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technology.

# Datasheet EE431

## Duct and Immersion Temperature Sensor


Modbus

BACnet

# EE431

## Duct and Immersion Temperature Sensor

The EE431 duct and immersion sensor reliably measures the temperature (T) in air and liquids and is optimized for building automation, HVAC and process control.

### Analogue, Digital and Passive Outputs

The measured data of the temperature is available at the voltage or current output, as well as on the RS485 interface with Modbus RTU or BACnet MS/TP protocol. In addition, EE431 features a wide choice of sensing elements for passive T measurement. An optional display is available for the EE431 with analog output.

### Easy Installation

The device can be mounted either with the plastic mounting flange or via external mounting holes at the enclosure. The innovative immersion well is dedicated for measurement in liquids and allows for fast and safe replacement of the sensor. The EE431 with RS485 interface is appropriate for daisy chain wiring.

### Configurable and Adjustable

An optional adapter and the free Product Configuration Software facilitate the setup and adjustment of the EE431.

EE431 temperature sensor with immersion well

EE431 temperature sensor with mounting flange

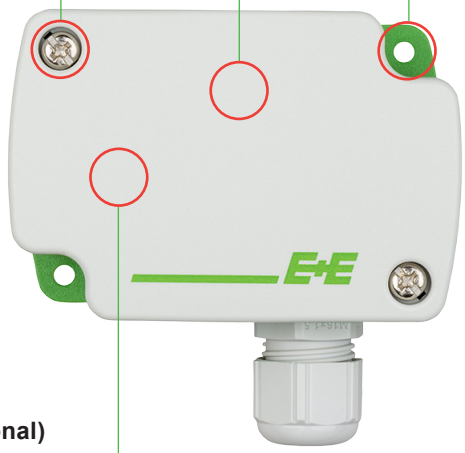

EE431 temperature sensor with display

# Features

**Enclosure**
- Protection rating: IP65 / Nema 4X
- Polycarbonate (PC)

**External mounting holes**
- Mounting with closed cover
- Protection against construction site pollution
- Easy and fast mounting

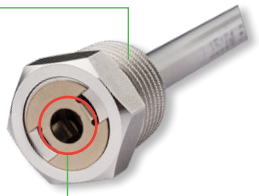
**Bayonet screws**
- Open / close with a ¼ rotation

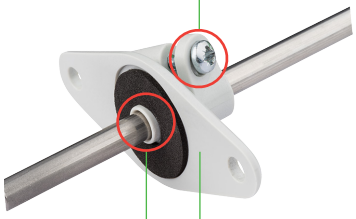


**LC display (optional)**
- 38 x 20 mm (1.5 x 0.8")

**Screw clamp**
- No direct screwing onto probe
- Inclined screw for easy installation

**Immersion well**





**Mounting flange**

**Innovative mounting spring**
- For securing the probe inside the well
- No fastening screw, no tools required

**Special sealing**
- Foam gasket for good tightness
- No scratching of probe due to alignment notch

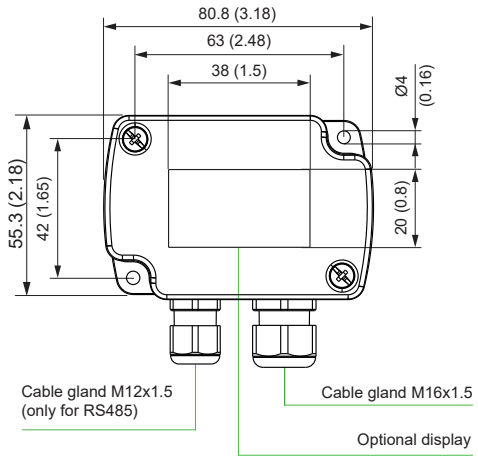
**Test report**

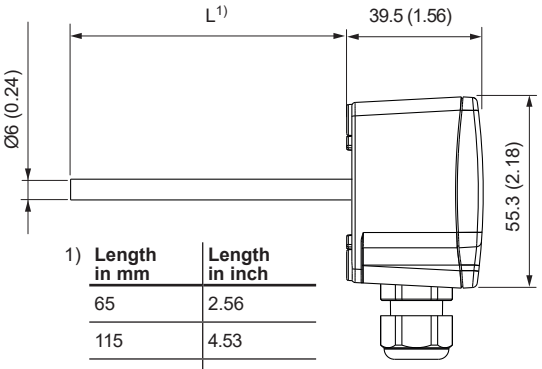
According to DIN EN 10204-2.2

# Dimensions

Values in mm (inch)

### Temperature sensor

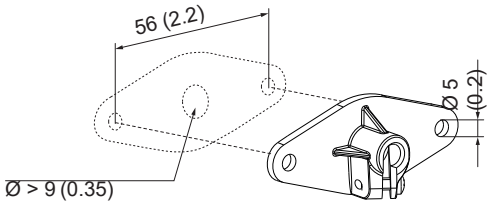


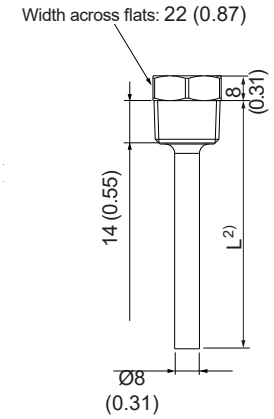

| 1) | Length in mm | Length in inch |
|---|---|---|
| | 65 | 2.56 |
| | 115 | 4.53 |
| | 150 | 5.91 |
| | 300 | 11.81 |

### Mounting accessories

Mounting flange
(not included in the scope of supply)




Immersion well
(not included in the scope of supply)




| 2) | Length in mm | Length in inch |
|---|---|---|
| | 50 | 1.97 |
| | 100 | 3.94 |
| | 135 | 5.31 |
| | 285 | 11.22 |

# Technical Data

## Measurands

### Temperature (T) - Active

| | |
|---|---|
| **Measuring range** **Duct sensor (probe tip)** | -40 °C…+110 °C (-40...+230 °F) |
| **With immersion well (probe tip)** | -40 °C…+130 °C (-40...+266 °F) |
| **Accuracy** @ 20 °C (68 °F) | |
| | ±0.25 °C (0.36 °F) |
| **Optional for analogue output** | ±0.1 °C (±0.18 °F)[1)] |

1) Uncertainty of factory calibration at 20 °C ±0.1 °C (68 °F ±0.18 °F).

### Temperature (T) - Passive

| | | | | |
|---|---|---|---|---|
| **Measuring range** | | | | |
| **Duct sensor** | | -40 °C…+110 °C (-40...+230 °F) | | |
| **Immersion Sensor with Pt and Ni T sensor** | | -40 °C…+150 °C (-40...+302 °F) | | |
| **Sensor type** | | **Nominal resistance** | **Sensitivity** | **Standard** |
| | **Pt100 DIN B** | $R_0$: 100 Ω | TC: 3.850 x $10^{-3}$/°C | DIN EN 60751 |
| | **Pt1000 DIN B** | $R_0$: 1000 Ω | TC: 3.850 x $10^{-3}$/°C | DIN EN 60751 |
| | **NTC10k B3950** | $R_{25}$: 10 kΩ ±0.5 % | $B_{25/85}$: 3989 K ($B_{25/50}$: 3950 K ± 1.0 %) | - |
| | **NTC20k B4286** | $R_{25}$: 20 kΩ ± 0.2 °C | $B_{25/85}$: 4286 K ($B_{25/85}$: 4286 K ± 1.0 %) | - |
| | **Ni1000 TK6180 DIN B** | $R_0$: 1000 Ω | TC: 6180 ppm/K | DIN 43760 |
| | **Ni1000 TK5000 DIN B** | $R_0$: 1000 Ω | TC: 5000 ppm/K | DIN 43760 |

## Outputs

### Analogue

| | | | |
|---|---|---|---|
| **Analogue output** | 0 - 10 V | -1 mA < $I_L$ < 1 mA | $I_L$ = load current |
| | 4 - 20 mA (2-wire) | $R_L$≤ 500 Ω | $R_L$ = load resistance |

### Digital

| | |
|---|---|
| **Digital interface** | RS485 (EE431 = 1 Unit Load) |
| **Protocol** | Modbus RTU |
| **Factory settings** | Baud rate see order information, data bits 8, parity even, 1 stop bit, Modbus address 66 |
| **Supported Baud rates** | 9600, 19200 und 38400 |
| **Measured data types** | FLOAT32 and INT16 |
| **Protocol** | BACnet MS/TP |
| **Factory settings** | Baud rate see order information, data bits 8, parity none, 1 stop bit, BACnet address 66 |
| **Supported Baud rates** | 9600, 19200, 38400, 57600, 76800 und 115200 |

### T Sensor Passive

| | |
|---|---|
| **Sensor connection** | 2-wire connection |
| **Measuring current,** typ. | < 1 mA (according to technical data of the specific T sensing element) |

# Technical Data

## General

| | | | | | |
|---|---|---|---|---|---|
| **Power supply** class III<br>USA & Canada: Class 2 supply necessary, max. voltage 30 V DC<br>**for output RS485 and 0 - 10 V**<br>**for output 4 - 20 mA** | | 15 - 35 V DC or 24 V AC ±20 %<br>10 V DC + $R_L$ x 20 mA < V+ < 35 V DC | | | $R_L$ = load resistance |
| **Current consumption,** @ 24 V | **Voltage output** | DC supply max. 0.8mA<br>AC supply max. 4.6 $mA_{rms}$ | with display max. 1.7 mA<br>with display max. 7 $mA_{rms}$ | | |
| | **Current output** | According to output current | According to output current | | |
| | **Digital interface** | DC supply typ. 3.5 mA<br>AC supply typ. 12 $mA_{rms}$ | | | |
| **Electrical connection** | | Screw terminals max. 2.5 $mm^2$ (AWG14) | | | |
| **Cable glands** | | M16x1.5 / M12x1.5 / UL94 V-2 | | | |
| **Insulation resistance (probe)**<br>@20 °C (68 °F) | | >100 MΩ | | | |
| **LC-display** | | Available for output A3 and A6<br>1 line, switchable between °C / °F or according to order code<br>Without backlight<br>Visible area 38 mm x 20 mm (1.5" x 0.8") | | | |
| **Response time $t_{63}$**<br>**Duct sensor at 3 m/s (590 ft/min) air velocity**<br>**Immersion sensor in liquid water bath** | | <1 min<br><30 s | | | |
| **Humidity working range** | | 5…95 %RH, non-condensing | | | |
| **Temperature working range** | | **Duct sensor (probe tip)** | **With immersion well (probe tip) Active** | **With immersion well (probe tip) Passive** | **Electronics without Display** | **Electronics with Display** |
| | | -40…+110 °C (-40...+230 °F) | -40…+130 °C (-40...+266 °F) | -40 °C…+150 °C (-40...+302 °F) | -40…+70 °C (-40...+158 °F) | -20...+50 °C (-4...+122 °F) |
| **Storage conditions**<br>**Without display**<br>**With display** | | -30…+70 °C (-22...+158 °F)<br>5…95 %RH, non-condensing<br>-20...+50 °C (-4...+122 °F)<br>5…95 %RH, non-condensing | | | | |
| **Probe material** | | Stainless steel (1.4571 / 316Ti) | | | | |
| **Enclosure**<br>**Material**<br>**Protection rating** | | Polycarbonate (PC), UL94 V-0 approved<br>IP65 / NEMA 4X | | | | |
| **Electromagnetic compatibility** | | EN 61326-1<br>FCC Part15 Class B | EN 61326-2-3<br>ICES-003 Class B | Industrial environment | | |
| **Conformity** | | CE UKCA | | | | |
| **Configuration and adjustment**<br>**For display and 0 - 10 V version**<br>**For digital and 4 - 20 mA version without display** | | | | | | |

# Technical Data

## Mounting Accessories

### Immersion Well

| | | | | | |
|---|---|---|---|---|---|
| **Material** | | Brass (nickel-plated)<br>Stainless steel (1.4404 / 316L; tube: 1.4571 / 316Ti) | | | |
| **Pressure rating** | **Brass**<br>**Stainless steel** | PN 15 bar (218 psi)<br>PN 25 bar (363 psi) | | | |
| **Max. flow speed** | | | | | |
| | | **50 mm (1.97")** | **100 mm (3.94")** | **135 mm (5.31")** | **285 mm (11.22")** |
| | **Brass** | 26 m/s (5 118 ft/min) | 12 m/s (2 362 ft/min) | 6 m/s (1 181 ft/min) | 1 m/s (197 ft/min) |
| | **Stainless steel** | 29 m/s (5 708 ft/min) | 15 m/s (2 953 ft/min) | 9 m/s (1 771 ft/min) | 2 m/s (394 ft/min) |

# Ordering Guide

| | Feature | Description | Code | | |
|---|---|---|---|---|---|
| | | | EE431- | | |
| Hardware Configuration | **Model** | Active | M3 | | |
| | | Passive | | | M7 |
| | **Output** | 0 - 10 V | A3 | | |
| | | 4 - 20 mA | A6 | | |
| | | RS485 | | J3 | |
| | **T sensor passive**[1] (R-T-characteristics see www.epluse.com/ee431) | Pt100 DIN B | | | TP2 |
| | | Pt1000 DIN B | | | TP4 |
| | | NTC 20k, B4286 | | | TP6 |
| | | Ni1000, TK6180 DIN B | | | TP9 |
| | | NTC 10k, B3950 | | | TP11 |
| | | Ni1000, TK5000 DIN B | | | TP19 |
| | **Probe length** | 65 mm (2.56") | L65 | | |
| | | 115 mm (4.53") | L115 | | |
| | | 150 mm (5.91") | L150 | | |
| | | 300 mm (11.81") | L300 | | |
| | **Accuracy** | ±0.25 °C | No code | | |
| | | ±0.1 °C[2] | TT2 | | |
| | **Display** | Without display | No code | | |
| | | Display | D1 | | |
| Software Setup - Outputs | **Output (T) measurand** | Temperature [°C] | No code | | |
| | | Temperature [°F] | MA2 | | |
| | **Output (T) scaling low** | 0 | No code | | |
| | | Value (within the working range) | SAL*Value* | | |
| | **Output (T) scaling high** | 50 | No code | | |
| | | Value (within the working range) | SAH*Value* | | |
| | **Protocol** | Modbus RTU[3] | | P1 | |
| | | BACnet MS/TP[4] | | P3 | |
| | **Baud rate** | 9 600 | | BD5 | |
| | | 19 200 | | BD6 | |
| | | 38 400 | | BD7 | |
| | | 57 600 (for BACnet only) | | BD8 | |
| | | 76 800 (for BACnet only) | | BD9 | |
| | | 115 200 (for BACnet only) | | BD10 | |

1) Other passive sensor types are available on request from a minimum order quantity of 500 pcs.
2) Uncertainty of factory calibration at 20°C ±0.1°C.
3) Factory settings: Parity even, stop bit 1. Modbus Map and communication setting: see User Guide and Modbus Application Note

# Order Examples

## EE431-M3J3L300P3BD7

| Feature | Code | Description |
|---|---|---|
| **Model** | **M3** | Active |
| **Output** | **J3** | RS485 |
| **Probe length** | **L300** | 300 mm (11.81") |
| **Protocol** | **P3** | BACnet MS/TP |
| **Baud rate** | **BD7** | 38 400 |

## EE431-M3A3L115TT2D1

| Feature | Code | Description |
|---|---|---|
| **Model** | **M3** | Active |
| **Output** | **A3** | 0 - 10 V |
| **Probe length** | **L115** | 115 mm (4.53") |
| **Accuracy** | **TT2** | ±0.1 °C (Uncertainty of factory calibration at 20°C ±0.1°C) |
| **Display** | **D1** | Display |

## EE431-M7TP11L65

| Feature | Code | Description |
|---|---|---|
| **Model** | **M7** | Passive |
| **T sensor passive** | **TP11** | NTC 10k, B3950 |
| **Probe length** | **L65** | 65 mm (2.56") |

# Accessories

For further information see datasheet Accessories.

| Description | | Code | | | |
|---|---|---|---|---|---|
| **Product configuration adapter for 4 - 20 mA version without display** | | **See datasheet EE-PCA** | | | |
| **Configuration adapter for display and 0 - 10 V versions without display** | | **HA011023** | | | |
| **USB configuration adapter for digital output** | | **HA011066** | | | |
| **E+E Product Configuration Software for digital output and for 4 - 20 mA version without display** (Free download: www.epluse.com/configurator) | | **EE-PCS** | | | |
| **E+E Product Configuration Software** (Free download: www.epluse.com/pcs10) **for display and 0 - 10 V versions without display** | | **PCS10** | | | |
| **Power supply adapter for digital output** | | **V03** | | | |
| **Conduit Adapter, M16x1.5 auf 1/2"** | | **HA011110** | | | |
| **Mounting flange** | | **HA401101** | | | |
| **Immersion well - thread R ½" ISO** | **Length in mm (inch)** | **50 (1.97")** | **100 (3.94")** | **135 (5.31")** | **285 (11.22")** |
| | **Brass** | **HA400101** | **HA400104** | **HA400102** | **HA400103** |
| | **Stainless steel** | **HA400201** | **HA400204** | **HA400202** | **HA400203** |
| **Immersion well - thread ½" NPT** | **Length in mm (inch)** | **50 (1.97")** | **100 (3.94")** | **135 (5.31")** | **285 (11.22")** |
| | **Brass** | **HA400111** | **HA400114** | **HA400112** | **HA400113** |
| | **Stainless steel** | **HA400211** | **HA400214** | **HA400212** | **HA400213** |