

**ORIGINAL INSTRUCTIONS** 

# **Instruction Manual Digital Sensor Monitor** PSE300AC / PSE310AC series



The intended use of the digital sensor monitor is to monitor and display pressure information from a pressure sensor.

# 1 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 and safety requirements for systems and their components.
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components.

IEC 60204-1: Safety of machinery - Electrical equipment of machines. Part 1: General requirements.

- ISO 10218-1: Robotics-Safety requirements Part 1: Industrial robots. • Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

| <b>▲</b> Danger  | Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.     |
|------------------|--|
| <b>▲</b> Warning | Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. |
| ▲ Caution        | Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.   |

# **Marning**

- Always ensure compliance with relevant safety laws and standards.
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.
- This product is class A equipment intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted or radiated disturbances.
- Refer to the operation manual on the SMC website (URL: https://www.smcworld.com) for more safety instructions.

#### 2 Specifications

#### 2.1 General specifications

| Product No.          |                                       | PSE3#0AC series  |  |
|----------------------|---------------------------------------|--|--|
| Rated pressure range |                                       |  |  |
| Pressure             | Display /                             | Refer to table for applicable pressure   |  |
|                      | set pressure range Display / minimum  | sensor specification   |  |
| ш                    | setting unit                          |  |  |
| Electrical           | Power supply voltage                  | 12 to 24 VDC ±10%,   |  |
|                      | Current consumption                   | ripple max. 10% (p-p) 25 mA or less  |  |
| Ele                  | Protection                            | Polarity protection  |  |
|                      | Display accuracy                      | ±0.5% F.S. ±1 digit  |  |
| acy                  | Display accuracy                      | (at 25 °C constant)  |  |
| Accuracy             | Repeatability                         | ±0.1% F.S. ±1 digit<br>(at 25 °C constant)   |  |
| Ac                   | Temperature characteristics           | ±0.5%F.S. (25 °C standard)   |  |
|                      | Output type                           | Select from NPN or PNP open collector output.  |  |
|                      | Output mode                           | Select from hysteresis mode, window comparator mode, error output or switch output OFF.                    |  |
| 1                    | Switch operation                      | Select from normal output or reversed output.  |  |
| Switch output        | Maximum load current                  | 20 mA  |  |
| witch                | Maximum voltage (NPN output)          | 30 VDC   |  |
| (O)                  | Internal volt drop (Residual voltage) | 1 V or less (Load current 20 mA)   |  |
|                      | Delay time                            | 1.0 ms or less<br>(delay time available for anti-chatter function:<br>20, 100, 500, 1000, 2000, 5000 ms)   |  |
|                      | Hysteresis                            | Variable from 0  |  |
|                      | Protection                            | Over current protection  |  |
| or                   | Input type                            | Voltage input: 1 to 5 VDC (Input impedance: 1 MΩ) Current input: 4 to 20 mA (Input impedance: 51 MΩ)       |  |
| Sensol               | Number of inputs                      | 1 input  |  |
| 0,                   | Connection method                     | M12 4-pin connector  |  |
|                      | Protection                            | Over voltage protection<br>(up to 26.4 V)  |  |
|                      | Units                                 | MPa, kPa, Pa, kgf/cm², bar, mbar, psi, inHg, mmHg or mmH2O   |  |
|                      | Display type                          | LCD  |  |
| ay                   | Number of displays                    | 3-screen display<br>(main display, sub display x 2)  |  |
| Display              | Display colour                        | Main display: Red/Green<br>Sub display: Orange   |  |
|                      | Number of digits                      | Main display: 4 digit (7-segments) Sub display: 4 digit (Upper 1 digit 11- segments, 7-segments for other) |  |
|                      | Operation LED                         | LED is ON when switch output is ON (OUT1/OUT2: Orange)   |  |
| Digi                 | tal Filter                            | 0, 10, 50, 100, 500, 1000, 5000 ms   |  |
|                      | Enclosure                             | IP65   |  |
| ent                  | Withstand voltage                     | 1000 VAC for 1 minute between terminals and housing  |  |
| Environment          | Insulation resistance                 | 50 MΩ or more between terminals and housing (with 500 VDC megger)  |  |
| En                   | Ambient temperature range             | Operation: -5 to 50 °C, Storage: -10 to 60 °C (no condensation or freezing)                                |  |
|                      | Operating humidity range              | Operation, Storage: 35 to 85%RH (no condensation)  |  |
| Weight               |                                       | 55.4 g<br>(without power supply or lead wire)  |  |

# 2 Specifications (continued)

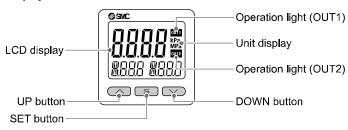
# 2.2 Applicable Pressure Sensor specifications

| Applicable SMC pressure sensor    | Rated pressure range | Display / set pressure range | Display /<br>minimum<br>setting unit |
|-----------------------------------|----------------------|------------------------------|--------------------------------------|
| PSE550                            | 0 to 2 kPa           | -0.2 to 2.1 kPa              | 0.001 kPa                            |
| PSE531, PSE541,<br>PSE561         | 0 to -101 kPa        | 10 to -105 kPa               | 0.1 kPa                              |
| PSE533, PSE543, PSE563, PSE573    | -100 to 100<br>kPa   | -105 to 105<br>kPa           | 0.1 kPa                              |
| PSE532                            | 0 to 100 kPa         | -10 to 105 kPa               | 0.1 kPa                              |
| PSE564, PSE574                    | 0 to 500 kPa         | -50 to 525 kPa               | 1 kPa                                |
| PSE530, PSE540,<br>PSE560, PSE570 | 0 to 1 MPa           | -0.105 to 1.05<br>MPa        | 0.001 MPa                            |
| PSE575                            | 0 to 2 MPa           | -0.105 to 2.1<br>MPa         | 0.001 MPa                            |
| PSE576                            | 0 to 5 MPa           | -0.25 to 5.25<br>MPa         | 0.01 MPa                             |
| PSE577                            | 0 to 10 MPa          | -0.50 to 10.5<br>MPa         | 0.01 MPa                             |
|                                   |                      |                              | ·                                    |

#### Warning

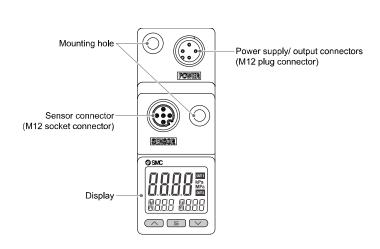
Special products (-X) might have specifications different from those shown in this section. Contact SMC for specific drawings.

# 3 Names and function of parts (continued)



| Part            | Description  |  |
|-----------------|--|--|
| Operation light | Displays the switch operating condition  |  |
| LCD display     | Displays the current status of pressure, setting mode, selected display units and error code.  4 types of display can be selected for the main display: Single constant colour red or green; or switching from red to green or green to red corresponding to the output.  The sub display is orange. |  |
| UP button       | Increases mode and ON/OFF set values   |  |
| DOWN button     | Decreases mode and ON/OFF set values   |  |
| SET button      | Press this button to change mode and to confirm settings   |  |
| Unit display    | Indicates the units currently selected. (Only for display units of kPa and MPa)  |  |

# 3 Names and function of parts



| Part                            | Description   |  |
|---------------------------------|---|--|
| Power supply / output connector | Connection for the power supply and output lead wire. |  |
| Sensor connector                | Connection for attached sensor                        |  |
| Mounting hole                   | Holes for mounting screws for installation            |  |
| Display                         | See below   |  |

# 4 Installation

# 4.1 Installation

### **Marning**

- Do not install the product unless the safety instructions have been read and understood.
- · Tighten to the specified tightening torque.
- If the tightening torque is exceeded the mounting screws, brackets and the product can be broken. Insufficient torque can cause displacement of the product from its correct position.
- Do not drop, hit or apply excessive shock to the product. Otherwise damage to the internal parts can result, causing
- Do not pull the lead wire forcefully, and do not lift the product by pulling the lead wire.

# 4.2 Environment

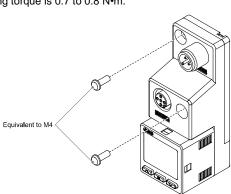
# Warning

- Do not use in an environment where corrosive gases, oil, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.

#### 4 Installation (continued)

#### 4.3 Mounting

- Install the product using M4 screw (2 pcs.) or equivalent.
- Screws are prepared by the user.
- Refer to the outline dimensions for the diameter and depth of the mounting screw holes.
- Tightening torque is 0.7 to 0.8 N·m.



#### 5 Wiring

#### 5.1 Wiring Connection

- Connections should be made with the power supply turned OFF.
- Do not insert or remove the connectors with the power ON.
- Use a separate route for the product wiring and any power or high voltage wiring. Otherwise, malfunction may result due to noise.
- If a commercially available switching power supply is used, be sure to ground the frame ground (FG) terminal. If the switching power supply is connected for use, switching noise will be superimposed and it will not be able to meet the product specifications. In that case, insert a noise filter such as a line noise filter/ferrite between the switching power supplies or change the switching power supply to the series power supply.

# 5.2 Wiring connections

- Align the connector key and the cable connector key groove to insert vertically and rotate the knurled part on the cable connector.
- Check that the connection is not loose.

# Power supply / output connector pin layout

M12 plug connector on monitor body



| Pin No. | Description |  |
|---------|-------------|--|
| 1       | DC (+)      |  |
| 2       | OUT2        |  |
| 3       | DC (-)      |  |
| 4       | OUT1        |  |

# Sensor connector pin layout

M12 socket connector on monitor body



|          | Description         |                             |          |  |
|----------|---------------------|-----------------------------|----------|--|
| Part No. | PSE300AC            | PSE310AC                    | PSE310AC |  |
| Pin No.  | Droccuro cono       | Draggues cancer 2 wire tune |          |  |
| FIII NO. | Flessule sells      | Pressure sensor 3-wire type |          |  |
| 1        | DC (+)              |                             | LINE (+) |  |
| 2        | N.C.                |                             | N.C.     |  |
| 3        | DC (-)              |                             | N.C.     |  |
| 4        | Sensor input:       | Sensor input:               | LINE (-) |  |
|          | 1 to 5 V 4 to 20 mA |                             | ` '      |  |
| 5        | N.C.                |                             | N.C.     |  |

#### 6 Outline of Settings

# Power is supplied



The Product code is displayed for 3 seconds Then Measurement mode is displayed. The switch starts after approximately 0.2 seconds.

# [Initial Setting]

Set the pressure range, display units and switch output NPN/PNP specification.



# [Measurement mode]

Detects the pressure and indicates the display and switch operating status. This is the basic mode; other modes should be selected for set-point changes and other function settings.

#### Measurement mode display



Set value or peak/bottom value (Sub display (right))

**[Other** 

settings]

Zero clear

Key Lock

#### Sub display

In measurement mode, the sub display can be temporarily changed by pressing the UP or DOWN buttons.



One arbitrary display mode can be added to the sub display by setting the [F10] sub display setting.

If the sub display is switched during the arbitrary display setting, the display will be returned to the arbitrary display 30 seconds later. (The default setting does not include arbitrary display).



model

Set value or

hysteresis









delay time

**[Function** selection mode] Change the settings

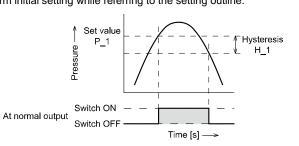
- The outputs will continue to operate during setting.
- If a button is not pressed for a certain time during the setting, the display will flash.
- 3-step setting mode, simple setting mode and function selection mode settings reflect on each other.

# 7 Pressure Setting

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

The default setting is to turn ON the output at 0.5 MPa when the pressure range of the connected sensor is 1.0 MPa.

Perform initial setting while referring to the setting outline.



### 8 3-Step Setting mode

#### 8.1 3-Step setting mode

In 3-step setting mode, the set value (P 1 or n 1, P 2 or n 2) and hysteresis (H\_1, H\_2) can be changed.

Set the items on the sub display (set value or hysteresis) using the DOWN button.

When changing the set value, follow the operation below. The hysteresis setting can be changed in the same way.



- (1) Press the SET button once when the item to be changed is shown on the sub display. The set value on the sub display (right) will start
- (2) Press the UP or DOWN button to change the set value. When the UP and DOWN buttons are pressed and held simultaneously for 1 second or longer, the set value is displayed as [- - -], and the set value will be the same as the current pressure value automatically (snap shot function).
  - Afterwards, it is possible to adjust the value by pressing the UP or DOWN button.
- (3) Press the SET button to complete the setting.

The product will turn on within a set pressure range (OUT1: from P1L to P1H, OUT2: from P2L to P2H) during window comparator mode. Set P1L/P2L, the lower limit of the switch operation, and P1H/P2H, the upper limit of the switch operation and WH1/WH2 (hysteresis).

When reversed output is selected, the sub display (left) will show [n1L] / [n2L] and [n1H] / [n2H].

 Setting of the normal/reverse output switching and hysteresis/window comparator mode switching are performed with the function selection mode [F 1] Setting of OUT1, [F 2] Setting of OUT2.

# 9 Simple Setting mode

(1) Press and hold the SET button for between 1 and 3 seconds in measurement mode. [SEt] is displayed on the main display. When the button is released while in the [SEt] display, the current pressure value is displayed on the main display, [P\_1] or [n\_1] is displayed on the sub display (left), and the set value is displayed on the sub display (right) (Flashing).



- (2) Change the set value with the UP or DOWN buttons, and press the SET button to set the value. Then, the setting moves to hysteresis setting (The snap shot function can also be used).
- (3) Change the hysteresis value using the UP or DOWN buttons, and press the SET button to set the value. Then, the setting moves to the delay time of the switch output (The snap shot function can also be used).
- (4) The delay time of the switch output can be set by pressing the UP or DOWN button.
  - Delay time setting can prevent the output from chattering.
- (5) Press the SET button for 2 seconds or less to complete the OUT1 setting. [P\_2] or [n\_2] is displayed on the sub screen (left). Continue with the setting of OUT2.
  - Press and hold the SET button for 2 seconds or longer to complete the setting. The product will return to measurement mode.
- In window comparator mode, set P1L/P2L, the lower limit of the switch operation, and P1H/P2H, the upper limit of the switch operation, WH1/WH2 (hysteresis) and dt1/dt2 (delay time). (When reversed output is selected, the sub display (left) will show [n1L] / [n2L] and [n1H] / [n2H].).

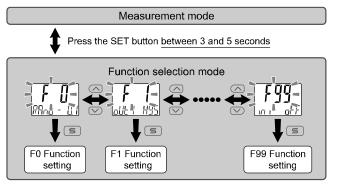
#### 10 Function Selection mode

In measurement mode, press the SET button for between 3 and 5 seconds, to display [F 0].

Select to display the function to be changed [F

].

Press and hold the SET button for 2 seconds or longer to return to measurement mode.



- Some products do not have all the functions. If a function is not available or selected due to configuration of other functions, [- - -] is displayed on the sub display (right).
- Refer to the operation manual on the SMC website (URL: https://www.smcworld.com) for more information about the Functions available

#### 10.1 Default function settings

The default settings are shown in the table below. If there is no problem with this setting, keep these settings. To change a setting, enter function selection mode

# Switching function of [F 0]

The default settings for pressure range, display units and switch output.

| ľ                            | tem               | Default setting |  |
|------------------------------|-------------------|-----------------|--|
| Connected sensor range       |                   | 1 MPa           |  |
| Display units                | Units: [Nil or M] | MPa             |  |
|                              | Units: [P]        | psi             |  |
| Switch output specifications |                   | NPN             |  |

#### Setting of OUT1 [F 1] and OUT2 [F 2]

| Item             | Explanation  | Default setting  |
|------------------|--|--|
| Output<br>mode   | Either hysteresis mode, window comparator mode, error output or switch output OFF can be selected. | Hysteresis mode  |
| Reversed output  | Selects which type of switch output is used, normal or reversed.                                   | Normal output  |
| Pressure setting | Sets the ON and OFF point of the switch output.  | 0.5 MPa  |
| Hysteresis       | Appropriate setting of the hysteresis will prevent the switch output from chattering.              | 0.05 MPa   |
| Delay time       | Delay time of the switch output can be selected.   | 1.0 ms or less   |
| Display colour   | Select the display colour.   | Output ON : Green<br>Output OFF: Red<br>(Linked to OUT1) |

# 10 Function Selection mode (continued)

#### 10.2 Other Parameters

| Item  | Description                      | Default                |
|-------|----------------------------------|------------------------|
| [F 3] | Digital filter setting           | 0.0 msec.              |
| [F 4] | Auto-preset function             | Not used               |
| [F 5] |                                  | No configurable items  |
| [F 6] | Fine adjustment of display value | 0.0%                   |
| [F10] | Sub display setting              | Standard               |
| [F11] | Display resolution setting       | 1000-split             |
| [F80] | Power saving mode                | OFF                    |
| [F81] | Security code                    | OFF                    |
| [F82] | Input of line name               | AAAA                   |
| [F90] | Setting of all functions         | OFF                    |
| [F96] |                                  | No configurable        |
| [F97] |                                  | items                  |
| [F98] | Output check                     | N/A<br>(normal output) |
| [F99] | Reset to default settings        | OFF                    |

# 11 Other Settings

- Snap shot function
- Peak / Bottom value indication
- Zero-clear function
- · Key-lock function

Refer to the operation manual on the SMC website (URL: <a href="https://www.smcworld.com">https://www.smcworld.com</a>) for setting these functions.

# 12 Outline Dimensions (mm)

Refer to the operation manual or catalogue on the SMC website (URL: <a href="https://www.smcworld.com">https://www.smcworld.com</a>) for the Outline Dimensions.

# 13 How to Order

Refer to the operation manual or catalogue on the SMC website (URL: https://www.smcworld.com) for How to Order information.

#### 14 Troubleshooting

#### 14.1 Error indication

| Error                         | Display              | Description   | Measures   |
|-------------------------------|----------------------|---|--|
| Over<br>current<br>error      |                      | The switch output load current is 20 mA or more.  | Turn the power off<br>and remove the<br>cause of the over<br>current.<br>Then supply the<br>power again. |
| Residual<br>pressure<br>error | Er 3                 | During zero clear operation, pressure greater than ±7%F.S. (±3.5%F.S. for compound pressure) is present. Note that the mode is returned to measurement mode automatically 1 sec. later. The zero clear range varies by ±1% F.S. due to variation between individual products. | Release the applied pressure to atmospheric pressure, and retry the zero clear operation.                |
|                               | HHH                  | Pressure exceeding<br>the upper limit of the<br>set pressure range is<br>applied.   | Reset applied pressure to a level within the set pressure range. Check the sensor connection and wiring. |
| Pressure<br>error             |                      | Pressure exceeding the lower limit of the set pressure range is applied. Sensor is not connected or wired incorrectly.  |  |
| System<br>error               | Er 0<br>Er 7<br>Er 8 | Displayed if an internal data error has occurred.   | Turn the power off<br>and on again.<br>If the failure cannot<br>be solved, contact<br>SMC.               |

If the error cannot be reset after the above measures are taken, or errors other than above are displayed, please contact SMC.

#### 15 Maintenance

#### 15.1 General Maintenance

# ▲ Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

#### 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 a power cut or de-energizing, but may change depending on the operating environment.

Therefore, check the safety of the whole installation before operating the product. If the installation is using accurate control, wait until the product has warmed up (approximately 10 to 15 minutes).

# 16 Limitations of Use

**16.1 Limited warranty and Disclaimer/Compliance Requirements**Refer to Handling Precautions for SMC Products.

# 17 Product disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose of this product correctly, in order to reduce the impact on human health and the environment.

# 18 Contacts

Refer to <u>www.smcworld.com</u> or <u>www.smc.eu</u> for your local distributor / importer

# **SMC** Corporation

Template DKP50047-F-085O

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