GREYSTONE
ENERGY SYSTEMS INC

Wireless MESH 2,4 GHz

Commissioning and maintenance

This user guide is for Greystone Config Tool version 2.0 or newer. Also, the devices must have been updated to the latest available firmware versions.

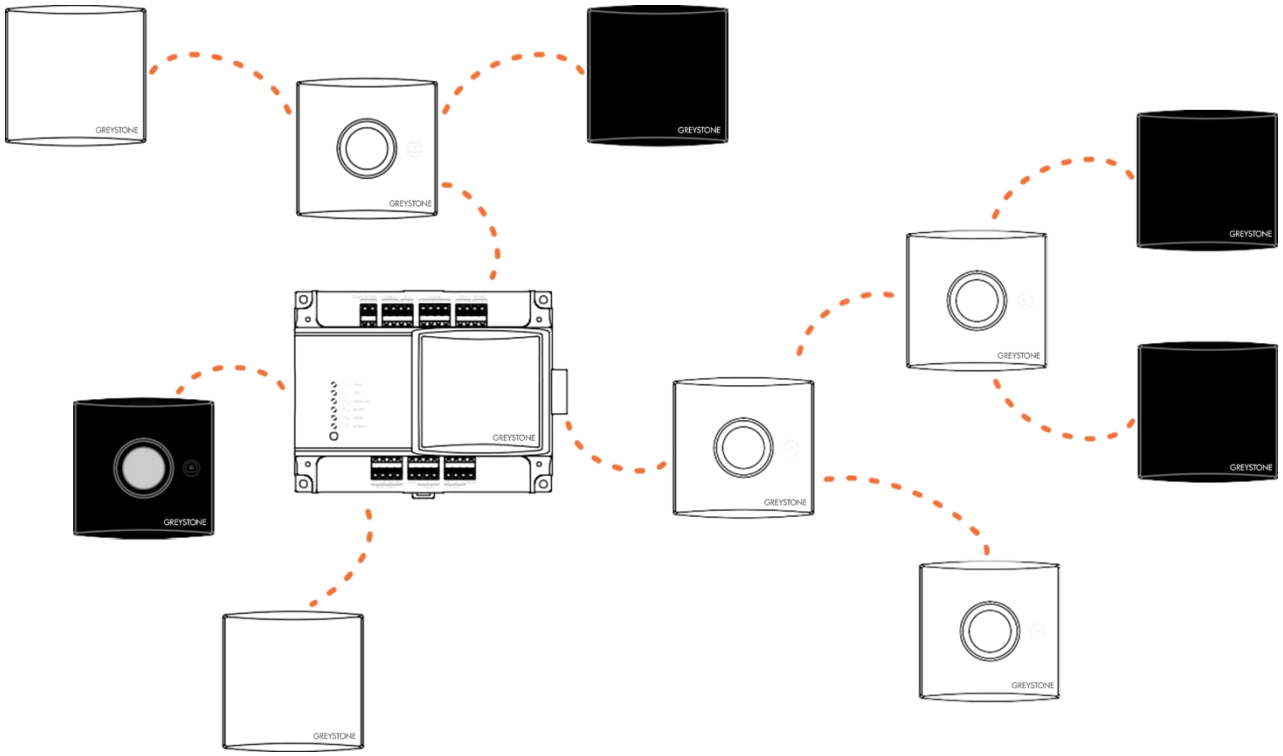
Contents

1 Network properties

The wireless MESH network is based on Lumenradio MIRA platform that provides a wireless mesh network with unprecedented scalability and reliability. The Mira network is a self-healing multi- hop network system that operates on the worldwide license-free 2,4 GHz ISM band. With patented Future-Proof Coexistence Connectivity (FPCC) technologies we enable connectivity that can safely co-exist along other wireless technologies, not being interfered or causing interference.

Important: The network uses 2,4 GHz frequency for communication. The frequency is an ISM frequency band that can be used worldwide without any license fees. If you are not sure about the permissions to use this frequency in your country, contact your local authority for more information.

Base unit supports up to 100 transmitters and separate repeaters are not needed. The transmitters work as repeaters without any special configuration.



Only wireless MESH 2,4 GHz products withing this product family are compatible with the network.

MIRA is used for wireless communication between transmitters and base unit. Configuration tool can't communicate with wireless devices using MIRA. Bluetooth is used for communication between Configuration tool and wireless devices. Bluetooth communication can be active with only one device at a time.

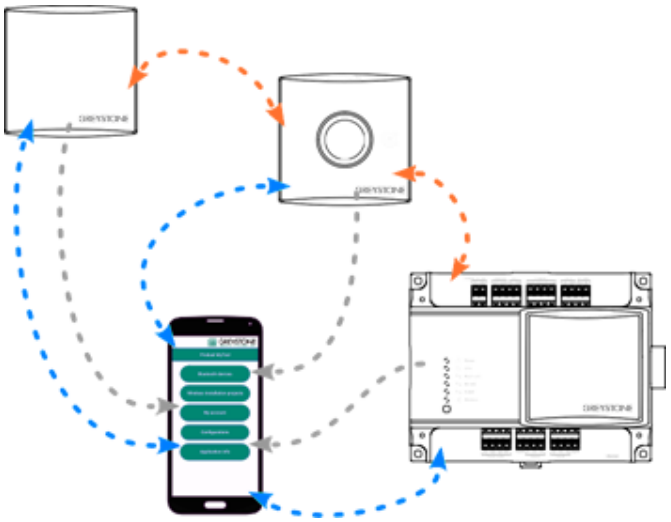
NOTE **Note:** The wireless devices can use only one communication protocol at a time. The device is disconnected from the MIRA network when Bluetooth is activated.

The wireless devices also support Bluetooth beacon messages. Beacon messages are one-way messages from transmitters and base unit to application. These messages are used to send information to applications when monitoring or debugging the network. *Signal scanner* also uses these beacon messages to calculate signal strength between device and application. The beacon messages can be used also when the device is connected to a MIRA network.

Base unit sends the beacon messages continuously. The transmitter beacon messages can be activated manually, and the messages are active for one hour in following situations.

- During the transmitter installation to network, after the MIRA communication is activated.
- Transmitter is restarted.
- Connection to the network is lost.
- The beacon messages are activated by pressing the connection button.

The following figure illustrates the signals between the wireless network devices.



Wireless MESH signal.

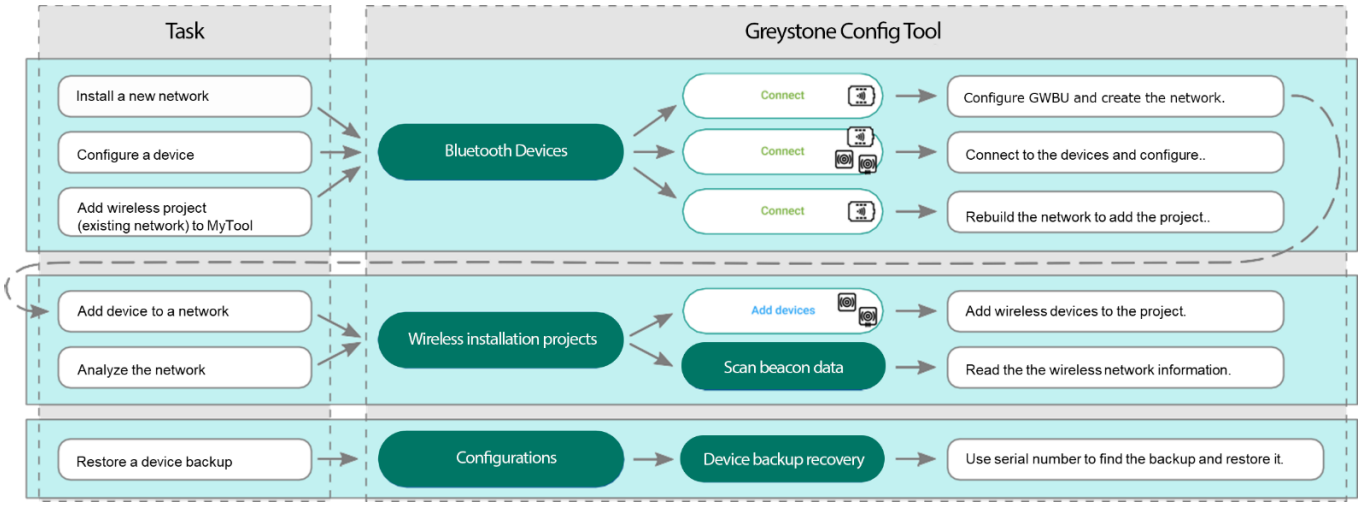
Bluetooth signal.

Beacon data signal.

1.1 Network configuring and commissioning procedure.

It's recommended to follow the following procedure to be able to configure and commission the wireless network successfully.

The following figure illustrates how the main functions are arranged in Configuration tool.

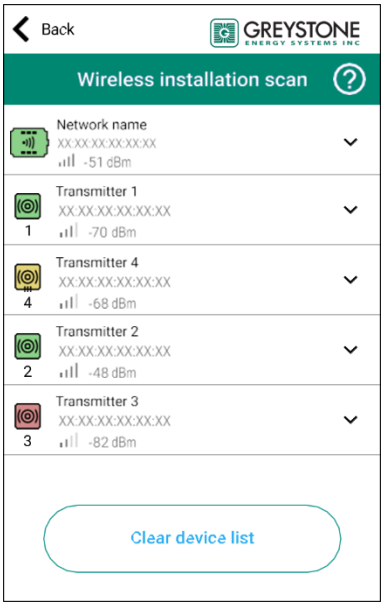


1. Design the network.
   See the section Designing the wireless network on page 24.
2. Place the devices.
   See the section Mounting and wiring the wireless devices on page 28.
3. Configure the base unit settings.
   See the section Configuring the base unit settings on page 32.
4. Set up the network.
   See the section Setting up a new wireless network on page 45.
5. Configure transmitter settings.
   See the section Configuring the wireless transmitters on page 53.
6. Connect the transmitters to the network starting from the closest transmitter.
   See the chapter Adding devices to wireless network on page 46.

1.2 Reading beacon data

The wireless devices also support Bluetooth beacon messages. These beacon messages are one-way messages that can be sent from wireless gateway and wireless transmitters without interrupting MIRA network communication. You can't install transmitters to network using beacon data.

1. Start Configuration tool.
2. Press the *Wireless installation projects* button.
3. Press the *Scan beacon data* button.



Symbol descriptions:

Symbol	Description
	Wireless base unit.
	Wireless transmitter.
	Wireless input module.

Background colours:

Colour	Transmitters and input modules	Base units
	The device is connected to a network.	All transmitters are connected to the network.
	The device is connecting to a network.	Some of the transmitters are connected to the network.
	The device is not connected to a network.	No transmitters are connected to the network.

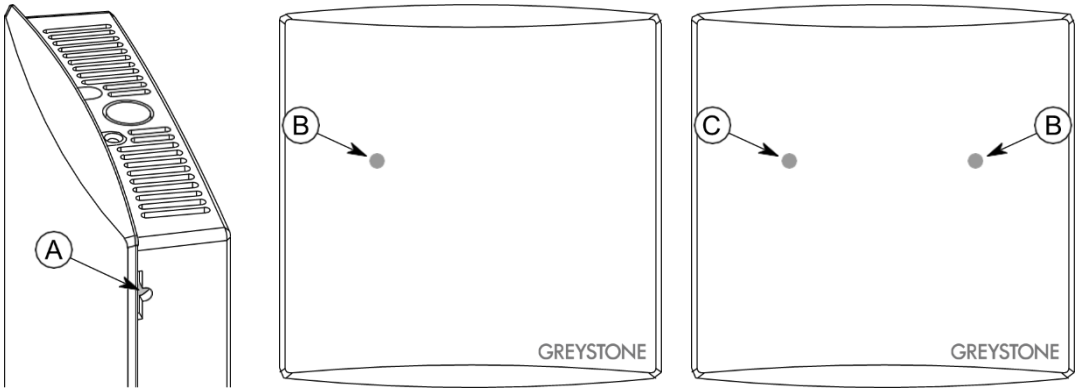
4. Select the device from the list.

   If the wireless device has ??? on the signal strength, the device is out of the coverage area, or the beacon data has turned off (transmitters send the beacon data for one hour). To remove the transmitters that are not in the area, press the *Clear device list* button.

5. If the device is not showing in the list, press the connection button very shortly (under one second).

The indicator light flashes once to indicate the button press.

There are two different indicator light configurations available depending on the device hardware version. The button press is indicated with the green indicator light in both hardware versions.



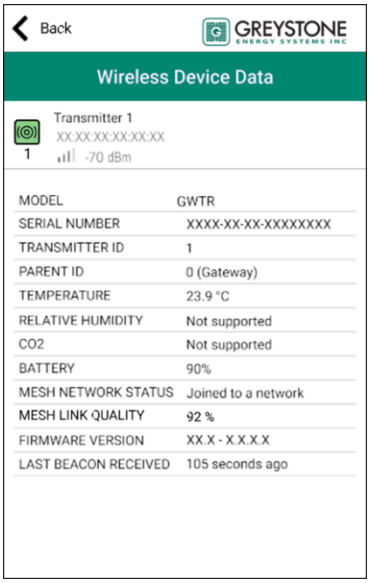
A. Connection button
B. Green indicator light
C. Blue indicator light

NOTE **Note:** Use a small screwdriver or a similar tool to push the button.

NOTE **Note:** If you press the button for over one second, the device Bluetooth activates, and the device is disconnected from the wireless network. Press the button again for over one second to deactivate the Bluetooth.

The transmitter sends the beacon messages for one hour. The beacon messages are also sent for one hour after the transmitter is connected to a network or restarted.

6. Press the *Show device data* button.



See the following table for more details about the *Wireless Device Data* view.

Parameter	Description
MODEL	Product model.
SERIAL NUMBER	Device serial number.
TRANSMITTER ID	Transmitter ID number.
PARENT ID	ID of the device that the transmitter is connected to. ID 0 means that the transmitter is directly connected to base unit. ID 255 means that the transmitter is not connected to a network.

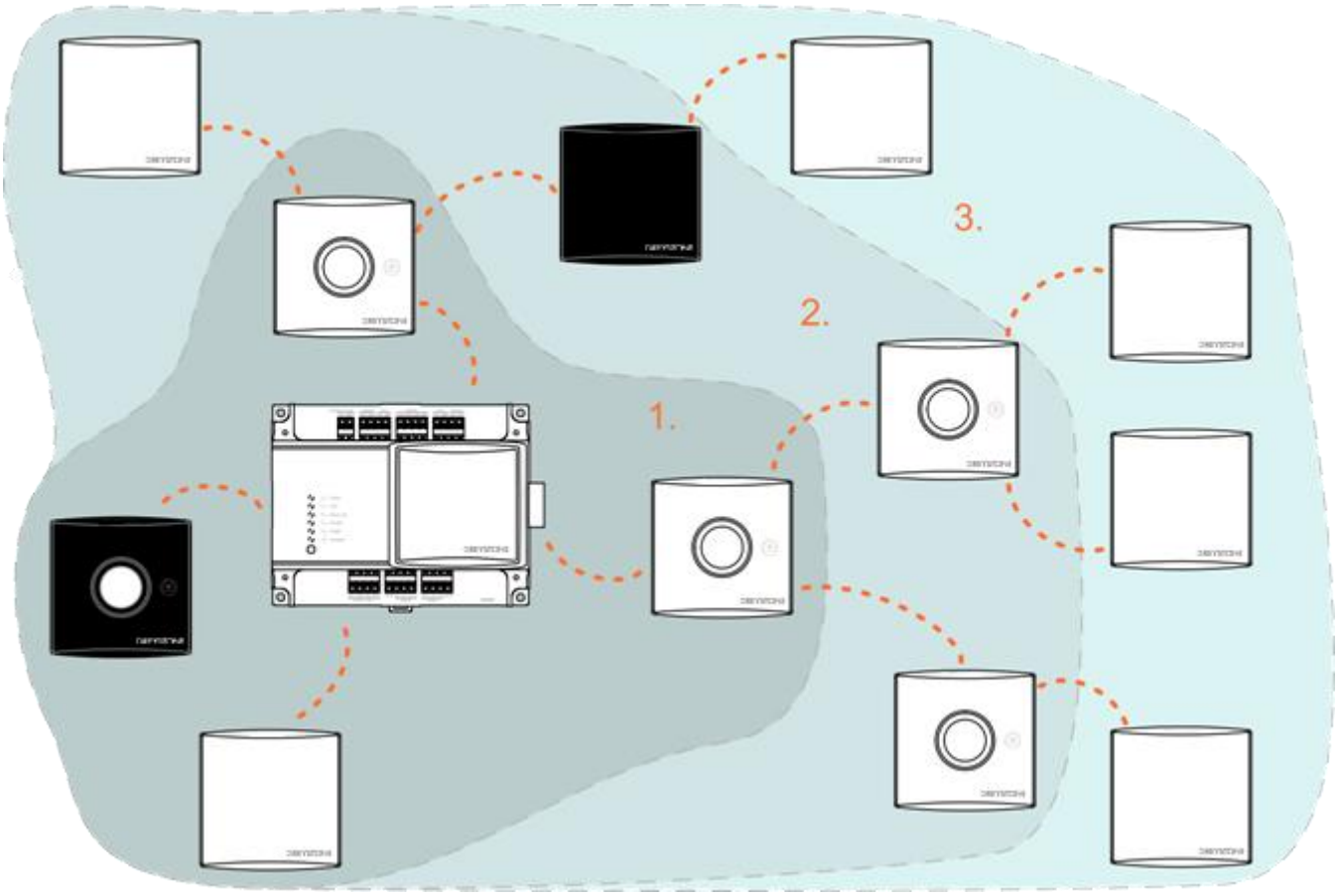
Parameter	Description		
TEMPERATURE	Temperature measurement.		
RELATIVE HUMIDITY	Relative humidity measurement. If the device is not equipped with relative humidity sensor, the text *Not supported* is displayed.		
CO2	CO_2 measurement. If the device is not equipped with CO_2 sensor, the text *Not supported* is displayed.		
BATTERY	Battery level (0...100 %). If the transmitter is powered externally, the text *Externally powered* is displayed.		
MESH NETWORK STATUS	Transmitter's network status.	*Not associated*	The transmitter doesn't see the network.
		Associated	The transmitter has found the network and is connecting to it.
		Joined to a network	The transmitter is connected to the network.
MESH LINK QUALITY	Signal quality. The signal quality value describes the connection quality to the parent device. Values between 35 % and 100 % are acceptable values for functional network.		
FIRMWARE VERSION	Device firmware version.		
LAST BEACON RECEIVED	Time that has elapsed since the Configuration tool has received the last beacon message.		

1.3 Wireless network restarting procedure.

The wireless network restarts in the following situations:

- Bluetooth is activated in the base unit.
- Base unit restarts due to a power failure.
- After the transmitters are updated using the Firmware Over The Air (FOTA) function.

The transmitters connect to the base unit in layers, starting from the closest transmitters. The connecting order is illustrated in the following figure.



The next layer starts connecting after the previous layer is completed. Connecting can take up to 10...30 minutes per layer. If the network has been down for a long time, the re-connecting may take hours because of the transmitters' power saving method.

2 Wireless network functions

2.1 Power consumption

Wireless devices can be powered with a battery or with external power supply (GWTR24).

Battery powered transmitters measure battery level two times a day. The value means that the battery level is at least the given value, not the absolute value.

Important: Battery level value is calculated based on device power consumption. The level counter resets when the battery is changed. Use only unused batteries when changing.

Important: Battery level calculation is based on 3600 mAh batteries. The calculation doesn't work correctly for other battery capacities.

Battery life depends on the installation environment, used measurement data sending intervals and firmware updates. Use 3600 mAh batteries to achieve optimal battery life.

Important: The transmitter consumes more power when joining to a network or searching the network. The battery life shortens significantly if the transmitter is without a working network connection for a long time.

2.2 Base unit inputs and outputs

The base unit has six configurable inputs and outputs for I/O purposes. Wireless transmitter signals can be forwarded directly to outputs and the input values can be read via Modbus. You can set the input and output functions by using the Configuration tool. There are also two 24 Vac supply outputs for external devices.

The available input types are: NTC 10K, Pt1000, potential free contact and 0...10 Vdc. The outputs are 0...10 Vdc and they can be scaled freely inside the range.

2.3 Occupancy detection

PIR models are equipped with occupancy detection. The movement information is sent to base station immediately or after a delay.

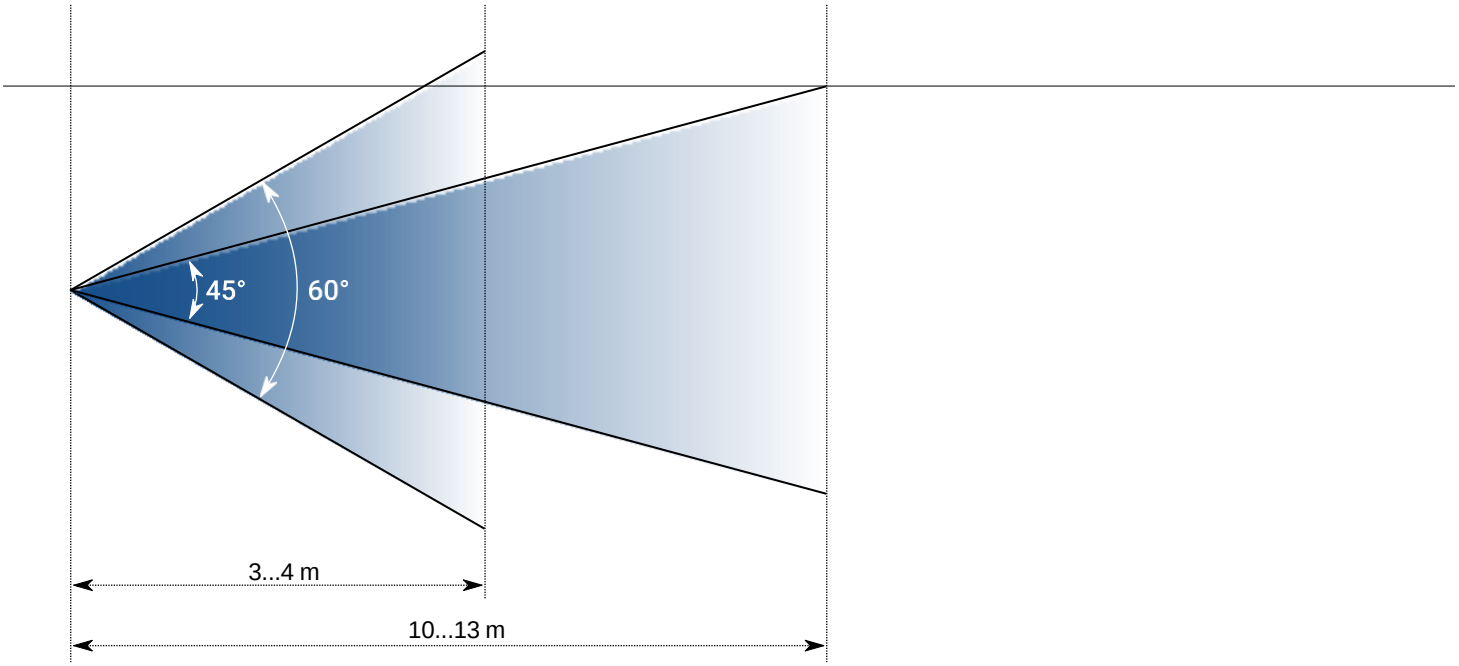
See the following tables for adjusting the delays and reading the occupancy status.

Parameter	Holding register	Default	Range	Description
PIR configuration time unit	6th bit of register *2XX89*	*Minutes*	*Minutes / Seconds*	Occupancy detection time unit selection.
PIR activation delay	*2XX46*	*Instant*	*Instant / 3 minutes / 6 minutes* or *Instant / 3 seconds / 6 seconds*	Occupancy activation delay. If the value is *Instant*, the base unit register value changes to 1 immediately. If the value is not *Instant*, at least two movement detections are required during the set time, before the register value changes.
PIR deactivation delay	*2XX90*	*5 minutes*	*5 / 15 / 30 / 60 / 90 / 120 minutes* or *5 / 15 / 30 / 60 / 90 / 120 seconds*	Occupancy deactivation delay. The register value changes to 0 after this time has elapsed and movement is not detected.

Parameter	Holding register	Default	Range	Description
PIR activated CO2 measurement	4th bit of register *2XX89*	*Disabled*	*Disabled / Enabled*	CO_2 measurement according to the occupancy information. If the parameter value is *Enabled*, the CO_2 measurement is executed only if occupancy is detected. The parameter is available if the device is equipped with CO_2 measurement.

Input register	Range	Description
2XX53 (*2XX54* in CO2 models)	*0 / 1*	Occupancy detection status.

2.3.1 Detection area (PIR models)



2.4 Average groups

The data collected from the transmitters can be arranged into five average groups. One average group can represent one measured property, such as temperature, humidity, carbon dioxide, etc. One transmitter can belong to several groups and one group can include only one measured property. The average groups can be defined using Configuration tool.

The average value is calculated continuously from the latest available values. The highest and lowest measurements are also available for the group.

Measurements that exceed or fall below a particular subset can be dropped out from the calculation. For example, you can set that measurements under 15 ºC and over 30 ºC are dropped from the average calculation. These limits are only available for temperature values.

2.5 Alarms

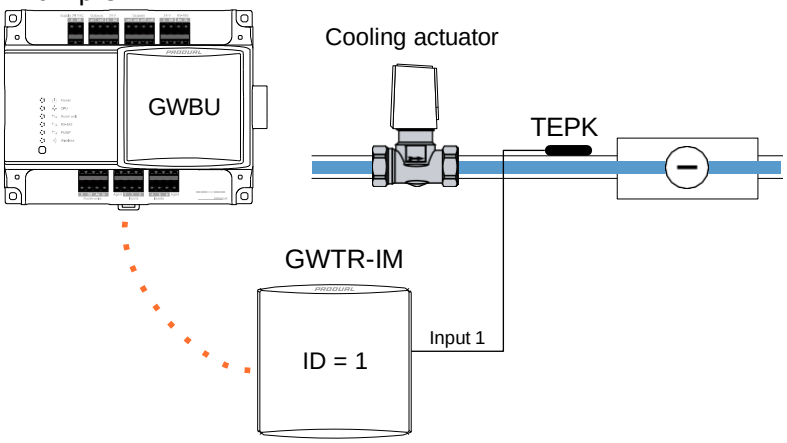
Wireless network alarms can be read from base unit Modbus registers. The alarms always include the device ID that is sending the alarm. The following alarms are available.

- Battery level alarm. The battery level that causes an alarm can be set.
- Missing transmitter alarm.
- Measurement value alarm. The measurement value limits that define the normal values can be set. An alarm is caused when the value drops under the low limit or rises over the high limit.
- Dew point alarm (GWTR-IM).

2.5.1 Dew point alarm

The dew point calculation can be used for example to prevent water to condensate on a cooling water pipe. If the pipe temperature drops below dew point, water will condensate on the pipe surface. The alarm function calculates the dew point using ambient temperature, relative humidity and external temperature (pipe temperature).

Example:



Cooling water pipe temperature is measured with TEPK temperature sensor that is connected to GWTR-IM input 1. The ambient temperature and humidity are measured with internal sensors of GWTR-IM.

Dew point alarm settings	
Dew point alarm low limit	3 °C
Dew point alarm high limit	5 °C

Starting ambient conditions	
Ambient temperature	21 °C
Temperature setpoint	23 °C
Relative humidity	30 %
Pipe temperature	10 °C
Starting dew point	2.8 °C

Room temperature rises to 23 °C due to the heating effect of the sun, for example. The relative humidity doesn't change, so the dew point rises to 4.5 °C. Cooling pipe temperature stays at 10 °C. The alarm is not activated.

Temperature continues to rise, and cooling is increased to keep room ambient temperature at the setpoint (23 °C). The room temperature is now 23 °C and relative humidity is 30 %rH (dew point is 4.5 °C). However, cooling pipe temperature drops to 7 °C when cooling power is increased. This causes alarm to trigger since the alarm value is 7.5 °C (dew point 4.5 °C + alarm low limit 3.0 °C).

The cooling power is now lowered due to the alarm. This rises the cooling pipe temperature to 10 °C, which causes alarm to turn off at 9.5 °C (dew point 4.5 °C + alarm high limit 5.0 °C).

Related Modbus registers:

Input register	Parameter description	Data type	Values	Range
12849	Dew point alarm active, ID 1.... 16. External temperature measurement, input 1.	U16	bits 0...15	ID 1...16

Input register	Parameter description	Data type	Values	Range
12900	Dew point, ID 1. If data is not available, the value is 0.	S16	-1000...1000	-100,0...100,0 °C
20051	Temperature value.	S16	-1000...1000	-100,0...100,0 °C
20052	Humidity value.	U16	0...10000	0...100,00 %rH
20057	Value of external input 1.	S16	-1000...1000	-100,0...100,0 °C

Holding register	Parameter description	Data type	Values	Range	Default
12060	Dew point alarm, low limit.	U16	0...1000	0.0.. 100.0 °C	0
12061	Dew point alarm, high limit.	U16	0...1000	0.0.. 100.0 °C	0

2.6 Modbus register grouping

With Modbus register grouping the transmitter information can be grouped to a smaller Modbus register range. This enables for example reading of all transmitters' temperature values using one Modbus function. You can set up to ten register groups (0...9) that can be read from the same input register range.

The grouped register range is from 18X00 to 18X99 according to the transmitter ID. The X is the set number (0...9). The grouped registers are defined in the holding registers 18000...18009.

For example, if a temperature value from the transmitter with ID 27 must be read, the value can be read from the input register 18026. The register group 0 is for temperature by default. The original register for the transmitter temperature is 22651.

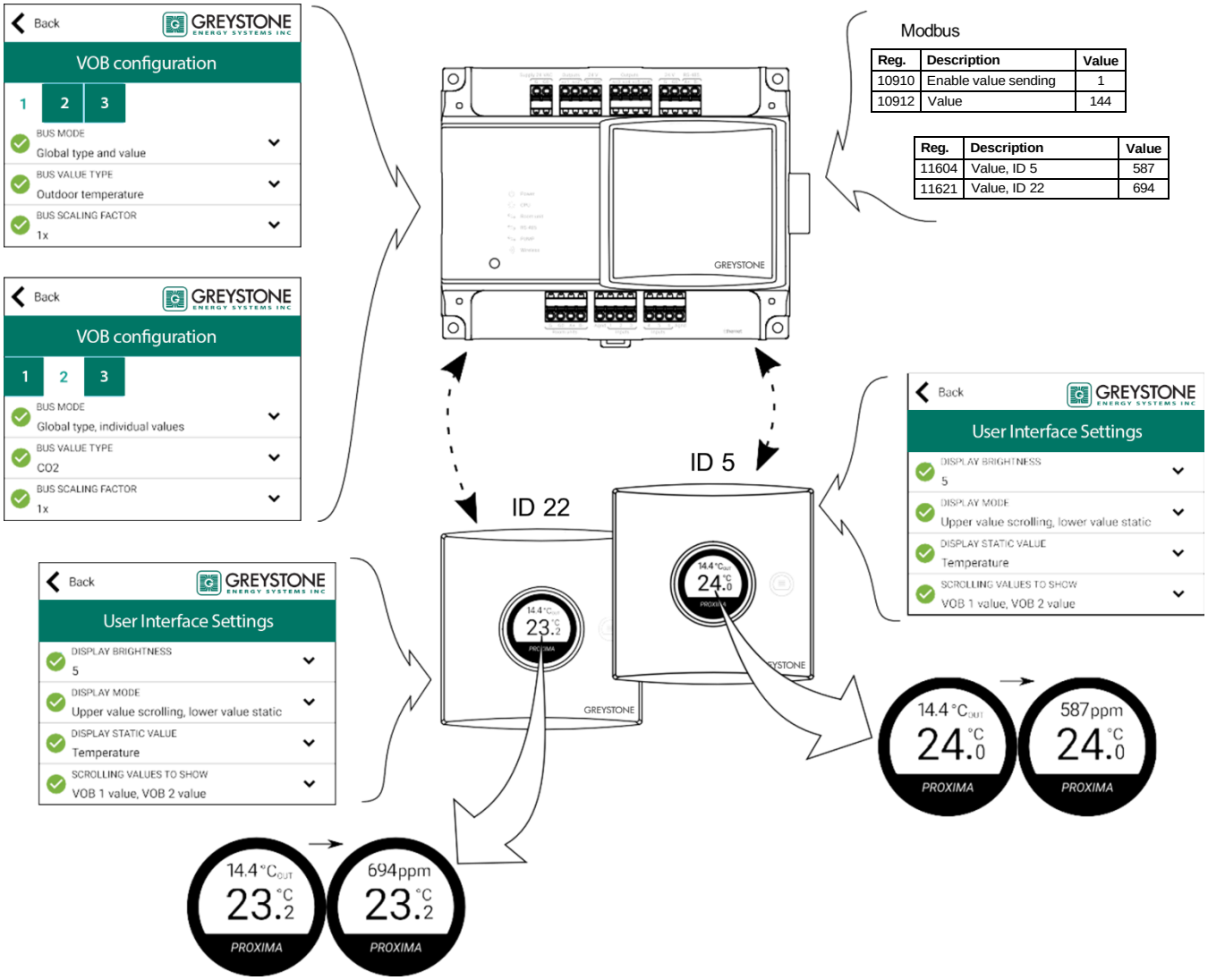
2.7 Value over bus (VOB)

Network data can be transmitted in two directions, which also allows external values to be viewed on the transmitters' displays. The base unit has writeable Modbus registers, where the data can be written and then sent to the transmitters. The function is useful for example if BMS information must be viewed on a transmitter display.

Two transmitter specific values can be shown on the displays. Also, one global value (e.g. outdoor temperature) can be shown on all displays in the network. The used value type is set to base unit settings by using Configuration tool.

NOTE **Note:** The transmitter specific value type must be the same for all transmitters.

See the following figure for an example configuration.



VOB data is updated to transmitters in specific messages and the interval of these messages is fixed to the network size. The update frequency can be calculated by using the following formula: network size x 20 s. For example, if there are 10 transmitters and a base unit in the network, the update interval is approximately 220 s (11 x 20 s = 220 s). The minimum update interval is 60 s.

2.7.1 VOB value types

MyTool value	Holding register 10906 value	VOB holding register value	Value description	Range
No value	Any	0	VOB is not in use.	-
Temperature	Any	1	Temperature.	-100,0...100,0 °C
Humidity	Any	2	Humidity.	0...100,00 %rH
CO2	Any	3	CO_2 value.	0...10000 ppm
Voltage	Any	4	Voltage.	0...10,00 V
Current	Any	5	Current.	0...20,00 mA
Resistance (low)	Any	6	Resistance, low.	0...2000,0 Ω
Resistance (high)	Any	7	Resistance, high.	0...300000 Ω
Hot water consumption	1	8	Hot water consumption (Finnish).	LV 0...30000 m^3
Hot water consumption	2	8	Hot water consumption (English).	HW 0...30000 m^3

MyTool value	Holding register 10906 value	VOB holding register value	Value description	Range
Cold water consumption	1	9	Cold water consumption (Finnish).	KV 0...30000 m^3
Cold water consumption	2	9	Cold water consumption (English).	CW 0...30000 m^3
Time	Any	10	Time.	0...99 h
Indoor temperature	Any	11	Indoor temperature.	-100,0...100,0 $°C_{IN}$
Outdoor temperature	Any	12	Outdoor temperature.	-100,0...100,0 $°C_{OUT}$
Binary	Any	13	Binary value.	0 / 1
Hot water consumption	1	14	Hot water consumption (Finnish).	LV 0.0….6553.5 m^3
Hot water consumption	2	14	Hot water consumption (English).	HW 0.0..6553.5 m^3
Hot water consumption per day	1	15	Hot water consumption per day (Finnish).	LV 0.0….6553.5 m^3/day
Hot water consumption per day	2	15	Hot water consumption per day (English).	HW 0.0..6553.5 m^3/ day
Hot water consumption per week	1	16	Hot water consumption per week (Finnish).	LV 0.0….6553.5 m^3/ week
Hot water consumption per week	2	16	Hot water consumption per week (English).	HW 0.0..6553.5 m^3/ week
Hot water consumption per month	1	17	Hot water consumption per month (Finnish).	LV 0.0….6553.5 m^3/ month
Hot water consumption per month	2	17	Hot water consumption per month (English).	HW 0.0..6553.5 m^3/ month
Cold water consumption	1	18	Cold water consumption (Finnish).	KV 0.0….6553.5 m^3
Cold water consumption	2	18	Cold water consumption (English).	CW 0.0..6553.5 m^3
Cold water consumption per day	1	19	Cold water consumption per day (Finnish).	KV 0.0….6553.5 m^3/day
Cold water consumption per day	2	19	Cold water consumption per day (English).	CW 0.0..6553.5 m^3/ day
Cold water consumption per week	1	20	Cold water consumption per week (Finnish).	KV 0.0….6553.5 m^3/ week
Cold water consumption per week	2	20	Cold water consumption per week (English).	CW 0.0..6553.5 m^3/ week
Cold water consumption per month	1	21	Cold water consumption per month (Finnish).	KV 0.0….6553.5 m^3/ month
Cold water consumption per month	2	21	Cold water consumption per month (English).	CW 0.0..6553.5 m^3/ month
Energy consumption	Any	30	Energy consumption.	0.0..6553.5 kWh
Energy consumption per hour	Any	31	Energy consumption per hour.	0.0..6553.5 kWh/hour
Energy consumption per day	Any	32	Energy consumption per day.	0.0….6553.5 kWh/day
Energy consumption per week	Any	33	Energy consumption per week.	0.0..6553.5 kWh/week
Energy consumption per month	Any	34	Energy consumption per month.	0.0..6553.5 kWh/ month

MyTool value	Holding register 10906 value	VOB holding register value	Value description	Range
Pressure (Pa)	Any	35	Pressure.	0.0….6553.5 Pa
Pressure (kPa)	Any	36	Pressure.	0.0….6553.5 kPa
Speed (m/s)	Any	37	Speed.	0.0. ..6553.5 m/s
Speed (km/h)	Any	38	Speed.	0.0. ..6553.5 km/h

2.8 Temperature measurement stability.

Temperature measurement stability function indicates how stable the measurement is. The stability is calculated from the measurement value and high and low limits. If the measured temperature drops under low limit or rises over high limit, stability value will start to decrease from 100 % towards 0 %.

If the temperature is outside the limits for the set time, the stability value reaches 0 %. If the measurement value rises/lowers back between limits, stability value will rise from 0 % towards 100 %.

The stability calculation is based on 24 measurements that are distributed to the chosen time frame (1...65535 h). For example, if the time is set to 24 h, the stability measuring interval is one hour.

2.9 Measurement data sending interval.

Measurement data can be read from the transmitters based on the base unit polling, with fixed interval and with a Change of Value (COV) function.

Transmitters send the measurement information to the base unit according to the base unit polling interval. The base unit requests the measurement information according to this interval even if other data sending methods are also selected. The base unit polling interval can be set to 60...65535 s (60 s...18 h). The default interval is 15 minutes (900 s).

NOTE **Note:** If COV is in use, base unit polling interval is recommended to be one hour or more for longer battery life.

There are two different fixed intervals that are used to set the transmitter's measurement interval, a common interval for all transmitters and a transmitter specific interval. The transmitter reads the measurements according to the interval and the values are sent to base unit according to the COV settings. The measurement is continuous in transmitters with external power supply.

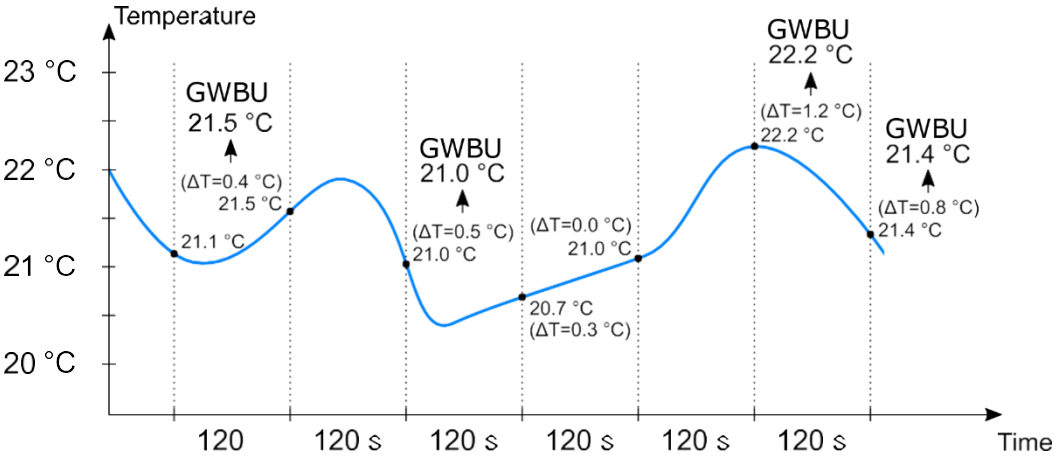
The common measurement update interval can be set to 30...65535 s and the default value is 120 s. The transmitter specific update interval overrides the common transmitter interval. The transmitter specific interval can be set to 5...65535 s and the function is deactivated as default.

NOTE **Note:** Short interval (< 60 s) may significantly shorten the battery life.

When COV mode is used, the transmitter sends the measurement data also when the data changes. If the value has changed more than the given hysteresis, this data is sent to the base station. The measured value is compared to the last value sent to the base station. When using COV mode, the base unit polling interval can be set to a higher value.

NOTE **Note:** COV mode may significantly shorten the battery life if the hysteresis is set to very low value.

In the following example, the measurement update interval is 120 s and the COV hysteresis is 0.4 °C.



The measurement data sent to base unit can also be forced at a specified interval. When this function is used, the measurement data is sent to the base unit even if the measurements are not changed. The forced update interval can be set to 30...65535 s and the function is deactivated as default.

NOTE **Note:** Short interval (< 60 s) may significantly shorten the battery life.

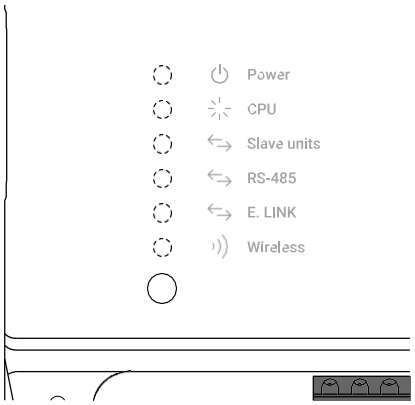
Note the following parameters:

Parameter	Holding register	Default	Range	Description
Gateway poll interval	*10902*	*900 s*	*60...65535 s*	Poll frequency for transmitters. Base unit polls transmitters with this interval.
Transmitter activity interval	*10903*	*120 s*	*30...65535 s*	Global setting for transmitters' measurement frequency.
Forced transmission interval	*2XX47*	*Off*	*Off / 30...65535 s*	Transmitter specific forced data update interval.

2.10 Indicator lights

2.10.1 GWBU indicator lights

The indicator lights indicate the device status.



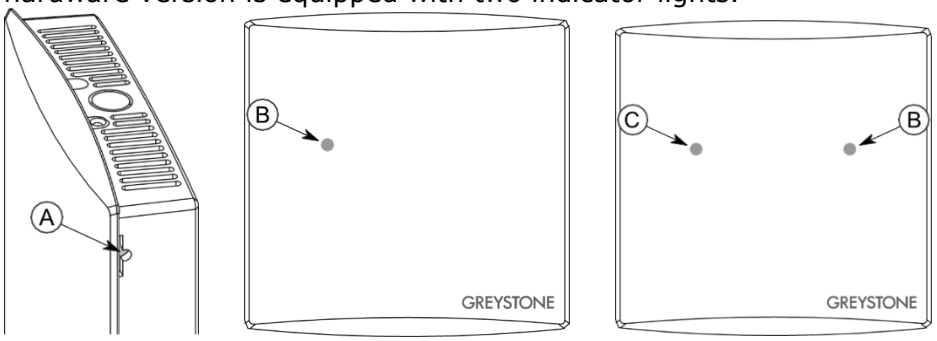
CPU	Indicates the push of the connection button.
Power	The light is on when the supply voltage is connected.
Slave units	The light is not in use.
RS-485	The light indicates the communication in the RS-485 port.

E.LINK	The light indicates that expansion modules are connected to the base unit.

Wireless		Configuration tool is connected to the device.
	2x 5 s 2x 5 s	All transmitters are online and working.
	3x 5 s 3x 5 s	At least one transmitter is offline.
	4x 5 s 4x 5 s	The network is not configured.

2.10.2 GWTR indicator lights

There are two different indicator light configurations available depending on the transmitter hardware version. The transmitter can have one (green) or two (blue and green) indicator lights. The newer hardware version is equipped with two indicator lights.



A. Connection button
B. Green indicator light
C. Blue indicator light

The indicator lights are used to indicate the device status. The status is indicated for one hour in the following situations.

- Power supply is connected.
- Transmitter has lost connection to network.
- Device has booted.
- The beacon messages are activated by pressing the connection button.

See the following table for the status indicator light functions. The status light is green in the device with one indicator light, and blue in the device with two indicator lights.

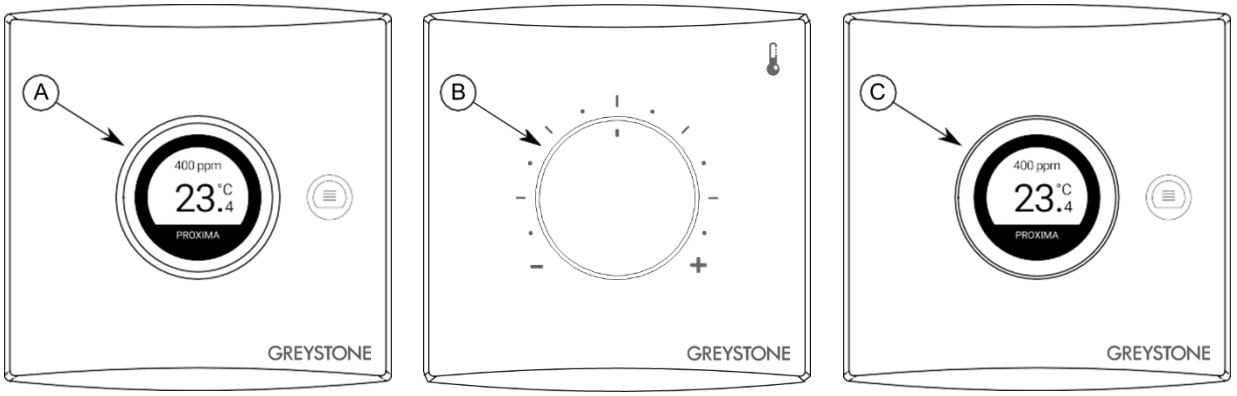
	Configuration tool is connected to the device.
2x 5 s 2x 5 s	The device is connected to the network.
3x 5 s 3x 5 s	The device is searching the network.
4x 5 s 4x 5 s	The network is not configured.

The indicator lights also indicate if the connection button is pressed. The button press is indicated with the green indicator light in both device hardware versions.

The indicator light functions can be disabled via base unit settings. The indicator lights work when the transmitter is turned on for the first time, even if disabled.

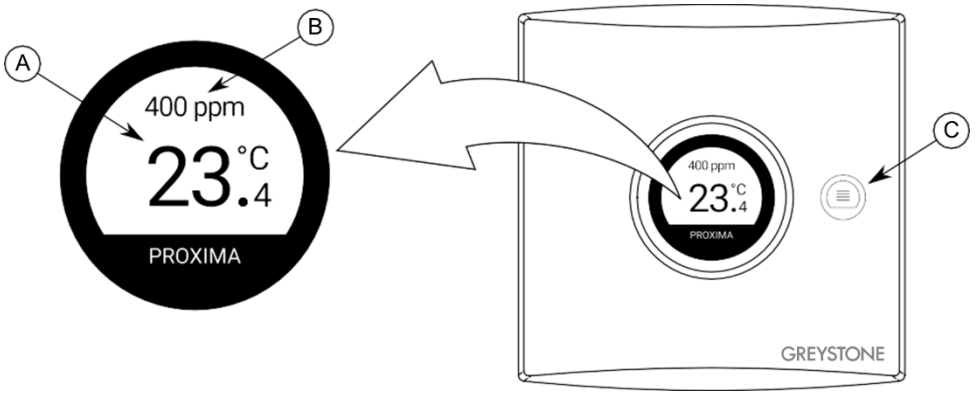
2.11 User interface

Wireless transmitters are available with several different user interface elements. The devices can be equipped with a display (-D), setpoint knob (-PK) or advanced setpoint knob (-AK).



A. Display
B. Setpoint knob
C. Advanced setpoint knob

2.11.1 Display



A. Main information view
B. Secondary information view
C. Menu button

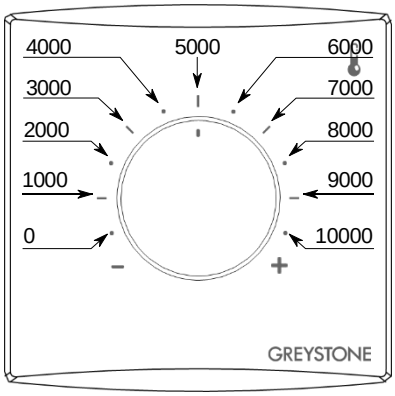
The display has two areas for displaying information, main and secondary views. Either main or secondary view shows one value and the other view can show the rest of the needed values in scrolling mode view. The visible values can be chosen freely. With the menu button you can activate the display and change the displayed value on the view that is in scrolling mode. The display can also be selected to be always active.

2.11.2 Setpoint knob

Setpoint knob can be used to set the temperature setpoint, for example. The setpoint information is not sent to base unit immediately. The information is sent according to the base unit polling interval or according to COV settings.

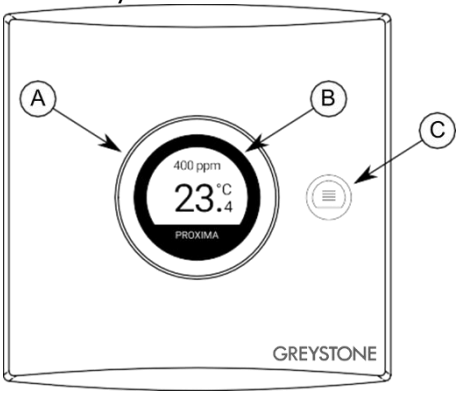
2.11.2.1 Setpoint knob output values

The setpoint output value can be read from the base unit Modbus registers (register 2XX53). The following figure illustrates how the cover markings correspond to the Modbus register value. The value tolerance is ±200.



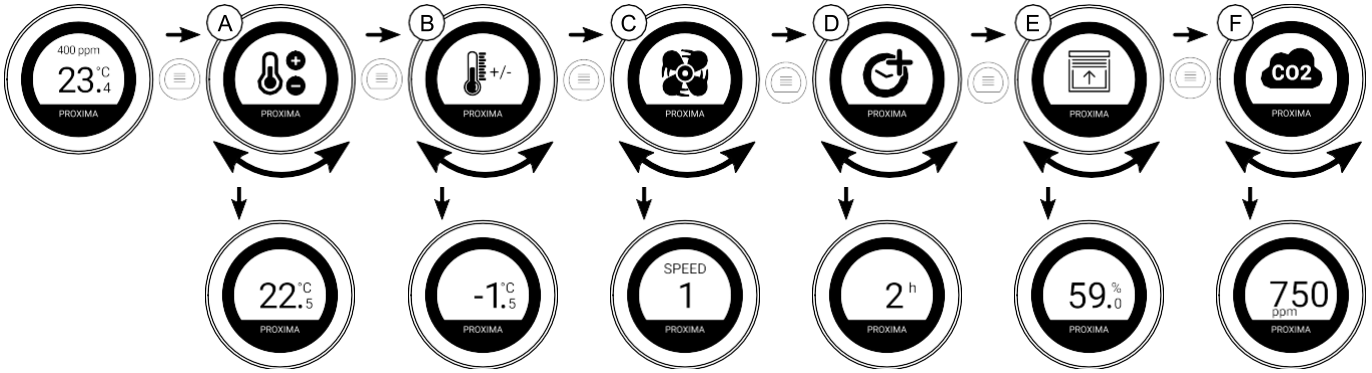
2.11.3 Advanced setpoint knob

Advanced setpoint knob can be used to control various processes wirelessly. The advanced knob option includes a push button and a display that shows the measurement values and setpoints. The transmitter communicates with the base unit via the wireless network. The user settings can be read to the automation system that controls the environment. The base unit or the transmitter doesn't have any control functionalities.



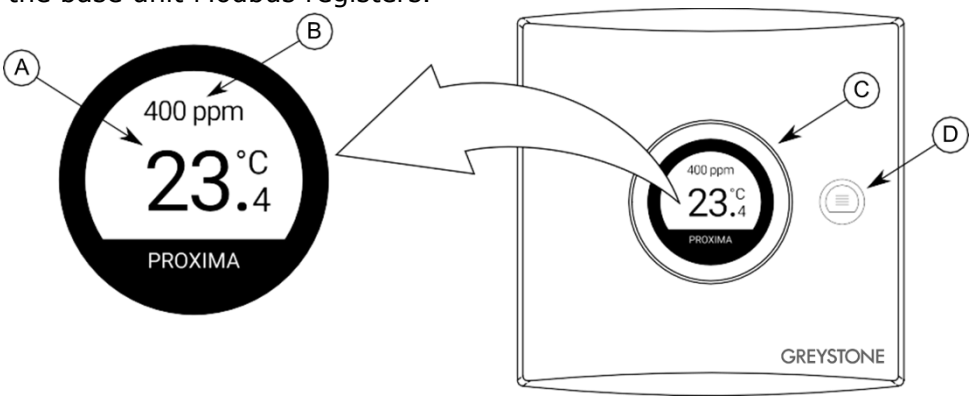
A. Advanced setpoint knob
B. Display
C. Menu button

The advanced setpoint knob can be used to change several setpoints. The menu button is used to select the setpoint value to be changed. The value is sent to the base unit immediately after changing.



A. Temperature setpoint
B. Temperature setpoint deviation
C. Fan speed setpoint
D. Timer function
E. Percentage setpoint (seven display symbols available)
F. CO_2 setpoint

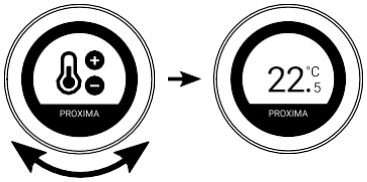
The visible setpoints can be selected with Configuration tool and the setpoint values can be read from the base unit Modbus registers.



A. Main information view
B. Secondary information view
C. Advanced setpoint knob
D. Menu button

Display has two areas for displaying information, main and secondary views. Either main or secondary view shows one value, and the other view can show the rest of the wanted values in scrolling mode view. The visible values can be chosen freely. With the advanced setpoint knob you can activate the display and change the displayed value on the view that is in scrolling mode. The display can also be selected to be always active.

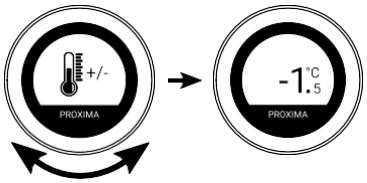
2.11.3.1 Temperature setpoint



Temperature setpoint can be -99.9…. 99.9 °C. The setpoint step can be 1 °C, 0.5 °C or 0.1 °C and the value can be with 1 or 0 decimals. The maximum and minimum values can also be set.

The setpoint settings can be adjusted by using Configuration tool. The current setpoint is written to the Modbus holding register 2XX91 (XX = transmitter ID - 1. For example, a transmitter with the ID 6: XX = 05.

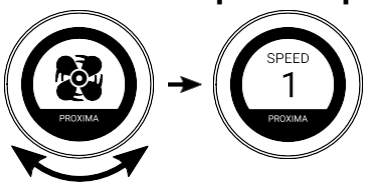
2.11.3.2 Temperature deviation setpoint



Temperature setpoint deviation can be -99.9 ….99.9 °C. The setpoint step can be 1 °C, 0.5 °C or 0.1 °C and the value can be 1 or 0 decimals. The maximum and minimum values can also be set.

The setpoint settings can be adjusted by using Configuration tool. The current setpoint is written to the Modbus holding register 2XX92 (XX = transmitter ID - 1. For example, a transmitter with the ID 6: XX = 05.

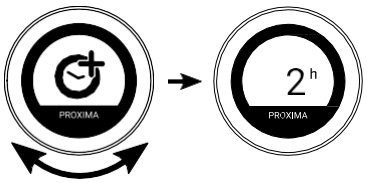
2.11.3.3 Fan speed setpoint



Fan speed setpoint can be *SPEED 1*, *SPEED 2*, *SPEED 3*, *SPEED 4*, *SPEED 5*, *SPEED 6*, *OFF*, *ON*, *ECO*, *DAY*, *NIGHT* or *AUTO*. The available setpoints can be selected with Configuration tool.

The current setpoint is written to the Modbus holding register 2XX93 (XX = transmitter ID - 1. For example, a transmitter with the ID 6: XX = 05. See the Modbus register values and the corresponding speeds from the chapter Holding registers for advanced setpoint knob settings on page 96.

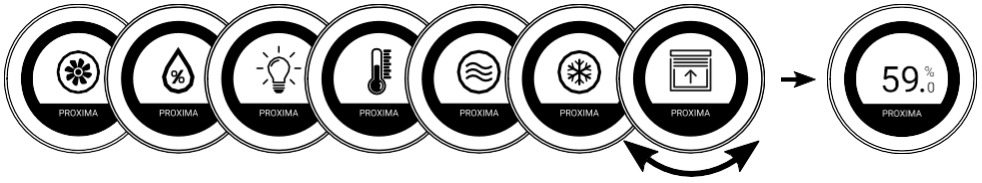
2.11.3.4 Timer function



Timer function value can be 0….99 and the unit can be hours on minutes. The maximum timer value can also be set. The remaining timer value is sent to base unit in every measurement message.

The timer function settings can be adjusted by using Configuration tool. The current timer value is written to the Modbus input register 2XX22 (XX = transmitter ID - 1. For example, a transmitter with the ID 6: XX = 05.

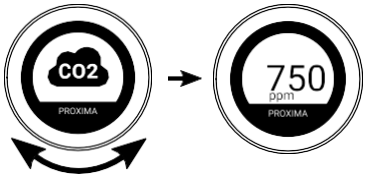
2.11.3.5 Percentage setpoint



Percentage setpoint can be 0….100 %. The setpoint step can be 1 %, 5 %, 10 %, 20 % or 25 %. The maximum and minimum values can also be set. There are seven symbols available for the setpoint.

The setpoint settings can be adjusted by using Configuration tool. The current setpoint is written to the Modbus holding register 2XX95 (XX = transmitter ID - 1. For example, a transmitter with the ID 6: XX = 05.

2.11.3.6 CO_2 setpoint



CO_2 setpoint can be 0...10000 ppm. The setpoint step can be 5 ppm, 25 ppm or 50 ppm. The maximum and minimum values can also be set.

The setpoint settings can be adjusted by using Configuration tool. The current setpoint is written to the Modbus holding register 2XX96 (XX = transmitter ID - 1. For example, a transmitter with the ID 6: XX = 05.

2.12 Firmware updates

Base unit firmware can be updated only locally using Configuration tool.

Transmitter firmware updates can be done locally or by using Firmware Over The Air (FOTA) function.

The FOTA function updates the devices over the wireless network. The FOTA firmware update process can take up from few minutes to several hours depending on the network size. The base unit updates two devices at a time and then moves to the next devices until the whole network is updated to the latest firmware version. The update process starts from the closest transmitter in the network.

NOTE **Note:** The FOTA function requires more power than the regular transmitter functioning. Therefore the FOTA updates should be planned carefully in battery powered network. The transmitter is not updated if the battery level is too low (under 10 %).

NOTE **Note:** The FOTA process doesn't interfere with the wireless network functioning. However, the whole network is restarted after all devices have been updated.

2.13 Device configuration backups

Configuration tool saves the device configuration backup to Configuration tool cloud every time the configuration is written to the device. These backups can be used when replacing a broken unit or when copying the configuration to other unit(s).

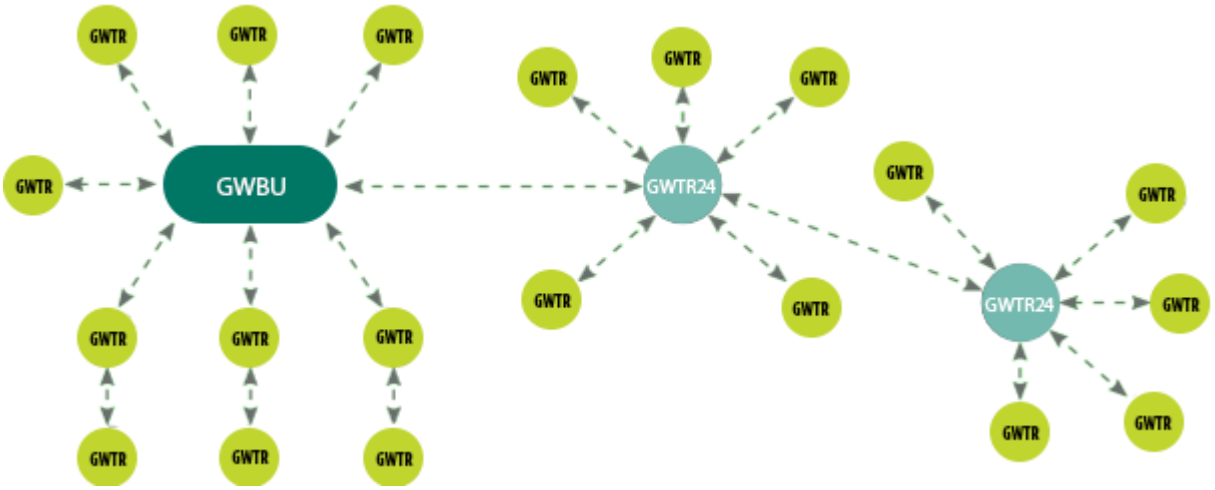
The original device's serial number is needed when restoring or copying the configuration. The serial number is printed to the type plate and it can be read from the QR code also.

The backup can be downloaded from Configuration tool cloud to a local device, or it can be saved to cloud with a new name.

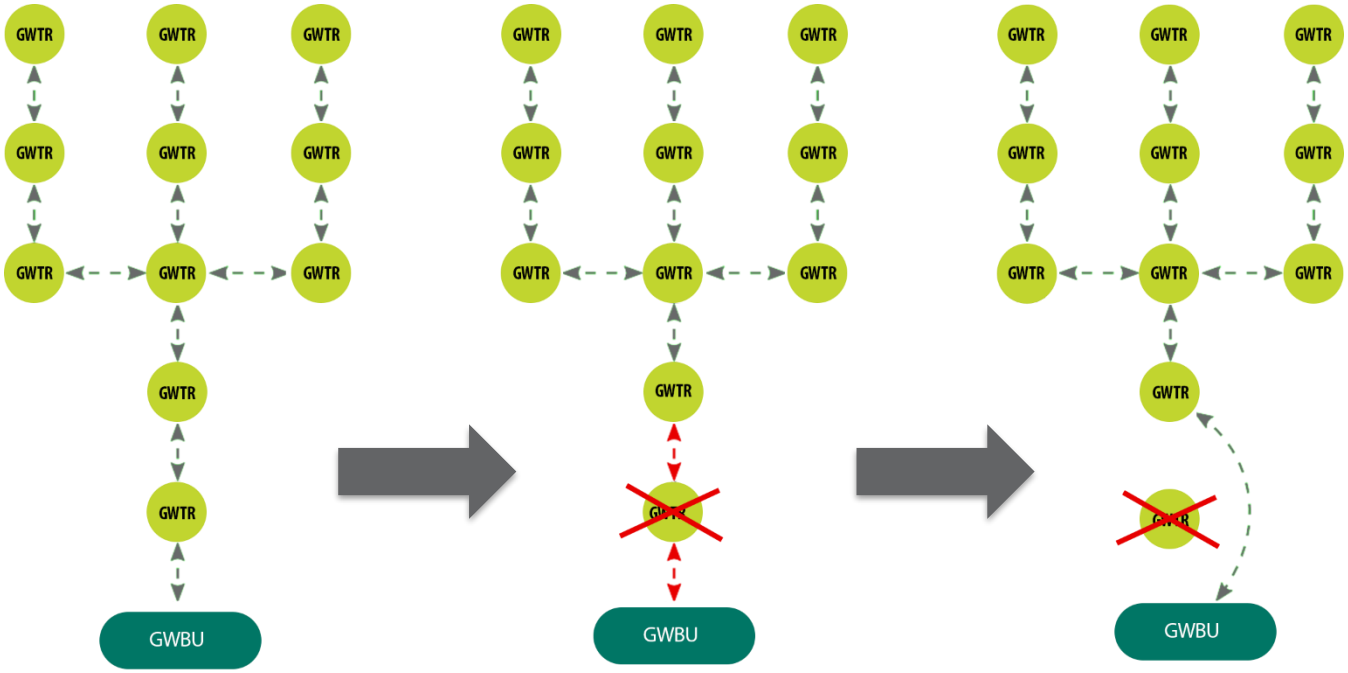
3 Designing the wireless network

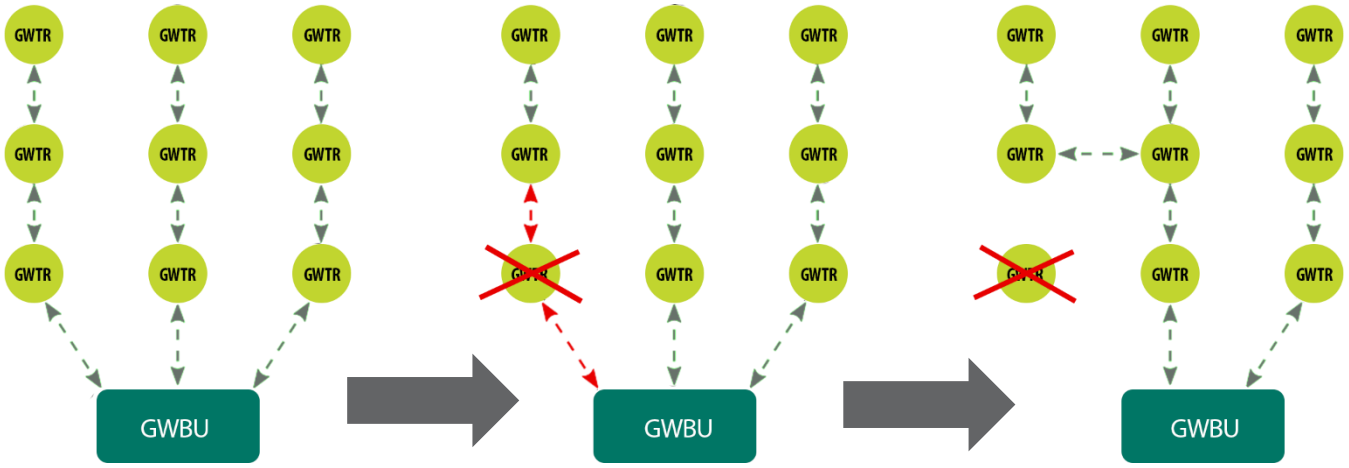
In the mesh network, the base unit should be located in the center of the network to achieve the optimal network functionality. However, the central base unit positioning is not always possible. In these situations, you should consider carefully the devices used in the network.

The wireless MESH can be fully battery operated. If your network has transmitters with external power supply, the network will prefer these when routing the messages. When designing a larger network these external power supply devices can be used as the backbone of the network. If there is power loss in external power supply, battery operated devices will route traffic normally.



It is recommended to install more than one routing transmitter within the base unit signal range. This improves the network functionality and reliability. The following figures illustrate the network re-routing functionality when a routing transmitter is disconnected from network.





3.1 Signal range

Because the radio signals are electromagnetic waves, the signal becomes weaker the further it travels. The radio signal coverage is also decreased by specific materials that are in the propagation direction. The radio waves can penetrate walls, but the signal is dampened more than in the direct line of sight path. See the following table for the different construction material effect on the radio signal strength.

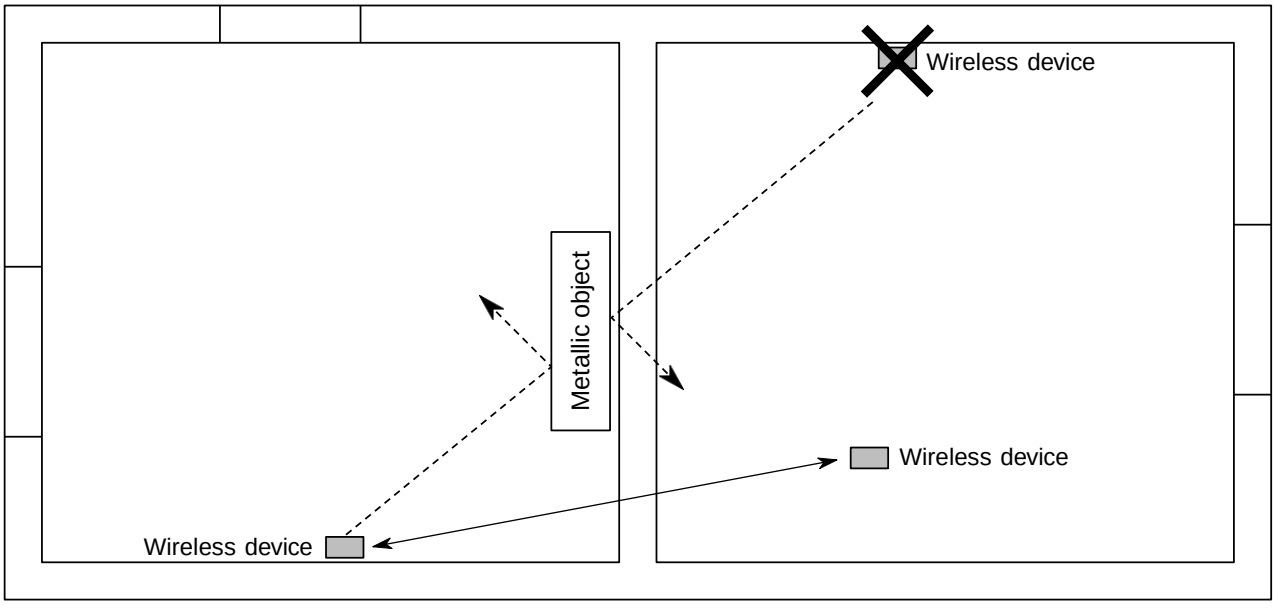
Material	Range reduction compared to direct line of sight
Wood, plaster, uncoated glass	0...10 %
Brick, press board	5...35 %
Concrete, reinforced concrete	10...90 %
Metal, aluminum lining	90...100 %

3.2 Effect of metal structures

Metallic parts, e.g. wall reinforcements, thermal insulation metal foils and metallized heat-absorbing glasses reflect radio waves. This creates a so-called radio shadow behind the structure.

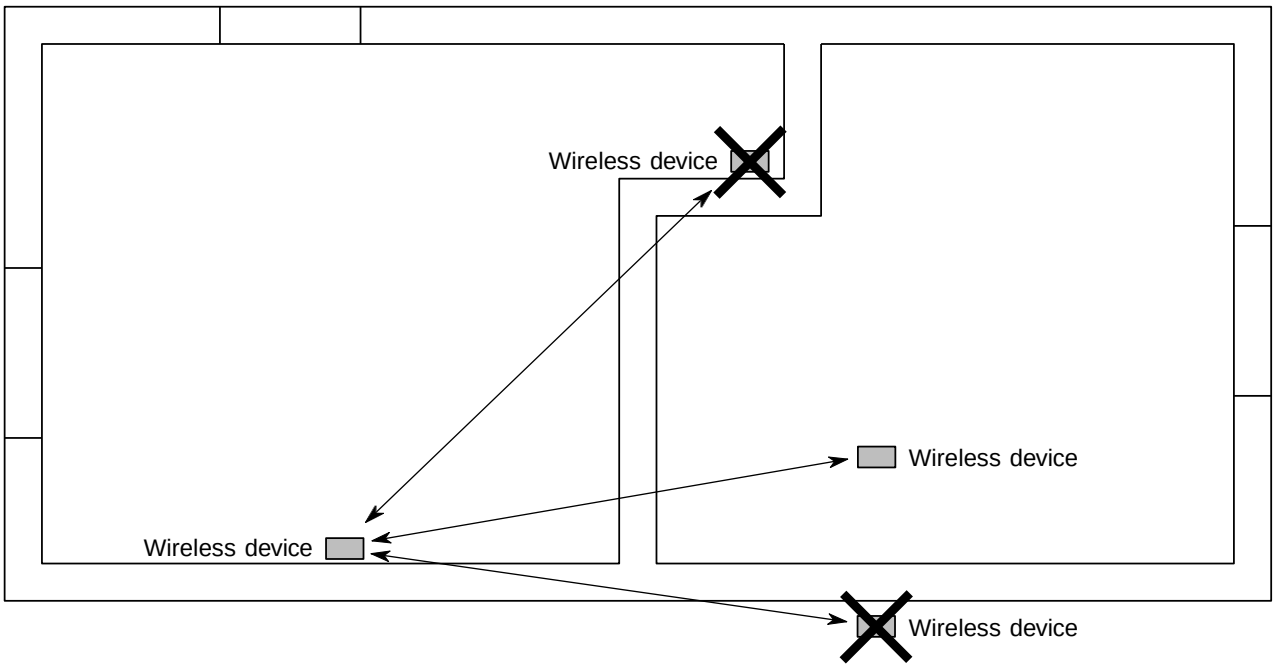
The radio transmission may work even if there are metallic obstacles on the direct path to the receiver. The radio waves reach the destination by reflecting from metallic objects and passing through non-metallic objects (doors, windows, wooden walls). However, the radio signal range is strongly reduced.

The radio transmission problems can be avoided by placing the devices on a direct propagation path.



3.3 Wall penetration angle

Wireless devices should be placed so that the radio signal goes through a wall as directly as possible. The attenuation is higher the longer the signal travels inside the wall. Avoid installing the devices in wall recesses.



3.4 Planning the wireless device positions

The device locations should be planned carefully by observing possible radio shadow places and other restrictive factors. The radio coverage in commercial buildings is usually restricted by fire safety walls that cause radio shadows. However, inside the fire protected sections, lightweight or glass partition walls are commonly used.

1. Take the building floor plan.
2. Locate and mark all relevant radio shadows to the plan.
   - Fire protection walls
   - Lavatories
   - Staircases
   - Elevator shafts
   - Big metallic furniture (e.g. cabinets)

3. Plan the device locations.
   Make sure that a fixed power supply is available where needed. See the following table for power supply options.

Device	Power supply	
	Battery	24 Vac/dc
GWBU		x
GWTR	x	
GWTR24		x
GWTR-IM	x	x

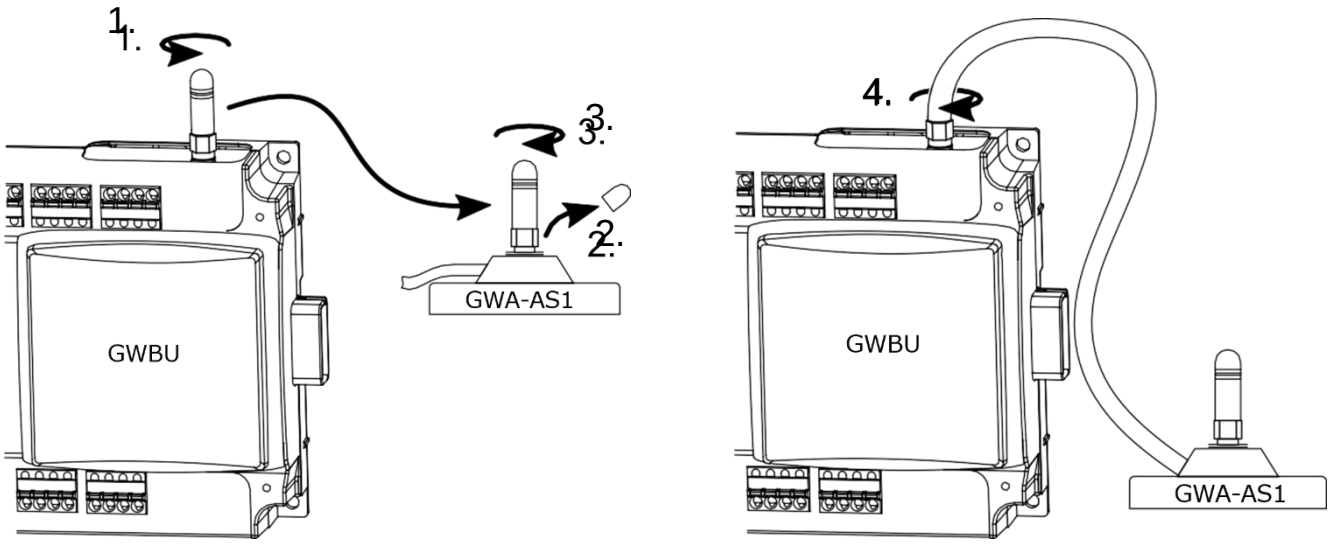
NOTE **Note:** For reliable range planning, you must assume some unfavorable conditions. Planning with a few meters smaller range offers reserve against the most typical bad conditions. Bad conditions often result from later environmental changes (people, partition wall relocations, furniture, plants, etc.). Also, the real device positions might deviate from the plan.

4. Verify the device locations before final installation by checking the signal propagation paths.
5. Check the signal strength in the planned locations during commissioning and adjust as needed. You can check the signal strengths by using the *Pre-installation scan* function in the Configuration tool.

4 Mounting and wiring the wireless devices

4.1 Placing and mounting the base unit

The ideal base unit installation place is the central location in the network area. The device should be at least 10…15 cm away from the wall corner or concrete ceiling. If the base unit is installed inside a metal cabinet, use the antenna extension cable GWA-AS1.



The base unit is designed for hidden installation, e.g. above a false ceiling, and doesn't normally require any additional cover for the cabling. However, the installation regulations may be different in your country.

Important: Check the local installation regulations before making any installations.

It's recommended to use cable ties or equivalent to have some strain relief and to tidy up the installation. If touch protection is required on the terminals, please use a CUCC cable cover.

The base unit can be mounted on the wall by screws or to a 35 mm DIN rail.

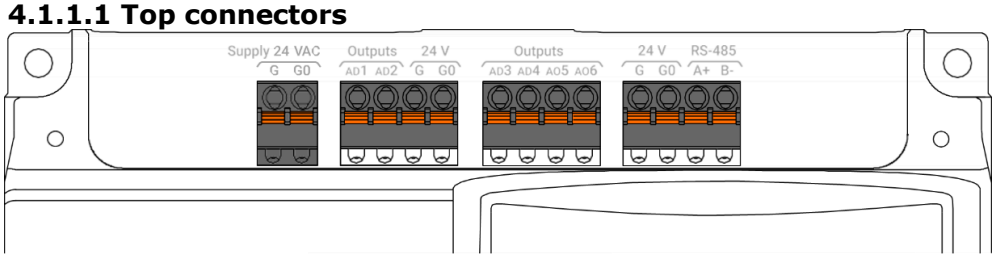
4.1.1 Wiring

CAUTION **CAUTION:** Device wiring and commissioning can only be carried out by qualified professionals. Always make the wirings while the power is switched off.

The device terminals are grouped according to the functions to avoid any wiring mistakes. There are extra G and G0 terminals for connecting the separate supply voltage for other devices.

The terminals are designed for maximum of 1,5 mm^2 cable area. Please note that the cables for communication (RS-485) should be twisted pair (2x2 pairs).

4.1.1.1 Top connectors



Supply 24 VAC

G	24 Vac/dc supply.
G0	Ground

Outputs

AD1	Output 1. 0...10 Vdc (-0,5...+2 mA) output.
AD2	Output 2. 0...10 Vdc (-0,5...+2 mA) output.

24 V

G	24 Vac output.
G0	Ground

Outputs

AD3	Output 3. 0...10 Vdc (-0,5...+2 mA) output.
AD4	Output 4. 0...10 Vdc (-0,5...+2 mA) output.
AO5	Output 5. 0...10 Vdc (-0,5...+2 mA) output.
AO6	Output 6. 0...10 Vdc (-0,5...+2 mA) output.

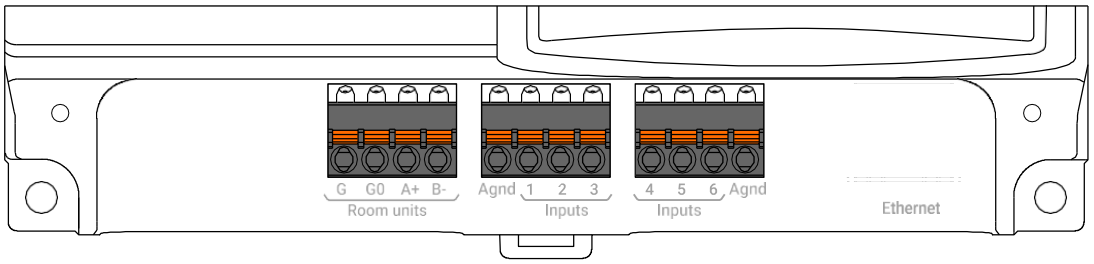
24 V

G	24 Vac output.
G0	Ground

RS-485

A+	RS-485 bus connection for Modbus RTU.
B-	

4.1.1.2 Bottom connectors



Room units

G	Not in use.
G0	
A+	
B-	

Inputs

Agnd	0 V
1	Input 1. NTC 10 / Pt1000 / Potential free contact / 0...10 Vdc
2	Input 2. NTC 10 / Pt1000 / Potential free contact / 0...10 Vdc
3	Input 3. NTC 10 / Pt1000 / Potential free contact / 0...10 Vdc
4	Input 4. NTC 10 / Pt1000 / Potential free contact / 0...10 Vdc
5	Input 5. NTC 10 / Pt1000 / Potential free contact / 0...10 Vdc
6	Input 6. NTC 10 / Pt1000 / Potential free contact / 0...10 Vdc
Agnd	0 V

Ethernet

Ethernet	RJ-45 connector for Modbus TCP.

4.2 Mounting wireless transmitters

Place the wireless transmitters according to the plan avoiding radio shadows.

The device can be installed in dry surroundings (IP20) by screws on the wall surface or on the standard flush mounting box. The recommended installation height is 150...180 cm.

Important: Be extra careful when mounting transmitters with CO_2 measurement. The CO_2 sensor is sensitive for bending and incorrect measurements are possible if the bottom cover is mounted incorrectly.

The device position should be selected carefully. All the error factors that can affect the measurements should be eliminated as well as possible. The following list defines the typical measurement error factors.

- direct sun light
- occupant proximity
- air flow coming from windows or doors
- air flow coming from ventilation louvres
- air flow coming from the flush mounting box
- differential temperature caused by external wall

4.2.1 Powering GWTR

GWTR models have a battery for power supply. The devices are delivered with a battery that is disconnected by using a disconnecting strip. Open the cover and remove the strip to enable the power supply for the device.

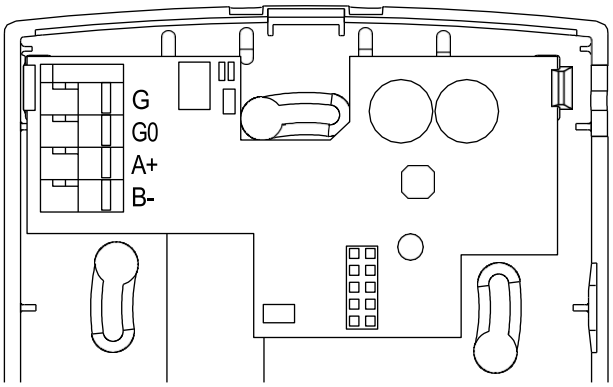
CAUTION **CAUTION:** There is a risk of explosion if the battery is replaced by an incorrect type. Use only battery types that are defined by manufacturer. Contact sales to get more information about recommended batteries.

CAUTION **CAUTION:** Dispose of the used batteries according to the instructions of local authorities.

4.2.2 Wiring GWTR24

The GWTR24 models have connectors for 24 Vac/dc supply.

CAUTION **CAUTION:** Device wiring and commissioning can only be carried out by qualified professionals. Always make the wirings while the power is switched off.



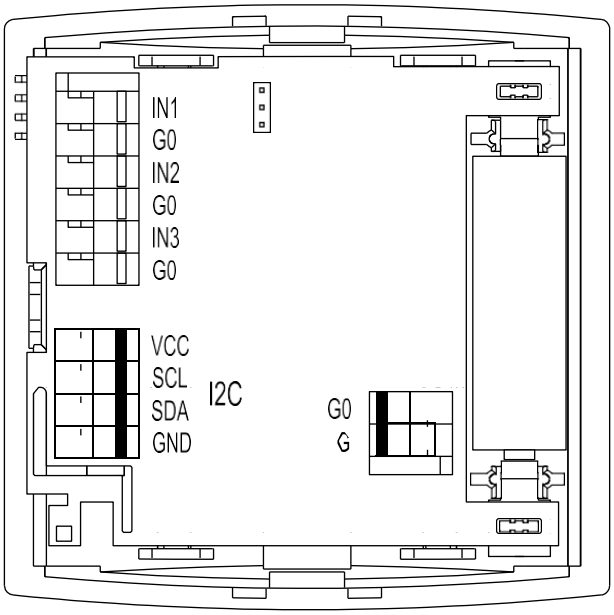
G	24 Vac/dc supply
G0	Ground
A+	Not in use.
B-	

4.2.3 Wiring GWTR-IM

CAUTION **CAUTION:** Device wiring and commissioning can only be carried out by qualified professionals. Always make the wirings while the power is switched off.

CAUTION **CAUTION:** There is a risk of explosion if the battery is replaced by an incorrect type. Use only battery types that are defined by the manufacturer. Contact sales to get more information about recommended batteries.

CAUTION **CAUTION:** Dispose of the used batteries according to the instructions of local authorities.



IN1	Input 1 (0...10 V or NTC 10K or digital or resistive).
G0	
IN2	Input 2 (0...10 V or NTC 10K or digital or resistive).
G0	
IN3	Input 3 (0...10 V or NTC 10K or digital or resistive). The input supports energy harvesting from 0...10 V signal when the device is battery powered. The harvesting is active if the signal is over 4 V.
G0	

NOTE **Note:** When using 0...10 V inputs, the input potential must be the same as that is used in the connected 0...10 V device. Use common G0 with the connected device's power supply, for example.

NOTE **Note:** Use NO type of contact for digital input, if the device is only battery powered. NC requires power and that significantly shortens the battery life.

VCC	I2C models	3...5 Vdc
SCL		Serial clock line.
SDA		Serial data line.
GND		0 V

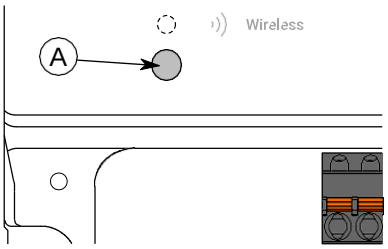
G0	0 V
G	10...30 Vdc / 12...28 Vac

5 Configuring the base unit settings

To configure the device, you first need to connect it to the Configuration tool application. When the device is connected to the application, you can make changes to the configuration.

1. Connect the supply voltage to the base unit.
2. Start Configuration tool.
3. Press the *Bluetooth Devices* button.
   The device list shows the devices that have Bluetooth activated.

   NOTE **Note:** The Bluetooth is enabled when the supply voltage is connected for the first time.
4. If the device is not showing in the list, press the connection button until the *CPU* indicator light flashes to enable the Bluetooth in the device.

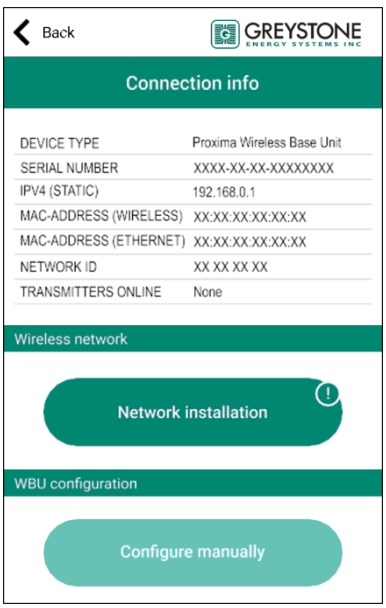


A. Connection button

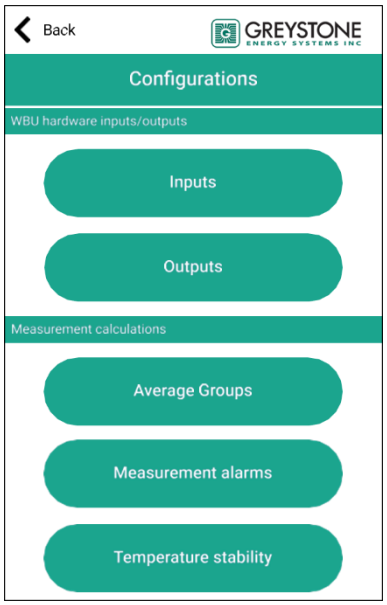
The indicator light should flash once after pressing the button for one second but under two seconds.

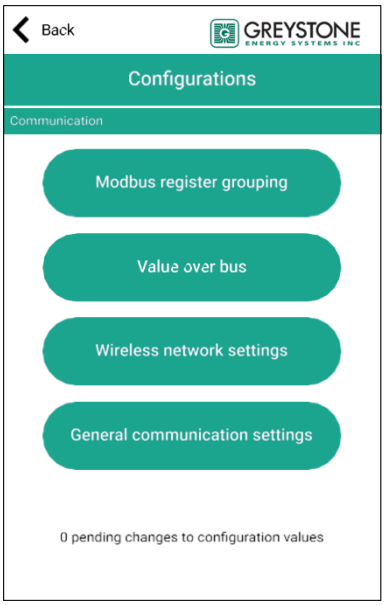
NOTE **Note:** Use a small screwdriver or a similar tool to push the button.

5. Select the device from the list.
6. Press the *Connect* button.
   Wireless indicator light is illuminated continuously when Configuration tool is connected to the device.



7. Press the *Configure manually* button.





Configurations view has the following menus:

Inputs	Set up inputs.
Outputs	Set up outputs.
Average groups	Set up average group calculations from measured values. There are five calculation groups available.
Measurement alarms	Set up measurement alarms.
Temperature stability	Set up temperature measurement stability calculation.
Modbus register grouping	Set up Modbus register grouping.
Value over bus	Set up value over bus (VOB) settings.
Wireless network settings	Set up wireless network settings.
General communication settings	Set up communication parameters and network alarms.

See more information about the settings in the following chapters.

8. Make the changes to configuration.
9. Press *Install to device* button to write the changes to the device.
10. Press the *Back* button.
11. Press the *Back* button again to disconnect from the device.
12. Select the disconnecting method.
    - Select *Disconnect* to disconnect the device without deactivating the device Bluetooth.
    - Select *End commissioning* to disconnect the device and deactivate the device Bluetooth.
    - Select *Cancel* to cancel disconnecting.

NOTE **Note:** The wireless network communication (MIRA communication) starts only if the Bluetooth is deactivated. However, the device also deactivates the Bluetooth if connection to Configuration tool is lost for 30 minutes.

5.1 Setting inputs

There are six inputs, and all the inputs are multifunctional. The input values can be read via Modbus.

1. Press the *Inputs* button in the *Configurations* display.
2. Select the input you are going to set by pressing the number.

3. Select the input type.
   The available types are:

Not used	The input is deactivated.
0...10 V Input	Input for 0...10 Vdc signal.
Temperature sensor NTC10K	Input for NTC 10K temperature sensor.
Temperature sensor Pt1000	Input for Pt1000 temperature sensor.
Digital input	Input for potential free contact.

4. Press the *Edit parameters* button to set up the input.
   Edit parameters button is available only for *Digital input* input type.
5. Make the settings.
   See the following chapters for more details about the parameters.
6. Press the *Confirm changes* button to save the changes.
7. Press the *Confirm changes* button again to save the changes.
8. Press *Install to device* button to write the changes to the device.

5.1.1 Available settings for potential free contact

Parameter name	Values	Default	Description
Contact-On level	*0...300000 Ω*	*300000 Ω*	Contact on level. Set the input value that is interpreted as contact ON on value. The function works as a "software contact". The value can also be lower than the *Contact-Off level* value. This way you can invert the function direction.
Contact-Off level	*0...300000 Ω*	*0 Ω*	Contact off level. Set the input value that is interpreted as contact OFF on value. The function works as a "software contact".

5.2 Setting outputs

1. Press the *Outputs* button in the *Configurations* display.
2. Select the output you are going to set.
3. Select the *Output source.*
   The available selections are:

Off	The output is deactivated.
BMS	The output is controlled via Modbus.
Transmitter ID	A transmitter measurement value is directed to the output.

4. Select the *Output type*.
   The available selections are:

Voltage	The output type is 0...10 Vdc.
24 Vac	The output type is 24 Vac. The selection is not available if the parameter *Output source* value is *Transmitter ID*.

5. Select *Wireless input*.
   Select the transmitter that is used for the output source. The selection is available only if the parameter *Output source* value is *Transmitter ID*.
6. Select the *Converted measurement*.
   Select the measurement for the output.
   If the parameter *Output source* value is *Transmitter ID*, you can set the scaling values for the measurement by pressing the *Edit parameters* button. See the following chapter for more details about the parameters.

7. Press the *Confirm changes* button to save the changes.
8. Press the *Confirm changes* button again to save the changes.
9. Press *Install to device* button to write the changes to the device.

5.2.1 Available settings for voltage output

These settings are available only if the parameter *Output source* value is *Transmitter ID*.

Parameter name	Values	Default	Description
Measurement source selection	*Internal temperature sensor / Internal humidity sensor / Transmitter specific measurement 1...4 / External measurement 1...4*	-	Measurement source. The default value and selectable values depend on the selected measurement type.
Transmitter offline value	*Off / 0.00. ..100.00 %*	*0.00 %*	The value to be used if the transmitter is offline. If the parameter value is *Off*, last known value is used.
Scale low point			
Temperature @ 0%	*-100.0. ..100.0 °C*	*0.0 °C*	Temperature value at 0 % output signal. The parameter value is available when the *Converted measurement* parameter value is *Temperature*.
Humidity @ 0%	*0.00. ..100.00 %rH*	*0.00 %rH*	Relative humidity value at 0 % output signal. The parameter value is available when the *Converted measurement* parameter value is *Relative humidity*.
CO2 @ 0%	*0...10000 ppm*	*0 ppm*	CO_2 value at 0 % output signal. The parameter value is available when the *Converted measurement* parameter value is *CO2*.
Voltage @ 0%	*0.000. ..... V*	*0.000 V*	Output voltage at 0 % measurement signal.
Scale high point			
Temperature @ 100%	*-100.0. ..100.0 °C*	*0.0 °C*	Temperature value at 100 % output signal. The parameter value is available when the *Converted measurement* parameter value is *Temperature*.
Humidity @ 100%	*0.00. ..100.00 %rH*	*100.00 %rH*	Relative humidity value at 100 % output signal. The parameter value is available when the *Converted measurement* parameter value is *Relative humidity*.
CO2 @ 100%	*0...10000 ppm*	*0 ppm*	CO_2 value at 100 % output signal. The parameter value is available when the *Converted measurement* parameter value is *CO2*.
Voltage @ 100%	*0.000. ..... V*	*10.000 V*	Output voltage at 100 % measurement signal.

5.3 Configuring average measurement groups

You can configure up to five average measurement groups. One transmitter can be in several groups and one group can include only one measured property.

1. Press the *Average Groups* button in the *Configurations* view.
2. Select the group you are going to set by pressing the number.

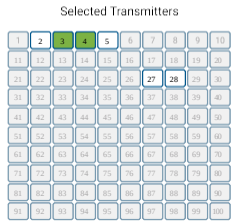
3. Select the average group type.

   The available types are:

Disabled	Average group disabled.
Temperature	Average group for temperature measurements.
Relative Humidity	Average group for relative humidity measurements.
CO2	Average group for CO_2 measurements.

4. Press the *Edit parameters* button.
5. Make the settings.
   See the chapter Available settings for average groups on page 36 for more details.
6. Press the *Confirm changes* button to save the changes.
7. Press the *Confirm changes* button again to save the changes.
8. Press *Install to device* button to write the changes to the device.

5.3.1 Available settings for average groups

Parameter name	Values	Default	Description
Average calculation source selection	*Internal / External 1...4*	*Internal*	Source for the measurement. *Internal* = internal measurement. *External* = external measurement. External measurements are available for the devices that have inputs (e.g. WTR-IM).
Selected transmitters			List of transmitters that are used in the average group. The selected transmitters are marked with green background and online transmitters are marked with white background. Offline transmitters can also be selected to the average group.
Temperature average high cutoff	*-100...100 °C*	*0,0 °C*	Set the highest value that is used in the average calculation. Values over the set value are not used in the calculation. The parameter is available only for temperature average groups.
Temperature average low cutoff	*-100...100 °C*	*0,0 °C*	Set the lowest value that is used in the average calculation. Values below the set value are not used in the calculation. The parameter is available only for temperature average groups.

5.4 Configuring alarms

5.4.1 Configuring measurement alarms

1. Press the *Measurement alarms* button in the *Configurations* view.
2. Make the settings.
   See the chapter Available settings for measurement alarms on page 36 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

5.4.1.1 Available settings for measurement alarms

Parameter name	Values	Default	Description
General temperature alarm, low	*Off / -100,0...100,0 °C*	*Off*	Low temperature alarm. Alarm activates when any transmitter's temperature drops below the set value.

Parameter name	Values	Default	Description
General temperature alarm, high	*Off / -100,0...100,0 °C*	*Off*	High temperature alarm. Alarm activates when any transmitter's temperature rises over the set value.
General RH% alarm, low	*Off / 0,00...100,00 %rH*	*Off*	Low humidity alarm. Alarm activates when any transmitter's humidity level drops below the set value.
General RH% alarm, high	*Off / 0,00...100,00 %rH*	*Off*	High humidity alarm. Alarm activates when any transmitter's humidity level rises over the set value.
General CO2 alarm, low	*Off / 0...10000 ppm*	*Off*	Low CO_2 alarm. Alarm activates when any transmitter's CO_2 level drops below the set value.
General CO2 alarm, high	*Off / 0...10000 ppm*	*Off*	High CO_2 alarm. Alarm activates when any transmitter's CO_2 level rises over the set value.
Condensation alarm			
Dew point alarm window on limit	*0,0...100,0 °C*	*0.0 °C*	Dew point alarm, low limit.
Dew point alarm window off limit	*0,0...100,0 °C*	*0.0 °C*	Dew point alarm, high limit.

5.4.2 Configuring network related alarms

1. Press the *Wireless network settings* button in the *Configurations* view.
2. Make the settings.
   See the chapter Available settings for network related alarms on page 37 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

5.4.2.1 Available settings for network related alarms

Parameter name	Values	Default	Description
Offline alarm	*Off / 180...65535 s*	*7200 s*	Alarm for offline transmitters. Set the offline time that activates the alarm.
Battery alarm limit	*1...99 %*	*11 %*	Battery level alarm. Set the battery level that activates the alarm. NOTE **Note:** The alarm activates when the level drops under the set value. For example, 11 % means that the alarm activates when the battery level is 10 %.

5.5 Configuring temperature measurement stability calculation

1. Press the *Temperature stability* button in the *Configurations* view.
2. Make the settings.
   See the chapter Available settings for temperature measurement stability calculation on page 38 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

5.5.1 Available settings for temperature measurement stability calculation

Parameter name	Values	Default	Description
Temperature stability calculation low limit	*-100.0…100.0 °C*	*-100.0 °C*	Temperature stability calculation range low limit.
Temperature stability calculation high limit	*-100.0…100.0 °C*	*100.0 °C*	Temperature stability calculation range high limit.
Temperature stability calculation window size	*1...65535 h*	*24 h*	Stability calculation time frame.

5.6 Configuring Modbus register grouping

1. Press the *Modbus register grouping* button in the *Configurations* view.
2. Make the settings.
   See the chapter Available settings for Modbus register grouping on page 38 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

5.6.1 Available settings for Modbus register grouping

Parameter name	Values	Default	Description
Address of register cloned from WTR, slot 1	See the following table.	*Temperature*	The transmitters' value to be grouped to slot 1. The values are grouped to base unit registers 18000...18099.
Address of register cloned from WTR, slot 2	See the following table.	*Humidity*	The transmitters' value to be grouped to slot 2. The values are grouped to base unit registers 18100...18199.
Address of register cloned from WTR, slot 3	See the following table.	*Transmitter specific measurement 1*	The transmitters' value to be grouped to slot 3. The values are grouped to base unit registers 18200...18299.
Address of register cloned from WTR, slot 4	See the following table.	*Transmitter specific measurement 2*	The transmitters' value to be grouped to slot 4. The values are grouped to base unit registers 18300...18399.
Address of register cloned from WTR, slot 5	See the following table.	*Input 1*	The transmitters' value to be grouped to slot 5. The values are grouped to base unit registers 18400...18499.
Address of register cloned from WTR, slot 6	See the following table.	*Input 2*	The transmitters' value to be grouped to slot 6. The values are grouped to base unit registers 18500...18599.
Address of register cloned from WTR, slot 7	See the following table.	*Input 3*	The transmitters' value to be grouped to slot 7. The values are grouped to base unit registers 18600...18699.
Address of register cloned from WTR, slot 8	See the following table.	*Input 4*	The transmitters' value to be grouped to slot 8. The values are grouped to base unit registers 18700...18799.
Address of register cloned from WTR, slot 9	See the following table.	*Battery level*	The transmitters' value to be grouped to slot 9. The values are grouped to base unit registers 18800...18899.
Address of register cloned from WTR, slot 10	See the following table.	*Signal strength*	The transmitters' value to be grouped to slot 10. The values are grouped to base unit registers 18900...18999.

Parameter value	Description
Temperature	Temperature measurement.
Humidity	Humidity measurement.
Transmitter specific measurement 1...3	Transmitter specific measurements (e.g. *Transmitter specific value 1* = CO_2 measurement).
Input 1...4	Inputs' values.
Battery level	Transmitter battery level.
Signal strength	Transmitter signal strength.

5.7 Configuring Value Over Bus settings

You can configure up to three Value Over bus functions.

1. Press the *Value Over Bus* button in the *Configurations* view.
2. Select the configuration you are going to set by pressing the number.
3. Make the settings.
   See the chapter Available settings for value over bus on page 39 for more details.
4. Press the *Confirm changes* button to save the changes.
5. Press *Install to device* button to write the changes to the device.

5.7.1 Available settings for value over bus

Parameter name	Values	Default	Description
Bus mode	*Global type and value / Global type, individual values*	*Global type and value*	VOB mode. *Global type and value*: The same value and value type is sent to all transmitters. *Global type, individual values*: Individual values are sent to the transmitters. The value type is the same for all values.
Bus value type	*No value / Temperature / ...*	*No value*	See the available values and their descriptions from the chapter Available value over bus (VOB) value types on page 87.
Bus scaling factor	*1x / x/10000 / x/1000 / x/100 / x/10 / 10x / 100x / 1000x / 10000x*	*1x*	Scaling factor for the value.

5.8 Configuring wireless network settings

1. Press the *Wireless network settings* button in the *Configurations* display.
2. Make the settings.
   See the chapter Available settings for wireless network on page 40 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

5.8.1 Available settings for wireless network

Parameter name	Values	Default	Description
Offline alarm	*Off / 180...65535 s*	*7200 s*	Alarm for offline transmitters. Set the offline time that activates the alarm.
Battery alarm limit	*1...99 %*	*11 %*	Battery level alarm. Set the battery level that activates the alarm. NOTE **Note:** The alarm activates when the level drops under the set value. For example, 11 % means that the alarm activates when the battery level is 10 %.
Gateway poll interval	*60...65535 s*	*900 s*	Poll frequency for transmitters. Base unit polls transmitters with this interval.
Transmitter activity interval	*30...65535 s*	*120 s*	Global setting for transmitters' measurement frequency.
Transmitter indication led flashing	*Enabled / Disabled*	*Enabled*	Transmitter indicator light flashing status. Flashing can be disabled by setting the parameter value to *Disabled*.
Measurement values when a transmitter is offline	*Keep last values / Zero all values*	*Keep last values*	Setting the measurement values when the transmitter is offline. *Keep last values* — Last values are kept. *Zero all values* — All values are reset to zero.
Network level WTR language setting	*English / Finnish*	*English*	Transmitters' user interface language selection.
Global COV settings			
Global COV limit, temperature	*Off / 0.1.…50.0 °C*	*Off*	Global COV limit for temperature values.
Global COV limit, RH %	*Off / 0.01. …50.00 rH%*	*Off*	Global COV limit for humidity values.
Global COV limit, CO2	*Off / 1...5000 ppm*	*Off*	Global COV limit for CO_2 values.

5.9 Configuring communication settings

1. Press the *General communication settings* button in the *Configurations* display.
2. Make the settings.
   See the chapter Available settings for communication on page 40 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

5.9.1 Available settings for communication

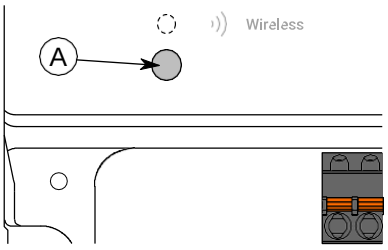
Parameter name	Values	Default	Description
Custom device name	0...32 characters	*Unnamed device*	Device name. Device name supports ASCII characters. The name is shown in the device connection view.
Ethernet Settings			
DHCP	*Enabled / Disabled*	*Disabled*	Enable DHCP. Enable to get the IP address from server.
IP-address	*xxx.xxx.xxx.xxx*	*192.168.1.1*	Ethernet IP address.

Parameter name	Values	Default	Description
Subnet mask	*xxx.xxx.xxx.xxx*	*255.255.255.0*	Ethernet subnet mask.
Gateway	*xxx.xxx.xxx.xxx*	*192.168.1.1*	Ethernet gateway.
Primary DNS server	*xxx.xxx.xxx.xxx*	*10.10.1.7*	Primary DNS server for Ethernet.
Secondary DNS server	*xxx.xxx.xxx.xxx*	*10.10.1.6*	Secondary DNS server for Ethernet.
RS-485 Settings			
BMS RS-485 address	*1...247*	*1*	Modbus address (RS-485).
BMS RS-485 speed	*9600 / 14400 / 19200 / 38400 / 57600 / 115200 bit/s*	*9600 bit/s*	Modbus speed (RS-485).
BMS RS-485 parity	*None / Odd / Even*	*None*	Modbus parity (RS-485).
BMS RS-485 stop-bits	*1 Stop-Bit / 2 Stop-Bits*	*1 Stop-Bit*	Modbus stop bits (RS-485).
Modbus TCP Unit ID	*0...255*	*1*	Modbus TCP unit identifier. The setting is available when the parameter value is *Modbus TCP Ethernet*.
Radio Settings			
Continuous beacon message sending	*Enabled / Disabled*	*Enabled*	Beacon message sending. Beacon messages can be disabled by setting the parameter value to *Disabled*.

5.10 Updating the device firmware

The device firmware can be updated when the Configuration tool notifies about the update.

1. Start Configuration tool.
2. Press the *Devices* button.
   The device list shows the devices that have Bluetooth activated.
   NOTE **Note:** The Bluetooth is enabled when the supply voltage is connected for the first time.
3. If the device is not showing in the list, press the connection button until the *CPU* indicator light flashes to enable the Bluetooth in the device.



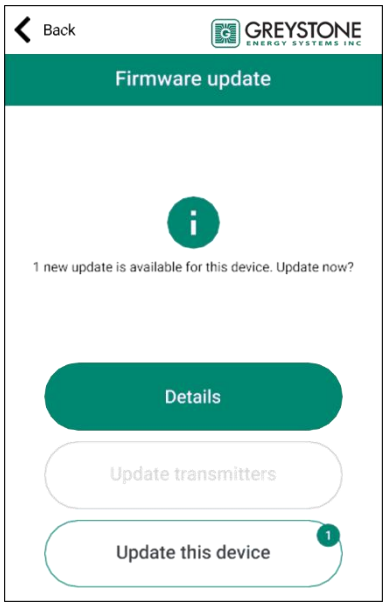
A. Connection button

The indicator light should flash once after pressing the button for one second but under two seconds.

NOTE **Note:** Use a small screwdriver or a similar tool to push the button.

4. Select the device from the list.
5. Press the *Connect* button.
   Wireless indicator light is illuminated continuously when Configuration tool is connected to the device.

6. Press the *Firmware update* button.



You can see the update details by pressing the *Details* button.

7. Press the *Update this device* button to update the firmware.

Important: The update starts immediately when you press the button. Do not interrupt the installation process.

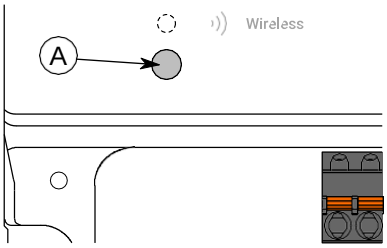
Application downloads the new firmware and transfers it to the device. The device restarts to complete the firmware update.

8. Press the *OK* button on the confirmation view.
9. Press the *Back* to disconnect from the device.
10. Select the disconnecting method.
    - Select *Disconnect* to disconnect the device without deactivating the device Bluetooth.
    - Select *End commissioning* to disconnect the device and deactivate the device Bluetooth.
    - Select *Cancel* to cancel disconnecting.

5.10.1 Resetting to factory firmware

If the firmware update fails, the device can be reset to factory firmware.

1. Disconnect the power supply.
2. Press and hold the connection button.



A. Connection button

3. Reconnect the power supply.
4. Wait for 30 seconds and release the button.

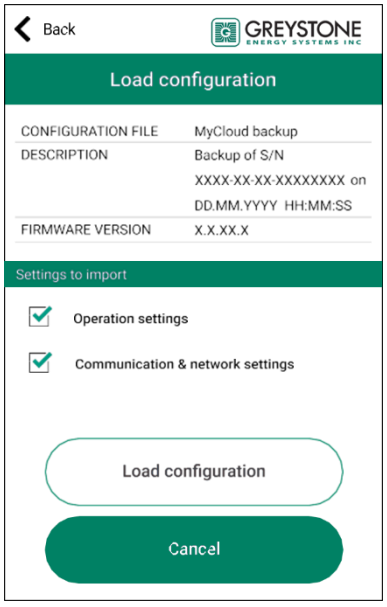
The factory firmware is now reset to the device.

5.11 Restoring device backup from Configuration tool cloud

Configuration tool saves the device configuration backup to Configuration tool cloud every time the configuration is written to the device. A working internet connection is needed for saving the configuration to cloud.

NOTE **Note:** The backup restoring can be used when replacing a broken unit or copying the configuration to another unit.

1. Start Configuration tool.
2. Press *Configurations* button.
3. Press *Device backup recovery* button.
4. Write the serial number of the device from which the backup is going to be loaded.
   The serial number is printed to the type plate on the device housing. You can also read the QR code from the type plate by pressing the *Scan QR code* button and following the on-screen instructions.
5. Press *Search backups* button.
6. Select the backup from the list.
7. Press *Choose* button.
8. Press *Load backup to device* button.
   In this view you can also select to export the file locally or save as the configuration to Configuration tool cloud.
9. Select the device to which you are going to upload the configuration.
   If the device is not on the list, check that the device's Bluetooth is active.
10. Press *Connect* button.
11. Select the settings to be imported.



12. Press *Load configuration* button.
13. Press *Install to device* button.
14. Press the *Back* button.
15. Press the *Back* button again to disconnect from the device.

16. Select the disconnecting method.

- Select *Disconnect* to disconnect the device without deactivating the device Bluetooth.
- Select *End commissioning* to disconnect the device and deactivate the device Bluetooth.
- Select *Cancel* to cancel disconnecting.

NOTE **Note:** The wireless network communication (MIRA communication) starts only if the Bluetooth is deactivated. However, the device also deactivates the Bluetooth if connection to Configuration tool is lost for 30 minutes.

6 Commissioning the wireless network

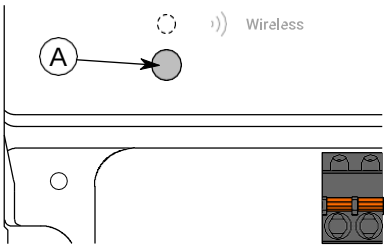
6.1 Setting up a new wireless network

Important: Configure all needed base unit settings (Modbus settings, output configurations etc.) before setting up the wireless network.

1. Connect the supply voltage to the base unit.
2. Start Configuration tool.
3. Press the *Devices* button.

   The device list shows the devices that has Bluetooth activated.

   NOTE **Note:** The Bluetooth is enabled when the supply voltage is connected for the first time.
4. If the device is not showing in the list, press the connection button until the *CPU* indicator light flashes to enable the Bluetooth in the device.



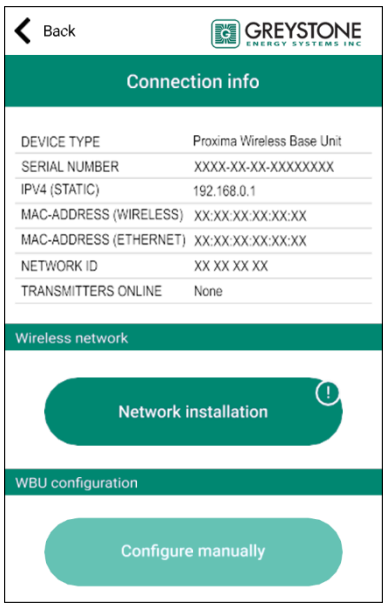
A. Connection button

The indicator light should flash once after pressing the button for one second but under two seconds.

NOTE **Note:** Use a small screwdriver or a similar tool to push the button.

5. Select the device from the list.
6. Press the *Connect* button.

   Wireless indicator light is illuminated continuously when Configuration tool is connected to the device.



You can also configure the base unit settings at this phase. See more information from the chapter Configuring the base unit settings on page 32.

7. Press the *Network installation* button.

8. Set the device name for the base unit.
   The device name is also used for the network name.
9. Press the *Next* button.
10. Set the transmitter naming pattern.
    Use ### to insert transmitter ID to the pattern.
11. Press the *Next* button.
12. Review the network configuration and press the *INITIALIZE NETWORK* button.
13. Select the method to continue.
    - Press *OK* button to return to main view.
    - Press *Add transmitters to project* button to add wireless transmitters to network.

    Important: Configure all needed transmitter settings before connecting to the wireless network.

    The base unit deactivates the Bluetooth communication and moves to MIRA communication mode. The wireless network is now visible in the *Wireless installation projects* view.

    NOTE **Note:** The project is saved in the local device. You can't see the project if you log in to another device.

6.1.1 Adding devices to wireless network

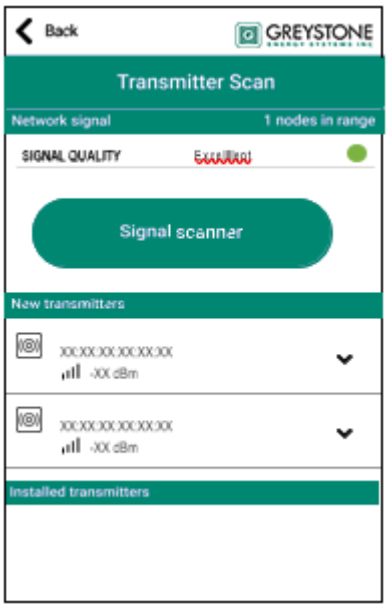
Important: Configure all needed transmitter settings before connecting to the wireless network.

Important: If you are adding new transmitters to an existing network, make sure that all network devices are updated to latest firmware version before adding the new devices.

1. Connect the supply voltage to the transmitter.
2. Start Configuration tool.
3. Press the *Wireless installation projects* button.

4. Select the project and press the *Add devices* button.

   Transmitter Scan view is displayed.



   All devices that can be connected to the network are listed in the *New transmitters* section. The transmitters that are already connected to the network are listed in the *Installed transmitters* section.

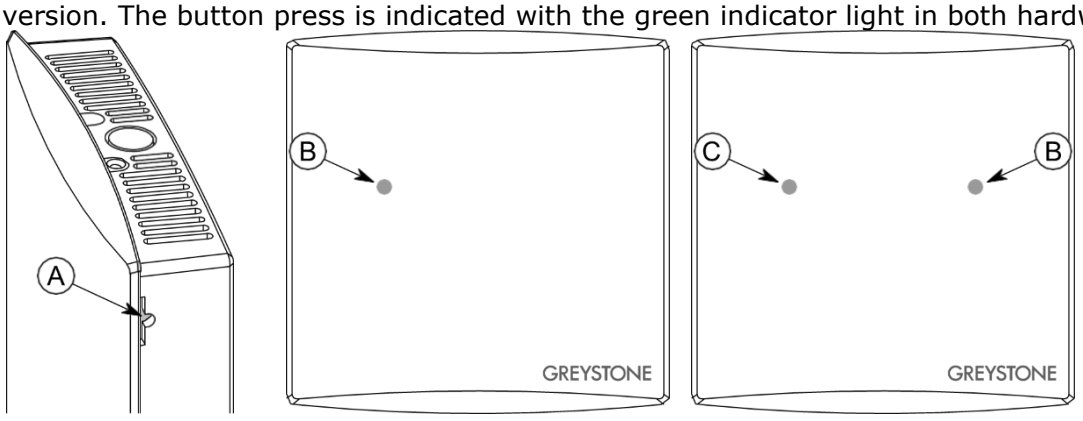
   NOTE **Note:** Make sure that the wireless devices to be connected are in the installation mode and they are not connected to another network.

   NOTE **Note:** By pressing the *Signal scanner* button you can analyze the network.

5. If the device is not showing in the list, press the connection button until the green indicator light flashes to enable the Bluetooth in the device.

   Important: Do not press the connection button within 10 seconds after connecting supply voltage. It takes up to 10 seconds until the transmitter is fully started and functional.

   There are two different indicator light configurations available depending on the device hardware version. The button press is indicated with the green indicator light in both hardware versions.



   A. Connection button
   B. Green indicator light
   C. Blue indicator light

   The indicator light should flash once after pressing the button for one second but under two seconds.

   NOTE **Note:** Use a small screwdriver or a similar tool to push the button.

6. Select the device to be connected to the network.
7. Press the *Connect* button.

8. Press the *Network installation* button.

   Important: Configure all needed transmitter settings before connecting to the wireless network.

   See the chapter Configuring the wireless transmitters on page 53 for more information.

   If the *Network installation* button is not visible, the device is already connected to a network. You have to reset the network settings to be able connect the device to a new network. See the chapter Resetting network settings on page 50 for more information.

9. Select ID for the device.

   When selecting the ID, there are few things to be considered.

   - The ID can be 1...100.
   - The ID must be unique inside the network.
   - If the ID is already used inside the network, the application asks to replace the existing device. The existing device is disconnected from the network if replaced.

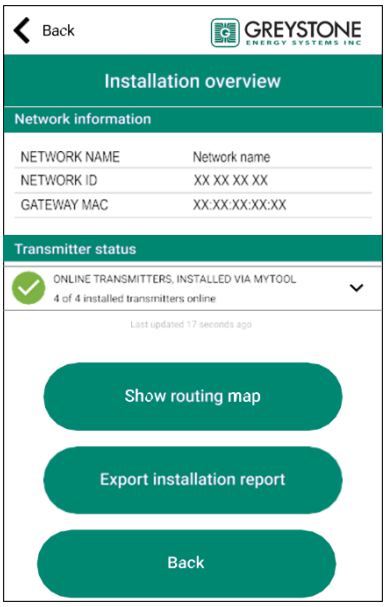
10. Press the *Next* button.
11. Write the device name.

    The application warns about names that are already used during the same commissioning session.

12. Press the *Next* button.
13. Review the network configuration and press the *INITIALIZE NETWORK* button.
14. Press *OK* button on the *Configuration finished* view.
    The base unit deactivates the Bluetooth communication and moves to MIRA communication mode. MyTool returns to the *Transmitter Scan* view.

    NOTE **Note:** The transmitter tries to connect to the network immediately. If the first connection attempt fails, the transmitter tries to connect again in the following schedule: 1, 2, 4, 8, 16, 32, 64, 128 min. If the network connection fails after 128 minutes, the transmitter restarts and starts the connecting procedure from the beginning.

15. Add more devices if needed.
16. When all needed devices are added, press the *Installation overview* button.



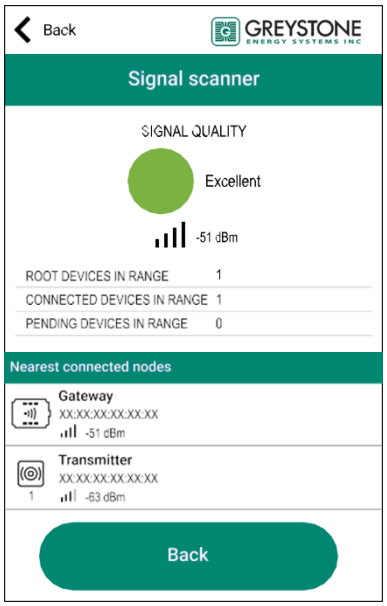
You can view the network structure by pressing the *Show routing map* button. See the chapter Routing map on page 49 for more information.

If needed, save the network settings to a .csv file by pressing the *Export installation report* button.

17. Press the *End installation* button to return to main view or press the *Discard project* button to close the project and remove it from the *Wireless installation projects* view.

NOTE **Note:** When installing transmitters to network or when the transmitters have lost the connection, it can take several minutes before the transmitters are connected to network.

6.1.1.1 Signal scanner



Signal quality	Signal level to the nearest wireless device.
Root devices in range	Base unit in range (0 / 1).
Connected devices in range	Device count for devices that are connected to the network.
Pending devices in range	Device count for devices that are going to connect to the network.
Nearest connected nodes	List of devices that are connected to the network. Nearest is on the top of the list.

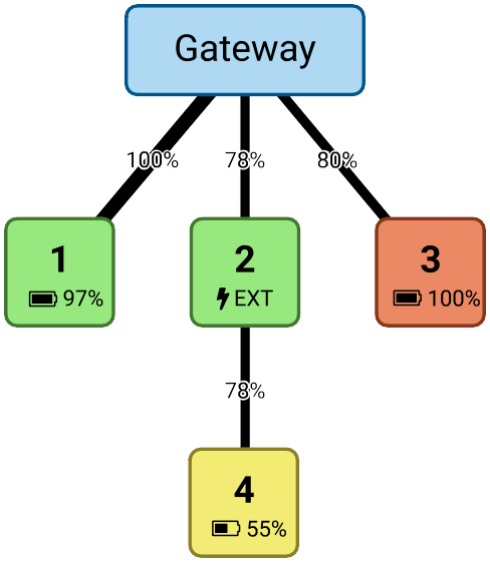
The signal strength (e.g. -63 dBm) value indicates the connection quality between Configuration tool and the device. It's not possible to view the signal strength between the wireless devices using the signal scanner.

The devices are arranged to the list according to the signal strength starting from the nearest device. The signal strength can be interpreted as follows.

Colour	Text	Value	Description
	Excellent	≥-55 dBm	Excellent signal strength.
	Good	-75...-56 dBm	Good signal strength.
	Average	-85...-76 dBm	Average signal strength.
	Poor	-95...-86 dBm	Poor signal strength.
	Very poor	<-95 dBm	Very poor signal strength.

6.1.1.2 Routing map

The network routing map shows the network structure, signal strengths between devices, battery levels and power consumption. The power consumption is indicated by the device box colour.



Symbol	Symbol description
78%	Signal quality.
2	Transmitter ID.
97%	Battery powered device's battery level.
EXT	Device with external power supply.
	Device's power consumption is low (< 60 µA). The externally powered devices are always displayed on green background.
	Device's power consumption is average (60...120 µA).
	Device's power consumption is high (> 120 µA).

6.1.1.3 Resetting network settings

1. Connect Configuration tool to the wireless device.
2. Press the *Reset network settings* button.
3. Press the *Reset network settings* button again to confirm the resetting.

   NOTE **Note:** Only the network settings are reset and the device other settings remain.

4. Press the *OK* button on the confirmation dialog.
   The network settings are now reset.

6.1.1.4 Resetting device settings to factory defaults

1. Connect Configuration tool to the device.
2. Press the *Reset to factory settings* button.
3. Press the *Reset to factory settings* button again to confirm the resetting.

   Important: All the device settings are reset to factory defaults. Also the network settings are reset.

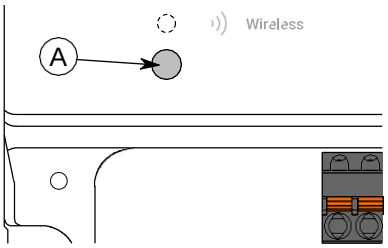
4. Press the *OK* button on the confirmation dialog.
   The settings are now reset factory defaults.

6.2 Reopening existing wireless project

Important: When enabling the Bluetooth in the base unit, the network communication stops. It can take up to several hours for a big network to resume fully functional condition.

1. Start Configuration tool.
2. Press the *Devices* button.
   The device list shows the devices that has Bluetooth activated.

   NOTE **Note:** The Bluetooth is enabled when the supply voltage is connected for the first time.
3. If the device is not showing in the list, press the connection button until the *CPU* indicator light flashes to enable the Bluetooth in the device.

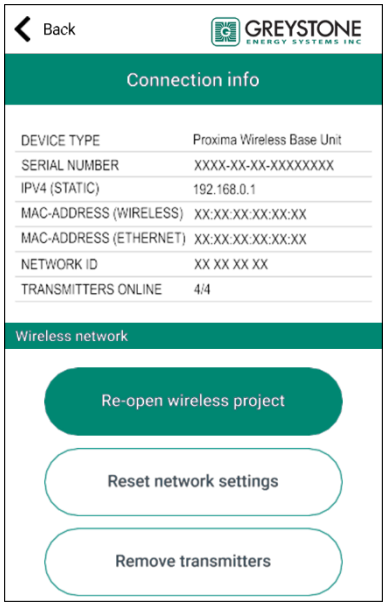


A. Connection button

The indicator light should flash once after pressing the button for one second but under two seconds.

NOTE **Note:** Use a small screwdriver or a similar tool to push the button.

4. Select the device from the list.
5. Press the *Connect* button.
   Wireless indicator light is illuminated continuously when Configuration tool is connected to the device.



6. Press the *Re-open wireless project* button.
   Existing network settings are displayed.
7. Edit the device name if needed.
   The device name is also used for the network name.
8. Press the *Next* button.
9. Set the transmitter naming pattern.
   Use ### to insert transmitter ID to the pattern.
10. Press the *Next* button.
11. Review the network configuration and press the *REBUILD NETWORK* button.

12. Select the method to continue.
    - Press *OK* button to return to main view.
    - Press *Add transmitters to project* button to add wireless transmitters to network.

    Important: Configure all needed transmitter settings before connecting to the wireless network.

    The base unit deactivates the Bluetooth communication and moves to MIRA communication mode. The wireless network is now visible in the *Wireless installation projects* view.

    NOTE **Note:** The project is saved in the local device. You can't see the project if you log in to another device.

6.2.1 Removing devices from wireless network

1. Reset the network settings in the devices that are going to remove.
   See the chapter Resetting network settings on page 50 for more information.
2. Connect Configuration tool to WBU.
3. Press the *Remove Transmitters* button.
4. Select the devices to be removed from the network.
5. Press the *REMOVE TRANSMITTERS* button.
6. Press the *OK* button.
7. Press the *REMOVE TRANSMITTERS* button.
   The selected devices are now removed from the network.

6.2.2 Replacing a transmitter in wireless network

If you have to replace a broken transmitter in wireless network, you can just add the new transmitter with the same ID.

1. Make sure the broken transmitter is disconnected from power supply.
   If there are two transmitters with the same ID, both transmitters are disconnected from the network.
2. Connect the supply voltage to the new transmitter.
3. Start Configuration tool.
4. Press the *Wireless installation projects* button.
5. Select the project from the list.
   If the wanted project is not available in the list, you have to reopen the project. See more information from the chapter Reopening existing wireless project on page 50.
6. Press the *Add devices* button.
7. Add the transmitter to the network.
   Select the broken transmitter ID for the new transmitter. See more information about adding transmitters to network from the chapter Adding devices to wireless network on page 46.

7 Configuring the wireless transmitters

To configure the device, you first need to connect it to Configuration tool application. When the device is connected to application, you can make changes to the configuration.

Important: Configure all needed transmitter settings before connecting to the wireless network.

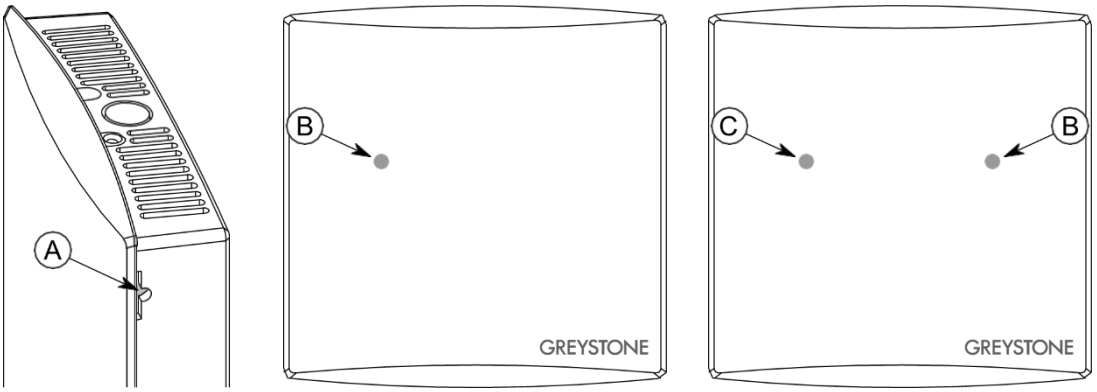
1. Connect the supply voltage to the transmitter.
2. Start Configuration tool.
3. Press the *Devices* button.

   The device list shows the devices that has Bluetooth activated.

   NOTE **Note:** The Bluetooth is enabled when the supply voltage is connected for the first time.
4. If the device is not showing in the list, press the connection button until the green indicator light flashes to enable the Bluetooth in the device.

   Important: Do not press the connection button within 10 seconds after connecting supply voltage. It takes up to 10 seconds until the transmitter is fully started and functional.

   There are two different indicator light configurations available depending on the device hardware version. The button press is indicated with the green indicator light in both hardware versions.

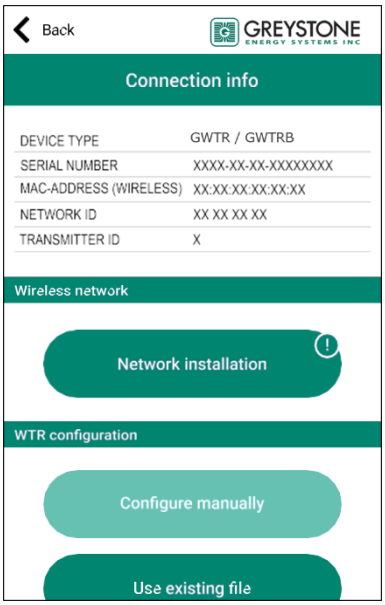


   A. Connection button
   B. Green indicator light
   C. Blue indicator light

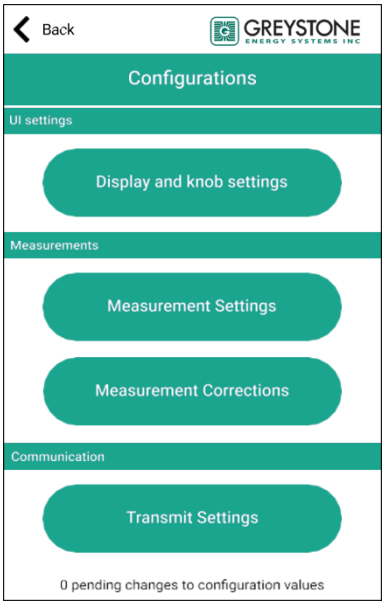
   The indicator light should flash once after pressing the button for one second but under two seconds.

   NOTE **Note:** Use a small screwdriver or a similar tool to push the button.
5. Select the device from the list.

6. Press the *Connect* button.
   The indicator light is illuminated continuously when Configuration tool is connected to the device.



7. Press the *Configure manually* button.



***Configurations* view has the following menus:**

Display and knob settings	Set up display and advanced setpoint knob settings.
Measurement Settings	Set up measurement settings.
Measurement Corrections	Tune the measurement values.
Transmit Settings	Set up change of value (COV) settings.

See more information about the settings from the following chapters.

8. Make the changes to configuration.
9. Press *Install to device* button to write the changes to the device.

   NOTE **Note:** You can also save the settings to Configuration tool cloud or locally to your device. Then the settings can be uploaded to another device by using *Use existing file* function.

10. Press the *Back* button.
11. Press the *Back* button again to disconnect from the device.

12. Select the disconnecting method.

- Select *Disconnect* to disconnect the device without deactivating the device Bluetooth.
- Select *End commissioning* to disconnect the device and deactivate the device Bluetooth.

NOTE **Note:** The wireless network communication (MIRA communication) starts only if the Bluetooth is deactivated. However, the device also deactivates the Bluetooth if connection to Configuration tool is lost for 30 minutes.

7.1 Configuring display and advanced setpoint knob

1. Press the *Display and knob settings* button in the *Configurations* view.
2. Make the settings.
   See the chapter Available settings for user interface and advanced setpoint knob on page 55 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

7.1.1 Available settings for user interface and advanced setpoint knob

Parameter name	Values	Default	Description
Display settings			
Display brightness	*0...10*	*5*	Display brightness level.
Display mode	*Upper value scrolling, lower value static / Upper value static, lower value scrolling*	*Upper value scrolling, lower value static*	Display scrolling settings.
Display static value	*Temperature / Relative humidity / Measurement 1...4 / External measurement 1...4 / I2C measurement 1..3 / VOB value 1..3*	*Temperature*	Static value selection.
Scrolling values to show	*Temperature / Relative humidity / Measurement 1...4 / External measurement 1...4 / I2C measurement 1..3 / VOB value 1..3*	*Humidity*	Scrolling values selection.
Autoscroll time	*1...30 s*	*10 s*	Scrolling value change interval. Time to show each value on display. Affects also to display off delay. Display off delay = (number of items in scrolling value selection) * (display scrolling delay).
Display always on	*Enabled / Disabled*	*Disabled*	Display status. *Disabled* — The button press activates the display. *Enabled* — The display is always on.
Active knob settings			

Parameter name	Values	Default	Description
Enabled functions in active knob	*Temperature setpoint / Temperature deviation setpoint / Fan speed / Extra time / Percentage setpoint / CO2 setpoint*	*Temperature setpoint*	The available setpoints for advanced setpoint knob.
Active knob temperature settings			
Temperature setpoint range, minimum	*-99.9. ..99.9 °C*	*18.0 °C*	Temperature setpoint range, minimum limit.
Temperature setpoint range, maximum	*-99.9. ..99.9 °C*	*30.0 °C*	Temperature setpoint range, maximum limit.
Temperature setpoint step size	*0.1.. 5.0 °C*	*0.5 °C*	Temperature setpoint adjustment step size.
Temperature deviation setpoint range, minimum	*-10.0. ..10.0 °C*	*-3.0 °C*	Temperature deviation setpoint range, minimum limit.
Temperature deviation setpoint range, maximum	*-10.0. ..10.0 °C*	*3.0 °C*	Temperature deviation setpoint range, maximum limit.
Temperature deviation setpoint step size	*0.1.. 5.0 °C*	*0.5 °C*	Temperature deviation setpoint adjustment step size.
Decimals in temperature values	*0 decimal places / 1 decimal place*	*1 decimal place*	Number of decimal places in temperature values.
Active knob fan speed settings			
Allowed fan speed modes	*Speed 1...6 / Off / On / Eco / Day / Night*	All modes are selected	The available fan speeds.
Active knob extra time settings			
Extra time value unit	*Hours / Minutes*	*Hours*	Extra time value unit.
Maximum extra time value, hours	*1...99 hours*	*99 hours*	Extra time maximum value. The parameter is available if the *Extra time value unit* value is *Hours*.
Maximum extra time value, minutes	*1...99 minutes*	*99 minutes*	Extra time maximum value. The parameter is available if the *Extra time value unit* value is *Minutes*.
Active knob percentage settings			
Percentage setpoint step size	*1 / 2 / 5 / 10 %*	*1 %*	Percentage setpoint adjustment step size.
Percentage setpoint range, minimum	*0.00...100.00 %*	*0.00 %*	Percentage setpoint range, minimum limit.
Percentage setpoint range, maximum	*0.00...100.00 %*	*100.00 %*	Percentage setpoint range, maximum limit.
Percentage mode symbol	*Lights / Temperature / Cooling / Fan / Heating / Blinds / Humidity*	*Blinds*	Percentage setpoint symbol.
Active knob CO2 settings			
CO2 setpoint	*400...2000 ppm*	*500 ppm*	CO_2 setpoint.

Parameter name	Values	Default	Description
CO2 setpoint step size	*5 / 10 / 25 / 50 ppm*	*25 ppm*	CO_2 setpoint adjustment step size.
CO2 setpoint range, minimum	*0...10000 ppm*	*400 ppm*	CO_2 setpoint range, minimum limit.
CO2 setpoint range, maximum	*0...10000 ppm*	*2000 ppm*	CO_2 setpoint range, maximum limit.

7.2 Configuring measurement settings

1. Press the *Measurement Settings* button in the *Configurations* view.
2. Make the settings.
   See the chapter Available measurement settings on page 57 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

7.2.1 Available measurement settings

Parameter name	Values	Default	Description
External input 1 type selection	*Off / 0-10V / Ohms x10 / NTC10K / Contact*	*Off*	Input 1 type. The parameter is available only if the device is equipped with inputs.
External input 2 type selection	*Off / 0-10V / Ohms x10 / NTC10K / Contact*	*Off*	Input 2 type. The parameter is available only if the device is equipped with inputs.
External input 3 type selection	*Off / 0-10V / Ohms x10 / NTC10K / Contact*	*Off*	Input 3 type. The parameter is available only if the device is equipped with inputs.
External input 4 type selection	*Off / 0-10V / Ohms x10 / NTC10K / Contact*	*Off*	Input 4 type. The parameter is available only if the device is equipped with inputs.
CO2 ABC logic state	*Disabled / Enabled*	*Enabled*	Automatic self-calibration of CO_2 measurement. The parameter is available only if the device is equipped with CO_2 measurement.
PIR configuration time unit	*Minutes / Seconds*	*Minutes*	Occupancy detection time unit selection. The selection affects to the parameters *PIR activation delay* and *PIR deactivation delay*. The parameter is available only if the device is equipped with occupancy detection.
PIR activation delay	*Instant / 3 minutes / 6 minutes* or *Instant / 3 seconds / 6 seconds*	*Instant*	Occupancy activation delay. The parameter is available only if the device is equipped with occupancy detection.
PIR deactivation delay	*5 / 15 / 30 / 60 / 90 / 120 minutes* or *5 / 15 / 30 / 60 / 90 / 120 seconds*	*5 minutes*	Occupancy deactivation delay. The parameter is available only if the device is equipped with occupancy detection.
PIR activated CO2 measurement	*Disabled / Enabled*	*Disabled*	CO_2 measurement according to the occupancy information. If the parameter value is *Enabled*, the CO_2 measurement is executed only if occupancy is detected. The parameter is available only if the device is equipped with occupancy detection.

Parameter name	Values	Default	Description
Network based CO2 measurement energy saving mode	*Disabled / Follow GWBU setting*	*Disabled*	CO_2 measurement energy saving. *Disabled* — Follows device specific measurement settings. *Follow GWBU setting* — Follows global measurement settings. The parameter is available only if the device is equipped with CO_2 measurement.
COV selection	*No selection / Temperature / Relative humidity / Measurement 1..4 / External measurement 1...4 / I2C measurement 1..3*	*No selection*	Selection of measurement values for COV function.

7.3 Tuning measurements

1. Press the *Measurement Corrections* button in the *Configurations* view.
2. Make the settings.
   See the chapter Available tuning values on page 58 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

7.3.1 Available tuning values

Parameter name	Values	Default	Description
Correction offset, temperature	*-50,0...50,0 °C*	*0,0 °C*	Temperature value tuning.
Correction offset, relative humidity	*-50,00...50,00 %rH*	*0,00 %rH*	Relative humidity value tuning.
Correction offset, CO2	*-200...200 ppm*	*0 ppm*	CO_2 value tuning.
Correction offset, passive knob reading	*-5000...5000*	*0*	Setpoint potentiometer value tuning.

7.4 Configuring transmit settings

1. Press the *Transmit Settings* button in the *Configurations* view.
2. Make the settings.
   See the chapter Available transmit settings on page 58 for more details.
3. Press the *Confirm changes* button to save the changes.
4. Press *Install to device* button to write the changes to the device.

7.4.1 Available transmit settings.

Parameter name	Values	Default	Description
Forced transmission interval	*Off / 30...65535 s*	*Off*	Transmitter specific forced update interval. The transmitter sends the last measured value to base unit at the specified interval.

Parameter name	Values	Default	Description
Transmitter specific activity interval	*Off / 5...65535 s*	*Off*	Transmitter specific update interval. The transmitter reads the measurements at the specified interval.
COV limit, temperature	*0,1...50,0 °C*	*0,5 °C*	COV limit for temperature.
COV limit, relative humidity	*0,01...50,00 %rH*	*5,00 %rH*	COV limit for humidity.
COV limit, CO2	*10...500 ppm*	*100 ppm*	COV limit for CO_2 value.
COV limit, passive knob reading	*0...10000*	*0*	COV limit for setpoint knob.

7.5 Copying configurations between devices

You can copy the settings between devices by using Configuration tool cloud or local copies.

1. Make the settings to a device.
2. Save the settings to Configuration tool cloud or local device by pressing *Save configuration* button in *Configurations* view.
3. Connect Configuration tool to another device.
4. Press the *Use existing file* or *Download settings from MyCloud button* button to load configuration from local device or from Configuration tool cloud.

   Follow the on-screen instructions to load the configuration.
5. Make changes to the settings if needed.
6. Press *Install to device* button to write the configuration to the device.

7.6 Transmitters' firmware updates

The transmitter firmware updates can be done locally or by using Firmware Over The Air (FOTA) function.

The FOTA function updates the devices over the wireless network. The FOTA firmware update process can take up from few minutes to several hours depending on the network size. The base unit updates two devices at a time and then moves to the next devices until the whole network is updated to the latest firmware version. The update process starts from the closest transmitter in the network.

NOTE **Note:** The FOTA function requires more power than the regular transmitter functioning. Therefore the FOTA updates should be planned carefully in battery powered network. The transmitter is not updated if the battery level is too low (under 10 %).

NOTE **Note:** The FOTA process doesn't interfere with the wireless network functioning. However, the whole network is restarted after all devices have been updated.

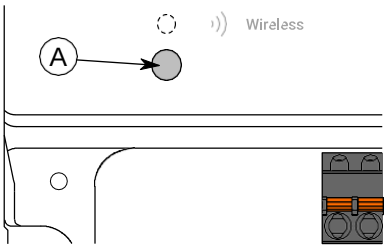
7.6.1 Updating wireless transmitters' firmware using FOTA

1. Start Configuration tool.
2. Press the *Devices* button.

   The device list shows the devices that has Bluetooth activated. Find the base unit from the list.

   NOTE **Note:** The Bluetooth is enabled when the supply voltage is connected for the first time.

3. If the device is not showing in the list, press the connection button until the *CPU* indicator light flashes to enable the Bluetooth in the device.



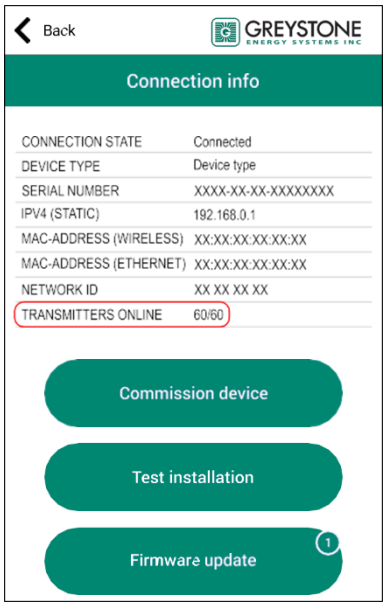
A. Connection button

The indicator light should flash once after pressing the button for one second but under two seconds.

NOTE **Note:** Use a small screwdriver or a similar tool to push the button.

4. Select the device from the list.
5. Press the *Connect* button.

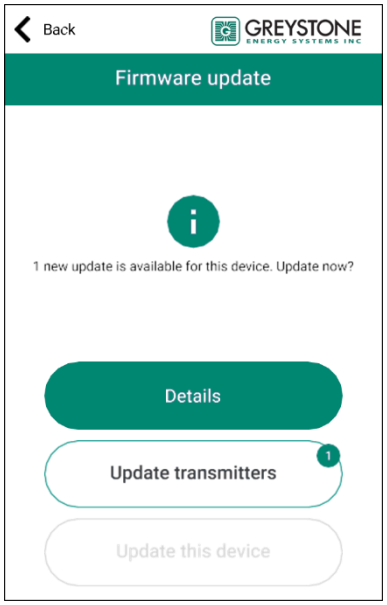
   Wireless indicator light is illuminated continuously when Configuration tool is connected to the device.
6. Check that all installed transmitters are online.



Important: If all transmitters are not online, don't start the update. The offline transmitters doesn't get updated even if they are connect to the network later.

NOTE **Note:** If transmitter's signal strength is poor, the FOTA update process might not complete. In these cases, it's recommended to update the firmware locally.

7. Press the *Firmware update* button.
   You can see the update details by pressing the *Details* button.



8. Press the *Update transmitters* button.
   The confirmation view is displayed.
9. Press the *Update transmitters* button to update the firmware in all devices in the network.
   The new firmware is now transferred to the base unit.
10. Press the *Back* button on the update confirmation view.
    The base unit turns off the Bluetooth and starts communicating the transmitters via the wireless network. If you get the following error message, press *Back* button and turn off the Bluetooth manually.

After the update process has started, Configuration tool is not needed to complete the update. The base unit updates the transmitters.

NOTE **Note:** You can monitor the update process via *Wireless installation projects* view.

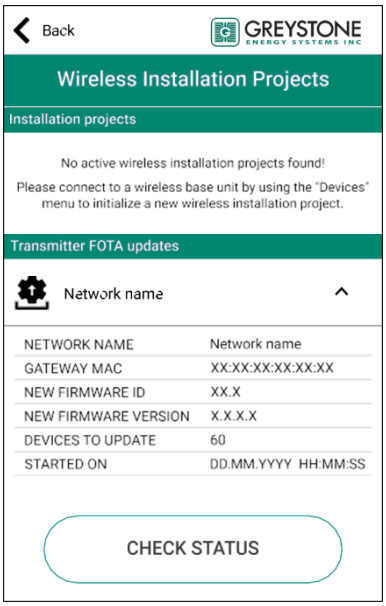
NOTE **Note:** The FOTA process doesn't interfere with the wireless network functioning. However, the whole network is restarted after all devices have been updated.

NOTE **Note:** The update process can take up to 48 hours in large networks. If the update process doesn't complete in 72 hours, reboot the base unit.

7.6.1.1 Viewing FOTA update process

1. Start Configuration tool.
2. Press the *Wireless projects* button.

3. Select the network name.



Parameter	Description
NETWORK NAME	Name of the network.
GATEWAY MAC	Base unit MAC address.
NEW FIRMWARE ID	The new firmware ID.
NEW FIRMWARE VERSION	The new firmware version.
DEVICES TO UPDATE	Number of devices to be updated.
STARTED ON	Update process starting time.

4. Press the *CHECK STATUS* button to view more detailed information about the update.
5. After successful update, press the *DISCARD* button to remove the project from the list.

7.6.2 Updating wireless transmitter firmware locally

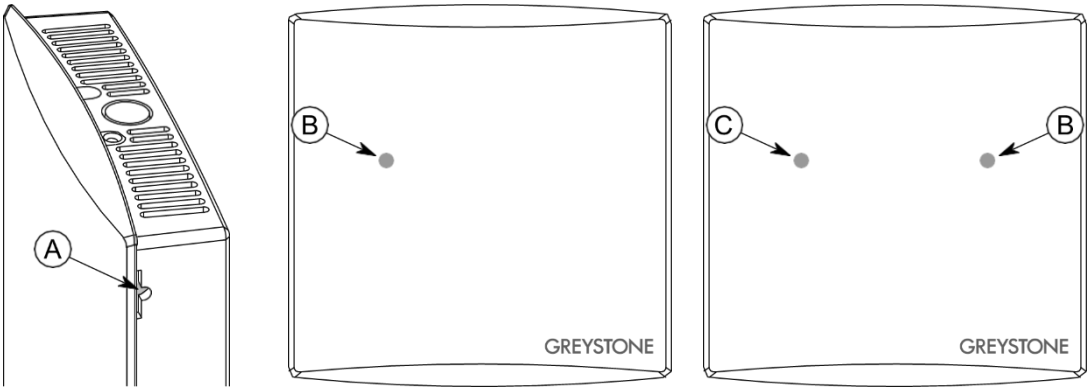
1. Start Configuration tool.
2. Press the *Devices* button.
   The device list shows the devices that has Bluetooth activated.

   NOTE **Note:** The Bluetooth is enabled when the supply voltage is connected for the first time.

3. If the device is not showing in the list, press the connection button until the green indicator light flashes to enable the Bluetooth in the device.

   Important: Do not press the connection button within 10 seconds after connecting supply voltage. It takes up to 10 seconds until the transmitter is fully started and functional.

   There are two different indicator light configurations available depending on the device hardware version. The button press is indicated with the green indicator light in both hardware versions.



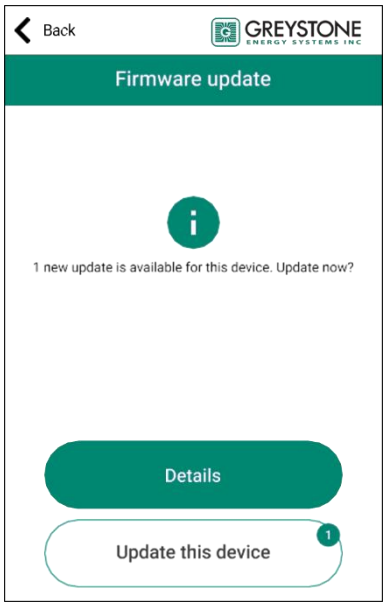
   A. Connection button
   B. Green indicator light
   C. Blue indicator light

   The indicator light should flash once after pressing the button for one second but under two seconds.

   NOTE **Note:** Use a small screwdriver or a similar tool to push the button.

4. Select the device from the list.
5. Press the *Connect* button.

   The indicator light is illuminated continuously when Configuration tool is connected to the device.
6. Press the *Firmware update* button.



   You can see the update details by pressing the *Details* button.
7. Press the *Update this device* button to update the firmware.

   Important: The update starts immediately when you press the button. Do not interrupt the installation process.

   Application downloads the new firmware and transfers it to the device. The device restarts to complete the firmware update.

8. Press the *OK* button on the confirmation view.
9. Press the *Back* to disconnect from the device.
10. Select the disconnecting method.
    - Select *Disconnect* to disconnect the device without deactivating the device Bluetooth.
    - Select *End commissioning* to disconnect the device and deactivate the device Bluetooth.

NOTE **Note:** The wireless network communication (MIRA communication) starts only if the Bluetooth is deactivated. However, the device also deactivates the Bluetooth if connection to Configuration tool is lost for 30 minutes.

8 Troubleshooting the network

8.1 Transmitter does not appear in the network.

Possible cause	Remedy
Bluetooth is enabled. If the transmitter Bluetooth is enabled, the transmitter can't connect to the network.	If the transmitter is available in the *Devices* view, the Bluetooth is enabled. Connect to the transmitter and press the *End commissioning* button in *Commission device* view. The Bluetooth can be turned off also by pressing the device's connection button.
Battery level is too low in the transmitter.	Check the battery level alarms from base unit Modbus registers.
Transmitter is connecting to the network. If the first connection attempt fails, the transmitter tries to connect again in the following schedule: 1, 2, 4, 8, 16, 32, 64, 128 min. If the network connection fails after 128 minutes, the transmitter restarts and starts the connecting procedure from the beginning.	Restart the transmitter by disconnecting and reconnecting the power supply to speed up the connecting process.
The network has been down earlier.	The network automatic rebuilding may take several hours in big networks. The network builds up starting from the transmitters that are closest to the base unit.

8.2 All transmitters appear to be offline

Possible cause	Remedy
Bluetooth is enabled. If the base unit Bluetooth is enabled, the network is down.	If the base unit is available in the *Devices* view, the Bluetooth is enabled. Connect to the base unit and press the *End commissioning* button in *Commission device* view.
Power failure in the base unit.	Check the base unit power supply. After a power failure in the base unit, the network automatic rebuilding may take several hours in big networks. The network builds up starting from the transmitters that are closest to the base unit.
Device or power failure in the critical point of the network.	Check the transmitters in the critical points of the network. Check that there is more than one transmitter within the base unit coverage area.

8.3 Bluetooth is enabled and the transmitter doesn't appear in Configuration tool

Possible cause	Remedy
Android device's Bluetooth communication has problems.	Restart Configuration tool and try connecting again. Also, toggling the smartphone's Bluetooth off and on can solve the problem. Android operating system requires that the location services are in use in order to use Bluetooth LE. Configuration tool uses Bluetooth LE for communication.

8.4 CO_2 measurement value is not correct.

Possible cause	Remedy
CO_2 sensor measurement is disturbed when mounting the transmitter.	Wait until the automatic calibration function corrects the measurement error. The measurement correction may take up to few weeks depending on the amount of error.

9 GWBU Modbus

9.1 Modbus properties

Protocol	RS-485 Modbus RTU
Bus speed	9600*/14400/19200/38400/57600/115200 bit/s
Data bits	8
Parity	none*/odd/even
Stop bits	1* / 2
Modbus ID	1*
Network size	up to 127 devices per segment
	* factory setting

Protocol	Modbus TCP
DHCP	Disabled*/Enabled
IP address	192.168.1.1*
Subnet mask	255.255.255.0*
Gateway	192.168.0.1*
Primary DNS	10.10.1.7*
Secondary DNS	10.10.1.6*
Modbus ID	1*
Unit ID	1*
	* factory setting

9.2 Modbus function codes

The device supports the following Modbus function codes.

Decimal	Hexa-decimal	Function
1	0x01	Read Coils
2	0x02	Read Discrete Inputs
3	0x03	Read Holding Registers
4	0x04	Read Input Registers
5	0x05	Write Single Coil
6	0x06	Write Single Register
15	0x0F	Write Multiple Coils
16	0x10	Write Multiple Registers

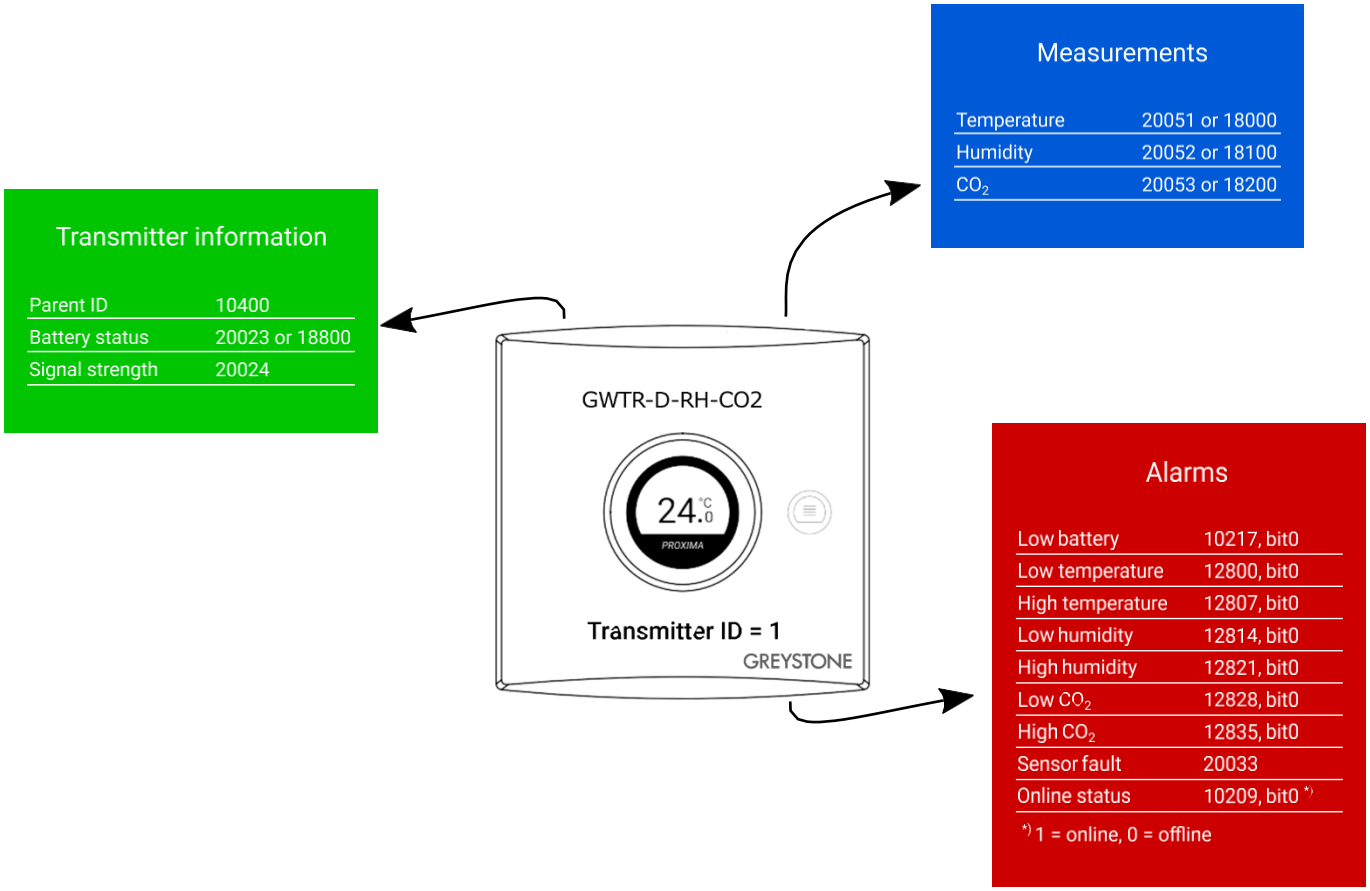
9.3 Modbus registers

Wireless gateway uses the whole Modbus register space from 1 to 65535. Holding registers and Input registers are not tied to classic 4xxxx and 3xxxx areas. There are also many registers that has the same register number but the function depends on the register type.

For example, a transmitter with ID1 has an input register for temperature (20051) and holding register for COV limit (20051). The address is the same, but the register usage depends on the used function code.

Important: Some BMS systems may need extra configuring to able to use the whole register space. Contact the system vendor support if needed.

The following figure illustrates how the basic data can be read via base unit Modbus registers.



9.3.1 Input registers for base unit

9.3.1.1 Input registers for inputs

Table reading instruction: The register numbers include an X in the middle. Replace the X with the input number you are reading.

Input register	Parameter description	Data type	Values	Range
X00	Input power.	S16	0...10000	0...100,00 %
X01	Input voltage.	S16	0...10000	0...10000 mV
X02	Resistance input value, high range	S16	0...30000	0...300000 Ω
X03	Resistance input value, low range	S16	0...20000	0...2000,0 Ω
X04	Temperature input value.	S16	-500...1000	-50,0...100,0 °C
X05	Humidity input value.	S16	0...10000	0...100,00 %rH
X06	CO_2 input value.	S16	0...10000	0...10000 ppm
X07	Contact input status.	S16	0 - 1	0. Inactive 1. Active
X08	Effective input power.	S16	0...10000	0...100,00 %

9.3.1.2 Input registers for device identification

Input register	Parameter description	Data type	Values	Range
10001	Hextet 0 for device type.	U16	0...65535	0...65535
10002	Hextet 1 for device type.	U16	0...65535	0...65535
10003	Hextet 0 for serial number.	U16	0...65535	0...65535
10004	Hextet 1 for serial number.	U16	0...65535	0...65535
10005	Hextet 0 for MAC address.	U16	0...65535	0...65535
10006	Hextet 1 for MAC address.	U16	0...65535	0...65535
10007	Hextet 2 for MAC address.	U16	0...65535	0...65535

9.3.1.3 Input registers for device status

Input register	Parameter description	Data type	Values	Range
10200	Number of transmitters paired with the base unit.	U16	0...100	0...100 pcs
10201	Transmitters installed, ID 1...16.	U16	bits 0...15	ID 1...16
10202	Transmitters installed, ID 17...32.	U16	bits 0...15	ID 17...32
10203	Transmitters installed, ID 33...48.	U16	bits 0...15	ID 33...48
10204	Transmitters installed, ID 49...64.	U16	bits 0...15	ID 49...64
10205	Transmitters installed, ID 65...80.	U16	bits 0...15	ID 65...80
10206	Transmitters installed, ID 81...96.	U16	bits 0...15	ID 81...96
10207	Transmitters installed, ID 97...100.	U16	bits 0...3	ID 97...100
10208	Number of transmitters that are online in the network.	U16	0...100	0...100 pcs
10209	Transmitters online, ID 1...16.	U16	bits 0...15	ID 1...16
10210	Transmitters online, ID 17...32.	U16	bits 0...15	ID 17...32
10211	Transmitters online, ID 33...48.	U16	bits 0...15	ID 33...48
10212	Transmitters online, ID 49...64.	U16	bits 0...15	ID 49...64
10213	Transmitters online, ID 65...80.	U16	bits 0...15	ID 65...80
10214	Transmitters online, ID 81...96.	U16	bits 0...15	ID 81...96
10215	Transmitters online, ID 97...100.	U16	bits 0...3	ID 97...100
10216	Number of transmitters that are indicating low battery alarm.	U16	0...100	0...100 pcs
10217	Transmitters that are indicating low battery alarm, ID 1...16.	U16	bits 0...15	ID 1...16
10218	Transmitters that are indicating low battery alarm, ID 17...32.	U16	bits 0...15	ID 17...32
10219	Transmitters that are indicating low battery alarm, ID 33...48.	U16	bits 0...15	ID 33...48
10220	Transmitters that are indicating low battery alarm, ID 49...64.	U16	bits 0...15	ID 49...64
10221	Transmitters that are indicating low battery alarm, ID 65...80.	U16	bits 0...15	ID 65...80
10222	Transmitters that are indicating low battery alarm, ID 81...96.	U16	bits 0...15	ID 81...96

Input register	Parameter description	Data type	Values	Range
10223	Transmitters that are indicating low battery alarm, ID 97...100.	U16	bits 0...3	ID 97...100
10224	Number of transmitters that are indicating battery overload notification.	U16	0...100	0...100 pcs
10225	Transmitters that are indicating battery overload notification, ID 1...16.	U16	bits 0...15	ID 1...16
10226	Transmitters that are indicating battery overload notification, ID 17...32.	U16	bits 0...15	ID 17...32
10227	Transmitters that are indicating battery overload notification, ID 33...48.	U16	bits 0...15	ID 33...48
10228	Transmitters that are indicating battery overload notification, ID 49...64.	U16	bits 0...15	ID 49...64
10229	Transmitters that are indicating battery overload notification, ID 65...80.	U16	bits 0...15	ID 65...80
10230	Transmitters that are indicating battery overload notification, ID 81...96.	U16	bits 0...15	ID 81...96
10231	Transmitters that are indicating battery overload notification, ID 97...100.	U16	bits 0...3	ID 97...100

9.3.1.4 Input registers for the last seen times

Input register	Parameter description	Data type	Values	Range
10300	Time that has elapsed since the transmitter has been last seen on network, ID 1.	U16	0...65535	0...65535 s
10301	Time that has elapsed since the transmitter has been last seen on network, ID 2.	U16	0...65535	0...65535 s
...	...	...	...	...
10399	Time that has elapsed since the transmitter has been last seen on network, ID 100.	U16	0...65535	0...65535 s

9.3.1.5 Input registers for network topology

Input register	Parameter description	Data type	Values	Range
10400	Parent device ID for the device with ID 1.	U16	0...100 / 255	0 = base unit, ID 1...100, 255 = transmitter is not connected to network
10401	Parent device ID for the device with ID 2.	U16	0...100 / 255	0 = base unit, ID 1...100, 255 = transmitter is not connected to network
...	...	...	...	...
10499	Parent device ID for the device with ID 100.	U16	0...100 / 255	0 = base unit, ID 1...100, 255 = transmitter is not connected to network

9.3.1.6 Input registers for extreme measurement values

Input register	Parameter description	Data type	Values	Range
12000	Lowest measured temperature value.	S16	-1000...1000	-100,0...100,0 °C
12001	Device ID for the lowest measured temperature value.	U16	1...100	ID 1...100
12002	Register of the lowest measured temperature value.	U16	37...48	37...48
12003	Highest measured temperature value.	S16	-1000...1000	-100,0...100,0 °C
12004	Device ID for the highest measured temperature value.	U16	1...100	ID 1...100
12005	Register of the highest measured temperature value.	U16	37...48	37...48
12006	Lowest measured humidity value.	U16	0...10000	0...100,00 %rH
12007	Device ID for the lowest measured humidity value.	U16	1...100	ID 1...100
12008	Register of the lowest measured humidity value.	U16	37...48	37...48
12009	Highest measured humidity value.	U16	0...10000	0...100,00 %rH
12010	Device ID for the highest measured humidity value.	U16	1...100	ID 1...100
12011	Register of the highest measured humidity value.	U16	37...48	37...48
12012	Lowest measured CO_2 value.	U16	0...10000	0...10000 ppm
12013	Device ID for the lowest measured CO_2 value.	U16	1...100	ID 1...100
12014	Register of the lowest measured CO_2 value.	U16	37...48	37...48
12015	Highest measured CO_2 value.	U16	0...10000	0...10000 ppm
12016	Device ID for the highest measured CO_2 value.	U16	1...100	ID 1...100
12017	Register of the highest measured CO_2 value.	U16	37...48	37...48

9.3.1.7 Input registers for measurement groups

Table reading instruction: The register numbers include an X in the middle. Replace the X with the measurement group number (1...5) you are reading.

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Input register	Parameter description	Data type	Values	Range
12X00	Lowest measured value in group.	-	-	-
12X01	Device ID for the lowest measured value in group.	U16	1...100	ID 1...100
12X02	Register of the lowest measured value in group.	U16	37...48	37...48
12X03	Highest measured value in group.	-	-	-
12X04	Device ID for the highest measured value in group.	U16	1...100	ID 1...100
12X05	Register of the highest measured value in group.	U16	37...48	37...48

Input register	Parameter description	Data type	Values	Range
12X06	Average value of the measurements in the group. Values that exceed the validation limits and values from the offline devices are excluded from the calculation.	-	-	-

9.3.1.8 Input registers for measurement stability

Input register	Parameter description	Data type	Values	Range
12600	Temperature stability on transmitter with ID1.	U16	0...100	0...100 %
12601	Temperature stability on transmitter with ID2.	U16	0...100	0...100 %
...	...	...	...	...
12699	Temperature stability on transmitter with ID100.	U16	0...100	0...100 %

9.3.1.9 Input registers for measurement alarms

Input register	Parameter description	Data type	Values	Range
12800	Low temperature alarm, ID 1...16.	U16	bits 0...15	ID 1...16
12801	Low temperature alarm, ID 17...32.	U16	bits 0...15	ID 17...32
12802	Low temperature alarm, ID 33...48.	U16	bits 0...15	ID 33...48
12803	Low temperature alarm, ID 49...64.	U16	bits 0...15	ID 49...64
12804	Low temperature alarm, ID 65...80.	U16	bits 0...15	ID 65...80
12805	Low temperature alarm, ID 81...96.	U16	bits 0...15	ID 81...96
12806	Low temperature alarm, ID 97...100.	U16	bits 0...3	ID 97...100
12807	High temperature alarm, ID 1...16.	U16	bits 0...15	ID 1...16
12808	High temperature alarm, ID 17...32.	U16	bits 0...15	ID 17...32
12809	High temperature alarm, ID 33...48.	U16	bits 0...15	ID 33...48
12810	High temperature alarm, ID 49...64.	U16	bits 0...15	ID 49...64
12811	High temperature alarm, ID 65...80.	U16	bits 0...15	ID 65...80
12812	High temperature alarm, ID 81...96.	U16	bits 0...15	ID 81...96
12813	High temperature alarm, ID 97...100.	U16	bits 0...3	ID 97...100
12814	Low humidity alarm, ID 1...16.	U16	bits 0...15	ID 1...16
12815	Low humidity alarm, ID 17...32.	U16	bits 0...15	ID 17...32
12816	Low humidity alarm, ID 33...48.	U16	bits 0...15	ID 33...48
12817	Low humidity alarm, ID 49...64.	U16	bits 0...15	ID 49...64
12818	Low humidity alarm, ID 65...80.	U16	bits 0...15	ID 65...80
12819	Low humidity alarm, ID 81...96.	U16	bits 0...15	ID 81...96
12820	Low humidity alarm, ID 97...100.	U16	bits 0...3	ID 97...100
12821	High humidity alarm, ID 1...16.	U16	bits 0...15	ID 1...16
12822	High humidity alarm, ID 17...32.	U16	bits 0...15	ID 17...32
12823	High humidity alarm, ID 33...48.	U16	bits 0...15	ID 33...48
12824	High humidity alarm, ID 49...64.	U16	bits 0...15	ID 49...64
12825	High humidity alarm, ID 65...80.	U16	bits 0...15	ID 65...80

Input register	Parameter description	Data type	Values	Range
12826	High humidity alarm, ID 81...96.	U16	bits 0...15	ID 81...96
12827	High humidity alarm, ID 97...100.	U16	bits 0...3	ID 97...100
12828	Low CO_2 alarm, ID 1...16.	U16	bits 0...15	ID 1...16
12829	Low CO_2 alarm, ID 17...32.	U16	bits 0...15	ID 17...32
12830	Low CO_2 alarm, ID 33...48.	U16	bits 0...15	ID 33...48
12831	Low CO_2 alarm, ID 49...64.	U16	bits 0...15	ID 49...64
12832	Low CO_2 alarm, ID 65...80.	U16	bits 0...15	ID 65...80
12833	Low CO_2 alarm, ID 81...96.	U16	bits 0...15	ID 81...96
12834	Low CO_2 alarm, ID 97...100.	U16	bits 0...3	ID 97...100
12835	High CO_2 alarm, ID 1...16.	U16	bits 0...15	ID 1...16
12836	High CO_2 alarm, ID 17...32.	U16	bits 0...15	ID 17...32
12837	High CO_2 alarm, ID 33...48.	U16	bits 0...15	ID 33...48
12838	High CO_2 alarm, ID 49...64.	U16	bits 0...15	ID 49...64
12839	High CO_2 alarm, ID 65...80.	U16	bits 0...15	ID 65...80
12840	High CO_2 alarm, ID 81...96.	U16	bits 0...15	ID 81...96
12841	High CO_2 alarm, ID 97...100.	U16	bits 0...3	ID 97...100

9.3.1.10 Input registers for dew point data availability

Input register	Parameter description	Data type	Values	Range
12842	High dew point data available, ID 1...16.	U16	bits 0...15	ID 1...16
12843	High dew point data available, ID 17...32.	U16	bits 0...15	ID 17...32
12844	High dew point data available, ID 33...48.	U16	bits 0...15	ID 33...48
12845	High dew point data available, ID 49...64.	U16	bits 0...15	ID 49...64
12846	High dew point data available, ID 65...80.	U16	bits 0...15	ID 65...80
12847	High dew point data available, ID 81...96.	U16	bits 0...15	ID 81...96
12848	High dew point data available, ID 97...100.	U16	bits 0...3	ID 97...100

9.3.1.11 Input registers for dew point alarms

Input register	Parameter description	Data type	Values	Range
12849	Dew point alarm active, ID 1.... 16. External temperature measurement, input 1.	U16	bits 0...15	ID 1...16
12850	Dew point alarm active, ID 17....32. External temperature measurement, input 1.	U16	bits 0...15	ID 17...32
12851	Dew point alarm active, ID 33....48. External temperature measurement, input 1.	U16	bits 0...15	ID 33...48
12852	Dew point alarm active, ID 49....64. External temperature measurement, input 1.	U16	bits 0...15	ID 49...64
12853	Dew point alarm active, ID 65....80. External temperature measurement, input 1.	U16	bits 0...15	ID 65...80
12854	Dew point alarm active, ID 81....96. External temperature measurement, input 1.	U16	bits 0...15	ID 81...96

Input register	Parameter description	Data type	Values	Range
12855	Dew point alarm active, ID 97….100. External temperature measurement, input 1.	U16	bits 0...3	ID 97...100
12856	Dew point alarm active, ID 1…. 16. External temperature measurement, input 2.	U16	bits 0...15	ID 1...16
12857	Dew point alarm active, ID 17….32. External temperature measurement, input 2.	U16	bits 0...15	ID 17...32
12858	Dew point alarm active, ID 33….48. External temperature measurement, input 2.	U16	bits 0...15	ID 33...48
12859	Dew point alarm active, ID 49….64. External temperature measurement, input 2.	U16	bits 0...15	ID 49...64
12860	Dew point alarm active, ID 65….80. External temperature measurement, input 2.	U16	bits 0...15	ID 65...80
12861	Dew point alarm active, ID 81….96. External temperature measurement, input 2.	U16	bits 0...15	ID 81...96
12862	Dew point alarm active, ID 97….100. External temperature measurement, input 2.	U16	bits 0...3	ID 97...100
12863	Dew point alarm active, ID 1…. 16. External temperature measurement, input 3.	U16	bits 0...15	ID 1...16
12864	Dew point alarm active, ID 17….32. External temperature measurement, input 3.	U16	bits 0...15	ID 17...32
12865	Dew point alarm active, ID 33….48. External temperature measurement, input 3.	U16	bits 0...15	ID 33...48
12866	Dew point alarm active, ID 49….64. External temperature measurement, input 3.	U16	bits 0...15	ID 49...64
12867	Dew point alarm active, ID 65….80. External temperature measurement, input 3.	U16	bits 0...15	ID 65...80
12868	Dew point alarm active, ID 81….96. External temperature measurement, input 3.	U16	bits 0...15	ID 81...96
12869	Dew point alarm active, ID 97….100. External temperature measurement, input 3.	U16	bits 0...3	ID 97...100
12870	Dew point alarm active, ID 1…. 16. External temperature measurement, input 4.	U16	bits 0...15	ID 1...16
12871	Dew point alarm active, ID 17….32. External temperature measurement, input 4.	U16	bits 0...15	ID 17...32
12872	Dew point alarm active, ID 33….48. External temperature measurement, input 4.	U16	bits 0...15	ID 33...48
12873	Dew point alarm active, ID 49….64. External temperature measurement, input 4.	U16	bits 0...15	ID 49...64
12874	Dew point alarm active, ID 65….80. External temperature measurement, input 4.	U16	bits 0...15	ID 65...80
12875	Dew point alarm active, ID 81….96. External temperature measurement, input 4.	U16	bits 0...15	ID 81...96
12876	Dew point alarm active, ID 97….100. External temperature measurement, input 4.	U16	bits 0...3	ID 97...100
12900	Dew point, ID 1. If data is not available, the value is 0.	S16	-1000...1000	-100,0...100,0 °C
12901	Dew point, ID 2. If data is not available, the value is 0.	S16	-1000...1000	-100,0...100,0 °C
...	...	...	...	...

Input register	Parameter description	Data type	Values	Range
12999	Dew point, ID 100. If data is not available, the value is 0.	S16	-1000...1000	-100,0...100,0 °C

9.3.1.12 Input registers for wireless inputs

Table reading instruction: The register numbers include an X in the middle. Replace the X with the input you are reading.

Input register	Parameter description	Data type	Values	Range
14X00	Wireless input power.	U16	0...10000	0...100,00 %
14X01	Wireless input contact status.	U16	0 - 1	0. Off 1. On

9.3.1.13 Input registers for register grouping

Table reading instruction: The register numbers include an X in the middle. Replace the X with the register group (0...9) you are reading.

The grouped registers are defined in the holding registers 18000...18009.

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Input register	Parameter description	Data type	Values	Range
18X00	Grouped register from transmitter ID 1.	-	-	-
...	...	...	...	...
18X99	Grouped register from transmitter ID 100.	-	-	-

9.3.2 Input registers for wireless transmitters

9.3.2.1 Input registers for wireless transmitter device identification

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

Input register	Parameter description	Data type	Values	Range
2XX01	Hextet 0 for device type.	U16	0...65535	0...65535
2XX02	Hextet 1 for device type.	U16	0...65535	0...65535
2XX03	Hextet 0 for serial number.	U16	0...65535	0...65535
2XX04	Hextet 1 for serial number.	U16	0...65535	0...65535
2XX05	Hextet 0 for MAC address.	U16	0...65535	0...65535
2XX06	Hextet 1 for MAC address.	U16	0...65535	0...65535
2XX07	Hextet 2 for MAC address.	U16	0...65535	0...65535

9.3.2.2 Input registers for transmitter status

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

Input register	Parameter description	Data type	Values	Range
2XX22	Timer function. The time left in the timer.	U16	0...65535	0...65535 s
2XX23	Battery status.	U16	0...100, 255	0...100 %, 255 = the device is not battery powered
2XX24	Signal strength.	U16	0...100	0...100 %. Amount of successful messages.
2XX25	Routing mode.	Bit	0 - 1	0. Routing node 1. Leaf node
2XX26	Hextet 0 for uptime.	U16	0...65535	0...65535 s
2XX27	Hextet 1 for uptime.	U16	0...65535	0...65535 s
2XX28	Available measurements in EXT1.	Bit	bits 0...6	0. Voltage 1. Current 2. Resistance, high 3. Resistance, low 4. NTC 10K 5. PT 1000 6. Contact
2XX29	Available measurements in EXT2.	Bit	bits 0...6	0. Voltage 1. Current 2. Resistance, high 3. Resistance, low 4. NTC 10K 5. PT 1000 6. Contact
2XX30	Available measurements in EXT3.	Bit	bits 0...6	0. Voltage 1. Current 2. Resistance, high 3. Resistance, low 4. NTC 10K 5. PT 1000 6. Contact
2XX31	Available measurements in EXT4.	Bit	bits 0...6	0. Voltage 1. Current 2. Resistance, high 3. Resistance, low 4. NTC 10K 5. PT 1000 6. Contact
2XX32	Number of supported I2C sensors.	U16	0...255	0...255

Input register	Parameter description	Data type	Values	Range
2XX33	Sensor fault alarms.	Bit	bits 0...15	0. Temperature 1. Humidity 2. Additional measurement 1 (CO_2) 3. Additional measurement 2 4. Additional measurement 3 5. Additional measurement 4 6. External input 1 7. External input 2 8. External input 3 9. External input 4 10. I2C value 1 11. I2C value 2 12. I2C value 3 13. Connection error in I2C value 1 14. Connection error in I2C value 2 15. Connection error in I2C value 3
2XX34	Not in use.	-	-	0
2XX35	Configuration compatibility number.	U16	0...65535	0...65535

9.3.2.3 Input registers for transmitter value types

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Input register	Parameter description	Data type	Values	Range
2XX36	Value type for transmitter specific measurement 1.	-	-	-
2XX37	Value type for transmitter specific measurement 2.	-	-	-
2XX38	Value type for transmitter specific measurement 3.	-	-	-
2XX39	Value type for transmitter specific measurement 4.	-	-	-
2XX40	Value type for external input 1.	-	-	-
2XX41	Value type for external input 2.	-	-	-
2XX42	Value type for external input 3.	-	-	-
2XX43	Value type for external input 4.	-	-	-
2XX44	Value type for I2C sensor 1 value 1.	-	-	-
2XX45	Value type for I2C sensor 1 value 2.	-	-	-
2XX46	Value type for I2C sensor 2 value 1.	-	-	-
2XX47	Value type for output 1.	-	-	-
2XX48	Value type for output 2.	-	-	-

Input register	Parameter description	Data type	Values	Range
2XX49	Value type for output 3.	-	-	-
2XX50	Value type for output 4.	-	-	-

9.3.2.4 Input registers for transmitters' measurements

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Input register	Parameter description	Data type	Values	Range
2XX51	Temperature value.	S16	-1000...1000	-100,0...100,0 °C
2XX52	Humidity value.	U16	0...10000	0...100,00 %rH
2XX53	Value of additional measurement 1 (CO_2).	U16	0...10000	0...10000 ppm
2XX54	Value of additional measurement 2.	-	-	-
2XX55	Value of additional measurement 3.	-	-	-
2XX56	Value of additional measurement 4.	-	-	-
2XX57	Value of external input 1.	-	-	-
2XX58	Value of external input 2.	-	-	-
2XX59	Value of external input 3.	-	-	-
2XX60	Value of external input 4.	-	-	-
2XX61	Value of I2C sensor 1 value 1.	-	-	-
2XX62	Value of I2C sensor 1 value 2.	-	-	-
2XX63	Value of I2C sensor 2 value 1.	-	-	-

9.3.2.5 Input registers for battery status

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

Input register	Parameter description	Data type	Values	Range
2XX68	Estimated battery life.	U16	0...65535	0...65535 days
2XX69	Average current consumption.	U16	0...65535	0...65535 µA

9.3.3 Holding registers for base unit

9.3.3.1 Holding registers for communication

NOTE **Note:** The control unit must be restarted to complete the communication settings change. The registers that are marked with *, doesn't require restarting.

Holding register	Parameter description	Data type	Values	Range	Default
0	IP address 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	0...65535	(0...255).(0...255)	49320
1	IP address 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	0...65535	(0...255).(0...255)	257
2	Subnet mask 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	0...65535	(0...255).(0...255)	65535

Holding register	Parameter description	Data type	Values	Range	Default
3	Subnet mask 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	0...65535	(0...255).(0...255)	65280
4	Gateway 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	0...65535	(0...255).(0...255)	49320
5	Gateway 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	0...65535	(0...255).(0...255)	257
6	1st DNS 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	0...65535	(0...255).(0...255)	2570
7	1st DNS 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	0...65535	(0...255).(0...255)	263
8	2nd DNS 1/2 (IPv4). **XXX.XXX**.XXX.XXX	U16	0...65535	(0...255).(0...255)	2570
9	2nd DNS 2/2 (IPv4). XXX.XXX.**XXX.XXX**	U16	0...65535	(0...255).(0...255)	262
10	DHCP status.	U16	0 - 1	0. DHCP disabled 1. DHCP enabled	0
11	Not in use.	U16	-	-	1
12	Modbus address (RS-485).	U16	0...255	0...255	1
13	Modbus speed (RS-485).	U16	0 - 1 - 2 - 3 - 4 - 5	0. 9600 bps 1. 14400 bps 2. 19200 bps 3. 38400 bps 4. 57600 bps 5. 115200 bps	0
14	Modbus parity (RS-485).	U16	0 - 1 - 2	0. None 1. Odd 2. Even	0
15	Modbus stop bits (RS-485).	U16	0 - 1	0. 1 stop bit 1. 2 stop bits	0
16	Not used.	U16	-	-	1
17	Room unit bus speed (RS-485).	U16	0 - 1 - 2 - 3 - 4 - 5	0. 9600 bps 1. 14400 bps 2. 19200 bps 3. 38400 bps 4. 57600 bps 5. 115200 bps	0
18	Room unit bus parity (RS-485).	U16	0 - 1 - 2	0. None 1. Odd 2. Even	0
19	Room unit bus stop bits (RS-485).	U16	0 - 1	0. 1 stop bit 1. 2 stop bits	0
20	*Bluetooth status.	U16	0 - 1	0. Bluetooth disabled 1. Bluetooth enabled	0
35	Modbus TCP unit identifier.	U16	0...255	0...255	1

9.3.3.2 Holding registers for general settings

Holding register	Parameter description	Data type	Values	Range	Default
10900	Transmitter offline alarm time. If a transmitter is not seen during this time, offline alarm is activated for that transmitter.	U16	0 / 3600...65535	0 = alarm off, 180...65535 s	7200
10901	Battery low alarm limit. If transmitter's battery level drops below this level, low battery alarm is activated for that transmitter.	U16	1...99	1...99 %	11
10902	Poll frequency for transmitters. Base unit polls transmitters with this interval.	U16	60...65535	60...65535 s	900
10903	Global setting for transmitters' measurement frequency.	U16	30...65535	30...65535 s	120
10904	Battery overload notification limit.	U16	0...65535	0...65535 µA	70
10905	Functionality selection.	Bit	bits 0...3	0. Enable base unit beacon message sending 1. Enable global CO_2 2. Disable indicator lights globally 3. Clear offline WTR input registers	0
10906	GWTR display language	U16	0 - 1	1. Finnish 2. English	2

9.3.3.3 Holding registers for inputs

Table reading instruction: The register numbers include an X in the middle. Replace the X with the input number you are adjusting.

Holding register	Parameter description	Data type	Values	Range	Default
X00	Input type.	S16	0 - 1 - 2 - 3 - 4 - 5 - 6 - 7	0. Not used 1. 0...10 Vdc 2. N/A 3. N/A 4. N/A 5. NTC 10 6. Pt1000 7. Resistive / Digital input	0
X01	Input overdrive status.	S16	0 - 1	0. Disabled 1. Enabled	0
X02	Input overdrive value.	S16	0...10000	0...100,00 %	0
X03	Input voltage @ 0 %.	S16	0...10000	0...10,000 V	0
X04	Input voltage @ 100 %.	S16	0...10000	0...10,000 V	10000
X05	Input temperature at 0 %.	S16	-500...1000	-50,0...100,0 °C	-500
X06	Input temperature at 100 %.	S16	-500...1000	-50,0...100,0 °C	500
X07	Input temperature offset.	S16	-1000...1000	-100,0...100,0 °C	0
X08	Input humidity at 0 %.	S16	0...10000	0...100,00 %rH	0

Holding register	Parameter description	Data type	Values	Range	Default
X09	Input humidity at 100 %.	S16	0...10000	0...100,00 %rH	10000
X10	Input humidity offset.	S16	-5000...5000	-50,00...50,00 %rH	0
X11	Input CO_2 at 0 %.	S16	0....10000	0...10000 ppm	0
X12	Input CO_2 at 100 %.	S16	0....10000	0...10000 ppm	2000
X13	Input CO_2 offset	S16	-200....200	-200...200 ppm	0
X14	Contact on level.	S16	0...10000	0...100,00 %	0
X15	Contact off level.	S16	0...10000	0...100,00 %	0
X16	Contact on level.	S16	0...30000	0...300000 Ω	0
X17	Contact off level.	S16	0...30000	0...300000 Ω	0
X18	Contact hold on time (seconds).	S16	0...59	0...59 s	0
X19	Contact hold on time (minutes).	S16	0...59	0...59 min	0
X20	Contact hold on time (hours).	S16	0...60	0...60 h	0
X21	Contact hold off time (seconds).	S16	0...59	0...59 s	0
X22	Contact hold off time (minutes).	S16	0...59	0...59 min	0
X23	Contact hold off time (hours).	S16	0...60	0...60 h	0
X24	Efficient control range min	S16	0...10000	0...100,00 %	0
X25	Efficient control range max	S16	0...10000	0...100,00 %	10000
X26	COV limit for voltage.	S16	1...5000	0,001...5,000 V	100
X27	COV limit for temperature.	S16	1...500	0,1. ....50,0 °C	5
X28	COV limit for humidity.	S16	1...5000	0,01...50,00 %	500
X29	COV limit for CO_2.	S16	1...1000	0...1000 ppm	50
X30	COV limit for resistance, high.	U16	1...15000	10...150000 Ω	50
X31	COV limit for resistance, low.	S16	1...1000	0,1...100,0 Ω	100
X32	Resistance high, minimum.	U16	0...30000	0...300000 Ω	0
X33	Resistance high, maximum.	U16	0...30000	0...300000 Ω	1000
X34	Resistance high, offset.	S16	-10000...10000	-100000...100000 Ω	0
X35	Input reaction time.	S16	0 - 1	0. Normal 1. Fast	0

9.3.3.4 Holding registers for outputs

Table reading instruction: The register numbers include an X in the middle. Replace the X with the output number you are adjusting.

Holding register	Parameter description	Data type	Values	Range	Default
1X00	Output type.	S16	0 - 1	0. Not in use 1. Analogue voltage	0
Registers 1X01...1X23 are not in use.					
1X24	Output voltage at 0 %.	S16	0...10000	0...10,000 V	0
1X25	Output voltage at 100 %.	S16	0...10000	0...10,000 V	10000
Registers 1X26...1X45 are not in use.					

Holding register	Parameter description	Data type	Values	Range	Default
1X46	Output source type.	S16	0 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12	0. BMS 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Wireless input 1 8. Wireless input 2 9. Wireless input 3 10. Wireless input 4 11. Wireless input 5 12. Wireless input 6	0
1X47	Output overdrive input.	S16	0 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12	0. Not in use 1. Input 1 2. Input 2 3. Input 3 4. Input 4 5. Input 5 6. Input 6 7. Wireless input 1 8. Wireless input 2 9. Wireless input 3 10. Wireless input 4 11. Wireless input 5 12. Wireless input 6	0

9.3.3.5 Holding registers for global COV settings

Holding register	Parameter description	Data type	Values	Range	Default
10793	Global COV value enabling bits.	Bit	bits 1...13	1. Register 49 enabled 2. Register 50 enabled 3. Register 51 enabled 4. Register 52 enabled 5. Register 53 enabled 6. Register 54 enabled 7. Register 55 enabled 8. Register 56 enabled 9. Register 57 enabled 10. Register 58 enabled 11. Register 59 enabled 12. Register 60 enabled 13. Register 61 enabled	0
10849	Global COV value for transmitter holding register 49 (temperature).	U16	0...65535	0...65535	0
10850	Global COV value for transmitter holding register 50 (humidity).	U16	0...65535	0...65535	0
10851	Global COV value for transmitter holding register 51 (CO_2).	U16	0...65535	0...65535	0
10852	Global COV value for transmitter holding register 52 (additional measurement 2).	U16	0...65535	0...65535	0
10853	Global COV value for transmitter holding register 53 (additional measurement 3).	U16	0...65535	0...65535	0
10854	Global COV value for transmitter holding register 54 (additional measurement 4).	U16	0...65535	0...65535	0
10855	Global COV value for transmitter holding register 55 (external measurement 1).	U16	0...65535	0...65535	0
10856	Global COV value for transmitter holding register 56 (external measurement 2).	U16	0...65535	0...65535	0
10857	Global COV value for transmitter holding register 57 (external measurement 3).	U16	0...65535	0...65535	0
10858	Global COV value for transmitter holding register 58 (external measurement 4).	U16	0...65535	0...65535	0
10859	Global COV value for transmitter holding register 59 (I2C value 1).	U16	0...65535	0...65535	0

Holding register	Parameter description	Data type	Values	Range	Default
10860	Global COV value for transmitter holding register 60 (I2C value 2).	U16	0...65535	0...65535	0
10861	Global COV value for transmitter holding register 61 (I2C value 3).	U16	0...65535	0...65535	0

9.3.3.6 Holding registers for global measurement COV values

Holding register	Parameter description	Data type	Values	Range	Default
10940	Global COV value for temperature.	U16	0...1000	0 = disabled, 0,1...100,0 °C	0
10941	Global COV value for humidity.	U16	0...5000	0 = disabled, 0,01...50,00 %rH	0
10942	Global COV value for CO_2.	S16	0...5000	0 = disabled, 1...5000 ppm	0
10943	Global COV value for voltage.	S16	0...5000	0 = disabled, 0,001...5,000 V	0
10944	Global COV value for current.	S16	0...10000	0 = disabled, 0,001...10,000 mA	0
10945	Global COV value for resistance (low).	S16	0...10000	0 = disabled, 0,1...1000,0 Ω	0
10946	Global COV value for resistance (high).	S16	0...15000	0 = disabled, 10...150000 Ω	0

9.3.3.7 Holding registers for common value over bus 1 configuration

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Holding register	Parameter description	Data type	Values	Range	Default
10910	Common value sending for all transmitters over the bus 1. If disabled, the transmitter specific VOB settings are used.	U16	0 - 1	0. Enabled 1. Disabled	0
10911	Value type over the bus 1.	U16	0 - 1 - 2 - ... - 12	See the list of available values from the chapter Available value over bus (VOB) value types on page 87.	0
10912	Value to send over the bus 1.	S16	-	-	0

9.3.3.8 Holding registers for common value over bus 2 configuration

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Holding register	Parameter description	Data type	Values	Range	Default
10913	Common value sending for all transmitters over the bus 2. If disabled, the transmitter specific VOB settings are used.	U16	0 - 1	0. Enabled 1. Disabled	0

Holding register	Parameter description	Data type	Values	Range	Default
10914	Value type over the bus 2.	U16	0 - 1 - 2 - ... - 12	See the list of available values from the chapter Available value over bus (VOB) value types on page 87.	0
10915	Value to send over the bus 2.	S16	-	-	0

9.3.3.9 Holding registers for common value over bus 3 configuration

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Holding register	Parameter description	Data type	Values	Range	Default
10916	Common value sending for all transmitters over the bus 3. If disabled, the transmitter specific VOB settings are used.	U16	0 - 1	0. Enabled 1. Disabled	0
10917	Value type over the bus 3.	U16	0 - 1 - 2 - ... - 12	See the list of available values from the chapter Available value over bus (VOB) value types on page 87.	0
10918	Value to send over the bus 3.	S16	-	-	0

9.3.3.10 Holding registers for common value over bus value scaling

Holding register	Parameter description	Data type	Values	Range	Default
10919	Scaling factor for common value over bus 1.	U16	0 - 1 - 2 - ... - 8	0. 1 1. 0.0001 2. 0.001 3. 0.01 4. 0.1 5. 10 6. 100 7. 1000 8. 10000	0
10920	Scaling factor for common value over bus 2.	U16	0 - 1 - 2 - ... - 8	0. 1 1. 0.0001 2. 0.001 3. 0.01 4. 0.1 5. 10 6. 100 7. 1000 8. 10000	0

Holding register	Parameter description	Data type	Values	Range	Default
10921	Scaling factor for common value over bus 3.	U16	0 - 1 - 2 - ... - 8	0. 1 1. 0.0001 2. 0.001 3. 0.01 4. 0.1 5. 10 6. 100 7. 1000 8. 10000	0

9.3.3.11 Holding registers for transmitter specific value over bus 1 configuration

NOTE **Note:** The transmitter specific value type must be the same for all transmitters.

Holding register	Parameter description	Data type	Values	Range	Default
11300	Transmitter value type, ID 1.	U16	0 - 1 - 2 - ... - 12	See the list of available values from the chapter Available value over bus (VOB) value types on page 87.	0
11301	Transmitter value type, ID 2.	U16	0 - 1 - 2 - ... - 12	See the list of available values from the chapter Available value over bus (VOB) value types on page 87.	0
...	...	...	...	...	
11399	Transmitter value type, ID 100.	U16	0 - 1 - 2 - ... - 12	See the list of available values from the chapter Available value over bus (VOB) value types on page 87.	0

9.3.3.12 Holding registers for transmitter specific value over bus 2 configuration

NOTE **Note:** The transmitter specific value type must be the same for all transmitters.

Holding register	Parameter description	Data type	Values	Range	Default
11400	Transmitter value type, ID 1.	U16	0 - 1 - 2 - ... - 12	See the list of available values from the chapter Available value over bus (VOB) value types on page 87.	0
11401	Transmitter value type, ID 2.	U16	0 - 1 - 2 - ... - 12	See the list of available values from the chapter Available value over bus (VOB) value types on page 87.	0
...	...	...	...	...	

Holding register	Parameter description	Data type	Values	Range	Default
11499	Transmitter value type, ID 100.	U16	0 - 1 - 2 - ... - 12	See the list of available values from the chapter Available value over bus (VOB) value types on page 87.	0

9.3.3.13 Holding registers for transmitter specific value over bus 1

The available values depend on the settings made in the chapter Holding registers for transmitter specific value over bus 1 configuration on page 86.

Holding register	Parameter description	Data type	Values	Range	Default
11600	Transmitter value to send over bus 1, ID 1.	S16	-	-	0
11601	Transmitter value to send over bus 1, ID 2.	S16	-	-	0
...	...	...	...	...	...
11699	Transmitter value to send over bus 1, ID 100.	S16	-	-	0

9.3.3.14 Holding registers for transmitter specific value over bus 2

The available values depend on the settings made in the chapter Holding registers for transmitter specific value over bus 2 configuration on page 86.

Holding register	Parameter description	Data type	Values	Range	Default
11700	Transmitter value to send over bus 2, ID 1.	S16	-	-	0
11701	Transmitter value to send over bus 2, ID 2.	S16	-	-	0
...	...	...	...	...	...
11799	Transmitter value to send over bus 2, ID 100.	S16	-	-	0

9.3.3.15 Available value over bus (VOB) value types

Register value	Value description	Data type	Values	Range
0	VOB is not in use.	-	-	-
1	Temperature	S16	-1000...1000	-100,0...100,0 °C
2	Humidity	S16	0...10000	0...100,00 %rH
3	CO_2	S16	0...10000	0...10000 ppm
8	Hot water consumption (Finnish)	S16	0...30000	0...30000 m^3 LV
9	Cold water consumption (Finnish)	S16	0...30000	0...30000 m^3 KV
11	Indoor temperature	S16	-1000...1000	-100,0...100,0 °C C_{IN}
12	Outdoor temperature	S16	-1000...1000	-100,0...100,0 °C C_{OUT}
13	Binary value.	S16	0 - 1	0 / 1

Register value	Value description	Data type	Values	Range
14	Hot water consumption (Finnish).	S16	0...65535	LV 0.0....6553.5 m^3
14	Hot water consumption (English).	S16	0...65535	HW 0.0. ..6553.5 m^3
15	Hot water consumption per day (Finnish).	S16	0...65535	LV 0.0....6553.5 m^3/ day
15	Hot water consumption per day (English).	S16	0...65535	HW 0.0. ..6553.5 m^3/ day
16	Hot water consumption per week (Finnish).	S16	0...65535	LV 0.0....6553.5 m^3/ week
16	Hot water consumption per week (English).	S16	0...65535	HW 0.0. ..6553.5 m^3/ week
17	Hot water consumption per month (Finnish).	S16	0...65535	LV 0.0....6553.5 m^3/ month
17	Hot water consumption per month (English).	S16	0...65535	HW 0.0. ..6553.5 m^3/ month
18	Cold water consumption (Finnish).	S16	0...65535	KV 0.0....6553.5 m^3
18	Cold water consumption (English).	S16	0...65535	CW 0.0. ..6553.5 m^3
19	Cold water consumption per day (Finnish).	S16	0...65535	KV 0.0. ..6553.5 m^3/ day
19	Cold water consumption per day (English).	S16	0...65535	CW 0.0. ..6553.5 m^3/ day
20	Cold water consumption per week (Finnish).	S16	0...65535	KV 0.0. ..6553.5 m^3/ week
20	Cold water consumption per week (English).	S16	0...65535	CW 0.0. ..6553.5 m^3/ week
21	Cold water consumption per month (Finnish).	S16	0...65535	KV 0.0. ..6553.5 m^3/ month
21	Cold water consumption per month (English).	S16	0...65535	CW 0.0. ..6553.5 m^3/ month
30	Energy consumption.	S16	0...65535	0.0. ..6553.5 kWh
31	Energy consumption per hour.	S16	0...65535	0.0. ..6553.5 kWh/ hour
32	Energy consumption per day.	S16	0...65535	0.0. ..6553.5 kWh/ day
33	Energy consumption per week.	S16	0...65535	0.0. ..6553.5 kWh/ week
34	Energy consumption per month.	S16	0...65535	0.0. ..6553.5 kWh/ month
35	Pressure.	S16	0...65535	0.0....6553.5 Pa
36	Pressure.	S16	0...65535	0.0....6553.5 kPa
37	Speed.	S16	0...65535	0.0. ..6553.5 m/s
38	Speed.	S16	0...65535	0.0. ..6553.5 km/h

9.3.3.16 Holding registers for measurement alarm limits

Holding register	Parameter description	Data type	Values	Range	Default
12000	Low temperature alarm limit.	S16	-1000...1000	-100,0...100,0 °C	0
12001	High temperature alarm limit.	S16	-1000...1000	-100,0...100,0 °C	0
12002	Low humidity alarm limit.	S16	0...10000	0...100,00 %rH	0
12003	High humidity alarm limit.	S16	0...10000	0...100,00 %rH	0
12004	Low CO_2 alarm limit.	S16	0...10000	0...10000 ppm	0
12005	High CO_2 alarm limit.	S16	0...10000	0...10000 ppm	0

9.3.3.17 Holding registers for temperature measurement stability

Holding register	Parameter description	Data type	Values	Range	Default
12050	Temperature stability calculation range low limit.	S16	-1000...1000	-100.0..100.0 °C	-1000
12051	Temperature stability calculation range high limit.	S16	-1000...1000	-100.0..100.0 °C	1000
12052	Stability calculation time frame.	U16	1...65535	1...65535 h	24

9.3.3.18 Holding registers for dew point alarms

Holding register	Parameter description	Data type	Values	Range	Default
12060	Dew point alarm, low limit.	U16	0...1000	0.0..100.0 °C	0
12061	Dew point alarm, high limit.	U16	0...1000	0.0..100.0 °C	0

9.3.3.19 Holding registers for wireless inputs

Table reading instruction: The register numbers include an X in the middle. Replace the X with the input number you are adjusting.

Holding register	Parameter description	Data type	Values	Range	Default
14X00	Selected transmitter.	S16	0...100	0 = Off, ID 1...100	0
14X01	Source value (transmitter register).	S16	0	0. Temperature 1. Humidity 2. Additional measurement 1 (CO_2) 3. Additional measurement 2 4. Additional measurement 3 5. Additional measurement 4 6. External input 1 7. External input 2 8. External input 3 9. External input 4 10. I2C value 1 11. I2C value 2 12. I2C value 3	0

Holding register	Parameter description	Data type	Values	Range	Default
14X02	Input overdrive status.	S16	0 - 1	0. Disabled 1. Enabled	0
14X03	Input overdrive value.	S16	0...10000	0...100,00 %	0
14X04	Minimum value.	S16	-32768...32767	-32768...32767	0
14X05	Maximum value.	S16	-32768...32767	-32768...32767	0
14X06	Value of input when the transmitter is offline.	S16	-1…10000	-1 = last known value, 0...100,00 %	0
14X07	Contact on value.	S16	0...10000	0...100,00 %	0
14X08	Contact off value.	S16	0...10000	0...100,00 %	0
14X09	Contact hold on time (seconds).	S16	0...59	0...59 s	0
14X10	Contact hold on time (minutes).	S16	0...59	0...59 min	0
14X11	Contact hold on time (hours).	S16	0...60	0...60 h	0
14X12	Contact hold off time (seconds).	S16	0...59	0...59 s	0
14X13	Contact hold off time (minutes).	S16	0...59	0...59 min	0
14X14	Contact hold off time (hours).	S16	0...60	0...60 h	0
14X15	Value type.	U16	0...65535	0...65535	0

9.3.3.20 Holding registers for measurement group settings

Table reading instruction: The register numbers include an X in the middle. Replace the X with the measurement group number (1...5) you are adjusting.

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Holding register	Parameter description	Data type	Values	Range	Default
12X00	Measured property.	U16	0 - 1 - 2 - 3	0. N/A 1. Temperature 2. Humidity 3. CO_2	0
12X01	Sensor mask.	U16	bits 0...11	0. Internal temperature 1. Internal humidity 2. Internal CO_2 3. Additional measurement 1 4. Additional measurement 2 5. Additional measurement 3 6. Additional measurement 4 7. Additional measurement 5 8. External input 1 9. External input 2 10. External input 3 11. External input 4	0
12X02	Transmitters that are included in the group, ID 1...16.	U16	bits 0...15	ID 1...16	0

Holding register	Parameter description	Data type	Values	Range	Default
12X03	Transmitters that are included in the group, ID 17...32.	U16	bits 0...15	ID 17...32	0
12X04	Transmitters that are included in the group, ID 33...48.	U16	bits 0...15	ID 33...48	0
12X05	Transmitters that are included in the group, ID 49...64.	U16	bits 0...15	ID 49...64	0
12X06	Transmitters that are included in the group, ID 65...80.	U16	bits 0...15	ID 65...80	0
12X07	Transmitters that are included in the group, ID 81...96.	U16	bits 0...15	ID 81...96	0
12X08	Transmitters that are included in the group, ID 97...100.	U16	bits 0...3	ID 97...100	0
12X09	Highest value used in the average calculation.	U16	-	-	0
12X10	Lowest value used in the average calculation.	U16	-	-	0

9.3.3.21 Holding registers for register grouping

Holding register	Parameter description	Data type	Values	Range	Default
18000	Register to be grouped, set 1. The selected Modbus address will be grouped from all transmitters to the input registers 18000. …18099.	U16	0...99	0...99 (Transmitter Modbus register number)	51
18001	Register to be grouped, set 2. The selected Modbus address will be grouped from all transmitters to the input registers 18100. …18199.	U16	0...99	0...99 (Transmitter Modbus register number)	52
18002	Register to be grouped, set 3. The selected Modbus address will be grouped from all transmitters to the input registers 18200. …18299.	U16	0...99	0...99 (Transmitter Modbus register number)	53
18003	Register to be grouped, set 4. The selected Modbus address will be grouped from all transmitters to the input registers 18300. …18399.	U16	0...99	0...99 (Transmitter Modbus register number)	54
18004	Register to be grouped, set 5. The selected Modbus address will be grouped from all transmitters to the input registers 18400. …18499.	U16	0...99	0...99 (Transmitter Modbus register number)	57
18005	Register to be grouped, set 6. The selected Modbus address will be grouped from all transmitters to the input registers 18500. …18599.	U16	0...99	0...99 (Transmitter Modbus register number)	58
18006	Register to be grouped, set 7. The selected Modbus address will be grouped from all transmitters to the input registers 18600. …18699.	U16	0...99	0...99 (Transmitter Modbus register number)	59
18007	Register to be grouped, set 8. The selected Modbus address will be grouped from all transmitters to the input registers 18700. …18799.	U16	0...99	0...99 (Transmitter Modbus register number)	60

Holding register	Parameter description	Data type	Values	Range	Default
18008	Register to be grouped, set 9. The selected Modbus address will be grouped from all transmitters to the input registers 18800. …18899.	U16	0...99	0...99 (Transmitter Modbus register number)	23
18009	Register to be grouped, set 10. The selected Modbus address will be grouped from all transmitters to the input registers 18900.….18999.	U16	0...99	0...99 (Transmitter Modbus register number)	24

9.3.4 Holding registers for wireless transmitters

9.3.4.1 Holding registers for transmitter user interface settings

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Holding register	Parameter description	Data type	Values	Range	Default
2XX27	Display brightness.	U16	0...10	0...10	5
2XX28	Display scrolling mode.	U16	0 - 1	0. Upper value scrolling, lower value is static 1. Lower value scrolling, upper value is static	0
2XX29	Static value selection.	U16	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 -15 - 16	1. Temperature 2. Humidity 3. Additional measurement 1 (CO_2) 4. Additional measurement 2 5. Additional measurement 3 6. Additional measurement 4 7. External input 1 8. External input 2 9. External input 3 10. External input 4 11. I2C value 1 12. I2C value 2 13. I2C value 3 14. Value over bus 1 15. Value over bus 2 16. Value over bus 3	1

Holding register	Parameter description	Data type	Values	Range	Default
2XX30	Scrolling value selection.	U16	bits 0...15	0. Temperature 1. Humidity 2. Additional measurement 1 (CO_2) 3. Additional measurement 2 4. Additional measurement 3 5. Additional measurement 4 6. External input 1 7. External input 2 8. External input 3 9. External input 4 10. I2C value 1 11. I2C value 2 12. I2C value 3 13. Value over bus 1 14. Value over bus 2 15. Value over bus 3	2
2XX31	Scrolling delay. Time to show each value on display. Affects also to display off delay. Display off delay = (number of items in scrolling value selection) * (display scrolling delay).	U16	1...30	1...30 s	10
Registers 2XX32...2XX35 are not in use.					
2XX36	Extra time increment step.	U16	0...65535	0...65535 s	1800
2XX37	Extra time maximum value.	U16	0...65535	0...65535 s	18000

9.3.4.2 Holding registers for transmitter measurement settings

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

Holding register	Parameter description	Data type	Values	Range	Default
2XX38	External input 1.	U16	0 - 1 - 2 - 3 - 4 - 5 - 6 - 7	0. Off 1. 0...10 V 2. 0...20 mA 3. Resistance x 0,1 4. Resistance x 10 5. NTC 10K 6. Pt1000 7. Contact	0
2XX39	External input 2.	U16	0 - 1 - 2 - 3 - 4 - 5 - 6	0. Off 1. 0...10 V 2. 0...20 mA 3. Resistance x 0,1 4. Resistance x 10 5. NTC 10K 6. Pt1000 7. Contact	0

Holding register	Parameter description	Data type	Values	Range	Default
2XX40	External input 3.	U16	0 - 1 - 2 - 3 - 4 - 5 - 6	0. Off 1. 0...10 V 2. 0...20 mA 3. Resistance x 0,1 4. Resistance x 10 5. NTC 10K 6. Pt1000 7. Contact	0
2XX41	External input 4.	U16	0 - 1 - 2 - 3 - 4 - 5 - 6	0. Off 1. 0...10 V 2. 0...20 mA 3. Resistance x 0,1 4. Resistance x 10 5. NTC 10K 6. Pt1000 7. Contact	0
2XX42	I2C input 1.	U16	0...65535	Upper 8 bits = I2C sensor type. Lower 8 bits = value selection (each known sensor has list of values that can be read)	0
2XX43	I2C input 2.	U16	0...65535	Upper 8 bits = I2C sensor type. Lower 8 bits = value selection (each known sensor has list of values that can be read)	0
2XX44	I2C input 3.	U16	0...65535	Upper 8 bits = I2C sensor type. Lower 8 bits = value selection (each known sensor has list of values that can be read)	0
2XX45	Automatic self-calibration of CO_2 measurement.	U16	0 - 1	0. Disabled 1. Enabled	1
2XX46	Occupancy detection delay.	U16	0 - 1 - 2	0. Instant detection 1. 3 minutes / 3 seconds 2. 6 minutes / 6 seconds The time unit can be selected with Configuration tool.	0
2XX47	Transmitter specific forced data update interval.	U16	0 / 30...65535	0 = function disabled, 30...65535 s	0

Holding register	Parameter description	Data type	Values	Range	Default
2XX48	Change of value (COV) selection.	Bit	bits 0...12	0. Temperature 1. Humidity 2. Additional measurement 1 (CO_2) 3. Additional measurement 2 4. Additional measurement 3 5. Additional measurement 4 6. External input 1 7. External input 2 8. External input 3 9. External input 4 10. I2C value 1 11. I2C value 2 12. I2C value 3	0

9.3.4.3 Holding registers for transmitter COV settings

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Holding register	Parameter description	Data type	Values	Range	Default
2XX49	COV limit for temperature.	S16	1...500	0,1...50,0 °C	5
2XX50	COV limit for humidity.	S16	1...5000	0,01...50,00 %rH	500
2XX51	COV limit for additional measurement 1 (CO_2).	-	-	-	0
2XX52	COV limit for additional measurement 2.	-	-	-	0
2XX53	COV limit for additional measurement 3.	-	-	-	0
2XX54	COV limit for additional measurement 4.	-	-	-	0
2XX55	COV limit for external measurement 1.	-	-	-	0
2XX56	COV limit for external measurement 2.	-	-	-	0
2XX57	COV limit for external measurement 3.	-	-	-	0
2XX58	COV limit for external measurement 4.	-	-	-	0
2XX59	COV limit for I2C value 1.	-	-	-	0
2XX60	COV limit for I2C value 2.	-	-	-	0
2XX61	COV limit for I2C value 3.	-	-	-	0

9.3.4.4 Holding registers for transmitter measurement tuning

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

NOTE **Note:** The values that are marked with "-" depend on the transmitters' properties.

Holding register	Parameter description	Data type	Values	Range	Default
2XX62	Temperature offset.	S16	-500...500	-50,0...50,0 °C	0
2XX63	Humidity offset.	S16	-5000...5000	-50,00...50,00 %rH	0
2XX64	Additional measurement 1 offset (CO_2).	-	-	-	0
2XX65	Additional measurement 2 offset.	-	-	-	0
2XX66	Additional measurement 3 offset.	-	-	-	0
2XX67	Additional measurement 4 offset.	-	-	-	0
2XX68	External measurement 1 offset.	-	-	-	0
2XX69	External measurement 2 offset.	-	-	-	0
2XX70	External measurement 3 offset.	-	-	-	0
2XX71	External measurement 4 offset.	-	-	-	0
2XX72	I2C value 1 offset.	-	-	-	0
2XX73	I2C value 2 offset.	-	-	-	0
2XX74	I2C value 3 offset.	-	-	-	0

9.3.4.5 Holding registers for transmitter occupancy settings

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

Holding register	Parameter description	Data type	Values	Range	Default
2XX90	Occupancy detection off delay. The occupancy detection on delay is set with the Modbus register 2XX46.	U16	0 - 1 - 2 - 3 - 4 - 5	0. 5 min / 5 s 1. 15 min / 15 s 2. 30 min / 30 s 3. 60 min / 60 s 4. 90 min / 90 s 5. 120 min / 120 s The time unit can be selected with Configuration tool.	0

9.3.4.6 Holding registers for advanced setpoint knob settings

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

Holding register	Parameter description	Data type	Values	Range	Default
2XX91	Temperature setpoint.	S16	-999...999	-99,9...99,9 °C	210
2XX92	Temperature deviation setpoint.	S16	-999...999	-99,9...99,9 °C	10

Holding register	Parameter description	Data type	Values	Range	Default
2XX93	Fan speed setting.	U16	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14	1. Speed 1 2. Speed 2 3. Speed 3 4. Speed 4 5. Speed 5 6. Speed 6 7. N/A 8. N/A 9. N/A 10. Off 11. On 12. Eco 13. Day 14. Night	10
2XX94	Not in use.	U16	-	-	1
2XX95	Percentage setpoint.	U16	0...10000	0...100,00 %	0
2XX96	CO_2 setpoint.	U16	0...10000	0...10000	500

9.3.4.7 Holding registers for transmitter specific measurement update interval

Table reading instruction: The register numbers include an XX in the middle. Replace the XX with the transmitter ID - 1 value. For example, a transmitter with the ID 6: XX = 05.

Holding register	Parameter description	Data type	Values	Range	Default
2XX97	Transmitter specific measurement update interval.	S16	0 / 30...65535	0 = function disabled, 30...65535 s	0