

Installation & Maintenance Manual

Digital Pressure Switch

Series ISE35



Safety Instructions

The Digital Switch, herein after referred to as the pressure switch, and this manual contain essential information for the protection of users and others from possible injury and property damage and to ensure correct handling.

Please check that you fully understand the definition of the following messages (signs) before going on to read the text, and always follow the instructions.

IMPORTANT MESSAGES

Read this manual and follow its instructions. Signal words such as WARNING, CAUTION and NOTE, will be followed by important safety information that must be carefully reviewed.

⚠ WARNING	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
⚠ CAUTION	Indicates a potentially hazardous situation which if not avoided, may result in minor injury or moderate injury.
NOTE	Gives you helpful information.

⚠ WARNING

Do not disassemble, modify (including change of printed circuit board) or repair.

An injury or failure can result.

Do not operate outside of the specification range.

Fire, malfunction or switch damage can result.

Do not operate in atmosphere of inflammable, an explosive or corrosive gas.

Fire, an explosion and corrosion can result.

This pressure switch is not an explosion-proof type.

Do not use this product in a place where static electricity is a problem.

Otherwise It can cause failure or malfunction of the system.

⚠ CAUTION

Perform proper functional checks and leak tests after maintenance.

Stop operation when an abnormality is observed such that the pressure switch does not work properly or there is a leakage of fluid.

Safety can not be assured due to unexpected malfunction.

When leakage occurs from other parts (except piping), the pressure sensor may be damaged.

Cut off power supply and stop supplying pressure. Do not apply pressure while in a leaking condition.

Safety Instructions (continue)

NOTE

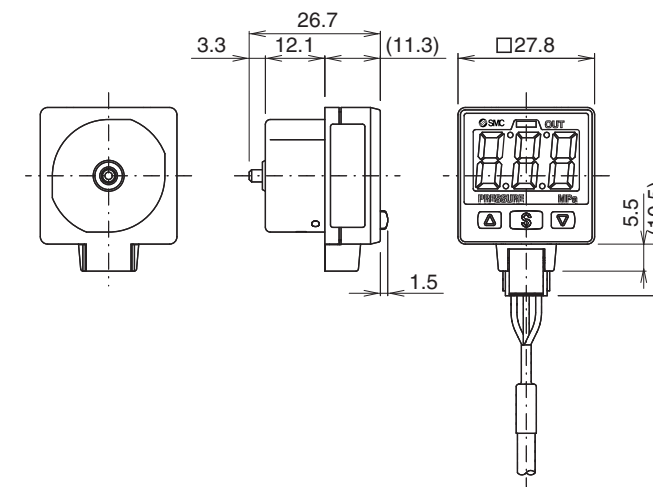
Follow the instructions given below when handling the pressure switch. Otherwise, the switch may be damaged or may fail, thereby resulting in malfunction.

- Do not drop it, bring it into collision with other objects or apply excessive shock (100m/s² or more).
- Do not pull the lead wire with force nor lift the main unit by holding the lead wire. (Tensile strength less than 50N)
- Perform wiring correctly.
- Do not perform wiring while power is on.
- Do not use with power cable or high-voltage cable in the same wire route.
- Connect terminal FG to ground when using a switching regulator obtained on the commercial market.
- Do not press the buttons with a sharply pointed tool.
- Warm-up for 20 to 30 minutes. Initial drift of about ± 1% occurs immediately after turning the power on.
- The direct-current power supply intended for use should be a class 2 UL approved power supply, according to UL1310, or a power supply based on a class 2 transformer, according to UL1585.
- Only the pressure switch with UL mark on the body becomes UL authorized article.

Specification

Series	ISE35
Rated Pressure Range	0 to 1MPa
Set Pressure Range	-0.1 to 1MPa
Proof Pressure	1.5MPa
Setting and Display Resolution	0.01MPa
Applicable Fluids	Air, inert gases and incombustible gases
Power Supply Voltage	12 to 24VDC, ripple(p-p)10% or less (Protected against inverse connection)
Current Consumption	55mA or less (With no load)
Switch Output	NPN Open Collector Output or PNP Open Collector Output
Max.Load Current	80mA
Max.Impressed Voltage	30V (During NPN output)
Residual Voltage	1V or less (80mA load current)
Response Time	1s
chattering-proof function	(0.25, 0.5, 2, 3 selectable)
Short Circuit Protection	Provided
Repeatability	±1%F.S. or less
Hyster-esis	Hysteresis Mode Window Comparator Mode
	Variable (from 0)
Display Method	3digits 7-segment display, dual-color display (Red/Green), A switch can be operated simultaneously.
Indicator Accuracy	±2%F.S.±1digit (25 °C ±3 °C reference)
Indicator Lamp	OUT : LIT When ON (Green)
Enviro-nment	Enclosure IP40
	Ambient Temperature -5 to 50 °C (No freezing)
Lead wire with connector (for option "L")	φ 3.4 3 cores 25AWG 2m

Outline with Dimensions (in mm)



Internal Circuit and Wiring

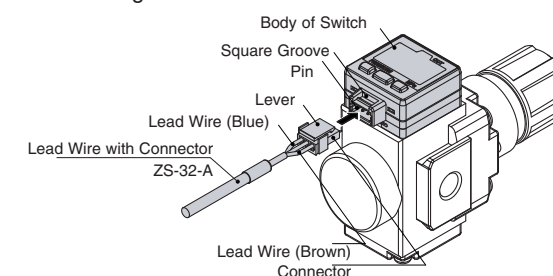
Connection

- Make connection after turning the power off.
- Use a separate route when installing wire.
- Malfunction stemming from noise may occur if wire is installed in the same route as that of power or high-voltage cable.
- Be sure to ground terminal FG when using a switching regulator obtained on the market. If analog output is performed connecting to a switching regulator obtained on the market, switching noise will be superimposed and product specification can no longer be met. This can be prevented by inserting a noise filter, such as a line noise filter and a ferrite element, between the switching regulator and the pressure switch, or by using a series power supply instead of a switching regulator.

Connector

Connecting/Disconnecting

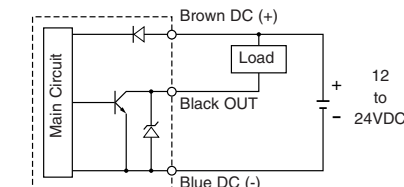
- When connecting the connector, insert it straight onto the pin holding the lever and connector body between fingers and lock the connector by pushing the lever claw into the square groove in the body of switch.
- When disconnecting the connector, push down the lever by thumb to disengage the lever claw from the square groove. Then pull the connector straight out.



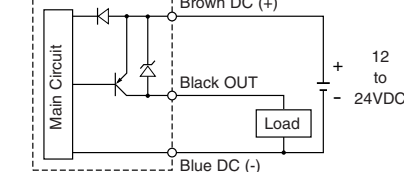
Output Specification

When the lead wire with connector provided by SMC is used, the colors of wire (Brown, Black, Blue) will apply as shown on circuit diagram.

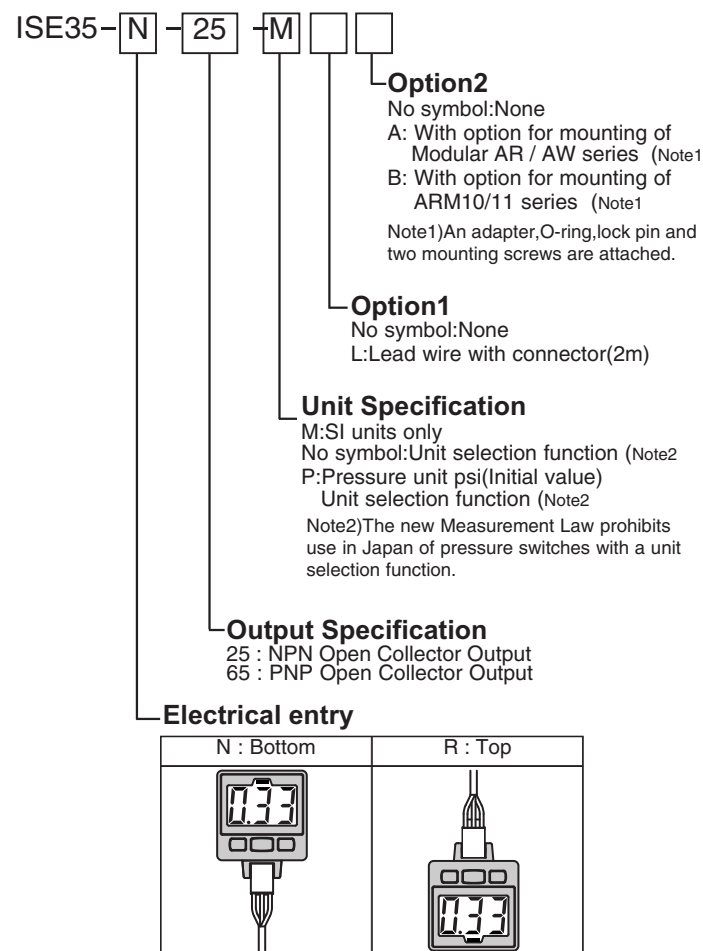
-25
NPN Open
Collector Output
Max. 30V, 80mA
Residual Voltage
is lower than 1V



-65
PNP Open Collector
Max. 80mA
Residual Voltage
is lower than 1V



Model Indication Method

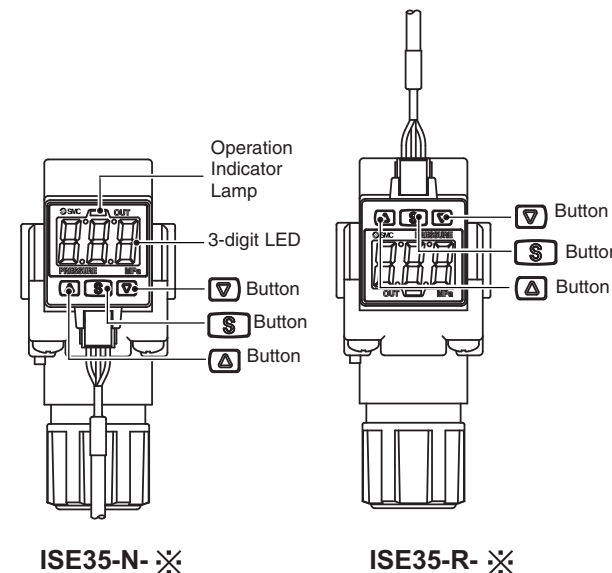


Names and Functions of Individual Parts

Main Unit

Operation Indicator Lamp : Displays the operation condition of the pressure switch.

- 3-digit LED :Displays the current status of pressure, setting mode and error code. Four display modes can be selected: display always in red or green only, or switch from green to red, or red to green according to the output.
- ⚠ Button :Increases the mode and ON/OFF set value. Press this button to change to the peak display mode.
- ▽ Button :Decreases the mode or ON/OFF set value. Press this button to change to the bottom display mode.
- ⌘ Button :Press this button to change to each mode and to set a set value.

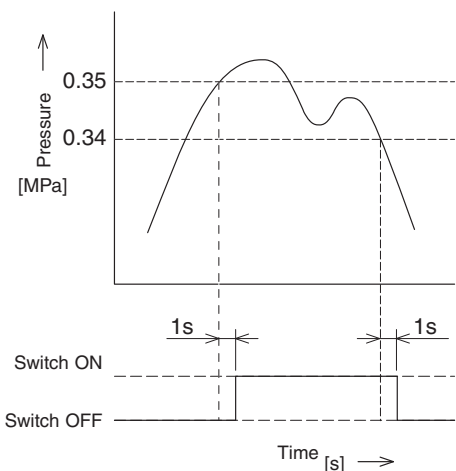


Pressure Setting

Operation

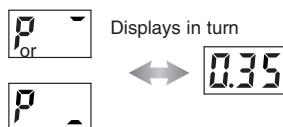
When the pressure exceeds the set value, the switch turns on. When the pressure decreases from the set value by hysteresis, the switch turns off.

At the time of shipment, the switch turns on when the pressure exceeds 0.35MPa, and turns off when it is below 0.34MPa. If the operation shown below does not cause any problem, keep this operation setting.



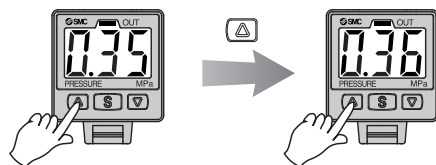
<How to perform>

- 1 Press **[S]** button in the measurement mode to display set values.

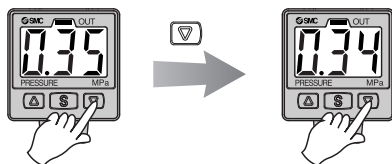


- 2 Press **[Δ]** button or **[▽]** button to change the set value. **[Δ]** button is for increase and **[▽]** button is for decrease.

- Press **[Δ]** button once to increase by one figure and press it continuously to keep increasing the set figure.



- Press **[▽]** button once to decrease by one figure and press it continuously to keep decreasing the set figure.



- 3 Press **[S]** button to finish the setting.

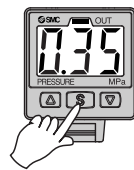
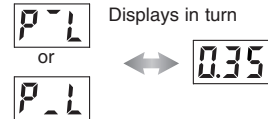
For setting in window comparator mode, refer to "Pressure Setting (in window comparator mode)"

Pressure Setting (continue)

Pressure Setting (in window comparator mode)

<How to perform>

- 1 Press **[S]** button in the measurement mode to display set values.



- 2 Press **[Δ]** button or **[▽]** button to change the set value. **[Δ]** button is for increase and **[▽]** button is for decrease.

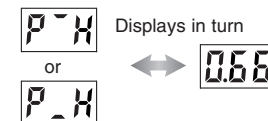
- Press **[Δ]** button once to increase by one figure and press it continuously to keep increasing the set figure.



- Press **[▽]** button once to decrease by one figure and press it continuously to keep decreasing the set figure.



- 3 Pressing **[S]** button, set value for the second setting item is displayed.



- 4 Press **[Δ]** button or **[▽]** button to change the set value.

- 5 Press **[S]** button to finish the setting.

Function Setting

Setting at the time of shipment

At the time of shipment, the settings are performed as follows. If the setting is acceptable, keep it for use. If the different setting is necessary, change the setting with reference to the relevant section.

Setting item	At the time of shipment
Switch Output It is possible to select whether or not the switch output is made available. If the switch output is not necessary, the switch can operate like a pressure gauge. Refer to "Switch Output".	ON
Indication Color Select the indication color. Refer to "Indication Color".	ON: Green OFF: Red
Response Time Setting the response time can prevent chattering of the output. Refer to "Response Time".	1s
Operation Mode Select the switch operation mode. Refer to "Operation Mode".	Hysteresis mode
Hysteresis Refer to "Hysteresis".	0.01MPa (1psi)

The value in () is for the indication unit "P".

Function Setting (continue)

Setting item	At the time of shipment
Output Type Set the method to generate the switch output. Refer to "Output Type".	Normally open
Power Saving Mode Select the power saving mode. Refer to "Power Saving Mode".	OFF
Security Code Input Select the necessity of security code input for key lock. Refer to "Security Code Input".	OFF

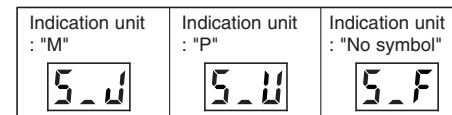
Caution for handling

- When the settings are to be changed, since the different setting item appears in order depending on how many times the **[S]** button is pressed, confirm that the item to be changed is displayed, to prevent undesired setting changes.

What is 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 where the setting change and other function settings are available as necessary. The power is supplied.

The symbol to show the indication unit appears for approx. 1sec.



The measurement mode comes and the current pressure is indicated.



Function Setting (continue)

1. Switch Output (S_□)

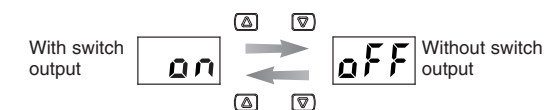
The switch output selection can be set ON or OFF. If the switch output is not selected, the switch does not generate the output, and the switch functions like a pressure gauge. In this case, only the indication color changes according to the pressure setting. The operation indication does not function.

<How to perform>

- 1 Keep pressing **[S]** button for 2sec or more in the measurement mode. "S_□" and current setting appears in turn.



- 2 Press **[Δ]** or **[▽]** button to select the necessity of switch output.



- 3 Keep pressing **[S]** button for 2 sec or more after selection is completed. Then, the setting is finished, and the measurement mode is returned.

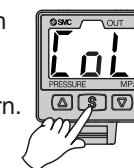
2. Indication Color (CoL)

There are 4 indication types available.

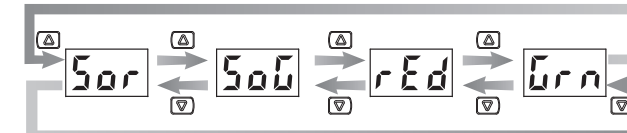
Switch		Display
ON	OFF	
Red	Green	Sor
Green	Red	SoG
Red		rEd
Green		Grn

<How to perform>

- 1 Keep pressing **[S]** button for 2sec or more in the measurement mode. After "S_□" is indicated, press **[S]** button. Then, "CoL" and current setting appears in turn.



- 2 Press the **[Δ]** or **[▽]** button to select the required indication color.



- 3 Keep pressing **[S]** button for 2 sec or more after selection is completed. Then, the setting is finished, and the measurement mode is returned.

3. Response Time (rES)

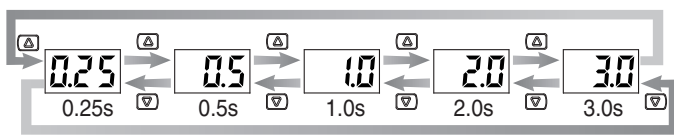
The response time of the switch output can be set optionally. If the response time is changed, the indication update interval changes accordingly. If the changed response time causes chattering in the switch output or indication, set the response time longer.

<How to perform>

- Keep pressing **[S]** button for 2sec or more in the measurement mode. After "S" is indicated, press **[S]** button twice. Then, "rES" and current setting appears in turn.



- Press **[Δ]** or **[▽]** button to select the response time.



- Keep pressing **[S]** button for 2 sec or more after selection is completed. Then, the setting is finished, and the measurement mode is returned.

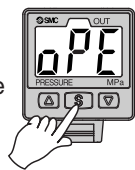
4. Operation Mode (oPE)

The switch operation mode can be selected.

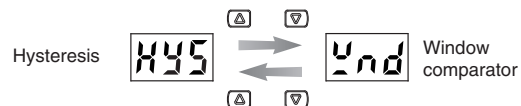
For the operation in hysteresis mode and window comparator mode, refer to "List of output mode".

<How to perform>

- Keep pressing **[S]** button for 2sec or more in the measurement mode. After "S" is indicated, press **[S]** button three times. Then, "oPE" and current setting appears in turn.



- Press **[Δ]** or **[▽]** button to select the operation mode.



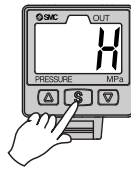
- Keep pressing **[S]** button for 2 sec or more after selection is completed. Then, the setting is finished, and the measurement mode is returned.

5. Hysteresis (H)

The hysteresis can be set.

<How to perform>

- Keep pressing **[S]** button for 2sec or more in the measurement mode. After "S" is indicated, press **[S]** button four times. Then, "H" and current setting appears in turn.



- Press **[Δ]** or **[▽]** button to select the hysteresis.

- Press **[Δ]** button once to increase by one figure and press it continuously to keep increasing the set figure.



- Press **[▽]** button once to decrease by one figure and press it continuously to keep decreasing the set figure.



- Keep pressing **[S]** button for 2 sec or more after selection is completed. Then, the setting is finished, and the measurement mode is returned.

6. Output Type (oU)

The desired output mode can be set freely for switch output.

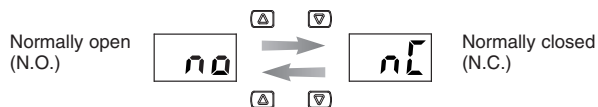
For the operation in N.O. and N.C., refer to "List of output mode".

<How to perform>

- Keep pressing **[S]** button for 2sec or more in the measurement mode. After "S" is indicated, press **[S]** button five times. Then, "oU" and current setting appears in turn.



- Press **[Δ]** or **[▽]** button to select the output type.



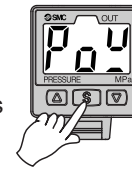
- Keep pressing **[S]** button for 2 sec or more after selection is completed. Then, the setting is finished, and the measurement mode is returned.

7. Power Saving Mode (Po)

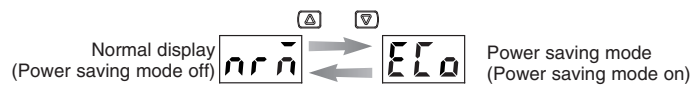
When the power saving mode is selected, the display switches off to reduce current consumption.

<How to perform>

- Keep pressing **[S]** button for 2sec or more in the measurement mode. After "S" is indicated, press **[S]** button six times. Then, "Po" and current setting appears in turn.



- Press **[Δ]** or **[▽]** button to select the power saving mode required.



- Keep pressing **[S]** button for 2 sec or more after selection is completed. Then, the setting is finished, and the measurement mode is returned. In the power saving mode, any key-in operation can return the normal display. Without key-in operation for 30sec., the power saving mode is returned again. (but only in the measurement mode)

The indication in power saving mode is as shown in the figure.

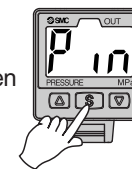


8. Security Code Input (Pi n)

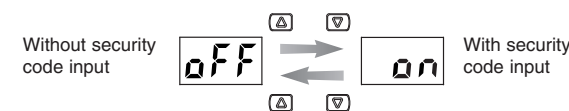
The need for security code input in key lock mode can be selected.

<How to perform>

- Keep pressing **[S]** button for 2sec or more in the measurement mode. After "S" is indicated, press **[S]** button seven times. Then, "Pi n" and current setting appears in turn.



- Press **[Δ]** or **[▽]** button to select the mode for security code.

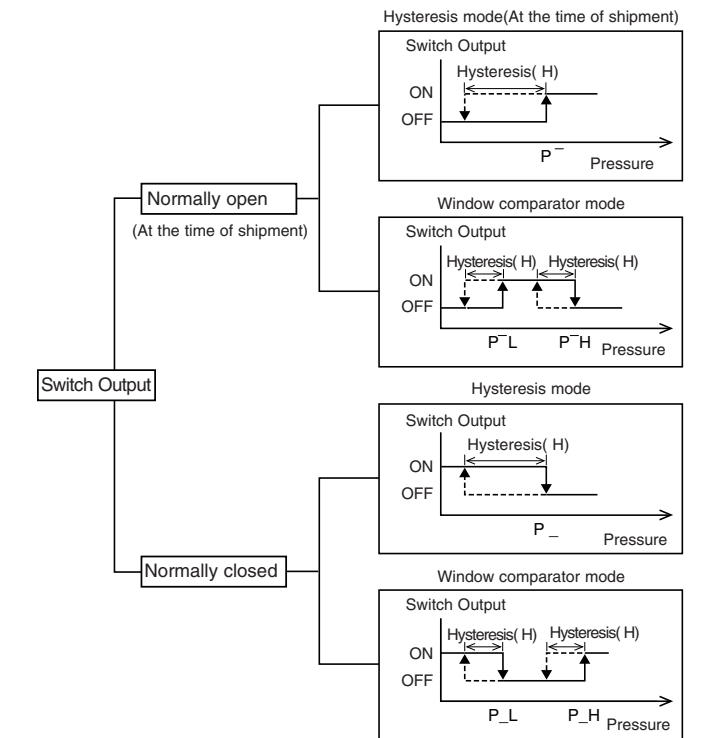


- Keep pressing **[S]** button for 2 sec or more after selection is completed. Then, the setting is finished, and the measurement mode is returned.

With security code input, it becomes necessary to input the security code to release key lock. The security code can be decided optionally by the operator. At the time of shipment, the security code is set to "000".

With security code input, refer to "Key Lock".

List of output mode



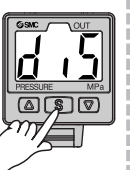
- If the point where the switch output is changed is out of set pressure range due to change of set pressure, hysteresis (H) is automatically compensated.

Indication Mode (d1 s)

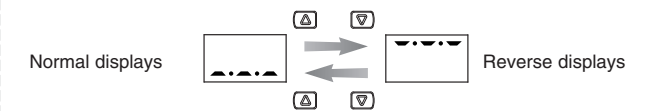
The indication mode can be reversed. This setting is necessary to change the indication direction on installation of the switch.

<How to perform>

- Keep pressing **[S]** button for 2sec or more in the measurement mode. After "S" is indicated, press **[S]** button eight times. Then, "d1 S" and current setting appears in turn.

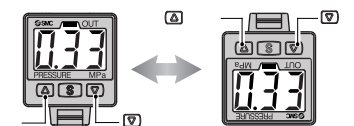


- Press **[Δ]** or **[▽]** button to select the indication mode.



- Keep pressing **[S]** button for 2 sec or more after selection is completed. Then, the setting is finished, and the measurement mode is returned.

If inverse indication is selected, the button operation is changed as shown on right figure.



Function Setting (continue)

● **Indication Unit (UnI)** (available with unit shifting function)

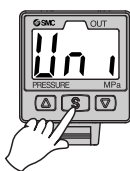
The indication unit can be selected freely.

Resolution of each unit

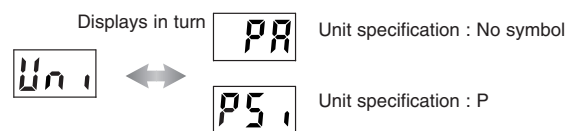
	Setting and Display Resolution
MPa	0.01
kgf/cm ²	0.1
bar	0.1
psi	1

<How to perform>

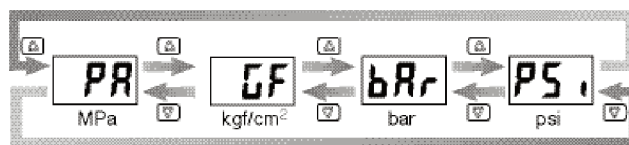
- 1 Press **[V]** button three times in the measurement mode.



"Un1" and current setting appears in turn.



- 2 Press **[Δ]** or **[▽]** button to select the indication unit.



- 3 Press **[S]** button to enter the setting. The measurement mode is returned.

Other Settings

● **Peak/Bottom value indication**

The maximum (minimum) pressure from when the power is supplied to this moment is detected and updated. In the peak/bottom indication mode, the pressure is indicated. For the peak indication, when **[Δ]** button is pressed for 1sec or more, the maximum pressure starts flashing and is held. To release holding the indication of the maximum pressure, press **[Δ]** button for 1sec or more again. The measurement mode is returned. For the bottom indication, when **[▽]** button is pressed for 1sec or more, the minimum pressure starts flashing and is held. To release holding the indication of the minimum pressure, press **[▽]** button for 1sec or less again. The measurement mode is returned. If **[Δ]** and **[▽]** buttons are pressed simultaneously for 1sec or more while the pressure is being held, the maximum (minimum) value is initialized.

● **Zero Clear**

A displayed value can be adjusted to zero when pressure to be measured is within ±10% F.S. of the pressure at the time of shipment from the factory. (The range of ±1digit setting is different depending on the individual product difference) Press continuously the **[Δ]** and **[▽]** buttons for one second or more simultaneously, display is cleared to "0". The switch will return to the measurement mode automatically.

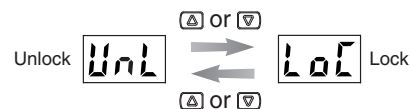
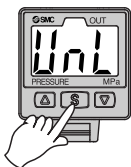
Other Settings (continue)

● **Key Lock**

This setting can be used to prevent any unintentional changes of set values. If the button operation is performed while key lock setting mode is selected, "LoC" is displayed for approx. 1sec.

<How to perform without security code input>

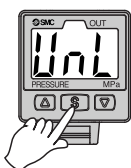
- 1 Keep pressing **[S]** button for 5sec or more in the measurement mode. The current setting "LoC" or "UnL" is indicated. (Releasing key lock can be done in the same way.)
- 2 Press **[Δ]** or **[▽]** button to select locking or unlocking of the key.



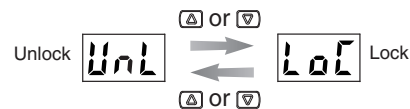
- 3 Press **[S]** button to enter the setting.

<How to perform with security code input>

- Locking
- 1 Keep pressing **[S]** button for 5sec or more in the measurement mode. "UnL" is indicated.



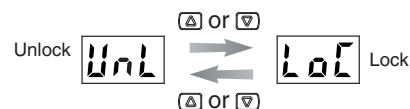
- 2 Press **[Δ]** or **[▽]** button to select locking of the key "LoC".



- 3 Press **[S]** button to enter the setting.

• **Unlocking**

- 1 Keep pressing **[S]** button for 5sec or more in the measurement mode. "LoC" is indicated.
- 2 Press **[Δ]** or **[▽]** button to select unlocking of the key "UnL".



- 3 When **[S]** button is pressed, the input of the security code is requested. For how to input the security code, refer to "How to input and change the security code".



- 4 If the security code entered is correct, the indication changes to "UnL", and pressing one of **[Δ]**, **[S]** or **[▽]** button releases key lock and returns the measurement mode. If the security code entered is incorrect, "FAL" is indicated and the security input mode is returned. If the wrong security code is entered three times, "LoC" is indicated and the measurement mode is returned.

How to change the security code

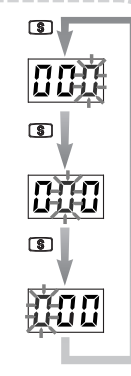
At the time of shipment, the security code is set to "000", but can be changed to an alternative one.

<How to perform>

- 1 If the lock mode has been set, perform all three steps in the unlock setting procedure. (Setting up to unlocking **[3]**)
- 2 After the security code is entered, and the indication changes to "UnL", keep pressing **[S]** and **[▽]** buttons simultaneously for 5sec or more. "000" is indicated and the change of security code is requested. For how to input the security code, refer to "How to input and change the security code". Changed security code is indicated.
- 3 After checking that the code is as required, press **[S]** button. The measurement mode is returned. At this time, if the **[Δ]** or **[▽]** button is pressed, and the **[S]** button not pressed, the changed security code is not entered, and the change of security code is requested.

• **How to input and change the security code**

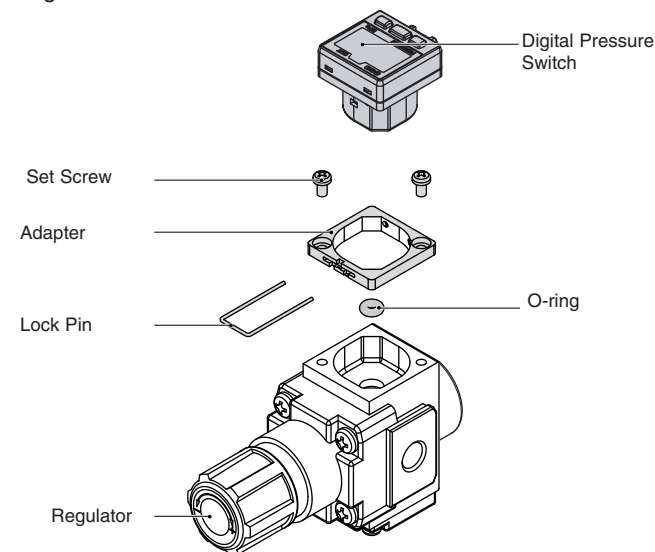
The first digit starts flashing. Press **[Δ]** or **[▽]** button to set the value. Pressing **[S]** button starts flashing the second digit. (If **[S]** button is pressed at the uppermost digit, the first digit starts flashing again.) After the setting is finished, keep pressing **[S]** button for 1sec or more. If the operation is not performed for 30sec. during input and change of the security code, the measurement mode is returned.



Maintenance

Mounting on a Regulator

- Cut the power supply to the switch when assembling. Also, turn the set pressure of the regulator to zero.
- Mount O-ring to the O-ring groove of the regulator. Attention should be taken not to damage the O-ring.
- Mount the adapter with 2 set screws. Recommended tightening torque :
Modular AR/AW series 0.6 ± 0.05N·m
ARM10/11 series 0.32 ± 0.03N·m
- Mount the main body of the switch.
- Insert the lock pin into the adapter to its full extent.
- Supply pressure slowly, and ensure no air leakage.
- The pressure switch can be assembled rotated through 180 degrees.



Error Indication

Error indication function

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

Error Name	Error Display	Error Content	Troubleshooting
Overcurrent Error	Er1	80mA or more of load current flows to the switch output.	Turn off the power and remove the output factor for the overcurrent. Then turn the power on.
Residual Pressure Error	Er3	During zero clear operation, pressure over ±10%F.S. is applied. In three seconds, the mode will reset to the measurement mode. ±1 digits of the zero clear range is possible with product variations.	Perform zero-clear operation again after restoring the applied pressure to an atmospheric pressure condition.
Pressurizing Error	HHH	Pressure exceeding the high limit of the set pressure range is applied.	Reset applied pressure to a level within the set pressure range.
	LLL	Pressure below the low limit of the set pressure range is applied.	
System Error	Er4	Displayed in the case of an internal data error.	Turn off the power and turn it on again.
	Er6	Displayed in the case of an internal data error.	
	Er7	Displayed in the case of an internal data error.	
	Er8	Displayed in the case of an internal data error.	

If the above remedies cannot recover the operation, the error needs to be investigated by SMC.

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