Senticon
SENTIENT CONTROL SOLUTIONS

Technical Data Sheet PS3.02

PMR25

Smart PM1.0/PM2.5/PM4/PM10 Particulate Matter, VOC, Temperature and Humidity Multi-Sensors, BACnet, Modbus

The PMR25 Series Smart Particulate Matter Multi-Sensors have been designed for monitoring Particulate Matter, VOC, Temperature and Humidity in room spaces. Optional CO2 and Occupancy detection are available. 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. Touchscreen option is available for network user interface functions and interactive sensor operations such as trending. Bluetooth wireless interface provides connection to Smart Phone App interface (iOS) or to PC Device Configuration Tool.

Features

- Smart Multi-Function Sensors for monitoring Particle Matter (PM1.0, PM2.5, PM4, PM10), Temperature, VOC and Humidity
- TVOC (Total VOC) Calculations based on WELL Building Standard® and RESET® Standard
- Optional CO2 Measurement and Occupancy Detection (Passive Infrared)
- 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
- Can be used as BACnet/Network User Interface for BMS Systems in distributed applications (provides measurements, user overrides and system indications)
- Built-in Bluetooth wireless connection to Device Configuration Tool USB-BLE dongle or to SmartConfig Smart Phone App
- 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

Power Supply:	Power:	24Vac/dc -10%/+15%
Measurements:	Particulate Matter	
	Mass Concentration Range:	0..1,000µg/m^3
	Mass Concentration Size Range	PM1.0: 0.3 to 1.0µm PM2.5: 0.3 to 2.5µm PM4: 0.3 to 4µm PM10: 0.4 to 10.0µm
	Mass Concentration Precision:	PM1.0/PM2.5: 0 to 100 ug/m^3: ±5 µg/m^3+ 5% m.v. PM1.0/PM2.5: 100 to 1000 ug/m^3: ±10% m.v. PM4/PM10: 0 to 100 ug/m^3: ±25 µg/m^3 PM4/PM4: 100 to 1000 ug/m^3: ±25% m.v.
	Number Concentration Range:	0..3,000µ#/cm^3
	Number Concentration Size Range	PM1.0: 0.3 to 0.5µm PM1.0: 0.3 to 1.0µm PM2.5: 0.3 to 2.5µm PM4: 0.3 to 4.0µm PM10: 0.4 to 10.0µm
	Number Concentration Precision:	PM0.5/1.0/PM2.5: 0 to 1000 #/cm^3: ±100 #/cm^3 PM0.5 1.0/PM2.5: 1000 to 3000 #/cm^3: ±10% m.v. PM4/PM10: 0 to 1000 #/cm^3: ±250 #/cm^3 PM4/PM4: 1000 to 3000 #/cm^3: ±25% m.v.
	Start-Up Time	Up to 30 seconds
	PM2.5 Mass Concentration Calibration:	Calibrated to TSI DustTrak™ DRX 8533 Ambient Mode
	PM2.5 Number Concentration Calibration:	Calibrated to TSI OPS 3330
	Sampling Rate:	2s
	Lifetime:	>10 years (24h/day operation)
	Acoustic Emission Level:	25 dB(A) 0.2m max. (fan operating)
	Temperature	
	Range: Accuracy:	0..50° (32..122°F) ±0.5°C
	Humidity	
	Range: Accuracy:	0..100%rH ±2%rH (within 20 to 80%rH)
	VOC / TVOC (Volatile Organic Compound / Total Volatile Organic Compunds)	
	Range:	Air Quality Index : 0..500 TVOC Ethanol: 17..4491 ug/m^3 / 9..2383 ppb TVOC Molhave (WELL Building Standard®): 23..6621 ug/m^3 / 5..1326 ppb TVOC Isobutylene (RESET® Standard): 21..5482 ug/m^3 / 9..2389 ppb
	CO2 (Option)	
	Range: Accuracy:	0..10,000ppm (Specified Range 400..5,000ppm ±50ppm + 3% of the reading
	PIR (Option)	
	Type/Range:	Passive Infrared Occupancy/Movement Detection, Range up to 5m
Communication:	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:	1..247 for Modbus, 1..127 for BACnet MS/TP (via display / configuration tool)
	Settings:	Baud Rate: 9600/19200/38400/76800 (bitswitch), 57600/115200 (software) Modbus Parity: None/Even/Odd, Modbus Stop Bits: 1 or 2 (Default: 9600/None/1)
Wireless Interface:	Bluetooth (Built-In):	Bluetooth Low Energy - Configuration Tool / iOS Smart Phone App Interface
Display:	LCD Option	Optional 2.4" Full Colour Display with Glass Overlay, 240 x 320px
	Touchscreen Option	Capacitive Touchscreen

Mechanical:	Wiring Terminals:	Rising Cage Screw Terminals, 0.2 to 1.5mm^2 (16AWG to 30AWG)
	Enclosure:	ABS ULV0 Plastics - White or Black
	Mounting:	Wall or Junction Box Mounting (60mm screw distance)
	Dimensions	W86 x H86 x D24mm
Country of Origin:		United Kingdom

Model Selection

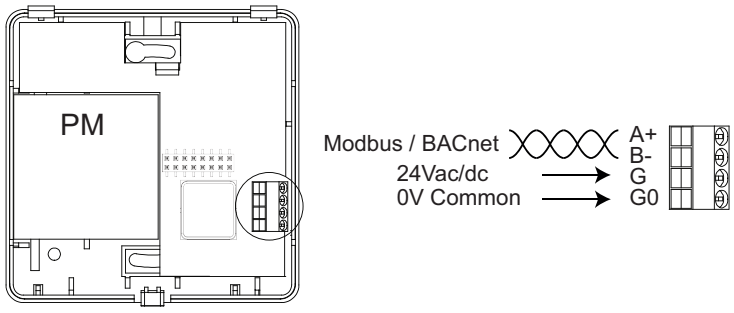
Refer to the below table to select the required model. The part number offers descriptive method for the product and options selection, and the SKU# number provides unique reference number for the part. It is possible to order products using either.

Part Number		SKU# Number					
Example	PMR25-BAC-TS-CO2-W	1400	2	02	06	00	02
Product Name		Product		Product Options			
PMR25	Room Particulate Matter Sensor, with Relative Humidity and VOC	1400					
Communication Options							
MOD	Modbus RS485		1				
BAC	BACnet MS/TP		2				
Interface Options							
	No Interface			00			
LCD	Colour Display			01			
TS	Colour Capacitive Touchscreen			02			
Measurement Options							
	No Extra Measurements				00		
OE	Passive Infrared Sensor (PIR)				03		
CO2	CO2 Carbon Dioxide Measurement				06		
OE-CO2	CO2 Measurement and Passive Infrared Sensor (PIR)				07		
Colour Options							
B	Black						01
W	White						02

Wiring Connections

The diagram below illustrates the wiring connections to the PMR25 sensors..

PMR25 WIRING



Measurements

PARTICULATE MATTER (PM1.0/PM2.5/PM4/PM10)

The PMR25 Particulate Matter (PM) sensor uses a technologically advanced optical Particulate Matter sensors. It's measurement principle is based on laser scattering and makes use of innovative contamination resistance technology. This technology, together with high-quality and long-lasting components, enables precisemeasurements from its first operation and throughout its lifetime of more than ten years. In addition, advanced algorithms provide superior precision for different PM types and higher-resolution particle size, binning, opening up new possibilities for the detection of different sorts of environmental dust and other particles.

The PMR25 particulate matter sensor has automatic cleaning function once a week, where the fan is accelerated to the maximum speed to blow out the dust accumulated inside the fan. The cleaning procedure can also be manually activated from parameter *588: Clean Particulate Sensor.*

The particulate matter sensor can measure

- PM1.0, PM2.5, PM4.5, PM10 mass concentration in ug/m^3
- PM0.5, PM1.0, PM2.5, PM4.5, PM10 number concentration in #/cm^3
- Typical Particle Size in nm

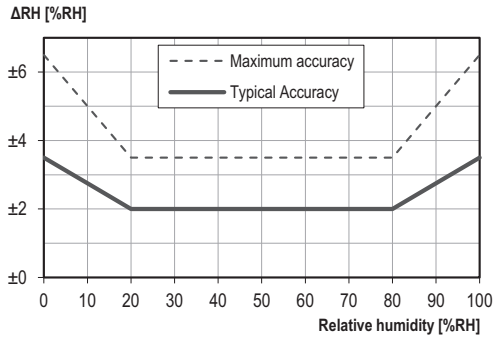
TEMPERATURE MEASUREMENT

Temperature measurement is available available via Modbus and BACnet communication network. The measurement signal is available as °C or °F. The measurement can be displayed on the screen (LCD and TS models). With TS models, it is also available from the historical trend graph.

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

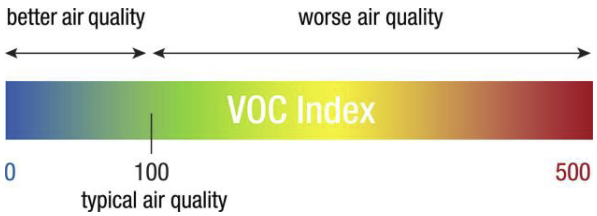
HUMIDITY MEASUREMENT

Typically 2% accurate (20% to 80% range) humidity measurement is available via Modbus and BACnet communication network. The measurement can be displayed on the screen (LCD and TS models). With TS models, it is also available from the historical trend graph.



VOLATILE ORGANIC COMPOUND MEASUREMENT

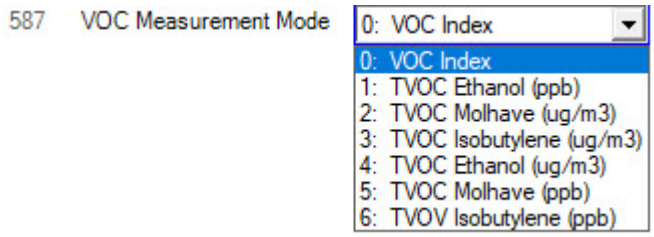
The VOC sensor measures Volatile Organic Compounds with automatic humidity compensation providing relative indoor air quality index signal (see below diagram). The measurement can be read over Modbus/BACnet communication network, and displayed on the screen.



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).

TVOC Ethanol Concentration Calculation

The PMR25 Sensors can calculate and display $TVOC_{Ethanol}$ by selecting *VOC Measurement Mode*/ *TVOC Ethanol* from the *Calibration and VOC Mode Settings* Menu. $TVOC_{Ethanol}$ setting provides Total Volatile Organic Compounds (ppb - parts per billion) with Ethanol as the reference gas. The maximum value is 2383 ppb (or 4491 ug/m^3).



WELL Building Standard ® Compliant TVOC Concentration

According to the Performance Guidebook v.2 of the WELL Building Standard®, performance of an IAQ monitor can be assessed by using ethanol as calibration gas and the Mølhave gas mixture to convert the ethanol concentration into the Mølhave equivalent of TVOC or $TVOC_{Mølhave.}$ The PMR25 Sensors can calculate and display $TVOC_{Mølhave}$ by selecting *587 VOC Measurement Mode = TVOC Molhave* from the *Calibration and VOC Mode Settings* Menu. Two options for both ppb and ug/m^3 calculation are available. The maximum value is 1321 ppb (or 5482 ug/m^3).

Now Parameter *403 VOC Sensor (index)* shows the TVOC conentration based on the $TVOC_{Mølhave}$ index. .

RESET® Air compliant TVOC concentration

The PMR25 Sensors can calculate and display $TVOC_{Isobutylene}$ by selecting *VOC Measurement Mode*/*TVOC Isobutylene* from the *Calibration and VOC Mode Settings* Menu. $TVOC_{Isobutylene}$ setting provides RESET® Air compliant TVOC concentration. Two options for both ppb and ug/m^3 calculation are available. The maximum value is 2389 ppb (or 5482 ug/m^3).

CO2 (CARBON DIOXIDE) MEASUREMENT (CO2 OPTION)

CO2 (Carbon Dioxide) measurement is available via Modbus and BACnet communication network. The CO2 sensor provides Automatic Self Calibration logic keeping the measurements accurate over the time.

Automatic Self Calibration

The self-calbration is activated by setting parameter *583 Auto-Calibration = Enabled* (default). When active the key assumption is that the lowest measured CO2 concentration corresponds to 400ppm. This means that the sensor should measure fresh air (400ppm) at least once in 7days period for automatic calibration to operate correctly.

Initial self calibration is triggered after 2 days of the power up. After this calibration period the self-calibration is triggered after every 7 days. If the CO2 reading is below 400ppm for more than 2 minutes, the self-calibration is triggered immediately. When a self-calibration is triggered, the CO2 measurement is shifted with a time constant of ~60 seconds for a smotth value change.

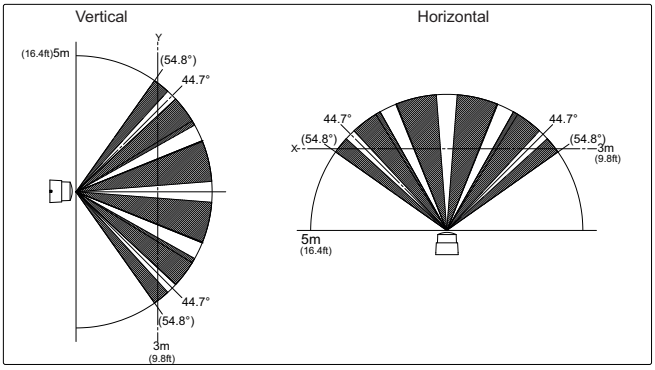
MOVEMENT DETECTION USING PASSIVE INFRARED SENSOR (OE OPTION)

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 displayed on the screen.

The diagram illustrates the detection area.

The movement sensor *556 Occupancy Delay* (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.

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 5 locations. Each of the locations can be individually configured according to the requirements. In addtion 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).

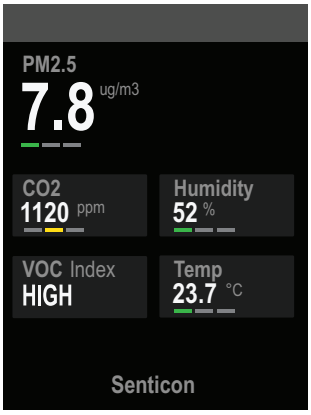
Each of the five display locations can be configured to show

- PM1.0, PM2.5, PM4.5, PM10, CO2, VOC/TVOC, Temperature, or Humidity Measurement
- 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)

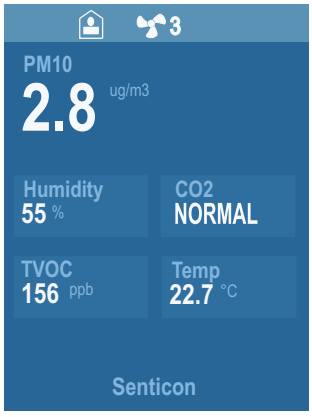
The display can be furthermore customised to:-

- 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).
- 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 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

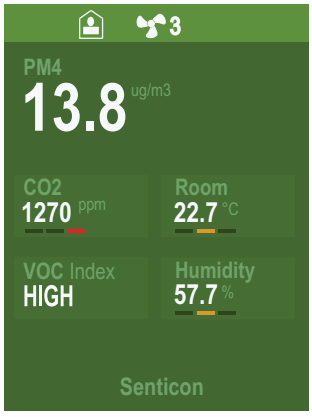
-LCD DISPLAY BLACK COLOUR



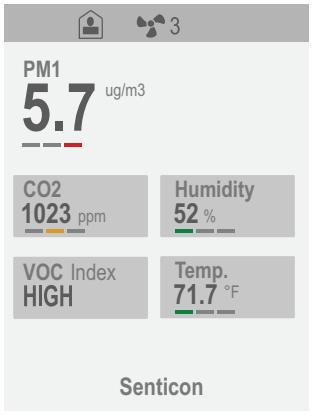
-LCD DISPLAY BLUE COLOUR



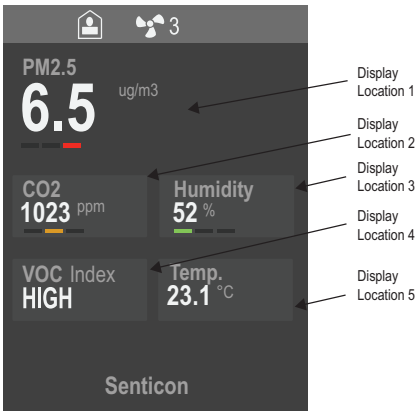
-LCD DISPLAY GREEN COLOUR

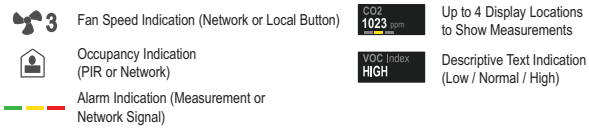


-LCD DISPLAY WHITE COLOUR



-LCD DISPLAY GREY COLOUR

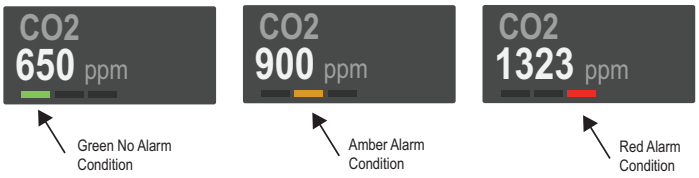




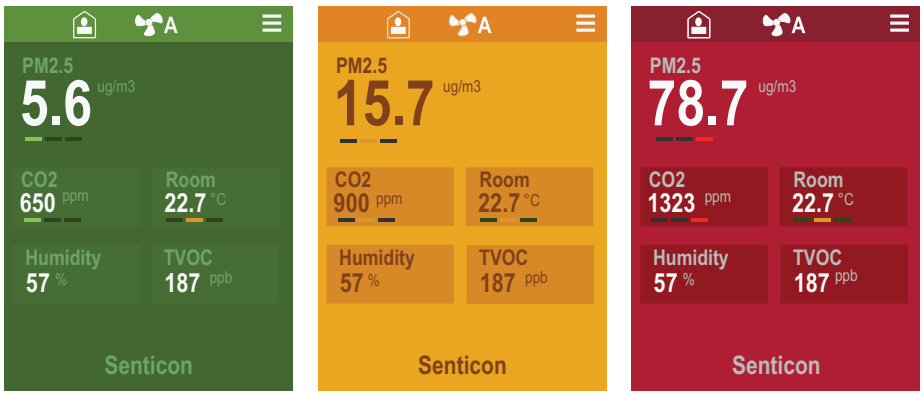
TRAFFIC LIGHT ALARM FUNCTION

Each of the 5 locations can be activated to display alarm condition based on the Amber and Red Limits. When measurement is above the Amber Limit, the location goes to Amber alarm (amber bar icon, or amber skin colour). When measurement is above the Red Limit, the location goes to Red Alarm (red bar icon or red skin colour).

ALARMING USING BAR DISPLAY



ALARMING USING SKIN COLOUR



Green No Alarm Condition (Set display colour to green)

Amber Alarm Condition

Red Alarm Condition

CAPACITIVE COLOUR TOUCHSCREEN OPTION (-TS)

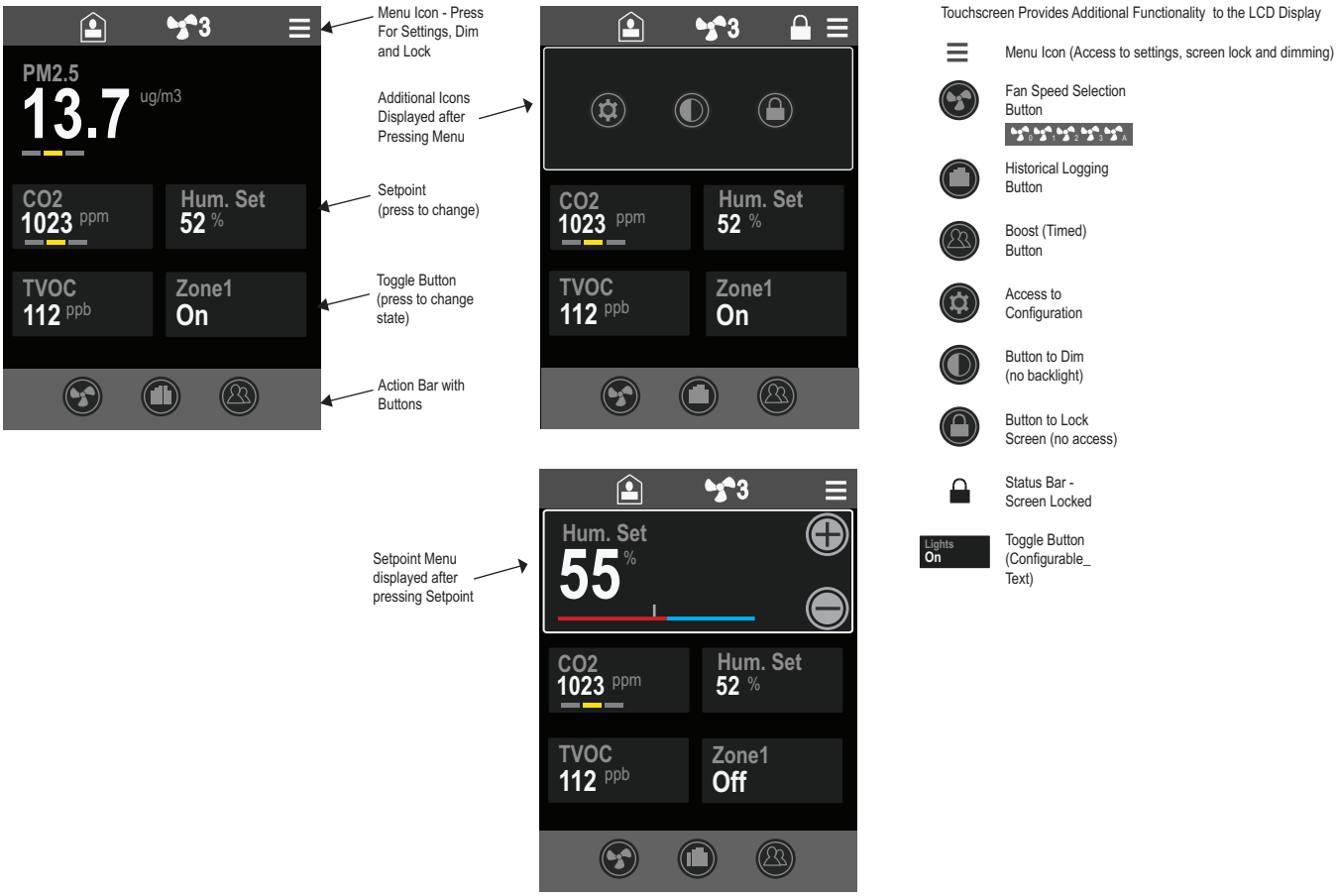
With the capacitive touchscreen option the display becomes interactive to the users. The capacitive touchscreen offers an accurate touch capability to the room sensors. With touchscreen the following additonal user interface options become available.

- Boost button with an adjustable timer
- Setpoint adjustment option for any of the four (5) locations - max. 2 setpoints
- Locations 2 to 5 can have On/Off button
- Window/blinds position adjustment and light level adjustment using the setpoint options
- 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 Configration Menu (network settings)

TOUCHSCREEN DISPLAY

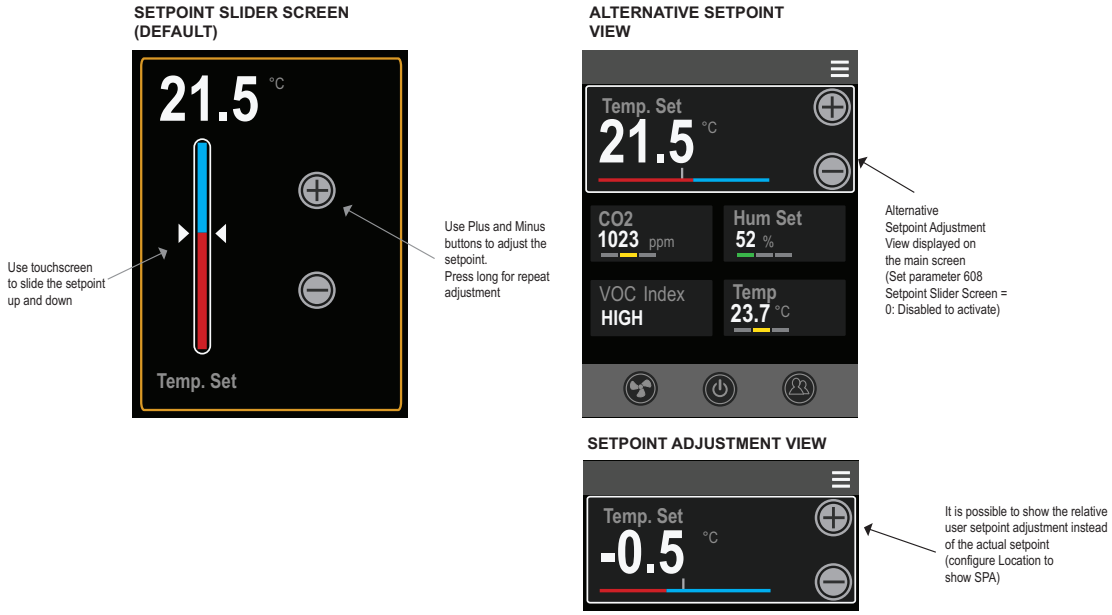


SETPOINT ADJUSTMENT

Two setpoint adjustments can be set to any of the five display locations. The setpoints can be confgured 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.

As default by pressing the setpoint field, the setpoint slider display is showed allowing it to be altered by pressing plus and minus buttons, or byusing the slider. Pressing the plus or minus button continuously repeats the change with accelerating pace.

It is also possible to show the setpoint adjustment overlay on the main screen, by setting the parameter *608 Setpoint Slider Screen : 0 = Disabled*.



BLINDS AND WINDOW ADJUSTMENT

By setting the Setpoint Adjustment Mode to Absolute, the device can be used e.g. for blinds and window 0-100% position adjustment. The user adjustment steps can be easilyt configured. The current level van be monitored over BACnet, Modbus or LoraWan, or it can be sent via 0-10Vdc output to the controlled equipment.

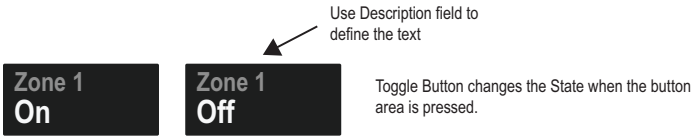
LIGHT LEVEL ADJUSTMENT; the devices can also be used as the light level adjustment and the lighting level can be connected to lighting ballasts via the 0-10Vdc outputs.

ON/OFF TOGGLE BUTTON

Locations 2 to 5 can have On/Off toggle button (from Fw 1.45 onwards).

.The button status is read from the network (BACnet/Modbus/LoraWan) and can be overriden. The text 'On/Off' can be customised using Language Translation utility to say e.g. 'Heat/Cool' or 'Open/Close'.

TOGGLE BUTTON (Default States)

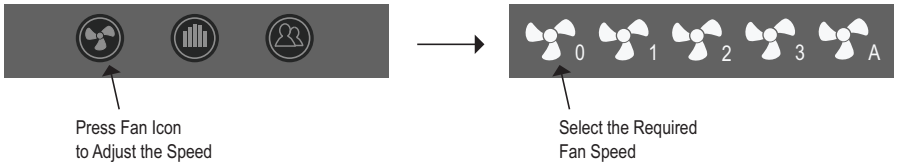


TOGGLE BUTTON (Custom Text)

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.

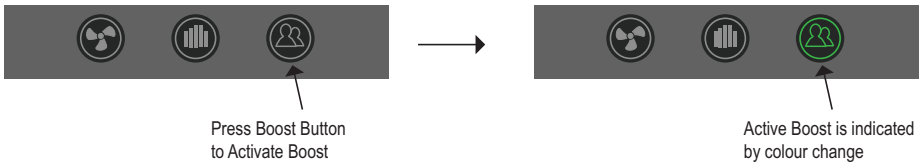
The Fan Speed button activation and number of fan speeds can be selected through the configuration parameters.



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 from 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

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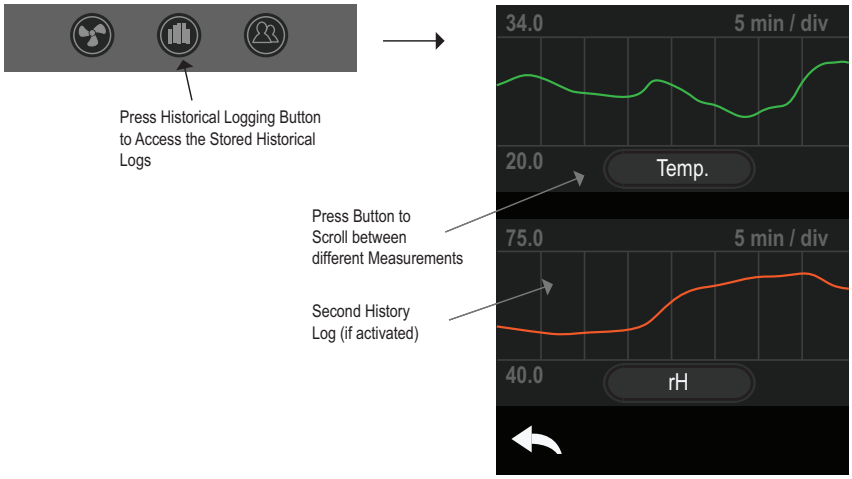

SCREEN LOCK

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.

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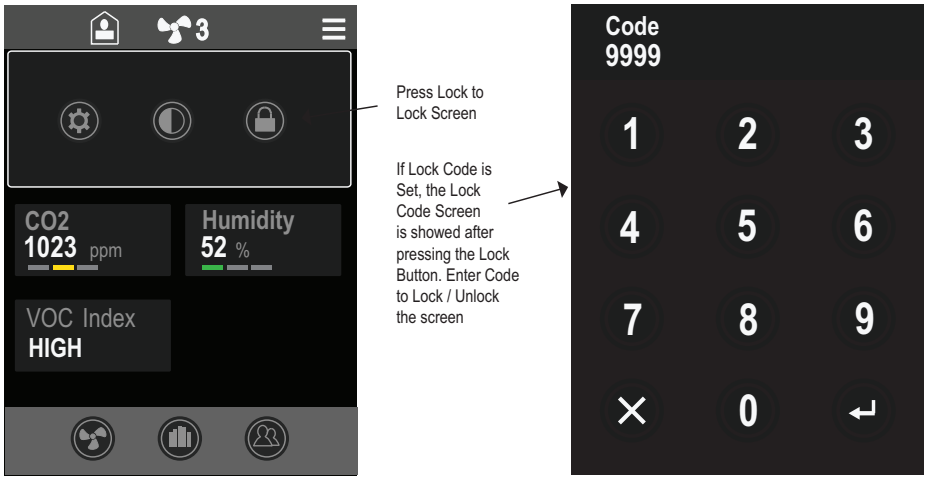

CONFIGURATION SCREEN

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.

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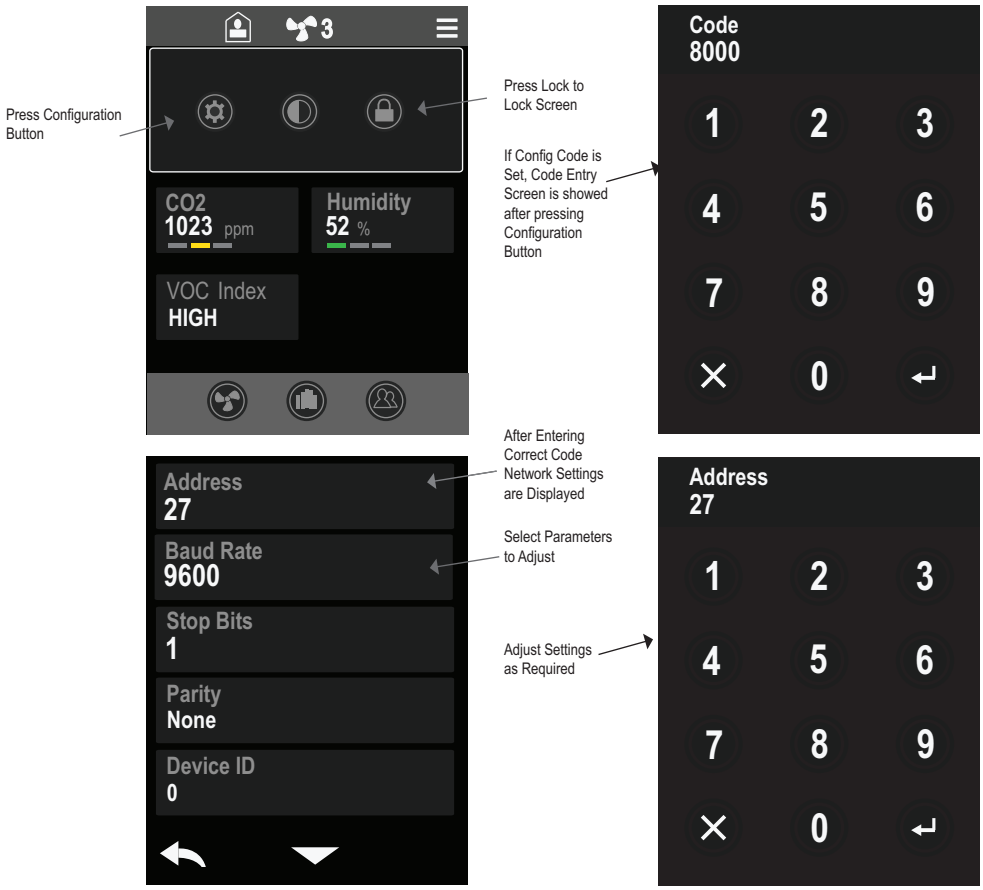


Device Setup and Modbus/BACnet Communications

The devices are available with Modbus RTU or BACnet MS/TP communication for system integration. Please also note that the devices can 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 Bluetooth connection.

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

The PMR25 devices have built-in BLE communication. The Windows PC Smart Config Tool is connected to the device using Bluetooth USB dongle (part no BLE-TOOLSET) that is plugged into the PC USB port. The iOS SmartConfig App is connected directly using iPhone's or iPad's built-in BLE adapter.

NOTE: To activate BLE connection, plug in first the USB-Dongle to PC, and then POWER CYCLE the PMR25. This establishes the connection from the BLE USB-Dongle to the Built-In BLE of the PMR25.

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 through Windows Smart Configuration Tool / iOS Smart Phone App, or from the touchscreen (TS-option).

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**
INPUTS						
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	Diplays current humidity measurement reading (With RH option)	**401**	uint16	0..1000 (x10)	0..100%rH	R
CO2 Sensor	Displays current measurement CO2 reading (QER multisensors)	**402**	uint16	0..10,000 (x1)	0..10,000ppm	R
VOC Sensor	Display current VOC (Volatile Organic Compound) Value, Index, TVOC, TVOCmolhave or TVOCisobutylene	**403**	uint16	0..6221 (x1)	0..500 index/ 0..6221ppb	R
Mass Concentration PM1.0	PM1.0 Particulate Mass Concentration	**422**	uint16	0..10000 (x10)	0..1000.0 ug/m3	R
Mass Concentration PM2.5	PM2.5 Particulate Mass Concentration	**423**	uint16	0..10000 (x10)	0..1000.0 ug/m3	R
Mass Concentration PM4	PM4 Particulate Mass Concentration	**424**	uint16	0..10000 (x10)	0..1000.0 ug/m3	R
Mass Concentration PM10	PM10 Particulate Mass Concentration	**425**	uint16	0..10000 (x10)	0..1000.0 ug/m3	R
Number Concentration PM0.5	PM0.5 Particulate Number Concentration	**426**	uint16	0..30000 (x10)	0..3000.0 #/cm3	R
Number Concentration PM1.0	PM1.0 Particulate Number Concentration	**427**	uint16	0..30000 (x10)	0..3000.0 #/cm3	R

Number Concentration PM2.5	PM2.5 Particulate Number Concentration	**428**	uint16	0..30000 (x10)	0..3000.0 #/cm3	R
Number Concentration PM4	PM4 Particulate Number Concentration	**429**	uint16	0..30000 (x10)	0..3000.0 #/cm3	R
Number Concentration PM10	PM10 Particulate Number Concentration	**430**	uint16	0..30000 (x10)	0..3000.0 #/cm3	R
Typical Particle Size	Typical Particel Size	**431**	uint16	0..100 (x10)	0..10.0 um	R
		DISCRETE INPUTS - FUNCTION CODE 02				
Occupancy Status	PIR (OE Option) Status	**202**		0..1	0..1	R
Push Button 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
DEMAND SIGNALS						
		MODBUS INPUT REGISTERS - FUNCTION CODE 04 MODBUS HOLDING REGISTER - FUNCTION CODES 03, (06), 16				
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, or the Absolute Setpoint)	**418**	uint16	-32000..32000 (x10)	-3200.0..3200.0	R
Calculated Setpoint 2	Calculated Setpoint (Nominal Network Setpoint + User Adjustment, or the Absolutele Setpoint)	**419**	uint16	-32000..32000 (x10)	-3200.0..3200.0	R
Toggle Button State	Current State of the Toggle Button (TS-models only)	**557**	int16	0..1 (x1)	0..1	R

INPUT/OUTPUT AND VOC 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 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
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 diisplaying 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
Occupancy Delay	Delay Off Timer for the PIR (movement) sensor	**556**	uint16	10..28,800 (x1)	10..28,800 seconds (default 600 secs)	R/W
VOC Measurement Mode	VOC Measurement Mode Selection (Index, TVOC, Well Standard, Reset Air Standard)	**587**	uint16	0..6	0 = VOC Index 1 = TVOC Ethanol, ppb (TVOC) 2 = TVOC Molhave, ug/m3 (Well) 3 = TVOC Isobutylene, ug/m3 (Reset) 4 = TVOC Ethanol, ug/m3 (TVOC) 5 = TVOC Molhave, ppb (Well) 6 = TVOC Isobutylene, ppb (Reset)	R/W

SENSOR 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
VOC Measurement Mode	VOC Measurement Mode Selection (Index, TVOC, Well Standard, Reaser Air Standard)	**587**	uint16	0..4	0 = VOC Index 1 = TVOC Ethanol (TVOC) 2 = TVOC Molhave (Well) 3 = TVOC Isobutylene (Reset)	R/W
Clean Particulate Sensor	Cleans the Particulate Matter Sensor by switching on the fan.	**588**	uint16	0..1	0 = None 1 = Clean	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 = Norrmal (0.5°C/F) 2 = Coarse (1°C/F)	R/W
Occupancy Icon Display	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 Boost Button	Enables Boost Button on the bottom action bar (TS-option only)	**650**	uint16	0..1	0 = Disabled (default) 1 = Enabled	R/W
Boost Time	Delay Off Timer for the Boost Button (TS-option only)	**651**	uint16	0..28,800 (x1)	0..28,800 seconds 0 = Timer disabled, toggle functionality	R/W

Enable Fan Speed 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 Speed 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
Toggle Button Override	Toggle Button Override (Locations 2 to 5). Overrides the toggle button location. (TS-option only)	**558**	uint16	0..2	0 = None 1 = Off 2 = On	R/W
Lock Code	Screen Lock Code - 0000 = User requires no code to lock the screen (TS-option only)	**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
Configuration 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
Setpoint Slider Screen	When enabled shows the Setpoint Slider Screen when adjusting setpoint. Disabled shows setpoint on the main screen.	**608**	unit16	0..1 (x1)	0 = Disabled 1 = Enabled (Default)	R/W

		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	**Description**		**Type**	**Data Range (multiplier)**	**Value Range / Enumerations**	**R/W**
DISPLAY LOCATION 1 (PRIMARY DISPLAY LOCATION)						
Location 1 Display	Location 1 Display Source. Sets what is displayed in Location 1. Default: 11 = PM2.5	**610**	uint16	0..13	0 = None 1 = Network Decimal Value 2 = Network Integer Value 3 = Temperature 4 = Humidity 5 = CO2 6 = VOC 7 = Setpoint 1 8 = Setpoint 2 9 = Text (Toggle Button) 10 = PM1 11 = PM2.5 12 = PM4 13 = PM10	R/W
Location 1 Description	Location 1 Description. Sets description for Location 1. Default: 16 = PM2.5	**611**	uint16	0..18	0 = None 1 = Temperature 2 = Humidity 3 = CO2 4 = VOC 5 = Room 6 = Zone 1 7 = Zone 2 8 = Temp. Set 9 = Hum. Set 10 = CO2 Set 11 = Room Set 12 = Zone 1 Set 13 = Zone 2 Set 14 = TVOC 15 = PM1 16 = PM2.5 17 = PM4 18 = PM10	R/W
Location 1 Unit	Location 1 Unit. Sets unit for Location 1. Default: 11 = ug/m3	**612**	uint16	0..11	0 = None 1 = °C 2 = °F 3 = ppm 4 = Lux 5 = Pa 6 = kWh 7 = m3 8 = % 9 = index (air quality index) 10 = ppb 11 =ug/m3	R/W
Location 1 Alarm	Activates Location 1 Alarm Bar, Alarm Skin Colour or Descriptive Text indication. Using 1=Bar activates Green, Amber, Red alarm icon indication underneath the current displayed parameter. Using 3=Text activates LOW, MEDIUM HIGH text indication instead of the measurement. Using 3= Skin activates the skin colour changing based on alarm condition.	**613**	uint16	0..3	0 = Disabled 1 = Bar (Default) 2 = Text 3 = Skin	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 10)	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
Location 1 Read Only	Sets the location 1 to be Read Only or Read/Write. In Read Only mode touch functions are disabled for this location (TS only).	**645**	uint16	0..1	0 = Read-Write (default) 1 = Read Only	R/W

		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	**Description**		**Type**	**Data Range (multiplier)**	**Value Range / Enumerations**	**R/W**
DISPLAY LOCATION 2 (PRIMARY DISPLAY LOCATION)						
Location 2 Display	Location 2 Display Source. Sets what is displayed in Location 2. Default: 6 = VOC	**617**	uint16	0..13	0 = None 1 = Network Decimal Value 2 = Network Integer Value 3 = Temperature 4 = Humidity 5 = CO2 6 = VOC 7 = Setpoint 1 8 = Setpoint 2 9 = Text (Toggle Button) 10 = PM1 11 = PM2.5 12 = PM4 13 = PM10	R/W
Location 2 Description	Location 2 Description Default 4 = VOC	**618**	uint16	0..18	0 = None 1 = Temperature 2 = Humidity 3 = CO2 4 = VOC 5 = Room 6 = Zone 1 7 = Zone 2 8 = Temp. Set 9 = Hum. Set 10 = CO2 Set 11 = Room Set 12 = Zone 1 Set 13 = Zone 2 Set 14 = TVOC 15 = PM1 16 = PM2.5 17 = PM4 18 = PM10	R/W
Location 2 Unit	Location 2 Unit Default: 9 = index	**619**	uint16	0..11	0 = None 1 = °C 2 = °F 3 = ppm 4 = Lux 5 = Pa 6 = kWh 7 = m3 8 = % 9 = index (air quality index) 10 = ppb 11 =ug/m3	R/W
Location 2 Alarm	Activates Location 2 Alarm Bar, Alarm Skin Colour or Descriptive Text indication. Using 1=Bar activates Green, Amber, Red alarm icon indication underneath the current displayed parameter. Using 3=Text activates LOW, MEDIUM HIGH text indication instead of the measurement. Using 3= Skin activates the skin colour changing based on alarm condition.	**620**	uint16	0..3	0 = Disabled 1 = Bar 2 = Text (Default) 3 = Skin	R/W
Location 2 Red Alarm Limit	Red Limit for Alarm 2 / High Limit for Descriptive Display	**621**	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	**622**	uint16	0..10,000 (x1)	0..10,000 (default 750)	R/W
Location 2 Hysteresis	Hysteresis for Alarm 2 / Low Limit for Descriptive Displays	**623**	uint16	0..10,000 (x1)	0..10,000 (default 100)	R/W
Location 2 Read Only	Sets the location 2 to be Read Only or Read/Write. In Read Only mode touch functions are disabled for this location (TS only).	**646**	uint16	0..1	0 = Read-Write (default) 1 = Read Only	R/W

		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	**Description**		**Type**	**Data Range (multiplier)**	**Value Range / Enumerations**	**R/W**
DISPLAY LOCATION 3						
Location 3 Display	Location 3 Display Source. Sets what is displayed in Location 3. Default: 5 = CO2 (if option fitted)	**624**	uint16	0..13	0 = None 1 = Network Decimal Value 2 = Network Integer Value 3 = Temperature 4 = Humidity 5 = CO2 6 = VOC 7 = Setpoint 1 8 = Setpoint 2 9 = Text (Toggle Button) 10 = PM1 11 = PM2.5 12 = PM4 13 = PM10	R/W
Location 3 Description	Location 3 Description Default: 3 = CO2 (if option fitted)	**625**	uint16	0..18	0 = None 1 = Temperature 2 = Humidity 3 = CO2 4 = VOC 5 = Room 6 = Zone 1 7 = Zone 2 8 = Temp. Set 9 = Hum. Set 10 = CO2 Set 11 = Room Set 12 = Zone 1 Set 13 = Zone 2 Set 14 = TVOC 15 = PM1 16 = PM2.5 17 = PM4 18 = PM10	R/W
Location 3 Unit	Location 3 Unit Default: 3 = ppm (if option fitted)	**626**	uint16	0..11	0 = None 1 = °C 2 = °F 3 = ppm 4 = Lux 5 = Pa 6 = kWh 7 = m3 8 = % 9 = index (air quality index) 10 = ppb 11 =ug/m3	R/W
Location 3 Alarm	Activates Location 3 Alarm Bar, Alarm Skin Colour or Descriptive Text indication. Using 1=Bar activates Green, Amber, Red alarm icon indication underneath the current displayed parameter. Using 3=Text activates LOW, MEDIUM HIGH text indication instead of the measurement. Using 3=Skin activates the skin colour changing based on alarm condition.	**627**	uint16	0..3	0 = Disabled 1 = Bar (Default) 2 = Text 3 = Skin	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 1250)	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 750)	R/W
Location 3 Hysteresis	Hysteresis for Alarm 3 / Low Limit for Descriptive Displays	**630**	uint16	0..10,000 (x1)	0..10,000 (default 100)	R/W
Location 3 Read Only	Sets the location 3 to be Read Only or Read/Write. In Read Only mode touch functions are disabled for this location)TS only).	**647**	uint16	0..1	0 = Read-Write (default) 1 = Read Only	R/W

Parameter	Description	Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
			Type	Data Range (multiplier)	Value Range / Enumerations	R/W
DISPLAY LOCATION 4						
Location 4 Display	Location 4 Display Source. Sets what is displayed in Location 4. Default: 4 = Temperature	**631**	uint16	0..13	0 = None 1 = Network Decimal Value 2 = Network Integer Value 3 = Temperature 4 = Humidity 5 = CO2 6 = VOC 7 = Setpoint 1 8 = Setpoint 2 9 = Text (Toggle Button) 10 = PM1 11 = PM2.5 12 = PM4 13 = PM10	R/W
Location 4 Description	Location 4 Description Default: 1 = Temperature	**632**	uint16	0..18	0 = None 1 = Temperature 2 = Humidity 3 = CO2 4 = VOC 5 = Room 6 = Zone 1 7 = Zone 2 8 = Temp. Set 9 = Hum. Set 10 = CO2 Set 11 = Room Set 12 = Zone 1 Set 13 = Zone 2 Set 14 = TVOC 15 = PM1 16 = PM2.5 17 = PM4 18 = PM10	R/W
Location 4 Unit	Location 4 Unit Default: 1 = °C	**633**	uint16	0..11	0 = None 1 = °C 2 = °F 3 = ppm 4 = Lux 5 = Pa 6 = kWh 7 = m3 8 = % 9 = index (air quality index) 10 = ppb 11 =ug/m3	R/W
Location 4 Alarm	Activates Location 4 Alarm Bar, Alarm Skin Colour or Descriptive Text indication. Using 1=Bar activates Green, Amber, Red alarm icon indication underneath the current displayed parameter. Using 3=Text activates LOW, MEDIUM HIGH text indication instead of the measurement. Using 3= Skin activates the skin colour changing based on alarm condition.	**634**	uint16	0..3	0 = Disabled 1 = Bar (Default) 2 = Text 3 = Skin	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 30)	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 25)	R/W
Location 4 Hysteresis	Hysteresis for Alarm 4 / Low Limit for Descriptive Displays	**637**	uint16	0..10,000 (x1)	0..10,000 (default 1)	R/W
Location 4 Read Only	Sets the location 4 to be Read Only or Read/Write. In Read Only mode touch functions are disabled for this location (TS only).	**648**	uint16	0..1	0 = Read-Write (default) 1 = Read Only	R/W

		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	**Description**		**Type**	**Data Range (multiplier)**	**Value Range / Enumerations**	**R/W**
DISPLAY LOCATION 5						
Location 5 Display	Location 5 Display Source. Sets what is displayed in Location 5. Default: 4 = Humidity	**631**	uint16	0..13	0 = None 1 = Network Decimal Value 2 = Network Integer Value 3 = Temperature 4 = Humidity 5 = CO2 6 = VOC 7 = Setpoint 1 8 = Setpoint 2 9 = Text (Toggle Button) 10 = PM1 11 = PM2.5 12 = PM4 13 = PM10	R/W
Location 5 Description	Location 5 Description Default: 2 = Humidity	**632**	uint16	0..18	0 = None 1 = Temperature 2 = Humidity 3 = CO2 4 = VOC 5 = Room 6 = Zone 1 7 = Zone 2 8 = Temp. Set 9 = Hum. Set 10 = CO2 Set 11 = Room Set 12 = Zone 1 Set 13 = Zone 2 Set 14 = TVOC 15 = PM1 16 = PM2.5 17 = PM4 18 = PM10	R/W
Location 5 Unit	Location 5 Unit Default: 8 = %	**633**	uint16	0..11	0 = None 1 = °C 2 = °F 3 = ppm 4 = Lux 5 = Pa 6 = kWh 7 = m3 8 = % 9 = index (air quality index) 10 = ppb 11 =ug/m3	R/W
Location 5 Alarm	Activates Location 5 Alarm Bar, Alarm Skin Colour or Descriptive Text indication. Using 1=Bar activates Green, Amber, Red alarm icon indication underneath the current displayed parameter. Using 3=Text activates LOW, MEDIUM HIGH text indication instead of the measurement. Using 3= Skin activates the skin colour changing based on alarm condition.	**634**	uint16	0..3	0 = Disabled 1 = Bar (Default) 2 = Text 3 = Skin	R/W
Location 5 Red Alarm Limit	Red Limit for Alarm 5 / High Limit for Descriptive Display	**635**	uint16	0..10,000 (x1)	0..10,000 (default 80)	R/W
Location 5 Amber Alarm Limit	Amber Limit for Alarm 5 / Medium Limit for Descriptive Displays	**636**	uint16	0..10,000 (x1)	0..10,000 (default 60)	R/W
Location 5 Hysteresis	Hysteresis for Alarm 5 / Low Limit for Descriptive Displays	**637**	uint16	0..10,000 (x1)	0..10,000 (default 10)	R/W
Location 5 Read Only	Sets the location 5 to be Read Only or Read/Write. In Read Only mode touch functions are disabled for this location (TS only).	**649**	uint16	0..1	0 = Read-Write (default) 1 = Read Only	R/W

		Modbus Register / BACnet Property	MODBUS HOLDING REGISTER - FUNCTION CODES 03, 06, 16			
Parameter	**Description**		**Type**	**Data Range (multiplier)**	**Value Range / Enumerations**	**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 = Humidity 3 = CO2 4 = VOC 5 = PIR (Movement) 6 = PM2.5	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
SETPOINT 1 (NETWORK DISPLAY) - DATA TYPE ADJUSTABLE TO INTEGER (x1) OR DECIMAL(x10)						
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	-27000..27000 (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	-27000..27000 (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**	unint16	0..1	0 = Integer (x1) 1 = Decimal (x10) - Default	R/W
Setpoint 1 Adjustment	Sets the Setpoint 1 user adjustment limits to use relative or absolute min/max settings.	**668**	unint16	0..1	0 = Relative - Default 1 = Absolute	R/W
SETPOINT 2 (NETWORK DISPLAY) - DATA TYPE ADJUSTABLE TO INTEGER (x1) OR DECIMAL(x10)						
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	-27000..27000 (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	-27000..27000 (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**	unint16	0..1	0 = Integer (x1) (Default) 1 = Decimal (x10)	R/W
Setpoint 2 Adjustment	Sets the Setpoint 2 user adjustment limits to use relative or absolute min/max settings.	**669**	unint16	0..1	0 = Relative - Default 1 = Absolute	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**
Addres	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

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			
Date:	Sep 1, 2023		
Vendor Name:	Senticon Ltd		
Vendor ID:	1374		
Product Name:	PMR25 Particulate Matter Sensors		
Product Models:	PMR25		
Applications Software Version:	1.0		
Firmware Revision:	1.0.0		
BACnet Prorocol Revision	1.19		
Product Description:	Smart Room Sensors		
BACnet Standard Device Profile:	BACnet Application Specific Controller (B-ASC)		
BACnet Interoperability Blocks Supported:	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)		
Segmentation Capability:	No		
Data Link Layer Options:	MS/TP Master; Supported Baud 9600/19200/38400/57600/76800/115200		
Device Address Binding:	No static device binding supported		
Networking Options:	None		
Character Sets Supported:	ISO 10646 (UTF-8)		
Gateway Options:	None		
Network Security Options:	Non-Secure Device		
Standard Object Types Supported:	**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 Subsriptions Max Master	Object Identifier Object Name APDU Timeout (0...6000) Number Of APDU Retries (0...3) Max Master (1...127)
	For all supported objects, device does not support CreateObject or DeleteObject. *For Analog Value objects that are classified as read only, there is the following behavior:* *- HVAC application overwrites the present value that has been written with the Write Property Service.* *- In this case, no error message will be sent.* *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:* *- No error message, if the limits have been exceeded* *- Too high values are set to the range maximum* *- Too small values are set to the range minimum*		

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.	PMR25	R/W
	Object_Type		8	R
	System_Status		Status_Operational	R
	Vendor_Name		Senticon Ltd	R
	Vendor_Identifer		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_Supporte		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)	MassConc PM2.5	0.0..1000.0	-	NO_UNITS	0.0..100 (Default 1)	R
AV(5)	MassConc PM10	0.0..1000.0	-	NO_UNITS	0.0..100 (Default 1)	R
AV(6)	PM Sensor (configurable AV object - param 589)	0.0..3000.0	-	NO_UNITS	0.0..100 (Default 1)	R
AV(7)	Setpoint_1	-2700.0..2700.0	Nonvol_Setpoint	DEGREES_CELCIUS or DEGREES_FAHRENHEIT or PARTS_PER_MILLION or PERCENT	5	R/W
AV(8)	Setpoint_2	-2700.0..2700.0	Nonvol_Setpoint	DEGREES_CELCIUS or DEGREES_FAHRENHEIT or PARTS_PER_MILLION or PERCENT	5	R/W
AV(9)	Fan_Speed	0..4.0	Nonvol_FanSpeed	NO_UNITS	1	R/W
AV(10)	Network_Decimal	-999.0..999.0	Nonvol_Setpoint	NO_UNITS	0	R/W
AV(11)	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).

OBJECT TYPE: BINARY VALUE					
Object Instance	**Object Name**	**Description**	**Present Value Range / Active - Inactive Tex**	**Relinquish_Default**	**R/W**
BV(0)	Occupancy	PIR Sensor Status	0: InActive 1: Active	Binary_Inactive	R
BV(1)	Boost	Boost Button Status (Active / non-active)	0: InActive 1: Active	Binary_Inactive	R/W
BV(2)	Screen_Lock	Locks / Unlocks Screen	0: InActive (Unlocked) 1: Active (Locked)	Binary_Inactive	R/W
BV(3)	Toggle_Button	Toggle Button Status	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 obejcts. Full list of available properties are listed in the *Device Setup and Modbus/BACnet Communication* 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 objcts the modifed 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.

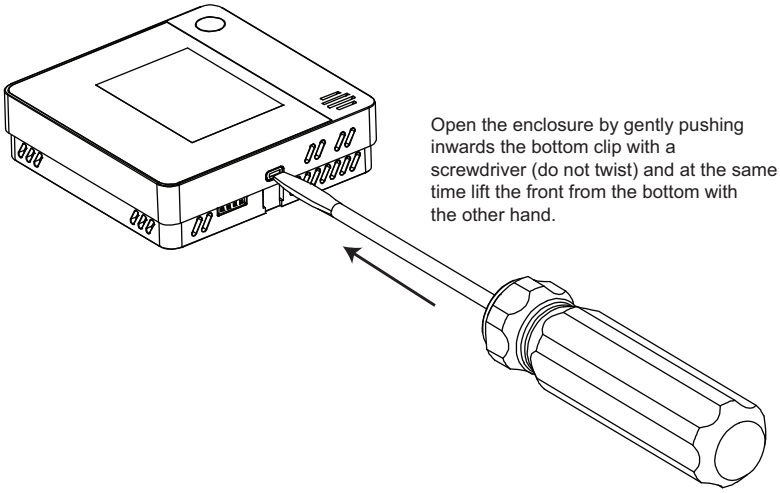
BACNET SPECIFIC AND BACNET COV OBJECT SETTINGS						
Parameter	**Description**	**BACnet Property**	**Type**	**Data Range (multiplier)**	**Value Range / Enumerations**	**R/W**
AV6 Data	AV6 Object Data Source - Configurable AV Object	**589**	uint16	0..7	0 = MassConcentration PM1 1 = MassConcentration PM4 2 = NumConcentration PM05 3 = NumConcentration PM1 4 = NumConcentration PM25 5 = NumConcentration PM4 6 = NumConcentration PM10 7 = Particle Size (Default)	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.



Open the enclosure by gently pushing inwards the bottom clip with a screwdriver (do not twist) and at the same time lift the front from the bottom with the other hand.

DIMENSIONS (xER10 SERIES)