USER MANUAL

HUMIDITY SENSOR

PCE-P18L

ENGLISH



User manuals in various languages (français, italiano, español, português, nederlands, türk, polski) can be found via our product search on:
www.pce-instruments.com

INTRODUCTION

The PCE-P18L temperature transducer has been developed and designed for the continuous monitoring of temperature or humidity. The compact dimensions of the temperature transducer are a key feature of this device. Temperature and humidity are measured using a semiconductor component. Internally, the measured physical quantities are converted into a standard 4–20 mA signal. The instrument is powered by a DC voltage in a current loop and is therefore ideally suited for displays with transmitter power supply. However, it can also be connected to a chart recorder for continuous monitoring of ambient conditions. The temperature transducer is mounted on the wall using two screws and is ready for immediate use.

Scope of delivery

» Temperature transducer PCE-P18L

» Operating instructions

SAFETY

Please read the operating instructions carefully before using the device. We accept no liability for damage caused by failure to follow the instructions in the operating manual.

Warning symbols



Warning notices

» This measuring instrument must only be used in the manner described in this user manual. If the measuring instrument is used for any other purpose, it may pose a risk to the operator and result in damage to the instrument.

» Do not expose the device to extreme temperatures, direct sunlight, extreme humidity or moisture.

» No technical modifications may be made to the device.

» The device should only be cleaned with a damp cloth. Do not use abrasive cleaners or cleaning agents containing solvents.

» The device may only be used with accessories supplied by PCE Germany or equivalent replacements.

» Before each use of this measuring instrument, please check the housing and the measuring leads for visible damage. If any visible damage is found, the instrument must not be used.

» Furthermore, this measuring instrument must not be used if the ambient conditions (temperature, humidity, etc.) are not within the limits specified in the technical specifications.

» Before each use, please check the measuring instrument by measuring a known value.

» The limit values for the measured quantities specified in the technical data must not be exceeded under any circumstances.

» Failure to observe the safety instructions may result in damage to the instrument and injury to the operator.

If you have any questions, please contact PCE Deutschland GmbH.

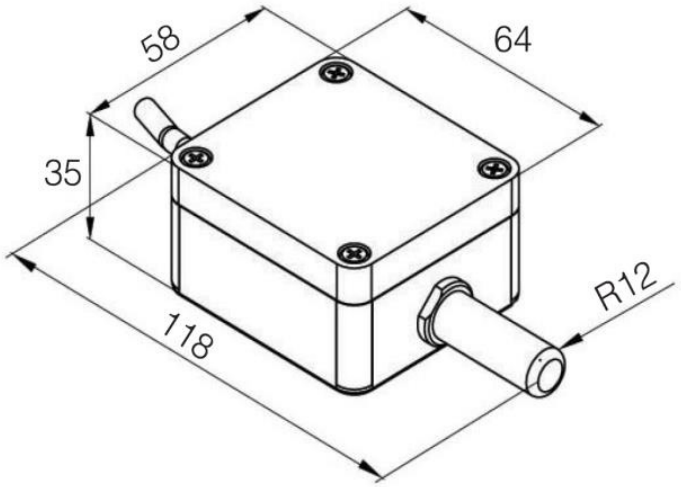
SPECIFICATIONS

Technical specifications for the PCE-P18L humidity sensor Humidity	
Measuring range	0 ... 100 % r.F
Accuracy	± 2% (in the range 10–90% RH) ± 3% (remaining range)
Hysteresis	± 1 % r.F
Temperature	
Measuring range	-20 ... 60 °C
Accuracy	± 0,5 % within the measurement range
Temperature effect	± 25 % / 10 °C
Humidity sensor output	
Current	4 ... 20 mA
Rmax at the output	≤ 500 Ω
General Technical Specifications: Humidity Sensors	
Supply voltage	19 V ... 30 V DC
Power	< 1.5 W
Output adjustment	via DIP switches
Ambient temperature	- 30 °C ... 85 °C
Max. humidity	≤ 95 % RH
Preheating time	15 minutes
Protection class	IP 65
Installation	Wall mounting
Dimensions (W x H x D)	35 x 58 x 118 mm
Weight	125 g

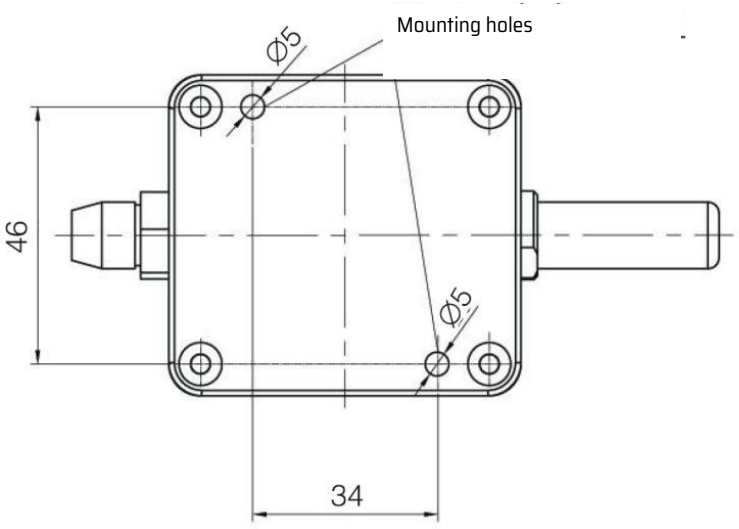
PRODUCT DESCRIPTION

Housing

The PCE-P18 transmitter is mounted on the wall using screws or adhesive. This maintains the IP65 protection rating. The housing is made of self-extinguishing plastic. The housing contains screw terminals that allow the connection of cables up to 1 mm².



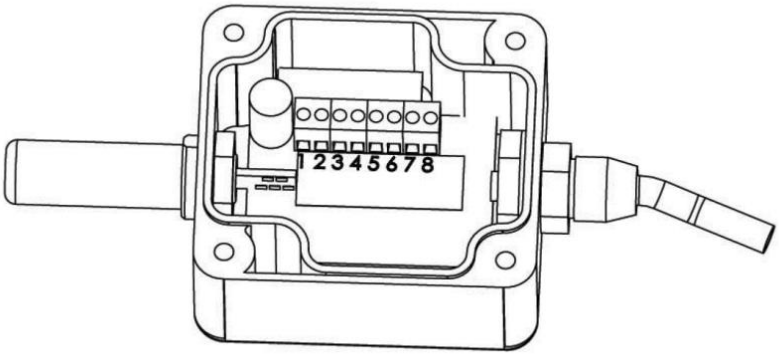
Dimensions of the transmitter



Mounting holes

Electrical connection

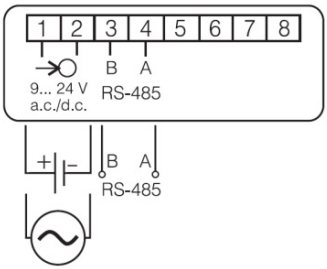
The PCE-P18 transmitter is connected using an 8-pin screw terminal. To connect the transmitter, the housing cover must be removed. Round cables with a diameter of between 3.5 and 6 mm are required for the connection. The cables must be fed into the housing through the cable glands. The gland must then be tightened to ensure the housing is watertight. If the cable gland is not tightened securely, IP65 protection cannot be guaranteed.



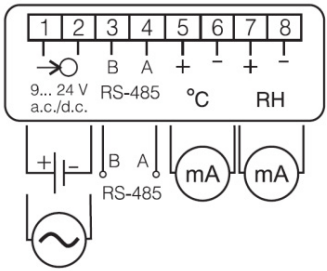
Marking the screw terminal

Electrical connection

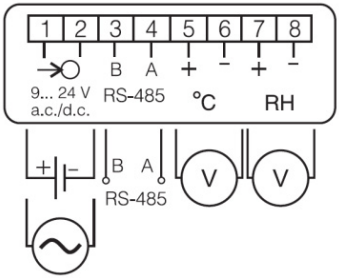
Model without analogue outputs



Model with power outputs



Model with voltage outputs



A twisted pair cable should be used to connect the RS485 interface. If significant electromagnetic interference is expected in the vicinity, shielded cables should be used for both the RS485 interface and the analogue outputs. The shield must be connected to the earth terminal on the power supply side, with the shortest possible distance between them.

Once the supply voltage is applied, the unit starts operating according to the factory settings (see Table 8). Some parameters can be reprogrammed via the RS485 interface:

- Interface parameters
- Measurement time over which an average value is calculated
- Individual scaling of the analogue output signals (only if these are present)

If suitable converters are used, the transmitter can also be connected to a USB or Ethernet interface.
The transmitter is equipped with a two-colour LED. The LED's illumination has the following meanings:

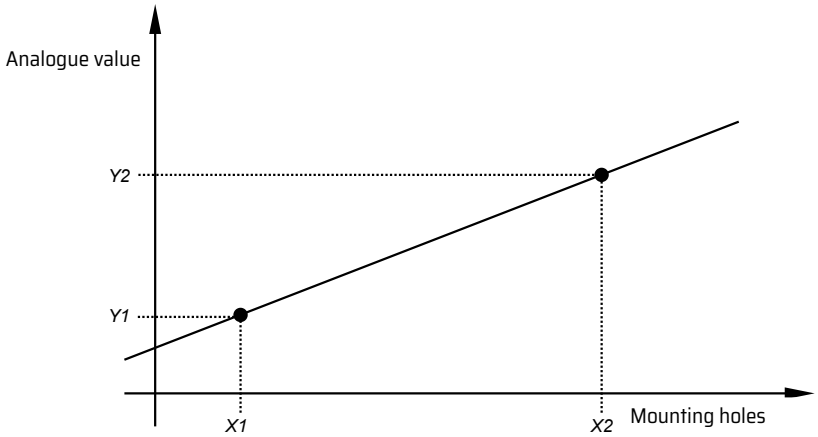
- Brief green flash: Measurement acquisition is proceeding without issues
- Brief red flash: Communication via the RS485 interface is in progress

The LED flashes only for the first three minutes after the supply voltage is applied or following a change in the baud rate (e.g. after short-circuiting the ZW jumper).

Functions of the PCE-P18 transmitter

- Calculation of the dew point and absolute humidity
- Output of measured values via analogue interfaces using custom scaling
- Storage of maximum and minimum values of measured and calculated parameters
- Measurement time for averaging can be set
- RS485 interface with MODBUS protocol in RTU mode

Custom scaling of the analogue output
In the version with analogue outputs, the PCE-P18 transmitter can output the measured variables as an analogue value (current or voltage) using custom scaling. Based on the coordinates of two points, which must be entered, the transmitter calculates the equation used to determine the output value of the analogue outputs as a function of the measured variable.



X1 and X2: measured values (temperature or humidity)
Y1 and Y2: the corresponding values to be set at the analogue output
Once two points have been specified, the transmitter calculates all other points on the line.
To perform custom scaling, suitable values for X1, X2, Y1 and Y2 must be stored in the corresponding registers 4007 to 4014 (Table 3). As only integer values can be stored in these registers, the values must first be multiplied by 100.

Example
The custom scaling for temperature measurement specifies that the temperature is to be measured from -12.25 °C to +77.75 °C. This temperature range is to be mapped to 4.5 to 18.5 mA. The following values must therefore be stored in the registers:

Register name	Address of the register	Value in the register
X1 Temperature	4007	-1225
Y1 Current signal	4008	450
X2 Temperature	4009	7775
Y2 Current signal	4010	1850

RS485 interface

Description of the MODBUS protocol

The protocol implemented in the transmitter complies with the Modicon Company's PI-MBUS-300 Rev G specification. The following functions of the MODBUS protocol have been implemented in the PCE-P18 transmitter:

Function code	**Meaning**
03 (0x03h)	Reading 'n' registers
16 (0x10h)	Writing 'n' registers
17 (0x11h)	Identifying the slave device

In addition, the following serial interface parameters can be configured:

Transmitter address	1 ... 247
Baud rate	4800, 9600, 19200, 38400, 57600 Bit/s
Operating mode	RTU
Data frame	8N2, 8E1, 801, 8N1
Maximum response time	300 ms

The configuration of the serial interface consists of the following parameters: baud rate (the 'Baudrate' register), device address (the 'Adresse' register) and operating mode (the 'Modus' register).

Warning!
No device address may be duplicated within a communication network. The baud rate and operating mode must be the same for all connected devices.

Register Overview

Table 5

Address range	Format	Description
4000 – 4014	Integers (16-bit)	These 16-bit registers contain the interface parameters, the time period over which the average is calculated, and the individual scaling parameters. The registers can be read and written to.
7000 – 7024	Floating-point numbers (32-bit)	These values are stored in two consecutive 16-bit registers. They are the same data that is stored in 32-bit registers in the address range 7500–7512. These registers are read-only.
7500-7512	Floating-point numbers (32-bit)	These 32-bit registers store measured values and calculated values from the transmitter. These registers are read-only.

Register with read and write access

Table 6

Address	Registry name	Range	Description
4000	Identification	0xAA	Identification of the PCE-P18
4001	Address (RS485 interface)	1 ... 247	Device address [1]
4002	Baud rate	0 ... 4	Baud rate of the RS485 interface (bits/s)[1]: 0: 4800 1: 9600 2: 19200 3: 38400 4: 57600
4003	Operating mode	0 ... 3	Confirmation of change to interface parameters[2]: 0: no action 1: change accepted
4005	Averaging time	6 ... 3600	The period over which the average is calculated
4006	Resetting the max/min values	0 ... 1	Resetting the max/min values[2]: 0: no action 1: reset values

Parameters for individual scaling of the analogue outputs[3)]

Address	Registry name	Range	Description
4007	X1 Temperature	-5000 ... 10000	Measured value X1 for temperature in [°C × 100]
4008	Y1 Temperature	0 ... 2000	Output value Y1 for temperature: For current output: [mA x 100] For voltage output: [V x 100]
4009	X2 Temperature	-5000 ... 10000	Measured value X2 for temperature in [°C × 100]
4010	Y2 Temperature	0 ... 2000	Output value Y1 for temperature: For current output: [mA x 100] For voltage output: [V x 100]
4011	X1 Relative humidity	0 ... 10000	Measured value X1 for relative humidity in [% x 100]
4012	Y1 Relative humidity	0 ... 2000	Output value Y1 for relative humidity: For current output: [mA × 100] For voltage output: [V × 100]
4013	X2 Relative humidity	0 ... 10000	Measured value X2 for relative humidity in [% × 100]

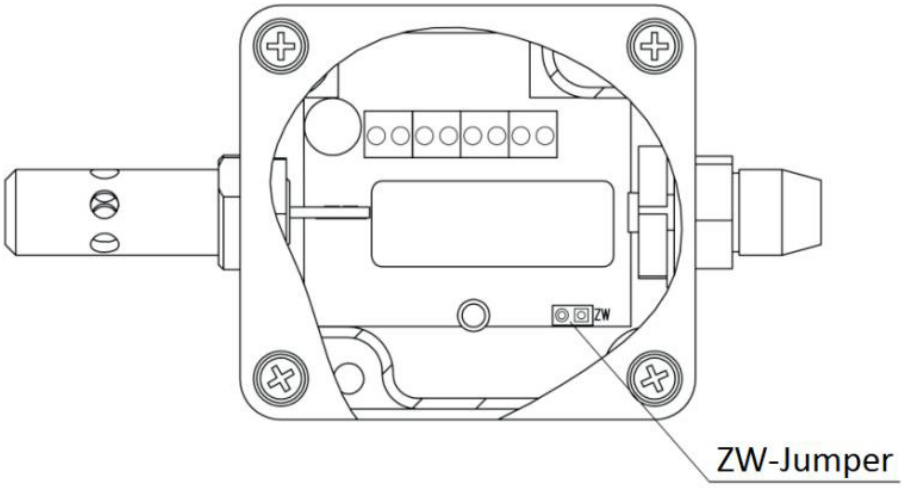
1) The transmitter will only accept a change if a “1” has been written to the “Interface parameter change” register
2) Once a “1” has been written to the register, the value is automatically reset to “0”
3) In the version without analogue outputs, registers 4007...4014 are set to “0”. Writing any other values to these registers will not result in any change

4014	Y2 relative humidity	0 ... 2000	Output value Y1 for relative humidity: For current output: [mA × 100] For voltage output: [V × 100]
4017	Status register	0 ... 65535	Status register; the individual bits have the following meanings: Bit 0 = 1: Transmitter with current outputs Bit 1 = 1: Transmitter with voltage outputs Bit 2 = 1: Measurement period for averaging has elapsed Bit 3, 4: Variable mapped to analogue output 1: 0 / 0: Temperature 0 / 1: Relative humidity 1 / 0: Dew point temperature 1 / 1: Absolute humidity Bit 5, 6: Parameter mapped to analogue output 2: 0 / 0: Temperature 0 / 1: Relative humidity 1 / 0: Dew point temperature 1 / 1: Absolute humidity Bit 7 ... Bit 15: Reserved

Please note!
The transmitter checks that all values written to the registers fall within the correct range. If the user attempts to write values outside the specified range to the registers, the write operation will not be carried out.

Register with read access

Address in the address range 7000 ... 7024	Address in the address range 7500 ... 7512	Register name	Description
7000	7500	Identification	Identification of the PCE-P18 – 0xAA
7002	7501	Temperature T	Measured temperature in [°C]
7004	7502	Relative humidity rF	Measured relative humidity in [%]
7006	7503	Dew point Td	Measured dew point temperature [°C]
7008	7504	Absolute humidity a	Measured absolute humidity [g/m³]
7010	7505	Min T	Min. temperature
7012	7506	Max T	Max. temperature
7014	7507	Min rF	Min. relative humidity
7016	7508	Max rF	Max. relative humidity
7018	7509	Min Td	Min. dew point temperature
7020	7510	Max Td	Max. dew point temperature
7022	7511	Min a	Min. absolute humidity
7024	7512	Max a	Max. absolute humidity



Positioning of the ZW jumper

Factory setting

Table 8

Parameter	Factory setting		
	Model without analogue outputs	Model with power outputs	Model with voltage outputs
Device address	1	1	1
Baud rate	9600	9600	9600
Operating mode	RTU 8N1	RTU 8N1	RTU 8N1
Averaging time	30 [s]	30 [s]	30 [s]
X1 temperature	0	-2000 [°C x 100]	-2000 [°C x 100]
Y1 temperature	0	400 [mA x 100]	0 [V x 100]
X2 temperature	0	6000 [°C x 100]	6000 [°C x 100]
Y2 temperature	0	2000 [mA x 100]	1000 [V x 100]
X1 relative humidity	0	0 [% x 100]	0 [% x 100]
Y1 relative humidity	0	400 [mA x 100]	0 [V x 100]
X2 relative humidity	0	10000 [% x 100]	10000 [% x 100]
Y2 relative humidity	0	2000 [mA x 100]	1000 [V x 100]

If the default interface parameters have been changed and are no longer known, they can be temporarily set to the following values by inserting the ZW jumper:

Device address: 247
Baud rate: 9600 bps
Operating mode: RTU 8N1

These parameters apply only whilst the jumper is in place. If the jumper is removed, the previously set values or those changed whilst the jumper was in place will apply again.

ACCESSORIES

The PCE-P18 transmitter is supplied without an additional filter as standard. This means it can only be used indoors. To enable the transmitter to be used outdoors and in the presence of water vapour, optional filters can be fitted to protect the sensor.

Order no.	Name	Features	Areas of application
PCE-P18L-MF	Diaphragm filter	medium filtration efficiency, max. 80°C, response time: t10/90: 15 s	Building automation, Suitable for use in environments with low levels of contamination
PCE-P18L-TF	Teflon filter	Good resistance to chemical exposure, max. 180 °C, response time: t10/90: 14 s	Drying processes involving chemical exposure
PCE-P18L-BSF	Sintered bronze filter	Resistant to mechanical stress and high levels of contamination; suitable for use in low-humidity environments; response time: t10/90: 10 s	Agriculture

AVAILABLE VARIANTS

PCE-P18-1: RS-485 interface only
PCE-P18-2: RS-485 interface and 2 x 4–20 mA outputs

Please enquire about models with voltage outputs.

DISPOSAL

For the disposal of batteries in the EU, the (EU) 2023/1542 directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose. In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law. For countries outside the EU, batteries and devices should be disposed of in accordance with your local waste regulations. If you have any questions, please contact PCE Instruments.

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