

ORIGINAL INSTRUCTIONS

Instruction Manual

Condensation Checker (Digital Temperature and Humidity Switch)

PSH series

OIO-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: 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.

A Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
M Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
A 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: <u>https://www.smcworld.com</u>) for more Safety instructions.

2 Specifications

2.1 General specifications

	Jenier	ai specifications			
Mode	el		PSH		
Appli	pplicable fluid		Air, Non-corrosive gas JISB8392-1 1.1.2 to 1.6.2 ISO8573-1 1.1.2 to 1.6.2		
Rated temperature			0 to 50°C		
Temperature	Display and set temperature range		-5 to 55°C		
Tem	Display and smallest		0.1°C		
	settable increment Display and set				
Relative Humidity	relative humidity range		0 to 100% R.H. (No condensation)		
Rel		lay and smallest ble increment	0.1% R.H. *1		
e		d pressure	0.3 to 1 MPa		
Pressure	Oper	rating pressure	0.1 to 1 MPa		
Pr		llest settable ment	0.001 MPa		
Flow	rate c	consumption	5 L/min (Pressure: 1 MPa)		
L N	Pow	er supply voltage	18 to 30 VDC (Including ripple)		
Power supply	Curre	ent consumption	35 mA or less		
цю		ection	Polarity protection		
	ature	Display accuracy	±3°C ±1 digit		
Accuracy *3	Temperature	Analogue output accuracy *4	±3.5°C		
Accur	ive ity *2	Display accuracy	±5% R.H. ±1 digit		
`	Relative Humidity *2	Analogue output accuracy *4	±5.5% R.H.		
	Output type		Select from NPN / PNP open collector output		
	Output mode		Hysteresis mode, window comparator mode, error output, output off mode		
	Swite	ch operation	Normal or reversed output		
		mum Load	10 mA		
utput	Current Maximum applied		30 V		
witch output	voltage (NPN only) Internal voltage drop (Residual voltage)		1.5 V or less (At 10 mA load current)		
Sw	Hysteresis	Hysteresis mode Window comparator mode	Variable from 0		
	Short circuit protection		Provided		
		Output type	1-5 V *5		
Analo	ogue C al filte	Dutput impedance r * ⁶	Approx. 1 kΩ 0.0 to 60.00 s (0.01 increments)		
Digita	Units		°C, °F, %R.H.		
	Display method		LCD		
ay	Number of displays		3 (Main display, sub display × 2) 1) Main display: White / Red		
Display	Display colour		2) Sub display: Orange 1) Main display: 3 1/2-digit 7-segment		
	Displayed digits		2) Sub display: 4-digit 7-segment LED on when switch output is ON		
	Operation LED Enclosure protection		OUT1, OUT2: Orange IP65 (IEC60529)		
tal	Withstand voltage		1000 VAC for 1 minute between		
Environmental	Insulation resistance		terminals and housing 50 MΩ or more between terminals and housing (with 500 VDC megger)		
:nviro	Ambient temperature range		Operation: 0 to 50°C, Storage: -10 to 60°C (no condensation or freezing)		
Ш	Ambient humidity range *7		Operation, storage: 35 to 85% R.H. (no condensation)		
Stor			UL/CSA (E508758), CE/UKCA marked		
Stan	dards		(EMC directive, RoHS directive)		

2 Specifications (continued)

Model	PSH
Lead wire with connector	Length: 2 m

*1: In relative humidity under pressure mode: 1% R.H.

- *2: This is the accuracy relative to atmospheric pressure and relative humidity when used within the rated pressure range. The relative humidity in the relative humidity under pressure mode is an arithmetic value and includes errors in the operating pressure and barometric pressure.
- *3: This is the overall accuracy, including the effects of factors such as temperature and repetition.
- *4: For products with analogue output, select relative humidity / temperature according to the setting.
- *5: 1-5 V in relative humidity 0 to 100% R.H., 1-5 V in temperature 0 to 50°C.
- *6: Time for 90% response to step input in internal sensor signals.
- *7: Do not store in closed conditions without air exchange conditions
- *8: 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 Sensor unit		Silicon, etc.
materials in contact with fluid	Piping port	SUS303, CAC403, C3604 (Electroless nickel plating), ZDC2 (Nickel plating), glass cloth epoxy resin, O-ring: EPDM, FKM
	Product body	103 g
Weight	Lead wire with connector	39 g (ZS-46-5F) 40 g (ZS-46-5F-X525 / -X526)

2.3 Cable specifications

Conductor cross sectional area		0.15 mm ² (AWG26)
	Outside diameter	1.0 mm
Insulator	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)			
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)-*: 728 (0x002D8) PSH-LL(-M)-*: 729 (0x002D9)			

• The IODD includes the main IODD file and a set of image files such as the vendor logo, device picture, and device icon.

IODD Configuration File

	Model number	IODD file
1	PSH-L2(-M)-*	SMC-PSH-L2-yyyymmdd-IODD1.1
2 PSH-LL(-M)-*		SMC-PSH-LL-yyyymmdd-IODD1.1

The IODD configuration file can be downloaded from the SMC website (<u>https://www.smcworld.com</u>).

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

IO-Link indicator LED —
Main display ———
Sub display (left) ———
UP button



Indicator LED (OUT1) Unit of temperature Unit of relative humidity Indicator LED (OUT2) Sub display (right)

DOWN button

SET button

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.
- The Condensation Checker should be used at an altitude of 3,000 m or less.
- Use the product only in an environment below Pollution Degree 3.

4 Installation (continued)

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



Mounting screws (accessory) Screws for bracket mounting should be supplied by the user. Recommended size: M5 Recommended tightening torque: 2.7 to 3.3 N•m.

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).



Front protective cover (option)

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 fittina
- 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 Φ 4) from SMC.



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.
- · Power must be supplied from a circuit that is reinforced or doubleinsulated from the mains supply.
- The direct current power supply used should be UL approved according to UL1310 Class 2 power supply unit or UL61010-1 LIM (Limited Energy Circuit).
- Any external circuits should also be connected to a circuit that is reinforced or double-insulated from the mains supply and free from risk of electric shock and fire hazard.

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 PSH-L2 / -LL (IO-Link + 1 output)





• Output specification: For PSH-RT / -RR (2 output + Analogue voltage output).



7 Outline of 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.

Relative humidity is linked to the display value selected from atomospheric pressure and under pressure.



Output specification: L2 / RT (Atmospheric pressure relative humidity)

Item	Default settings	Item	Default settings
OUT1 output operating mode	Relative humidity	OUT2 output operating mode	Temperature
[h.P_1] OUT1 setting value	5.0% R.H.	[t.P_2] OUT2 setting value	25.0°C
[h.H_1] OUT1 hysteresis	1.0% R.H.	[t.H_2] OUT2 hysteresis	5.0°C





8 Setting Relative Humidity and Temp. (continued)

Output specification: LL / RR (Relative humidity under pressure)

• •	•		•	• •
Item	Default settings		Item	Default settings
OUT1 output operating mode	Relative humidity		OUT2 output operating mode	Temperature
[h.P_1] OUT1 setting value	50% R.H.		[t.P_2] OUT2 setting value	25.0°C
[h.H_1] OUT1 hysteresis	5% R.H.		[t.H_2] OUT2 hysteresis	5.0°C

9 3-step Setting mode

In this mode, the set values, hysteresis and operating pressure 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, hysteresis or operating pressure. (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, hysteresis or operating pressure to be displayed by pressing the UP or DOWN button).

*: The operating pressure is only valid when the relative humidity under pressure mode is ON.

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)), hysteresis (h.H_1 (t.H_1) or h.H_2 (t.H_2)) and operating pressure (PrES) can be changed.

Set the items on the sub display (set value, hysteresis or operating pressure) with the UP or DOWN buttons in advance.

When changing the set value, follow the operation below. The hysteresis and operating pressure 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.

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(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).

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10 Simple Setting mode

In the simple setting mode, the set value, hysteresis and operating pressure 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, $[h.P_1 \text{ or } t.P_1]$ or $[h.n_1 \text{ or } t.n_1]$ 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. Then, the settings shift in the order of hysteresis and operating pressure.



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



(4) Press and hold 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 <u>between 3 and 5 seconds</u>, to display [F 0]. Select to display the function to be changed [F##].

Press and hold the SET button for <u>2 seconds or longer</u> 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	IO-Link When the output specification is "LS," Select enable or disable of IO-Link.	
Relative humidity under pressure	Display of Relative humidity under pressure can be selected.	L2/RT: OFF LL/RR: ON
Operating pressure	The operating pressure can be set (if the relative humidity under pressure display is enabled).	0.300 MPa (for LL/RR)

11 Function Selection mode (continued)

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.	L2/RT: 5.0% R.H. LL/RR: 50% R.H.	
Hysteresis	Setting the hysteresis will prevent the switch output from chattering.	L2/RT: 1.0% R.H. LL/RR: 5% 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.	25.0°C
Hysteresis	Setting the hysteresis will prevent the switch output from chattering.	
Display colour	Select the display colour linked to the output.	OUT1 ON: Red OUT1 OFF: White

Other parameter settings

Item	Default setting	
[F 3] Digital filter	0.00 s	
[F 6] Display value fine adjustment setting	0.0%	
[F10] Display	Main display: Relative humidity Sub display: std (Standard)	
[F11] Display resolution	1,000-division (Atmospheric pressure 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: <u>https://www.smcworld.com</u>) for setting these functions.

13 How to Order

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

14 Outline Dimensions (mm)

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

15 Troubleshooting

15.1 Error indication

15.1 Error indication						
Error	Error display	Description	Measures			
Over current error	Er _{o[}] Er 2 _{o[2}	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.			
Temperature error	XXX	The upper temperature range limit has been exceeded.	Reset the applied temperature to a level within the set temperature range.			
		The lower temperature range limit has been exceeded.				
System error		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.			
Version does not match	[r] u	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: <u>https://www.smcworld.com</u>) 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.

16 Maintenance (continued)

- 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. Use a soft cloth dampened with water to remove heavy stains.

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

SMC Corporation

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