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# Datasheet EE872

## Modular Probe for $CO_2$, Humidity, Temperature and Ambient Pressure



Modbus

www.epluse.com

# EE872

## Modular Probe for $CO_2$, Humidity, Temperature and Ambient Pressure

The EE872 probe, with a $CO_2$ measurement range of up to 5 % (50 000 ppm), is designed for use in harsh and demanding environments such as agricultural facilities, lifestock barns, hatchers, incubators, greenhouses and outdoor areas.

### Outstanding Accuracy

A multi-point $CO_2$ and temperature adjustment procedure ensures excellent $CO_2$ measurement accuracy across the entire temperature working range of -40…+60 °C (-40…+140 °F), making the EE872 ideal for agricultural and outdoor applications.

### Long-Term Stability

The EE872 utilises the E+E dual-wavelength NDIR $CO_2$ sensor, which automatically compensates for ageing effects and offers exeptional resistance to contamination. The relative humidity sensing element, featuring E+E's proprietary coating, ensures reliable performance even in aggressive or corrosive environments.

### Pressure and Temperature Compensation

Active compensation with on-board sensors ensures highly accurate $CO_2$ measurements, regardless of weather conditions, altitude or temperature variations.

### 4-in-1

In addition to $CO_2$, the EE872 also measures relative humidity (RH), temperature (T) and ambient pressure (p). The probe further calculates the dew point temperature (Td), providing a comprehensive set of environmental parameters in a single probe.

### Reliable in Harsh and Condensing Environment

The heated version of the EE872 is designed for operation in areas with high humidity and condensation. Its robust IP65 enclosure and replaceable filter provide excellent protection in polluted or dust-laden environments. With a special filter, the EE872 is also suitable for applications requiring periodic $H_2O_2$ sterilisation.

### Analogue Output or RS485 Interface

The $CO_2$ measured data is simultaneously available as voltage and current signals at the analogue outputs. Depending on the model, the EE872 with RS485 interface and Modbus RTU additionally supplies values for RH, T, p and Td.

### Configurable and Adjustable

The free PCS10 Product Configuration Software used together with an optional adapter cable enables straightforward configuration and adjustment of the EE872.



PET probe (Polyethyleneterephthalate) with PTFE filter (Polytetrafluoroethylene)



Stainless steel probe with $H_2O_2$ filter



PET probe with PTFE-membrane filter cap



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# Features

**Interchangeable Sensing Module**

- E+E dual wavelength NDIR, auto-calibration
- T and p compensation with on-board sensors
- Heated versions for preventing condensation
- RH sensing element protected by E+E sensor coating
- T range -40…+60 °C (-40…+140 °F)
- Configurable and adjustable

**Filter Cap**

- PTFE
- Catalytic for $H_2O_2$ sterilisation
- PTFE membrane
- Replaceable



**Supply and Output Module**

- $CO_2$ voltage and current output
- Modbus RTU ($CO_2$, T, RH, p, Td)
- IP65 protection rating
- Stainless steel or plastic enclosure
- M12 stainless steel connector
- User configurable

**Test Report**

According to DIN EN 10204-2.2



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# Features

## Protective Sensor Coating

The E+E proprietary sensor coating is a protective layer applied to the active surface of the sensing element. The coating substantially extends sensor lifetime and ensures optimal measurement performance in corrosive environment (salts, off-shore applications). Additionally, it improves the sensors' long term stability in dusty, dirty or oily applications by preventing stray impedance caused by deposits on the active sensor surface.

## Device Protection During Site Cleaning

If the probe remains on the measuring site during cleaning operations, the optional calibration adapter can be used for protection. For this purpose, both nipples are closed with the rubber caps supplied. In case the probe is removed from the site, it is recommended to apply the protection caps for the M12 cable socket and the EE872 M12 plug.

## E+E Modular Sensor Platform

The EE872 is compatible with the Sigma 05 host device of the E+E Modular Sensor Platform. Together they become a versatile, plug-and-play $CO_2$/RH/T/p modular sensor with analogue outputs and optional display. Besides EE872, Sigma 05 accommodates also other E+E intelligent sensing probes. See www.epluse.com/sigma05 for further details.




Sigma 05 with EE872

## Accredited Traceable Calibration Certificate

Internationally recognised certificates for the calibration of measuring instruments from accredited laboratories document the traceability of the measurements to the International System of Units (SI). The E+E Elektronik calibration laboratory offers two levels of traceable calibrations.

- As a Designated Institute (DI) of the Republic of Austria, the E+E calibration laboratory maintains Austria's national measurement standards for humidity, dew point temperature, air velocity and $CO_2$. This authorises the E+E calibration laboratory to issue calibration certificates at the level of a National Metrological Institute (NMI).
- The E+E calibration laboratory is accredited by Akkreditierung Austria in accordance with DIN EN ISO/IEC 17025 with the identification number 0608. This allows the laboratory to issue ISO 17025 certificates for the measurands humidity, temperature, dew point temperature, air velocity, flow, pressure and $CO_2$.

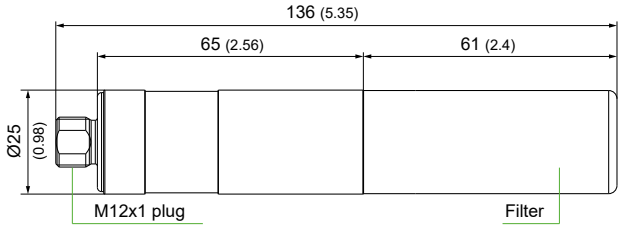
Visit www.eplusecal.com for detailed information on calibration and to enquire a certificate of accredited traceable calibration for the EE872 from the Designated Institute.



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# Dimensions

Values in mm (inch)




# Technical Data

## Measurands

### $CO_2$

| | | | |
|---|---|---|---|
| **Measurement principle** | Dual wavelength non-dispersive infrared technology (NDIR) | | |
| **Measuring range** | 0...2 000 ppm / 5 000 ppm / 10 000 ppm / 3 % / 5 % | | |
| **Accuracy**[1)]<br>@ 25 °C (77 °F) and 1 013 mbar (14.7 psi)<br>**0...2 000 ppm**<br>**0...5 000 ppm**<br>**0...10 000 ppm**<br>**0...3 %**<br>**0...5 %** | <br><br><±(40 ppm + 1.8 % of mv)<br><±(40 ppm + 2.2 % of mv)<br><±(70 ppm + 2.5 % of mv)<br><±(450 ppm + 1.8 % of mv)<br><±(750 ppm + 1.8 % of mv) | | <br><br><br><br><br>mv = measured value |
| **Factory calibration uncertainty**[1)]<br>@ 25 °C (77 °F) **0...2 000 / 5 000 / 10 000 ppm**<br>**0...3 % / 0...5 %** | <br>±2.6 % of mv, min ±20 ppm<br>±0.38 % of mv, min ±60 ppm | | <br><br>mv = measured value |
| **Temperature dependency**<br>in the range of -20...+45 °C (-4...+113 °F)<br>**0...2 000 / 5 000 / 10 000 ppm**<br>**0...3 % / 0...5 %** | <br>±(1 + mv / 1 000) ppm/°C<br>-0.3 % of mv/°C | <br>±0.556*(1 + mv / 1 000) ppm/°F<br>-0.167 % mv/°F | <br><br>mv = measured value |
| **Residual pressure dependency**[2)]<br>in the range of -20...+45 °C (-4...+113 °F),<br>related to 1 013 mbar (14.7 psi) | 0.014 % of mv/mbar | 0.965 % of mv/psi | mv = measured value |
| **Long-term stability**, typ.<br>@ 0 ppm $CO_2$ | ±20 ppm/year | | |
| **Response time $t_{63}$**, typ.[3)] | 90 s[4)] | | |
| **Measuring interval** | 15 s (user adjustable from 15 s to 1 h) | | |

1) Defined with a coverage factor k=2, corresponding to a confidence level of 95 %.
2) Pressure dependency of a sensor without pressure correction: 0.14 % of mv/mbar.
3) With data averaging algorithm for smooth output signal. Faster response time available on request.
4) With PTFE standard filter cap.


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# Technical Data

## Measurands

### Relative Humidity (RH)

| | |
|---|---|
| **Measuring range** | |
| **Heating enabled** | 0...100 %RH |
| **Heating disabled** | 0…95 %RH (non-condensing) |
| **Accuracy**[1)] @ 25 °C (77 °F) | |
| **20...80 %RH** | ±3 %RH |
| **0...95 %RH** | ±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)

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

### Temperature (T)

| | |
|---|---|
| **Measuring range** | -40...+60 °C (-40...+140 °F) |
| **Accuracy**, typ.[1)] 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 parameters** | | Unit |
|---|---|---|
| **Dew point temperature** | Td | °C |
| | | °F |
| | | °K |

## Outputs

### Analogue

| | | | |
|---|---|---|---|
| **$CO_2$** | 0 – 5 V / 0 – 10 V | 0 < $I_L$ < 1 mA | $I_L$ = load current |
| | 0 – 20 mA / 4 – 20 mA (3-wire) | $R_L$ ≤ 500 Ω | $R_L$ = load resistance |

### Digital

| | |
|---|---|
| **Digital interface** | RS485 (EE872 = 1/10 unit load) |
| **Protocol** | Modbus RTU |
| **Factory settings**[1)] | Baud rate acc. to order code, parity even, 1 stop bit, Modbus address 237 |
| **Supported Baud rates** | 9 600, 19 200 and 38 400 |
| **Measured data types** | FLOAT32 and INT16 |

1) More details about communication setting and the Modbus map: See User Manual and Modbus Application Note at www.epluse.com/ee872.

# Technical Data

## General

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



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# Ordering Guide

## Probe

| | Feature | Description | | Code | |
|---|---|---|---|---|---|
| | | | | EE872- | |
| Hardware Configuration | Model | $CO_2$ (default: heated) | | M10 | |
| | | $CO_2$ + T + RH + p (default: not heated) | | | M13 |
| | $CO_2$ measuring range | 0...2 000 ppm | | HV1 | |
| | | 0...5 000 ppm | | HV2 | |
| | | 0...10 000 ppm | | HV3 | |
| | | 0...3 % (30 000 ppm) | | HV5 | |
| | | 0...5 % (50 000 ppm) | | HV6 | |
| | Probe material | PET (Polyethyleneterephtalate) | | No code | |
| | | Stainless steel | | PM2 | |
| | Filter | PTFE (Polytetrafluoroethylene) | | No code | |
| | | Catalytic for $H_2O_2$ sterilisation | | F12 | |
| | | PTFE (Polytetrafluoroethylene) membrane | | F21 | |
| Software Setup | Output | Output 1: 0 – 10 V | Output 2: 4 – 20 mA | GA7 | |
| | | Output 1: 0 – 5 V | Output 2: 0 – 20 mA | GA11 | |
| | | Modbus RTU | | P1 | P1 |
| | Baud rate | 9 600 | | No code | |
| | | 19 200 | | BD6 | |
| | | 38 400 | | BD7 | |
| | Accredited Traceable Calibration Certificate in accordance with DIN EN ISO/IEC 17025 | | | see www.eplusecal.com | |

## Sensing Module (Spare Part)

| | Feature | Description | Code |
|---|---|---|---|
| | | | EE872S- |
| Hardware Configuration | Model | $CO_2$ (default: heated) | M10 |
| | | $CO_2$ + T + RH + p (default: not heated) | M13 |
| | $CO_2$ range[1)] | 0...2 000 ppm | HV1 |
| | | 0...5 000 ppm | HV2 |
| | | 0...10 000 ppm | HV3 |
| | | 0...3 % (30 000 ppm) | HV5 |
| | | 0...5 % (50 000 ppm) | HV6 |

1) The sensing module's $CO_2$ range must match that of the originally ordered EE872 probe.



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# Order Examples

### Sensor EE872-M10HV1GA7

| Feature | Code | Description |
|---|---|---|
| **Model** | **M10** | $CO_2$ |
| **$CO_2$ range** | **HV1** | 0...2 000 ppm |
| **Probe material** | **No code** | PET (Polyethyleneterephtalate) |
| **Filter** | **No code** | PTFE (Polytetrafluoroethylene) |
| **Output signal** | **GA7** | Output 1: 0 – 10 V<br>Output 2: 4 – 20 mA |

### Sensor EE872-M13HV6PM2F12P1

| Feature | Code | Beschreibung |
|---|---|---|
| **Modell** | **M13** | $CO_2$ + T + RH + p |
| **$CO_2$ range** | **HV6** | 0...5 % |
| **Probe material** | **PM2** | Stainless steel |
| **Filter** | **F12** | Catalytic for $H_2O_2$ sterilisation |
| **Protocol** | **P1** | Modbus RTU |
| **Baud rate** | **No code** | 9 600 |
| **Parity** | **No code** | Even |
| **Stop bit** | **No code** | 1 |

### Sensing Module EE872S-M10HV1

| Feature | Code | Beschreibung |
|---|---|---|
| **Model** | **M10** | $CO_2$ + T + RH + p |
| **$CO_2$ range** | **HV1** | 0...2 000 ppm |



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# Accessories

For further information see datasheet Accessories.

| Description | Code |
|---|---|
| **E+E Product Configuration Software**<br>(Free download from www.epluse.com/pcs10) | **PCS10** |
| **Stainless steel mounting flange, Ø25 mm (0.98")** | **HA010226** |
| **Wall mounting clip, Ø25 mm (0.98")** | **HA010227** |
| **Radiation shield** | **HA010510** |
| **Flange socket, M12x1 ↔ 50 mm (1.97") stranded wire, 5 poles, M16x1 screw-in thread** | **HA010705** |
| **Modbus configuration adapter, M12 4 poles ↔ USB** | **HA011018** |
| **Sensor connection cable, shielded, 5 poles, M12x1 socket ↔ wire ferrules**<br>**1.5 m (4.9 ft)**<br>**5 m (16.4 ft)**<br>**10 m (32.8 ft)** | <br>**HA010819**<br>**HA010820**<br>**HA010821** |
| **Y-style splitter, M12x1, 1 plug ↔ 2 sockets, 5 poles** | **HA030204** |
| **Connector, M12x1 socket, 5 poles, for self assembly** | **HA010708** |
| **Protection cap / calibration adapter** | **HA010785** |
| **Protection cap for M12 socket** | **HA010781** |
| **Protection cap for M12 plug** | **HA010782** |



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