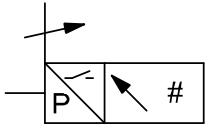




Instruction Manual

Digital Pressure Switch

ZSE20AF-#-#-X576 / X577 / X578 / X579 / X580



The intended use of this digital pressure switch is to measure, monitor and display pressure and to provide an output signal.

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 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: Robots and robotic devices - Safety requirements for industrial robots - Part 1: 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.

	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

- 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.
- Otherwise electric shock, malfunction or product damage can result.
- 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.		ZSE20AF-#-#				
		-X576	-X577	-X578	-X579	-X580
Applicable fluid		Air, non-corrosive and non-flammable gas				
Pressure	Rated pressure range	-500 to 500 Pa	-1.00 to 1.00 kPa	-2.00 to 2.00 kPa	-5.00 to 5.00 kPa	-10.00 to 10.00 kPa
	Display / Set pressure range	-525 to 525 Pa	-1.05 to 1.05 kPa	-2.10 to 2.10 kPa	-5.25 to 5.25 kPa	-10.50 to 10.50 kPa
	Display / Min. setting unit	1 Pa	0.001 kPa	0.01 kPa	0.01 kPa	0.01 kPa
	Proof pressure	2.5 kPa	5 kPa	10 kPa	25 kPa	50 kPa
Electrical	Power supply voltage	12 to 24 VDC (±10%), ripple 10% (p-p) max.				
	Current consumption	35 mA or less				
	Protection	Polarity protection				
Accuracy	Display accuracy	± 2% F.S. ±1 digit (at ambient temperature 25 ±3 °C)				
	Repeatability	± 1% F.S. ±1 digit				
	Temperature characteristics	± 3% F.S. (25 °C standard)				
Switch output	Output type	NPN or PNP open collector output				
	Output mode	Hysteresis mode, window comparator mode, error output, switch output off				
	Switch operation	Normal output, reversed output				
	Maximum load current	80 mA				
	Maximum applied voltage	28 V				
	Internal voltage drop (Residual voltage)	1.0 V or less (Load current 80 mA)				
	Delay time *1	4 ms or less, variable from 0 to 60 s / 0.01 s increments				
	Hysteresis	Hysteresis mode	Variable from 0 *2			
		Window comparator mode				
	Short circuit protection		Provided			
Analogue output	Voltage output *3	Output type (rated pressure range)	Voltage output: 1 to 5 V ±2.5% F.S.			
		Linearity	±1.5% F.S.		±1.0% F.S.	
		Output Impedance	1 kΩ approx.			
	Current output *4	Output type (rated pressure range)	Current output: 4 to 20 mA ±2.5% F.S.			
		Linearity	±1.5% F.S.		±1.0% F.S.	
		Load Impedance	Max. load impedance: 300 Ω (at 12 VDC) 600 Ω (at 24 VDC) Min. load impedance: 50 Ω			
	Analogue response time		20 ms			
External input	Input type	Non-voltage input: 0.4 V or less Current consumption: 5.5 mA or less				
	Input mode	Zero clear *5				
	Input time	30 ms or more				
Display	Units *6	kPa, Pa, mbar, psi, inchHg, mmHg, inchH2O, mmH2O			kPa, mbar, psi, inchHg, mmHg, inchH2O, mmH2O	
	Display type	LCD				
	Number of displays	3-screen display (Main display, sub display x 2)				
	Display colour	Main display: Red/Green Sub display: Orange				
	Number of display digits	Main display: 4 digits (7-segments) Sub display: 4 digits (Upper 1 digit 11-segments, 7-segments for others)				
	Operation light	LED is ON when switch output is ON (OUT1, OUT2: Orange)				
Digital filter *7 *8		Variable between 0 and 30 s / 0.01 s increments				
Environment	Enclosure	IP40				
	Withstand voltage	1000 VAC for 1 minute between terminals and housing				
	Insulation resistance	50 MΩ or more between terminals and housing (with 50 VDC megger)				
	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)				
Length of lead wire with connector		2 m				

2 Specifications (continued)

- *1: Value without digital filter (at 0 ms).
- *2: If the applied pressure fluctuates around the set value, the hysteresis must be set to a value more than the amount of fluctuation or chattering will occur.
- *3: When the analogue voltage output is selected, the analog current output cannot be selected simultaneously.
- *4: When the analogue current output is selected, the analog voltage output cannot be selected simultaneously.
- *5: Zero-clear values on external inputs are not stored in memory.
- *6: This setting is only available for models with the units selection function. Only kPa or Pa is available for models without this function.
- *7: Response time indicates when the set value is 90% in relation to the step input.
- *8: Display, switch output and analogue response time are affected.
- *9: Any products with tiny scratches, smears, or variations in the display colour or brightness, which does not affect the performance of the product, are verified as conforming products.

2.2 Piping / Weight specifications

Port size		M5 x 0.8
Materials in contact with fluid	Pressure-sensing part	Silicon
	Piping port	PBT, CB156, PPS, epoxy resin, O-ring: Silicone rubber
Weight	Body	25 g
	Lead wire with connector	+39 g

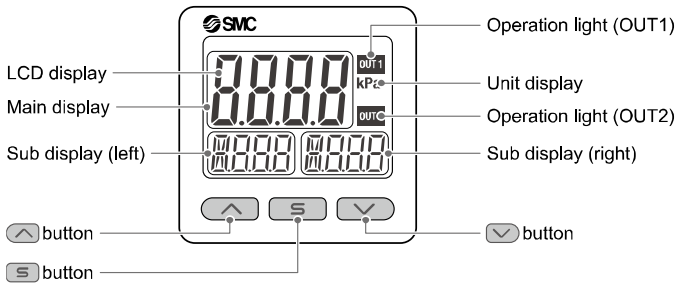
2.3 Cable specifications

Conductor area	0.15 mm ² (AWG26)
Insulator outside diameter	1.0 mm
Colour	Brown, Blue, Black, White, Grey (5 core)
Sheath outside diameter	φ3.5

Warning

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

3 Name and function of parts



- 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 colour of constant red or green; or switching from red to green or green to red corresponding to the output. The indication for the sub display is orange.
- Main display: Displays pressure measurement values and error codes.
- Sub display (left): Displays items.
- Sub display (right): Displays set values, peak and bottom values.
- UP button: Increases the mode and ON/OFF set values.
- DOWN button: Decreases the mode and ON/OFF set values.
- SET button: Press this button to change mode and to confirm settings.
- Units display: Indicates the units currently selected (only for display units of kPa).

4 Installation

4.1 Installation

Warning

Do not install the product unless the safety instructions have been read and understood.

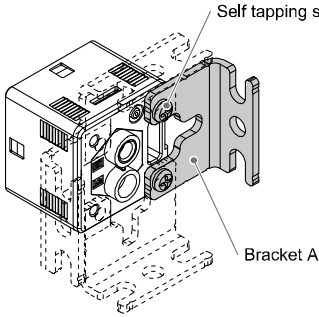
4.1.1 Mounting

- 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 into the atmospheric vent port of the pressure switch (refer to “Tube attachment”).

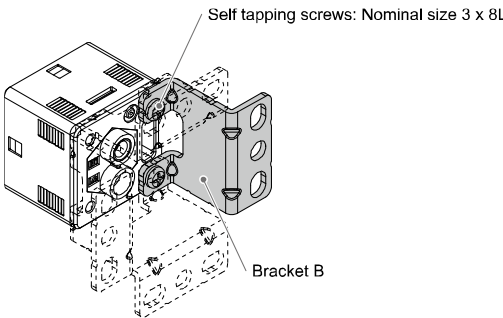
4.1.2 Mounting with bracket

- Mount the bracket to the body with mounting screws (Self tapping screws: Nominal size 3 x 8L (2 pcs.)), then set the body to the specified position.
- *: Tighten the bracket mounting screws to a torque of 0.5 ±0.05 N•m. Self-tapping screws are used and should not be re-used several times.

- Bracket A (Part No.: ZS-46-A1)



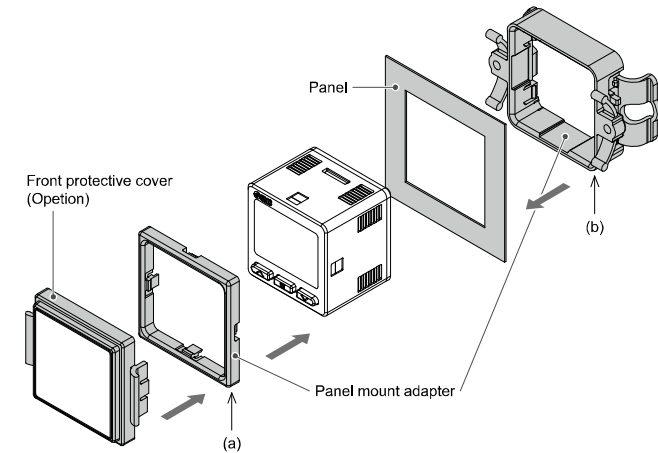
- Bracket B (Part No.: ZS-46-A2)



4.1.3 Mounting with panel mount adapter

- Mount part (a) to the front of the body and fix it. Then insert the body with (a) into the panel until (a) comes into contact with the panel front surface. Next, mount part (b) to the body from the rear and insert it until (b) comes into contact with the panel.

- Panel mount adapter (Part No.: ZS-46-B)
Panel mount adapter + Front protective cover (Part No.: ZS-46-D)

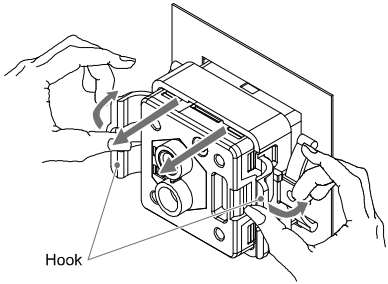


*: The panel mount adapter can be rotated through 90 degrees for mounting.

4 Installation (continued)

Removing the panel mount adapter

- When removing the digital pressure switch with panel mount adapter from the installation, pull it forward while expanding the hooks on each side as shown below.
- If the panel mount adapter is pulled forward with the hook caught, the product and the adapter may be damaged.



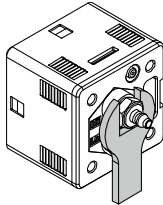
4.2 Piping

Caution

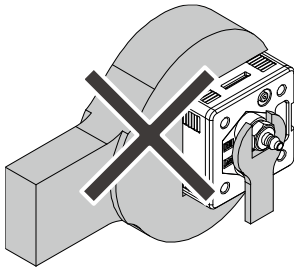
- Before piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

4.2.1 Tightening the connection thread

- For connecting to the body
After hand tightening, apply a spanner of the correct size to the spanner flats of the piping body, and tighten with a 1/6 to 1/4 rotation. As a reference, the tightening torque is 1 to 1.5 N•m. (When replacing the piping adapter ZS-46-N#, tighten it using the same method).



- When tightening, do not hold the pressure switch body with a spanner.



4.3 Environment

Warning

- Do not use in an environment where corrosive gases, 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. Check the product specifications.
- Do not mount in a location exposed to radiant heat.

4.4 Lubrication

Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, use turbine oil Class 1 (no additive), ISO VG32. Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.

5 Wiring

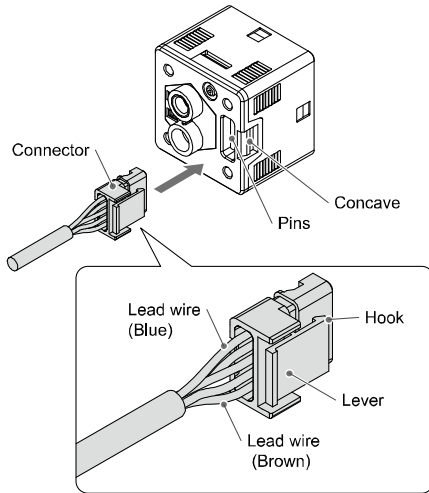
5.1 Wiring connections

- Connections should be made with the power supply turned off.
- 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 a series power supply.

5.2 How to use connector

Connector attachment / detachment

- When connecting the connector, insert it straight onto the pins, holding the lever and connector body, and lock the connector by pushing the lever hook into the concave groove on the housing.
- To detach the connector, remove the hook from the groove by pressing the lever downward, and pull the connector straight out.



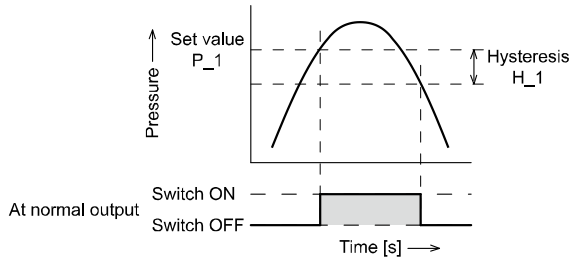
Connector pin numbers

	Pin No.
DC(+)	Brown 5
OUT1(C/Q)	Black 4
NC	White 3
NC	Gray 2
DC(-)	Blue 1

6 Pressure Setting

6.1 Default Pressure setting

When the pressure exceeds the set value, the switch will turn on. When the pressure falls below the set value by the amount of hysteresis or more, the switch will turn off. The default setting is to turn on the pressure switch when the pressure reaches the center of the atmospheric pressure and upper limit of the rated pressure range. If this condition, shown to the below, is acceptable, then keep these settings.



7 Outline of Settings

Power is supplied.

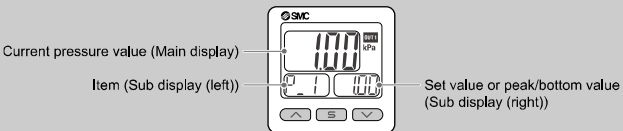
The product code is displayed for approximately 3 seconds after power is supplied.

*: Within approximately 0.2 seconds after power-on, the switch starts.

[Measurement mode]

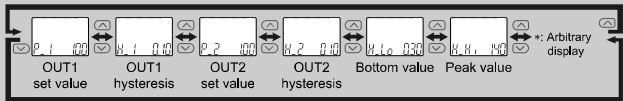
Detects the pressure after power is supplied and indicates the display and switch operating status. This is the basic mode; other modes should be selected for set-point changes and other function settings.

Measurement mode screen



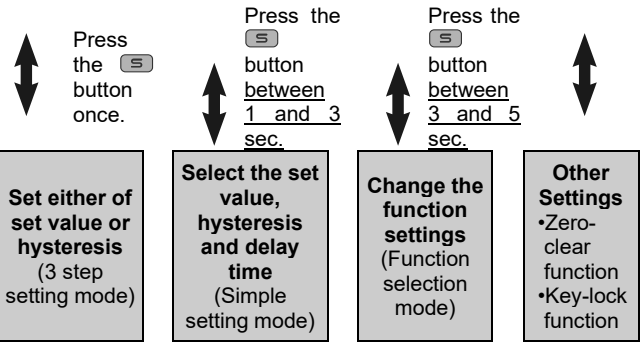
Sub display

In measurement mode, the display of the sub display can be temporarily changed by pressing the or .



*: 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.)



- *: The outputs will continue to operate during setting.
- *: If a button operation is not performed for 3 seconds during the setting, the display will flash.
- (This is to prevent the setting from remaining incomplete if, for instance, an operator were to leave during setting.)
- *: 3 step setting mode, simple setting mode and function selection mode

8 3 step Setting mode

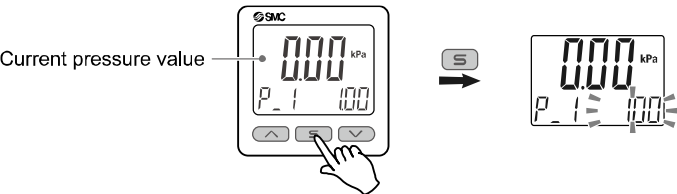
In this mode the set values can be input in just 3 steps.

[3 step setting mode (hysteresis mode)]

In the 3 step setting mode, the set value (P_1 or n_1, P_2 or n_2) and hysteresis (H_1 or H_2) can be changed. Set the items on the sub display (set value or hysteresis) with or button. When changing the set value, follow the operation below. The hysteresis setting can be changed in the same way.

(1) Press the button once when the item to be changed is displayed on the sub display.

The set value on the sub display (right) will start flashing.



(2) Press the or button to change the set value.

8 3 step Setting mode (continued)

The set value can be increased with button and can be reduced with button. When the and 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 or button.

(3) Press the button to complete the setting.

The Pressure switch turns on within a set pressure range (from P1L to P1H) during window comparator mode.

Set P1L, the lower limit of the switch operation, and P1H, the upper limit of the switch operation and WH1 (hysteresis) following the instructions given above. (When reversed output is selected, the sub display (left) shows [n1L] and [n1H].)

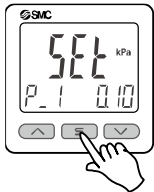
*: Set OUT2 in the same way. (ex. P_2, H_2)

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 or [F 2] Setting of OUT2.

9 Simple Setting mode

[Simple setting mode (hysteresis mode)]

(1) Press and hold the button 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 or button and press the button to set the value. Then, the setting moves to hysteresis setting. (The snap shot function can be used).

(3) Change the set value with or button and press the button to set the value. Then, the setting moves to the delay time of the switch output. (The snap shot function can be used).



(4) The delay time of the switch output can be selected by pressing the or button at the ON and OFF point of the switch output. Delay time setting can prevent the output from chattering. The delay time can be set in the range 0.00 to 60.00 sec. in 0.01 sec. increments.

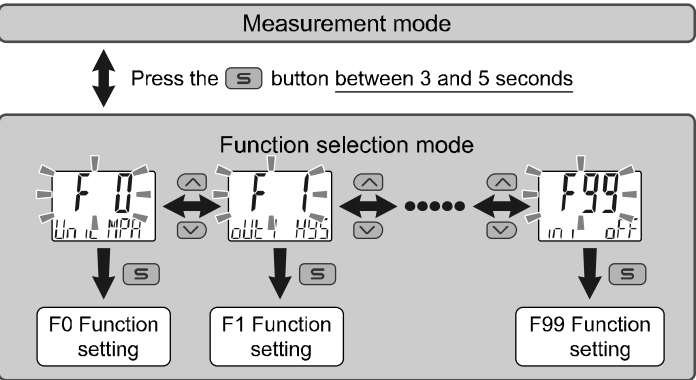
(5) Press the button for 2 seconds or longer to complete the setting. (If the button is pressed for less than 2 seconds, the setting will move to the OUT2 setting).

In the window comparator mode, set P1L, the lower limit of the switch operation, and P1H, the upper limit of the switch operation, WH1 (hysteresis) and dt1 (delay time) following the instructions above. (When reversed output is selected, the sub display (left) shows [n1L] and [n1H]).

*: Set OUT2 in the same way.

10 Function Selection mode

In measurement mode, press the  button between 3 and 5 seconds, to display [F 0]. Select to display the function to be changed [F##]. Press and hold the  button for 2 seconds or longer in function selection mode to return to measurement mode.



*: Some products do not have all the functions. If no function is available or selected due to configuration of other functions, [- - -] is displayed on the sub display (right).

10.1 Default Function settings

The default setting is as follows.
If no problem is caused by this setting, keep these settings.

- [F 0] Units selection function.

Model number	Default setting
X576	Pa
X577	kPa
X578	
X579	
X580	

- [F 1] Setting of OUT1

Item	Default setting
Output mode	Hysteresis mode
Reversed output	Normal output
Pressure setting	X576: 250 Pa X577: 0.500 kPa X578: 1.00 kPa X579: 2.50 kPa X580: 5.00 kPa
Hysteresis	X576: 25 Pa X577: 0.050 kPa X578: 0.10 kPa X579: 0.25 kPa X580: 0.50 kPa
Delay time	4 msec or less
Display colour	OUT1 ON: Green / OUT1 OFF: Red

- [F 2] Setting of OUT2 is the same setting as [F 1] OUT1.

- Other parameter settings

Item	Default setting
[F 3] Digital filter setting	0 ms
[F 4] Auto-preset function	Not used
[F 5] FUNC terminal setting	External zero clear
[F 6] Fine adjustment of display value	0%
[F10] Sub display setting	std (Standard)
[F11] Display resolution setting	1000-split
[F14] Zero cut-off setting	0.0%
[F80] Power saving mode	OFF
[F81] Security code	OFF
[F90] Setting of all functions	OFF
[F96] Input signal check	-
[F97] Selection of copy check	OFF
[F98] Output check	N/A (normal output)
[F99] Reset to default settings	OFF

11 Other Settings

- **Snap shot function**
The current pressure value can be stored to the switch output ON/OFF set point.
- **Peak/bottom value indication**
The maximum (minimum) pressure from when the power is supplied is detected and updated.
- **Zero clear function**
The displayed value can be adjusted to zero if the measured pressure is within $\pm 3.5\%$ F.S. of the zero point set at the time of default settings.
- **Key-lock function**
The key-lock function is used to prevent errors occurring due to unintentional changes of the set values.

For further details refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>).

12 How to Order


Refer to the operation manual on the SMC website (URL: <https://www.smcworld.com>) for How to order information.

13 Outline Dimensions

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

14 Maintenance


14.1 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 a 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).

15 Limitations of Use

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

-  **Caution**
- **SMC products are not intended for use as instruments for legal metrology.**
Measurement instruments manufactured or sold by SMC have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.
Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

16 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.

17 Contacts

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

SMC Corporation

URL: <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan
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