

Technical Data Sheet PS3.01

**QER10 / VER10 / TER10 / MER10**

**QER / VER / TER / MER Series Smart CO<sub>2</sub>, VOC, Temperature and Humidity Multi-Sensors and Network Interfaces, BACnet, Modbus and LoraWan**



The QER10, VER10, TER10 and MER10 Series Smart Multi-Sensors have been designed for monitoring and control CO<sub>2</sub>, VOC, Temperature and Humidity in room spaces. The sensors have modern design and are mounted on the wall surface directly or to standard wall mounting boxes.

The sensors can have an optional colour display with high hardness glass front, and/or additional PIR sensor. Touchscreen option is available for network user interface functions and interactive sensor operations such as trending. Optional Bluetooth wireless interface provides Smart Phone App interface (iOS). LoraWan option allows integration wirelessly to the LoraWan systems.

## Features

- Smart Multi-Function Sensors for monitoring temperature, CO<sub>2</sub>, VOC, humidity and passive infrared movement (select model / options for the required measurements)
- 4 x Analogue 0..10Vdc Outputs, max. 2mA, for measurements and control
- 2 x Universal inputs (temperature/0-10V/digital) offer application flexibility and local measurements
- BACnet MS/TP or Modbus RS485 RTU with up to 60V industrial isolation on RS485 for system integration
- Optional 2.4" Colour Screen / Touchscreen for Alarms, Trend Graphs and User Interface Functions
- Optional 24V pilot relay (RL-option) allows equipment switching locally
- With Touchscreen option Timed Boost Override for control outputs
- Can be used as BACnet/Network User Interface and I/O for BMS Systems in distributed applications (provides measurements, user overrides and system indications, hardware network inputs and outputs)
- 2 x Built-In PI Control Loops that allow local control of Temperature, Humidity, CO<sub>2</sub>, VOC or combination of them
- Bluetooth wireless connection (Smart Phone App) and LoraWan wireless communication options
- Configuration wirelessly through Smart Config Windows Software or Smart Phone iOS App (via Built-In Bluetooth or using Bluetooth Dongles)
- Available in both White and Black. The screen has number of different skin colour options for user preferences.
- User display language customisable using the language packs



## Technical Specifications

<b>Power Supply:</b>	Power: 24Vac/dc -10%/+15%, max 80mA with display
<b>Measurements:</b>	CO2 (QER Models) Range: 0..10,000ppm Accuracy: +/-50ppm + 5% of the reading Temperature (All Models) Range: 0..50° (32..122°F) Accuracy: +/-0.5°C Humidity (Option / MER Models) Range: 0..100%rH Accuracy: +/-2%rH (within 20 to 80%rH) VOC (Volatile Organic Compound) (Option / VER Models); Range: 0..500 (Air Quality Index)
<b>Inputs:</b>	PIR (Option) Type/Range: Passive Infrared Occupancy/Movement Detection, Range up to 5m Universal Inputs: 2 xUniversal Inputs - RI/AI/DI Application Selected RI = NTC10 Measurement AI = 0..10Vdc Input DI = Digital Volt-Free Input
<b>Outputs:</b>	Analogue Outputs: 4 x 0..10Vdc, min. load resistance >5 kOhms (max. 2mA @ 10V) Relay Output (Option): 1 x 24V Pilot Relay, max 0.25A (resistive load)
<b>Communication:</b>	Physical Interface: 1 x RS485 driver with up to 60V industrial Isolation, recommended max 63 devices Protocol: Modbus RTU or BACnet MS/TP (order relevant model) Addressing: Via Bitswitch: 1..127 Via Software: 1..247 for Modbus, 1..127 for BACnet MS/TP Settings: Baud Rate: 9600/19200/38400/76800 (bitswitch), 57600/115200 (software) Modbus Parity: None/Even/Odd, Modbus Stop Bits: 1 or 2
<b>Wireless Interface:</b>	Bluetooth (Option): Bluetooth Low Energy - iOS Smart Phone App Interface LoraWan (Option): LoraWan® Wireless Interface (EU868, other bands available on request) Encrypted LoraWan® 1.0.3 Class C Device with secure OTAA activation with IPEX antenna for long-range communication.
<b>Display:</b>	LCD Option: Optional 2.4" Full Colour Display with Glass Overlay, 240 x 320px Touchscreen Option: Capacitive Touchscreen
<b>Mechanical:</b>	Wiring Terminals: Rising Cage Screw Terminals, 0.2 to 2.5mm <sup>2</sup> / 26 to 12 AWG Enclosure: ABS ULV0 Plastics - White or Black Mounting: Wall or Junction Box Mounting (60mm screw distance) Dimensions: W86 x H86 x D24mm

## Wiring Connections

The diagram below illustrates the wiring connections to the sensors.

Terminal	Description
G	24Vac/dc -10%/+15% Supply
G0	0V Common
UI1	NTC10/0-10V/Volt-Free Digital Input 1
UI2	NTC10/0-10V/Volt-Free Digital Input 2
A+	Modbus / BACnet RS485 A+
B-	Modbus / BACnet RS485 B-
G0	0V Common

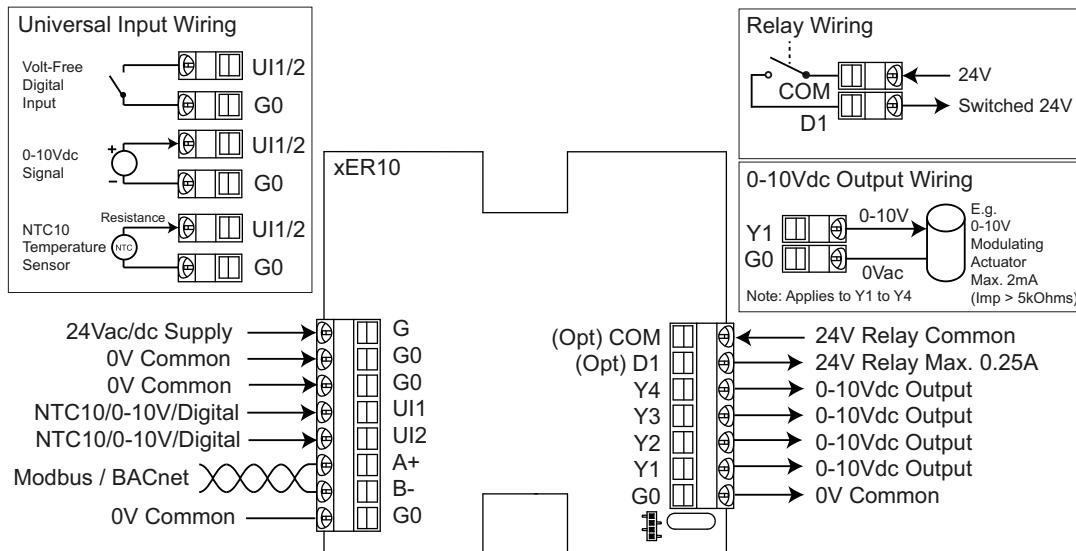
Terminal	Description
COM	24V Relay Common (Option)
D1	24V Relay Max 0.25A (Option)
Y4	0-10Vdc Output max. 2mA
Y3	0-10Vdc Output max. 2mA
Y2	0-10Vdc Output max. 2mA
Y1	0-10Vdc Output max. 2mA
G0	0V Common

### WIRING GUIDELINES

In order to wire the device, remove the front cover by pressing the clip on the bottom of the display e.g. using a flat headed screwdriver. Be careful not to use excess force. Whilst pressing the clip lift the front cover from the bottom edges of the enclosure.

Make sure that power is switched off and carry out wiring according to the wiring connections drawing and local wiring guidelines. Insert the front cover and power up the device.

**NOTE: For opening and mounting the enclosure please refer to the Dimensions and Installation Chapter.**



## Model Selection

Refer to the below table to select the required model. The part number offers descriptive method for the product and options selection, and the SKU# number provides unique reference number for the part. It is possible to order products using either.

Part Number		SKU# Number					
Example	QER10-MOD-LCD-BLE-RH-VOC-B	1000	1	04	02	00 01	
<b>Product Name</b>		Product	Product Options				
QER10	Room CO2 and Temperature Multi-Sensor, 2UI, 4AO	1000					
MER10	Room Humidity and Temperature Multi-Sensor, 2UI, 4AO	1100					
TER10	Smart Room Temperature Sensor, 2UI, 4AO	1200					
VER10	Room VOC, Humidity and Temperature Multi-Sensor, 2UI, 4AO	1300					
<b>Communication Options</b>							
MOD	Modbus RS485		1				
BAC	BACnet MS/TP			2			
<b>Interface Options</b>							
	No Interface			00			
LCD	Colour Display			01			
TS	Colour Capacitive Touchscreen			02			
BLE	Bluetooth App Interface			03			
LCD-BLE	Colour Display and Bluetooth			04			
TS-BLE	Touchscreen and Bluetooth			05			
LRA	LoraWan Wireless Interface, EU868MHz			06			
LCD-LRA	Colour Display and LoraWan Interface, EU868MHz			07			
TS-LRA	LoraWan Wireless Interface EU868MHz with Touchscreen			08			
<b>Measurement Options</b>							
	No Extra Measurements			00			
RH	Relative Humidity (QER Only)			01			
RH-VOC	Volatile Organic Compound and Humidity (QER Only)			02			
OE	Passive Infrared Sensor (PIR)			03			
RH-OE	Relative Humidity and PIR (QER Only)			04			
RH-VOC-OE	VOC, Relative Humidity and PIR (QER Only)			05			
<b>Output Options</b>							
	No Output Options			00			
RL	24V Relay Output			01			
<b>Colour Options</b>							
B	Black			01			
W	White			02			

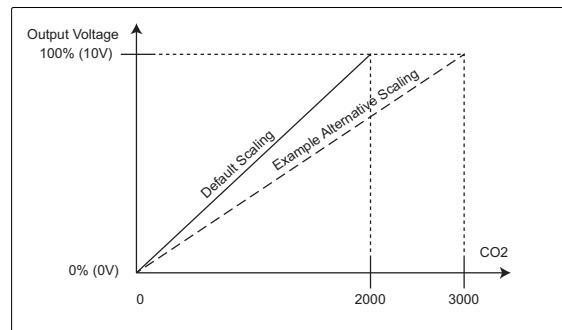
## Measurements

### CO2 (CARBON DIOXIDE) MEASUREMENT (QER MODELS)

CO2 (Carbon Dioxide) measurement is available through the analogue outputs Y1 to Y4 as proportional 0..10Vdc signal. As default Y3 has been configured for CO2 reading. The measurement is also available via Modbus and BACnet communication network.

The output signal is scaled as default 0..2,000ppm = 0..10Vdc. The output scaling can be modified by changing the max scaled CO2 parameter. The maximum scaling is the full range of the CO2 sensor (10,000ppm).

The CO2 sensor provides Automatic Self Calibration logic keeping the measurements accurate over the time.

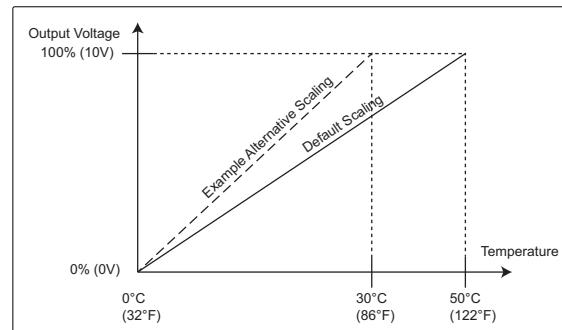


### TEMPERATURE MEASUREMENT (ALL MODELS)

Temperature measurement is available through the analogue outputs Y1 to Y4 as proportional 0..10Vdc signal. As default Y1 has been configured for temperature. The measurement is also available via Modbus and BACnet communication network.

The output signal is scaled as default 0..50°C (32..122°F) = 0..10Vdc. The output scaling can be modified by changing the max scaled temperature parameter.

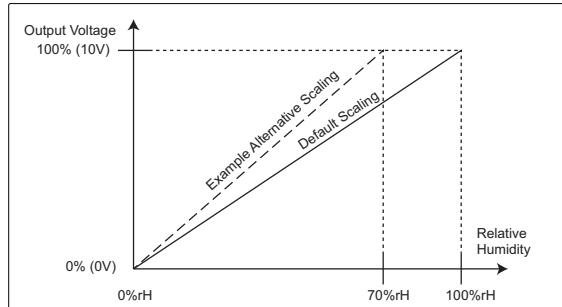
**NOTE: For accurate temperature measurement it is important that correct installation instructions are followed - see Dimensions and Installation Chapter.**



### HUMIDITY MEASUREMENT (MER MODELS / OPTION)

Humidity measurement is available through the analogue outputs Y1 to Y4 as proportional 0..10Vdc signal. As default Y2 has been configured for relative humidity. The measurement is also available via Modbus and BACnet communication network.

The output signal is scaled as default 0..100%rH = 0..10Vdc. The output scaling can be modified by changing the max scaled humidity parameter.



### MOVEMENT DETECTION USING PASSIVE INFRARED SENSOR (OPTION)

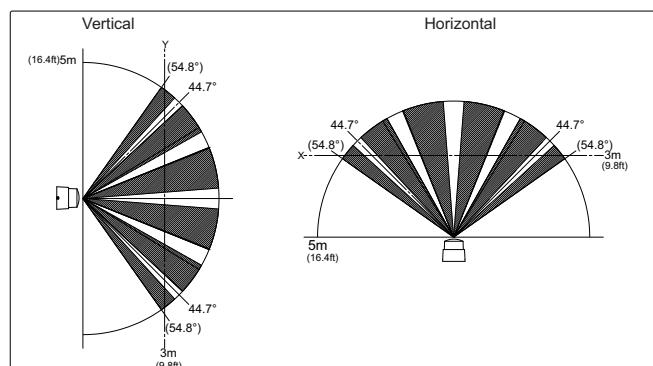
The sensors can be fitted with an optional pyroelectric infrared motion sensor for the occupancy and movement detection. The sensor element is designed for optimal usability and reliability with low power consumption, better sensitivity and signal-to-noise ratio reducing the false detections.

The movement sensor status is available over the network or through the optional relay output.

The diagram illustrates the detection area.

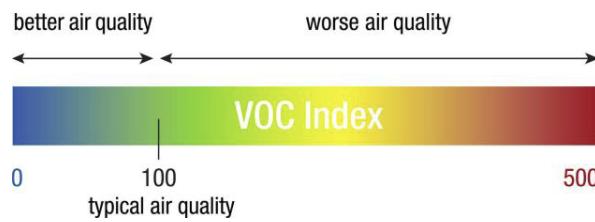
The movement sensor *Delay Off Timer* (10..28,800 seconds) parameter sets the time that the status latches ON after detection of movement.

**NOTE:** Any new detected movement resets the timer. The movement sensor has 30 seconds warm-up delay on power up.



### RH-VOC VOLATILE ORGANIC COMPOUND MEASUREMENT (VER MODELS / OPTION)

The VOC sensor option measures Volatile Organic Compounds with automatic humidity compensation providing relative indoor air quality index signal (see below diagram). The measurement can be outputted to 0..10Vdc output and read over Modbus/BACnet communication network.



Measured air pollutants include harmful gases (acetone from paints and glues, toluene from furniture, mattresses and building products), other gases (ethanol from alcohol, perfumes and cleaners), odours (hydrogen sulfide and volatile sulfuric compounds from rotten food and farts; ammonia and amines from pet urine), smoke (benzene and nitrosamines from cigarette smoke).

The output signal is scaled as 0..500 index = 0..10Vdc.

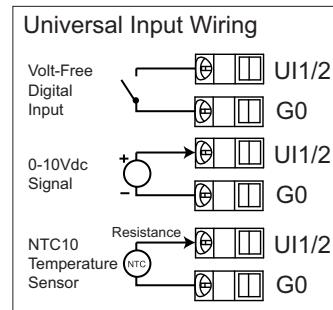
## Universal Inputs

The sensors have two Universal Inputs. The universal inputs can be configured to operate as NCT10 (resistive), Analogue (0..10V) or Digital Binary On/Off. The NTC10 and 0-10V measurements are available as network values or can be displayed on the screen. The Digital Binary inputs can be used to control the relay (RL option), or as network indication.

If the Universal Input is configued as 0..10V (0..100%), then the input voltage can be scaled to the measurement values using *UI Scale Min.* and *UI Scale Max.* parameters.

The maximum 0..10V measurement range is 0..3000. If the device connected to 0..10V inputs use wider range, it can also be configured using voltage clamping parameters (within the measurement range 0..3000).

Examples of the typical settings are showed on the table below.



Connected Device Output Voltage	Connected Device Measurement	Universal Input Measurement	Universal Input Settings (See Input/Ouput Settings parameters for further info)
0..10V	0..100%	0..100%	Default Settings
0..10V	0.50 degree	0..50 degree	Default Settings + UI Scale Max. = 50.0
0..10V	0.2000ppm	0..2000ppm	Default Settings + UI Scale Max. = 2000.0
0..10V	400..2000ppm	400..2000ppm	Default Settings + UI Scale Min. = 400.0; UI Scale Max. = 2000
0..10V	0.5000ppm	0..3000ppm	Default Settings + UI Scale Max. = 2000; UI Voltage Max. = 6.0V

## Analogue Outputs

The sensors have 4 x 0..10Vdc outputs. The Y1/Y2/Y3/Y4 0..10V outputs can be configured to transmit the temperature, humidity, VOC, CO2 and UI measurements. In addition the outputs can be configured for Control Loop output and for Max Loop1/Loop2 outputs (see Control Loops chapter for further details).

The outputs can also be controlled from the Modbus/BACnet network.

If the analogue output is configured for the Universal Input measurement, the output voltage depends on the Input configuration. In case of the NTC10, the 0..10V output is scaled based on the Max. Scaled Temperature. If 0..10V input option is selected, the input voltage is transmitted to the output directly. In case of digital mode, the output voltage is 0V when input is OFF and the output voltage is 10V when the input is ON.

## Relay Output (RL-Option)

The sensors can have optional 24V relay output. The relay contacts are volt-free. The relay can be controlled from the network, transmit UI or PIR status, or used for control (see Relay Output Control section for further details).

## Colour Display and Capacitive Touchscreen Options

The sensors can have optional full colour 240 x 320 pixel high resolution glass fronted display. The display can be used to indicate the current measurements and indicate alarm conditions. Additional capacitive touchscreen option allows the users to interact with the system.

### COLOUR DISPLAY OPTION (-LCD)

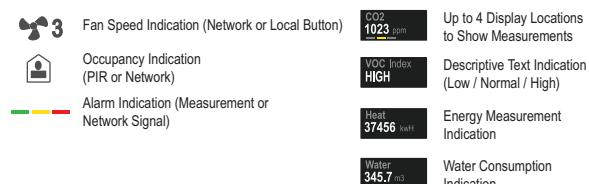
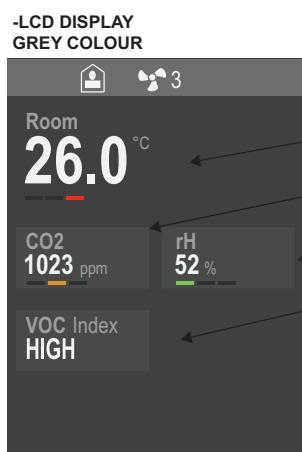
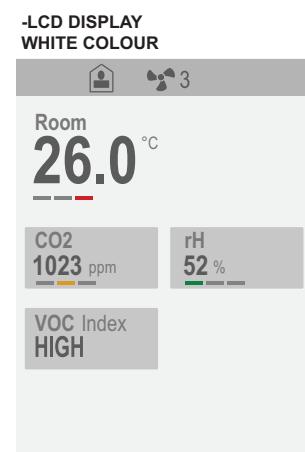
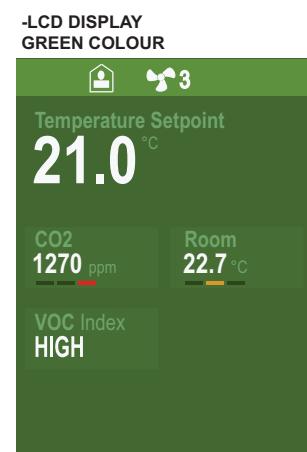
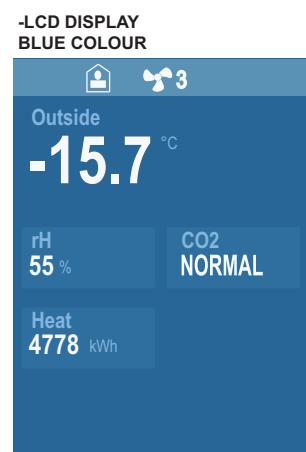
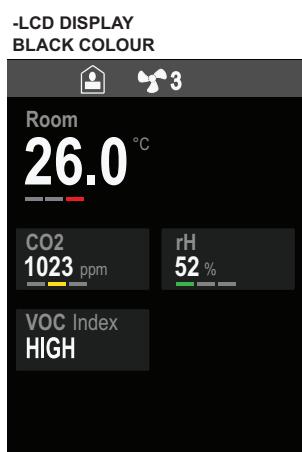
The colour display has been designed to display measurements in up to 4 locations. Each of the locations can be individually configured according to the requirements. In addition status bar on the top of the display can be used to indicate system conditions (status of the built-in PIR or BMS can send display commands via Modbus/BACnet network).

Each of the four display locations can be configured to show

- CO2, VOC, Temperature, or Humidity Measurement
- Universal Input Measurements (0..10Vdc or NTC10)
- Network Signals (e.g. Energy, Water Consumption, Pressure, Light Level Signals)
- Alarm Conditions of the Measurements (Green, Amber, Red)
- Descriptive Text instead of Measurement Value (Low / Normal / High )

The display can be furthermore customised to:-

- Change the resolution of the temperature display; Fine (0.1°C/0.1°F), Normal (0.5°C/0.5°F), and Coarse (1°C/1°F). Please note Humidity, CO2 and VOC are displayed with resolution of one integer.
- To show fan speed and movement (PIR) status (Modbus/BACnet signals from the BMS)
- The description and units of each location can be customised
- The skin colour of the display can be changed according to the preference; White, Blue, Green, Grey and Black
- Brightness of the display can be adjusted
- Using Language Pack it is possible to change the text language



### CAPACITIVE COLOUR TOUCHSCREEN OPTION (-TS)

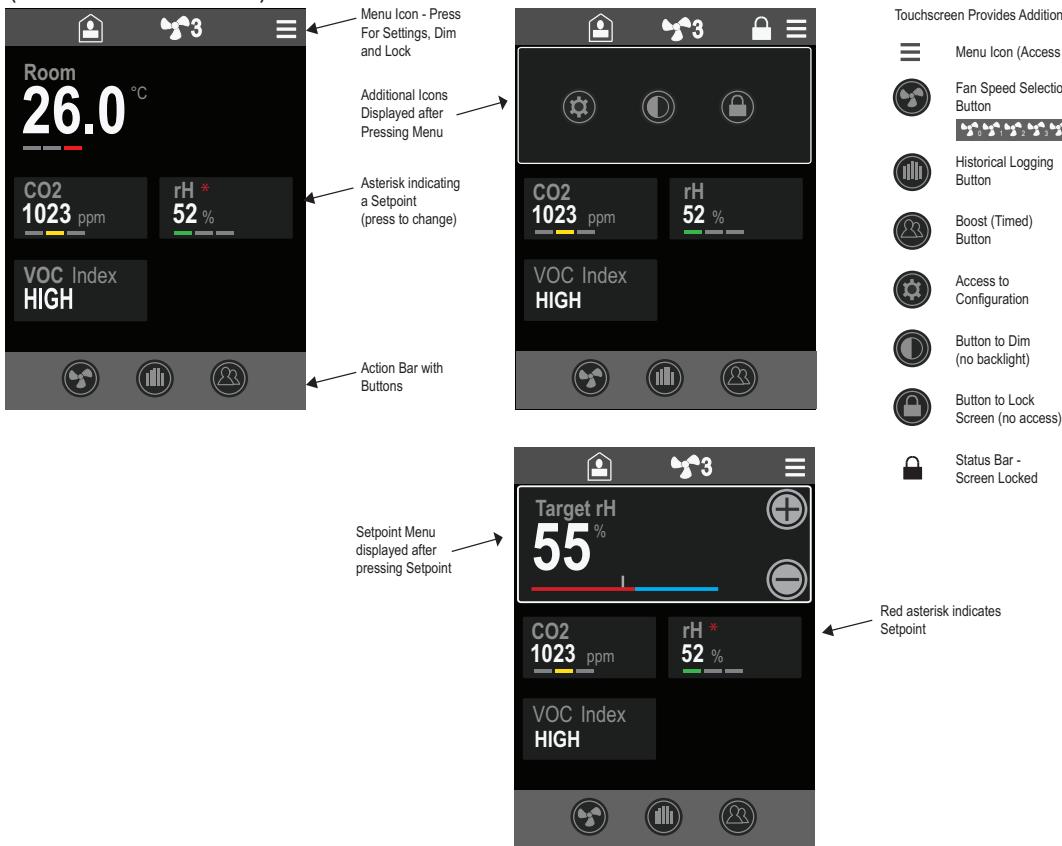
With the capacitive touchscreen option the display becomes interactive to the users. The capacitive touchscreen offers an accurate touch capability to the room sensors. With touchscreen the following additional user interface options become available.

- Boost button with an adjustable timer
- Setpoint adjustment option for any of the four (4) locations - max. 2 setpoints
- Fan speed adjustment option (A - 0 - 1 - 2 - 3)
- Two historical trend (data logging) functions - Note. Data stored in volatile memory only

Furthermore the status bar will have menu option, that allows

- The display to be dimmed
- The display to be locked from unauthorised access
- Access to the Configuration Menu (network settings)

#### TOUCHSCREEN DISPLAY (SKIN COLOUR SELECTABLE)



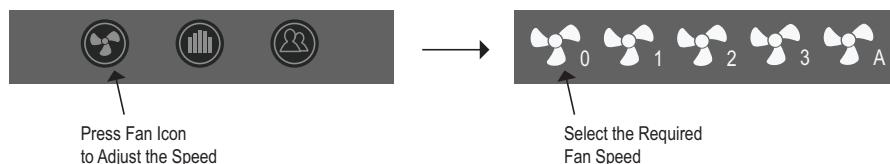
### SETPOINT ADJUSTMENT

Two setpoint adjustments can be set to any of the four display locations. The setpoints can be configured to operate with decimal point (e.g. temperature) or with integer (e.g. CO2) accuracy. Each setpoint can have minimum and maximum adjustment limits for the user. The adjustment steps (resolution) can also be controlled. The nominal (initial) setpoint can be set from the network.

### FAN SPEED ADJUSTMENT

By pressing the Fan button the fan speed adjustment options are displayed on the bottom Action Bar - select the required speed. The number of fan speeds is configurable. The current fan speed is displayed on the status bar on the top.

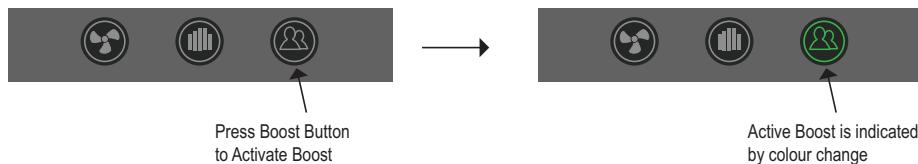
The Fan Speed button activation and number of fan speeds can be selected through the configuration parameters.



### BOOST BUTTON (TIMED)

Pressing the Boost Button the device switches to Occupied Mode - Button Colour Changes and the Occupancy Icon on the Status Bar (if activated) indicates occupancy. The boost button has adjustable timer between 0..28,800 seconds. By setting boost time to 0 seconds, the Boost is permanent. The boost can be cancelled by pressing the boost button again.

The boost button and the boost time is activated through the configuration parameters.



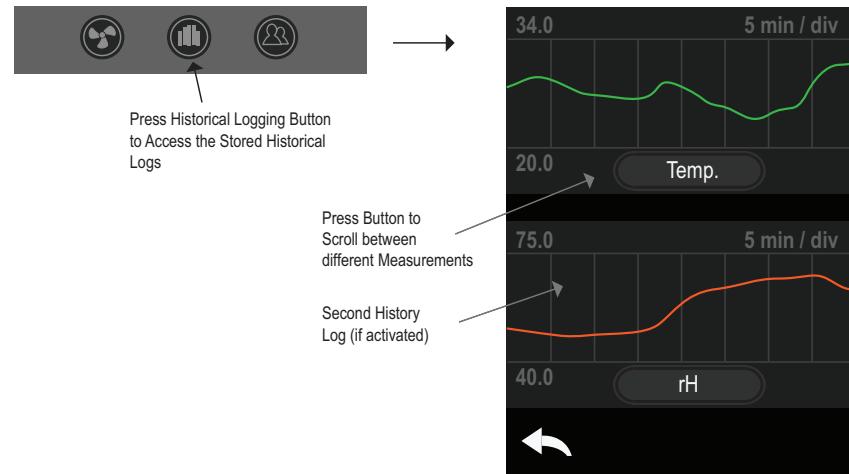
It is also possible to set the boost target to one of the control loop outputs (which can be linked to any of the analogue outputs or to the relay output). When the boost is active the output is set fully on to 100%.

### HISTORICAL TREND LOGGING

If the historical logging function has been activated the Action Bar shows the Button to Access the historical log data. The history function will automatically log all measurements. It is possible to configure one or two history logs displayed on the screen. Once on the screen the different measurements can be selected by pressing the buttons for comparison. The historical logging interval can be configured between the selectable options: 10 seconds, 30 seconds, 1 minute, 3 minutes, 30 minutes, 90 minutes.

Up to 240 historical logging samples per measurement are stored in the volatile memory (Note. The historical logs are not stored during the power off). The table below illustrates the maximum data period for each logging interval setting.

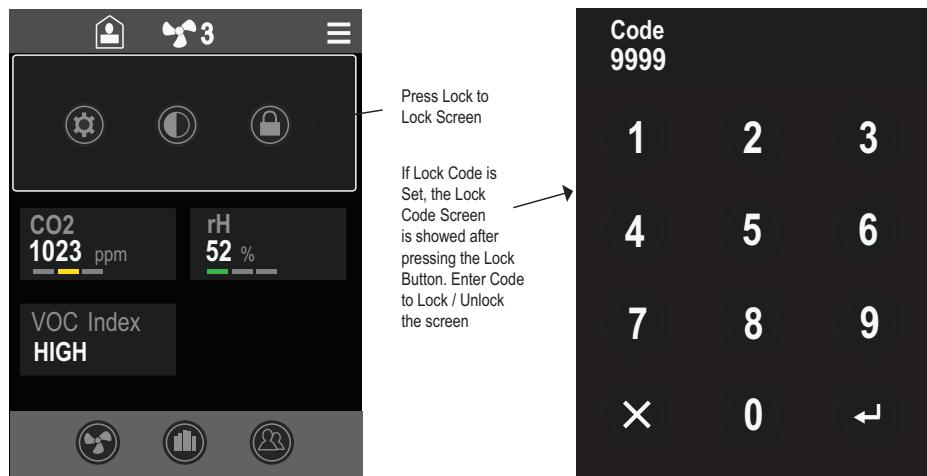
Logging Interval	Maximum Data Period
10 Second	40 minutes
30 seconds	120 minutes - 2 hours
1 minute	240 minutes - 4 hours
3 minutes	720 minutes - 12 hours
30 minutes	120 hours - 5 days
90 minutes	360 hours - 15 days



### SCREEN LOCK

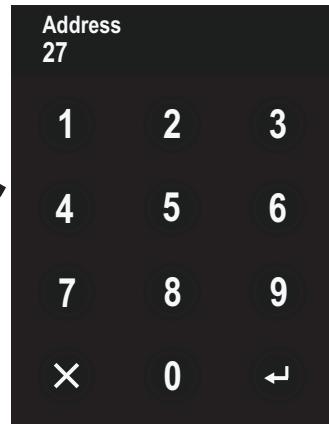
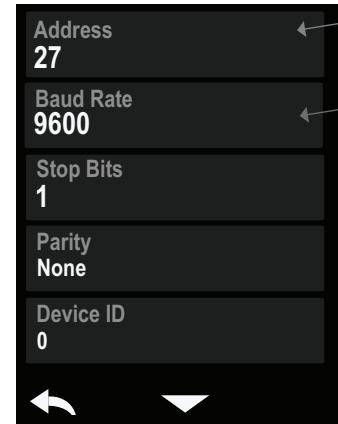
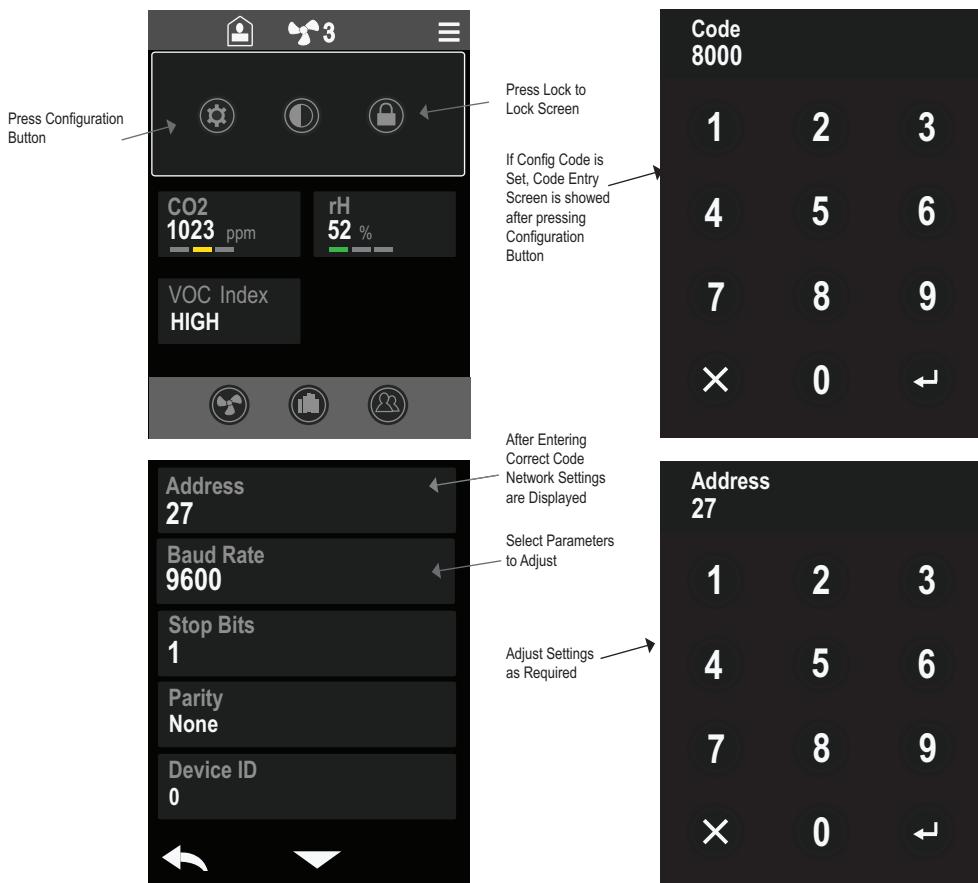
By selecting the Lock icon from the menu bar the screen is locked (buttons disabled, except menu and lock icons). If the Lock code is 0000, no code is required to lock and unlock the screen. By setting the lock code to any other value, the user needs to enter the code to lock and unlock the screen.

Note: The screen can also be locked and unlocked over the Modbus or BACnet network.



### CONFIGURATION SCREEN

To access the Configuration Screen (for network settings), Press the Configuration Icon. If the configuration code is set, default 8000, the Network Settings Configuration Menu is displayed. If the code is set to 0000 then no passcode is required. To store the new configuration settings in the Non Volatile memory press the back arrow to return to the main screen.



## Control Functions

### RELAY OUTPUT CONTROL (RL OPTION)

The devices can be fitted with additional relay (-RL option). Using the relay it is possible to switch system on/off based on the configured switching points and selected measurement. E.g. relay can be switched ON/OFF based on the CO2 reading. For available options please see the Sensor Configuration parameters.

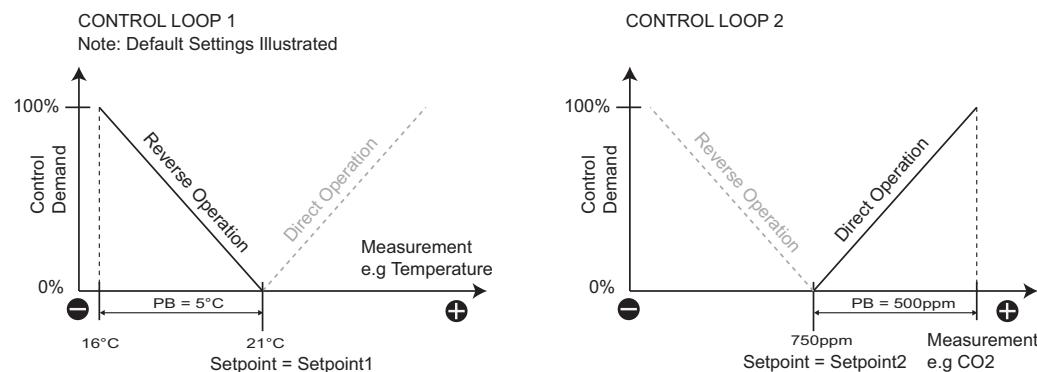
**NOTE:** By reversing the switching points the relay operation is reversed.

## CONTROL LOOPS (ALL MODELS)

The devices have two PI (Proportional + Integral) control loops that can be configured to control temperature, humidity, CO2 or VOC. The control loops can operate as in reverse or direct mode. In reverse mode when the measurement e.g. temperature drops from the setpoint, the control loop output will increase based on the proportional band and integral action settings. If integral action is disabled the control output increases proportionally (image below illustrates this).

In direct mode when the measurement e.g. CO2 increases above the setpoint the control output also proportionally increases base on the proportional band (and integral action) settings.

The control loop outputs can be linked to any of the analogue outputs. The output of two control loops can be combined by selecting Max Loop 1 and Loop 2 setting. This can be useful in cases where e.g. supply air flow is required to be controlled both by temperature and air quality level, or by both CO2 and VOC..



**NOTE:** The control outputs can also be boosted for a set period by the boost button (with TS models).

## Wireless Interfaces

### BLUETOOTH WIRELESS INTERFACE

With the -BLE option the devices are fitted with integrated Bluetooth Low Energy. The Bluetooth interface provides wireless connection point to SmartPhone app (iOS) to be able to interrogate and change the controller settings. Using the SmartView application the end users can change the device settings and see the current measurements. The SmartView application can be used as a complement to the display, or with non-display versions it can be used as the user interface.

**NOTE:** The SmartView application uses the device's display configuration to create the user view. If the device has no display, the display configuration settings can still be used to customise the user views on the App.



### LORAWAN® WIRELESS INTERFACE

With the -LRA option the devices are fitted with LoraWan® interface. The LoraWan® interface allows the devices to be connected to the LoraWan system wirelessly using Senticon's standard payload format.



The LoraWan® enabled devices will automatically connect to the network on power up. The connection attempts are staggered automatically based on the device serial number to ensure network performance on large systems. The devices will automatically send the device information (temperature, humidity, CO2, VOC, input and output levels and setpoints) on Senticon's Standard Payload format on scheduled intervals (1 to 60 minutes, default 10 minutes). If required, any other device parameter can also be read and set using Standard messaging format - please refer to Senticon LoraWan Payload Specification for further details.

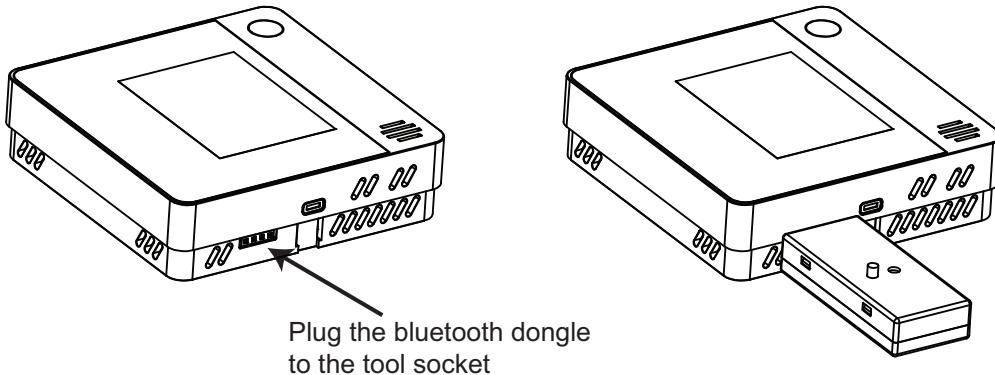
## Device Setup and Modbus/BACnet Communications

The devices are available with Modbus RTU or BACnet MS/TP communication for system integration. Please also note that the devices can be configured via Modbus or via BACnet MS/TP. Alternatively the devices can be configured locally using via PC Based Smart Config Tool or via iOS Smart Phone Application. Using any of these methods the device settings can be altered to suit the site requirements and the current device status can be interrogated.

Modbus and BACnet communication is carried out over RS485 serial network.

The Windows Smart Config Tool and iOS Smart Phone Application are connected to the device using Bluetooth dongle set (part no BLE-TOOLSET) that are plugged into the PC USB port and to the device (connection to device illustrated below).

If the device is supplied with Built-In Bluetooth App interface (an option), then this can also be used for the tool communication connection.



### MODBUS / BACNET NETWORK SETUP

**NOTE:** Modbus RS485 or BACnet MS/TP versions are hardware specific models. It is not possible to change the communication protocol on the device. Please make sure to order the required model.

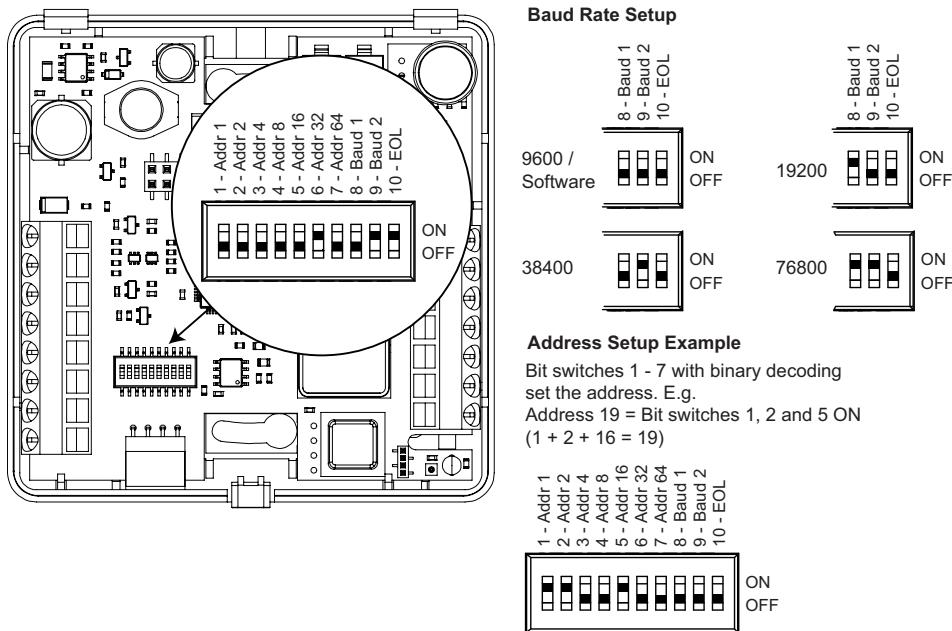
The devices can operate either as Modbus RTU RS485 slave device, or BACnet MS/TP Server. The device (slave/MAC) address and baud rate are set up using bit switches or through Windows Smart Configuration Tool / iOS Smart Phone App.

Bit switches 1-7 act as a binary decoder to set the (slave/MAC) address. Set these bitswitches to OFF position if the address is configured by the software.

Bit switches 8 and 9 are used to set the baud rate. Set these bit switches to OFF position if the baud rate is configured by the software.

Bit switch EOL is used to activate 120 Ohm RS485 network End of Line termination (only used on the end of line devices).

**NOTE:** Once bit switches are changed the device will automatically carry out soft reset to activate the new settings.



**NOTE:** Please note that Modbus register addresses start with 0 (0-based). If your Modbus master addresses start from one (1), then you will need to add one to the register values on the below table. If your Modbus master uses zero based addressing then the registers can be used as is.

**NOTE:** BACnet configuration parameter addresses are split to multiple Device Configuration objects.

**NOTE: \*) Reg Field shows the Modbus register offset. The Reg field is also used with BACnet Device Configuration Objects.**

LIVE DATA						
		MODBUS INPUT REGISTERS - FUNCTION CODE 04 MODBUS HOLDING REGISTER - FUNCTION CODES 03, (06), 16				
Parameter	Description	Reg	Type	Data Range (multiplier)	Value Range / Enumerations	R/W
Temperature Sensor	Displays current temperature measurement reading (built-in sensor) Note: Value depends on the temperature unit °C/°F selection	400	int16	-400..2480 (x10)	-40.0..120.0°C / -40.0..248.0°F	R
Humidity Sensor	Displays current humidity measurement reading (With RH option)	401	int16	0..1000 (x10)	0..100%rH	R
CO2 Sensor	Displays current measurement CO2 reading (QER multisensors)	402	int16	0..10,000 (x1)	0..10,000ppm	R
VOC Sensor	Display current VOC (Volatile Organic Compound) Index Value	403	int16	0..500 (x1)	0..500 index	R
UI1	Universal Input 1 Measurement Note: Value depends on the temperature / mode selection	410	int16	-400..2480 (x10)	NTC Mode: -40..120° AI Mode: 0..100% = 0..10V	R
UI2	Universal Input 2 Measurement Note: Value depends on the temperature / mode selection	411	int16	-400..2480 (x10)	NTC Mode: -40..120° AI Mode: 0..100% = 0..10V	R
Y1	Analogue Output 1 Value (Default Output Mode: Built-In Temperature)	412	uint16	0..1000 (x10)	0..100% = 0..10V	R/W
Y2	Analogue Output 2 Value (Default Output Mode: Humidity)	413	uint16	0..1000 (x10)	0..100% = 0..10V	R
Y3	Analogue Output 3 Value (Default Output Mode: CO2 Reading)	414	uint16	0..1000 (x10)	0..100% = 0..10V	R
Y4	Analogue Output 4 Value (Default Output Mode: VOC Index)	415	uint16	0..1000 (x10)	0..100% = 0..10V	R
Fan Level	Current Fan Level / Fan Level Network Override (Range depends on the fan mode configuration). If TS model the fan level can be set from touchscreen or from network (last command prevails)	417	unit16	0..4	0..4 (Off / Speed1-2-3 / Auto)	R/W
Calculated Setpoint 1	Calculated Setpoint (Nominal Network Setpoint + User Adjustment) for Location 1	418	uint16	-32000..32000 (x10)	-3200.0..3200.0	R
Calculated Setpoint 2	Calculated Setpoint (Nominal Network Setpoint + User Adjustment) for Location 2	419	uint16	-32000..32000 (x10)	-3200.0..3200.0	R
	DISCRETE INPUTS - FUNCTION CODE 02					
DI1	Digital Input 1 Status	200		0..1	0..1	R
DI2	Digital Input 2 Status	201		0..1	0..1	R
Movement Status	PIR (OE Option) Status	202		0..1	0..1	R
Relay Status	Relay Output Status (RL Option)	203		0..1	0..1	R
Boost Status	Boost Button Status (TS Option) - Shows if Boost Button has been activated by the user.	204		0..1	0 = No Boost 1 = Boost	R
Screen Lock Status	Screen Lock Status	205		0..1	0 = Not Locked 1 = Locked	R

INPUT/OUTPUT SETTINGS						
		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	Description		Type	Data Range (multiplier)	Value Range / Enumerations	R/W
UNIVERSAL INPUTS						
UI1 Voltage Min.	Sets Min. Clamp Voltage for UI1.	516	unit16	0..100 (x10)	0..10.0 (Default 0)	R/W
UI1 Voltage Max.	Sets Max. Clamp Voltage for UI1. Use only if the connected device upper range is more than 3000.	517	unit16	0..100 (x10)	0..10.0 (Default 10.0)	R/W
UI2 Voltage Min.	Sets Min. Clamp Voltage for UI2. Advanced Setting.	518	unit16	0..100 (x10)	0..10.0 (Default 0)	R/W
UI2 Voltage Max.	Sets Max. Clamp Voltage for UI2. Use only if the connected device upper range is more than 3000.	519	unit16	0..100 (x10)	0..10.0 (Default 10.0)	R/W

UI1 Mode	Sets the Universal Input 1 Mode	520	unit16	0..3 (x1)	0 = Not Used 1 = 0..10V (0..100%) - Default 2 = NTC10 3 = Off / On	R/W
UI2 Mode	Sets the Universal Input 2 Mode	521	unit16	0..3 (x1)		R/W
Temperature Units	Selects between Celcius and Fahrenheit Note: The display and network measurements will automatically reflect reading in the selected units.	522	unit16	0..1 (x1)	0 = Celcius (Default) 1 = Fahrenheit	R/W
UI1 Scale Min.	Sets the scaling for Min. Measurement when UI1 @ 0V (0%)	523	unit16	0..3000 (x10)	0.0..3000.0 (Default 0)	R/W
UI1 Scale Max.	Sets scaling for the Max. Measurement when UI1 @ 10V (100%)	524	unit16	0..3000 (x10)	0.0..3000.0 (Default 100.0)	R/W
UI2 Scale Min.	Sets the scaling for Min. Measurement when UI2 @ 0V (0%)	525	unit16	0..3000 (x10)	0.0..3000.0 (Default 0)	R/W
UI2 Scale Max.	Sets scaling for the Max. Measurement when UI2 @ 10V (100%)	526	unit16	0..3000 (x10)	0.0..3000.0 (Default 100.0)	R/W
Max Scaled Temperature	Scales the 0-10V output for temperature. Linear scaling, temperature value at 10V.	527	uint16	0..2120 (x10)	0..100° (32..212°F) Default 50°C (122°F)	R/W
Max Scaled Humidity	Scales the 0-10V output for humidity. Linear scaling, humidity value at 10V.	528	uint16	0..1000 (x10)	0..100%rh (Default 100%)	R/W
Max Scaled CO2	Scales the 0-10V output for CO2. Linear scaling, CO2 value at 10V.	529	uint16	0..10000 (x1)	0..10,000ppm (Default 2000)	R/W
<b>ANALOGUE OUTPUTS</b>						
Y1 Mode	Analogue Output Y1 Mode Default: Built-In Temperature  Universal Input Mode: NTC - Output scaled 0..10V based on Max Scaled Temperature Analogue - 0..10V input scaled to 0..10V Digital Mode - Off = 0V, On = 10V	530	unit16	0..9 (x1)	0 - Network 1 = Built-In Temperature 2 = Humidity 3 = CO2 Reading 4 = VOC Reading 5 = Universal Input 1 6 = Universal Input 2 7 = Control Loop 1 8 = Control Loop 2 9 = Max Loop 1 and 2	R/W
Y2 Mode	Analogue Output Y2 Mode Default: Humidity	531	unit16	0..9 (x1)		R/W
Y3 Mode	Analogue Output Y3 Mode Default: CO2 Reading	532	unit16	0..9 (x1)		R/W
Y4 Mode	Analogue Output Y4 Mode Default: VOC Reading	533	unit16	0..9 (x1)		R/W
Y1 Override	Analogue Output Y1 Override Value	534	unit16	0..1000 (x10)	0.0..100.0% (Default 0)	R/W
Y2 Override	Analogue Output Y2 Override Value	535	unit16	0..1000 (x10)	0.0..100.0% (Default 0)	R/W
Y3 Override	Analogue Output Y3 Override Value	536	unit16	0..1000 (x10)	0.0..100.0% (Default 0)	R/W
Y4 Override	Analogue Output Y4 Override Value	537	unit16	0..1000 (x10)	0.0..100.0% (Default 0)	R/W
Network Value 1	Network Value 1 (for displaying network single decimal value). Set Display Location Source to 'Network Decimal Value' (1) Note: Only for Modbus variants. Use AV(13)/(14) for BACnet.	538	int16	-9990..9990 (x10)	-999.0..999.0 (Default 0)	R/W
Network Value 2	Network Value 2 (for displaying network integer value). Set Display Location Source to 'Network Integer Value' (2) Note: Only for Modbus variants. Use AV(13)/(14) for BACnet.	539	uint16	0..65535 (x1)	0..65535 (Default 0)	R/W

<b>DIGITAL INPUTS AND OUTPUTS</b>						
DI1 Off Delay	Delay Off Timer for the Universal Input 1 in Digital Input Mode	550	uint16	0..28,800 (x1)	0..28,800 seconds (default 0 secs)	R/W
DI2 Off Delay	Delay Off Timer for the Universal Input 2 in Digital Input Mode	551	uint16	0..28,800 (x1)	0..28,800 seconds (default 0 secs)	R/W
Relay Control Mode	Relay (RL Option) control mode. Relay can be configured to switch on measurements or based on the internal control logic.	552	uint16	0..11 (x1)	0 = Network 1 = Digital - PIR Status 2 = Digital UI1 3 = Digital UI2 4 = Control - Built-In Temp 5 = Control - UI1 6 = Control - UI2 7 = Control - Humidity 8 = Control - CO2 9 = Control - VOC Index 10 = Control - Loop 1 11 = Control - Loop 2	R/W
Relay High Setpoint	Relay High Setpoint. Measurement where the relay switches ON. Only applicable when Relay Control mode is set to Control (options 4-9). Note: If Low Setpoint is higher than the High Setpoint, the relay operation is reversed.	553	uint16	0..65000 (x10)	0.6500 (default 850.0)	R/W

Relay Low Setpoint	Relay Low Setpoint. Measurement where the relay switches OFF. Only applicable when Relay Control mode is set to Control.	554	uint16	0..65000 (x10)	0.6500 (default 750.0)	R/W
Relay Override	Overrides the current output status of the relay permanently (overrides the local control).	555	uint16	0..2 (x1)	0 = No override 1 = Override OFF 2 = Override ON	R/W
Movement Off Delay	Delay Off Timer for the PIR (movement) sensor	556	uint16	10..28,800 (x1)	10..28,800 seconds (default 600 secs)	R/W

CALIBRATION SETTINGS						
		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	Description	Type	Data Range (multiplier)	Value Range / Enumerations		R/W
Temperature Offset	Built-In Temperature Single Point Sensor Calibration Offset	580	int16	-100..100 (x10)	-10.0..+10.0deg (Default 0)	R/W
Humidity Offset	Humidity Single Point Calibration Offset	581	int16	-100..100 (x10)	-10.0..+10.0%rh (Default 0)	R/W
CO2 Offset	CO2 Single Point Calibration Offset (adjusts CO2 reading the specified amount)	582	int16	-500..500 (x1)	-500..+500ppm (Default 0)	R/W
CO2 Auto-Calibration	Shows if the auto-calibration of the CO2 has been Activated	583	uint16	0..1	0 = Disabled 1 = Enabled (Default)	R/W
CO2 Calibration Value	Single Point Calibration Value for the CO2 Sensor. Note: Writing this value will reset the calibration settings of the sensor to the value set. Only recommended for advanced users.	584	uint16	350..3,000 (x1)	350..3,000ppm	R/W
Force CO2 Calibration	Forces CO2 Calibration to the CO2 Calibration Value. Use when CO2 level known e.g with calibration gas or outside air.	585	uint16	0..1	0 = None 1 = Force Calibration	R/W
CO2 Calibration Persist	Store CO2 Calibration Settings in the Permanent Memory	586	uint16	0..1	0 = None 1 = Save Data	R/W

DISPLAY SETTINGS						
		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	Description	Type	Data Range (multiplier)	Value Range / Enumerations		R/W
GENERAL						
Display Colour	Sets the display colour (display skin).	600	uint16	0..4	0 = White 1 = Green 2 = Blue 3 = Grey (default) 4 = Black	R/W
Display Brightness	Controls display brightness. By setting to Off, the display switches off after the timeout. Display wakes up when it is touched (TS models only)	601	uint16	0..6	0 = Off 1 = 5% 2 = 10% 3 = 25% 4 = 50% (default) 5 = 75% 6 = 100%	R/W
Temperature Display Resolution	Sets temperature display resolution (for built-in sensor only)	602	uint16	0..2 (x1)	0 = Fine (0.1°C/F) 1 = Normal (0.5°C/F) 2 = Coarse (1°C/F)	R/W
Occupancy Icon	Activates Occupancy Icon display (Man in the House) on the top status bar.	603	uint16	0..1	0 = Disabled (default) 1 = Enabled	R/W
Occupancy Icon Override	Occupancy Icon Network Override (Man In the House). Override the icon status between occupied and unoccupied. The display uses the last transition. Please note PIR (OE option) uses also the Occupancy Icon and it affects the icon status.	604	uint16	0..2	0 = No Override 1 =Override OFF 2 = Override ON	R/W

Enable Fan Display	Enables Fan Speed Display and/or Fan Speed Button for touchscreen models.	605	uint16	0..7	0 = Disabled (default) 1 = Display Only With -TS Option Only 2 = Touch-0-1 3 = Touch-0-1-2 4 = Touch-0-1-2-3 5 = Touch-0-1-A 6 = Touch-0-1-2-A 7 = Touch-0-1-2-3-A	R/W
Fan Level Override	Fan Level Network Override (overrides the fan speed). Range depends on the Fan Speed display configuration.	606	uint16	0..5	0 = Fan Override Off 1 = Fan Override Speed 1 2 = Fan Override Speed 2 3 = Fan Override Speed 3 4 = Fan Override Speed 4 5 = None (Default)	R/W
<b>DISPLAY LOCATION 1 (PRIMARY DISPLAY LOCATION)</b>						
Location 1 Display	Location 1 Display Source. Sets what is displayed in Location 1.	610	uint16	0..10	0 = None 1 = Network Decimal Value 2 = Network Integer Value 3 = Temperature (Default) 4 = Universal Input 1 5 = Universal Input 2 6 = Humidity 7 = CO2 8 = VOC Index With Touchscreen 9 = Setpoint 1 10 = Setpoint 2	R/W
Location 1 Description	Location 1 Description. Sets description for Location 1.	611	uint16	0..14	0 = None 1 = Temperature (Default) 2 = Humidity 3 = CO2 4 = VOC Index 5 = Light Level 6 = Pressure 7 = Room 8 = Outside 9 = Fan 10 = Energy 11 = Water 12 = Electricity 13 = Heating 14 = Cooling	R/W
Location 1 Unit	Location 1 Unit. Sets unit for Location 1.	612	uint16	0..9	0 = None 1 = °C (Default) 2 = °F 3 = ppm 4 = Lux 5 = Pa 6 = kWh 7 = m3 8 = % 9 = index (air quality index)	R/W
Location 1 Alarm	Activates Location 1 Alarm Bar or Descriptive Text indication. Using 1=Bar activates Green, Amber, Red alarm icon indication underneath the current displayed parameter. Using 1=Text activates LOW, MEDIUM HIGH text indication instead of the measurement.	613	uint16	0..2	0 = Disabled 1 = Bar (Default) 2 = Text	R/W
Location 1 Red Alarm Limit	Red Limit for Alarm 1 / High Limit for Descriptive Display	614	uint16	0..10,000 (x1)	0..10,000 (default 30)	R/W
Location 1 Amber Alarm Limit	Amber Limit for Alarm 1 / Medium Limit for Descriptive Displays	615	uint16	0..10,000 (x1)	0..10,000 (default 25)	R/W
Location 1 Hysteresis	Hysteresis for Alarm 1 / Low Limit for Descriptive Displays	616	uint16	0..10,000 (x1)	0..10,000 (default 1)	R/W

DISPLAY LOCATION 2						
Location 2 Display	Location 2 Display Source. Sets what is displayed in Location 2.	<b>617</b>	uint16	0..10	0 = None 1 = Network Decimal Value 2 = Network Integer Value 3 = Temperature 4 = Universal Input 1 5 = Universal Input 2 6 = Humidity 7 = CO2 (Default) 8 = VOC Index With Touchscreen 9 = Setpoint 1 10 = Setpoint 2	R/W
Location 2 Description	Location 2 Description	<b>618</b>	uint16	0..14	0 = None 1 = Temperature 2 = Humidity 3 = CO2 (Default) 4 = VOC Index 5 = Light Level 6 = Pressure 7 = Room 8 = Outside 9 = Fan 10 = Energy 11 = Water 12 = Electricity 13 = Heating 14 = Cooling	R/W
Location 2 Unit	Location 2 Unit	<b>619</b>	uint16	0..9	0 = None 1 = °C 2 = °F 3 = ppm (Default) 4 = Lux 5 = Pa 6 = kWh 7 = m3 8 = % 9 = index (air quality index)	R/W
Location 2 Alarm	Activates Location 2 Alarm Bar or Descriptive Text indication. Using 1=Bar activates Green, Amber, Red alarm icon indication underneath the current displayed parameter. Using 2=Text activates LOW, MEDIUM HIGH text indication instead of the measurement.	<b>620</b>	uint16	0..2	0 = Disabled (default) 1 = Bar (Default) 2 = Text	R/W
Location 2 Red Alarm Limit	Red Limit for Alarm 2 / High Limit for Descriptive Display	<b>621</b>	uint16	0..10,000 (x1)	0..10,000 (default 1250)	R/W
Location 2 Amber Alarm Limit	Amber Limit for Alarm 2 / Medium Limit for Descriptive Displays	<b>622</b>	uint16	0..10,000 (x1)	0..10,000 (default 750)	R/W
Location 2 Hysteresis	Hysteresis for Alarm 2 / Low Limit for Descriptive Displays	<b>623</b>	uint16	0..10,000 (x1)	0..10,000 (default 100)	R/W

DISPLAY LOCATION 3						
Location 3 Display	Location 3 Display Source. Sets what is displayed in Location 3.	<b>624</b>	uint16	0..10	0 = None 1 = Network Decimal Value 2 = Network Integer Value 3 = Temperature 4 = Universal Input 1 5 = Universal Input 2 6 = Humidity (Default) 7 = CO2 8 = VOC Index With Touchscreen 9 = Setpoint 1 10 = Setpoint 2	R/W

Location 3 Description	Location 3 Description	625	uint16	0..14	0 = None 1 = Temperature 2 = Humidity (Default) 3 = CO2 4 = VOC Index 5 = Light Level 6 = Pressure 7 = Room 8 = Outside 9 = Fan 10 = Energy 11 = Water 12 = Electricity 13 = Heating 14 = Cooling	R/W
Location 3 Unit	Location 3 Unit	626	uint16	0..9	0 = None 1 = °C 2 = °F 3 = ppm 4 = Lux 5 = Pa 6 = kWh 7 = m3 8 = % (Default) 9 = index (air quality index)	R/W
Location 3 Alarm	Activates Location 3 Alarm Bar or Descriptive Text indication. Using 1=Bar activates Green, Amber, Red alarm icon indication underneath the current displayed parameter. Using 2=Text activates LOW, MEDIUM HIGH text indication instead of the measurement.	627	uint16	0..2	0 = Disabled (default) 1 = Bar (Default) 2 = Text	R/W
Location 3 Red Alarm Limit	Red Limit for Alarm 3 / High Limit for Descriptive Display	628	uint16	0..10,000 (x1)	0..10,000 (default 80)	R/W
Location 3 Amber Alarm Limit	Amber Limit for Alarm 3 / Medium Limit for Descriptive Displays	629	uint16	0..10,000 (x1)	0..10,000 (default 60)	R/W
Location 3 Hysteresis	Hysteresis for Alarm 3 / Low Limit for Descriptive Displays	630	uint16	0..10,000 (x1)	0..10,000 (default 10)	R/W
<b>DISPLAY LOCATION 4</b>						
Location 4 Display	Location 4 Display Source. Sets what is displayed in Location 4.	631	uint16	0..10	0 = None 1 = Network Decimal Value 2 = Network Integer Value 3 = Temperature 4 = Universal Input 1 5 = Universal Input 2 6 = Humidity 7 = CO2 8 = VOC Index (Default) With Touchscreen 9 = Setpoint 1 10 = Setpoint 2	R/W
Location 4 Description	Location 4 Description	632	uint16	0..14	0 = None 1 = Temperature 2 = Humidity 3 = CO2 4 = VOC (Default) 5 = Light Level 6 = Pressure 7 = Room 8 = Outside 9 = Fan 10 = Energy 11 = Water 12 = Electricity 13 = Heating 14 = Cooling	R/W
Location 4 Unit	Location 4 Unit	633	uint16	0..9	0 = None 1 = °C 2 = °F 3 = ppm 4 = Lux 5 = Pa 6 = kWh 7 = m3 8 = % 9 = index (default)	R/W

Location 4 Alarm	Activates Location 4 Alarm Bar or Descriptive Text indication. Using 1=Bar activates Green, Amber, Red alarm icon indication underneath the current displayed parameter. Using 2=Text activates LOW, MEDIUM HIGH text indication instead of the measurement.	634	uint16	0..2	0 = Disabled (default) 1 = Bar 2 = Text (Default)	R/W
Location 4 Red Alarm Limit	Red Limit for Alarm 4 / High Limit for Descriptive Display	635	uint16	0..10,000 (x1)	0..10,000 (default 140)	R/W
Location 4 Amber Alarm Limit	Amber Limit for Alarm 4 / Medium Limit for Descriptive Displays	636	uint16	0..10,000 (x1)	0..10,000 (default 120)	R/W
Location 4 Hysteresis	Hysteresis for Alarm 4 / Low Limit for Descriptive Displays	637	uint16	0..10,000 (x1)	0..10,000 (default 10)	R/W

TOUCHSCREEN SETTINGS (TS MODELS ONLY)						
		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	Description		Type	Data Range (multiplier)	Value Range / Enumerations	R/W
<b>GENERAL</b>						
Enable Boost Button	Enables Boost Button on the bottom action bar	650	uint16	0..1	0 = Disabled (default) 1 = Enabled	R/W
Boost Time	Delay Off Timer for the Boost Button	651	uint16	0..28,800 (x1)	0..28,800 seconds 0 = Timer disabled, toggle functionality	R/W
Boost Target	Sets the boost operation target	652	uint16	0..2	0 = None 1 = Control Loop 1 Output 2 = Control Loop 2 Output	R/W
Lock Code	Screen Lock Code - 0000 = User requires no code to lock the screen	653	unit16	0..9,999 (x1)	0..9,999 (Default 0000)	R/W
Screen Lock Override	Overrides the Current State of the Screen Lock	654	unit16	0..2 (x1)	0 = No Override 1 = Unlock Screen 2 = Lock Screen	R/W
Config Code	Code to Enter Configuration Screen, Set to 0000 to bypass the requirement to enter the code.	655	unit16	0..9,999 (x1)	0..9,999 (Default 8000)	R/W

DATA LOGGING						
History 1 Display	Default Display for Historical Logging Location 1. Activates the history acces button on the bottom action bar.	660	uint16	0..6	0 = Disabled 1 = Built-In Temp 2 = Universal Input 1 3 = Universal Input 2 4 = Humidity 5 = CO2 6 = VOC Index 7 = PIR (Movement) 8 = DI1 (UI1) 9 = DI2 (UI2)	R/W
History 2 Display	Default Display for Historical Logging Location 2. Activates the history acces button on the bottom action bar.  Note: History is stored in the RAM memory only and is lost during the power interrupt.	661	uint16	0..6		R/W
Logging Interval	History Logging Interval	662	uint16	0..5	0 = 10 seconds 1 = 30 seconds 2 = 1 minute 3 = 3 minutes 4 = 30 minutes 5 = 90 minutes	R/W
<b>SETPOINT (NETWORK DISPLAY) - DATA TYPE ADJUSTABLE TO INTEGER (x1) OR DECIMAL(x10)</b>						
Nominal Setpoint 1	Nominal Setpoint 1. The calculated setpoint is displayed at Register 418 Note: If setpoint changed from network, the user adjustment is reset to zero	670	uint16	-27000..27000 (x1/x10) Note: Scaling set by 'Setpoint 1 Data Type'	x1: -27000..+27000 x10: -2700.0..2700.0 - Default 21.0 (x10)	R/W
Setpoint 1 Min Adj Limit	Minimum Setpoint Adjustment Limit for Setpoint 1	671	int16	-5000..0 (x1/x10)	x1: -5000..0 x10: -500.0..0 (default -3.0)	R/W
Setpoint 1 Max Adj Limit	Maximum Setpoint Adjustment Limit for Setpoint 1	672	int16	0..+5000 (x1/x10)	x1: 0..5000 x10: 0..500.0 (default +3.0)	R/W
Setpoint 1 Resolution	Setpoint 1 Adjustment Resolution	673	uint16	1..100 (x1/x10)	x1: 1..100 x10: 0.1..10.0 (default 0.1)	R/W

Setpoint 1 Data Type	Setpoint 1 Data Type. Data Type parameter defines if the parameters 670-673 are scaled with x1 or with x10 (multiplier 10).	674	uint16	0..1	0 = Integer (x1) 1 = Decimal (x10) - Default	R/W
Nominal Setpoint 2	Nominal Setpoint 2 The calculated setpoint is displayed at Register 419 Note: If setpoint changed from network, the user adjustment is reset to zero	675	uint16	-27000..27000 (x1/x10) Note: Scaling set by 'Setpoint 2 Data Type'	x1: -27000..+27000 - Default 750 (x1) x10: -2700.0..2700.0	R/W
Setpoint 2 Min Adj Limit	Minimum Setpoint Adjustment Limit for Setpoint 2	676	int16	-5000..0 (x1/x10)	x1: -5000..0 (default -250) x10: -500.0..0	R/W
Setpoint 2 Max Adj Limit	Maximum Setpoint Adjustment Limit for Setpoint 2	677	int16	0..+5000 (x1/x10)	x1: 0..5000 (default 250) x10: 0..500.0	R/W
Setpoint 2 Resolution	Setpoint 2 Adjustment Resolution	678	uint16	1..100 (x1/x10)	x1: 1..100 (default 50) x10: 0.1..10.0	R/W
Setpoint 2 Data Type	Setpoint 2 Data Type. Data Type parameter defines if the parameters 675-678 are scaled with x1 or with x10 (multiplier 10).	679	uint16	0..1	0 = Integer (x1) (Default) 1 = Decimal (x10)	R/W

CONTROL SETTINGS						
		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	Description		Type	Data Range (multiplier)	Value Range / Enumerations	R/W
Control Loop 1 Source	Control Loop Source Note: Setting to 'None' allows the control loop output be controlled only by Boost button (TS models)	700	uint16	0..5 (x1)	0 = None 1 = Temperature (default) 2 = Humidity 3 = CO2 4 = VOC	R/W
Control Loop 1 Setpoint	Control Loop Setpoint	701	uint16	0..1 (x1)	0 = Setpoint 1 (default) 1 = Setpoint 2	R/W
Control Loop 1 PB	Control Loop Proportional Band	702	uint16	1..5000 (x1)	1..5000 (Default 5)	R/W
Control 1 IA	Control Loop 1 Integral Action Time	703	unit16	0..3600 (x1)	0..3600 sec (default 0s) 0 = Disabled	R/W
Control 1 Direction	Control Loop 1 Direction; For Temperature Reverse = Heating, Direct = Cooling	704	uint16	0..1 (x1)	0 = Reverse 1 = Direct (Default)	R/W
Control 2 Loop Source	Control Loop 2 Source Note: Setting to 'None' allows the control loop output be controlled only by Boost button (TS models)	705	uint16	0..5 (x1)	0 = None 1 = Temperature 2 = Humidity 3 = CO2 (Default) 4 = VOC	R/W
Control 2 Loop Setpoint	Control Loop 2 Setpoint	706	uint16	0..1 (x1)	0 = Setpoint 1 1 = Setpoint 2 (Default)	R/W
Control Loop 2 PB	Control Loop 2 Proportional Band	707	uint16	1..5000 (x1)	1..5000 (Default 500)	R/W
Control 2 IA	Control Loop 2 Integral Action Time	708	unit16	0..3600 (x1)	0..3600 sec (default 0s) 0 = Disabled	R/W
Control 2 Direction	Control Loop 2 Direction; For CO2 Control Set Direct	709	uint16	0..1 (x1)	0 = Reverse 1 = Direct (Default)	R/W

SYSTEM AND COMMUNICATION SETTINGS						
		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	Description		Type	Data Range (multiplier)	Value Range / Enumerations	R/W
Address	Modbus Address BACnet MAC Address	800	uint16	1..247 (x1) 1..127 (x1)	Modbus: 1..247 BACnet: 1..127	R/W
Baud Rate	Baud Rate	801	uint16	0..5	0 = 9600 1 = 19200 2 = 38400 3 = 57600 4 = 76800 5 = 115200	R/W

Modbus Parity	Modbus Parity	802	uint16	0..2	0 = None 1 = Odd 2 = Even	R/W
Modbus Stopbits	Modbus Stopbits	803	uint16	0..1	0 = 1 Stop Bit 1 = 2 Stop Bits	R/W
Soft Reset	Soft Reset	810	uint16	0..1	0 = Normal 1 = Reset	R/W
Persist	Persist (Store Parameters in Non-Volatile Memory)	811	uint16	0..1	0 = Normal 1 = Persist	R/W
Reload Defaults	Reload Defaults (NOTE: Resets all settings to factory defaults)	812	uint16	0..1	0 = Normal 1 = Factory Defaults	R/W
Service Pin	Service Pin (BACnet Only)	813	uint16	0..1	0 = Normal 1 = Service Pin	R/W
Language Pack Enable	Enables the Language Pack (using language pack it is possible to change the user text entries on the screen)	814	uint16	0..1	0 = English 1 = Language Pack Enabled	R/W
Logo Timer	Time after which the Logo is displayed on the Display after background level is activated. Set to 0 to disable the logo.	815	uint16	0..255 (x1)	1..255 seconds 0 = Logo Disabled	R/W
Firmware Version	Firmware Version	820	uint16	N/A	N/A	R
Serial Number	Serial Number	821	uint16	N/A	N/A	R
Date Code	Date Code	822	uint16	N/A	N/A	R
Product ID	Product ID	823	uint16	N/A	N/A	R
Device ID	BACnet Device ID. Set to 0 to use Automatically generated ID. Follow change with "Persist" and "Reset".	825	unit32	0..4,194,303 (x1)	0..4,194,303	R/W

The following registers are available with Modbus only. The registers combine two parameters to a single 16-bit (2 Bytes) Modbus register.

MODBUS SPECIFIC COMBINATION REGISTERS						
		MODBUS INPUT REGISTERS - FUNCTION CODE 04 MODBUS HOLDING REGISTER - FUNCTION CODES 03, 16				
Parameter	Description		Type	Data Range (multiplier)	Value Range / Enumerations	R/W
Y1/Y2	Combined 16-Bit Register for Outputs Y1 and Y2. E.g. Y1=0x64 (100%), Y2=0x64 (100%) Register=0x6464 (25700)	450	unit16	0..25700 (x1) 0x0000..0x6464	Byte 1:Y1 (0x00..0x64), Byte 2:Y2 (0x00..0x64)	R
Y3/Y4	Combined 16-Bit Register for Outputs Y3 and Y4	451	unit16	0..25700 (x1) 0x0000..0x6464	Byte 1: Y3 (0x00..0x64), Byte 2: Y4 (0x00..0x64)	R
Device Status	Combined 16-Bit Register for Binary Status of the Device	455	unit16	0..25700 (x1)	Bit0 - DI1, Bit1 = DI2, Bit3 = PIR, Bit4 = Relay, Bit5= Boost, Bit6 = Screen Lock	R

## Bacnet Protocol Implementation Statement (PICS) and BACnet Objects

The -BAC versions of the sensors come with BACnet MS/TP communication. The following tables describe the PICS (Protocol Implementation Conformance Statement) and BACnet Objects (Standard and Proprietary). The Proprietary Objects are used for the device configuration.

GENERAL INFORMATION															
<b>Date:</b>	Sep 1, 2022														
<b>Vendor Name:</b>	Senticon Ltd														
<b>Vendor ID:</b>	1374														
<b>Product Name:</b>	xER Smart Room Sensors														
<b>Product Models:</b>	TERxx, MERxx, QERxx, VERxx														
<b>Applications Software Version:</b>	1.0														
<b>Firmware Revision:</b>	1.0.0														
<b>BACnet Prorocol Revision</b>	1.19														
<b>Product Description:</b>	Smart Room Sensors														
<b>BACnet Standard Device Profile:</b>	BACnet Application Specific Controller (B-ASC)														
<b>BACnet Interoperability Blocks Supported:</b>	Data Sharing - ReadProperty-B (DS-RP-B) Data Sharing - ReadPropertyMultiple-B (DS-RPM-B) Data Sharing - WriteProperty-B (DS-WP-B) Data Sharing - COV-B (DS-COVU-B) Device Management - DynamicDeviceBinding-B (DM-DDB-B) Device Management - DynamicObjectBinding-B (DM-DOB-B) Device Management - DeviceCommunicationControl-B (DM-DCC-B)														
<b>Segmentation Capability:</b>	No														
<b>Data Link Layer Options:</b>	MS/TP Master; Supported Baud 9600/19200/38400/57600/76800/115200														
<b>Device Address Binding:</b>	No static device binding supported														
<b>Networking Options:</b>	None														
<b>Character Sets Supported:</b>	ISO 10646 (UTF-8)														
<b>Gateway Options:</b>	None														
<b>Network Security Options:</b>	Non-Secure Device														
<b>Standard Object Types Supported:</b>	<table border="1"> <thead> <tr> <th>Object Type:</th><th>Optional Properties</th><th>Writeable Properties</th></tr> </thead> <tbody> <tr> <td>Analog Value:</td><td>Description, COV Increment, Relinquish Default</td><td>Present Value COV Increment</td></tr> <tr> <td>Binary Value:</td><td>Description, Inactive_Text, Active_Text</td><td>Present Value</td></tr> <tr> <td>Device Object:</td><td>Description Active COV Subscriptions Max Master</td><td>Object Identifier Object Name APDU Timeout (0...60000) Number Of APDU Retries (0...10) Max Master (1...127)</td></tr> </tbody> </table> <p><i>For all supported objects, device does not support CreateObject or DeleteObject.</i></p> <p><i>For Analog Value objects that are classified as read only, there is the following behavior:</i></p> <ul style="list-style-type: none"> <li>- HVAC application overwrites the present value that has been written with the Write Property Service.</li> <li>- In this case, no error message will be sent.</li> </ul> <p><i>The device application checks the ranges of the Present Value and the COV Increment of the Analog Objects. For this reason, there is the following behavior:</i></p> <ul style="list-style-type: none"> <li>- No error message, if the limits have been exceeded</li> <li>- Too high values are set to the range maximum</li> <li>- Too small values are set to the range minimum</li> </ul>	Object Type:	Optional Properties	Writeable Properties	Analog Value:	Description, COV Increment, Relinquish Default	Present Value COV Increment	Binary Value:	Description, Inactive_Text, Active_Text	Present Value	Device Object:	Description Active COV Subscriptions Max Master	Object Identifier Object Name APDU Timeout (0...60000) Number Of APDU Retries (0...10) Max Master (1...127)		
Object Type:	Optional Properties	Writeable Properties													
Analog Value:	Description, COV Increment, Relinquish Default	Present Value COV Increment													
Binary Value:	Description, Inactive_Text, Active_Text	Present Value													
Device Object:	Description Active COV Subscriptions Max Master	Object Identifier Object Name APDU Timeout (0...60000) Number Of APDU Retries (0...10) Max Master (1...127)													

OBJECT TYPE: DEVICE OBJECT				
Object Instance	Property Identifier	Value Range	Default Value	R/W
Device[x]	Object Identifier		MAC_Address	R/W
	Object Name	32 chars max.		R/W
	Object_Type		8	R
	System_Status		Status_Operational	R
	Vendor_Name		Senticon Ltd	R
	Vendor_Identifier		1374	R
	Model_Name		xER	R
	Firmware_Revision		1.0.0	R
	Application_Software_Version		1.0	R
	Protocol_Version		1	R
	Protocol_Revision		19	R
	Protocol_Services_Supported		See General Information	R
	Protocol_Object_Types_Supported		See General Information	R
	Object_List		See Objects List	R
	Max_APDU_Length_Accepted		480	R
	Segmentation_Supported		No	R
	APDU_Timeout		6000 ms	R/W
	Number_Of_APDU_Retries		3	R/W
	Max_Master		127	R/W
	Device_Address_Binding			R
	Database_Revision		0	R
	Property_List			R

OBJECT TYPE: ANALOGUE VALUE						
Object Instance	Object Name	Value Range	Relinquish_Default	Units	COV Increment	R/W
AV(0)	Temperature	-40.0..120.0°C / -40.0..248.0°F	-	DEGREES_CELCIUS or DEGREES_FAHRENHEIT	0.0..100 (Default 1)	R
AV(1)	Humidity	0...100.0	-	RELATIVE_HUMIDITY	0.0..100 (Default 5)	R
AV(2)	CO2	0...10,000	-	PARTS_PER_MILLION	0.0..100 (Default 50)	R
AV(3)	VOC	0..1,000	-	NO_UNITS	0.0..100 (Default 10)	R
AV(4)	UI1	-40.0..120.0°C / -40..248°F 0..100.0%	-	DEGREES_CELCIUS or DEGREES_FAHRENHEIT or PERCENT	0.0..100 Default 1	R
AV(5)	UI2	-40.0..120°C / -40..248°F 0..100.0%	-	DEGREES_CELCIUS or DEGREES_FAHRENHEIT or PERCENT	0.0..100 Default 1	R
AV(6)	Y1	0.0..100.0%	-	PERCENT	5	R/W
AV(7)	Y2	0.0..100.0%	-	PERCENT	5	R/W
AV(8)	Y3	0.0..100.0%	-	PERCENT	5	R/W
AV(9)	Y4	0.0..100.0%	-	PERCENT	5	R/W
AV(10)	Setpoint_1	-2700.0..2700.0	Nonvol_Setpoint	DEGREES_CELCIUS or DEGREES_FAHRENHEIT or PARTS_PER_MILLION or PERCENT	5	R/W
AV(11)	Setpoint_2	-2700.0..2700.0	Nonvol_Setpoint	DEGREES_CELCIUS or DEGREES_FAHRENHEIT or PARTS_PER_MILLION or PERCENT	5	R/W
AV(12)	Fan_Speed	0..4.0	Nonvol_FanSpeed	NO_UNITS	1	R/W
AV(13)	Network_Decimal	-999.0..999.0	Nonvol_Setpoint	NO_UNITS	0	R/W
AV(14)	Network_Integer	0..65535.0	Nonvol_Setpoint	NO_UNITS	0	R/W

NOTE: Priority Input 16 is reserved for internal value. If COV increment is set to 0.0 (default), the COV is disabled.

NOTE: AV(10), AV(11) and AV(12) Priority Inputs 1 to 15 have to be set to 'Null' in order for the user to be able to change the settings from the display (Setpoint\_1, Setpoint\_2 and Fan\_Speed).

**NOTE: In order to override Y1/Y2/Y3/Y4 outputs (priority inputs 1-15), the corresponding output mode has to be set as 'Network'.**

OBJECT TYPE: BINARY VALUE					
Object Instance	Object Name	Description	Present Value Range / Active - Inactive Text	Relinquish_Default	R/W
BV(0)	DI_1	Digital Input 1 Status	0: InActive 1: Active	Binary_Inactive	R
BV(1)	DI_2	Digital Input 2 Status	0: InActive 1: Active	Binary_Inactive	R
BV(2)	Occupancy	PIR Sensor Status	0: InActive 1: Active	Binary_Inactive	R
BV(3)	DO_1	Digital Output (Relay) Status	0: InActive 1: Active	Binary_Inactive	R/W
BV(4)	Boost	Boost Button Status (Active / non-active)	0: InActive 1: Active	Binary_Inactive	R/W
BV(5)	Screen_Lock	Locks / Unlocks Screen	0: InActive (Unlocked) 1: Active (Locked)	Binary_Inactive	R/W

**NOTE: Note: Priority Input 16 is reserved for Internal Value.**

**NOTE: BV(5) - Set Priority Inputs 1-15 to 'null' to allow the user to unlock/lock the device**

PROPRIETARY OBJECT
OBJECT NAME / TYPE: "CONFIGx" / 128
The devices have five instances of proprietary Device Configuration objects split as with the configuration tools; Cfg_IO, Cfg_Calibration, Cfg_Display, Cfg_Touchscreen, Cfg_System. The devices can be fully configured using the properties of these configuration objects. Full list of available properties are listed in the <i>Device Setup and Modbus/BACnet Communication</i> section tables.

In addition to the generic parameters, the BACnet AV (AV0 to AV12) and BV (BV0 to BV4) objects have proprietary property to enable COV (Unsubscribed COV) function. For the AV0 to AV5 objects the modified COV increment is stored in the non-volatile memory. For the BV objects data is transmitted when the state changes.

**NOTE: Enabling COV increases network load as the messages are broadcasted to all devices. For efficient network performance limit the number of COV objects to minimal and configure routers to allow broadcasts only on the subnets.**

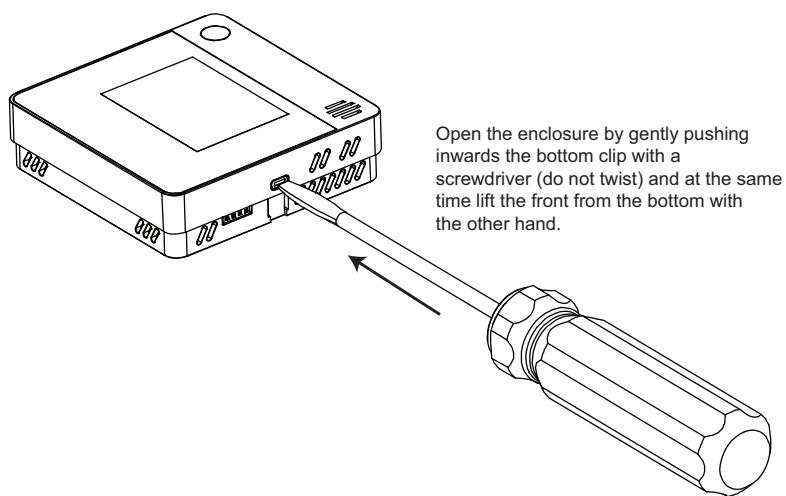
BACNET COV OBJECT SETTINGS						
Parameter	Description	BACnet Property	Type	Data Range (multiplier)	Value Range / Enumerations	R/W
AVx COV	AV Object COV Enable Flag x = AV Object Number	100x	uint16	0..1(x1)	0 = COV Disabled 1 = COV Enabled	R/W
BVx COV	BV Object COV Enable Flag x = BV Object Number	110x	uint16	0..1(x1)	0 = COV Disabled 1 = COV Enabled	R/W

## Dimensions and Installation

The devices typically mounted on the flat wall surfaces or on the junction boxes. The enclosure has 56/60mm screw distance for standard mounting boxes.

### Installation Notes:

- Follow the diagram below to open the enclosure to access the mounting holes and the wiring terminals.
- Install the sensors away from the sources of heat and cool e.g. from direct sunlight or cold external walls.
- Install the sensors at 120-150 cm height for optimal performance.
- For correct movement (PIR) sensor operation consider the location of the sensor carefully.
- Make sure that the cable entries and junction boxes are sealed from air flows. This is the most common reason for inaccuracies in temperature measurement.
- Bring the cables through the dedicated hole (black area) marked on the dimensions drawing.
- If surface mounted cable is required to be used, the top of the enclosure (center) has a thin wall section that can be cut.



### DIMENSIONS

