

# Alledio Indoor Modbus & BACnet Sensor

Temperature | Humidity | VOC | CO2 | Pressure | Enthalpy | Dew Point | Density of Moist Air | Presence



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Notes	Data and descriptions in this document are subject to change without notice. Product photos and pictures are for illustrations purposes only and may differ from the real product appearance.

Parameter	Technical data
<b>Housing Material</b>	ABS (flame resistant)
<b>Power Supply</b>	AC: 24 VAC DC: 15-35 V; configuration 24V – 45mA (1,08W); normal operation 24V – 34mA (0,82W)
<b>Sensor Measuring Ranges – Output Data</b>	Temperature: -40°C to +125°C Humidity: 0 – 100 % VOC Index points: range 1 – 500 VOC Index points (0-100%). This is based on the measurement range within of 0 – 1000 ppm Ethanol in clean air; specified range: 0,3 – 30 ppm Ethanol in clean air. CO2: 0 – 5000 ppm Pressure: 300 - 1200 hPa (300 mbar – 1200 mbar) Presence: from min 0.0m to max 8.4m (adjustable with a 0.7m step)
<b>Sensor Accuracy:</b>	Temperature: average $\pm 0,2$ °C (at 0 – 65°C); Humidity: $\pm 1,8$ % (30 – 70%), $\pm 2$ % (10-30%, 70-90%) VOC: $< \pm 15$ VOC Index points ( $< \pm 3\%$ ); algorithm stability maintains $< 5$ index point drift/year under continuous operation CO2: $\pm (50 \text{ ppm} + 5\% \text{ of reading})$ at 400 – 2000 ppm Pressure: relative accuracy: $\pm 0.06$ hPa (or $\pm 0.5$ m); absolute accuracy: $\pm 1$ hPa (or $\pm 8$ m) Presence: $\pm 0.35$ m
<b>Temperature Sensor</b>	PT1000
<b>CO2 Auto Calibration</b>	The CO2 sensor is designed to perform automatic self-calibration every 7 days. To ensure optimal calibration and maintain long-term accuracy, the sensor should be exposed to low CO2 levels (ideally around 400-500 ppm which is considered an unoccupied environment), at least once per week.
<b>Communication Protocols</b>	Modbus RS485, BACnet MS/TP, BACnet IP
<b>NFC</b>	Used to connect with Android and iOS smart phones
<b>WiFi</b>	WiFi is activated as an internal hidden network working in the proximity of ~2 meters. Once connected, you can set up Modbus Settings, BACnet Settings and Offset Settings of the Sensors and view the current measured values in real time (automatic reading every 5 seconds). Stay in Wi-Fi range in order to stay connected.
<b>Electrical Insulation</b>	Not in standard version; optional upon special request: Isolated RS-485; Up to 1kV (optional); prevents interference transmission, potential differences, and protects against over voltages between devices.
<b>Connections</b>	Pluggable screw terminals for 0.3 to 1.5mm cable
<b>Power Supply Cable</b>	Screened, twin twisted pair 0.75mm to 1mm. Screen earthed at controller end only.
<b>Communication Cable</b>	Twisted pair with drain wire and foil wrap or equivalent. Must Be suitable for RS485 Standard.
<b>Ingress Protection</b>	IP30
<b>Ambient condition</b>	From -10 °C to +50 °C max. 85% rH non-condensing
<b>Product dimensions</b>	87 mm × 87 mm × 19 mm
<b>Product weight</b>	55 g

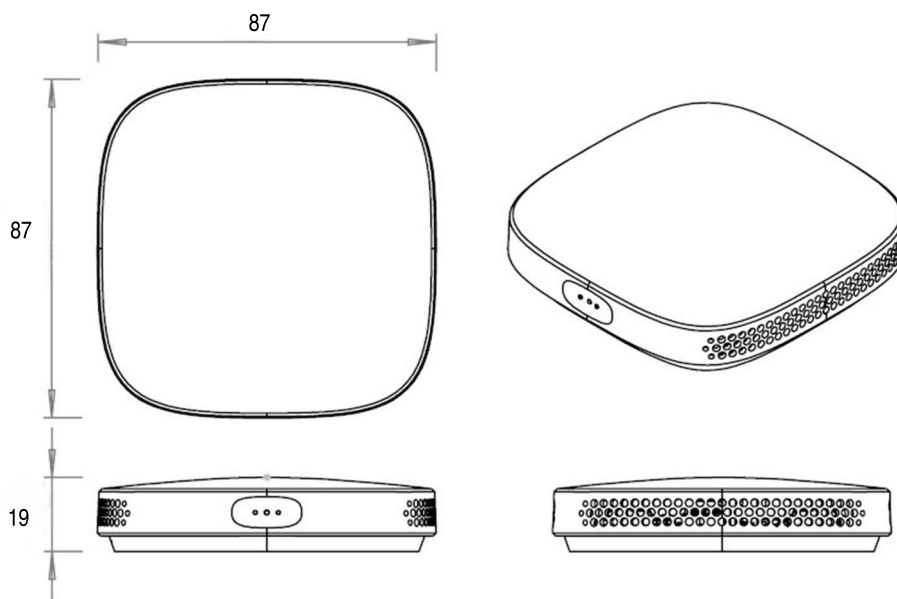
<b>Package dimensions</b>	115 mm x 115 mm x 42 mm (protective case)
<b>Package weight</b>	90 g (optional bulk packaging – quantity dependent)
<b>Standard</b>	CE
<b>Country of origin</b>	Slovenia, EU
<b>Warranty</b>	1 year

**Sensor Variations for ANM-[...] with Modbus & ANB-[...] with Modbus & BACnet**

ANM-[...]	Temperature	Humidity	Pressure	VOC	CO2	Presence	Dew Point	Enthalpy	Density of Moist Air	Modbus	BACnet
TH	x	x								x	
THPV	x	x	x	x			x	x	x	x	
THPC	x	x	x		x		x	x	x	x	
THPVC	x	x	x	x	x		x	x	x	x	
THPVCP	x	x	x	x	x	x	x	x	x	x	
<b>ANB-[...]</b>											
TH	x	x								x	x
THPV	x	x	x	x			x	x	x	x	x
THPC	x	x	x		x		x	x	x	x	x
THPVC	x	x	x	x	x		x	x	x	x	x
THPVCP	x	x	x	x	x	x	x	x	x	x	x

**Case - Dimensions**

<b>L x W x H</b>	87 mm x 87 mm x 19 mm
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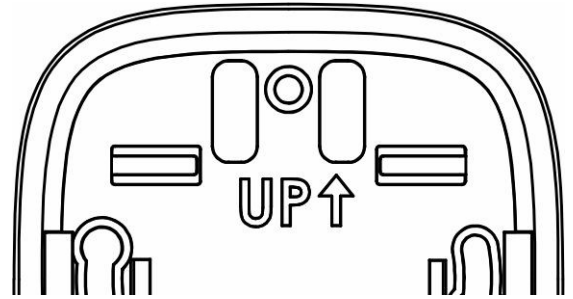


## Mounting

<b>Mounting Location</b>	Wall-mounted, approx. 1.5m from floor level; avoid direct blow or other intense airflow
<b>EU</b>	flush mounted with standard EU box (Ø=60 mm), M3.5 countersunk screw

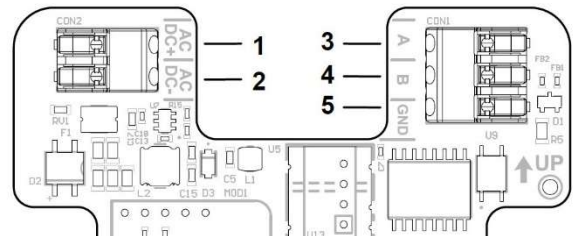
## Mounting Instructions

- Mount the sensor in a location that is **free from direct airflow**, such as air blown by fan coil units, split system units, localized heating or cooling devices, or central ventilation system intake grilles, to ensure accurate and reliable measurements.
- Mount the sensor at a height of **1.5 meters** from the floor to ensure optimal performance and accurate readings.
- Mount the sensor to the wall. On the **back plate** of the sensor there is an “UP ↑” marking in order to attach the back plate in the correct direction for best measurement performance;
- Connect the sensor firstly with **Modbus / BACnet MS/TP communication** cables: Pin 3,4,5.
- Connect the sensor secondly with **Power Supply** cables: Pin 1,2.
- Once sensor is mounted and connected you can close the sensor with the front plate;
- You are ready for configuration with a smart phone.



## Electrical Connection

<b>Pin 1</b>	+ Vin / ~ Vin
<b>Pin 2</b>	- Vin / ~ Vin
<b>Pin 3</b>	Modbus A / BACnet A
<b>Pin 4</b>	Modbus B / BACnet B
<b>Pin 5</b>	GND iso



## Sensor Calibration and Commissioning Process

To ensure optimal performance and accuracy, proper calibration of the sensor during commissioning is essential. Begin by connecting the Modbus / BACnet cables to sensor. Then connect it to a stable power supply. Connect to the sensor with your Smart Phone and configure the Modbus Settings (Address, Baudrate, Party ...) or BACnet Settings (Device ID, MAC ID, Baud rate ...).

### Setting manual Offsets

Once powered, allow the sensor to initialize and auto-calibrate itself. This process typically requires a waiting period of **30 to 45 minutes** during which the sensor will **automatically calibrate itself** before it begins providing accurate readings. Avoid interacting with or making adjustments to the sensor during this critical auto-calibration phase.

After the auto-calibration period has passed, you can connect to the sensor using a NFC enabled smartphone. Utilize the provided application to establish a connection, enabling you to configure the sensor settings. At this stage, you can proceed to set up Modbus / BACnet Communication and make any necessary adjustments to the sensor offsets to match your application's requirements.

**Important Consideration for Power Interruptions:** If the power supply to the sensor is interrupted during the commissioning process, it is vital to ensure the sensor has **cooled down to room temperature before reconnecting it** to the power source. This precaution helps maintain the integrity of the sensor's calibration process and prevents potential errors in operation. Following this guideline will contribute to achieving reliable and consistent performance from the sensor.

## Connecting to the Sensor with a Smart Phone (iOS or Android)

## Android devices

<b>Tap Sensor (1st time)</b>	<p><b>Tap the sensor</b> with your smart phone on the lower right part of the case for the <u>first</u> time.</p> <p>The sensor will push a <b>notification to connect</b> to the sensors internal WiFi network.</p> <p><b>Accept</b> the connection.</p> <p>Wait for 2-3 seconds for the sensor to <b>connect</b> with your smart phone.</p> <p><b>Note:</b></p> <p>If you touch the sensor before it manages to connect with your smart phone it will re-read the NFC tag as empty. In this case, wait an additional 1-2 seconds, before tapping for the second time.</p> <p>The sensors Wi-Fi network is a private hidden network. You won't be able to see it in your smart phones Wi-Fi networks list</p>
<b>Tap Sensor (2nd time)</b>	<p><b>Tap the sensor</b> with your smart phone on the lower right part of the case for the <u>second</u> time.</p> <p>The sensor will push a <b>notification to open</b> your web browser on your smart phone.</p> <p><b>Tap</b> the notification.</p> <p>Your browser will open up with the Andivi Sensor Web App, where you can configure the sensor.</p>

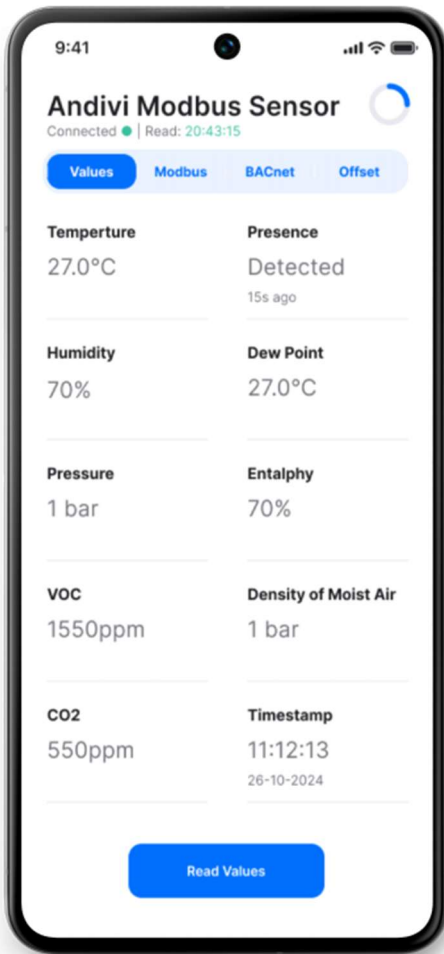
Important: First-Time WiFi Connection Android: On Android devices, a pop-up will appear asking if you want to stay connected to the network. If you select "Stay Connected" or leave the pop-up open, the connection will be maintained without issues. However, if you close the pop-up or select "Do Not Stay Connected," the device will switch to another available network.

## iOS devices

<b>Download from App Store</b>	<p>For iOS we recommend downloading the <i>NFC21 Reader</i> App to your smart phone: <a href="https://apps.apple.com/us/app/nfc21-reader/id1293225257">https://apps.apple.com/us/app/nfc21-reader/id1293225257</a> or any other NFC app.</p>
<b>Launch App</b>	<p>Once downloaded, open the app on your smart phone.</p>
<b>Tap Sensor (1st time)</b>	<p><b>Tap the sensor</b> with your smart phone on the lower right part of the case for the <u>first</u> time.</p> <p>The sensor will push a <b>notification to connect</b> to the sensors internal WiFi network.</p> <p><b>Accept</b> the connection.</p> <p><b>Wait for 2-3 seconds</b> for the sensor to <b>connect</b> with your smart phone.</p> <p><b>Note:</b></p> <p>If you touch the sensor before it manages to connect with your smart phone it will re-read the NFC tag as empty. In this case, wait an additional 1-2 seconds, before tapping for the second time.</p> <p>The sensors Wi-Fi network is a private hidden network. You won't be able to see it in your smart phones Wi-Fi networks list</p>
<b>Tap Sensor (2nd time)</b>	<p><b>Tap the sensor</b> with your smart phone on the lower right part of the case for the <u>second</u> time.</p> <p>The sensor will push a <b>notification to open</b> your web browser on your smart phone.</p> <p><b>Tap</b> the notification.</p> <p>Your browser will open up with the Andivi Sensor Web App, where you can configure the sensor.</p>

Important: First-Time WiFi Connection iOS: If another known WiFi network is nearby and you are connecting to the sensor for the first time, the iPhone will automatically switch to the other known network after a few seconds. On the second connection attempt, the iPhone will remain connected to the sensor for approximately 20 minutes before disconnecting from the WiFi network again.

Configuring the Sensor with the Web App



**Status:**

Connected status:

- = sensor is connected
- = sensor is disconnected

Read status:

hh/mm/ss - Last time the sensor retrieved data.

**Menu:**

**Values**

see live readings from the sensor; refreshed every 5 seconds.

**Modbus RS485 Settings**

set Modbus Address, Baudrate, Parity, Mode, Stop Bits and Termination.

**BACnet MSTP Settings**

set Device ID, MAC ID, Max Master, Baudrate

**BACnet IP Settings**

set Device ID, SSID, Password, Port

**Registers**

see the registers table and the gains.

**Offset**

see the offsets for every value.

**Modbus Settings**

<b>Baud rate</b>	9600, 19200, 38400, 57600
<b>Termination</b>	None, 120 Ω
<b>Parity</b>	Even, Odd, No Parity
<b>Modus</b>	RTU, ASCII
<b>Stop Bits</b>	1, 2
<b>Address</b>	From 1 to 247
	<u>Important:</u> The addresses of the Modbus communication registers can be shifted by 1 depending on the controller used to receive the data.

**Modbus Input Registers (for reading measured values)**

Value	Unit	Register	Gain
Temperature	°C	10	10
Humidity	% r H	15	10
VOC	%	20	/
VOC Index	VOC Points	21	/
CO2	ppm	25	/
Pressure	mbar	30	10
Dew Point	°C	35	10
Enthalpy	kJ/kg	40	10
Density of Moist Air	kg/m <sup>3</sup>	45	10
Presence	[detection Y/N]	50	0 = presence not detected; [else] presence detected

**Modbus Holding Registers (for setting offset via Modbus communication)**

Value	Unit	Register	Gain
Temperature	°C	10	10
Humidity	% r H	15	10
VOC	Cannot be readjusted manually because it automatically readjusts based on last 24h with a new average baseline 50% (=100 VOC Points)		
CO2	ppm	25	/
Force Calibrate CO2*	ppm	26	/
Pressure	mbar	30	100

\*The purpose of the **force calibration feature for the CO2 sensor** is to allow an installer to manually calibrate the sensor by entering the current CO2 level in the space, provided they know its exact value. While the sensor automatically self-calibrates once a week under normal conditions, this option is available for situations where immediate calibration is required, such as for testing purposes, without the need to wait for the automatic calibration process.

**BACnet MS/TP Settings**

<b>Device ID</b>	<p>The Device ID, also known as the Device Object Identifier or Device Instance, is a unique identifier for each BACnet device across the entire BACnet internetwork.</p> <p>It is used for device discovery, communication, and referencing devices in the control system network and can typically range from 0 to 4,194,303 (22-bit value). The Device ID is typically field-configurable to ensure uniqueness in each installation.</p>
<b>MAC ID</b>	<p>The MAC ID (Media Access Control address) uniquely identifies devices within a specific network segment and facilitates direct communication within that segment.</p> <p>The MAC ID, must be unique within the specific network segment or MS/TP trunk.</p> <p>BACnet MS/TP: 0-127 for master devices.</p>
<b>Max Master</b>	<p>The Max Master setting indicates the highest Media Access Control (MAC) address assigned to any master device on the MS/TP network. It is used to limit the range of addresses that a device will poll when searching for other master devices on the network.*</p> <p>The default Max Master value is typically 127. Valid values range from 1 to 127, corresponding to the possible master device addresses in MS/TP networks.</p> <p>For optimal configuration set Max Master equal to the highest MAC address actually in use on the network. Use consecutive MAC addresses for devices when possible.</p> <p>Setting Max Master significantly higher than the highest numbered device will result in increased network traffic and slower response times. Setting Max Master lower than the highest MAC address on the network will result in some controllers being unavailable for network traffic</p>
<b>Baud rate</b>	Select baud rate 9600, 19200, 38400, 57600, 76800, 115200

**BACnet IP Settings**

<b>Device ID</b>	<p>The Device ID, also known as the Device Object Identifier or Device Instance, is a unique identifier for each BACnet device across the entire BACnet internetwork.</p> <p>It is used for device discovery, communication, and referencing devices in the control system network and can typically range from 0 to 4,194,303 (22-bit value). The Device ID is typically field-configurable to ensure uniqueness in each installation.</p>
<b>SSID</b>	The SSID (Service Set Identifier) is the name of a WiFi network that you want to connect your BACnet sensor with.
<b>Password</b>	Type in the password of the selected WiFi network to securely access to the BACnet sensor.
<b>Port</b>	<p>Set the UDP port used for BACnet communication. It specifies which application reads the BACnet messages when a computer receives an Ethernet message</p> <p>Default value 47808.</p>

**BACnet Property List**

<b>Object Name</b>	Temperature / Humidity / Pressure / CO2 / VOC / VOC Index / Presence / Enthalpy / Dew Point / Density of Moist Air
<b>Present value</b>	Displayed value of selected variable (e.g. 23.5°C for temperature)
<b>Out of service</b>	If a particular hardware component (e.g. CO2 sensing element) is not present on this sensor version then "Out of Service = True".
<b>Units</b>	°C for temperature, % for humidity, % for VOC, Points for VOC Index, ppm (particles per million) for CO2, mbar for pressure.
<b>Resolution</b>	Temperature: 0,1 °C, Humidity: 0,1%, VOC: 1%, VOC Index : 1, CO2: 1 ppm, Pressure: 0,1 mbar, Dew Point: 0,1°C, Enthalpy: 0,1 kJ, Density of Moist Air: 0,01 kg/m3

**BACnet Object Table**

<b>Analog Input</b>	<b>Value</b>	<b>Unit</b>	<b>Resolution</b>	<b>Default COV Increment</b>
AI: 0	Temperature	°C	0.1 °C	0.5 °C
AI: 1	Humidity	r H	0,1 % r H	5 % r H
AI: 2	VOC	%	1 %	5 %
AI: 3	VOC Index	Index point	1	25
AI: 4	CO2	ppm	1 ppm	50 ppm
AI: 5	Pressure	mbar	0,01 mbar	10 mbar
<b>Analog Value</b>				
AV: 0	Dewpoint	°C	0.1 °C	1 °C
AV: 1	Enthalpy	kJ	0.1 kJ	0,5 kJ
AV: 2	Density of Moist Air	kg/m3	0.01 kg/m3	0,05 kg/m3
<b>Binary Input</b>				
BI: 0	Presence	/	/	/

**Understanding VOC Index**

The VOC Index provides a standardized 0–500 scale for assessing indoor air quality by measuring volatile organic compounds (VOCs) – gases emitted from sources like cleaning products, paints, furniture and building materials. Unlike raw ppm measurements, this index normalizes readings across different VOC types and environmental conditions using a proprietary algorithm, while compensating for humidity variations.

The VOC Index sensor works much like a highly sensitive electronic nose. Here's how you can think about it:

When you walk into a room, your nose instantly compares the air's smell to what you've been breathing recently. If you just came from outside and enter a kitchen where someone is cooking, your nose quickly notices the change and tells you, "This air smells different!" The VOC sensor does something very similar:

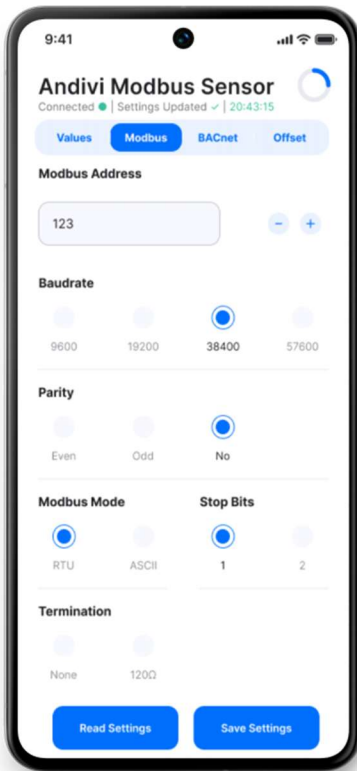
- It constantly "sniffs" the air and remembers what the air has been like over the past 24 hours (its "memory" or baseline).
- When the air changes—maybe someone starts cleaning, cooking, or opens a window—the sensor detects this difference and updates the VOC Index accordingly.
- A value of 100 on the VOC Index means the air quality is about the same as what the sensor has learned is "normal" for that room. If the index goes above 100, it means there are more VOCs (volatile organic compounds) than usual—just like your nose noticing a stronger smell. If it drops below 100, the air is fresher than usual, similar to when you notice a fresh breeze after opening a window.

Just as your nose can't always tell you exactly what chemicals are present, but can sense if the air feels stuffy or fresh, the VOC Index gives a simple number that reflects the overall air quality trend compared to recent history.

Higher values indicate poorer air quality, with actionable thresholds typically set at:

VOC Index Points	VOC %	Air Quality
1–99	1% – 49%	Less intense than average – in the last 24h
100	50%	Average - in the last 24h
101–500	51% – 100%	More intense than average – in the last 24h

Web App Screenshot: Configuring the Modbus RS485 Settings



Web App Screenshot: Configuring the BACnet MS/TP Settings & BACnet Settings

