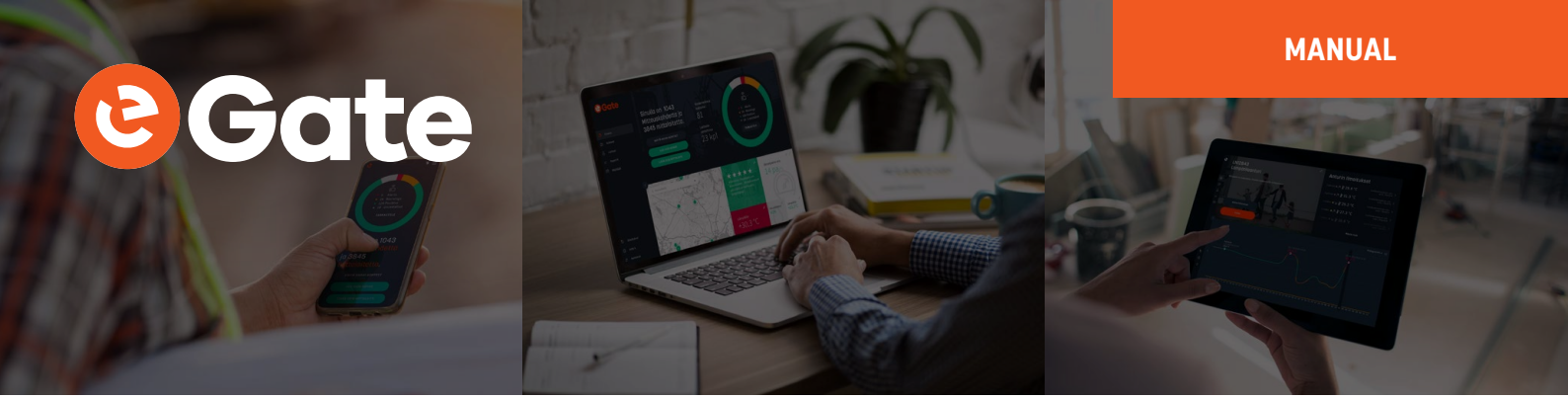
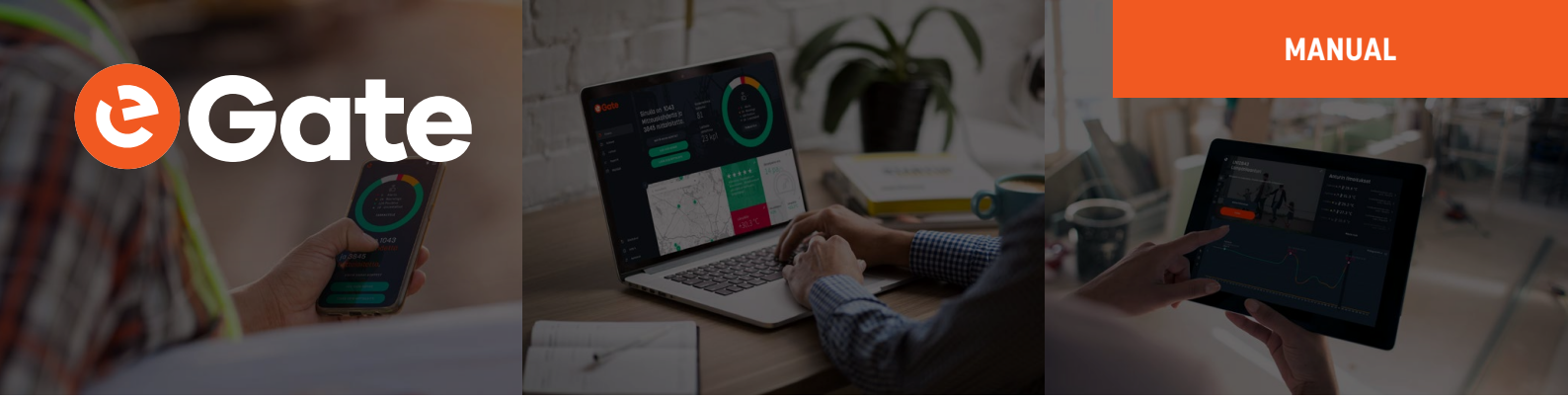


MANUAL

eGate-Flex-T-RH
eGate-Flex-Sky-nSens

Modular wireless transmitters

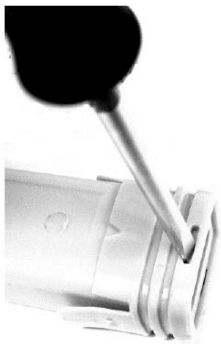


Installation

Opening the measurement module

Opening the module is necessary only for replacing the battery and for wiring the internal connector.

- Detach the measurement module from the radio module.
- Use a large flat-bladed screwdriver to push the measurement module cover off via the rectangular hole (see picture).
- Pull the circuit board out.
- Assemble reversely, taking care that the circuit board sits on the grooves.



Wiring

The wiring of the sensor connector is described in the chapter for each module, where applicable.

Configuring

Configure the device per page 3 and per the chapters for your modules.

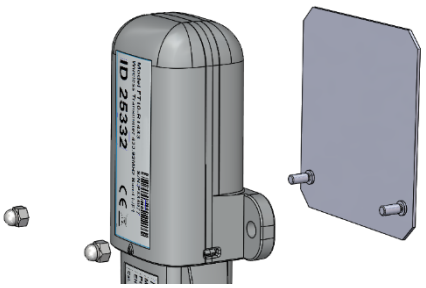
Mounting

Select a good place for the transmitter, avoiding metal surfaces near the radio module.

Fasten the radio module to a surface either with a double-sided tape or with two screws 50 mm apart. The maximum diameter of the screws is 4.5 mm.

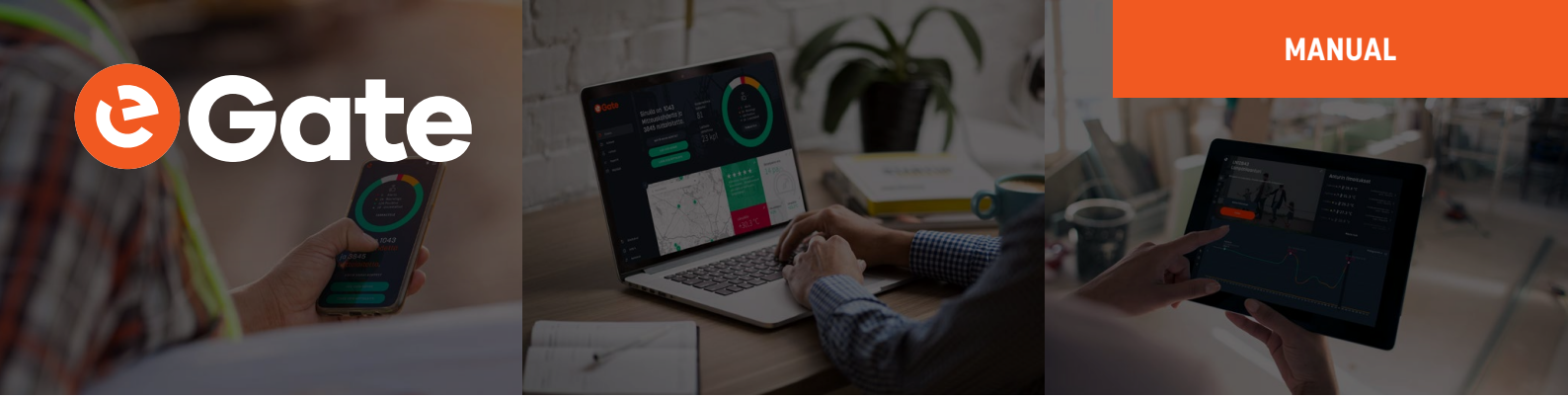
Alternatively, use a mounting plate available separately.

If not already, join the two modules.



Using with eGate

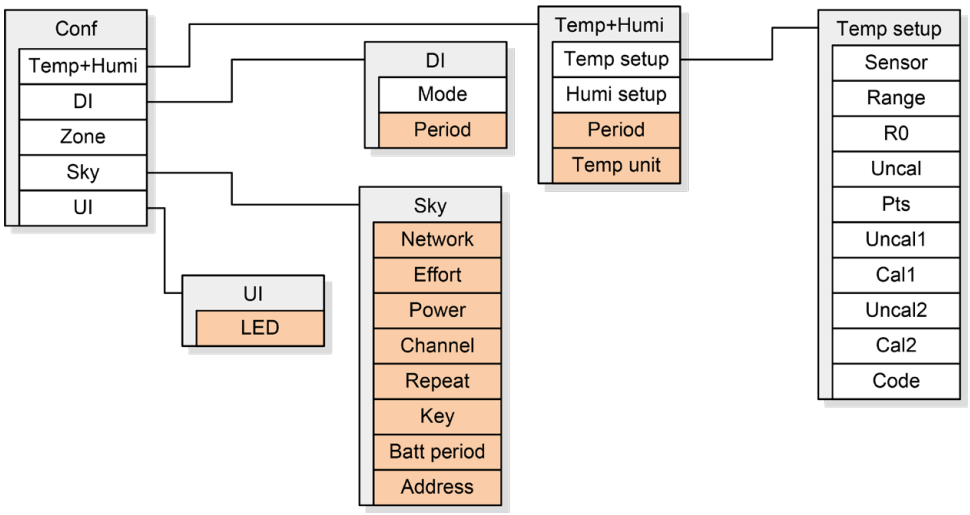
The device sends the measurement data with its radio network address using the channels as described in the measurement module chapters. A compatible gateway is needed.



Configuration

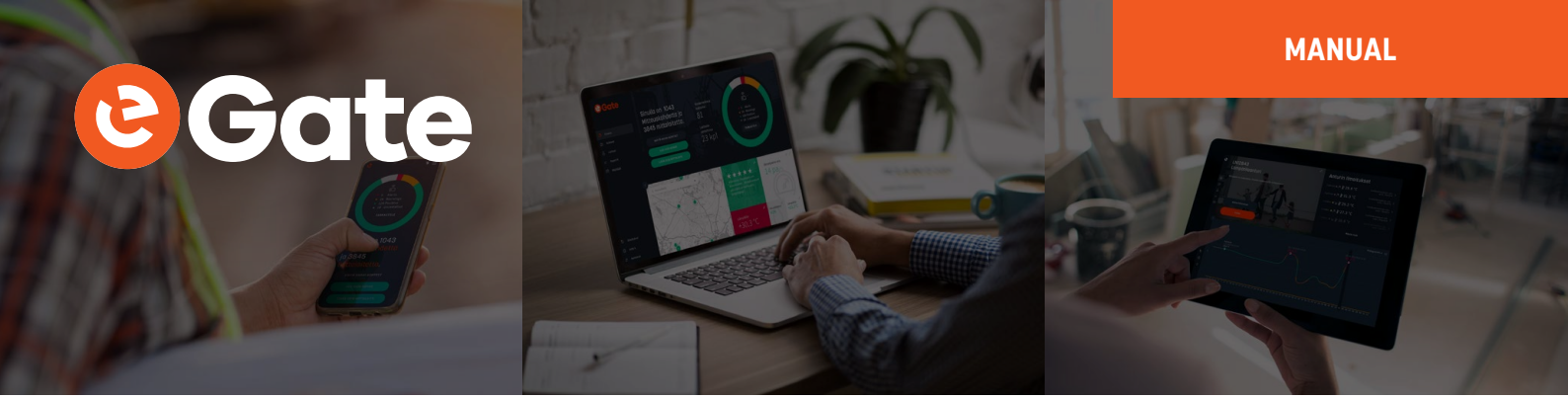
Configuration means adjusting the settings like the measurement interval, the wireless network settings, or the measurement settings. To view and change them:

1. If the measurement module was not recently connected to a radio module, connect it for a couple of seconds (until the LED inside shines). A part of the settings is stored in the radio module, namely the ones shaded in orange in the picture below. Now the measurement module can read the settings to its memory. The purpose of storing some settings in the radio module is to allow replacing the measurement module with a fresh recalibrated unit, still using the settings optimized for the local application.
2. Detach the modules.
3. Connect a Nokeval DCS772 programming cable to the 3.5 mm jack in the measurement module.
4. Launch the Nokeval Mekuwin software (freely downloadable from http://www.nokeval.com/). Select your DCS772 from the list, then select Protocol=SCL, Baud=9600, Address=0, and click Direct. A new window should open, showing the settings as a tree.
5. Adjust the settings, and finally click Save to EEPROM. The settings that are stored in the measurement module are now written to the non-volatile EEPROM memory. In addition, the settings that are to be stored in the radio module, are temporarily stored in the measurement module, and a flag is set to write the settings to their final location.
6. (If there is no menu visible but a text “Connect radio for a moment”, something went wrong. Repeat from step 1.)
7. Close the Mekuwin connection.
8. Disconnect the 3.5 mm plug.
9. Join the modules. Now that the flag is set, the settings are written to the radio module EEPROM.



The exact contents of the menu depend on the module types. Some general guidelines:

- The **Temp+Humi** and **Inputs** menus contain sensor input related settings. See the relevant measurement module chapter in this manual.
- The **Zone** and **Sky** menus contain radio related settings. See the radio module chapters in this manual.
- The **UI** menu contains one setting: whether to blink the indicator **LED** light or not. It is recommended to keep the light on as it will help in troubleshooting. It can be turned off for maximal battery savings or for a discreet operation.



eGate-Flex-T and eGate-Flex-T-RH modules

Wiring

The T and T-RH modules have no external connections as they measure the ambient air. The temperature sensor is located inside the enclosure, at the bottom end. The humidity sensor is inside a protruding sintered filter.

Temp+Humi configuration menu

Temp setup and Humi setup submenus: These are for selecting the temperature sensor type and for tuning the reading. For the -T and -T-RH models, these menus contain the factory calibration (fine tuning) and should not be accessed unless recalibrating the transmitter. Please note that if the Sensor setting in the Temp setup menu is set to Humi, then the temperature reading is obtained from the humidity sensor instead of the internal RTD. When the temperature (and humidity) have been factory calibrated, the corresponding submenu will be password protected to prevent further adjustment.

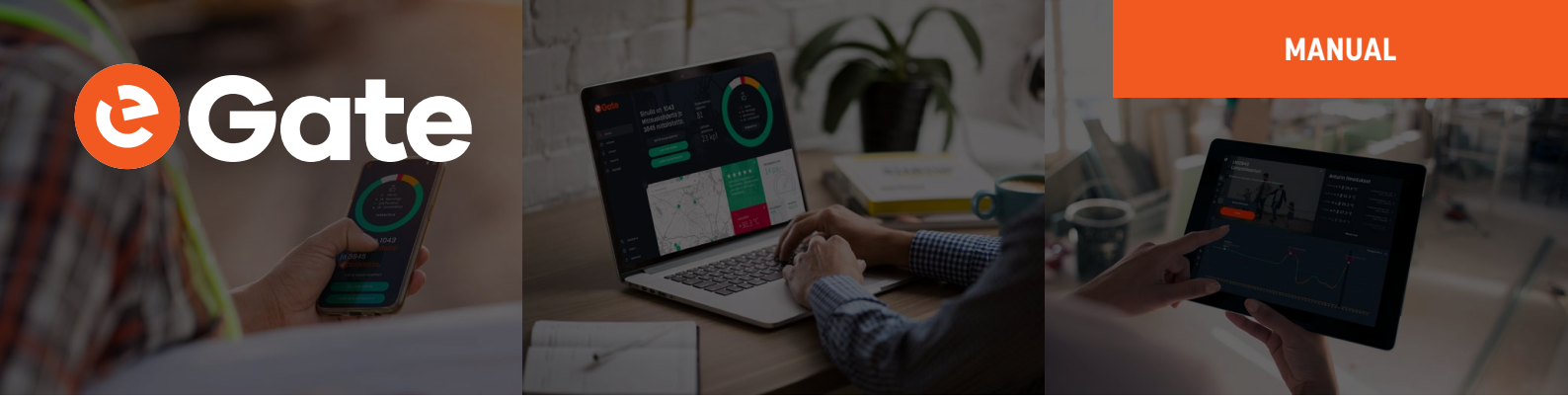
Period: Select the temperature measurement interval in seconds. 60…300 seconds is a good range for most tasks. An unnecessarily short interval will consume the battery and the radio band.

Temp unit: Select the temperature unit °C or °F.

Output

The radio sends the measurement data using the channels as follows:

Channel	Physical quantity	Unit
1	Temperature	°C or °F
2	Relative humidity (T-RH only)	%RH
3	Battery status (not with FT10 radio)	%
4	Neighbors (not with FT10 radio)	pcs



eGate-Flex-nSens module

Sensor probe

The measurement module accepts a eGate-nSens-HT-ENS or an eGate-nSens-HT-CSS humidity and temperature probe. For that, the measurement module has a three-pole female connector. The nSens probe can be attached directly to the measurement module, or an up to 2 m extension cable used in between.

The nSens probe must have a firmware 2.00 or newer. Otherwise it will not work at all. It is beneficial tho have a nSens hardware version 2.00 or newer, otherwise the current consumption will be much greater.

The probe contains the calibration data of its own. Replacing the probe with a recalibrated one will restore the accuracy. Please still consider replacing the battery too. To adjust the nSens calibration, use tools provided by nSens, the details falling outside the scope of this manual.

Temp+Humi configuration menu

Temp setup and Humi setup submenus: These are for selecting the temperature sensor type and for tuning the reading. As the nSens probe is very accurate and has calibration options of its own (via nSens' tools), it is not recommended to adjust the readings here. Both the Pts settings should have a value of 0 meaning no adjustment.

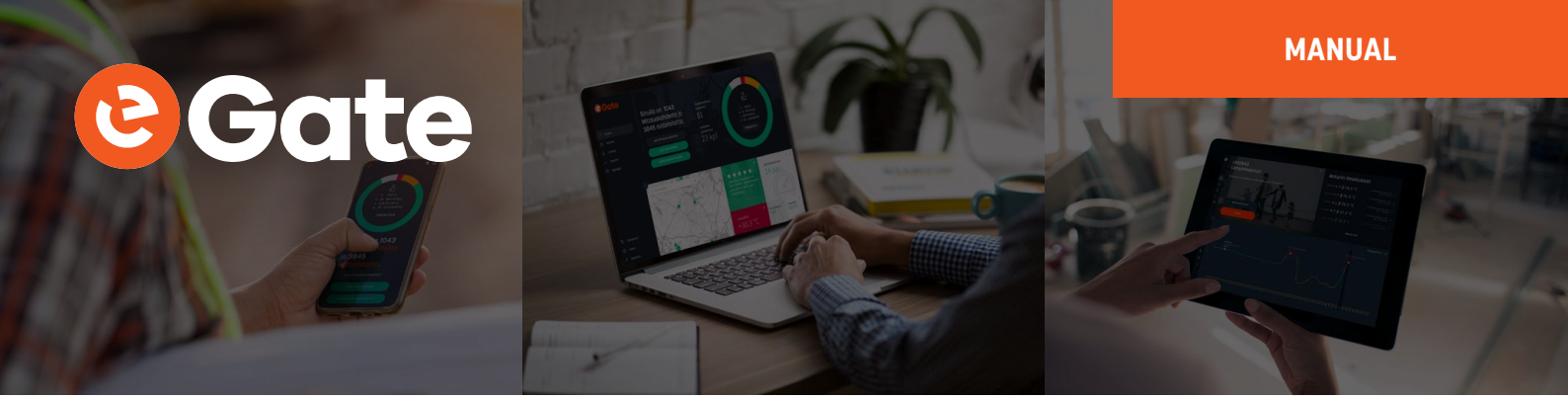
Period: Select the temperature measurement interval in seconds. 60…300 seconds is a good range for most tasks. A short interval will consume the battery and the radio band.

Temp unit: Select the temperature unit °C or °F.

Output

The radio sends the measurement data using the channels as follows:

Channel	Physical quantity	Unit
1	Temperature	°C or °F
2	Relative humidity	%RH
3	Battery status (not with FT10 radio)	%
4	Neighbors (not with FT10 radio)	pcs



Flex-Sky-Radio module

By equipping any of the Flex measurement module with an eGate-Flex-Sky-Radio module, it can be used with the other Sky devices, e.g. the eGate-Flex-Sky-Link-RS485 receiver. The measurement module must have a firmware 2.1 or newer.

About Sky

The Sky devices use the Semtech LoRa modulation technique that allows unforeseen wireless range in a battery powered transmitter. The protocol used is defined by Nokeval, called NLORA1, which means that the Sky devices are not compatible with the LoRaWAN infrastructure.

The modulation has some parameters to define its operation. With “maximal” settings, a very long range can be reached, but at the expense of high battery and radio band consumption. One radio transmission can last approx. 2 seconds (compared to 20 ms of the MTR series). This means that the number of transmitters within the range must be limited in order to avoid collisions and to allow radio time for each. It is not practical to use a short interval between transmissions; 10 to 30 minutes is the recommended interval range.

When the maximal range is not necessary, the parameters must be adjusted for lower battery and band consumption. All the devices within one network must share the parameters, because the receiver can only listen with one set of parameters at a time. Consequently the parameters must be selected according to the most distant device. It is also possible to adjust the transmission power. The devices that are closer to the receiver can use a lower power setting.

Before using the 433 MHz radio, make sure it is legal in your country.

The antenna is typically mounted directly on the radio module, but it is also possible to use an extension cable. The supplied antenna should be used. Using any directional antenna is illegal. The gain must not exceed 2.5 dBi.

Sky configuration menu

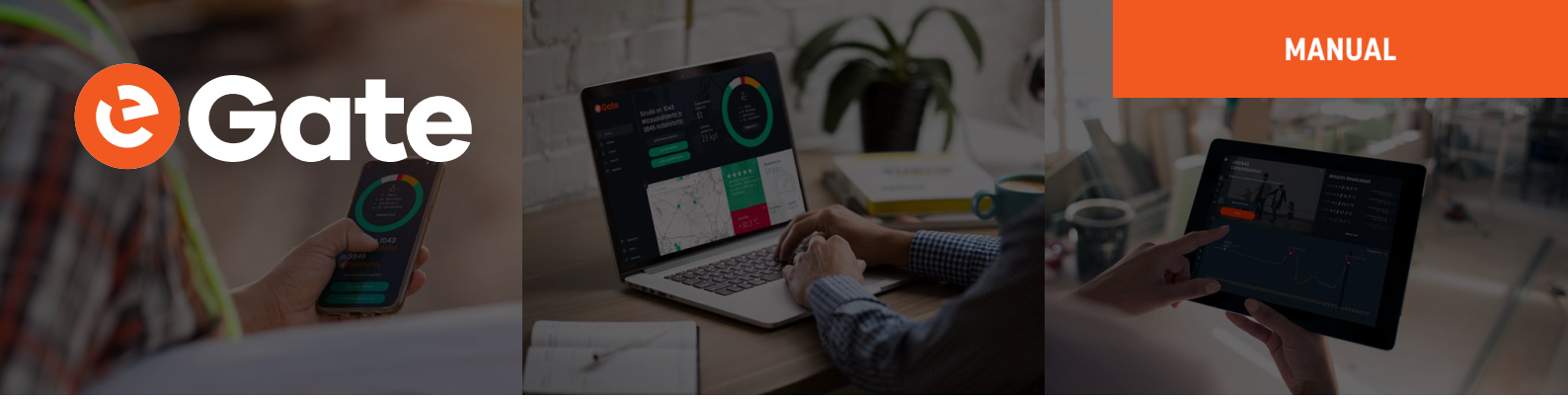
The Sky menu contains the settings for the wireless network. After changing the settings, close the Mekuwin session, disconnect the programming cable and attach the radio module. Wait until the indicator in the measurement module lights for a moment. The configured settings will be loaded to the radio module on the first attachment but not on the subsequent attachments unless they are changed again.

Furthermore, if another radio module is connected to the measurement module, the measurement module will read the wireless settings to its memory so that they are visible in the configuration menu on the next Mekuwin session.

Network: To prevent mixing the different networks (and users) data, the network address should be set to some value not used nearby. In most cases a random value 1 to 255 is OK. All the devices within one network must share the value. The receiver will only accept packets that have the matching network address. Default 1.

Effort: The modulation effort. The bigger value, the longer range but the more battery and radio band consumption. This single setting controls the LoRa bandwidth and spreading parameters as in the table below. Increasing the effort one step will coarsely add 2.5 dB in the link budget, or 30% of open-space range, but also double the battery consumption caused by the radio.

The range estimates are only estimates, the real range depends heavily on objects on the radio path. Especially metal walls will severely attenuate radio waves.



Effort setting	Bandwidth	Spreading factor	Estimated indoor range 40…35 dB/decade	Estimated outdoor range 30 dB/decade
1	250 kHz	7	110...310 m	1300 m
2	250 kHz	8	120...370 m	1600 m
3	250 kHz	9	140...440 m	2000 m
4	250 kHz	10	160...520 m	2400 m
5	250 kHz	11	190...610 m	2900 m
6	250 kHz	12	220...720 m	3500 m
7	125 kHz	12	260...870 m	4400 m

The default Effort is 4, which is good for many tasks.

The Effort setting can be set to Custom position; then it is possible to set the bandwidth and spreading parameters independently, as well as adjust the frequency steplessly within 433.3 to 434.5 MHz. Normally this should not be necessary.

Power: The transmission power; 10 means the maximum power (the value is approximately in dBm). A lower value should be selected to conserve battery and to avoid disturbing other users of the band whenever possible. However this setting will not affect the battery consumption as much as the Effort setting, which means that the first mean to lower the battery consumption should be lowering the effort if possible.

Channel: The radio frequency channel. If several LoRa/Sky networks exists within the same area, a different frequency should be selected for each network. The radio frequency is 433.3 + 0.2 MHz * (channel-1), i.e. the first channel is 433.3 MHz, second 433.5 etc. When using bandwidth of 250 kHz, the nearby networks (systems) should have channels of at least two steps apart, e.g. 1 and 3 to avoid overlap. The channel 4 uses 433.9 MHz which is the most crowded frequency on this band, so it should be avoided.

Key: An authentication and encryption key for the radio. If an authentication is not desired, leave this blank. Then it is quite easy to eavesdrop and disrupt the radio traffic. To get a secured operation, enter any text string (up to 16 characters). Use the same key in the receiver, and consequently in all the other transmitters.

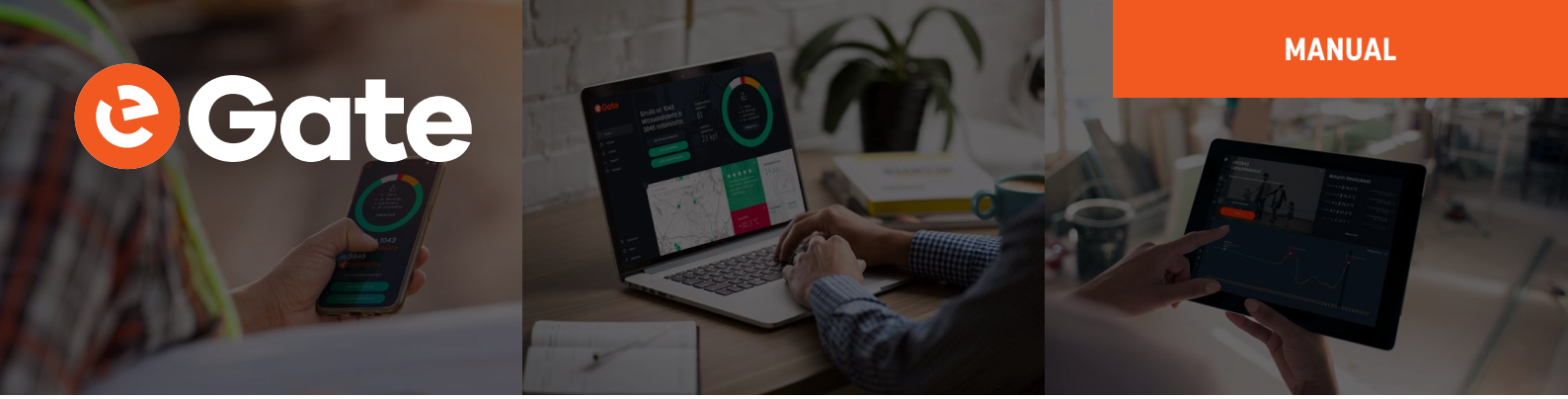
Acknowledge: Defines if the transmitter requests an acknowledge from the receiver, and retransmits when the acknowledge fails. This increases reliability but consumes more current. Use this when a regular throughput is desired. Do not use if it is ok to lose some packets now and then. This feature is not available yet.

Destination: Available only when acknowledgement is used. This is the address of the receiver that is supposed to acknowledge. The network may have several receivers, and it is not desirable that all of them acknowledge.

Repeat: How many times a radio packet is transmitted. Normally this should be 1, but it is possible to repeat each packet for increased reliability, at the cost of battery consumption.

Battery period: If set to non-zero value, this transmitter will transmit its battery status and number of network neighbors similarly to the measurement readings. Please note that the battery status value is very coarse as explained on the page 8.

Address: The address of the last connected radio module. Can't be changed here.



Maintenance

Battery

When the battery is about to die (reported state below 20%), replace it:

- Open the measurement module as described on page 2.
- Replace the battery with a new battery, according to the type marked on the circuit board. Note the polarity as marked on the circuit board.
- Assemble the device.
- Properly dispose of the used battery observing the local regulations.

Note regarding the nSens device battery: To view technical specifications or order replacement batteries (EVE ER14505), please visit the TME online store: https://www.tme.eu/en/details/eve-er14505_phr-2/batteries/eve-battery/er14505-phr-2/.

Recalibration

It is recommended to recalibrate the measurement module every two years. Detach the measurement module and send it for recalibration. Alternatively obtain a recalibrated module, exchange it to the radio module, and send the old module for recalibration. Normally the recalibration includes replacing the battery.

The calibration certificate for the measurement module can be downloaded from www.nokeval.com.

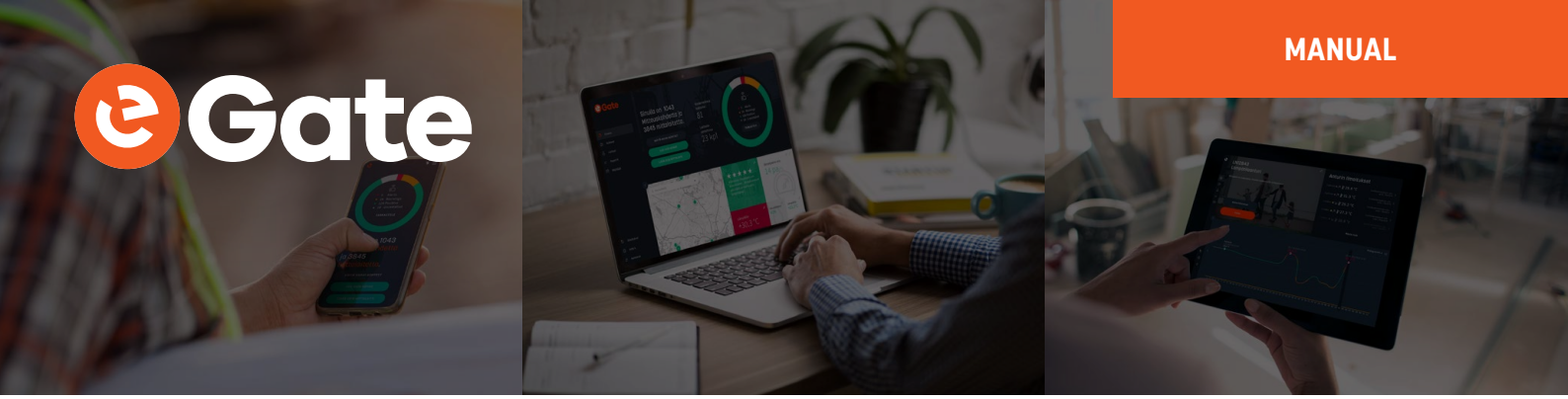
The nSens model is an exception. As the calibration data is stored in the nSens probe, it is sufficient to recalibrate the probe only. However for replacing the battery, it may be convenient to send the measurement module to be serviced too.

Cleaning

The enclosure exterior can be wiped with a damp cloth soaked in soapy water or isopropyl alcohol, except that it is not allowed to wipe the humidity probes of the -T-RH and -nSens models. The filters of the humidity probes can be manually screwed off, cleaned, dried, and reattached.

Storage

If the device is not used for a while, detach the modules to stop the measurements and radio transmissions and store the halves in a dry place. For longer storage, remove the battery.



Troubleshooting

If there is a suspicion of the proper operation, first check the indicator light. It blinks every 30 seconds through the bottom right side of the enclosure, unless it has been disabled in the configuration menu.

- One blink: everything OK.
- Two blinks: Battery low, please replace soon (page 8).
- Three blinks: Radio error. Try reconfiguring the radio parameters. If it doesn't help, send the device for service.
- Four blinks: Network error. No connection to a gateway. Check that the gateway is operating. Check that the distance to the gateway or Zone neighbor devices is not too long. Check that the radio settings correspond to the other devices in the network.
- Five blinks: Humidity probe error. For nSens model, make sure a sensor has been connected, and it has a firmware 2.00 or newer. Send the device for service.
- Six blinks: A/D converter error. Send the device for service.
- Seven blinks: Pt100 error; internal Pt100 in the -T model, external in the -CS and -ES models. Check the external sensor.
- Eight blinks: Configuration settings not available. Re-configure the settings.
- Nine blinks: Factory calibration data not available. Send the device for service.
- Not blinking at all: Make sure you have the two modules connected – the indicator will not blink when separated. Check the battery (page 8) with a multimeter, it should have 3.3 to 3.7 V. If in doubt, replace it anyway. Please note that it is possible to turn the indicator off in the settings.
- Irregular or very fast blinking: Battery too low for operation.

If the measurement reading is incorrect, check the sensor and its connections. If it didn't help, connect to the device with the programming cable and Mekuwin as described on the page 2. Check all the settings, and use the Mon(itor) menu to check the readings.

If there are problems connecting with the programming cable, check that the indicator light is constantly on when the cable is plugged in the jack. If not, replace the battery and try again.