



Operation manual

**EE360**  
**Moisture in Oil**  
**Transmitter**

YOUR PARTNER IN SENSOR TECHNOLOGY



**ELEKTRONIK**<sup>®</sup>  
Ges.m.b.H.

E+E Elektronik® Ges.m.b.H. provides no warranty of any kind for this publication and accepts no liability for improper use of the products described.

This publication might contain technical inaccuracies or typographical errors. The content is revised regularly and is not subject to change management. The manufacturer reserves the right to modify or change its described products at any time.

© Copyright E+E Elektronik® Ges.m.b.H.  
All rights reserved.

## **USA**

### **FCC notice**

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.

## **CANADA**

### **ICES-003 Issue 5:**

CAN ICES-3 A / NMB-3 A

# CONTENT

<b>1</b>	<b>General</b> .....	<b>4</b>
1.1	Explanation of symbols .....	4
1.2	Safety instructions .....	4
1.3	Environmental aspects .....	4
<b>2</b>	<b>Product Description</b> .....	<b>5</b>
2.1	Product design .....	5
2.2	Probes .....	6
2.3	Water activity vs. water content .....	6
<b>3</b>	<b>Installation</b> .....	<b>7</b>
3.1	Mechanical installation .....	7
3.1.1	Standard mounting of the enclosure .....	7
3.1.2	DIN rail mounting of the enclosure .....	7
3.2	Electrical connection .....	8
3.2.1	Standard connection .....	8
3.2.2	Plug options .....	8
3.3	Probe mounting .....	10
3.3.1	Installation of the probe directly in the process .....	10
3.3.2	Installation of the probe with ball valve set .....	11
<b>4</b>	<b>Optional modules</b> .....	<b>13</b>
4.1	Alarm module (option AM2) .....	13
4.2	Power supply module (option AM3) .....	15
4.3	Modbus RTU module (option J3) .....	15
4.4	Pluggable probe (option PC4) .....	16
<b>5</b>	<b>Operation</b> .....	<b>18</b>
5.1	Configuration interface .....	18
5.2	3.5" TFT Colour Display (optional) .....	18
5.3	Chart + Data logger .....	19
5.4	Configuration Menu .....	21
5.5	Status information .....	21
5.6	Buzzer ON / OFF .....	21
5.7	Error indication .....	21
<b>6</b>	<b>Maintenance</b> .....	<b>22</b>
6.1	Self diagnosis and error messages .....	22
6.1.1	Error messages via display .....	22
6.1.2	Error messages via LEDs .....	22
6.1.3	Solving typical problems .....	23
6.2	Sensor replacement .....	23
6.3	Cleaning the sensing head / filter replacement .....	24
6.4	RH / T adjustment and calibration .....	24
<b>7</b>	<b>Replacement parts / Accessories</b> .....	<b>26</b>
<b>8</b>	<b>Scope of supply</b> .....	<b>26</b>
<b>9</b>	<b>Technical data</b> .....	<b>27</b>
<b>10</b>	<b>Appendix</b> .....	<b>28</b>
10.1	Appendix A .....	28

# 1 General

This manual is included in the scope of supply and serves to ensure proper handling and optimum performance of the instrument. The manual shall be read before putting the device into operation. The manual is relevant for all staff involved in transport, setup, operation, maintenance and repair. The manual may not be used for the purpose of competition and shall also not be forwarded to third parties. Copies for personal use are allowed. All contents, technical data and illustrations contained in the manual are based on information available at the time of publication.

## 1.1 Explanation of symbols



**This symbol indicates safety information.**

It is essential that all safety information is strictly observed. Failure to comply with this information can lead to personal injuries or damage to property. E+E Elektronik® assumes no liability if this happens.



**This symbol indicates instructions.**

The instructions shall be observed in order to reach optimal performance of the device.

## 1.2 Safety instructions

### 1.2.1. General

Excessive mechanical stress and inappropriate usage may lead to failures and shall be avoided. The sensors inside the sensing head (the tip of the sensing probe) are is an Electro Static Discharge (ESD) sensitive components and shall be handled as such.

Do not touch the sensing elements inside the sensing head. The replacement of the filter cap shall be done with utmost care not to touch the sensors.

Installation, electrical connection, maintenance and commissioning shall be performed by qualified staff only.

The devices are designed for the operation with class III supply (EU) and class 2 supply (NA).

### 1.2.2. Alarm module with voltages >50V (option AM2)

The optional alarm module is isolated from the low-voltage side of EE360 by a special partition; this must remain fitted at all times in the bottom part of the enclosure.

The EE360 enclosure must be tightly closed during operation. An open enclosure corresponds to IP00 and exposes components carrying dangerous voltage. Any work (maintenance for instance) on the device may be performed by qualified staff only.

### 1.2.3. Integrated power supply (option AM3)

The EE360 enclosure must be tightly closed during operation. An open enclosure corresponds to IP00 and exposes components carrying dangerous voltage. Any work (maintenance for instance) on the device may be performed by qualified staff only.

## 1.3 Environmental aspects



Products from E+E Elektronik® are developed and manufactured observing of all relevant requirements with respect to environment protection. Please observe local regulations for the device disposal.



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 Product Description

EE360 is dedicated for reliable monitoring of lubrication, hydraulic and insulation oils as well as diesel fuel. In addition to highly accurate measurement of water activity (aw) and temperature (T), EE360 calculates the absolute water content (x) in ppm (see also 2.3 *Water activity vs. water content*).

The probe can be employed up to 180 °C (356 °F), 20 bar (290 psi) and is available with either ISO or NPT slide fitting, which allows for variable immersion depth. Using the optional ball valve, the probe can be mounted or removed even without process interruption.

The rugged polycarbonate enclosure facilitates easy mounting and maintenance. The measured values are available on two analogue outputs and on the Modbus RTU interface. An optional relays module can be used for alarms and process control.

The state of the art TFT colour display can show all measurands simultaneously and offers extensive error diagnostics. The integrated data logging function saves all measured data in the internal memory. The logged data can be displayed in a graph directly on the device or easily downloaded via USB interface.

The EE360 configuration and adjustment can be performed either directly on the device via display and push buttons or with the free EE-PCS software using the USB service interface.

### 2.1 Product design



Fig. 1 Product design

- ① Upper enclosure part with electronic / display\* and probe cable
- ② 3.5" TFT colour display\*
- ③ 5 push-buttons for configuration menu
- ④ Bottom part with electrical connection, alarm + supply module\* and mounting holes
- ⑤ Micro USB service interface
- ⑥ Standard cable glands / connectors\*
- ⑦ Cable gland / connector\* for probe cable

\* optional

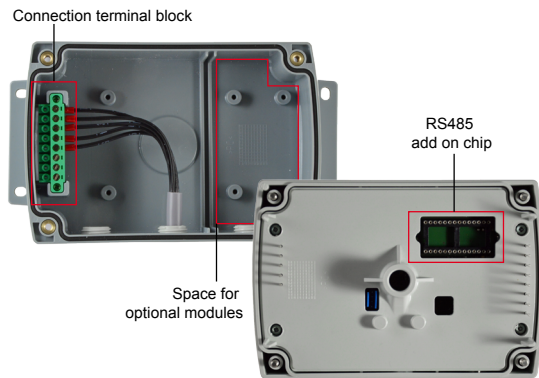


Fig. 2 Modular enclosure

## 2.2 Probes

The EE360 remote probe can be employed over the T range -40...180 (-40...356 °F), up to 20 bar (300 psi) and is available with 100 mm (3.94") and 200 mm (7.87") length.

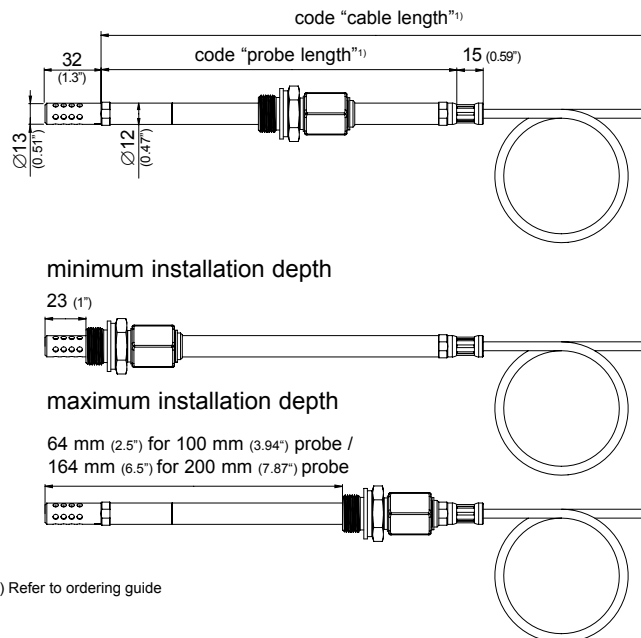


Fig. 3 EE360 probe

## 2.3 Water activity vs. water content

The moisture in oil can be expressed in absolute or relative terms.

- **Water activity  $a_w$**  is the relative measure for moisture in oil. It represents the ratio between the actual amount of dissolved water and the maximum possible amount of dissolved water in the oil at a certain temperature T. Independently of the oil type, the water activity shows how close to saturation is the oil at a certain temperature.

$a_w=0$  indicates completely dry oil, while  $a_w=1$  fully saturated oil.  
EE360 measures directly the water activity.

- The **water content  $x$**  is an absolute measure equal to the share of water (dissolved, emulsified or separate) in the oil. The water content is measured in ppm (parts per million) and is independent from the oil temperature. For assessing how far is the oil from saturation,  $x$  must be regarded together with T.  
EE360 calculates  $x$  out of the measured  $a_w$  and T values. The calculation is oil dependent and requires a set of oil specific parameters. (Contact an E+E representative for details.)

# 3 Installation

## 3.1 Mechanical installation

### 3.1.1 Standard mounting of the enclosure

- Drill the mounting holes according to the mounting template below.
- Mount the bottom part of the enclosure with 4 screws (screw diameter < 4.2 mm (0.2"), not included in the scope of supply).

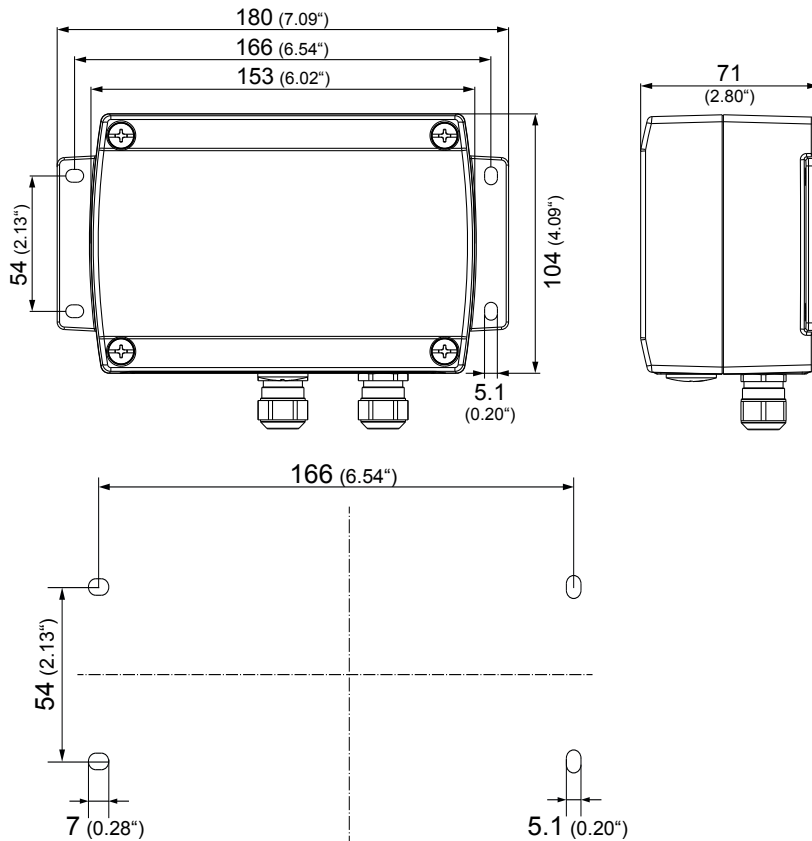


Fig. 4 Dimensions and mounting template of polycarbonate enclosure in mm (inch)

### 3.1.2 DIN rail mounting of the enclosure

- Mount the two DIN rail brackets (to be ordered separately, see chapter 7 *Replacement parts / Accessories*) onto the back side of the enclosure.
- Snap in the enclosure onto the DIN rail

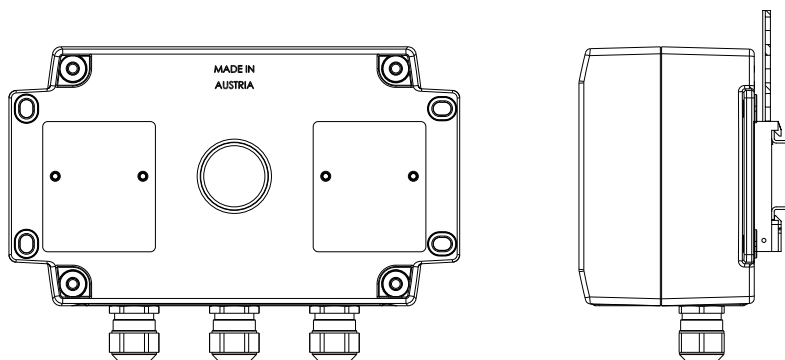


Fig. 5 DIN rail installation

## 3.2 Electrical connection



The electrical installation of the EE360 shall be performed by qualified personnel only. Observe all applicable national and international requirements for the installation of electrical devices as well as for power supply according to EN 61140, class III (EU) and class 2 supply (N. America).

### 3.2.1 Standard connection

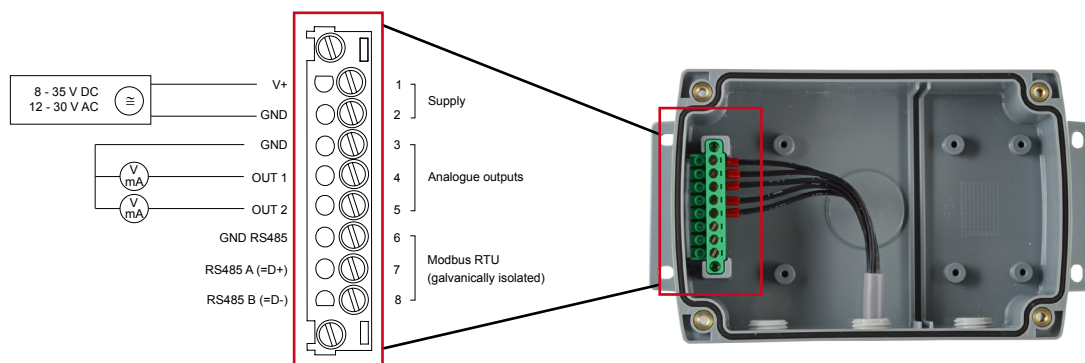


Fig. 6 Electrical connection

#### Analogue outputs

Both analogue outputs shall be configured to either voltage or current. Measurands, analogue range and scaling are freely selectable. All settings can be performed via display and push buttons or using the EE-PCS Product Configuration Software.

#### Error indication

The analogue outputs feature an error indication function according to NAMUR NE43. In the case of an error the output signal will freeze at 21 mA or 11 V respectively.



#### Note

By default the error indication is disabled.

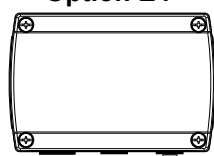
When changing one of the analogue outputs from current to voltage and vice versa, the second output will change automatically as well. The output scaling changes automatically if it is out of physical range (i.e. 20 mA will be changed to 10 V instead of 20 V).



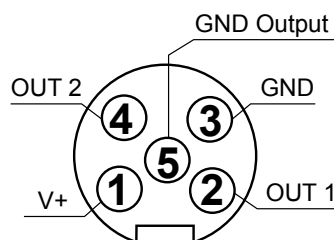
Check output scale after changing between voltage and current output.

### 3.2.2 Plug options

#### Option E4



power supply +  
analogue output





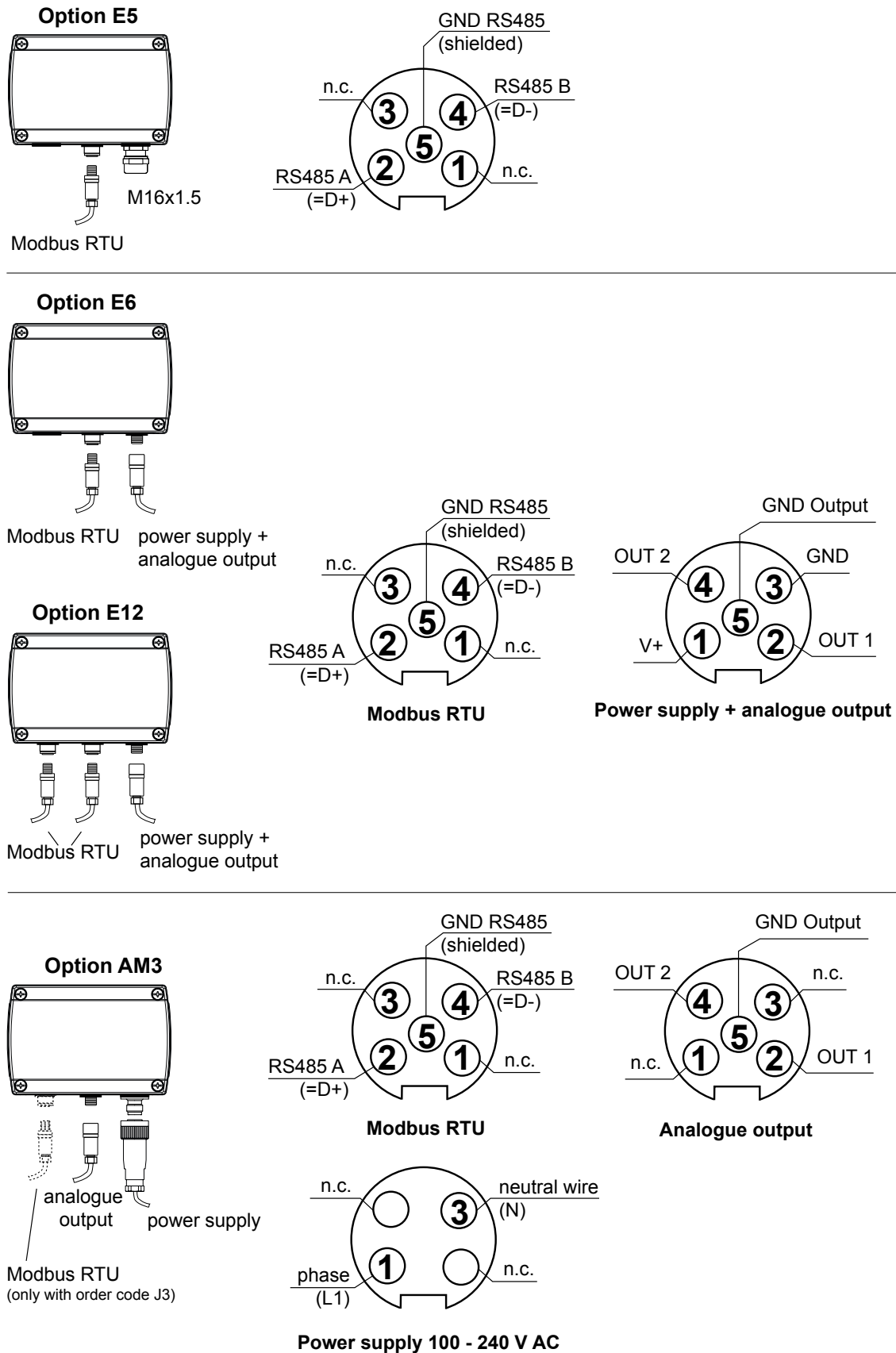


Fig. 7 Plug options for EE360 (front connector view)



External diameter of the supply cable for option AM3 and power supply + analogue output (E4 / E6 / E12): 10-12 mm (0.39-0.47"). Maximum wire cross section for connecting cable: 1.5 mm<sup>2</sup> (AWG 16). The AM3 option includes a 1.25 A fuse on the 100-240 V side. This fuse may not be replaced by the user, but only by the E+E Service. National regulations for installation shall be observed. External diameter of the cable for Modbus RTU female plug: 4 - 6 mm (0.16 - 0.24"). Maximal wire cross section for connecting cable: 0.5 mm<sup>2</sup> (AWG 21).

### 3.3 Probe mounting



The probe shall be mounted horizontally or vertically pointing downwards.

For accurate measurement it is of paramount importance to avoid T gradients along the probe. In case of large T difference between the front and the back of the probe, it is highly recommended to insert the probe completely into the process. Should this not be possible, place a thermal isolation layer on the part of the probe outside the process (on the cable side).

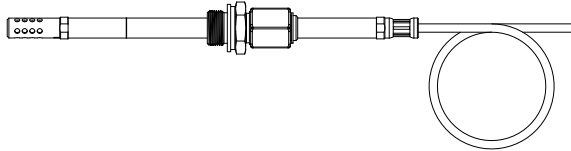


Fig. 8 EE360 probe



#### General safety instructions for installation

The installation, commissioning and operation of the EE360 may be performed by qualified staff only. Special attention shall be paid to the correct installation of the probe into the process. In case of inappropriate installation there is the risk for the probe to be suddenly expelled due to the pressure in the process.

Bending over the sensing probe should be avoided under any circumstances!  
Make sure that the surface of the probe is not damaged during installation. A damaged probe surface may lead to damaged seals and consequently to leakage and pressure loss.

#### 3.3.1 Installation of the probe directly in the process

(see Fig. 9 Installation of the EE360 probe directly into the process)

For direct probe installation into a duct stop valves should be provided on both sides of the probe insert. This allows the sensor probe to be easily removed for maintenance and calibration.

For direct installation into a pressure chamber make sure that the pressure in the chamber and the ambient pressure are equal before removing the probe. The temperature during probe installation may deviate by max.  $\pm 40$  °C ( $\pm 72$  °F) from the regular temperature during normal operation.



Replace the metal sealing ring (see Fig. 9 Installation of the EE360 probe directly into the process) by a new one every time before re-installing the probe.

#### Probe installation steps

- Close both valves.
- Place the sensor probe into the probe insert and adjust the immersion depth.
- Tighten the lock nut with a torque of 30 Nm.
- Open the valves.



Observe strictly the tightening torque.

A torque lower than 30 Nm results in a smaller retention force of the clamping sleeve. This leads the risk of sudden expulsion of the sensing probe due to the pressure. A torque higher than 30 Nm may lead to permanent deformation of the clamping sleeve and the sensing probe. This would make the removal and re-installation of the probe difficult or even impossible.

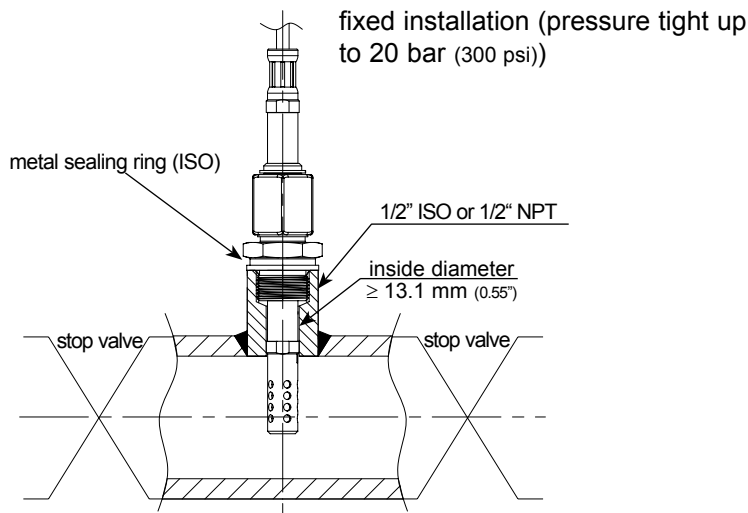


Fig. 9 Installation of the EE360 probe directly into the process

### 3.3.2 Installation of the probe with ball valve set

The ball valve set allows for installation and removal of the 200 mm (7.87") probe without process interruption.

For mounting into a duct, the ball valve shall be installed perpendicular to the flow direction.



The two metal sealing rings (see Fig. 10 Installation of the probe by utilizing the ball valve set) shall be replaced every time prior to re-installing the probe.

The temperature during probe installation may deviate by max.  $\pm 40$  °C ( $\pm 72$  °F) from the regular temperature during normal operation.

**Installation of the probe** (see Fig. 10 Installation of the probe by utilizing the ball valve set):

- Install the probe into the ball valve while the ball valve is closed.
- Open the ball valve.
- Slide the probe through the ball valve to the desired immersion depth. Depending on the process pressure additional tools may be necessary for pushing the probe into the process. Make sure not to damage the probe and the cable.
- Tighten the lock nut with a torque of 30 Nm.



Observe strictly the tightening torque. A torque lower than 30 Nm results a smaller retention force of the clamping sleeve. This leads the risk of sudden expulsion of the sensing probe due to the pressure. A torque higher than 30 Nm may lead to permanent deformation of the clamping sleeve and the sensing probe. This would make the removal and re-installation of the probe difficult or even impossible.

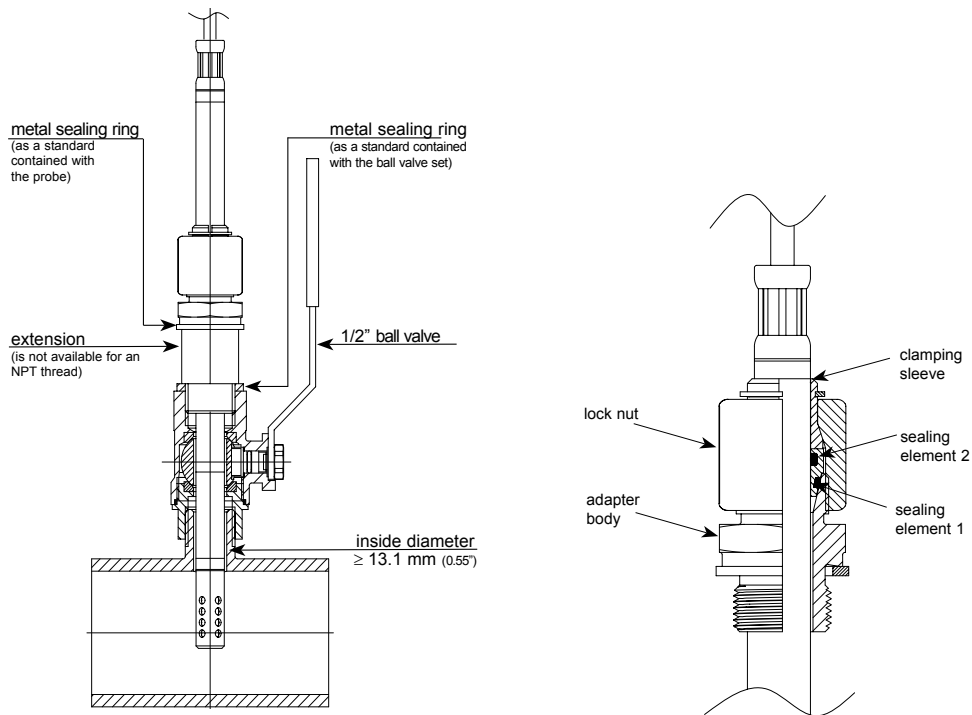


Fig. 10 Installation of the probe by utilizing the ball valve set

### Removing the probe

- Hold firmly the probe to avoid it being suddenly expelled when releasing the lock nut. May sure nut to bend and damage the probe cable.
- Loosen slowly the lock nut with a spanner (spanner width 24) only till the probe is pushed out by the overpressure in the process. Do not completely loosen the lock nut, but only as much as necessary for the probe to slide.
- After the probe has been pushed out of the process up to the stop, close the ball valve.
- Remove the probe from the ball valve.



Observe the correct positioning of the sealing element 1 before reinstalling the probe.

### Replacement of the sealing element

In case of repeated installations and removals the sealing element 1 can be damaged. It can be replaced by the user.

## 4 Optional modules

### 4.1 Alarm module (option AM2)

The module offers two freely configurable relay outputs for alarm or control purposes.

Max. switch load: 250 V AC / 6 A                      28 V DC / 6 A  
 Min. switch load: 12 V / 100 mA

No overcurrent and short circuit protection.  
 Both relays shall be connected to either high or low voltage.

Various operation modes are available including hysteresis, window and error indication.

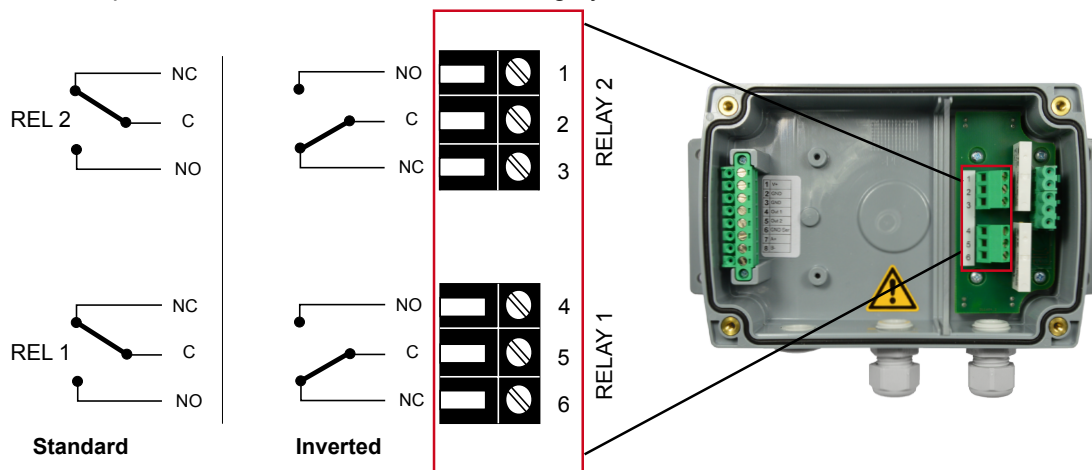


Fig. 11 Alarm module (option AM2)



When error indication mode is selected, various errors will trigger the alarm output. An alarm output in this operation mode is used for error indication only.

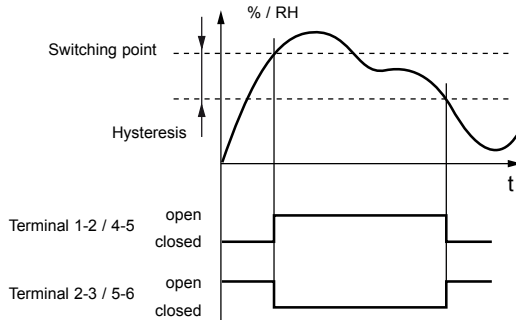


Fig. 12 Example hysteresis mode

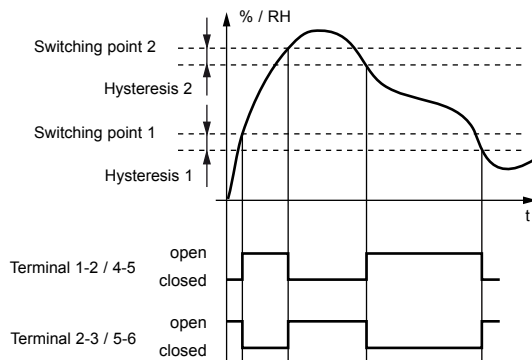


Fig. 13 Example window mode

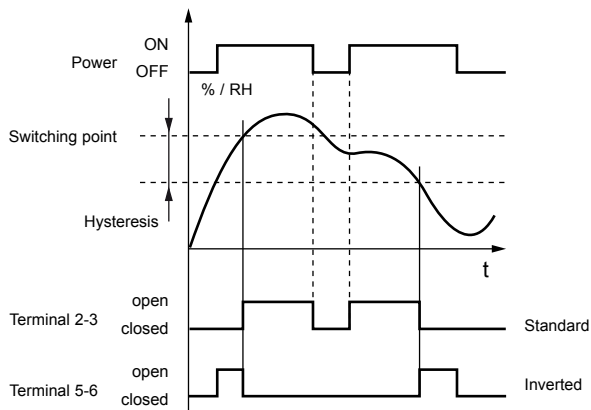
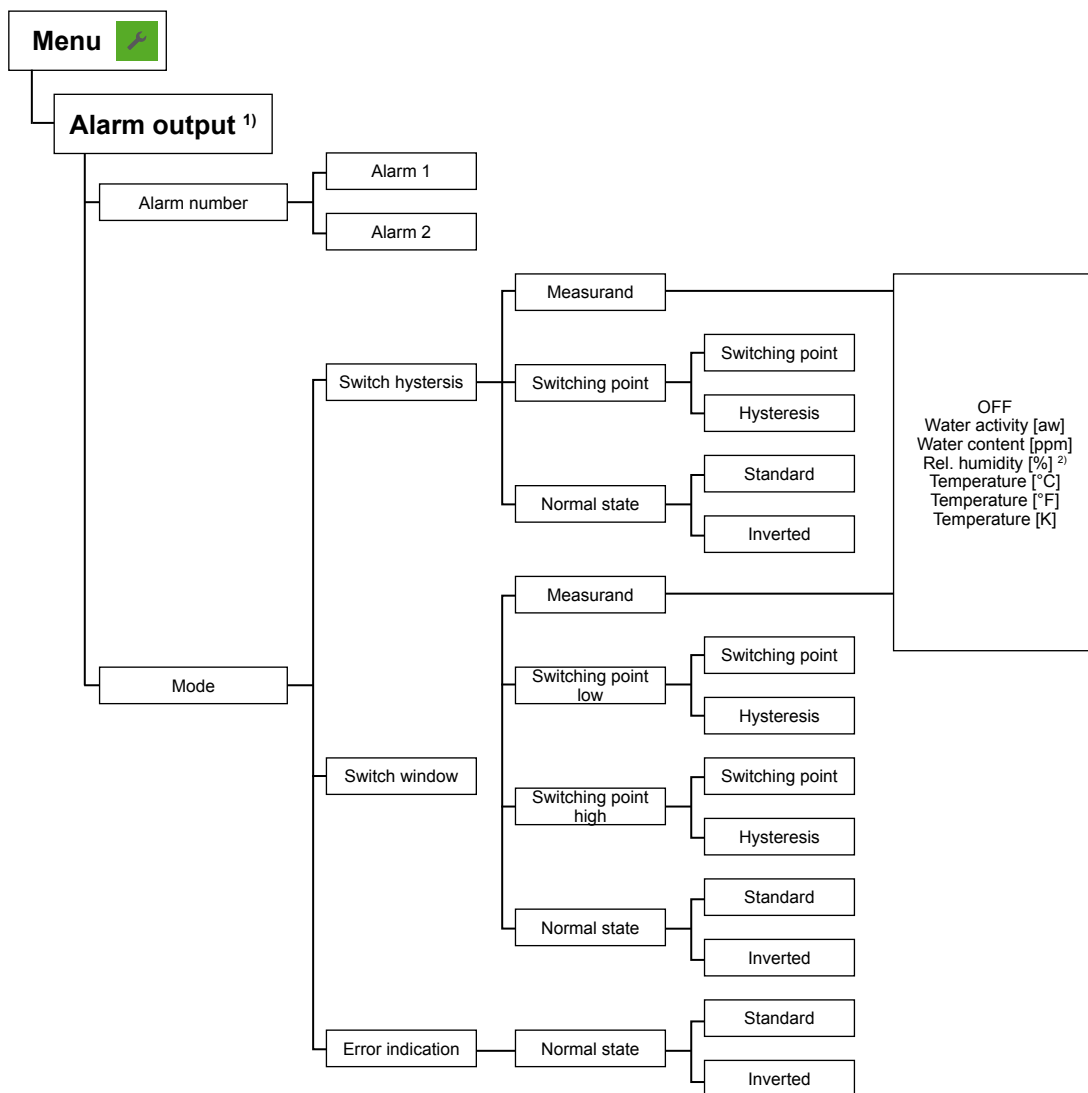


Fig. 14 Example of alarm in case of power supply failure using inverted alarm outputs..

The measurands at the outputs as well as switching points, hysteresis and the default state (standard / inverted) can be set via EE-PCS Product Configuration Software or using the display and the push buttons.



1) Menu only available with connected alarm module during EE360 start-up

## 4.2 Power supply module (option AM3)

This module allows the EE360 to be powered with 100...240 V AC (50/60 Hz), 2 V A.

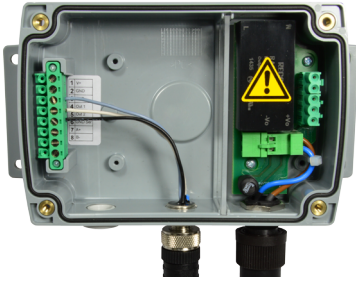


Fig. 15 Power supply module (option AM3)

Plug connections for option AM3 see chapter 3.2.2 Plug options.

The AM3 option includes a 1.25 A fuse on the 100-240 V side. This fuse may not be replaced by the user, but only by the E+E Service. National regulations for installation shall be observed.

## 4.3 Modbus RTU module (option J3)

Instructions for Modbus-Protocol-Setup please see Application Note AN0103 ([www.epluse.com/EE310](http://www.epluse.com/EE310)).

Up to 32 EE360 transmitters with Modbus RTU interface can be connected in a RS-485 bus system.

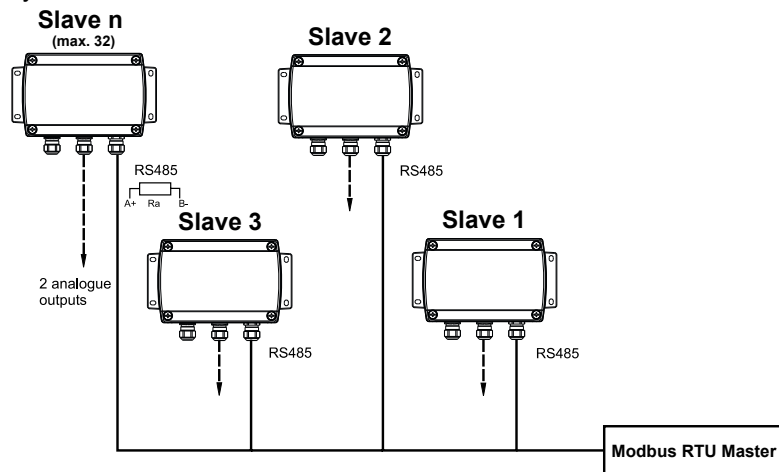
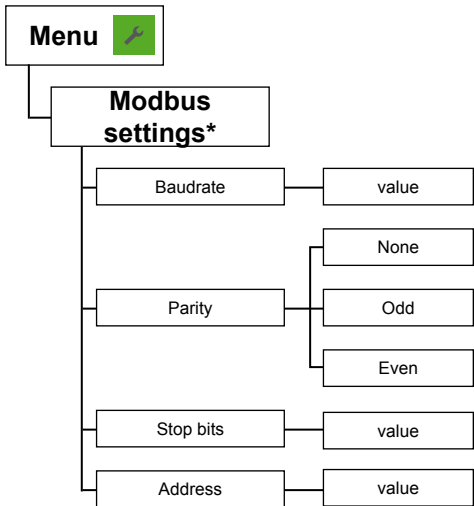


Fig. 16 Two wire RS485 network



Both ends of the network shall be terminated with a resistor  $R_a=120\text{ Ohm}$ .

The setup of the Modbus RTU communication can be performed via EE-PCS Product Configuration Software or via display and push buttons.



\* Menu only available with connected Modbus RTU module during EE360 start-up.

**Data transmission**

	Factory settings	Selectable values
Baud rate	9600	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800
Data bits	8	8
Parity	EVEN	None, odd, even
Stop bits	1	1 or 2
Slave address	231	1...247



The recommended setting for multiple devices in a Modbus RTU network is 9600 8 Even 1.

**Modbus Map**

Register [DEC]	Protocol address [HEX]	Measured value	Unit	Type
Read registers: function code 0x03 / 0x04				
31021	3FC	Relative humidity <sup>1)</sup>	%	
31003	3EA	Temperature	°C	32-bit float
31005	3EC	Temperature	°F	32-bit float
31009	3F0	Temperature	K	32-bit float
31135	46E	Water activity	aw	32-bit float
31141	474	Water content	x	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

1) Use for adjustment and calibration.



## 4.4 Pluggable probe (option PC4)

EE360 transmitters are optionally available with pluggable sensing probe, which is attached to the EE360 enclosure by a push-pull plug.

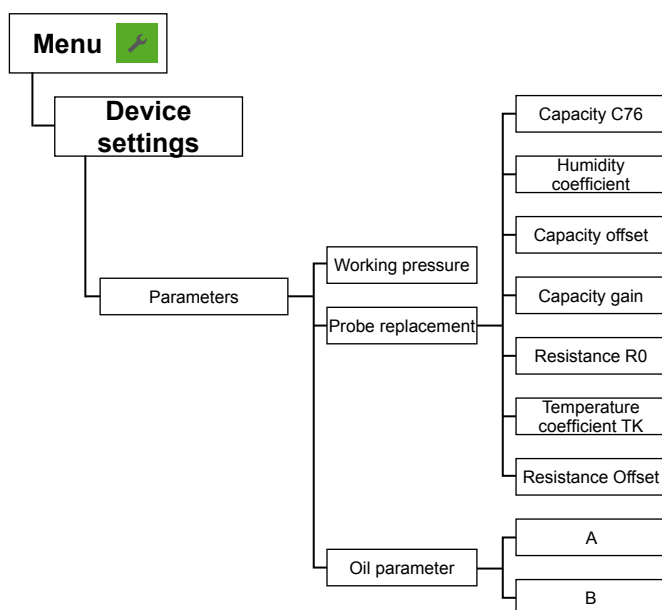
If the probe or the probe cable gets damaged it is possible to easily replace the probe without humidity and temperature adjustment. The replacement probe (see order information below) is supplied with a set of 7 individual parameters.



Fig. 17 Pluggable probe

### Probe replacement procedure

- Plug off the damaged probe
- Plug on the new probe
- Update the 7 parameters with EE-PCS Product Configuration Software or via display and push buttons.



**Note:** When replacing the probe, the factory calibration loses its validity. A calibration to verify accuracy is recommended but not mandatory.

### Order information for replacement probe

		PE360
Cable length	2 m (6.6 ft)	K2
	5 m (16.4 ft)	K5
	10 m (32.8 ft)	K10
Probe length	100 mm (3.94")	L100
	200 mm (7.87")	L200
Process conn.	1/2" ISO thread	PA23
	1/2" NPT thread	PA25

Tab. 1 Ordering code for replacement probe

# 5 Operation

## 5.1 Configuration interface

The transmitter can be used for configuration or calibration via the micro USB configuration interface. An additional supply is not necessary. After the USB cable is connected, the transmitter is initialised and the configuration is loaded. The green status LED flashes and indicates proper operation of the electronics.



Fig. 18 Remove the blind cover and plug in the USB cable

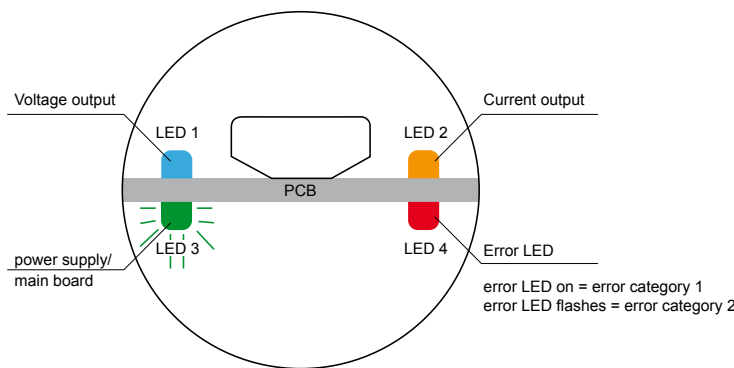


Fig. 19 Status LEDs are located at the USB port

## 5.2 3.5" TFT Colour Display (optional)

The EE360 display includes a data logger and push buttons for full configuration of the device. Upon start-up of an EE360 with display, the data logger and the configuration menu will be initialised during the first 5 seconds.



Fig. 20 Display with push buttons

## 5.3 Chart + Data logger

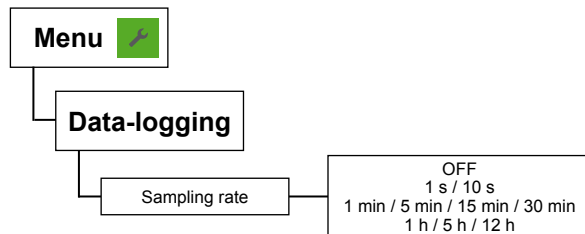
The TFT display with the integrated data logging function saves all measured and calculated values to the internal memory. The data logger has a real time clock (UTC time) with a battery back-up.



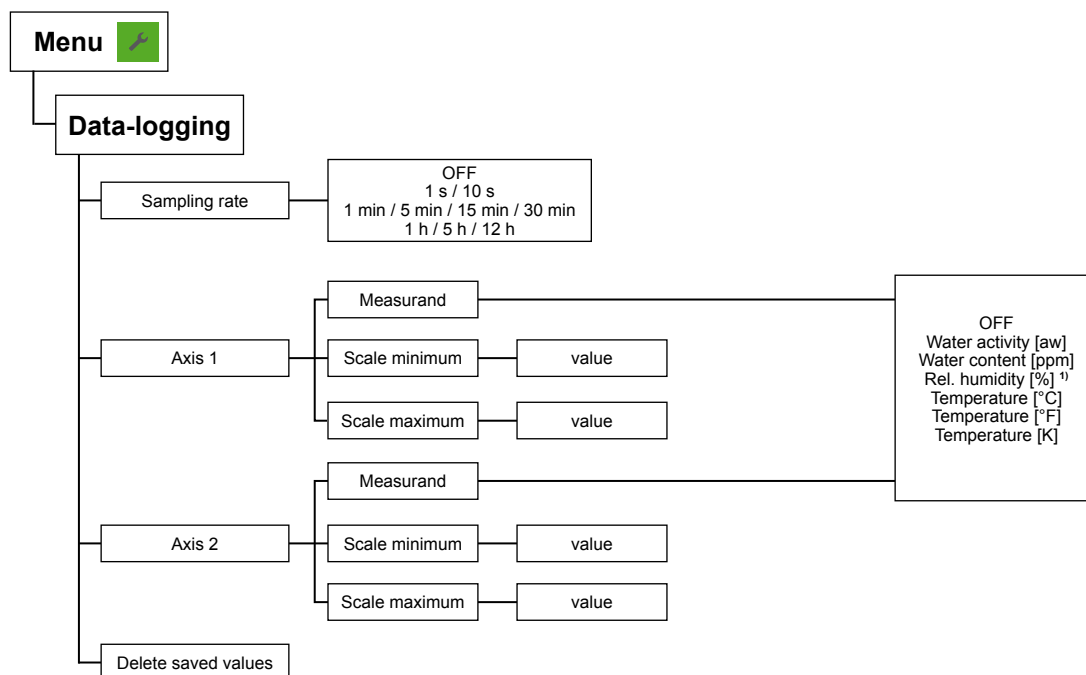
Changing the UTC time erases all stored data.

The data logger can save 20.000 values for each measurand. The logging interval is to be set by the user from 1 second to 12 hours.

The data logger setup can be performed via display and push buttons.



The data logger menu is also used to select the logged data to be shown as a graph as well as for scaling the graph.



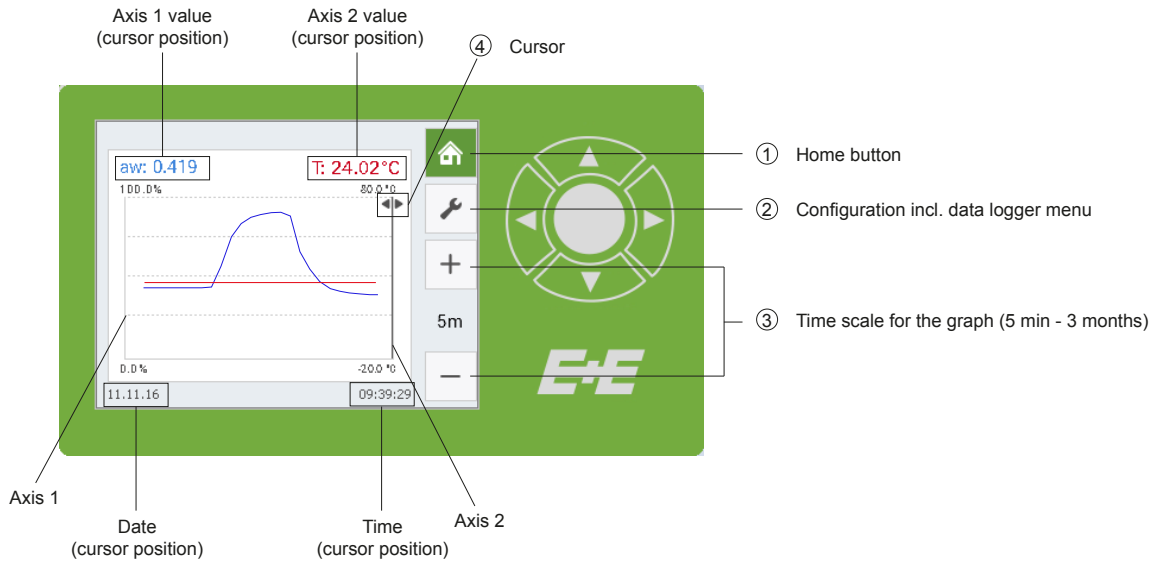


Fig. 21 Data logging

Each point in the graph represents a logged value. The points are connected by a linear interpolation.

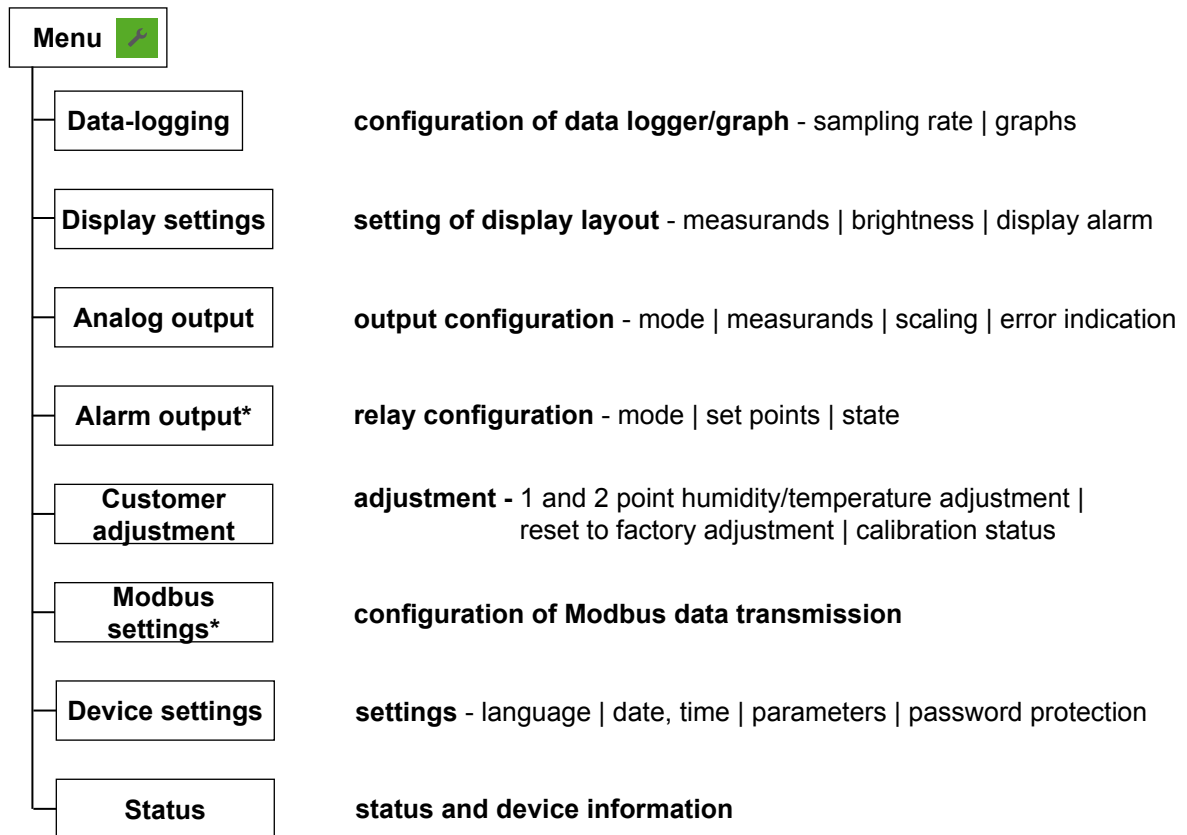


The data logging continues even when the data memory is full; new data is stored while the oldest data is deleted (first in first out memory). The last 20.000 logged values are available in the internal memory.

The logged data can be downloaded with EE-PCS Product Configuration Software as .csv file by choosing the measurands and the time period.

## 5.4 Configuration Menu

Detailed information to the configuration menu see chapter 10 Appendix.



\* Menu only available with connected corresponding modules.

## 5.5 Status information

The status information shows all actual EE360 settings.

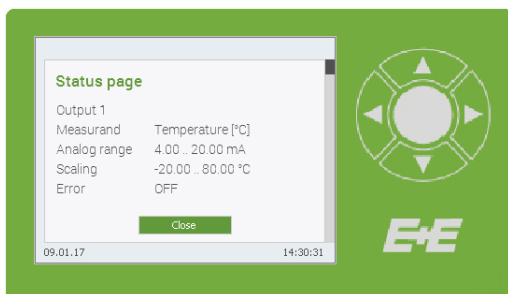


Fig. 22 Status information

## 5.6 Buzzer ON / OFF



Buzzer ON



Buzzer OFF

## 5.7 Error indication

When an error occurs, the error indication shows the error code.

## 6 Maintenance

### 6.1 Self diagnosis and error messages

#### 6.1.1 Error messages via display

Error description	Error code (display)	Error category	Recommended action
Voltage out short circuit - output 1 only*	1.1	1	Check wiring of outputs
Voltage out short circuit - output 2 only*	1.2		
Voltage out short circuit - both outputs*	1.3		
Current loop open - output 1 only	2.1		Check wiring of outputs
Current loop open - output 2 only	2.2		
Current loop open - both outputs	2.3		
Humidity sensor dirty	3.x	2	Clean the sensor (see 6.3 <i>Cleaning the sensing head / filter replacement</i> )
Hardware error	5.x		Return the faulty unit to E+E for service
	6.x		
	8.x		
Temperature measurement failure	7.x		
Humidity measurement failure	9.x		
	10.x		

\* not available with 0 - 1 V output

Tab. 2 Overview of error codes

**Error category 1** = non-critical error, can be solved by the user

- The display blinks and the buzzer beeps every 10 seconds.
- The red status LED flashes.

**Error category 2** = critical error, return the device to E+E for service

- The display blinks and the buzzer beeps continuously.
- The red status LED lights continuously.

#### 6.1.2 Error messages via LEDs

Four status LEDs placed on both sides of a PCB are located close to the USB service interface, under a blind cover.

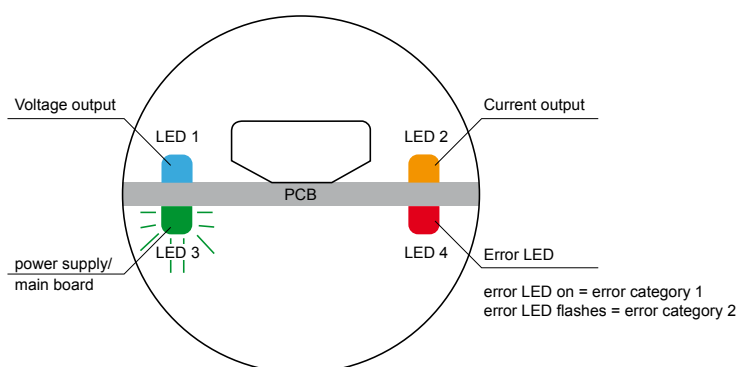


Fig. 23 Status LEDs

**LED 1 (blue):** analogue output is set to voltage.

**LED 2 (orange):** analogue output is set to current.

**LED 3 (flashing green):** supply voltage applied (microprocessor is active).

**LED 4 (red):** constant lit: error category 1  
flashes: error category 2

### 6.1.3 Solving typical problems

Error description	Likely causes and solutions
Display shows incorrect values	Error during re-adjustment of the transmitter. → Reset to factory calibration and repeat the adjustment routine.
	Filter soiled → Replace filter
	Output configured incorrectly → check configuration
Long response time	Filter soiled → Replace filter
	Inappropriate filter type → Contact E+E representative for advice.
High humidity values - red LED blinks	Water in sensing head → Investigate the cause for water / condensation. Contact E+E representative for advice.
	Inappropriate filter type → Contact E+E representative for advice.

Tab. 3 Self diagnosis

## 6.2 Sensor replacement

A damaged capacitive humidity sensing element can be replaced by the user against an E+E replacement sensor, see chapter 7 *Replacement parts / Accessories*.

### Sensor replacement procedure:

- Switch off supply voltage.
- Loose the lock of the filter cap with an appropriate tool (see *Fig. 24 Loosen the lock of the filter cap*).
- Remove the filter cap from the tip of the probe with utmost care not to touch the sensors.
- Solder off the damaged humidity sensing element.
- Shorten the leads of the replacement sensor from 10 mm / 0.39" to 6 mm / 0.24".
- Solder in the new humidity sensor, the active side shall face the temperature sensor.
- Screw on a new filter cap with upmost care not to touch the sensors.
- Fix the filter cap by pressing in the lock.
- Perform a 2 point humidity adjustment of the EE360 with the EE-PCS Product Configuration Software or with the display and push buttons.

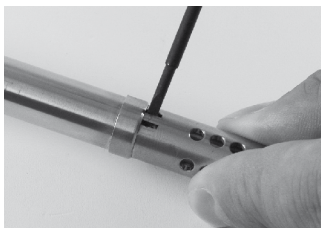


Fig. 24 Loosen the lock of the filter cap



- When replacing the humidity sensor element the factory calibration is not any longer valid.
- The humidity sensor element is an Electro Static Discharge (ESD) sensitive components and shall be handled as such.
- Hold the humidity sensor element only by the leads. Never touch the active surface of the sensor.



The replacement of the humidity sensor element may be performed by qualified staff only. Since the performance of the instrument after the sensor exchange depends on the overall accuracy of the adjustment procedure, it is strongly recommended to return the device to E+E for sensor replacement.

## 6.3 Cleaning the sensing head / filter replacement

In case of dusty, oily and polluted environment:

- The filter cap shall be replaced once in a while with an E+E original one. A polluted filter cap causes longer response time of the device (see ordering guide at chapter 7 *Replacement parts / Accessories*).
- If needed, the sensing head can be cleaned. For cleaning instructions please see [www.epluse.com/EE360](http://www.epluse.com/EE360).

## 6.4 RH / T adjustment and calibration

### Humidity 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

For humidity calibration and adjustment select measurand “Relative humidity” (RH). The adjustment / calibration shall be performed in the air.

Depending on the level of accuracy required, the humidity reference can be:

- Humidity Calibrator (e.g. Humor 20), please see [www.epluse.com/humor20](http://www.epluse.com/humor20).
- Handheld device (e.g. Omniport30), please see [www.epluse.com/omniport30](http://www.epluse.com/omniport30).
- Humidity calibration Kit (e.g. E+E Humidity Standards), please see [www.epluse.com/EE360](http://www.epluse.com/EE360).

Perform 1 or 2 point adjustment via EE-PCS Product Configuration Software or via display (details see below).

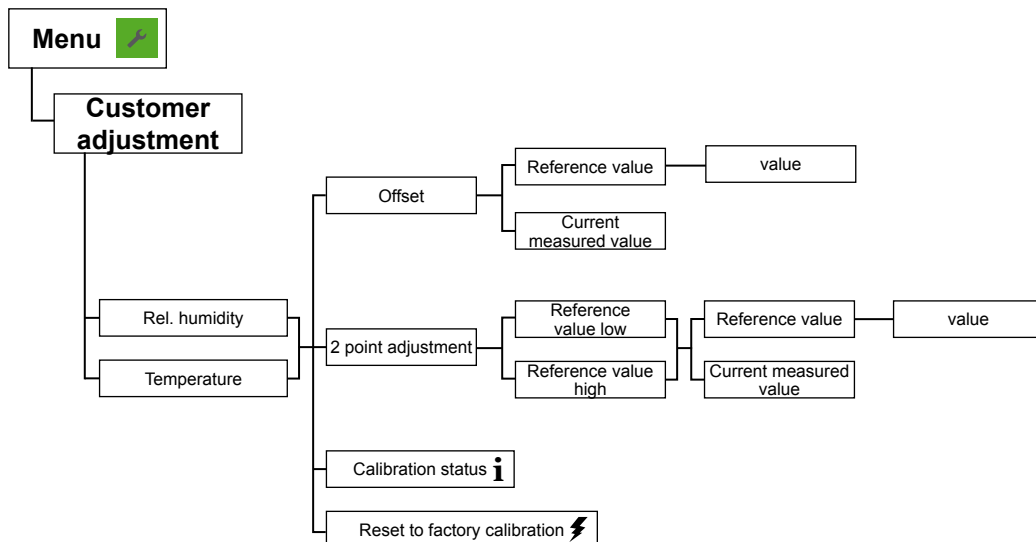


Fig. 25 Adjustment menu



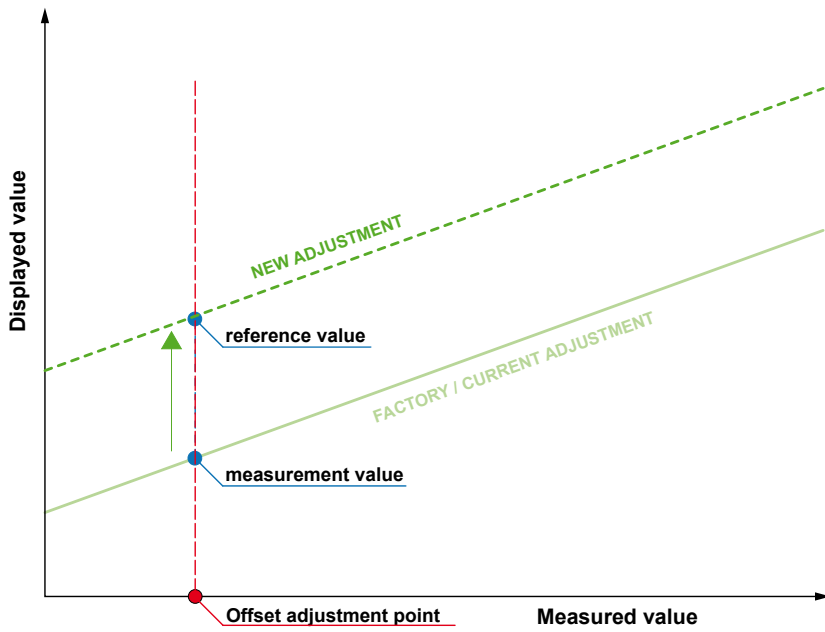


Fig. 26 Offset adjustment

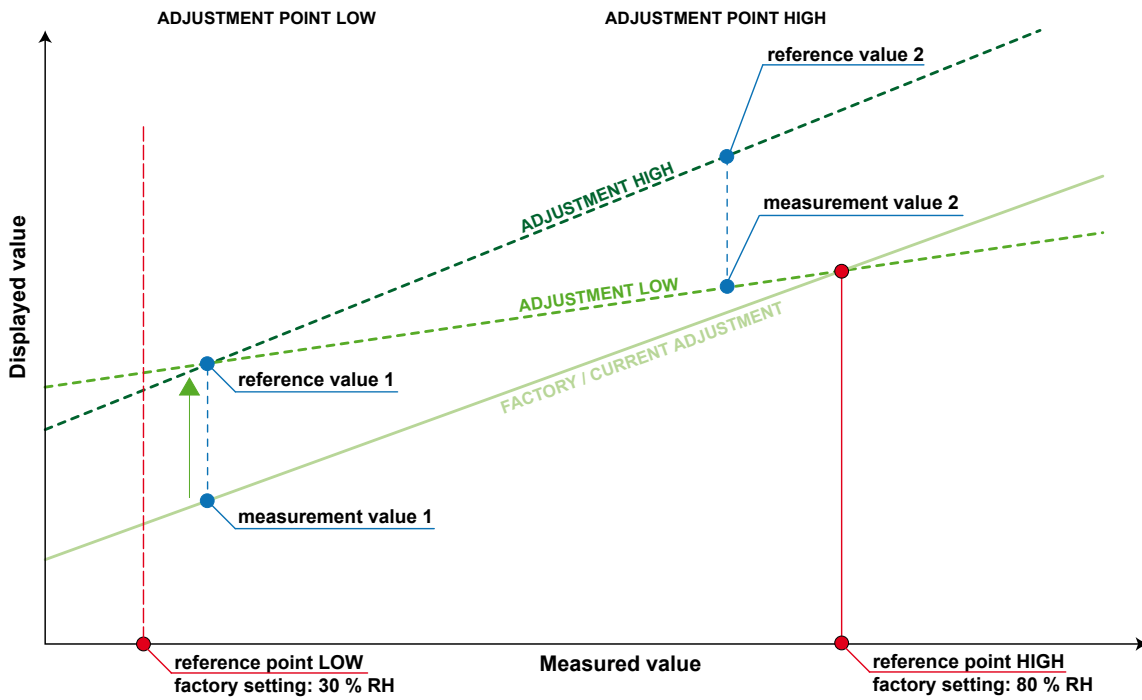


Fig. 27 2 point adjustment procedure

## 7 Replacement parts / Accessories

see data sheet "Accessories"

### Description

- Replacement filter cap
- Replacement probe <sup>1)</sup>
- Replacement humidity sensor
- Bracket for installation onto mounting rails <sup>2)</sup>
- Investigation of oil specific parameters
- Humidity calibration kit
- Ball valve set 1/2" ISO
- Ball valve set 1/2" NPT
- RS485 add-on chip <sup>3)</sup>

### Order code

HA010110  
 see „4.4 Pluggable probe (option PC4)“  
 FE09  
 HA010203  
 ppm-cal  
 refer to data sheet „Humidity calibration kit“  
 HA050101  
 HA050104  
 HA010605

1) Only for devices with PC4 option.

2) 2 pieces necessary per device.

3) For upgrade to Modbus RTU interface.

## 8 Scope of supply

	Included in versions
EE360 according to ordering guide	all versions
Operation manual English*	all versions
Inspection certificate according to DIN EN 10204 – 3.1	all versions
Two self-adhesive labels for configuration changes (see user guide at <a href="http://www.epluse.com/relabeling">www.epluse.com/relabeling</a> )	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

\*) Other languages can be downloaded at [www.epluse.com/EE360](http://www.epluse.com/EE360)

Tab. 4 Scope of supply

# 9 Technical data

## Measuring values

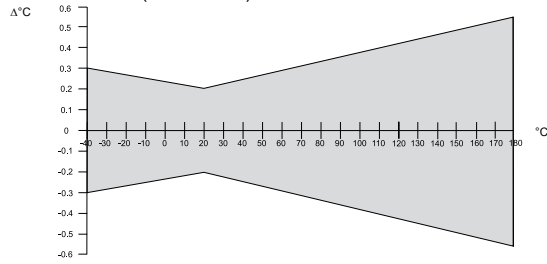
### Water activity (a<sub>w</sub>) / Water content (x)<sup>1)</sup>

Humidity sensor	HC1000-400	
Measuring range	0...1 a <sub>w</sub> / 0...100,000 ppm	
Accuracy <sup>2)</sup>		
-15...40 °C (5...104 °F)	≤0.9 a <sub>w</sub>	± (0.013 + 0.3%*mv) a <sub>w</sub>
-15...40 °C (5...104 °F)	>0.9 a <sub>w</sub>	± 0.023 a <sub>w</sub>
-25...70 °C (-13...158 °F)		± (0.014 + 1%*mv) a <sub>w</sub>
-40...180 °C (-40...356 °F)		± (0.015 + 1.5%*mv) a <sub>w</sub>
Temperature dependence of electronics	typ. ± 0.0001 [1/°C]	(typ. ± 5.6 * 10 <sup>-5</sup> [1/°F])
Temperature dependence of sensing probe	typ. ± (0.00002 + 0.0002 x a <sub>w</sub> ) x ΔT [°C]	ΔT = T - 20 °C
Response time at 20 °C (68 °F) / t <sub>90</sub>	typ. 10 min in still oil	

mv = measured value

### Temperature (T)

Temperature sensor	Pt1000 (tolerance class A, DIN EN 60751)
Working range sensing probe	-40...180 °C (-40...356 °F)
Accuracy	



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

## Outputs

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

## General

Power supply class III ⚡ (EU) / class 2 (NA)	8...35 V DC	12...30 V AC
	100...240 V AC, 50/60Hz with option AM3 <sup>3)</sup>	
Current consumption	- 2x voltage output	typ. 40 mA
	- 2x current output	typ. 80 mA
Pressure range sensing probe	0.01...20 bar (0.15...300 psi)	
Probe material	stainless steel 1.4404 (AISI 316L)	
Enclosure material	Polycarbonate UL94-V0 approved	
Protection class	IP65	
Cable gland	M16 x 1.5 for cable Ø 4.5 - 10 mm (0.18 - 0.39")	
Electrical connection	screw terminals up to max. 1.5 mm <sup>2</sup> (AWG 16)	
Working and storage temperature electronics	-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 ClassB
Alarm outputs (2 relays) <sup>3)</sup>	250 V AC / 6 A	FCC Part15 ClassB
	28 V DC / 6 A	
System requirements for EE-PCS software	Windows XP or higher; USB port	

1) ppm output is valid in the range 0...100 °C (32...212 °F)

2) Including hysteresis, non-linearity and repeatability, 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).

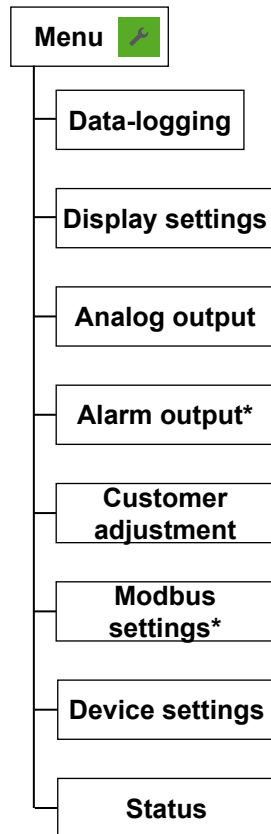
The accuracy was calculated in accordance with EA-4/02 and with regard to GUM (Guide to the Expression of Uncertainty in Measurement).

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

# 10 Appendix

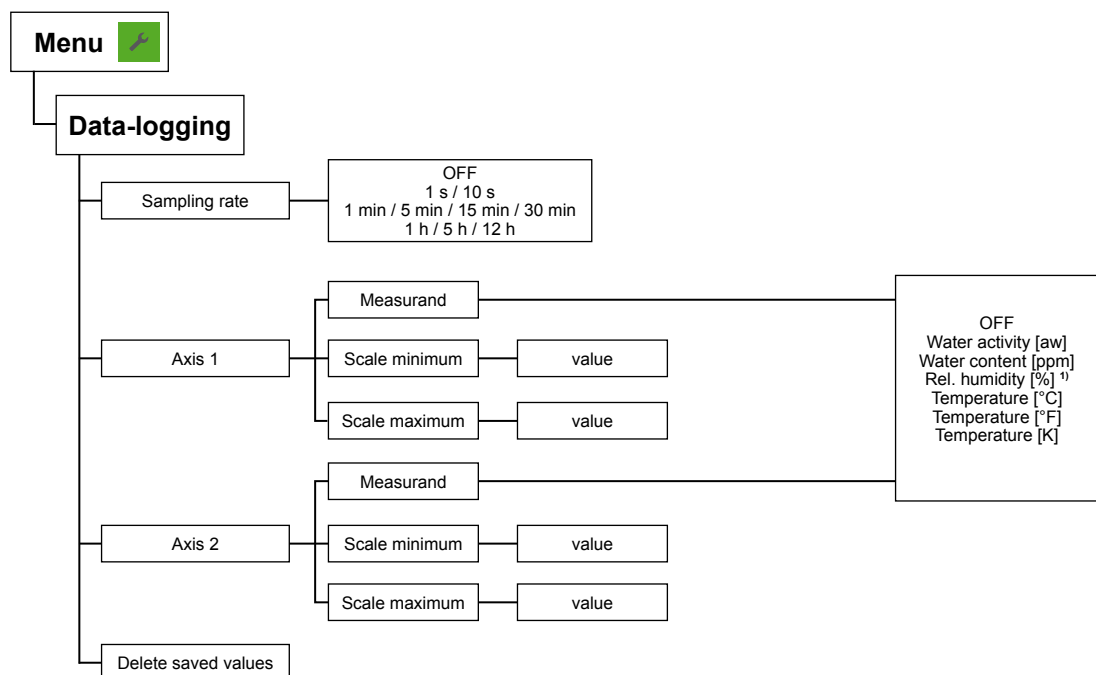
## 10.1 Appendix A

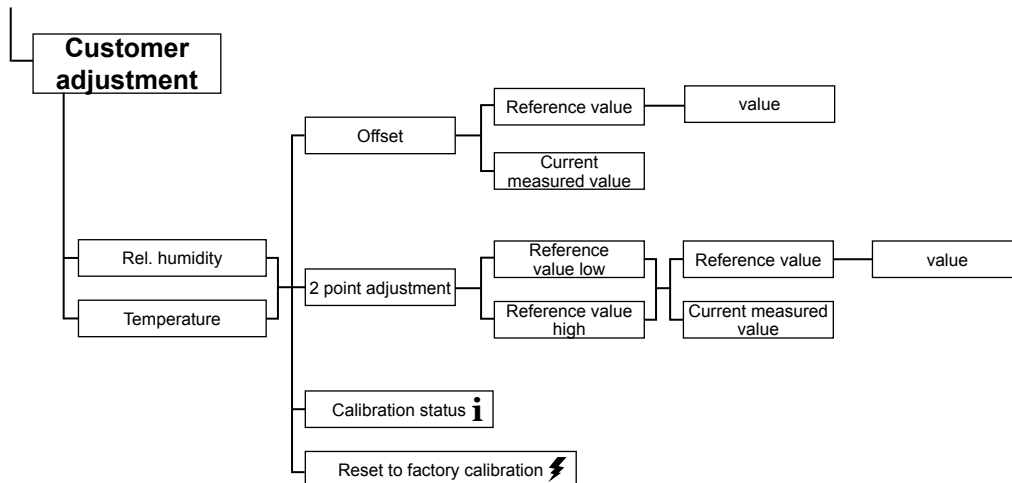
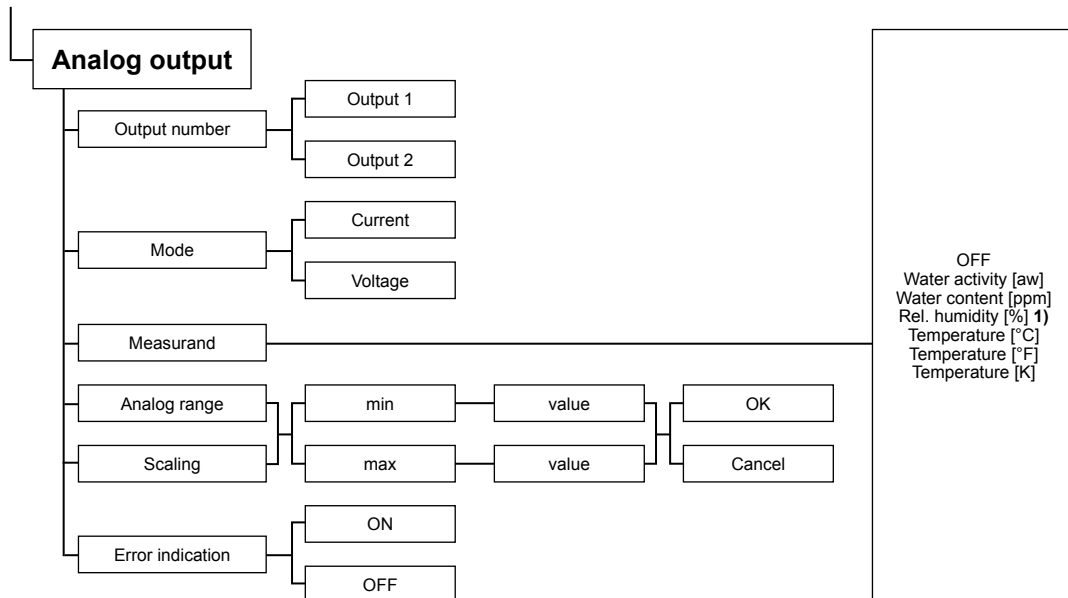
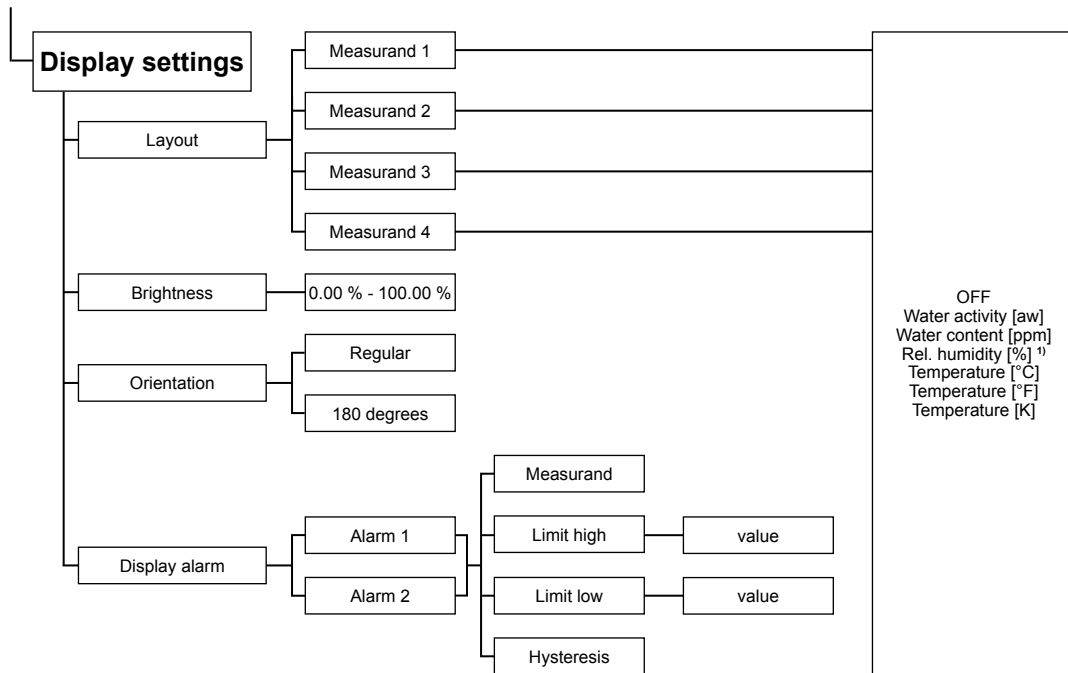
### Overview

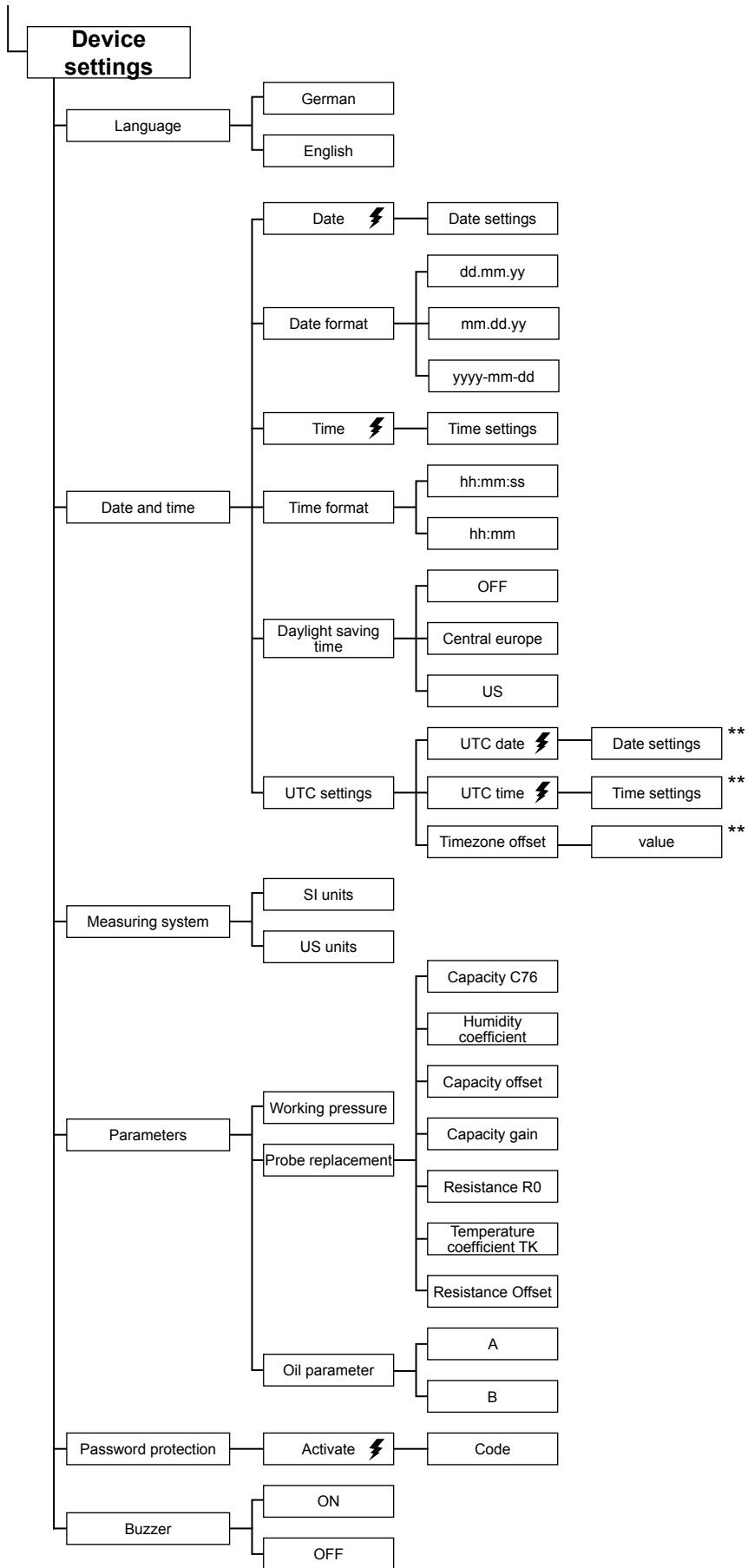


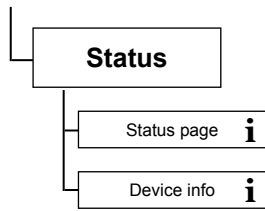
\* Menu only available with connected modules.

### Detailed information









**Optional menu** (only available with plugged in modules during the start up procedure)

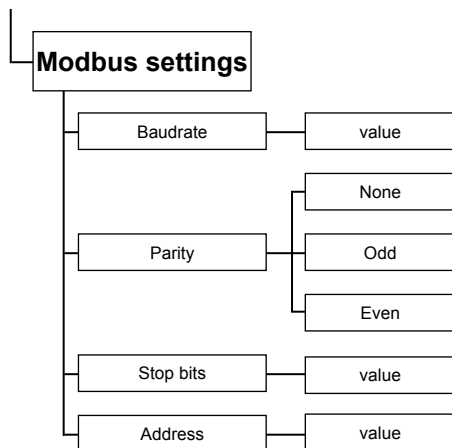
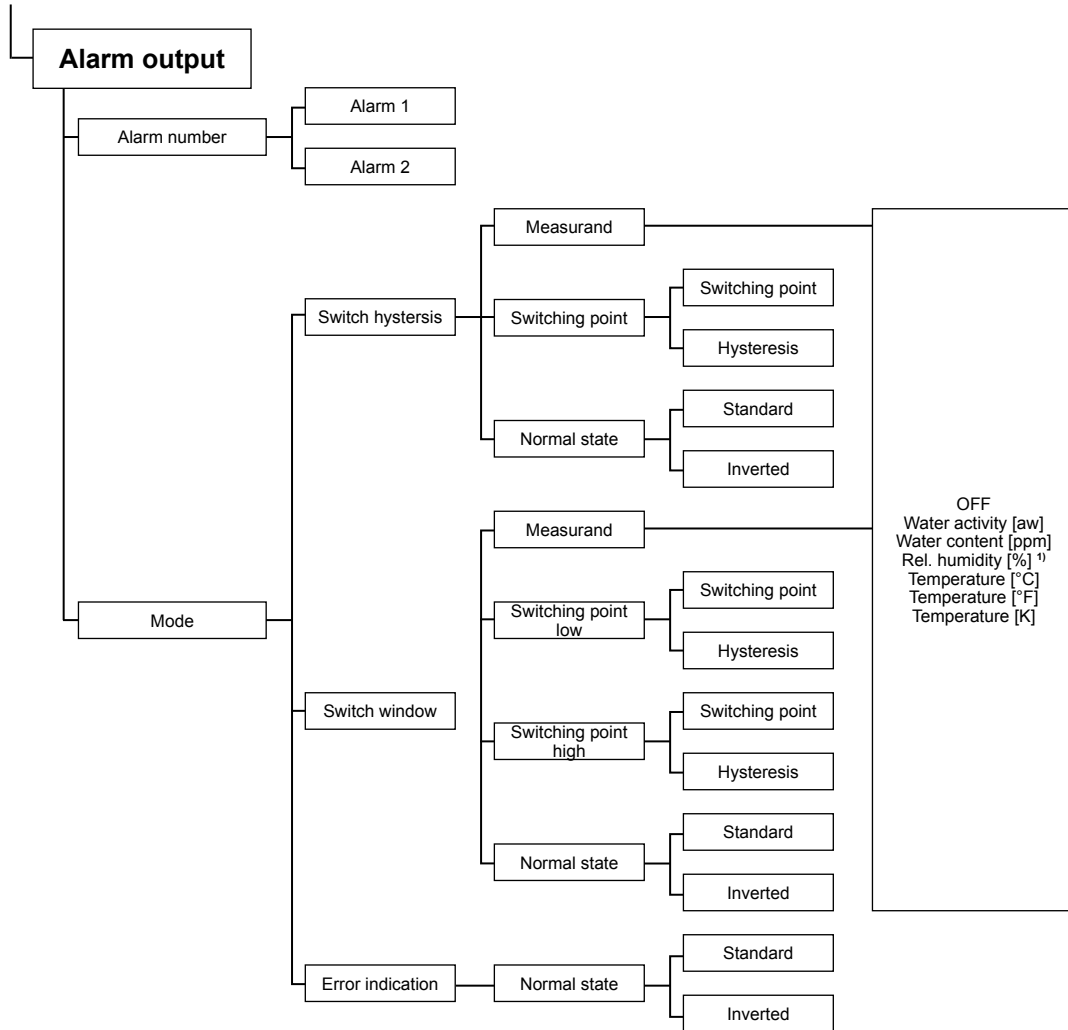


Fig. 28 Configuration menu



#### COMPANY HEADQUARTERS

##### **E+E ELEKTRONIK Ges.m.b.H.**

**www.epluse.com**  
Langwiesen 7  
A-4209 Engerwitzdorf  
Austria  
Tel: +43 7235 605 0  
Fax: +43 7235 605 8  
info@epluse.com

#### TECHNICAL OFFICES

##### **E+E CHINA** **www.epluse.cn**

**BEIJING**  
Tel: +86 10 84992361  
info@epluse.cn  
**SHANGHAI**  
Tel: +86 21 61176129  
info@epluse.cn

**E+E GERMANY**  
**www.epluse.de**  
Tel: +49 6172 13881 0  
info@epluse.de

**E+E FRANCE**  
**www.epluse.fr**  
Tel: +33 4 7472 35 82  
info@epluse.fr

**E+E ITALY**  
**www.epluse.it**  
Tel: +39 02 2707 8636  
info@epluse.it

**E+E KOREA**  
**www.epluse.co.kr**  
Tel: +82 31 732 6050  
info@epluse.co.kr

**E+E USA**  
**www.epluse.com**  
Tel: +1 508 530 3068  
office@epluse.com

YOUR PARTNER IN SENSOR TECHNOLOGY



**ELEKTRONIK®**  
Ges.m.b.H.