NOVOS 3 INC (EPD) RS485 Modbus

Room operating unit for temperature measurement
Optional: Humidity | CO_2 | VOC

thermokon®
HOME OF SENSOR TECHNOLOGY

Data sheet

Subject to technical changes
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»APPLICATION

Room control unit for setpoint/fan stage adjustment, presence detection and triggering an ECO mode function. With measurement of the room temperature, optionally with humidity, CO_2 or VOC. The setpoint can be changed as needed by turning the encoder within a predefined range, e.g. -3 K...+3 K. The current status of the setpoint adjustment is visualised by LEDs. By pressing the encoder, the ECO mode function can be activated. The maintenance-free sensor creates the conditions for a pleasant room climate and well-being. Typical applications are schools, office buildings, hotels or cinemas.

»TYPES AVAILABLE

Room operating unit with temperature sensor, optional with humidity, CO_2 and VOC sensors – active, RS485 Modbus

NOVOS 3 INC ECO



NOVOS 3 INC TD ECO



NOVOS 3 INC FS5 ECO



NOVOS 3 INC EPD ECO



NOVOS 3 INC EPD TD ECO



NOVOS 3 INC EPD FS5 ECO



Note: All types are also available without symbol (ECO) print.

»SECURITY ADVICE – CAUTION

The installation and assembly of electrical equipment should only be performed by authorised personnel.

The product should only be used for the intended application. Unauthorised modifications are prohibited! The product must not be used in relation to any equipment that in case of failure may threaten, directly or indirectly, human health or life or result in danger to human beings, animals or assets. Ensure all power is disconnected before installation. Do not connect to live/operating equipment.

Please comply with

- Local laws, health & safety regulations, technical standards and regulations
- The state of the technology at the time of installation
- This data sheet and installation manual

»PRODUCT TESTING AND CERTIFICATION

Declaration of conformity
The declaration of conformity of the products are available on our website:
https://www.thermokon.de/direct/en-gb/categories/novos-3-inc

»NOTES ON DISPOSAL

The crossed-out wheelie bin symbol indicates that the product or removable batteries must not be disposed of with household or commercial waste. Within the EU, you are legally obliged to dispose of the product separately and appropriately in accordance with the national laws of your country. Alternatively, please contact your supplier or Thermokon Sensortechnik GmbH. Further information can be found at: www.thermokon.com

»BUILD-UP OF SELF-HEATING BY ELECTRICAL DISSIPATIVE POWER

Sensors with electronic components always have a dissipative power, which affects the temperature measurement of the ambient air. The dissipation in active temperature sensors shows a linear increase with rising operating voltage. This dissipative power must be considered when measuring temperature. In case of a fixed operating voltage (±0,2 V) this is normally done by adding or reducing a constant offset value.

Thermokon transducers can be operated with variable operating voltages. The transducers are set at the factory with a reference operating voltage of 24 V =.

At this voltage, the expected measuring error of the output signal will be the least. Other operating voltages can cause a measurement deviation changing power loss of the sensor electronics.

A recalibration can be carried out directly on the unit or via a software variable (app or bus).

»APPLICATION NOTICE FOR HUMIDITY SENSORS

At regular environmental conditions, it is recommended to calibrate the sensor annually to check the compliance with the accuracy required in the application. The following conditions can damage the sensor element or lead in long term to loss of the specified accuracy:

- Mechanical stress
- Contamination (e.g. dust or fingerprints)
- Aggressive chemicals
- Ambient conditions (e.g. condensation on measuring elements)

Do not touch the sensor elements!

Re-calibration or exchange of the sensor elements are not subject of the general warranty.

»INFORMATION ABOUT SELF-CALIBRATION FEATURE CO_2

All gas sensors are subject to drift. The degree of drift is dependent on the use of components and product design. In addition, the following environmental conditions, among others, can accelerate/favor the aging and wear of the sensors:

- Mechanical stress (also due to temperature fluctuation)
- Contamination (e.g. dust or fingerprints)
- Aggressive chemicals
- Ambient conditions (high humidity or condensation on measuring elements)

An internal self-calibration function with dual channel technology compensates for the caused drift. Thermokon sensors are for permanent use (e.g. hospitals).

»INFORMATION ABOUT INDOOR AIR QUALITY CO_2

EN 13779 defines several classes for indoor air quality:

Category	CO_2 content above the content in outdoor air in ppm		Description
	Typical range	Standard value	
IDA1	<400 ppm	350 ppm	Good indoor air quality
IDA2	400..600 ppm	500 ppm	Standard indoor air quality
IDA3	600..1.000 ppm	800 ppm	Moderate indoor air quality
IDA4	>1.000 ppm	1.200 ppm	Poor indoor air quality

»USER INFORMATION FOR VOC AIR QUALITY SENSORS

Volatile organic compounds (VOC) are gaseous and vaporous substances of organic origin present in the air. VOC sensors detect the major portion of air quality that is perceived olfactorily (through the sense of smell) by humans (e.g. body odors, tobacco smoke, emissions from materials such as furniture, carpets, paints, adhesives, etc.).

The VOC value is an application-specific indicator of indoor air quality and does not provide any information about the composition of the substances present.

A VOC sensor oxidises the organic molecules that come into contact with it, causing the resistance of the semiconductor to change. The VOC index (0...500) describes the air quality relative to the learned indoor air conditions. A value of 100 corresponds to “normal” indoor air quality (reference value determined dynamically over approximately 8 days); values below 100 indicate an improvement, while values above 100 indicate a deterioration in air quality. If the room is not ventilated despite high index values, the value will gradually approach 100 again, as the sensor learns the poor air as the new “normal”.

The sensor must not be exposed to direct drafts, as these can significantly influence and distort the measurement result. Any contact with the sensitive sensors must be avoided and will void the warranty.

VOC index	Classification	Meaning	Recommendation
0 – 100	Better air quality	Lower VOC load than the learned reference level of the previously measured indoor air quality (see Section 4.2), e.g. after ventilation, when using an air purifier, or with low room occupancy.	No action needed
100	Reference value (baseline)	Corresponds to the “normal” indoor air quality learned by the algorithm. On Thermokon devices, this reference is determined dynamically over approx. 8 days (see Section 4.2).	Normal condition
100 – 500	Worse air quality	Higher VOC load than the learned reference level, e.g. due to cooking, cleaning agents, high occupancy, or emissions from new furniture or fresh paint.	Ventilation or air purification are recommended; at high values (> 350) intense ventilation is recommended

»TECHNICAL DATA

Measuring values *(optional)*	Temperature, humidity (optional), CO_2 (optional), VOC (optional)
Network technology	RS485 Modbus, RTU, half-duplex, baud rate 9.600, 19.200, 38.400 or 57600, parity: none (1 stopbit, alternative 2 stopbits), even or odd (1 stopbit), **Fail-safe Biasing required**
Power supply*	15..35 V = (or 19..29 V ~)* SELV
Power consumption	Typ. 0,4 W (24 V =) | 0,8 VA (24 V ~)
Inputs	1 input for floating input
Set point	Rotary/press encoder (incremental encoder)
Button (T) *(optional)*	For presence detection, with LED (TD) or fan stage adjustment
LED (D) *(optional)*	For status feedback, button LED colour can be set (from 7 colours) via Thermokon NOVOSapp (any from RGB or BUS)
Display *(optional)*	ePaper, for measured values, display optionally parameterised via Thermokon NOVOSapp
Control functions	**INC ECO:** temperature setpoint adjustment, ECO mode **INC TD ECO:** temperature setpoint adjustment, presence detection, ECO mode **INC FS5 ECO:** temperature setpoint adjustment, fan stage adjustment, ECO mode
Enclosure	PC V0, pure white
Degree of Protection	IP20, according to DIN EN 60529
Cable entry	Open rear side, predetermined breaking points at the bottom, drill marks on the top
Electrical connection	Tool-free mountable spring terminal, max. 1,5 mm²
Ambient condition	-20..+70 °C | -4..+158 °F, max. 85 % (non-condensing), with CO_2 or VOC sensor operating temperature range 0..+50 °C | 32..+122 °F
Mounting	Surface mounted on flush-mounting box (Ø=60 mm) or to be mounted flat onto the surface using screws, base part can be mounted and wired separately

***Power supply**
When several BUS devices are supplied by one 24 V AC voltage supply, it is to be ensured that all "positive" operating voltage input terminals (+) of the field devices are connected with each other and all "negative" operating voltage input terminals (-) (= reference potential) are connected together (in-phase connection of field devices). In case of reversed polarity at one field device, a supply voltage short-circuit would be caused by that device. ***The consequential short-circuit current flowing through this field may cause damage to it. Therefore, pay attention to correct wiring.***

AC voltage requires higher power consumption. This results in greater self-heating and requires an on-site offset adjustment. Therefore, we recommend using a DC power supply.

» Temperature

Measuring range temperature	-20..+70 °C | -4..+158 °F
Accuracy temperature	±0,5 K (typ. at 21 °C | 70 °F)

» Humidity (optional)

Measuring range humidity *(optional configurable)*	**Relative humidty** (default) 0..100 % rH	**Enthalpy** 0..85 KJ/kg | 0..37 BTU/lb	**Absolute humidity** 0..50 | 0..80 g/m³ 0..1,5 | 0..2,3 g/ft³	**Dew point** 0..+50 | -20..+80 °C +32..+122 | -4..+176 °F
	Configurable via Thermokon NOVOSapp or BUS			
Accuracy humidity	±2 % between 10..90 % rH (typ. at 21 °C | 70 °F)			

» CO_2 *(optional)*

Measuring range CO_2	0..2000 ppm | 0..5000 ppm (configurable via Thermokon NOVOSapp or BUS)
Accuracy CO_2	±50 ppm +3 % of reading (typ. at 21 °C | 70 °F, 50 % rH, 1015 hPa)
Calibration	Self-calibration dual channel
Sensor	NDIR (non-dispersive, infrared)

» VOC *(optional)*

Measuring range VOC	VOC index: 0..500
Calibration	Self-calibration
Sensor	Heated metal oxide semiconductor

» MOUNTING ADVICE

The Accuracy of the room sensors is influenced by the technical specifications as well as the positioning and the installation type.

During assembly:
- Seal mounting box (if present).
- Installation type, air draught, heat source, radiation heat or direct sunlight can affect the measurement.
- Building material specific properties of the installation place *(brick-, concrete-, partition wall, cavity wall)* can affect the measurement.

Assembly not recommended:
- in air draughts (e.g.: close to windows/doors/fans)
- near heating sources,
- in direct sunlight
- niches/between furniture

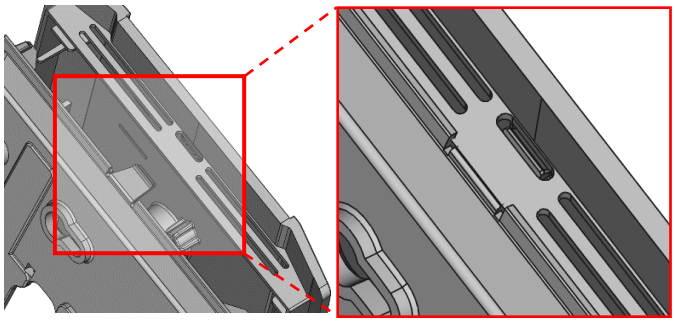
Please make sure that the device is de-energised if you want to install it!

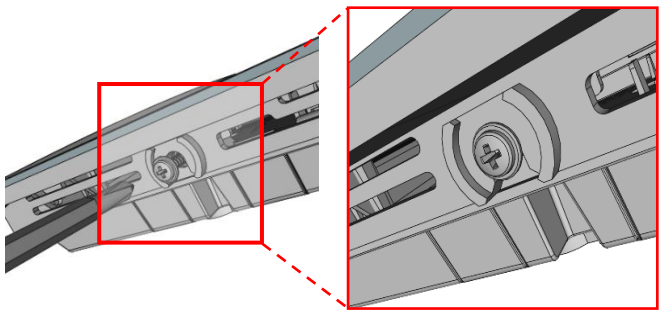
The installation can be performed on the flat wall surface or on a flush-mounted box. A representative place should be selected. Sunshine and draft, e.g. in the installation tube should be avoided, so that the measurement result is not falsified. Seal the end of the installation tube.

- for wiring, the upper part of the device must be removed from the base plate. Base plate and upper part are detachable connected to each other by means of locking lugs.
- the base plate is mounted on the flat wall surface with wall plugs and screws.
- finally, the device is attached to the base plate and fixed with the screw.
- internal connecting wires must be routed in such a way that they do not press against the PCB or the sensors. Excess cable must be stored in the flush-mounted wall box.

Housing open/close

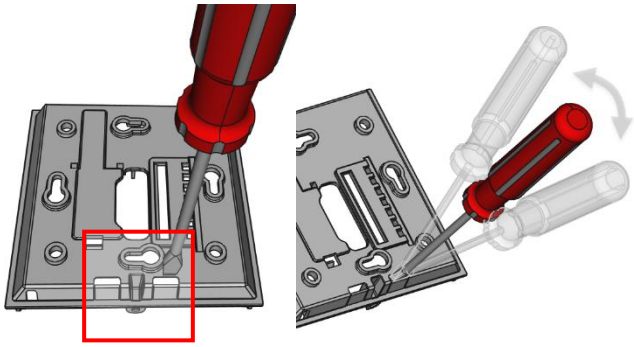
Snap the upper part of the housing into the locking lug on the upper side	Fix the upper part of the housing on the underside with the screw

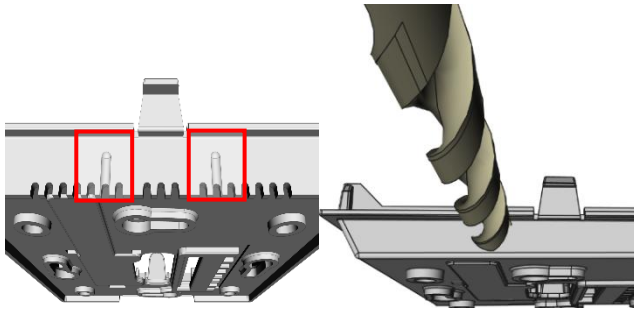




Cable entry

There are predetermined breaking points for 2 optional cable entries on the underside of the base plate	On the upper side of the base plate there are 2 grits as position for a drill hole max. Ø 6 mm



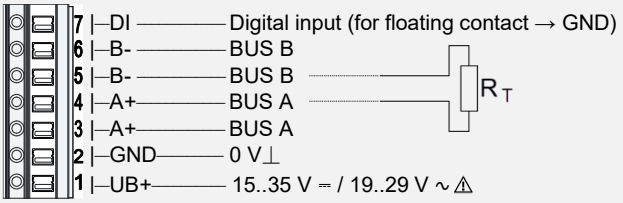


When using a drill, you should absolutely ensure that the base plate is firmly clamped. Before drilling, the pressure must be reduced and carefully drilled. A sudden break-through of the drill bit can be the result.

»WIRING DIAGRAM

Room operating unit – active, RS485 Modbus

NOVOS 3 RS485 Modbus

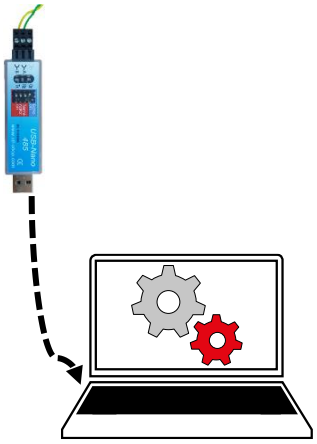
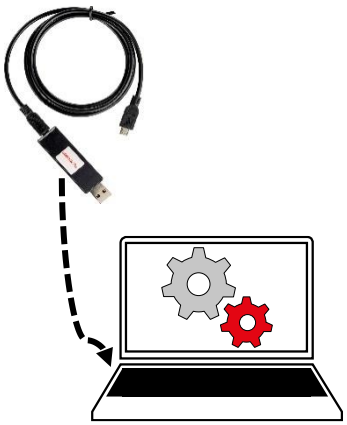


With alternating voltage, the correct polarity must be ensured! Please note the technical data.

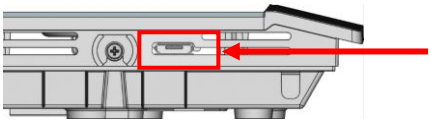
Don´t forget the BUS termination (120 Ω) at the last device of the line! *(Not included in delivery)*

»CONFIGURATION

The configuration is performed in powered state. The following options are available for configuring the device:

Device connection	RS485	Micro USB	Micro USB
Configuration adapter	USB RS485 converter 	Thermokon USB interface 	USB Bluetooth dongle 
Configuration software	PC/notebook with uConfig software *Parameterisation via desktop PC/notebook with uConfig software and a USB/RS485 converter – Item No. 668293.*	PC/notebook with uConfig software *Parameterisation via desktop PC/notebook with uConfig software, via Thermokon USB interface* – Item No. 597838.*	Smartphone/tablet with NOVOSapp *Parameterisation with mobile devices via Bluetooth and NOVOSapp. A separately available Bluetooth dongle* is required – Item no. 668262.*

**Commercially available Bluetooth dongles or USB-to-Micro-USB adapter cables are not compatible. You need a mobile device that supports at least Bluetooth version 4.1. The configuration app with the corresponding instructions can be downloaded from the Google Play Store or the Apple App Store.*

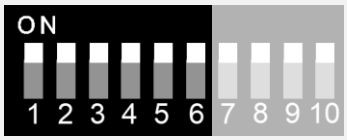


Position of the Micro USB port, see bottom of the device, for configuration with Bluetooth dongle or Micro-USB programming interface.

»DIP SWITCH SETTINGS

The Modbus address of the device is set in the range of 1..63 (binary encoded) using a 6-pole DIP switch. With address 0 via DIP, an extended address range (64..247) is available via NOVOSapp.

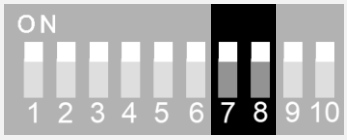
Modbus address – DIP 1..6 (binary coded)



DIP switch	1 = ON	2 = ON	3 = ON	4 = ON	5 = ON	6 = ON
Value	2^0 (1)	2^1 (2)	2^2 (4)	2^3 (8)	2^4 (16)	2^5 (32)

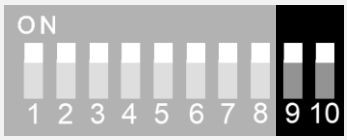
Factory default, address 63

Baud rate – DIP 7 & 8



7	8	Baud rate	
OFF	OFF	9.600	
ON	OFF	19.200	
OFF	ON	38.400	
ON	ON	57.600	(Factory default)

Parity / Stop bits - DIP 9 & 10



9	10	Parity
OFF	OFF	None – 2-Stop bits
ON	OFF	Even – 1 Stop bit
OFF	ON	Odd – 1 Stop bit
ON	ON	None – 1-Stop bit (factory default)

» CONTROL FUNCTIONS

In the factory default settings, the brightness of all LEDs during an interaction is 100 %. After a configurable time, the LEDs go into standby mode and the brightness is dimmed down to a configurable value until the next interaction.

Address/access	Description	Factory default	Resolution/unit	
1200 R/W	Brightness of LEDs in active state (interaction)	100 = 100 % (default)	1.0	%
1201 R/W	Brightness of the LEDs in standby mode	100 = 100 % (default)	1.0	%
1202 R/W	Change to standby mode after x seconds	120 = 120 sec. (default)	1.0	sec.

NOVOS 3 INC TD | Button for room occupancy

Pressing the button switches the room occupancy. As status feedback, the push-button LED can be switched on when the room is occupied.

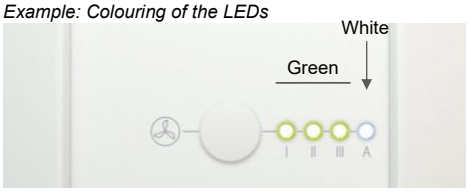
Address/access	Description
100 R/W	**Room occupancy** 0 = Unoccupied 1 = Occupied
1307 R/W	**Room occupancy after Power-On reset** 0 = Unoccupied 1 = Occupied (default)
426 R/W	**LED behaviour** 0 = LED Off 1 = LED On 2 = Room occupancy *(occupied = LED On unoccupied = LED Off)*
427 R/W	**Button LED colour** 1 = White 2 = LED Off 3 = Red 4 = Green 5 = Blue 6 = Yellow 7 = Magenta 8 = Turquoise

NOVOS 3 INC TD FS5 | Button for fan stages

Press the key to set the fan level. The individual fan levels are "toggled".

Address/access	Description
104 R	**Fan stage** 0 = Off 1 = Stage 1 2 = Stage 2 3 = Stage 3 6 = Stage Auto
105 W	See address 104
1310 R/W	**Fan stage Auto available** 0 = No 1 = Yes (default)
1312 R/W	**Fan stage after Power-On Reset** 0 = Off 1 = Stage 1 2 = Stage 2 3 = Stage 3 6 = Stage Auto

Example: Colouring of the LEDs



NOVOS 3 INC ECO



NOVOS 3 INC TD ECO

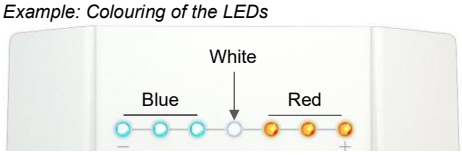


NOVOS 3 INC FS5 ECO



7 LEDs indicate the status of the currently adjusted setpoint. The LED display scales automatically to the set setpoint adjustment range.

Example: Colouring of the LEDs



Rotary/press encoder

One control element with 2 functions.
The target value can be adjusted by turning.

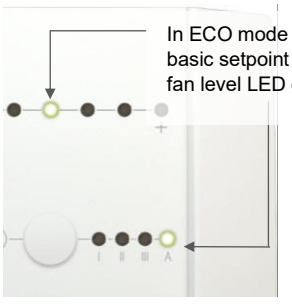
Address/access	Description
103 R/W	**Set point (effective)** 210 = 21,0 °C
1302 R/W	**Base set point** 210 = 21,0 °C (default)
1303 R/W	**Set point adjustement range** 30 = ±3,0 °C (default) *It makes sense to adapt the setpoint adjustment range of the NOVOS 3 INC to the number of LEDs.*
1304 R/W	**Set point step width** 5 = 0,5 °C (default)
1305 R/W	**ECO button function** 0 = No 1 = Yes

Press to activate/deactivate the ECO function (address 101).

ECO mode is deactivated when the setpoint or fan speed is adjusted on the device. (Green LED is deactivated)

In ECO mode, the set setpoint offset and the fan speeds remain as configured in the Modbus register.

Address/access	Description
101 R/W	**ECO function** 0 = Not active 1 = Active

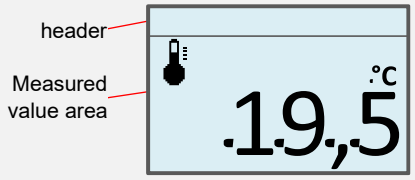
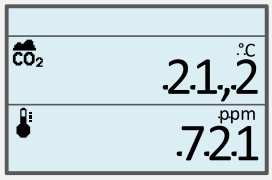
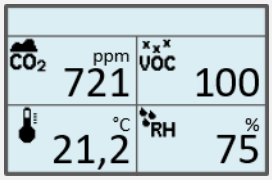


In ECO mode the colour of the basic setpoint LED and the auto fan level LED changes to green.

» DISPLAY

The display scales automatically depending on the device and the number of measured variables. Parameters such as the display/hiding of measured variables are changed via the app. The software and hardware versions are displayed during the boot process.

Display

1 measured value	2 measured values	3 or 4 measured values
		

Symbols

Measured values*				Header symbols *(can be displayed in the header via bus)**							
Temperature	Humidity	Eco-Mode	Notice	Heating	Cooling
VOC	CO_2	Window contact	Occupied	Unoccupied	Maintenance

Additional symbols *(displayed at activation)*

Traffic light function	Threshold value coloured display illumination	Display illumination
Fan stage*	Permanent display of the fan speed	Header area
Setpoint *	Display of the set target value	Measured value range
Notice	Internal sensor error (display next to measured variable)	Measured value range

*depending on variant

» MODBUS DATA ADDRESSES

Address	Access	Description		Resolution/unit	
501	**R**	**Relative humidity** 850 = 85,0 % rH	Offset | Address 2111 | 1 = 0,1 %	0.1	% rH
505	**R**	**CO_2**	Offset | Address 2511 | 1 = 1 ppm	1.0	ppm
506	**R**	**VOC**	Offset | Address 2611 | 1 = 0,1 %	1.0	Index
507	**R**	**CO_2/VOC Mix**	Offset | Address 2711 | 1 = 0,1 %	0.1	%
514	**R**	**Status digital input** 0 = Open | 1 = Closed			

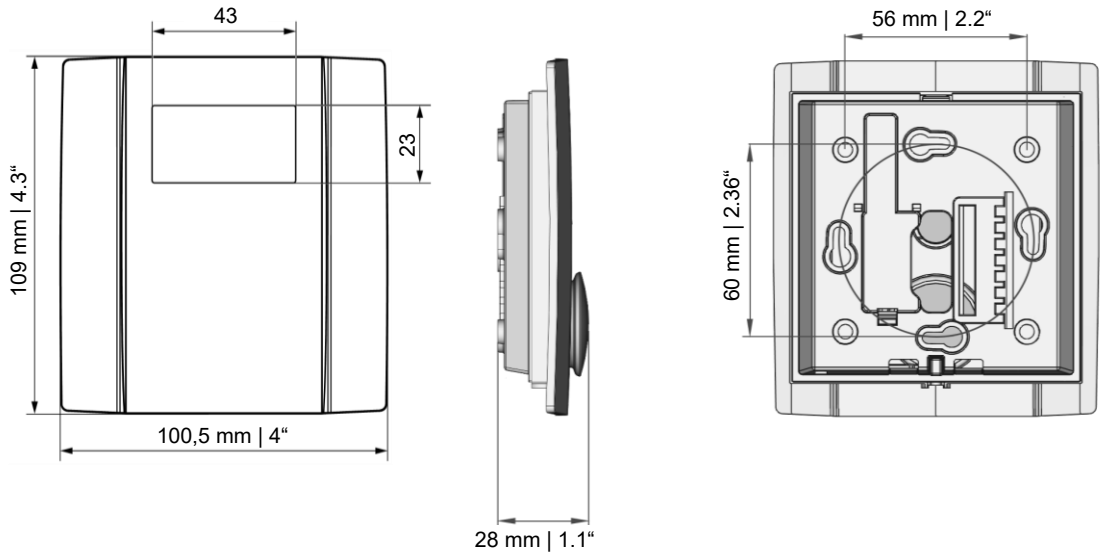
Register 1100 = 1 (Unit SI)

Address	Access	Description		Resolution/unit		
500	**R**	**Temperature** 210 = 21,0 °C	Offset | Address 2011 | 1 = 0,1 °C	SI	0.1	°C
502	**R**	**Absolute humidity** 150 = 15,0 g/m³	Offset | Address 2211 | 1 = 0,01 g/m³	SI	0.1	g/m³
503	**R**	**Enthalpy** 550 = 55,0 kJ/kg	Offset | Address 2311 | 1 = 0,1 KJ/kg	SI	0.1	kJ/kg
504	**R**	**Dew point** 180 = 18,0 °C	Offset | Address 2411 | 1 = 0,1 °C	SI	0.1	°C

Register 1100 = 2 (Unit Imperial)

Address	Access	Description		Resolution/unit		
500	**R**	**Temperature** 700 = 70,0 °F	Offset | Address 2011 | 1 = 0,1 °F	Imperial	0.1	°F
502	**R**	**Absolute humidity** 420 = 4,2 gr/ft³	Offset | Address 2211 | 1 = 0,01 gr/ft³	Imperial	0.1	gr/ft³
503	**R**	**Enthalpy** 240 = 24,0 BTU/lb	Offset | Address 2311 | 1 = 0,1 BTU/lb	Imperial	0.1	BTU/lb
504	**R**	**Dew point** 600 = 60,0 °F	Offset | Address 2411 | 1 = 0,1 °F	Imperial	0.1	°F

»DIMENSIONS (MM | IN.)



»ACCESSORIES (OPTIONAL)

Wall plugs and screws (2 pcs. each)	Item No. 102209
PSU-UP24 – flush mount power supply, 24 V (AC input: 100..240 V ~ | DC output 24 V = 0,5 A)	Item No. 645737
Mounting bracket (surface mounted) white	Item No. 795050
Mounting bracket (surface mounted) black	Item No. 795074
Bluetooth dongle	Item No. 668262
Thermokon USB-Interface	Item No. 597838
USB RS485 Modbus RTU Logger	Item No. 809917
USB Interface RS485 (incl. driver CD)	Item No. 668293
RS485 Biasing Adapter	Item No. 811378