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# User Manual EE872

Modular Probe for CO<sub>2</sub>, Humidity,  
Temperature and Ambient Pressure



# Content

<b>1</b>	<b>General Information</b>	<b>3</b>
1.1	Explanation of Warning Notices and Symbols	3
1.2	Safety Instructions	4
1.2.1	General Safety Instructions	4
1.2.2	Intended Use	4
1.2.3	Mounting, Start-up and Operation	4
1.3	Environmental Aspects	5
<b>2</b>	<b>Scope of Supply</b>	<b>5</b>
<b>3</b>	<b>Product Description</b>	<b>5</b>
3.1	Operation Principle	5
3.2	Dimensions	6
3.3	Electrical Connection	6
3.4	Hardware Selection between Analogue Output and RS485 Interface with Modbus RTU or BACnet MS/TP	7
<b>4</b>	<b>Mounting and Installation</b>	<b>7</b>
<b>5</b>	<b>Setup and Adjustment</b>	<b>8</b>
5.1	PCS10 Product Configuration Software	9
5.2	RS485 Digital Interface	9
5.2.1	BACnet Protocol Settings	9
5.2.2	Modbus RTU Protocol Settings	10
5.3	Modbus Register Map	11
5.4	Modbus RTU Example	11
5.5	Error Messages in PCS10	12
<b>6</b>	<b>Maintenance and Service</b>	<b>13</b>
6.1	Sensing Module Replacement of the EE872S	13
6.2	Filter Cap Exchange	13
6.3	EE872 Calibration or Adjustment with Reference CO <sub>2</sub> Gas	14
6.4	Protection of EE872 During Site Cleaning Application	14
6.5	CO <sub>2</sub> , RH and T Calibration and Adjustment	14
6.6	Repairs	15
<b>7</b>	<b>Spare Parts</b>	<b>16</b>
<b>8</b>	<b>Accessories</b>	<b>16</b>
<b>9</b>	<b>Technical Data</b>	<b>17</b>
<b>10</b>	<b>Conformity</b>	<b>19</b>
10.1	Declarations of Conformity	19
10.2	Electromagnetic Compatibility	19
10.3	FCC Part 15 Compliance Statement	19
10.4	ICES-003 Compliance Statement	19

# 1 General Information

This user manual serves for ensuring proper handling and optimal functioning of the device. The user manual shall be read before commissioning the equipment and it shall be provided to all staff involved in transport, installation, operation, maintenance and repair. E+E Elektronik Ges.m.b.H. does not accept warranty and liability claims neither upon this publication nor in case of improper treatment of the described products.

All information, technical data and diagrams included in this document are based on the information available at the time of writing. It may contain technical inaccuracies and typographical errors. The contents will be revised on a regular basis and changes will be implemented in subsequent versions. The described product(s) and the contents of this document may be changed or improved at any time without prior notice.

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## PLEASE NOTE

Find this document and further product information on our website at [www.epluse.com/ee872](http://www.epluse.com/ee872).

## 1.1 Explanation of Warning Notices and Symbols

### Safety precautions

Precautionary statements warn of hazards in handling the device and provide information on their prevention. The safety instruction labeling is classified by hazard severity and is divided into the following groups:

#### DANGER

**Danger** indicates hazards for persons. If the safety instruction marked in this way is not followed, the hazard will very likely result in severe injury or death.

#### WARNING

**Warning** indicates hazards for persons. If the safety instruction marked in this way is not followed, there is a risk of injury or death.

#### CAUTION

**Caution** indicates hazards for persons. If the safety instruction marked in this way is not followed, minor or moderate injuries may occur.

#### NOTICE

**Notice** signals danger to objects or data. If the notice is not observed, damage to property or data may occur.

### Informational notes

Informational notes provide important information which stands out due to its relevance.

#### INFO

The information symbol indicates tips on handling the device or provides additional information on it. The information is useful for reaching optimal performance of the device.

The title field can deviate from "INFO" depending on the context. For instance, it may also read "PLEASE NOTE".

## 1.2 Safety Instructions

### 1.2.1 General Safety Instructions

#### NOTICE

Improper handling of the device may result in its damage.

- The EE872 device and mainly the filter cap shall not be exposed to unnecessary mechanical stress.
- The EE872 must be operated with the filter cap on at all times.
- Do not apply the supply voltage to the RS485 data lines.
- Use the EE872 only as intended and observe all technical specifications.

### 1.2.2 Intended Use

The EE872 modular probe is intended for the measurement of CO<sub>2</sub>, relative humidity (RH), temperature (T) and ambient pressure (p). Additionally, the device calculates the dew point temperature (Td). The probe is designed for the use in harsh and demanding environments such as agriculture, life stock barns, hatchers, incubators, green houses or outdoors.

#### WARNING

Non-compliance with the product documentation may cause safety risks for people and the entire measurement installation.

The manufacturer cannot be held responsible for damages as a result of incorrect handling, installation and maintenance of the device.

- This device is not appropriate for safety, emergency stop or other critical applications where device malfunction or failure could cause injury to human beings.
- The device may not be manipulated with tools other than specifically described in this manual.

#### NOTICE

Failing to follow the instructions in this user manual may lead to measurement inaccuracy and device failures.

- The EE872 may only be operated under the conditions described in this user manual and within the specification included in chapter 8 Technical Data.
- Unauthorized product modification leads to loss of all warranty claims. Modification may be accomplished only with an explicit permission of E+E Elektronik Ges.m.b.H.!

### 1.2.3 Mounting, Start-up and Operation

The EE872 has been produced under state of the art manufacturing conditions, has been thoroughly tested and has left the factory after fulfilling all safety criteria. The manufacturer has taken all precautions to ensure safe operation of the device. The user must ensure that the device is set up and installed in a way that does not impair its safe use. The user is responsible for observing all applicable local and international safety guidelines for safe installation and operation of the device. This user manual contains information and warnings that must be observed by the user in order to ensure safe operation.

#### PLEASE NOTE

The manufacturer or his authorized agent can only be held liable in case of willful or gross negligence. In any case, the scope of liability is limited to the corresponding amount of the order issued to the manufacturer. The manufacturer assumes no liability for damages incurred due to failure to comply with the applicable regulations, operating instructions or the specified operating conditions. Consequential damage is excluded from liability.

**⚠ WARNING**

Non-compliance with the product documentation may cause accidents, personal injury or property damage.

- Mounting, installation, commissioning, start-up, operation and maintenance of the device may be performed by qualified staff only. Such staff must be authorized by the operator of the facility to carry out the mentioned activities.
- The qualified staff must have read and understood this user manual and must follow the instructions contained within. The manufacturer accepts no responsibility for non-compliance with instructions, recommendations and warnings.
- All process and electrical connections shall be thoroughly checked by authorized staff before putting the device into operation.
- Do not install or start-up a device supposed to be faulty. Make sure that such devices are not used accidentally by marking them clearly as faulty.
- A faulty device shall be removed from the process.
- Service operations other than described in this user manual may only be performed by the manufacturer.

## 1.3 Environmental Aspects

**i PLEASE NOTE**

Products from E+E Elektronik Ges.m.b.H. are developed and manufactured in compliance with relevant environmental protection requirements. Please observe local regulations for the disposal of the device.



For disposal, the individual components of the device must be separated according to local recycling regulations. The electronics shall be disposed of correctly as electronics waste.

# 2 Scope of Supply

- EE872 - Modular Probe for CO<sub>2</sub>, Humidity, Temperature and Ambient Pressure according to the ordering guide
- Test report according to DIN EN10204-2.2
- Quick User Guide

# 3 Product Description

## 3.1 Operation Principle

The EE872 is available in two different versions.

1. **EE872-M10:** The probe measures the CO<sub>2</sub> concentration. The sensing module is heated in the default factory setting to prevent condensation. The CO<sub>2</sub> measurement value is available at the analogue output or at the digital interface.
2. **EE872-M13:** The probe measures CO<sub>2</sub>, RH, T and p, and calculates Td. As the sensing module is not heated in the default factory setting, accurate measurement of RH and T is possible. If the user activates the probe heating, the RH and T data are not available. However, the calculated Td value is still available. All values are only available via the digital interface.

Both versions provide CO<sub>2</sub> measurement T and p compensated.

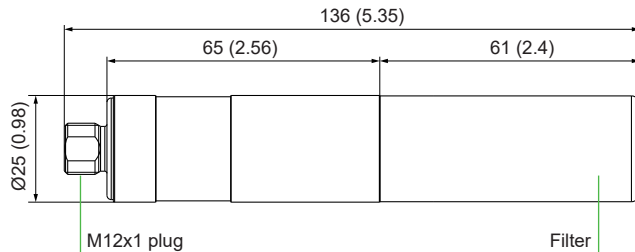
The CO<sub>2</sub> measurement is based on the NDIR principle with two wavelengths and two detectors. Infrared light is passed through the gas to be examined. One detector is tuned to 4.2 μm, which is the wavelength absorbed by CO<sub>2</sub>. The second detector is tuned to 3.9 μm, a wavelength that is not affected by any gas. The CO<sub>2</sub> concentration is calculated from the different outputs of the two according detectors. For more information, please refer to [E+E's paper on the principles of CO<sub>2</sub> measurement](#).

**i PLEASE NOTE**

Changing the factory setup in respect of the heating (on/off) can lead to an additional measurement error, as a result of which the CO<sub>2</sub> measurement accuracy may be outside the specification.

### 3.2 Dimensions

Values in mm (inch)



### 3.3 Electrical Connection

**⚠ WARNING**

Incorrect installation, wiring or power supply may cause overheating and therefore personal injuries or damage to property.

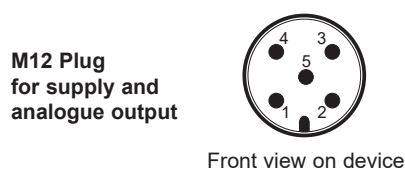
For correct cabling of the device, always observe the presented wiring diagram for the product version used.

The manufacturer cannot be held responsible for personal injuries or damage to property as a result of incorrect handling, installation, wiring, power supply and maintenance of the device.

**NOTICE**

The device may only be powered with a power supply class III ⚡ (Europe) or with a class 2 supply (North America).

Pin	Assignment	Wire colors for accessories:
		Couplig flange HA010705 Connection cable HA010819/820/821
1	Supply voltage	Brown
2	B RS485 (D-) or voltage output	White
3	GND	Blue
4	A RS485 (D+) or current output	Black
5	Configuration pin	Grey



Tab. 1 Pin and flying leads assignment

**i PLEASE NOTE**

The pin numbers are stamped in the M12 plug.

### 3.4 Hardware Selection between Analogue Output and RS485 Interface with Modbus RTU or BACnet MS/TP

The “default output” of the EE872 can be analogue, Modbus RTU or BACnet MS/TP. The “default output” of a new EE872 corresponds to the specified order code, refer to the EE872 datasheet. In case the user altered the factory setup, the “default output” corresponds to the latest settings uploaded to the EE872 using the PCS10 Product Configuration Software (refer to the help function of the PCS10).

Pin	Default: analogue	Default: Modbus RTU	Default: BACnet MS/TP
5 open (=high)	10 s timeout <sup>1)</sup> , then analogue output	Modbus RTU	10 s timeout <sup>1)</sup> , then BACnet MS/TP <sup>1)</sup>
5 GND (=low)	Analogue	Analogue	BACnet MS/TP

1) For configuration purposes, during the first 10 seconds after power on the EE872 awaits connection with the PCS10 Product Configuration Software.

Tab. 2 Function of the configuration pin (pin 5 of the M12 connector)

## 4 Mounting and Installation

The best measuring performance is achieved when the entire probe is located within the environment to be monitored. This is the case, for example, when the EE872 is fixed on a wall using the mounting clip HA010227 (see Fig. 1), or hangs freely from the ceiling with the connection cable. The probe can also be installed into a partition wall using the stainless steel mounting flange HA010226 (see Fig. 2).

HA010226 and HA010227 are not included in the scope of supply, for more information please refer to the accessories datasheet.

If there are large temperature differences between the two sides of the wall, T gradients can occur along the probe. Although the CO<sub>2</sub> measurement is T compensated, these gradients have a large influence on the RH and T accuracy in the M13 model. Therefore, it is of the highest importance to minimise temperature gradients. The part of the probe that rises out of the wall on the connection side must be as small as possible and well thermally insulated.

#### **i** PLEASE NOTE

To achieve the best accuracy for RH and T, the M13 model must be installed horizontally or with the filter cap facing downwards.



Fig. 1 EE872 with mounting clip HA010227



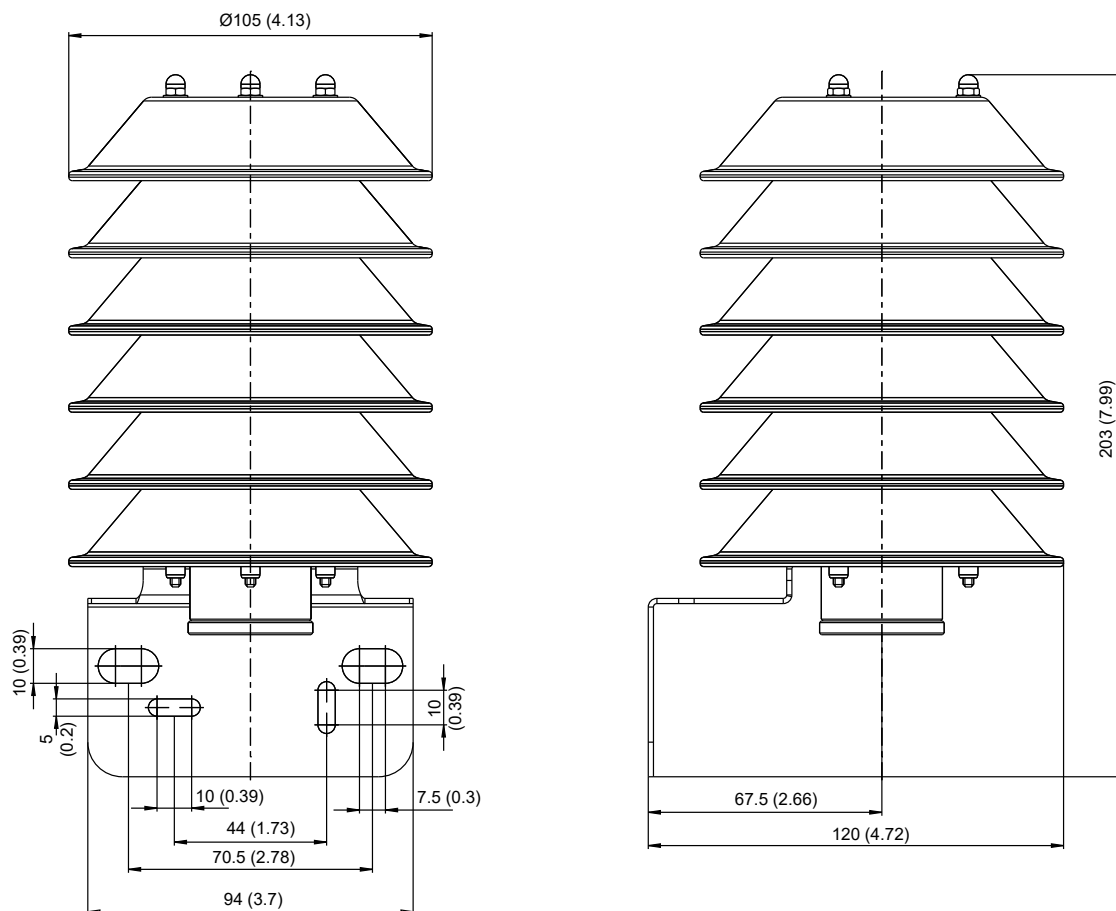
Fig. 2 EE872 with mounting flange HA010226

#### **i** PLEASE NOTE

For outdoor applications, the EE872 must be used with the radiation shield HA010510 (not included in the scope of supply, see data sheet “Accessories”), which protects the device from rain, snow, ice and solar radiation.

**Radiation shield HA010510**

(needs to be ordered separately)



## 5 Setup and Adjustment

The EE872 is ready to use and does not require any configuration by the user. The factory setup of the EE872 corresponds to the specified order code. Please refer to chapter 3.1 for a model overview and to the datasheet at [www.epluse.com/ee872](http://www.epluse.com/ee872). If needed, the user can change the factory setup with the help of the free PCS10 Product Configuration Software and the Modbus configuration adapter (HA011018).

To do this, pin 5 must be open (=high), refer to chapter 3.4 Hardware Selection between Analogue Output and RS485 Interface with Modbus RTU or BACnet MS/TP.

An EE872 that was originally set to analogue output can be converted to RS485 interface and vice versa. The CO<sub>2</sub> output signal type (analogue to RS485/Modbus RTU or RS485/BACnet MS/TP and vice versa), the scaling of the analogue output and the digital settings can be changed. An offset correction is possible for the p measurement. The CO<sub>2</sub>, RH and T measurement is offset and 2-point adjustable.

In addition, it is possible to enable or disable the pressure compensation (factory setting: enabled), the sensing module heating (factory setting according to the model ordered) and the NAMUR error indication (factory setting: disabled).

### NOTICE

The EE872 must not be connected to an additional power supply when using the Modbus configuration adapter HA011018.

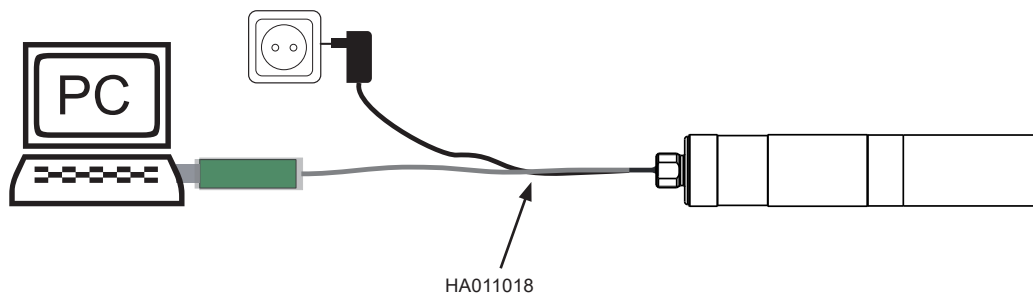


Fig. 3 EE872 connected to a PC running PCS10

**i PLEASE NOTE**

Changing the configuration of the EE872 will invalidate the product and the packaging label.

## 5.1 PCS10 Product Configuration Software

To use the software for changes in settings, please proceed as follows:

1. Download the PCS10 Product Configuration Software from [www.epluse.com/pcs10](http://www.epluse.com/pcs10) and install it on the PC.
2. Connect the EE872 to the PC using the Modbus configuration adapter.
3. Start the PCS10 software.
4. Follow the instructions on the PCS10 opening page for scanning the ports and identifying the connected device
5. Click on the desired setup mode from the main PCS10 menu on the left. Follow the online instructions of the PCS10 which are displayed when clicking the “Tutorial” button.
6. Changes are uploaded to the sensor by pressing the “Sync” button.

## 5.2 RS485 Digital Interface

### 5.2.1 BACnet Protocol Settings

	Factory settings	User selectable values (via PCS10)
Baud rate	As specified in the order code	9 600, 19 200, 38 400, 57 600, 76 800, 115 200
Data bits	8	8
Parity	None	None
Stop bits	1	1
BACnet address	6	0...127

Tab. 3 BACnet protocol settings

**i PLEASE NOTE**

The recommended settings for multiple devices in a BACnet MS/TP network are 38 400, 8, none, 1.

The EE872 PICS (Product Implementation Conformance Statement) is available on the E+E website at [www.epluse.com/ee872](http://www.epluse.com/ee872).

BACnet address and baud rate can be set via:

- PCS10 Product Configuration Software and the Modbus configuration adapter HA011018.
- BACnet protocol, see the PICS.

## 5.2.2 Modbus RTU Protocol Settings

	Factory settings	Selectable values (via EE-PCS)
Baud rate	As specified in the order code	9 600, 19 200, 38 400, 57 600, 76 800, 115 200
Data bits	8	8
Parity	Even	None, odd, even
Stop bits	1	1, 2
Modbus address	237	1...247

Tab. 4 Modbus RTU protocol settings

### **i** PLEASE NOTE

- The recommended settings for multiple devices in a Modbus RTU network are 9600, 8, even, 1.
- The EE872 represents 1/10 unit load on an RS485 network.

Device address, baud rate, parity and stop bits can be set via:

- PCS10 Product Configuration Software and the Modbus configuration adapter HA011018.  
The PCS10 can be downloaded free of charge from [www.epluse.com/pcs10](http://www.epluse.com/pcs10).
- Modbus protocol in the register 1 (0x00) and 2 (0x01).  
See Application Note Modbus AN0103 (available at [www.epluse.com/ee872](http://www.epluse.com/ee872)).

The serial number as ASCII-code is located in read-only registers 1 - 8 (0x00 - 0x07).

The firmware version is located in read-only register 9 (0x08) (bit 15...8 = major release; bit 7...0 = minor release).

The sensor name as ASCII-code is located in read-only registers 10 - 17 (0x09 - 0x10).

### NOTICE

When reading information that spans multiple registers, it is always necessary to read all registers, even if the desired information requires less.

### NOTICE

For obtaining the correct floating point values, both registers have to be read within the same reading cycle. The measured value can change between two Modbus requests, exponent and mantissa may get inconsistent then.

### **i** INFO

The Modbus function codes mentioned throughout this document shall be used as described in the MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b3, chapter 6:

[www.modbus.org/docs/Modbus\\_Application\\_Protocol\\_V1\\_1b3.pdf](http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf)

#### Communication settings (INT16)

Parameter	Register number <sup>1)</sup> [Dec]	Register address <sup>2)</sup> [Hex]	Size <sup>3)</sup>
Write register: function code 0x06			
Modbus address <sup>4)</sup>	1	00	1
Modbus protocol settings <sup>4)</sup>	2	01	1

#### Device information (INT16)

Parameter	Register number <sup>1)</sup> [Dec]	Register address <sup>2)</sup> [Hex]	Size <sup>3)</sup>
Read register: function code 0x03 / 0x04			
Serial number (as ASCII)	1	00	8
Firmware version	9	08	1
Sensor name (as ASCII)	10	09	8

1) Register number (decimal) starts from 1.

2) Register address (hexadecimal) starts from 0.

3) Number of registers

4) For Modbus address and protocol settings see Application Note Modbus AN0103 (available at [www.epluse.com/ee872](http://www.epluse.com/ee872)).

Tab. 5 EE872 registers for device setup

## 5.3 Modbus Register Map

The measurement data is saved as 32 bit floating point values (data type FLOAT32) and as 16 bit signed integer values (data type INT16).

### FLOAT32

Parameter	Unit <sup>1)</sup>	Register number <sup>2)</sup> [DEC]	Register address <sup>3)</sup> [HEX]
Read register: function code 0x03 / 0x04			
CO <sub>2</sub> (average)	ppm	1061	424
CO <sub>2</sub> (raw)	ppm	1063	426
Pressure*	mbar	1201	4B0
Pressure*	psi	1203	4B2
Relative humidity**	%	1021	3FC
Temperature**	°C	1003	3EA
Temperature**	°F	1005	3EC
Temperature**	K	1009	3F0
Dew point temperature***	°C	1105	450
Dew point temperature***	°F	1107	452
Dew point temperature***	K	1147	47A

### INT16

Parameter	Unit <sup>1)</sup>	Scale <sup>4)</sup>	Register number <sup>2)</sup> [DEC]	Register address <sup>3)</sup> [HEX]
Read register: function code 0x03 / 0x04				
CO <sub>2</sub> (average)	ppm	1	4031	FBE
CO <sub>2</sub> (raw)	ppm	1	4032	FBF
Pressure*	mbar	10	4101	1004
Pressure*	psi	100	4102	1005
Relative humidity**	%	100	4011	FAA
Temperature**	°C	100	4002	FA1
Temperature**	°F	50	4003	FA2
Temperature**	K	50	4005	FA4
Dew point temperature***	°C	100	4053	FD4
Dew point temperature***	°F	100	4054	FD5
Dew point temperature***	K	100	4074	FE9

\* Available for version M13.

\*\* Only available with the M13 version if the probe is not heated (default setting).

\*\*\* Always available for the M13 version: Activating or deactivating the probe heating has no effect on the Td measurement.

1) The choice of measurement units (metric or non-metric) must be done according to the ordering guide, refer to EE872 datasheet. Switching from metric to non-metric or vice versa by using the PCS10 is not possible.

2) Register number (decimal) starts from 1

3) Register address (hexadecimal) starts from 0

4) Examples: For scale 100, the reading of 2550 means a value of 25.5. For scale 50, the reading of 2550 means a value of 51.

Tab. 6 EE872 FLOAT32 and INT16 measured data registers

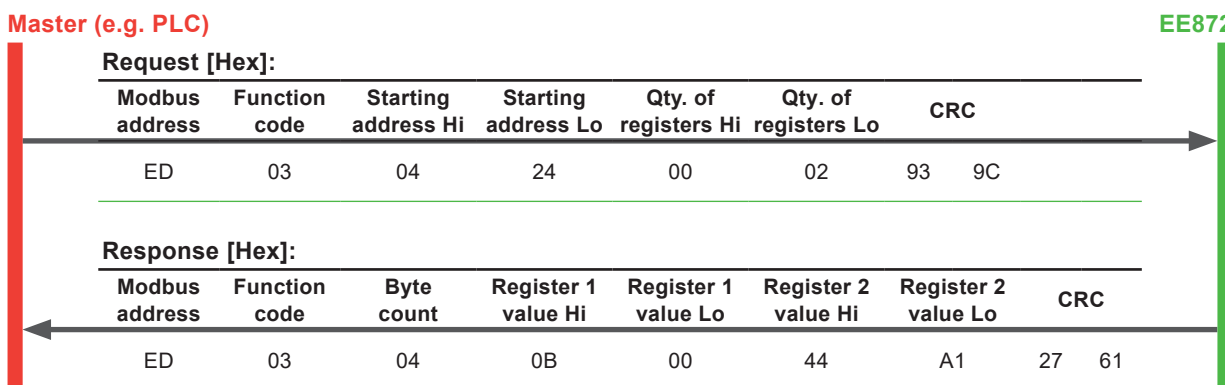
## 5.4 Modbus RTU Example

The EE872's Modbus address is 237 [0xED].

Please refer to

- MODBUS APPLICATION PROTOCOL SPECIFICATION V1.1b3, chapter 6:  
[www.modbus.org/docs/Modbus\\_Application\\_Protocol\\_V1\\_1b3.pdf](http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf)
- E+E Application Note Modbus AN0103 (available at [www.epluse.com/ABC123](http://www.epluse.com/ABC123))

**Read the CO<sub>2</sub> (FLOAT32) CO<sub>2</sub> = 1288.34375 ppm from register address 0x424:**



Tab. 7 Example temperature query

**Decoding of floating point values:**

Floating point values are stored according to IEEE754. The byte pairs 1, 2 and 3, 4 are transformed as follows (numbers taken from T reading Modbus request/response example above):

**Modbus response [Hex]**

Byte 3	Byte 4	Byte 1	Byte 2
0B	00	44	A1
MMMMMMMM	MMMMMMMM	SEEEEEEE	EMMMMMMM

Tab. 8 Modbus response

**IEEE754**

Byte 1	Byte 2	Byte 3	Byte 4
44	A1	0B	00
0100 0100	1010 0001	0000 1011	0000 0000
SEEE EEEE	EMMM MMMM	MMMM MMMM	MMMM MMMM

Decimal value: 1288.34375

Tab. 9 Data representation according to IEEE754

## 5.5 Error Messages in PCS10

The EE872 features an error indication on the analogue output according to the NAMUR NE 043 recommendations (Standardisation of the Signal Level for the Failure Information of Digital Transmitters, Edition 2003-02-03, see [www.namur.net/en/recommendations-and-worksheets/current-nena.html](http://www.namur.net/en/recommendations-and-worksheets/current-nena.html)).

The feature is disabled by factory default and can be enabled with the PCS10 Product Configuration Software, see above.

Output signal	NAMUR signal level
0 - 5 V	5.5 V
0 - 10 V	11 V
4 - 20 mA	21 mA
0 - 20 mA	21 mA

## 6 Maintenance and Service

The sensing module and the filter cap can be easily replaced on the EE872.

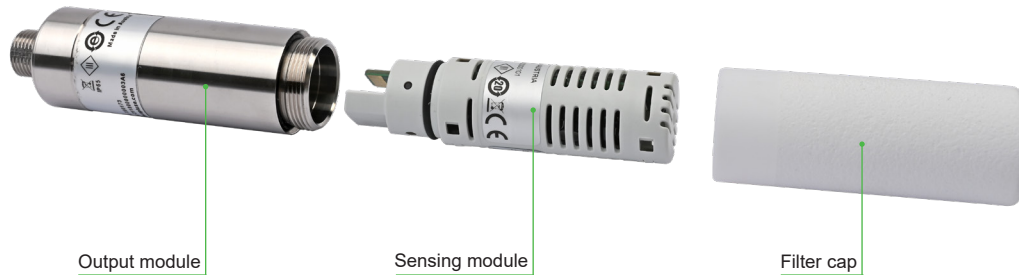


Fig. 4 EE872 modular construction

### **i** PLEASE NOTE

Extreme working conditions such as highly polluted, aggressive and chemically contaminated environment might require periodical maintenance of the device. The maintenance is facilitated by the modular design. The sensing module replacement under above conditions represents a standard maintenance operation, whereby the sensing module is a wear component. A possible measurement drift or the failure of the sensing module caused by harsh working environment are excluded from any warranty claims.

### 6.1 Sensing Module Replacement of the EE872S

If needed, the EE872 sensing module can be replaced by a new one. Please refer to chapter 7 Spare Parts, for the order code.

#### Procedure:

1. Power off the EE872.
2. Remove the filter cap by turning it counter-clockwise.
3. Remove the sensing module by pulling it straight out from the output module.
4. Plug the new EE872S sensing module into the output module.
5. Screw the filter cap finger-tight onto the probe.

### **i** PLEASE NOTE

A new sensing module EE872S must feature the same CO<sub>2</sub> measuring range as the original EE872 probe! If the measuring range of the replacement module and of the original EE872 probe differ, the analogue output remains at 4 mA, 0 V or NAMUR error indication, while the CO<sub>2</sub> measured value via the RS485 interface is 0 ppm.

### 6.2 Filter Cap Exchange

In a dusty, polluted environment it might be necessary to replace the filter cap once in a while. In most of the cases, a clogged filter shows visible contamination or dirt. Longer response time of the CO<sub>2</sub> measurement also indicates a clogged filter cap. In such cases, replace the filter by a new, original one, refer to the “Accessories” datasheet.

#### Procedure:

1. Turn the filter cover counter-clockwise for removal.
2. Install the new filter cap fingertight by turning it clockwise.

## 6.3 EE872 Calibration or Adjustment with Reference CO<sub>2</sub> Gas

The EE872 can be calibrated / adjusted with the help of the PCS10. For this purpose, the probe needs to be connected to a PC via a Modbus configuration adapter.

### Definitions

- Calibration documents the accuracy of a measurement device. The device under test (specimen) is compared with the reference and the deviations are documented in a calibration certificate. During the calibration, the specimen is not changed or improved in any way.
- Adjustment improves the measurement accuracy of a device. The specimen is compared with the reference and brought in line with it. An adjustment can be followed by a calibration which documents the accuracy of the adjusted specimen.

For EE872 calibration or adjustment with reference CO<sub>2</sub> gas use the calibration adapter HA010785 (not included in the scope of supply, refer to the “Accessories” datasheet available at [www.epluse.com/ee872](http://www.epluse.com/ee872)).



Fig. 5 Calibration adapter HA010785 (with rubber caps mounted as protective caps)

### Procedure:

1. Remove the filter cap and install the calibration adapter onto the probe.
2. Connect the calibration gas to one of the two connection nipples. The gas fed into the calibration adapter shall freely flow out through the second nipple.
3. Set the flow rate to 0.1...1.0 l/min and consider a stabilisation time of 10 min.

### **i** PLEASE NOTE

- For best accuracy of the calibration procedure, the temperature difference between the reference gas and the probe should be as low as possible.
- Adjustment/calibration shall be performed with the factory settings activated concerning sensing module heating and pressure compensation.

## 6.4 Protection of EE872 During Site Cleaning Application

The calibration adapter (HA010785) can also be used as a protection cap, for instance if the device remains on the measuring site during cleaning operations. For this purpose, close both nipples with the supplied rubber caps.

In case the probe is removed from the site, it is recommended to apply the protection cap for the M12 cable socket (HA010781) and the one for the EE872 M12 plug of (HA010782).

## 6.5 CO<sub>2</sub>, RH and T Calibration and Adjustment

Depending on the application and the requirements of certain industries, there might arise the need for periodical humidity calibration (comparison with a reference) or adjustment (bringing the device in line with a reference).

### Calibration and adjustment at E+E Elektronik

Calibration and/or adjustment can be performed in the E+E Elektronik calibration laboratory. For information on the E+E capabilities in ISO or accredited calibration please see [www.eplusecal.com](http://www.eplusecal.com).

**Calibration and adjustment by the user**

Perform offset and 2-point adjustment via PCS10 Product Configuration Software (see below). Depending on the level of accuracy required, the humidity reference can be:

- Humidity Calibrator (e.g. Humor 20), please refer to [www.epluse.com/humor20](http://www.epluse.com/humor20).
- Hand-held Device (e.g. Omniport30), please refer to [www.epluse.com/omniport30](http://www.epluse.com/omniport30).

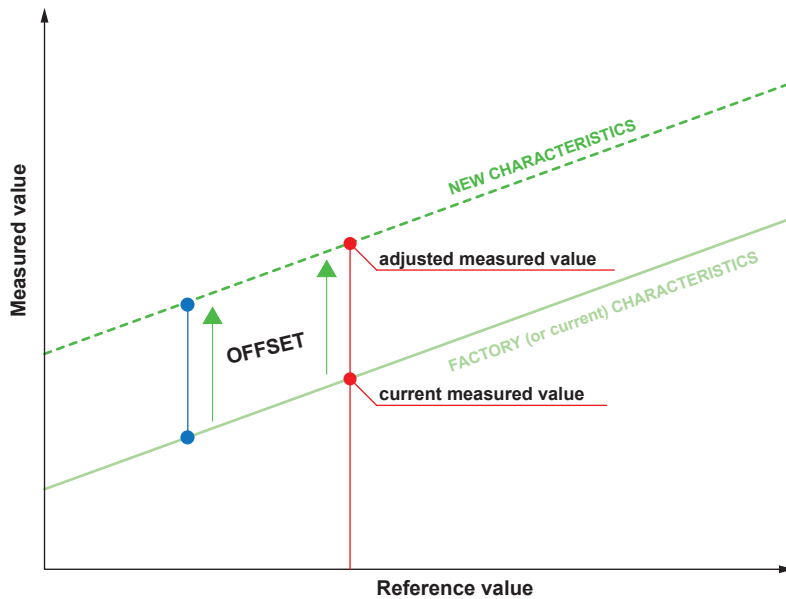


Fig. 6 1-point adjustment (offset)

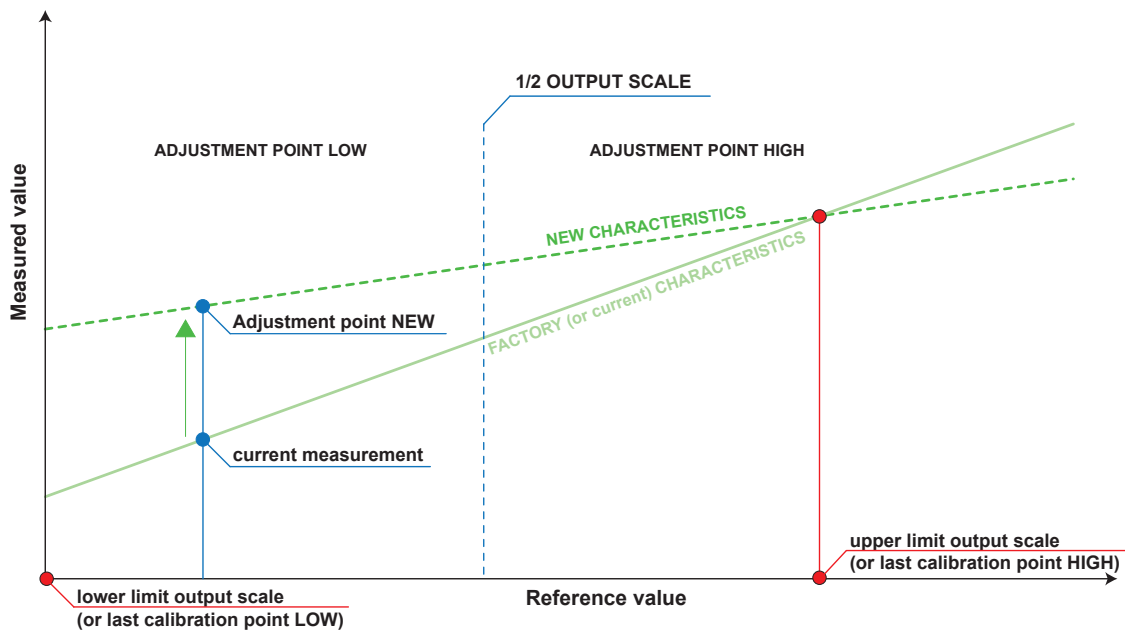


Fig. 7 2-point adjustment

**6.6 Repairs**

Repairs may be carried out by the manufacturer only. The attempt of unauthorised repair excludes any warranty claims.

## 7 Spare Parts

Description		Code
PTFE filter cap		HA010123
Catalytic filter cap for H <sub>2</sub> O <sub>2</sub> sterilisation		HA010124
Replacement sensing module		EE872S-
Model	CO2 (default: heated)	M10
	CO2 + T + RH + p (default: not heated)	M13
CO2 range <sup>1)</sup>	0...2 000 ppm	HV1
	0...5 000 ppm	HV2
	0...1 % (10 000 ppm)	HV3
	0...3 % (30 000 ppm)	HV5
	0...5 % (50 000 ppm)	HV6

1) The CO<sub>2</sub> range of the EE872S must be the same as of the original EE872 probe.

## 8 Accessories

For further information please refer to the [Accessories](#) datasheet.

Description	Code
E+E Product Configuration Software (Free download from <a href="http://www.epluse.com/pcs10">www.epluse.com/pcs10</a> )	PCS10
Modbus configuration adapter	HA011018
Connection cable M12 - flying leads	1.5 m (59.06") HA010819 5 m (196.85") HA010820 10 m (393.70") HA010821
Y-style splitter M12 - M12	HA030204
M12x1 connector, 5 poles, for self assembly	HA010708
Protection cap / calibration adapter	HA010785
Protection cap for the M12 cable socket	HA010781
Protection cap for the M12 plug of EE872	HA010782
Mounting flange	HA010226
Wall mounting clip Ø25 mm (0.98")	HA010227
Radiation Shield	HA010510
M12x1 flange coupling with 50 mm (1.97") flying leads	HA010705

1) For replacement only, not for retrofitting an EE872

2) Minimum order quantity: 10 pcs

# 9 Technical Data

## Measurands

### CO<sub>2</sub>

<b>Measurement principle</b>	Dual wavelength non-dispersive infrared technology (NDIR)		
<b>Measuring range</b>	0...2 000 ppm / 5 000 ppm / 10 000 ppm / 3 % / 5 %		
<b>Accuracy</b> @ 25 °C (77 °F) and 1 013 mbar (14.7 psi)	<b>0...2 000 ppm</b>	< ±(50 ppm + 2 % mv)	
	<b>0...5 000 ppm</b>	< ±(50 ppm + 3 % mv)	
	<b>0...10 000 ppm</b>	< ±(100 ppm + 5 % mv)	
	<b>0...3 %</b>	< ±(1.5 % of full scale + 2 % mv)	
	<b>0...5 %</b>	< ±(1.5 % of full scale + 2 % mv)	mv = measured value
<b>Temperature dependency</b> in the range of -20...+45 °C (-4...+113 °F)	<b>&lt;10 000 ppm</b>	±(1 + mv / 1 000) ppm/°C	±0.556*(1 + mv / 1 000) ppm/°F
	<b>&gt;10 000 ppm</b>	-0.3 % of mv/°C	-0.167 % mv/°F
			mv = measured value
<b>Residual pressure dependency<sup>1)</sup></b> in the range of -20...+45 °C (-4...+113 °F), related to 1 013 mbar (14.7 psi)		0.014 % of mv/mbar	0.965 % of mv/psi
			mv = measured value
<b>Long-term stability, typ.</b> @ 0 ppm CO <sub>2</sub>	20 ppm/year		
<b>Response time t<sub>63</sub>, typ.<sup>2)</sup></b>	90 s		
<b>Measuring interval</b>	15 s (user adjustable from 15 s to 1 h)		

1) Pressure dependency of a sensor without pressure correction: 0.14 % of mv/mbar.

2) With data averaging algorithm for smooth output signal. Faster response time available on request.

### Relative Humidity (RH)

<b>Measuring range</b>	<b>Heating enabled</b>	0...100 %RH
	<b>Heating disabled</b>	0...95 %RH (non-condensing)
<b>Accuracy<sup>1)</sup></b> @ 25 °C (77 °F)	<b>20...80 %RH</b>	±3 %RH
	<b>0...95 %RH</b>	±5 %RH

1) With 24 V DC supply, air flow min. 0.3 m/s, probe horizontal or with sensing head downwards, excl. hysteresis

### Pressure (p)

<b>Measuring range</b>	700...1 100 mbar (10.15...15.95 psi)
<b>Accuracy, typ.</b> @ 25 °C (77 °F)	±2 mbar (±0.03 psi)
<b>Temperature dependency</b> in the range of 0...60 °C (32...140 °F)	±0.016 mbar/K (0.00013 psi/°F)

### Temperature (T)

<b>Measuring range</b>	-40...+60 °C (-40...+140 °F)
<b>Accuracy, typ.<sup>1)</sup></b> in the range of 5...60 °C (41...140 °F)	±0.5 °C (±0.9 °F)

1) With 24 V DC supply, air flow min. 0.3 m/s, probe horizontal or with sensing head downwards, excl. hysteresis.

Calculated quantities		Unit
Dew point temperature	Td	°C
		°F
		K

## Outputs

### Analogue




CO <sub>2</sub>	0 - 5 V / 0 - 10 V 0 - 20 mA / 4 - 20 mA (3-wire)	$0 < I_L < 1 \text{ mA}$ $R_L \leq 500 \Omega$	$I_L = \text{load current}$ $R_L = \text{load resistance}$
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### Digital

Digital interface	RS485 (EE872 = 1/10 unit load)
Protocol Factory settings <sup>1)</sup> Supported Baud rates Measured data types	Modbus RTU Baud rate acc. to order code, parity even, 1 stop bit, Modbus address 237 9 600, 19 200 and 38 400 FLOAT32 and INT16
Protocol Factory settings <sup>2)</sup> Supported Baud rates	BACnet MS/TP Baud rate acc. to order code, BACnet address 6 9 600, 19 200, 38 400, 57 600, 76 800 and 115 200

- 1) More details about communication setting and the Modbus map: See User Manual and Modbus Application Note at [www.epluse.com/ee872](http://www.epluse.com/ee872).  
2) The BACnet MS/TP Product Implementation Conformance Statement (PICS) is available at [www.epluse.com/ee872](http://www.epluse.com/ee872).

## General

Power supply class III  USA & Canada: Class 2 supply necessary, max. voltage 30 V DC <b>Current output</b> <b>RS485 interface and voltage output</b>	15 - 35 V DC 12 - 30 V DC
<b>Current consumption</b> @ 24 V DC and 15 s measurement interval <b>20 mA current output</b> <b>RS485 interface and voltage output</b>	37 mA 17 mA
<b>Peak current, max.</b>	200 mA
<b>Electrical connection</b>	M12x1 5 poles, stainless steel 1.4404
<b>Filter</b>	PTFE (Polytetrafluoroethylene), UL94 V-0 approved
<b>Storage conditions</b>	-40...+60 °C (-40...+140 °F) 700...1 100 mbar (10.15...15.95 psi) 0...95 %RH, non-condensing
<b>Enclosure material</b>	Stainless steel 1.4404 PET (Polyethyleneterephthalate), UL94HB approved
<b>Protection rating</b> probe body	IP65
<b>Electromagnetic compatibility</b>	EN 61326-1      EN 61326-2-3      Industrial environment FCC Part15 Class A      ICES-003 Class A
<b>Conformity</b>	 

# 10 Conformity

## 10.1 Declarations of Conformity

E+E Elektronik Ges.m.b.H. hereby declares that the product complies with the respective regulations listed below:



European directives and standards.

and



UK statutory instruments and designated standards.

Please refer to the product page at [www.epluse.com/ee872](http://www.epluse.com/ee872) for the Declarations of Conformity.

## 10.2 Electromagnetic Compatibility

EMC for industrial / basic environment.

Our sensors are group 1 devices and correspond to class A.

### **WARNING**

This device is not intended for use in residential areas and cannot ensure adequate protection of radio reception in such environments.

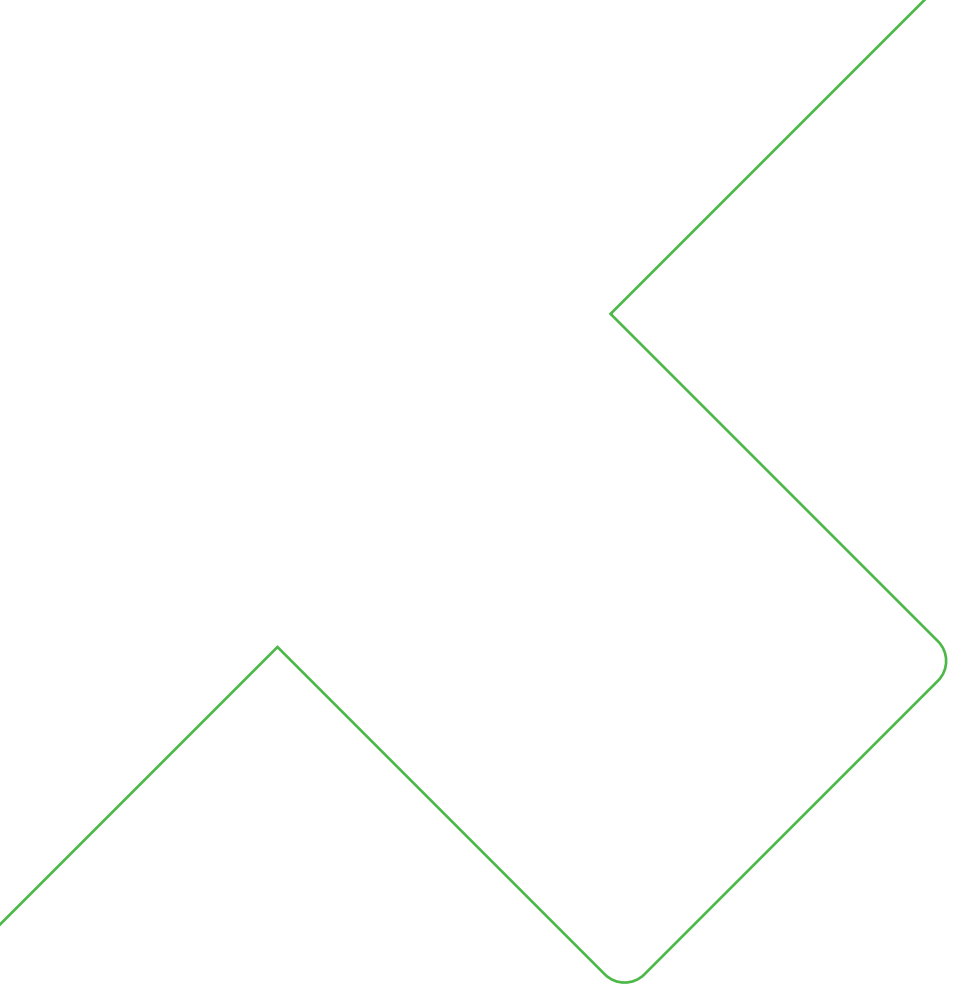
## 10.3 FCC Part 15 Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## 10.4 ICES-003 Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.



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