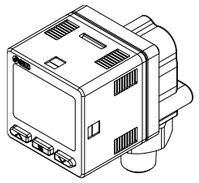
ORIGINAL INSTRUCTIONS

Instruction Manual

Condensation Checker (Digital Temperature and Humidity Switch)

PSH series



IO-Link

The intended use of the condensation checker is to monitor and display temperature and relative humidity values and 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 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: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.

- Refer to the product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

⚠ **Danger**	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ **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.

⚠ 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.
- Refer to the operation manual on the SMC website (URL: https://www.smcworld.com) for more Safety instructions.

2 Specifications

2.1 General specifications

Model			PSH
Applicable fluid			Air, Non-corrosive gas JISB8392-1 1.1.2 to 1.6.2 ISO8573-1 1.1.2 to 1.6.2
Temperature	Rated temperature range		0 to 50°C
	Display and set temperature range		-5 to 55°C
	Display and smallest settable increment		0.1°C
Relative Humidity	Display and set relative humidity range		0 to 100% R.H. (No condensation)
	Display and smallest settable increment		0.1% R.H.
Pressure	Rated pressure range *1		0.3 to 1 MPa
	Operating pressure range		0.1 to 1 MPa
Flow rate consumption			5 L/min (Pressure: 1 MPa)
Power supply	Power supply voltage		18 to 30 VDC (Including ripple)
	Current consumption		35 mA or less
	Protection		Polarity protection
Accuracy *2	Temperature	Display accuracy	±3°C ±1 digit
		Analogue output accuracy *3	±3.5°C
	Relative Humidity	Display accuracy	±5% R.H. ±1 digit
		Analogue output accuracy *3	±5.5% R.H.
Switch output	Output type		Select from NPN / PNP open collector output
	Output mode		Hysteresis mode, window comparator mode, error output, output off mode
	Switch operation		Normal or reversed output
	Maximum Load current		10 mA
	Maximum applied voltage (NPN only)		30 V
	Internal voltage drop (Residual voltage)		1.5 V or less (At 10 mA load current)
	Hysteresis	Hysteresis mode	Variable from 0
		Window comparator mode	
	Short circuit protection		Provided
Analogue Output type			1-5 V *4
Analogue Output impedance			Approx. 1 kΩ
Digital filter *5			0.0 to 60.00 s (0.01 increments)
Display	Units		°C, °F, %R.H.
	Display method		LCD
	Number of displays		3 (Main display, sub display × 2)
	Display colour		1) Main display: White / Red 2) Sub display: Orange
	Displayed digits		1) Main display: 3 1/2-digit 7-segment 2) Sub display: 4-digit 7-segment
	Operation LED		LED on when switch output is ON OUT1, OUT2: Orange
Environmental	Enclosure protection		IP65 (IEC60529)
	Withstand voltage		1000 VAC for 1 minute between terminals and housing
	Insulation resistance		50 MΩ or more between terminals and housing (with 500 VDC megger)
	Ambient temperature range		Operation: 0 to 50°C, Storage: -10 to 60°C (no condensation or freezing)
	Ambient humidity range *6		Operation, storage: 35 to 85% R.H. (no condensation)

2 Specifications (continued)

Model	PSH
Length of lead wire with connector	2 m

∗1: This is the accuracy relative to atmospheric pressure and relative humidity when used within the rated pressure range.
∗2: This is the overall accuracy, including the effects of factors such as temperature and repetition.
∗3: For products with analogue output, select relative humidity / temperature according to the setting.
∗4: 1-5 V in relative humidity 0 to 100% R.H., 1-5 V in temperature 0 to 50°C.
∗5: Time for 90% response to step input in internal sensor signals.
∗6: Do not store in closed conditions without air exchange conditions.
∗7: If the piping contains gases such as oil mist or organic solvents, it may not meet the specified accuracy or may cause malfunction.

2.2 Piping and Weight specifications

Model		PSH
Port size		R1/8
Main materials in contact with fluid	Sensor unit	Silicon, etc.
	Piping port	SUS303, CAC403, C3604 (Electroless nickel plating), ZDC2 (Nickel plating), glass cloth epoxy resin, O-ring: EPDM, FKM
Weight	Product body	103 g
	Lead wire with connector	39 g

2.3 Cable specifications

Conductor cross sectional area		0.15 mm² (AWG26)
Insulator	Outside diameter	1.0 mm
	Wire colours	Brown, blue, black, white, grey (5 cores)
Sheath	Wire O.D.	φ3.5

2.4 Communication specifications

IO-Link type	Device
IO-Link version	V1.1
Communication speed	COM2(38.4 kbps)
Configuration (IODD) file	SMC-PSH-L2-yyyymmdd-IODD1.1 *1 (for model PSH-L2(-M)-∗)
Minimum cycle time	3.8 ms
Process data length	Input Data: 6 bytes, Output Data: 0 bytes
On-request data communication	Supported
Data storage function	Supported
Event function	Supported
Vendor ID	131 (0x0083)
Device ID	PSH-L2(-M)-∗: 650 (0x00028A)

∗1: The IODD includes the main IODD file and a set of image files such as the vendor logo, device picture, and device icon.
The IODD configuration file can be downloaded from the SMC website. (https://www.smcworld.com)

⚠ Warning

- Special products (-X) might have specifications which are different to those shown in the specifications section. Contact SMC for specific drawings.

3 Names of Individual parts

Part	Description
Indicator LED	Displays the switch operating condition.
Main display	Displays relative humidity measurement value, temperature measurement value, error code, etc. (2-colour display).
Sub display (left)	Displays a value item (Orange).
Sub display (right)	Displays relative humidity measurement value, temperature measurement value, setting value, and peak/bottom value (Orange).
UP button	Increases the mode and ON/OFF set values.
SET button	Changes the mode and confirms the settings.
DOWN button	Decreases the mode and ON/OFF set values.
IO-Link Indicator LED	Displays OUT1 output communication status (SIO mode, start-up mode, Pre-operation mode, operation mode) and the presence of communication data.

4 Installation

4.1 Installation

⚠ Warning

- Do not install the product unless the safety instructions have been read and understood.
- Use the product within the specified rated pressure and temperature range.
- Note that there are restrictions on installation direction and operating environment.
- Do not block the exhaust port.
- Mount the product using the optional bracket or the panel mount adapter.
- When installing at a location exposed to water or dust, insert a tube (purchased separately) in the exhaust port and extend it to a safe location not exposed to water or dust. Refer to the operation manual for further details.

4.2 Environment

⚠ Warning

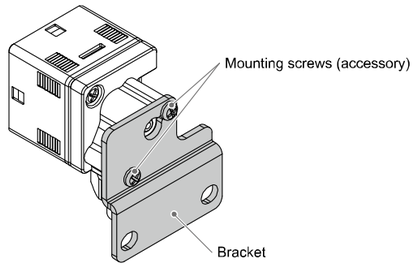
- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product’s specifications.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

4.3 Mounting with Bracket

- Mount the bracket to the product using mounting screws M3 x 6L (2 pcs).
  ∗ Tighten the bracket mounting screws to a torque of 0.5 ±0.05 N•m.

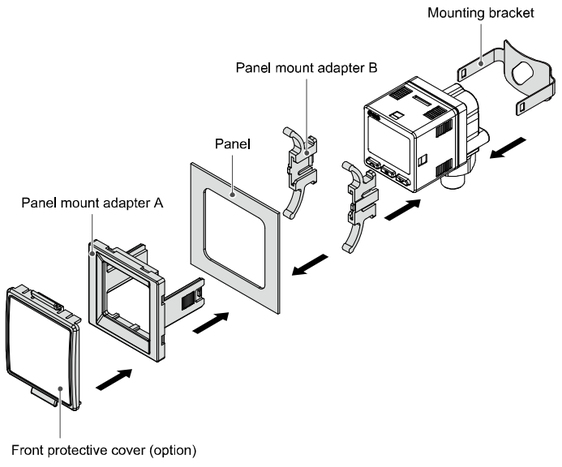
4 Installation (continued)

Mounting Bracket (Part No. ZS-55-A)



4.4 Mounting with Panel mount adapter

- Mount part A to the front of the product and fix it. Then insert the product with A into the panel until it is in contact with the panel front surface.
- Next, mount part B to the product from the rear and insert it until it is in contact with the panel for fixing.
- Panel mount adapter (Part No.: ZS-55-B)
- Panel mount adapter + Front protective cover (Part No.: ZS-55-D)

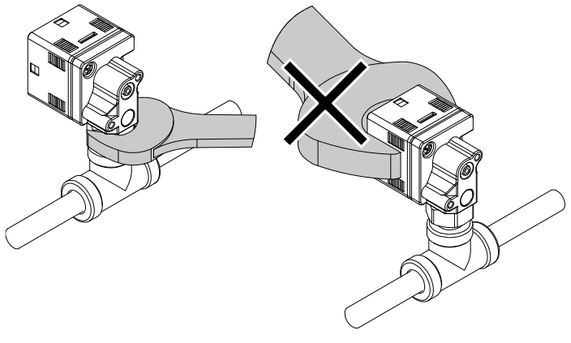


5 Piping

5.1 Tightening the connection thread

For connecting to the product

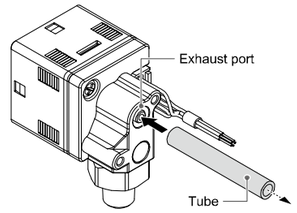
- For piping, use a piping material suitable for the piping port.
- After hand tightening, apply a spanner of the correct size to the spanner flats of the body, and tighten by rotating 2 to 3 turns.
- As a reference, the recommended tightening torque is 3 to 5 N•m.
- When using the M5 female thread, check the specifications of the pipe fitting.
- When tightening do not hold the product body with a spanner.



5 Piping (continued)

5.2 Attaching tube to the exhaust port

- When the exhaust port of the switch could get clogged by water or dust, insert a tube (sold separately) in the exhaust port to the bottom and extend the other end to a secure location where it is not exposed to water or dust.
- Check that the exhaust port is always set to an atmospheric release condition.
- Check that the tube is inserted to the bottom of the exhaust port.
- For the tube, use TU0604 (polyurethane material, outside diameter Φ6, inside diameter Φ4) from SMC.



Extend to a secure location not exposed to water or dust.

6 Wiring

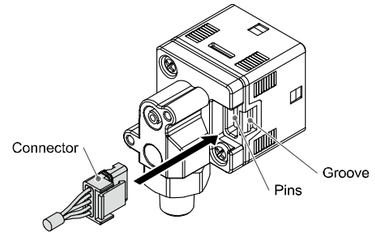
6.1 Wiring

⚠ Caution

- **Do not perform wiring while the power is on.**
- **Confirm proper insulation of wiring.**
- **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, 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.

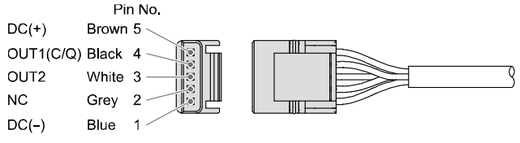
Connection attachment / detachment

- 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.

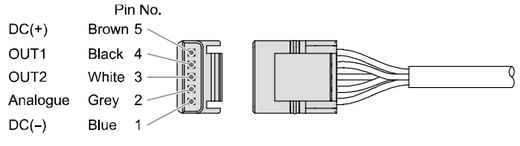


6.2 Connector pin layout

- Output specification: For model PSH-L2 (IO-Link + 1 output)



- Output specification: For model PSH-RT (2 output + Analogue voltage output)



7 Outline of Settings

Power is supplied

The product code is displayed for approximately 3 seconds and the switch operation starts within approximately 0.3 seconds after power is supplied.

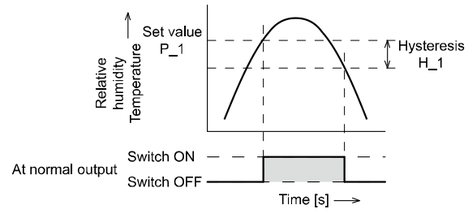
[Measurement mode]
Detects the relative humidity and temperature and indicates the display and switch operation status.
This is the basic operation mode. From this mode, move to other modes for setting changes and other function settings.

Press SET button once	Press SET button for 1-3 sec.	Press SET button for 3-5 sec.	
[3-step setting mode]	**[Simple setting mode]**	**[Function selection mode]**	**Other Settings**

- The outputs will continue to operate during setting.
- If a button operation is not performed for 3 seconds during 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 settings are reflected in each other.

8 Setting Relative Humidity and Temperature

- **Default setting**
  When the relative humidity and temperature exceed the set value, the switch will turn on.
  When the relative humidity and temperature fall below the set value by the amount of hysteresis or more, the switch will turn off.



Item	Default settings
OUT1 output operating mode	Relative humidity
[h.P_1] OUT1 setting value	5.0% R.H.
[h.H_1] OUT1 hysteresis	1.0% R.H.

Item	Default settings
OUT2 output operating mode	Temperature
[t.P_2] OUT2 setting value	25°C
[t.H_2] OUT2 hysteresis	5°C

9 3-step Setting mode

In this mode, the set values can be input in just 3 steps.
Use this mode if the product is to be used straight away, after changing only the set values. (The current relative humidity or temperature value is displayed on the main display).

3-step setting mode is not available from the display when displaying the measurement value.
(When using the 3-step setting mode, select each set value to be displayed by pressing the UP or DOWN button).

9.1 Operation

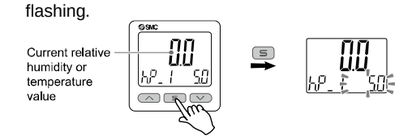
In 3-step setting mode, the relative humidity or temperature set value (h.P_1 (t.P_1) or h.n_1 (t.n_1), h.P_2 (t.P_2) or h.n_2 (t.n_2)) and hysteresis (h.H_1 (t.H_1) or h.H_2 (t.H_2)) can be changed.
Set the items on the sub display (set value or hysteresis) with the UP or DOWN buttons in advance.

9 3-step Setting mode (continued)

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

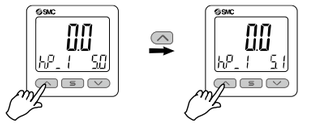
(1) Press the SET button once when the item to be changed is displayed on the sub display. The set value on the sub display (right) will start flashing.

Current relative humidity or temperature value

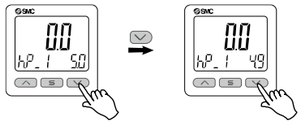


(2) Press the UP or DOWN button to change the set value.
The UP button is to increase and the DOWN button is to decrease.

- Press the UP button once to increase by one digit, or press and hold to continuously increase.



- Press the DOWN button once to decrease by one digit, or press and hold to continuously decrease.



(3) Press the SET button to finish the setting.

- In window comparator mode, the switch operates within the relative humidity or temperature setting range (between h.P1L or t.P1L and h.P1H or t.P1H).
  Set h.P1L or t.P1L (lower limit of the switch operation point), h.P1H or t.P1H (upper limit of the switch operation point), or h.H1 or t.H1 (hysteresis).

10 Simple Setting mode

In the simple setting mode, the set value and hysteresis can be changed while viewing the current relative humidity or temperature value on the main display.

(1) Press and hold the SET button <u>between 1 and 3 seconds</u> in measurement mode. [SEt] is displayed on the main display.

When the button is released while in the [SEt] display, the current measurement value is displayed on the main display, [h.P_1 or t.P_1] or [h.n_1 or t.n_1] is displayed on the sub display (left), and the set value (flashing) is displayed on the sub display (right).

(2) Change the set value using the UP or DOWN button and press the SET button to set the value. The setting moves to hysteresis setting.

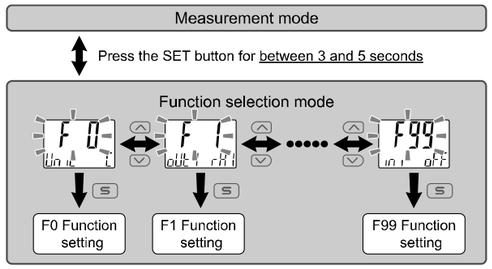
Current relative humidity or temperature alue

(3) Change the set value using the UP or DOWN button and press the SET button to set the value.

(4) Press the SET button for <u>2 seconds or more</u> to complete the setting. If the button is pressed for <u>less than 2 seconds</u>, the setting will return to the setting of OUT2.

11 Function Selection mode

In measurement mode, press the SET button 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 in function selection mode to return to measurement mode.



∗: Some functions are not supported on models with specific product numbers. [---] will be displayed on the sub display (right) for functions that are not supported or cannot be selected due to other settings.

11.1 Default function settings

The default settings are as follows. If these settings are acceptable, use them without changing the setting. To change the setting, enter function selection mode.

- [F 0] System setting

Item	Description	Default setting
Display units	When the units specification is "Nil," select either Celsius: °C or Fahrenheit: °F.	°C
Switch output	Either PNP or NPN can be selected.	PnP
IO-Link	When the output specification is "LS," Select enable or disable of IO-Link.	ON (Enabled)

- Setting of [F 1] OUT1

Item	Description	Default setting
Output operating mode	Select relative humidity, temperature, error output, or output OFF.	Relative humidity
Output mode	Select hysteresis mode or window comparator mode.	Hysteresis mode
Reversed output	Select normal or reversed output.	Normal
Relative humidity / temperature	Set the ON and OFF point of the switch output.	5.0% R.H.
Hysteresis	Setting the hysteresis will prevent the switch output from chattering.	1.0% R.H.
Display colour	Select the display colour linked to the output.	OUT1 ON: Red OUT1 OFF: White

- Setting of [F 2] OUT2

Item	Description	Default setting
Output operating mode	Select relative humidity, temperature, error output, or output OFF.	Temperature
Output mode	Select hysteresis mode or window comparator mode.	Hysteresis mode
Reversed output	Select normal or reversed output.	Normal
Relative humidity / temperature	Set the ON and OFF point of the switch output.	25°C
Hysteresis	Setting the hysteresis will prevent the switch output from chattering.	5°C
Display colour	Select the display colour linked to the output.	OUT1 ON: Red OUT1 OFF: White

11 Function Selection mode (continued)

- Other parameter settings

Item	Default setting
[F 3] Digital filter	0.00 s
[F 6] Display value fine adjustment setting	0%
[F10] Display	Main display: Relative humidity Sub display: std (Standard)
[F11] Display resolution	1,000-division (Relative humidity) 500-division (Temperature)
[F22] Analogue output	Relative humidity
[F50] Relative humidity OUT1	∗
[F51] Relative humidity OUT2	∗
[F52] Temperature OUT1	∗
[F53] Temperature OUT2	∗
[F80] Display off mode	Display ON
[F81] Security code input	OFF
[F90] Setting of all functions	OFF
[F96] Cycle time check	∗
[F98] Output check	N/A (Normal output)
[F99] Reset to default settings	OFF

∗: These parameters can only be used with IO-Link communication.

12 Other Settings

- **Peak / Bottom value display function**
- **Key-lock function**

Refer to the operation manual on the SMC website (URL: https://www.smcworld.com) for setting these functions.

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 Outline Dimensions (mm)

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

15 Troubleshooting

15.1 Error indication

Error	Error display	Description	Measures
Over current error	Er1 oC1	The load current applied to the switch output has exceeded the maximum value.	Turn the power off and remove the cause of the over current. Then supply the power again.
	Er2 oC2		
Temperature error	HHH	The upper temperature range limit has been exceeded.	Reset the applied temperature to a level within the set temperature range.
	LLL	The lower temperature range limit has been exceeded.	
System error	Er0	Displayed if an internal data error has occurred.	Turn the power off and on again. If the product cannot be reset, contact SMC for further investigation.
	Er4		
	Er6		
	Er7		
	Er8		
	Er9		
	E40		
	E70		
	E71		
Version does not match	Er5 ucn	The IO-Link version does not match with the master. Mismatch because the master version is 1.0.	Match the master IO-Link version to the device.

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

Refer to the operation manual on the SMC website (URL: https://www.smcworld.com) for more detailed Troubleshooting information.

16 Maintenance

16.1 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.
- Do not use organic solvents such as benzine, thinner or ethanol to clean the switch.

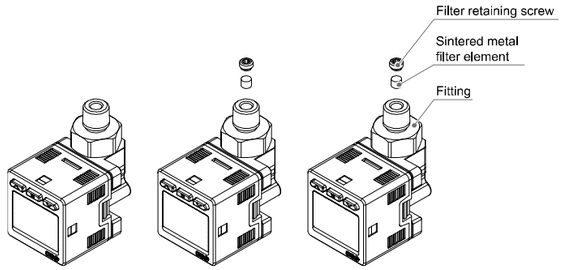
16 Maintenance (continued)

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

- The settings of the product before power loss are retained in the product memory.
  The output condition is also recoverable to that prior to the power loss. However, this may change depending on the operating environment. Therefore, check the safety of the whole system before operating the product.
- Air should be run and warm-up (at least 15 minutes) before use.

16.3 Maintenance of sintered metal filter element

● When the sintered metal filter element has been clogged by foreign matter, etc., remove the hexagon retaining screw and replace the sintered metal filter element.
∗: Pay attention not to scratch the fixed orifice of the fitting when removing the filter.
∗: When assembling, insert the sintered metal filter element and hexagon holding screw and tighten with a tightening torque of 0.45 to 0.55 N•m.
∗: Do not use the product without the sintered metal filter element.



17 Limitations of Use

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

18 Product disposal

This product should 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.

19 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.smceu.com (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan

Template DKP50047-F-085N