

HLX310

High-End Humidity and Temperature Transmitter for Demanding Process Control

HLX310 is optimized for reliable measurement in demanding industrial applications. In addition to highly accurate measurement of relative humidity (RH) and temperature (T), the transmitter also calculates parameters such as dew point, absolute humidity and mixing ratio.

Various models are available including wall, duct and remote probe. The remote probe can be used up to 180 °C (356 °F) and the pressure tight probe up to 20 bar (290 psi). The design of the enclosure facilitates easy mounting and maintenance. HLX310 is available with IP65 polycarbonate or stainless steel enclosure.

The measured data is available on two analogue outputs and on the optional digital interface RS485 with Modbus RTU or Ethernet with Modbus TCP.

The state of the art TFT colour display shows up to four measurands simultaneously and offers extensive error diagnostics. The integrated data logging function saves all measured and calculated values to the internal memory. The data can be displayed as graph directly on the device or easily downloaded via USB interface.

The proprietary coating protects the sensor elements against corrosive and electrically conductive pollution.

The outputs can be freely configured and an adjustment performed directly via display or with the free EE-PCS software using the USB service interface.



HLX310

Typical applications

- industrial process monitoring and control
- food and pharmaceutical industry
- dryers and humidifiers
- climate and test chambers

Features

3.5" TFT Colour Display

- » shows up to 4 measurands simultaneously
- » layout and measurands freely selectable
- » integrated data logger for 20.000 values per measurand
- » logged values shown in graph
- » error diagnostics
- » intuitive device setup with push buttons

Enclosure

- » easy mounting
- » two part housing allows easy unit replacement
- » IP65 protection class
- » polycarbonate UL94-V0 approved or stainless steel
- » screws secured in cover

Outputs

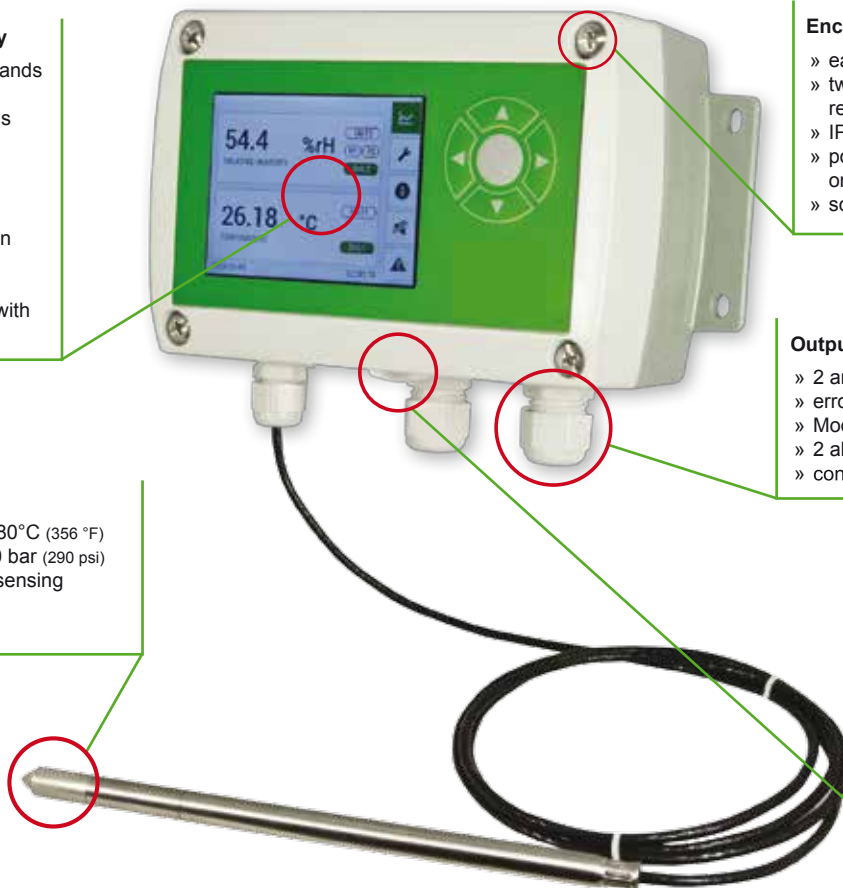
- » 2 analogue outputs current / voltage
- » error indication
- » Modbus RTU / Modbus TCP
- » 2 alarm outputs
- » configurable via display or software

Probe

- » working range up to 180°C (356 °F)
- » pressure tight up to 20 bar (290 psi)
- » protective coating for sensing elements
- » pluggable probe

USB Service Interface

- » download logged data
- » perform configuration, adjustment and firmware update
- » 4 status LEDs



TFT colour display with integrated data logger (option D2)



Settings

- » analogue, digital and alarm outputs setup
- » one and two point adjustment for RH and T
- » probe replacement (for pluggable probe)
- » password protection for all relevant settings

Error Diagnostics

- » error self-diagnosis
- » error description
- » auditive and visual error warnings

Data logger

- » 20.000 values saved per measurand
- » selectable sampling rates
- » view recorded data as graph
- » download data via USB port and EE-PCS software



Protective sensor coating (option C1)

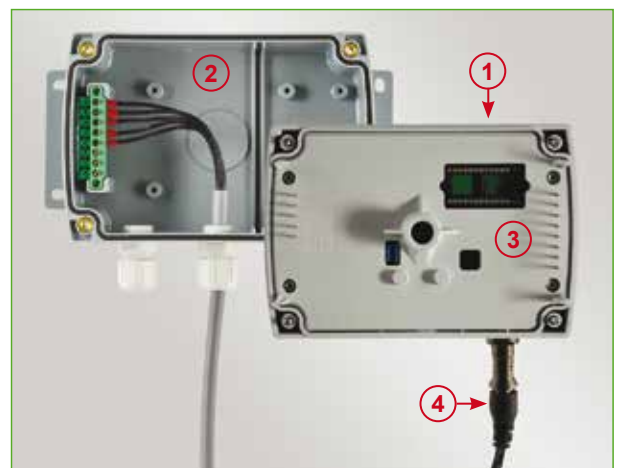
The E+E proprietary sensor coating is a protective layer applied to the active surface and leads of the sensing elements. The coating substantially extends the lifetime and the measurement performance of the E+E sensor in corrosive environment (salts, off-shore applications). Additionally, it improves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

Modular enclosure / Pluggable probe (option PC4)

The upper part of the transmitter (1), which accommodates the electronics and the probe, can be plugged off for service or adjustment and can be replaced within seconds. This allows for the bottom part (2) to remain mounted and with intact cabling.

A polycarbonate cover (3) on the inside of the housing protects the electronics during installation or service.

The remote probe models are also available with a pluggable probe (4) which can be easily exchanged by a push-pull plug. It is ideal for installation of long probe cables and in applications that might require periodical probe replacements.



Modbus RTU (Option J3) and Modbus TCP (Option J4)

Additional to the analogue outputs, HLX310 offers optionally a digital interface, either RS485 with Modbus RTU or Ethernet with Modbus TCP. The RS485 and Ethernet modules are available also for upgrading existing HLX310.

The Ethernet interface features power over Ethernet (PoE) and RJ45 connector with IP65 protection class. It is available for EE310 duct mount and with remote probe (types T2, T5 and T10). Type T5 with 0.5 m (1.6 ft) probe cable can be employed in wall mount applications by fixing the sensing probe onto the wall with the mounting bracket HA010211.



RS485 - Modbus RTU



Ethernet - Modbus TCP

Modbus Map

| Register [DEC] | Protocol address [HEX] | Measured value | Unit | Type |
|--|------------------------|-------------------------------------|--------------------|----------------|
| Read registers: function code 0x03 / 0x04 | | | | |
| 31021 | 3FC | Relative humidity | % | 32-bit float |
| 31003 | 3EA | Temperature | °C | 32-bit float |
| 31005 | 3EC | Temperature | °F | 32-bit float |
| 31105 | 450 | Dew point temperature | °C | 32-bit float |
| 31107 | 452 | Dew point temperature | °F | 32-bit float |
| 31131 | 46A | Frost point / Dew point temperature | °C | 32-bit float |
| 31133 | 46C | Frost point / Dew point temperature | °F | 32-bit float |
| 31113 | 458 | Absolute humidity | g/m ³ | 32-bit float |
| 31115 | 45A | Absolute humidity | gr/ft ³ | 32-bit float |
| 31121 | 460 | Mixing ratio | g/kg | 32-bit float |
| 31123 | 462 | Mixing ratio | gr/lb | 32-bit float |
| 31109 | 454 | Wet bulb temperature | °C | 32-bit float |
| 31111 | 456 | Wet bulb temperature | °F | 32-bit float |
| 31125 | 464 | Specific enthalpy | kJ/kg | 32-bit float |
| 31129 | 468 | Specific enthalpy | BTU/lb | 32-bit float |
| 31127 | 466 | Specific enthalpy | ft lbf/lb | 32-bit float |
| 31101 | 44C | Water vapour partial pressure | mbar | 32-bit float |
| 31103 | 44E | Water vapour partial pressure | psi | 32-bit float |
| 31151 | 47E | Volume concentration | ppm | 32-bit float |
| 35001 | 1388 | Air pressure | mbar | 32-bit float |
| Write registers: function code 0x06 for 16-bit and 0x10 (decimal: 16) for 32-bit | | | | |
| 0001 | 0 | Slave-ID | / | 16-bit integer |
| 5001 | 1388 | Air pressure | mbar | 32-bit float |

Alarm outputs (option AM2)

This optional module features two freely configurable relay outputs for control purposes. Various operation modes are available including hysteresis, window and error indication. When error indication is selected, a fault in the humidity or temperature measurement will trigger the alarm output. The measurands at the outputs as well as the thresholds and hysteresis can be set using the PCS software or directly on the device via display and push buttons.



100...240 V AC supply module (option AM3)

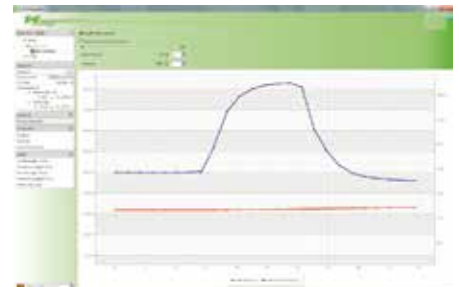
The back cover of HLX310 can accommodate the optional supply module for 100...240 V AC (50/60 Hz). With this option, the HLX310 features connectors instead of the cable glands for wiring. The matching cable connectors are included in the scope of supply.



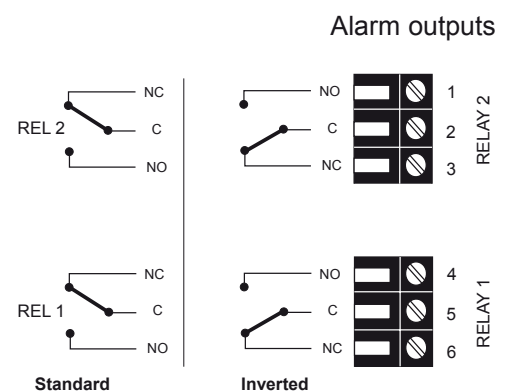
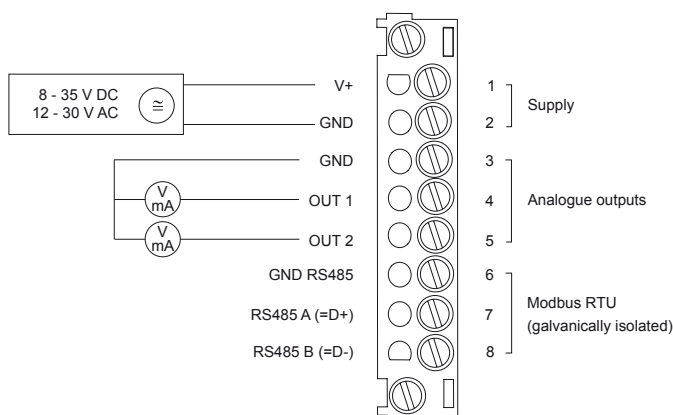
Product Configuration Software

EE-PCS is an intuitive software that allows the user to perform:

- flexible, easy and fast setup of the analogue and alarm outputs
- 1 or 2 point adjustment of humidity and temperature
- replacement of the pluggable sensing probe
- Modbus RTU communication setup
- setup of the display layout
- download logged data
- view error diagnosis information

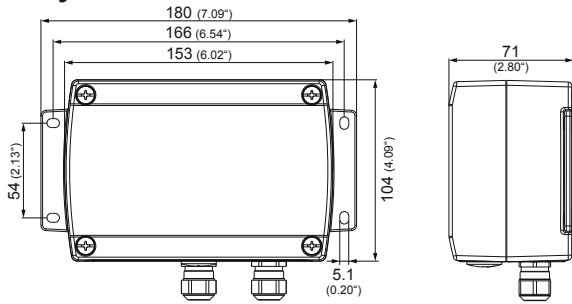


Connection diagram

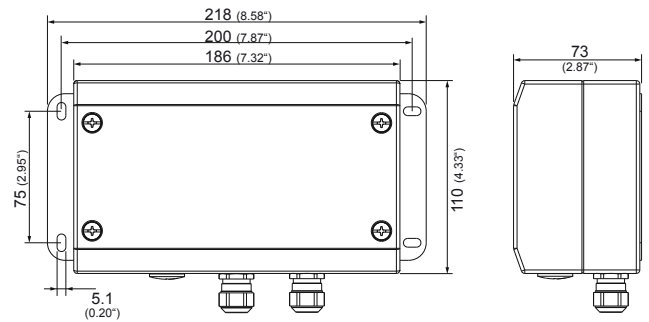


Dimensions (mm/inch)

Polycarbonate enclosure

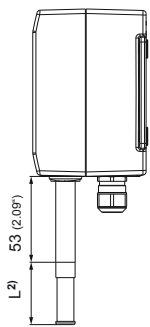


Stainless steel enclosure

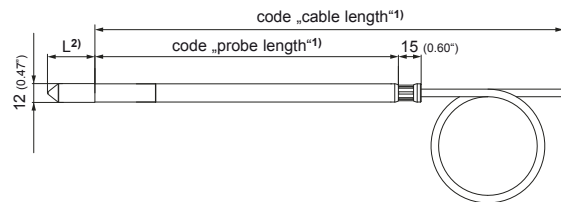


Models:

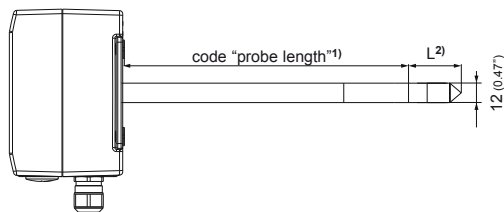
T1: Wall mount



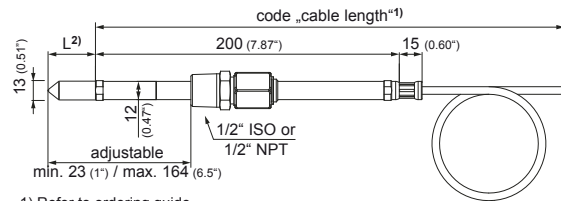
T5: Remote probe up to 180 °C (356 °F)



T2: Duct mount

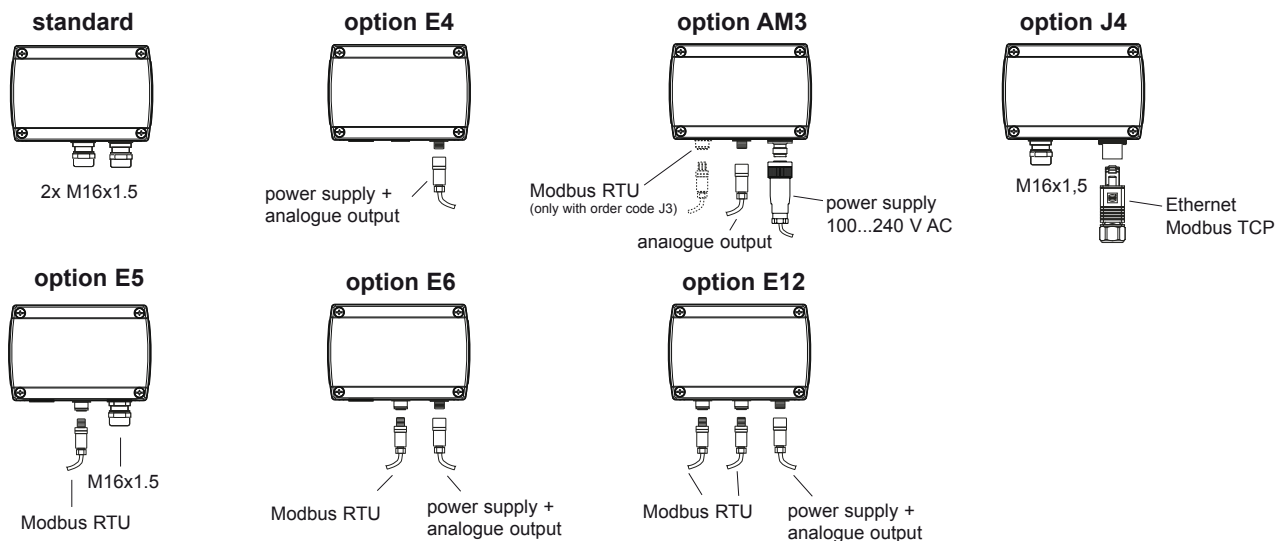


T10: Pressure tight probe up to 20 bar (300 psi)



- 1) Refer to ordering guide
- 2) L = filter length; refer to data sheet "Accessories"

Electrical connection



Mating plugs included in the scope of supply

Technical data

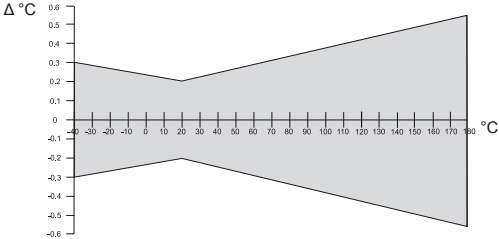
Measured values

Relative humidity (RH)

| | | |
|--|--|----------------------------|
| Sensor | HC1000-400 | |
| Working range ¹⁾ | 0...100 % RH | |
| Accuracy ²⁾ (incl. hysteresis, non-linearity and repeatability) | | |
| -15...40 °C (5...104 °F) RH ≤90 % | ± (1.3 + 0.3 % * mv) % RH | <i>mv = measured value</i> |
| -15...40 °C (5...104 °F) RH >90 % | ± 2.3 % RH | |
| -25...70 °C (-13...158 °F) | ± (1.4 + 1 % * mv) % RH | |
| -40...180 °C (-40...356 °F) | ± (1.5 + 1.5 % * mv) % RH | |
| Temperature dependence of electronics | typ. ± 0.01 % RH/°C (0.0055 %RH / °F) | |
| Response time | < 15 s with metal grid filter at 20 °C (68 °F) / t ₉₀ | |

Temperature (T)

| | | |
|-----------------------------|--|-----------------------------|
| Sensor | Pt1000 (Tolerance class A, DIN EN 60751) | |
| Working range sensing probe | T1, wall: | -40...60 °C (-40...140 °F) |
| | T2, duct: | -40...80 °C (-40...176 °F) |
| | T5, remote: | -40...180 °C (-40...356 °F) |
| | T10, pressure tight: | -40...180 °C (-40...356 °F) |



| | |
|----------|---|
| Accuracy |  |
|----------|---|

| | |
|---------------------------------------|--------------------|
| Temperature dependence of electronics | typ. ± 0.005 °C/°C |
|---------------------------------------|--------------------|

Outputs

| | | |
|--------------------------------|--|-------------------------------|
| Two analogue outputs | 0 - 1 / 5 / 10 V | -1 mA < I _L < 1 mA |
| freely selectable and scalable | 4 - 20 mA 3-wire | R _L < 500 Ohm |
| | 0 - 20 mA 3 wire | R _L < 500 Ohm |
| Digital interface | RS485 with Modbus RTU, up to 32 devices in one bus Ethernet with Modbus TCP | |

General

| | | |
|--|--|---|
| Power supply class III  (EU) / class 2 (NA) | 8...35 V DC | 12...30 V AC |
| | 100...240 V AC, 50/60 Hz with option AM3 ³⁾ | |
| Current consumption | - 2x voltage output | for 24 V DC/AC: typ. 40 mA |
| | - 2x current output | typ. 80 mA |
| Pressure range for pressure tight probe | 0.01...20 bar (0.15...300 psi) | |
| Probe material | Stainless steel 1.4404 / AISI 316L | |
| Enclosure material | for plastic enclosure | Polycarbonate UL94-V0 approved |
| | for metal enclosure | Stainless steel 1.4404 / AISI 316 L |
| Protection class | IP65 | |
| Cable glands | for plastic enclosure | M16 x 1.5, for cable Ø 3 - 7 mm (0.12 - 0.28") |
| | for metal enclosure | M16 x 1.5, for cable Ø 4.5 - 10 mm (0.18 - 0.39") |
| Electrical connection | Screw terminals max. 1.5 mm ² (AWG 16) | |
| Working and storage temperature range | -40...60 °C (-40...140 °F) without display -20...50 °C (-4...122 °F) with display | |
| Electromagnetic compatibility | EN61326-1 | EN61326-2-3 |
| | Industrial Environment | ICES-003 ClassA |
| | | FCC Part15 ClassA |
| Alarm outputs (2 relays) ³⁾ | 250 V AC / 6 A |  |
| | 28 V DC / 6 A | |
| System requirements for PCS software | Windows XP or higher; USB port | |

1) Refer to the working range humidity sensor on next page.

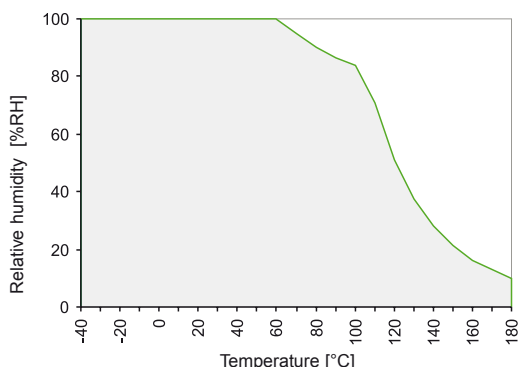
2) Traceable to intern. standards, administrated by NIST, PTB, BEV,...

The accuracy statement includes the uncertainty of the factory calibration with an enhancement factor k=2 (2-times standard deviation).

The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

3) Appropriate for outdoor use, wet location, degree of pollution 2, overvoltage category II, altitude up to 3000 m (9843 ft).

Working range humidity sensor



The graph shows the allowed measurement range for the humidity sensor.

Operating beyond this range does not damage the sensor, nevertheless the specified measurement accuracy cannot be guaranteed.

Measurement range¹⁾

| Humidity | RH | from | | up to | | | unit | |
|-------------------------------|----|-----------|-------------|---------------|---------------|---------------------------------------|------|--|
| | | EE310-T1 | EE310-T2 | EE310-T5, T10 | % RH | | | |
| Temperature | T | -40 (-40) | 60 (140) | 80 (176) | 180 (356) | °C (°F) | | |
| Dew point temperature | Td | -40 (-40) | 60 (140) | 80 (176) | 100 (212) | °C (°F) | | |
| Frost point temperature | Tf | -40 (-40) | 0 (32) | 0 (32) | 0 (32) | °C (°F) | | |
| Wet bulb temperature | Tw | 0 (32) | 60 (140) | 80 (176) | 100 (212) | °C (°F) | | |
| Water vapour partial pressure | e | 0 (0) | 200 (3) | 500 (7.5) | 1100 (15) | mbar (psi) | | |
| Mixing ratio | r | 0 (0) | 425 (2900) | 999 (9999) | 999 (9999) | g/kg (gr/lb) | | |
| Absolute humidity | dv | 0 (0) | 150 (60) | 300 (120) | 700 (300) | g/m ³ (gr/f ³) | | |
| Specific enthalpy | h | 0 (0) | 400 (50000) | 1000 (375000) | 2800 (999999) | kJ/kg (Btu/lb) | | |

1) Output scaling is freely selectable and can be easily changed via display or with the EE-PCS software. Refer to accuracies of calculated values (www.epluse.com/humiditymeasurement).

Scope of supply

| | Included in the scope of supply of: |
|--|-------------------------------------|
| HLX310 according to ordering guide | all versions |
| Operation manual english* | all versions |
| Inspection certificate according to DIN EN 10204 – 3.1 | all versions |
| Mating plug for integrated power supply | AM3 |
| Mating plug RKC 5/7 | AM3 / E4 / E6 / E12 |
| Mating plug RSC 5/7 (2 pcs. for option E12) | E5 / E6 / E12 |
| Mating plug HPP V4 RJ45 Cat5 | J4 |

*) Other languages can be downloaded at www.epluse.com/EE310

Accessories / Replacement Parts (see data sheet "Accessories")

- Filter caps
- Mounting flange stainless steel
- Drip water protection
- RS485 kit for retrofitting
- Ethernet Module for retrofitting plastic enclosure
- Bracket for installation onto mounting rails¹⁾
- Mounting bracket for remote probe
- Replacement humidity sensor
- Replacement humidity sensor with coating
- Replacement probes²⁾
- Humidity calibration kit

- HA0101xx
- HA010201
- HA010503
- HA010605
- HA010606 for remote probe type T5, T10
- HA010607 for duct mounting type T2
- HA010203
- HA010211
- FE09
- FE09-HC01
- refer to device manual
- see data sheet „Humidity calibration kit“

1) 2 pieces are necessary for one HLX310. For polycarbonate enclosure only.
2) Only for devices with pluggable probe option PC4.

Measurand Code for order code output 1 and 2

| | | MAxx / MBxx |
|-------------------|-------|-------------|
| relative humidity | % | 10 |
| Temperature | °C | 1 |
| | °F | 2 |
| dew point Td | °C | 52 |
| | °F | 53 |
| frost point Tf | °C | 65 |
| | °F | 66 |
| mixing ratio r | g/kg | 60 |
| | gr/lb | 61 |

| | | MAxx / MBxx |
|---------------------------------|--------------------|-------------|
| absolute humidity dv | g/m ³ | 56 |
| | gr/ft ³ | 57 |
| wet bulb temperature Tw | °C | 54 |
| | °F | 55 |
| water vapour partial pressure e | mbar | 50 |
| | psi | 51 |
| specific enthalpy h | kJ/kg | 62 |
| | BTU/lb | 64 |

Ordering Guide

| | | HLX310 | | | | |
|--------------------------------------|---|---|-----------------------------------|---|---|--|
| Type | | T1 wall mounting | T2 ⁸⁾ duct mounting | T5 remote probe up to 180 °C (356 °F) | T10 pressure tight probe up to 20 bar (300 psi) | |
| Enclosure | polycarbonate stainless steel | no code HS2 | no code | no code HS2 | no code HS2 | |
| Filter | plastic - metal grid (up to 120 °C / 248 °F) | F3 | F3 | no code | no code | |
| | stainless steel sintered | no code | no code | no code | no code | |
| | PTFE | F5 | F5 | F5 | F9 | |
| | stainless steel - metal grid (up to 180 °C / 356 °F) H ₂ O ₂ | F9 F12 | F9 F12 | F9 F12 | F9 | |
| Cable length (incl. probe length) | 0.5 m (1.64 ft) | | | K0.5 | no code | |
| | 2 m (6.6 ft) | | | no code | no code | |
| | 5 m (16.4 ft) | | | K5 | K5 | |
| | 10 m (32.8 ft) | | | K10 | K10 | |
| | 20 m (65.6 ft) | | | K20 | K20 | |
| Probe length | 65 mm (2.55") | | | L65 | no code | |
| | 200 mm (7.87") | | no code | no code | no code | |
| | 400 mm (15.75") | | L400 | L400 | L400 | |
| Process connection | 1/2" ISO thread | | | | PA23 | |
| | 1/2" NPT thread | | | | PA25 | |
| Electrical connection ¹⁾ | cable glands | no code | no code | no code | no code | |
| | 1 plug for power supply and outputs | E4 | E4 | E4 | E4 | |
| | 1 cable gland / 1 plug for Modbus RTU | E5 | E5 | E5 | E5 | |
| | 2 plugs for power supply / outputs and for Modbus RTU | E6 | E6 | E6 | E6 | |
| Optional features | 3 plugs for power supply / outputs and Modbus RTU | E12 | E12 | E12 | E12 | |
| | TFT colour display with integrated data logger ²⁾ | D2 | D2 | D2 | D2 | |
| | RS485 Module - Modbus RTU ³⁾ | J3 | J3 | J3 | J3 | |
| | Ethernet Module - Modbus TCP ^{5) 8)} | J4 | J4 | J4 | J4 | |
| | pluggable probe ⁸⁾ | | | PC4 | PC4 | |
| | E+E sensor coating | C1 | C1 | C1 | C1 | |
| | alarm outputs ^{4) 5)} | AM2 | AM2 | AM2 | AM2 | |
| | integrated power supply 100...240 V AC, 50/60 Hz ^{5) 6)} | AM3 | AM3 | AM3 | AM3 | |
| Setup - Analogue outputs | Output 1 | relative humidity RH [%] | | no code | | |
| | | other measurand (xx see Measurand Code below) | | MAxx | | |
| | Output Signal 1 ⁷⁾ | 0-1 V | | | GA1 | |
| | | 0-5 V | | | GA2 | |
| | | 0-10 V | | | GA3 | |
| | | 0-20 mA | | | GA5 | |
| | | 4-20 mA | | | GA6 | |
| | Scaling 1 low | 0 | | no code | | |
| | | value | | SALvalue | | |
| | Scaling 1 high | 100 | | no code | | |
| | | value | | SAHvalue | | |
| | Output 2 | temperature T [°C] | | | no code | |
| | | temperature T [°F] | | | MB2 | |
| | | other measurand (xx see Measurand Code below) | | | MBxx | |
| Output Signal 2 ⁷⁾ | 0-1 V | | | GB1 | | |
| | 0-5 V | | | GB2 | | |
| | 0-10 V | | | GB3 | | |
| | 0-20 mA | | | GB5 | | |
| | 4-20 mA | | | GB6 | | |
| Scaling 2 low | value | | SBLvalue | | | |
| Scaling 2 high | value | | SBHvalue | | | |

1) Plug options E5 / E6 / E12 only in combination with RS485 Modul - Modbus RTU option J3.

2) Factory setup: the display shows the measurands selected for output 1 and output 2.

Default language English, other languages selectable in display menu.

3) Factory settings: bau drate 9600, parity even, stop bit 1 / slave-ID 231 (16 bit integer).

4) Alarm output only available with cable glands (other plug options are not possible).

5) Combination of alarm output, Ethernet Modul - Modbus TCP and integrated power supply is not possible.

6) Integrated power supply includes 2 plugs for power supply and outputs, other plug options are not possible.

7) Both analogue outputs shall be either voltage or current.

8) Only with polycarbonate enclosure

Order Example

HLX310-T5D2J3C1GA3GB3SBL-40SBH180

Type: **T5** remote probe for T up to 180 °C (356 °F)
 Enclosure: **no code** polycarbonate
 Filter: **no code** stainless steel sintered filter
 Cable length: **no code** 2 m (6.6")
 Probe length: **no code** 200 mm (7.87")
 Electrical connection: **no code** cable glands
 Optional features: **D2** TFT colour display with integrated data logger
J3 RS485 Modul - Modbus RTU
C1 E+E sensor coating

Output 1: **no code** relative humidity %
 Output Signal 1: **GA3** 0-10 V
 Scaling 1 low: **no code** 0
 Scaling 1 high: **no code** 100
 Output 2: **no code** temperature T [°C]
 Output Signal 2: **GB3** 0-10 V
 Scaling 2 low: **SBL-40** -40
 Scaling 2 high: **SBH180** 180