto-shift input

Auto-shift function

This function is available when analog output/ auto-shift is equipped.

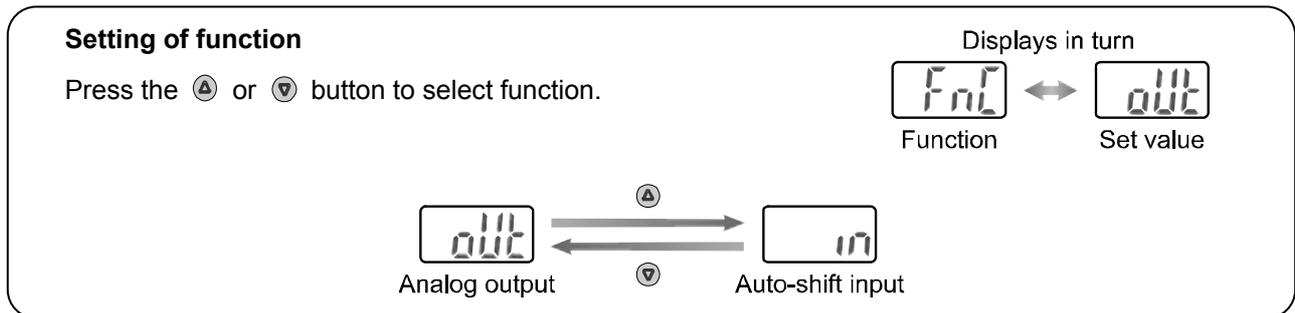
Auto-shift: Function to perform output to relative change referring to the pressure when signal is input.

Auto-shift zero: Function to perform output to relative change and clear the display value to zero referring to the pressure when signal is input.

<Operation>

Press the ▲ or ▼ button in function selection mode to display [F 5].

Press the Ⓢ button. ↓ Move on to setting of function.



[in] (Auto-shift input) selected.

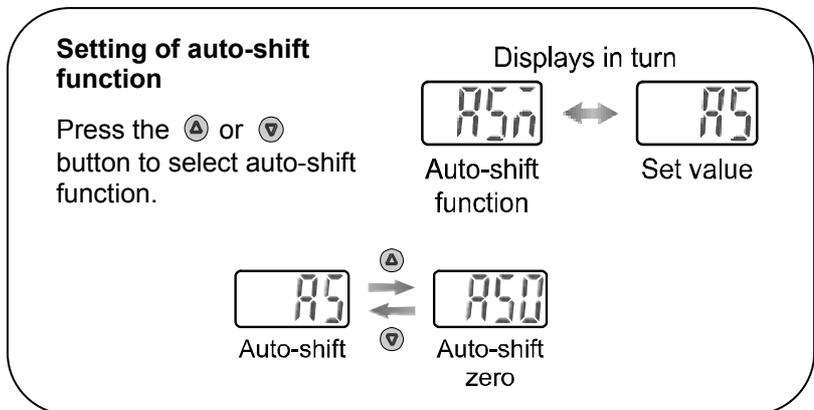
Press the Ⓢ button to set.

Move on to auto-shift function setting.

[oUt] (Analog output) selected.

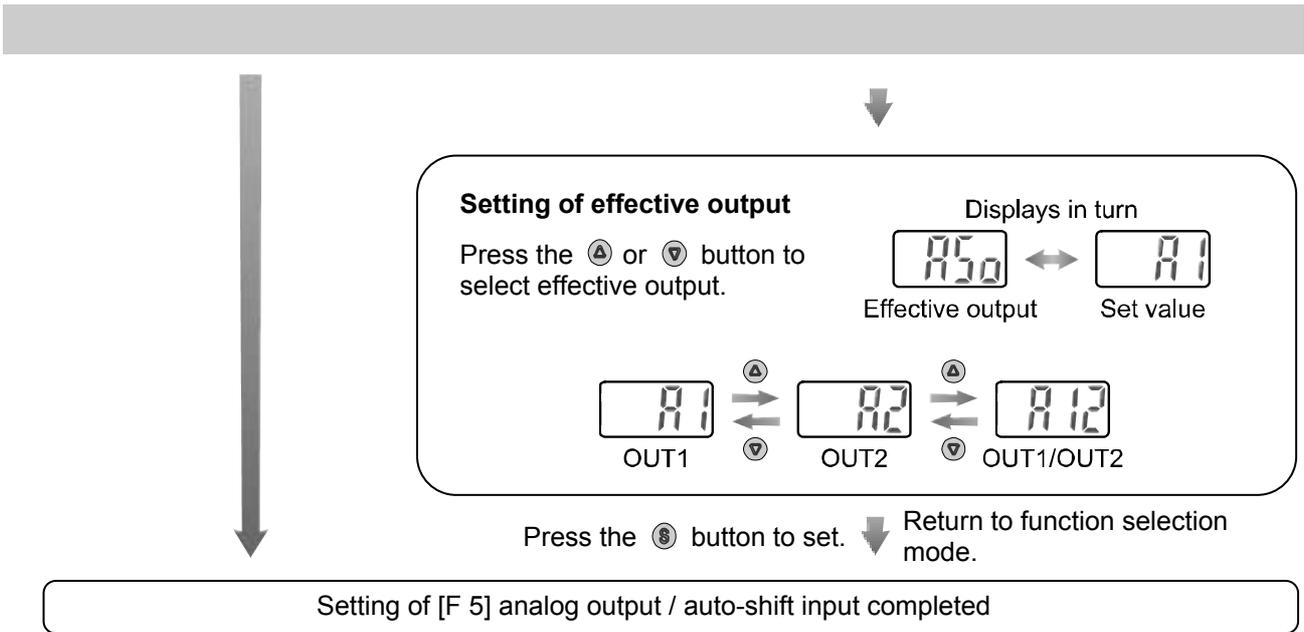
Press the Ⓢ button to set.

Return to function selection mode when analog output is selected.



Press the Ⓢ button to set.

Move on to setting of effective output.



Conditions and explanations for auto-shift function

- Keep constant pressure for 5 ms or longer from the close signal of auto-shift input.
- At auto-shift input, [ooo] is displayed for approximate 1 second. Pressure value at that time is memorized as corrected value [C_5].
- With corrected value which is memorized, set value are compensated.
- Span is 10 ms or less until the switch output starts soon after auto-shift input.
- When the measured pressure exceeds the set pressure range at auto-shift input, corrected value is not memorized and [o.r] is displayed for approximate 1 second.
- If the pressure is within the set pressure range and beyond the set value corrected by auto-shift (including hysteresis) when the auto-shift input is applied, the set value is corrected to the upper limit or lower limit (which is closer) of the set pressure range automatically. (The correction is performed when the auto-shift input is applied at the pressure beyond the set pressure range. If the auto-shift input is applied again at the pressure within the set pressure range, the correction is released and the product operates along with the set value.)
- Completing pressure setting of OUT2, the corrected value and [C_5] will be displayed alternately. Press the Ⓢ button to return to the measurement mode.
- Corrected value [C_5] after auto-shift input will vanish when off the power, and is reset to zero (Initial value) when the power is re-supplied.

*: EEPROM is not used for memory corrected value.

Using with auto-shift input, accepted set range is like below.

Range	Set pressure range	Accepted set range
For compound	-105.0 to 105.0 kPa	-210 to 210 kPa
For positive pressure	-0.105 to 1.050 MPa	-1.155 to 1.155 MPa
For vacuum	10.0 to -105.0 kPa	-115.0 to 115.0 kPa

■[F 6] Setting of fine adjustment of display value

This is the function to perform fine adjustment of the displayed pressure manually.
It is adjustable within the range $\pm 5\%$ R.D.

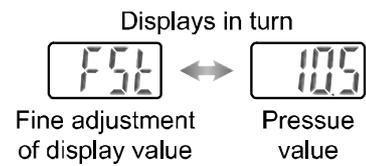
<Operation>

Press the \blacktriangle or \blacktriangledown button in function selection mode to display [F 6].

Press the $\text{\$}$ button. \blacktriangledown Move on to setting of fine adjustment of display value.

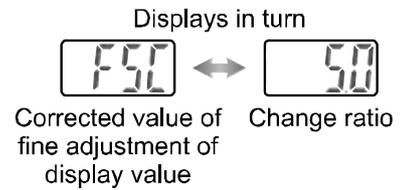
Setting of fine adjustment of display value

Press the \blacktriangle or \blacktriangledown button to change the set pressure.



Press the $\text{\$}$ button to set. \blacktriangledown

If the \blacktriangle and \blacktriangledown buttons are displayed simultaneously for 1 second or longer while [F5C] is displayed, the adjusted value is initialized.



Press the $\text{\$}$ button to set. \blacktriangledown Return to function selection mode.

Setting of [F 6] fine adjustment of display value completed

■[F11] Setting of display resolution

This function is to change the pressure display digit.
The flickering on the display can be eliminated.

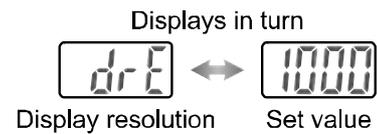
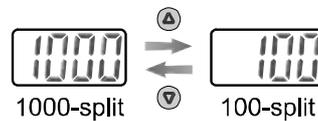
<Operation>

Press the Δ or ∇ button in function selection mode to display [F11].

Press the $\text{\textcircled{S}}$ button. \downarrow Move on to setting of display resolution.

Setting of display resolution

Press the Δ or ∇ button to select display resolution.



Press the $\text{\textcircled{S}}$ button to set. \downarrow Return to function selection mode.

Setting of [F11] display resolution completed

*: Not selectable depending on selected pressure unit.

The display resolution selectable unit is MPa, kPa (for ZSE only), kgf/cm², bar, psi and inHg.
The unit kgf/cm², bar, psi and inHg are selectable when a unit conversion function is provided.

➡ See [F 0] Unit conversion function on page 24.

■[F80] Setting of power saving mode

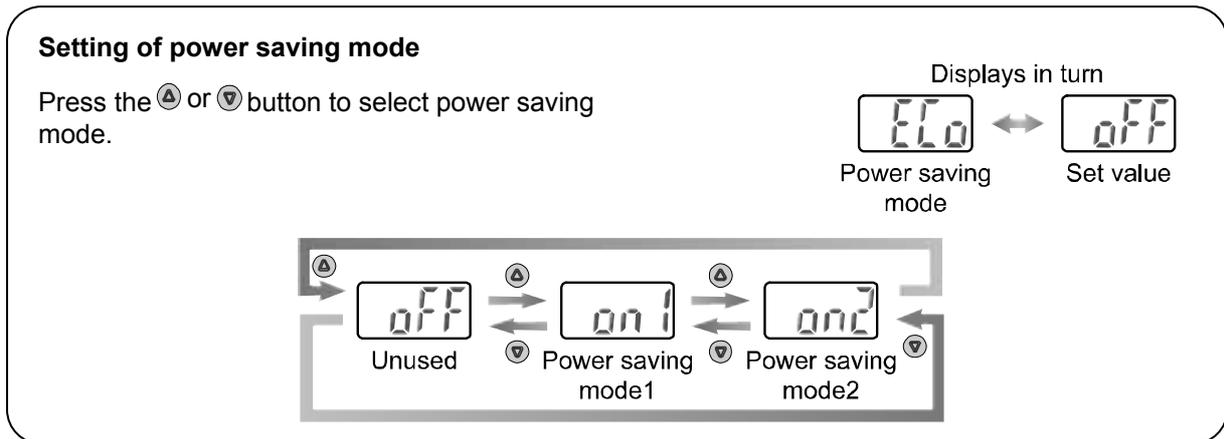
Power saving mode is selectable.

When the Pressure switch is left for 30 seconds without any operation, it is shifted to power saving mode.

<Operation>

Press the Δ or ∇ button in function selection mode to display [F80].

Press the $\text{\textcircled{S}}$ button. \downarrow Move on to setting of power saving mode.



Press the $\text{\textcircled{S}}$ button to set. \downarrow Return to function selection mode.

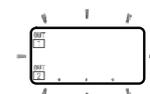
Setting of [F80] power saving mode completed

Power saving mode 1 remains enabled until turned off.

In power saving mode 1, the brightness of the whole display is reduced.

In power saving mode 2, when keys are pressed the display is normal, but if no keys are pressed for 30 seconds, the display returns to power saving mode. (In measurement mode only)

On the display in power saving mode 2, only decimal points and indication lights flash. (The indication lights flash only when the switch is turn on.)



At switch ON



At switch OFF

■[F81] Setting of security code

Security code can be entered during the key lock is released.

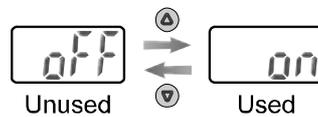
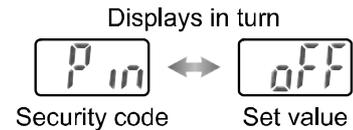
<Operation>

Press the ▲ or ▼ button in function selection mode to display [F81].

Press the Ⓢ button. ↓ Move on to setting of security code.

Setting of security code

Press the ▲ or ▼ button to select security code.



Press the Ⓢ button to set. ↓ Return to function selection mode.

Setting of [F81] security code completed

If the security code is used, it is necessary to input the security code to release the key lock.
The security code can be set optionally by operator.
Default setting is "000".

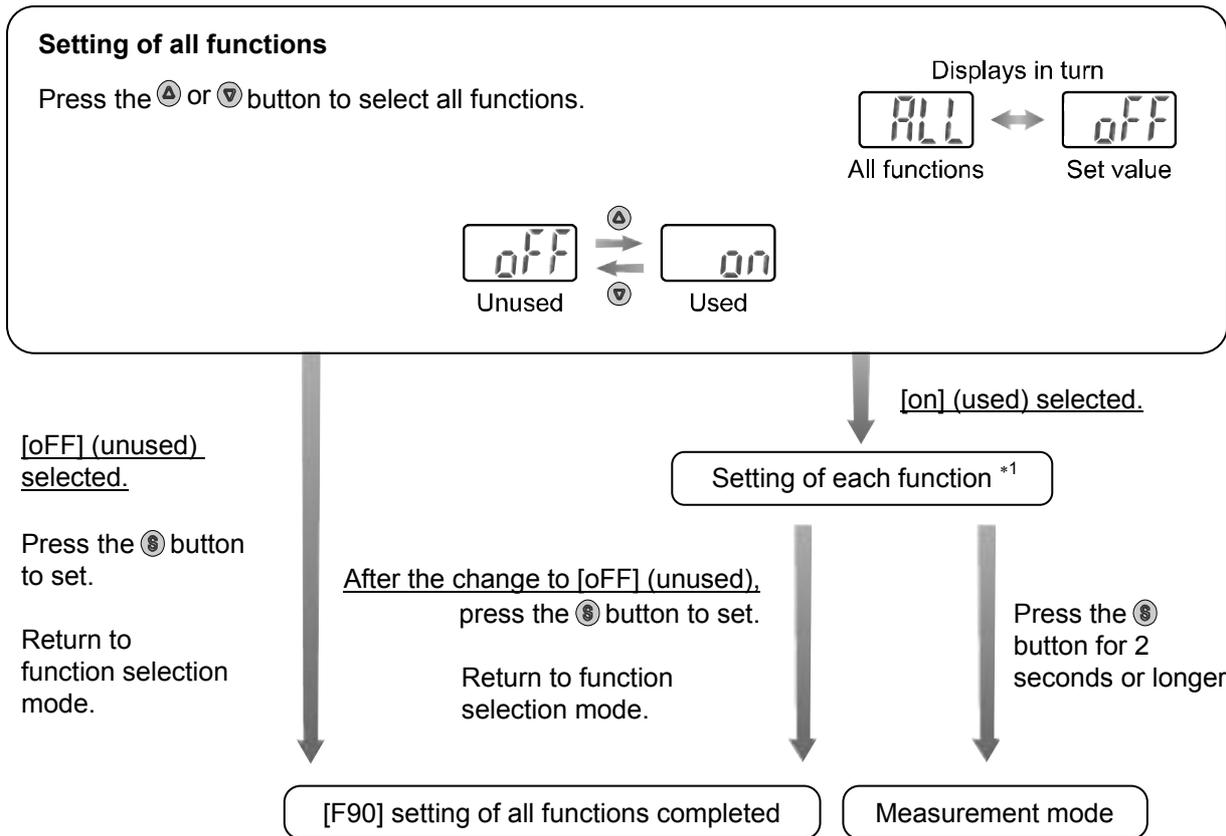
Refer to page 47 when the security code is used.

- Special function setting
- [F90] Setting of all functions
All functions can be set in series.

<Operation>

Press the ▲ or ▼ button in function selection mode to display [F90].

Press the Ⓢ button. ↓ Move on to setting of all functions.



*1: Setting of functions

Every time Ⓢ button is pressed, function turns in order of Function of setting on page 40.

Set by ▲ or ▼ button.

Refer each paragraph for the detail of setting

•Function of setting

Order	Function	Applicable model
1	Selection of display unit	All models
2	Setting of output mode (OUT1)	All models
3	Setting of reversed output (OUT1)	All models
4	Setting of pressure (OUT1)	All models
5	Setting of hysteresis (OUT1)	All models
6	Setting of display color	All models
7	Setting of output mode (OUT2)	All models
8	Setting of reversed output (OUT2)	All models
9	Setting of pressure (OUT2)	All models
10	Setting of hysteresis (OUT2)	All models
11	Setting of response time	All models
12	Setting of auto-preset	All models
13	Setting of analog output/auto-shift input	Only output type of R, T, S and V
14	Setting of auto-shift function	
15	Setting of effective output	
16	Setting of initialization of fine adjustment of display value	All models
17	Setting of display resolution	All models
18	Setting of power saving mode	All models
19	Setting of security code	All models

*: Measurement mode can return from any setting item by pressing the  button for 2 seconds or longer.

*: Function that will be set by the return to the measurement mode is memorized.

The copy ready status is held even if the power supply is turned off.

Copy is ready (Red)

Press the button to start copying. ↓

	The master Pressure switch	The slave Pressure switch
Sending/ Receiving	Flashing (Red)	Flashing (Green)
Copy completed	Displays in turn ↔ (Red)	Displays in turn ↔ (Green)

Press the button.

The copy can be done continuously and the copy ready statuses can be held even if the power supply is turned off.

Copy is ready (Red)

Press the and buttons simultaneously for 1 second or longer.

Press the button.

When completing copy function, press the and buttons simultaneously for 1 second or longer.

Setting of [F97] copy function completed

*: If the copy to the slave Pressure switch is not completed, it is detected as a copying function sending/receiving error. Press the and buttons simultaneously for 1 second or longer to return to measurement mode. Then, check the wiring and specifications of the switch and retry copy function.

■ [F98] Check of output

Output from the switch can be confirmed.
It can be selected to provide or not to provide the output voluntarily.

<Operation>

Press the ▲ or ▼ button in function selection mode to display [F98].

Press the Ⓢ button. ↓ Move on to check of output.

Check of output

Press the ▲ or ▼ button to select check of output.

Normal output Forcibly output

Displays in turn

EE9

↔

n

Check of output Set value

[n] (normal output) selected.

Press the Ⓢ button to set.

Return to function selection mode.

[F] (forcibly output) selected.

Press the Ⓢ button to set.

OUT1 check of output

Press the ▲ or ▼ button to select OUT1 check of output.

Forcibly output OFF Forcibly output ON

Displays in turn

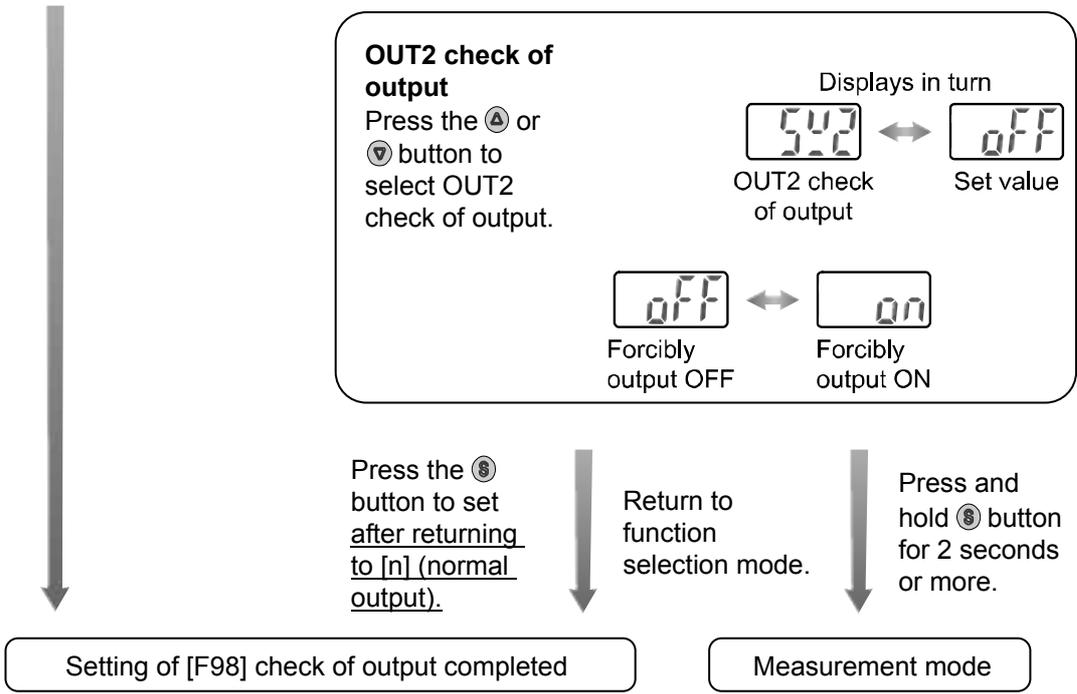
547

↔

off

OUT1 check of output Set value

Press the Ⓢ button to set.



*: If [enter] button is pressed and held for 2 seconds or more, the mode is returned to the measurement mode regardless of the current mode.

■ [F99] Reset to the default setting

When the setting of the Pressure switch becomes unsure, the default setting can be returned.

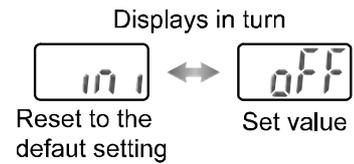
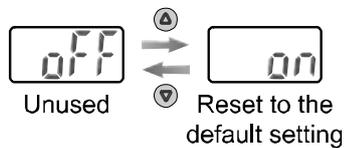
<Operation>

Press the ▲ or ▼ button in function selection mode to display [F99].

Press the Ⓢ button, ↓ Move on to reset to the default setting.

Reset to the default setting

Display [ON] with pressing the ▲ or ▼ button, then press the Ⓢ and ▼ buttons for 5 seconds or longer simultaneously.



[oFF] (unused) selected.

Press the Ⓢ button to set.

Return to function selection mode.

The setting is reset to the default setting, and the mode returns to the function selection mode.

Setting of [F99] reset to the default setting completed

Other Settings

○Peak/Bottom hold value indication

The maximum (minimum) pressure from when the power is supplied to this moment is detected and updated. In peak/bottom indication mode, the pressure is indicated.

As the peak indication, when the  button is pressed for 1 second or longer, the maximum pressure and "Hi" starts flashing, and is held.

To release holding the indication of the maximum pressure, press the  button for 1 second or longer again. The measurement mode returns.

As the bottom indication, when the  button is pressed for 1 second or longer, the minimum pressure and "Lo" starts flashing and is held.

To release holding the indication of the minimum pressure, press the  button for 1 second or longer again. The measurement mode returns.

If the  and  buttons are pressed simultaneously for 1 second or longer while the pressure is being held, the maximum (minimum) value is cleared.

○Zero clear

A displayed value can be adjusted to zero when the pressure to be measured is within $\pm 7\%$ F.S. ($\pm 3.5\%$ F.S. for compound pressure) of the pressure at the time of shipment from the factory.

(The range of $\pm 1\%$ F.S. setting is different depending on the individual product difference)

Press continuously the  and  buttons for 1 second or longer simultaneously, display is cleared as "0". Return to the measurement mode automatically.

○Key lock

A wrong operation performed unintentionally such as change of set value can be prevented.

If the button operation is performed while key lock setting is being performed, "LoC" is displayed for approximate 1 second.

(When the  button is pressed, the set pressure is displayed following "LoC".)

<Operation -Without security code input- >

1, Keep pressing the  button for 5 seconds or longer in measurement mode.

The current setting "LoC" or "UnL" is displayed.

(Releasing key lock can be done in the same way.)



2, Press the  or  button to select locking or unlocking of the key.



3, Press the  button to enter the setting.

<Operation -With security code input- >

•Locking

- 1, Keep pressing the  button for 5 seconds or longer in the measurement mode.
[UnL] is indicated.



- 2, Press the  or  button to select locking of the key [LoC].



- 3, Press the  button to enter the setting.

•Unlocking

- 1, Keep pressing the  button for 5 seconds or longer in the measurement mode.
[LoC] is indicated.



- 2, Press the  or  button to select unlocking of the key [UnL].



- 3, When the  button is pressed, the input of security code is asked.
For how to input the security code, refer to "How to input and change the security code" on page 48.



- 4, If inputted security code is correct, the indication changes to [UnL], and pressing one of ,  or  button releases key lock and returns the measurement mode.
If inputted security code is wrong, [FAL] is indicated and the security input mode is returned. If the wrong security code is inputted 3 times, [LoC] is indicated and the measurement mode is returned.

•How to change the security code

At the time of shipment, the security code is set to [000], but can be changed to optional one.

<Operation>

1, After the lock setting is finished (page 47), perform all three steps in the unlock setting procedure. (page 47, "3,").

2, After the security code is inputted and the indication changes to [UnL], keep pressing  and  buttons simultaneously for 5 seconds or longer.

[000] is indicated and the change of security code is asked.

For how to input the security code, refer to "How to input and change the security code".

Changed security code is indicated.

3, After check it is as desired, press the  button for 1 second or longer.

The measurement mode is returned.

At this time, if the  or  button is pressed, changed security code is not entered and the change of security code is asked.



•How to input and change the security code

The left digit starts flashing.

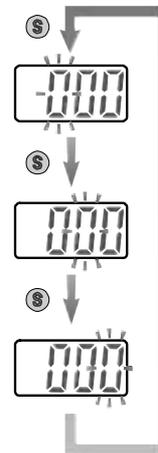
Press the  or  button to set the value.

Pressing the  button moves the flashing point to the right.

(If the  button is pressed at the last digit, the left digit starts flashing again.)

After the setting is finished, keep pressing  button for 1 second or longer.

(If the operation is not performed for 30 seconds during input and change of the security code, the measurement mode is returned.)



Maintenance

How to reset the product after power cut or forcible de-energizing

The setting of the product will be retained as it was before a power cut or de-energizing.

The output condition is also basically recovered to that before power cut or de-energizing, but may change depending on the operating environment.

Therefore, check the safety of whole facility before operating the product.

If the facility is under accurate control, wait until the Pressure switch has warmed up.

(Approximate 10 to 15 minutes)

If the security code is forgotten

The following mode is used only when the security code is forgotten.

<Operation>

Keep pressing the  button for 5 seconds or longer in the of measurement mode.

The current setting "UnL" or "LoC" is indicated.



Keep pressing  and  buttons simultaneously for 5 seconds or longer.

Then, keep pressing  and  buttons simultaneously for 5 seconds or longer.

*: There is no change of the indication.

(At this time, if the other operation is performed or no operation is performed for 30 seconds, the measurement mode returns.)

After that, keep pressing  and  buttons for 5 seconds or longer. The indication changes to [000] and the security code changing mode returns.

(At this time, if another operation is performed or no operation is performed for 30 seconds, the measurement mode returns.)

Refer to "How to change the security code" on page 48 and decide the security code.

Changed security code is indicated.

Check and press the  button for 1 second or longer.

The measurement mode returns.

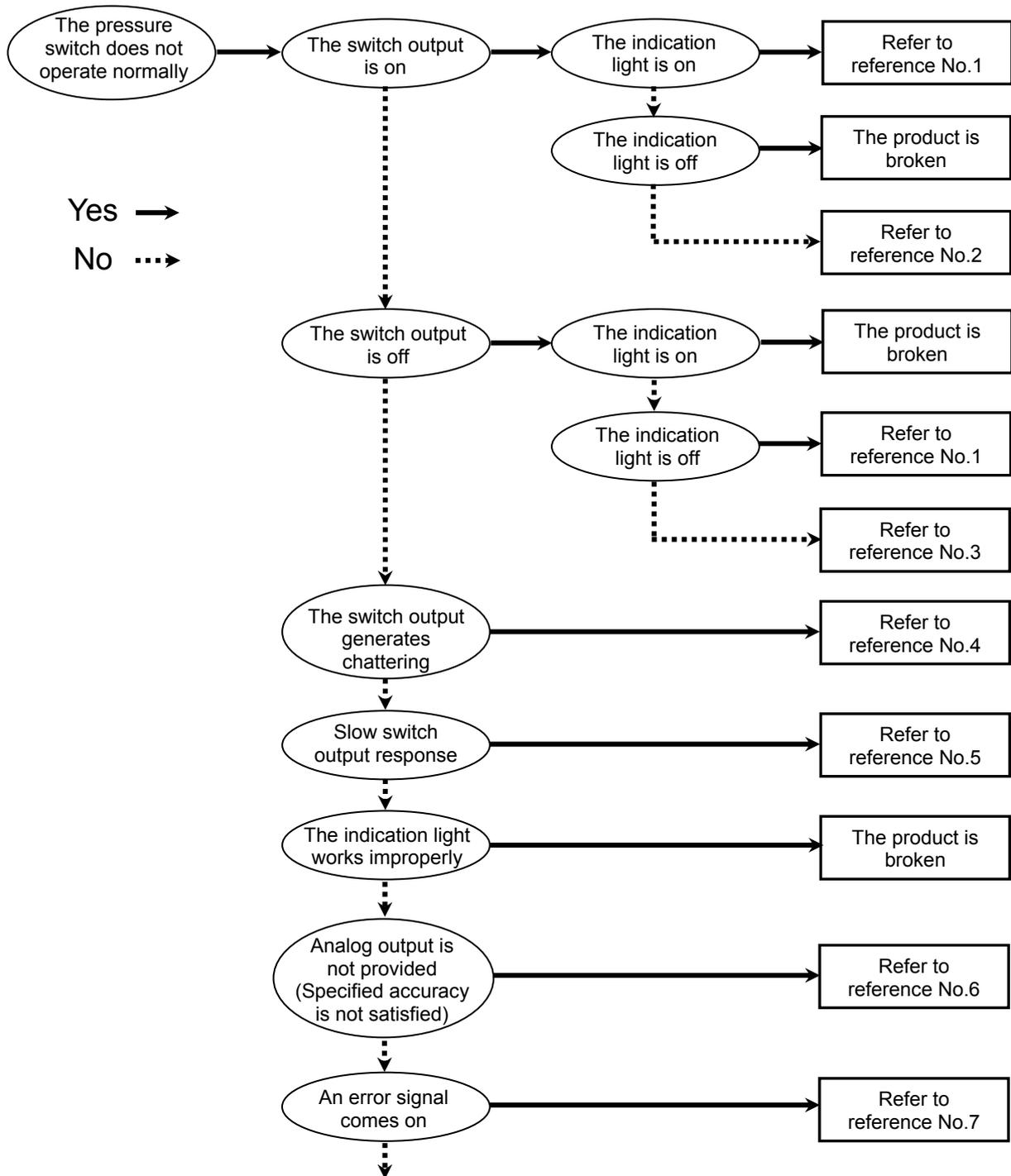
At this time, if the , or  button is pressed, changed security code is not entered and the change of security code is asked.

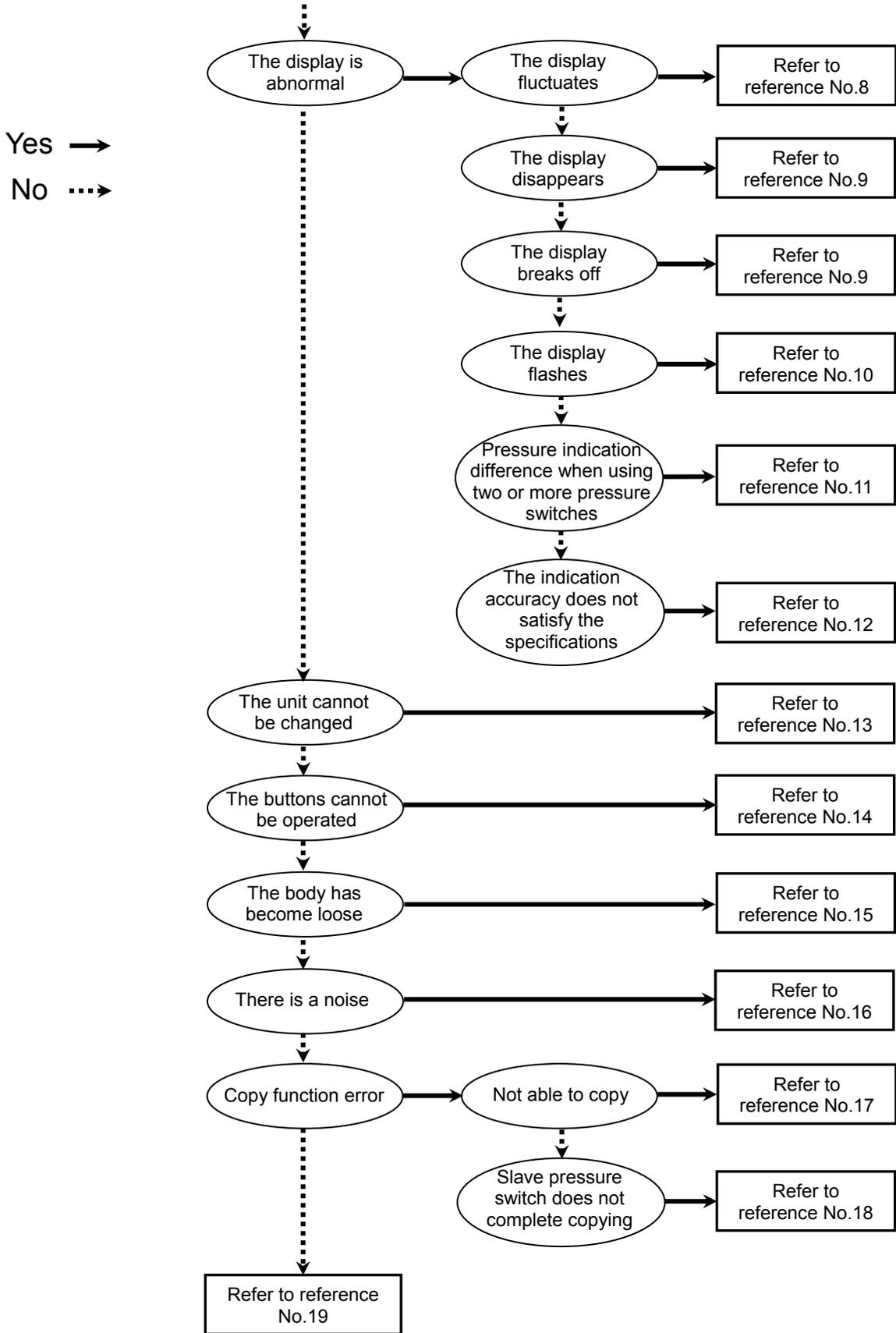
Troubleshooting

○Troubleshooting

Applicable Pressure switch: **ZSE40A(F)/ISE40A**

If a cause applicable to the failure cannot be identified and normal operation can be recovered by replacement with a new Pressure switch, this indicates that the Pressure switch itself was broken. The Pressure switch breakage can be caused by operating environment (network construction, etc.), and so consult with SMC separately to obtain countermeasures.





○Cross-reference for troubleshooting

Reference No.	Problem	Possible cause	Investigation method	Countermeasure
1	<ul style="list-style-type: none"> •Output remains on. Indication light remains on. •Output remains off. Indication light remains off. 	Wrong pressure setting	(1) Check the set pressure. (2) Check the settings of the operation mode, hysteresis and output style. (Hysteresis mode/window comparator mode, normal output/reversed output)	(1) Reset the pressure setting. (2) Reset the setting of function.
		Product failure		Replace the product.
2	Output remains on. Indication light works correctly.	Incorrect wiring	Check the wiring of the output line. Check if the load is connected directly to DC(+) or DC(-).	Correct the wiring.
		Product failure		Replace the product.
3	Output remains off. Indication light works correctly.	Incorrect wiring	Check the wiring of the output line. Check if the load is connected directly to DC(+) or DC(-).	Correct the wiring.
		Unsuitable model selection	Check if PNP is used even though NPN should have been selected, or the other way around.	Review the selected model (output type).
		Lead wire breakage	Check if there is bending stress applied to any parts of the lead wire. (Bending radius and tensile force applied to the lead wire)	Correct the wiring conditions. (Adjust the tensile force and widen the bending radius.)
		Product failure		Replace the product.
4	Switch output generates chattering.	Incorrect wiring	Check the wiring. Check if the brown and blue wires are connected to DC(+) and DC(-) respectively, and if the output line is about to come off (contact failure).	Correct the wiring.
		Wrong setting	(1) Check the set pressure. (2) Check if the hysteresis range is too narrow. (3) Check the response time set as initial setting. Check if the response time is too short.	(1) Reset the pressure setting. (2) Widen the hysteresis. (3) Reset the setting of function.
		Product failure		Replace the product.
5	Slow switch output response	Incorrect pressure setting	Check the pressure setting. Check if the detected pressure and the set pressure value have the same value or are too close.	Reset the pressure setting. Set up the pressure setting value so it is not too close to the detected pressure value.

Reference No.	Problem	Possible cause	Investigation method	Countermeasure
6	Analog output is not provided. (Specified accuracy is not satisfied.)	Incorrect wiring	Check if the analog output line is connected with a load.	Correct the wiring.
		Non-compliance with the load spec.	(1) Check if the proper load is connected. (2) Check if input impedance of input equipment (A/D transformer) is proper.	Connect a proper load.
		Insufficient warm-up	Check if the product satisfies the specified accuracy in 10 minutes after supplying power.	After energizing, indication and output can drift. For detecting fine pressure, warm up the product for 10 to 15 minutes.
		Product failure		Replace the product.
7	<ul style="list-style-type: none"> •An over current error (Er1 and 2) is indicated. •System error (Er0, 4, 6, 7, 8 and 9) is indicated. •The display shows "HHH". •The display shows "LLL". •Residual pressure error (Er3) is indicated. 	Over current to the output (Er1 and 2)	(1) Check if a current of 80mA or more is flowing to the output. (2) Check if the connected load satisfies the specifications, and if the load is shorted. (3) Check if a relay without a surge voltage suppressor is connected. (4) Check if the wiring is in the same route as (or bundled together with) a high-voltage line or the power line.	(1) , (2) Connect the load as specified. (3) Use a relay with a surge voltage suppressor or take a measure to prevent noise. (4) Separate the wiring from the high-voltage line and/or power line.
		Improper transaction of the internal data of the Pressure switch (Er0, 4, 6, 7, 8 and 9)	(1) Check if there is noise interference such as static electricity. Check if there is a noise source (2) Check if the power supply voltage is in the range of 12 to 24 VDC $\pm 10\%$.	(1) Remove the noise and the noise source (or take measures to prevent noise interference), and reset the product or turn off the power supply. Then, supply the power again. (2) Supply power voltage of 12 to 24 VDC $\pm 10\%$.
		Applied pressure is over the upper limit (HHH).	(1) Check if the pressure gets over the upper limit of the set pressure range. (2) Check if foreign matter got into the piping.	(1) Bring the pressure back within the set pressure range. (2) Take measures to prevent foreign matter from getting into the piping.
		Applied pressure is under the lower limit (LLL).	(1) Check if the pressure gets below the lower limit of the set pressure range. (2) Check if foreign matter got into the piping.	(1) Bring the pressure back within the set pressure range. (2) Take measures to prevent foreign matter from getting into the piping.
		Pressure is not atmospheric pressure at zero-clear operation (Er3)	Check if the pressure over $\pm 7\%$ F.S. ($\pm 3.5\%$ F.S. for compound pressure) of the atmospheric pressure is applied.	Return the applied pressure to atmospheric pressure, and retry the zero clear operation.
		Product failure		Replace the product.

Reference No.	Problem	Possible cause	Investigation method	Countermeasure
8	Indicated values fluctuate.	Incorrect power supply	Check if the power supply voltage is within the range of 12 to 24 VDC $\pm 10\%$.	Supply power supply voltage of 12 to 24 VDC $\pm 10\%$.
		Incorrect wiring	Check the wiring to the power supply. Check if the brown and blue wires are connected to DC(+) and DC(-) respectively and if the output line is about to come off (contact failure).	Correct the wiring.
		Factory pressure change	Check if the factory pressure is changed.	If the fluctuation is not acceptable, the number of digit can be changed by the setting of the resolution of display.
9	<ul style="list-style-type: none"> •Indicator turns off. •A part of the indication misses. 	Incorrect power supply	Check if the power supply voltage is within the range of 12 to 24 VDC $\pm 10\%$.	Supply power supply voltage of 12 to 24 VDC $\pm 10\%$.
		Power saving mode	Check if the power saving mode is selected.	Reset the setting of function.
		Incorrect wiring	Check the power supply wiring. Check if the brown and blue wires are connected to DC(+) and DC(-) respectively and if the output line is about to come off (contact failure).	Correct the wiring.
		Product failure		Replace the product.
10	Indicator is blinking.	The peak value/bottom value indication mode is selected.	Check if the peek value or bottom value indicating mode is selected.	Turn off the peak value/bottom value indication mode.
		Wiring failure	(1) Check the power supply wiring. (2) Check if bending stress is being applied to a specific part of the lead wire.	(1) Correct the wiring. (2) Correct the wiring (bending radius and stress).
11	Pressure indication difference when using two or more Pressure switches.	Dispersion within the indication accuracy range	Check if the dispersion is within the indication accuracy range.	Use the fine adjustment mode to adjust the indication if the dispersion is within the indication accuracy range.
		Product failure		Replace the product.

Reference No.	Problem	Possible cause	Investigation method	Countermeasure
12	The pressure indication accuracy does not satisfy the specifications.	Foreign matter	Check if foreign matter has entered the pressure port.	Install a 5 μm filter to prevent foreign matter from getting into the pressure port. Also, clean the filter regularly to prevent drainage deposits.
		Air and liquid leakage	Check if air and liquid are leaking from the piping.	Rework the piping. If excessive tightening torque over the specified range is applied, a mounting screw, mounting bracket, and product may be broken.
		Insufficient warm-up	Check if the product satisfies the specified accuracy 10 minutes after supplying power.	After energizing, indication and output can drift. For detecting fine pressure, warm up the product for 10 to 15 minutes.
		Product failure		Replace the product.
13	The unit cannot be changed.	Improper model selection (Selection of model "without unit conversion function")	Check if there is a "-M" at the end of the part number printed on the product	"M" in the part number means that the unit cannot be changed. (kPa↔MPa can be selected) *: The unit change function is not available in Japan due to a new measurement law. *: It is fixed to the SI unit "kPa", "MPa".
		Product failure		Replace the product.
14	The buttons cannot be operated.	Key lock mode	Check if the key lock mode is turned on.	Turn off the key lock mode.
		Product failure		Replace the product.
15	The body is loose.	Incorrect installation	Check that the panel mounting adapter and the body are firmly engaged.	Mount the body on the panel properly.
		Product failure		Replace the product.
16	Noisy.	Air and liquid leakage	Check if air liquid are leaking from the piping.	Rework the piping. If excessive tightening torque over the specified range is applied, a mounting screw, mounting bracket, and product may be broken.
		Product failure		Replace the product.
17	<ul style="list-style-type: none"> •Copy function error •Unable to copy 	Incorrect wiring	(1) Check the connection at FUNC terminal. (2) Check the power supply wiring.	Correct the wiring.
		Product failure		Replace the product.

Reference No.	Problem	Possible cause	Investigation method	Countermeasure
18	Slave Pressure switch does not complete copying.	Incorrect wiring	(1) Check the connection at FUNC terminal. Check the power supply wiring. (2) Check the length of lead wire.	(1) Correct the wiring. (2) The maximum transmitting distance of the copy function is 4 m. Shorten the lead wire to 4 m or less.
		Improper model	The models of the master Pressure switch and the slave Pressure switch are different from each other.	Check the models. Copying is available when the pressure range, output specification and unit specification are identical.
		Error in connected product numbers	Check the number of connected slave Pressure switches.	The number of connected products with which copying at a time is possible is up to 10 pcs. Reduce the number to 10 pcs or less.
		Product failure		Replace the product.
19	The operation is unstable. (Chattering)	Effect of pressure source fluctuation due to small hysteresis or too early of a response time	(1) Check the set pressure (hysteresis) (2) Check the response time	(1) Check the pressure setting. (2) Reset the setting of function.
		Incorrect wiring/ lead wire breakage	(1) Check the power supply wiring. (2) Check if bending stress is applied to a specific part of the lead wire. (bending radius and tensile force applied to the lead wire)	(1) Correct the wiring (2) Correct the wiring conditions. (Adjust the tensile force and widen the bending radius.)
		Product failure		Replace the product.

○ Error indication function

This function is to display error location and content when a problem or an error occurs.

Error Name	Error Display	Error Type	Troubleshooting Method
Over current Error	Er1 Er2	A load current of switch output is 80 mA or more.	Turn the power off and remove the output factor for the over current. Then turn the power on.
Residual Pressure Error	Er3	During zero clear operation, pressure over $\pm 7\%$ F.S. ($\pm 3.5\%$ F.S. for compound pressure) is applied. After 1 s, the mode will reset to the measurement mode. $\pm 1\%$ F.S. of the zero clear range varies with individual product differences.	Perform zero clear operation again after restoring the applied pressure to an atmospheric pressure condition.
Pressurizing Error	HHH	Pressure has exceeded the upper limit of the set pressure range.	Reset applied pressure to a level within the set pressure range.
	LLL	Pressure has exceeded the lower limit of the set pressure range.	
Auto-shift Error	as	The measured pressure at auto-shift input exceeds the set pressure range. *: After 1 s, measurement mode returns automatically.	Auto-shift input is invalid. Check the connected equipment and machine.
System Error	Er0 Er4 Er6 Er7 Er8 Er9	Displayed in the case of an internal data error.	Turn the power off and turn it on again. If resetting fails, an investigation by SMC Corporation will be required.

If the error can not be reset after the above measures are taken, then please contact SMC.

Specification

■ Specifications

Model No.	ZSE40A (For vacuum)	ZSE40AF (For compound)	ISE40A (For positive pressure)		
Rated pressure range	0 to -101.3 kPa	-100.0 to 100.0 kPa	-0.100 to 1.000 MPa		
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. display unit	0.1 kPa	0.1 kPa	0.001 MPa		
Applicable fluid	Air, inert gases and incombustible gases				
Power supply voltage	12 to 24 VDC $\pm 10\%$, ripple (p-p) 10% or less (Protected against inverse connection)				
Current consumption	45 mA or less				
Switch output	NPN or PNP open collector output 2 outputs				
Max. load current	80 mA				
Max. applied voltage	28 V (NPN output)				
Residual voltage	1 V or less (at 80 mA load current)				
Response time	2.5 ms or less (Chattering-proof function working: 20, 100, 500, 1000 or 2000 ms selected)				
Short circuit protection	Provided				
Repeatability	$\pm 0.2\%$ F.S. ± 1 digit				
Hys teresis	Hysteresis mode	0 to variable *1			
	Window comparator mode				
Analog output	Voltage output *2	Output Voltage (rated pressure range)	1 to 5 V $\pm 2.5\%$ F.S.	0.6 to 5 V $\pm 2.5\%$ F.S.	
		Linearity	$\pm 1\%$ F.S.		
		Output impedance	Approx. 1 k Ω		
	Current output *3	Output current (rated pressure range)	4 to 20 mA $\pm 2.5\%$ F.S.	2.4 to 20 mA $\pm 2.5\%$ F.S.	
		Linearity	$\pm 1\%$ F.S.		
		Load impedance	Max. load impedance: 300 Ω (at power supply voltage of 12 VDC) 600 Ω (at power supply voltage of 24 VDC) Min. load impedance: 50 Ω		
Auto-shift input	Non-voltage input (reed or solid state), Low level 0.4 V or less, input times 5 ms or more				
Display method	3 1/2 digits 7-segment display, Dual-color display (red/green)				
Indicator accuracy	$\pm 2\%$ F.S. ± 1 digit (at ambient temperature 25 ± 3 °C)				
Indication light	Light when ON OUT1, OUT2: Orange				
Environ ment	Enclosure	IP65			
	Ambient temperature range	Operation: -5 to 50 °C, Storage: -10 to 60 °C (No condensation or freezing)			
	Ambient humidity range	Operation, Storage: 35 to 85%RH (No condensation)			
	Withstand voltage	1000 VAC, 1 minute Between lead block and case			
Insulation resistance	50 M Ω or more at 500 VDC Between lead block and case				
Temperature characteristic	$\pm 2\%$ F.S. (25 °C reference)				
Lead wire	Oil resistance vinyl cabtyre cable 5 cores $\phi 3.5$, 2 m Sectional area of conductor: 0.15 mm ² (AWG26) Outside diameter of insulator: 0.95 mm				
Standard	CE, UL/CSA, RoHS				

*1: If the applied voltage fluctuates around the set value, the hysteresis more than the fluctuating width needs to be set. Otherwise, chattering will occur.

*2: If analog voltage output is selected, the analog current output cannot be selected at the same time.

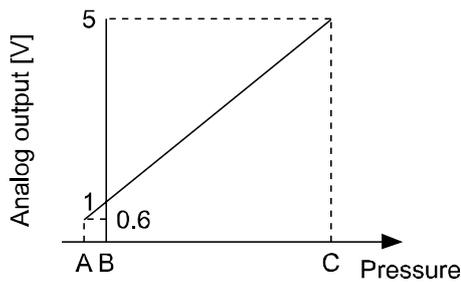
*3: If analog current output is selected, the analog voltage output cannot be selected at the same time.

○Piping specifications

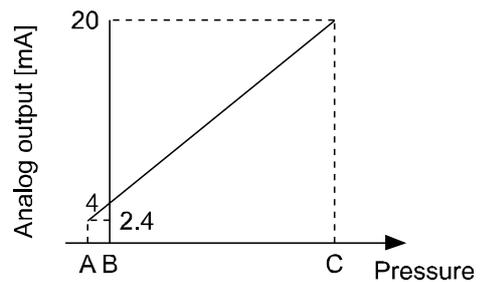
Model No.		01	N01	W1	WF1	M5	C4	C6
Port size		R1/8 (with M5 female thread)	NPT1/8 (with M5 female thread)	Rc1/8	G1/8	M5×0.8 (Female)	One-touch fitting φ4	One-touch fitting φ6
Wetted part material	Pressure sensing part	Silicone						
	Piping port	C3602 (Electro less nickel plating) O-ring: HNBR	ZDC2 O-ring: HNBR			ZDC2, POM, SUS304, C304 (Electro less nickel plating) O-ring: HNBR		
Weight		78 g	79 g	97 g	97 g	104 g	101 g	101 g

○Analog output

Voltage output



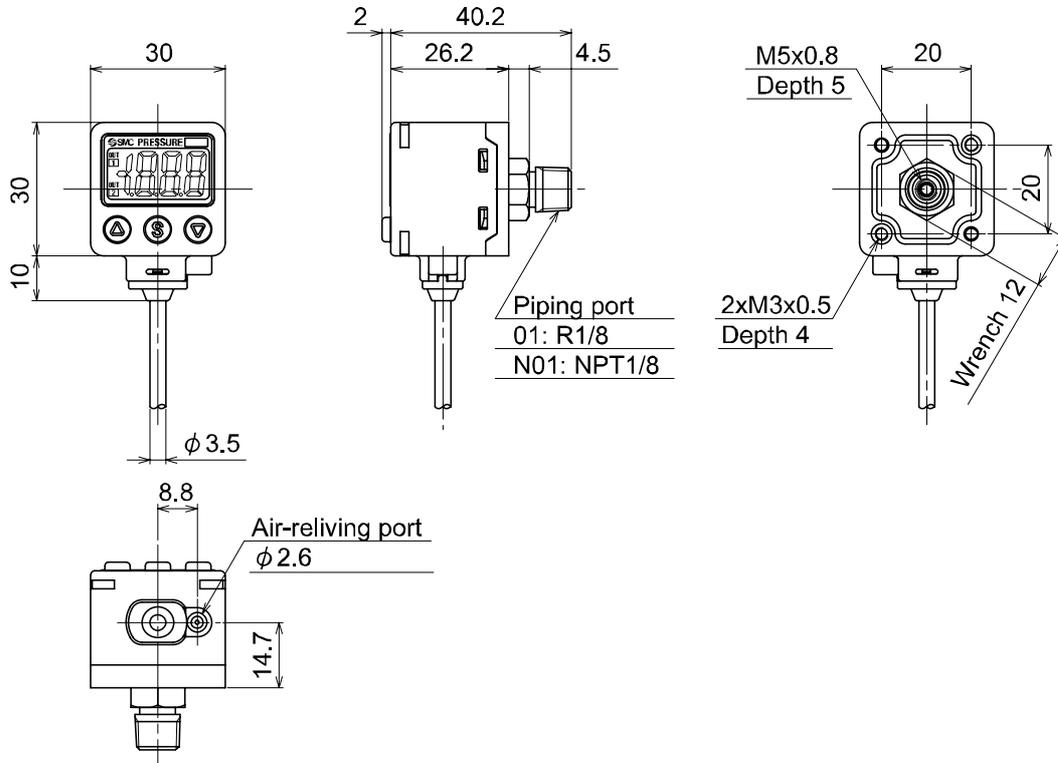
Current output



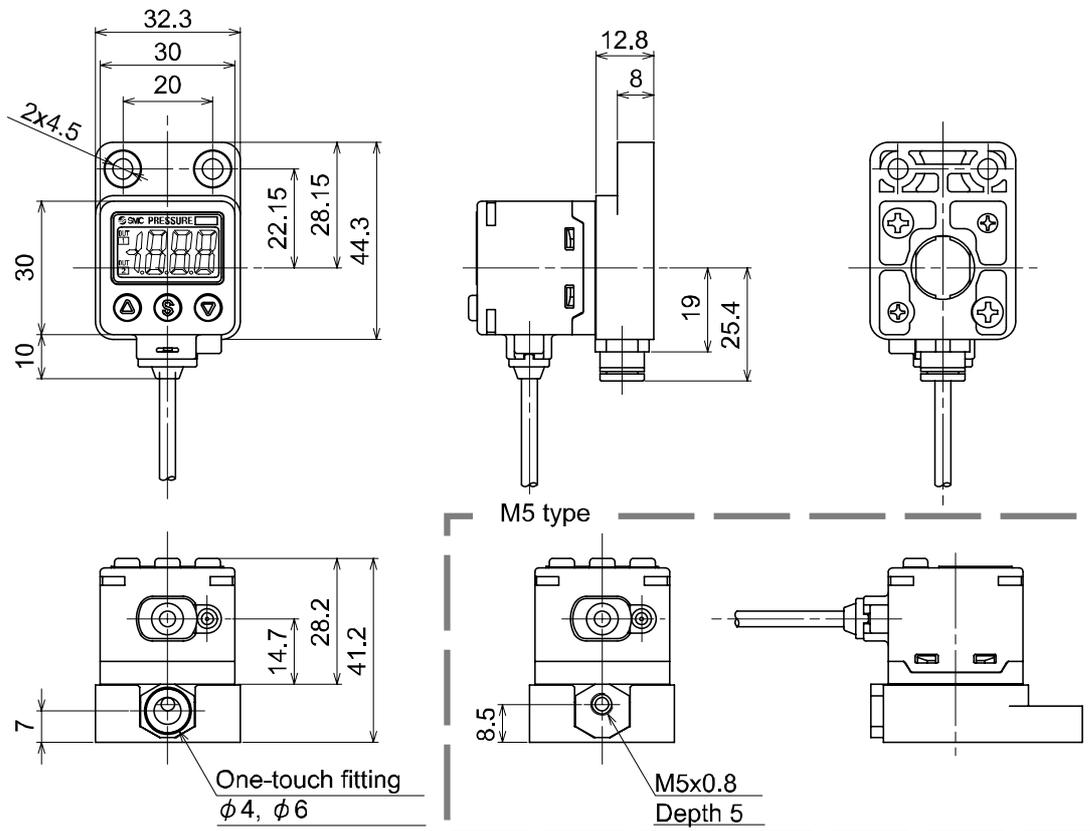
Range	Rated pressure range	A	B	C
For vacuum	0.0 to -101.3 kPa	-	0	-101.3 kPa
For compound	-100.0kPa to 100.0 kPa	-	-100 kPa	100 kPa
For positive pressure	-0.100 to 1.000 MPa	-0.1 MPa	0	1 MPa

■Dimensions

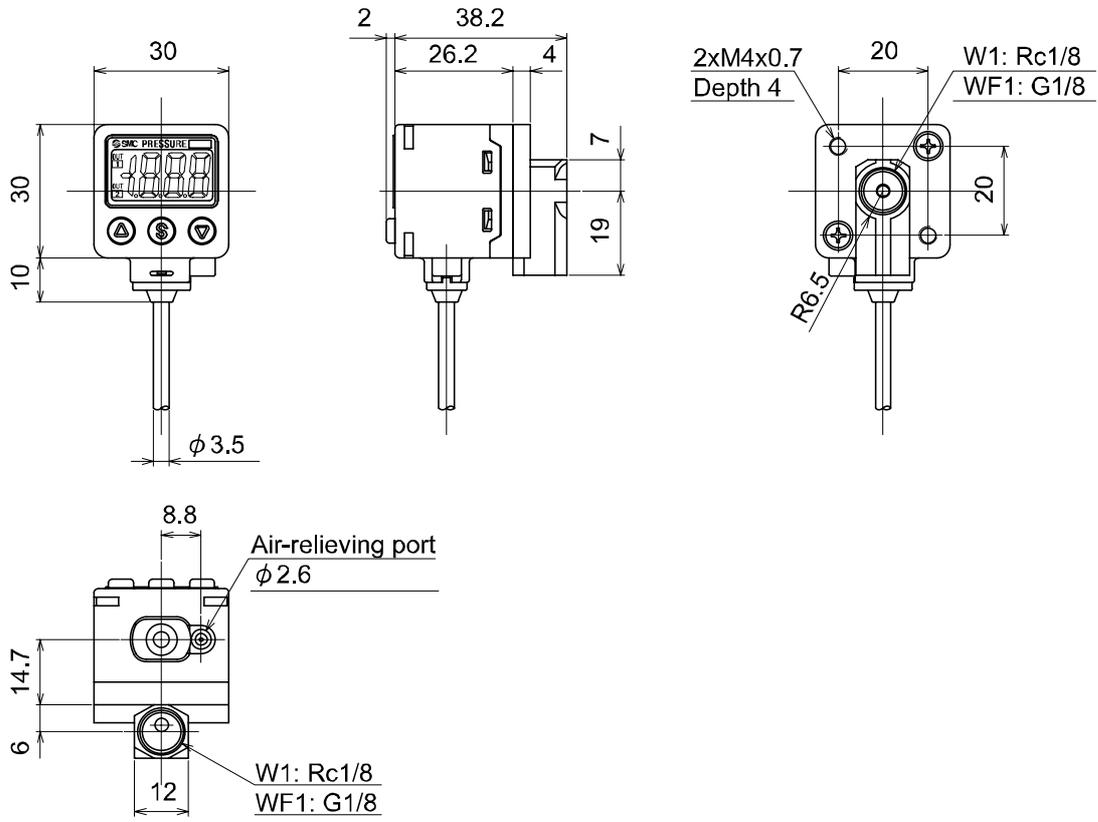
○01/N01 type



○C4/C6 type

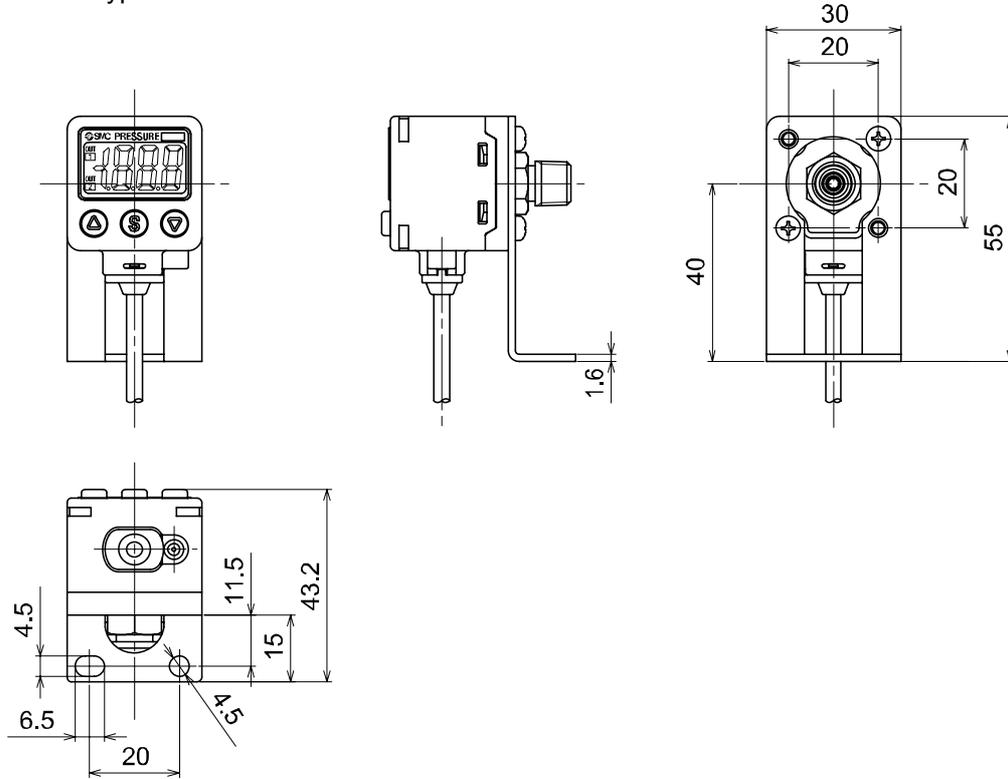


○W1/WF1 type

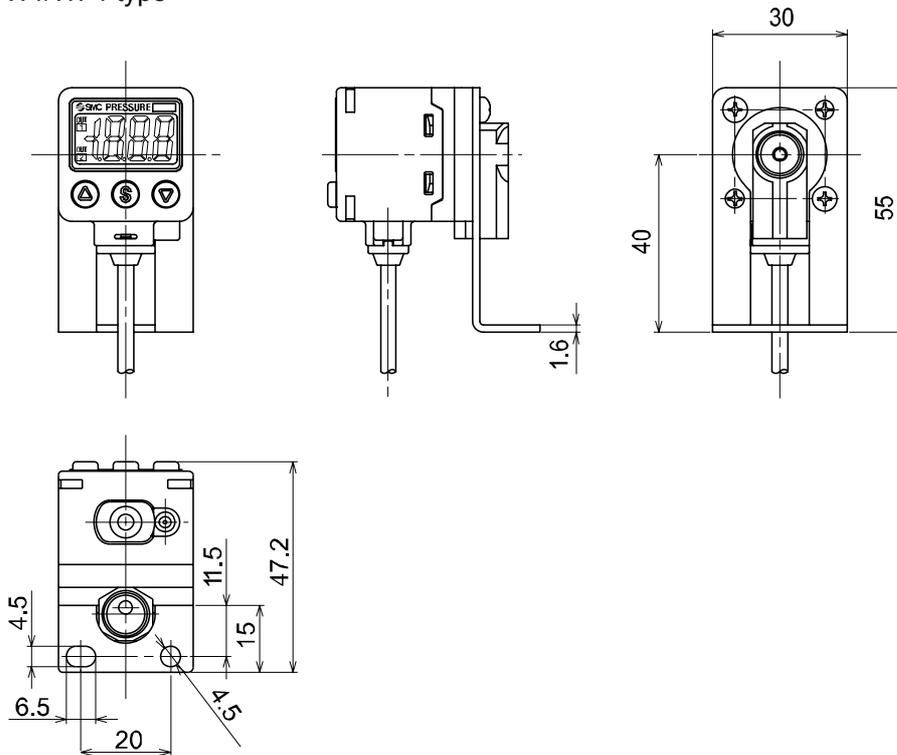


○ Mounting by bracket

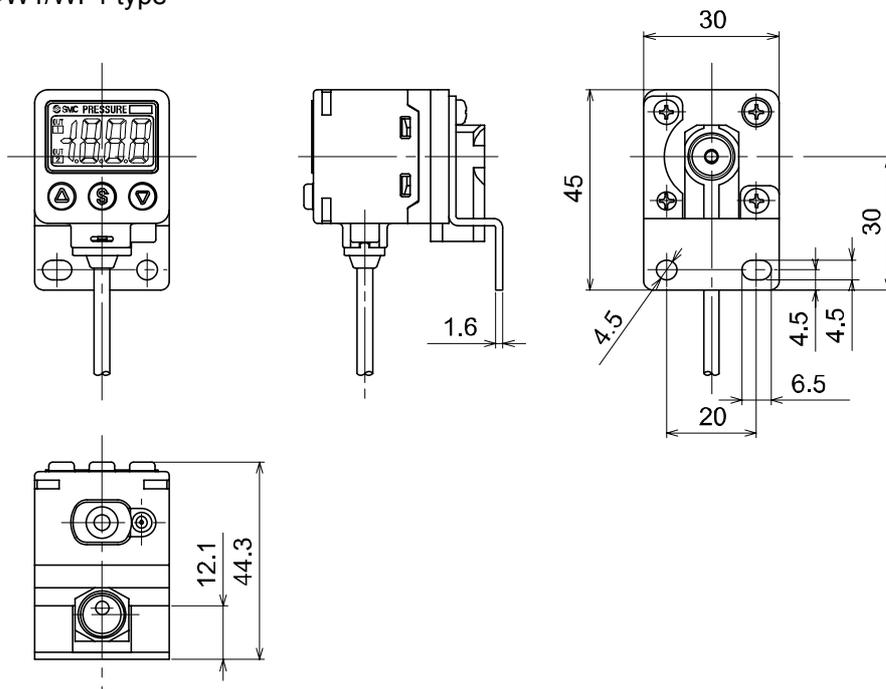
- Bracket A
 - 01/N01 type



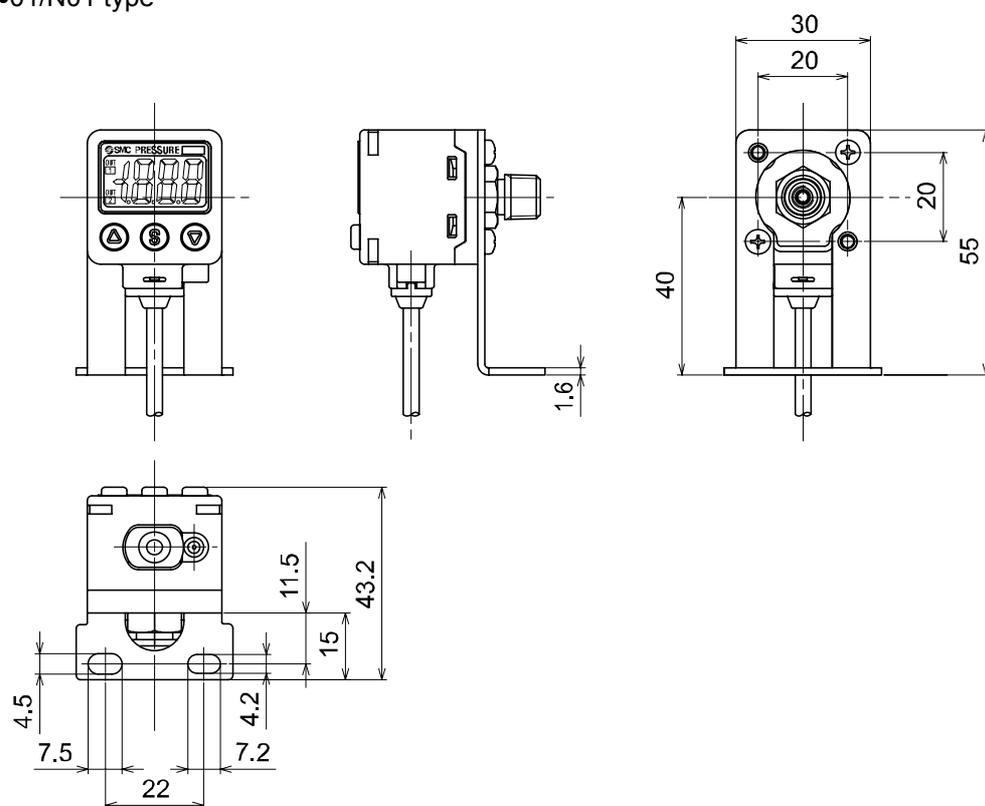
● W1/WF1 type



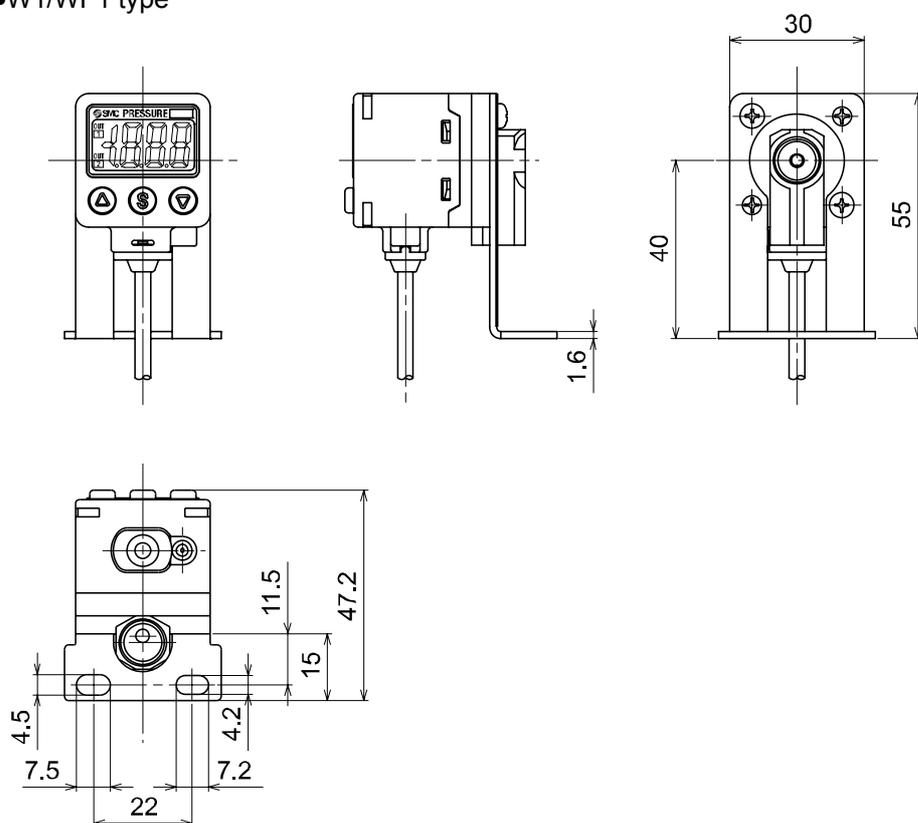
- Bracket B
- W1/WF1 type



- Bracket D
- 01/N01 type

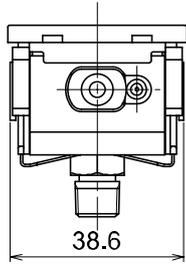
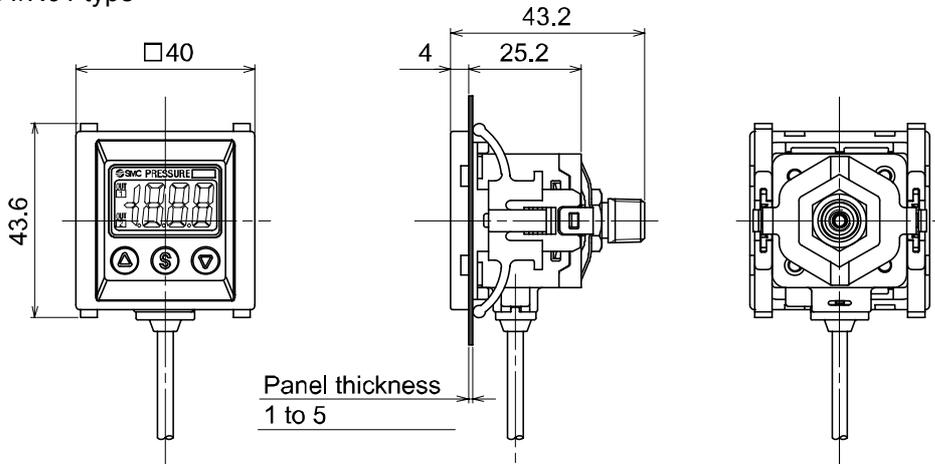


- W1/WF1 type

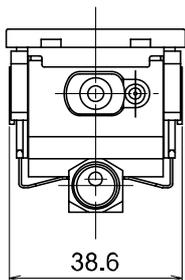
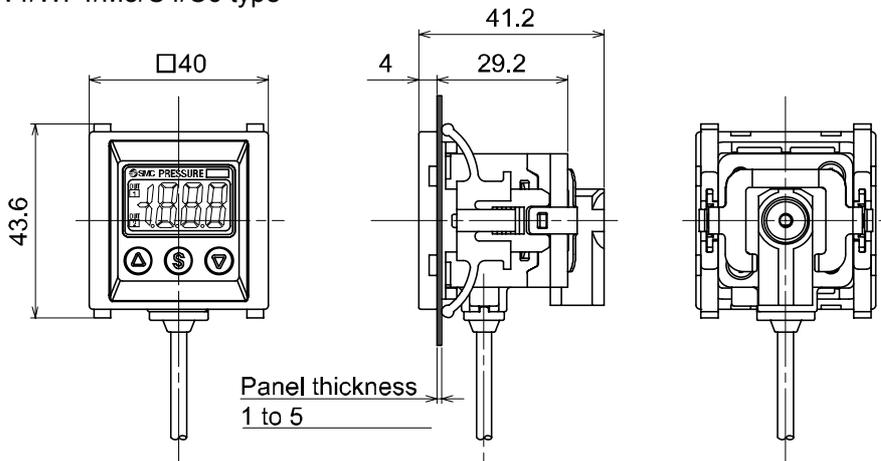


○ Mounting by panel mount adapter

● 01/N01 type

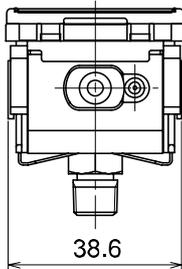
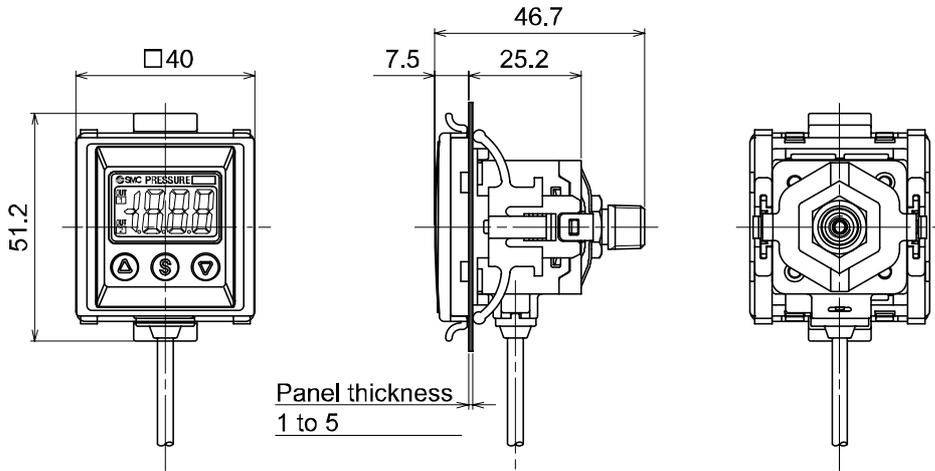


● W1/WF1/M5/C4/C6 type

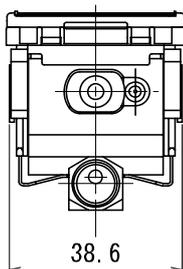
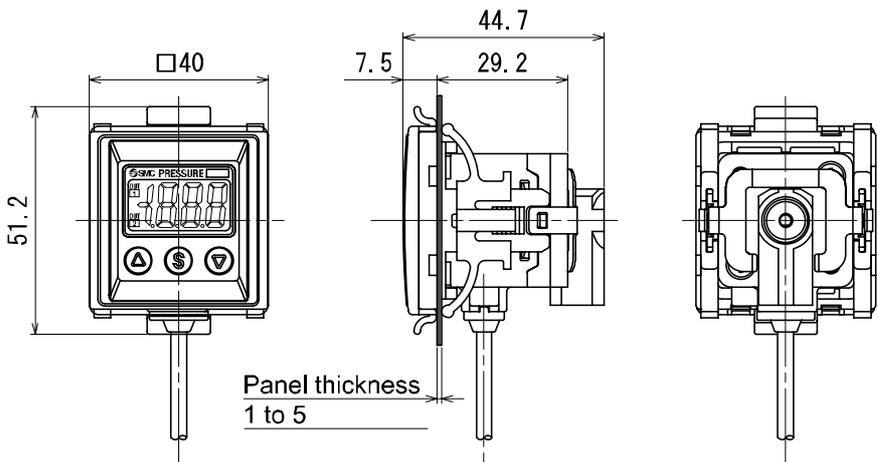


○ Mounting by panel mount adapter + Front protective cover

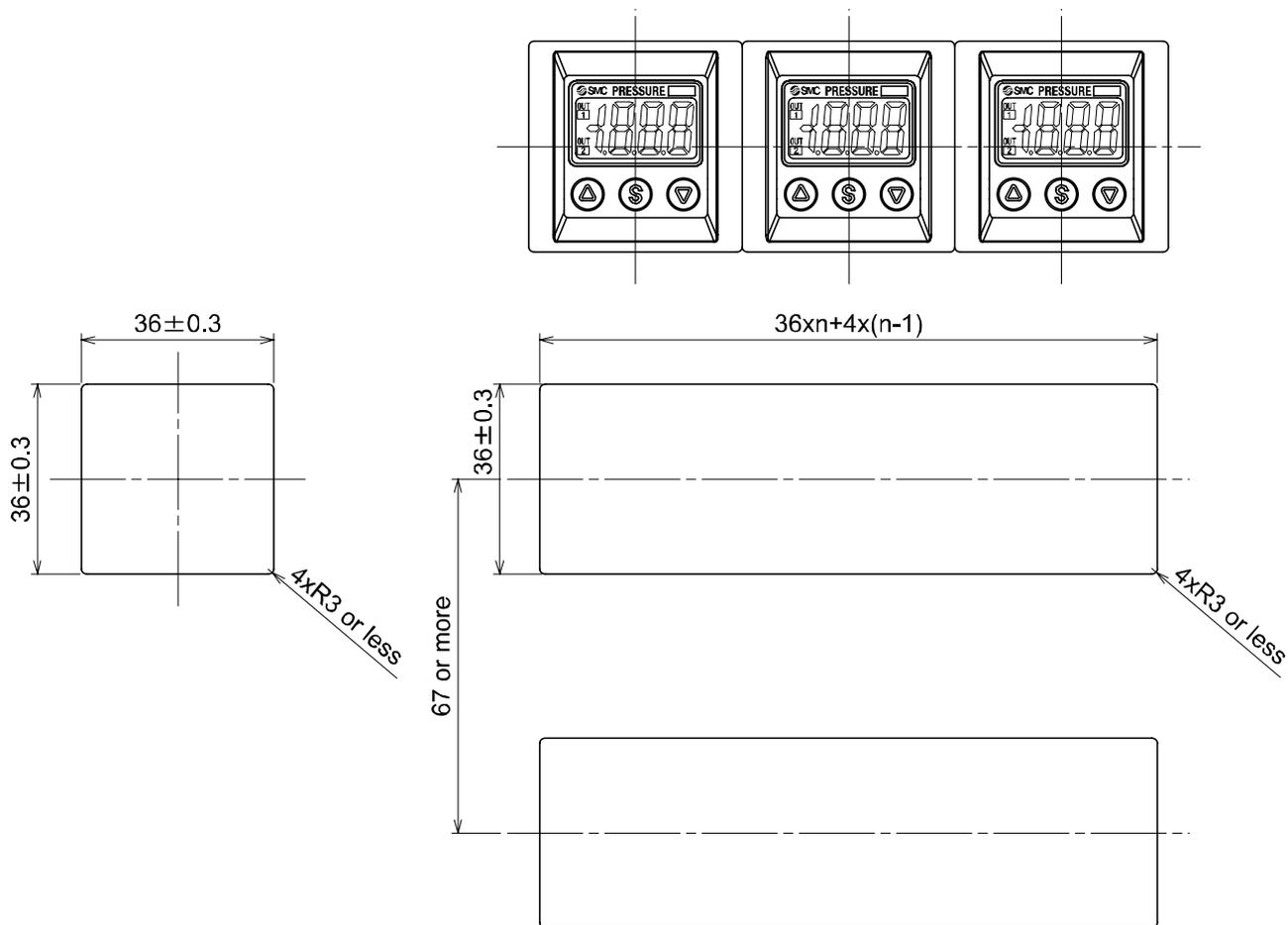
● 01/N01 type



● W1/WF1/M5/C4/C6 type



○ Panel cutout dimension



Revision history
A: Revision

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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