

# OPERATING MANUAL



Elsys Room Sensor. ERS, ERS-lite, ERS-CO<sub>2</sub>, ERS-Sound

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## Description

Elsys room sensor (ERS) is a universal indoor climate sensor for LoRaWAN™ wireless network. The sensor measures temperature, humidity, light intensity\*, Co2\*, sound level and detects motion\*. Elsys room sensor is a battery powered device and designed to be installed quickly and easily. The motion sensor can be used for presence monitoring systems. All Elsys sensors are equipped with NFC (Near Field Communication) and can be easily configured from a smartphone.

## Main features of Elsys Room Sensor

- Compatible with LoRaWAN™ specification
- Measures ambient temperature
- Measures ambient humidity
- Measures ambient Co2
- Measures light intensity
- Detects motion using a passive IR sensor
- Measures sound level
- Easy installation
- Easy configuration
- May be installed on wall or any surface
- Battery powered
- Long range
- Configurable over NFC
- Configurable over the air
- 10 years batty life\*\*
- Supports US902-928, EU863-870, AS923, AU915-928, KR920-923

\* Depends on ERS model (ERS-light, ERS, ERS-Co2, ERS-Sound).

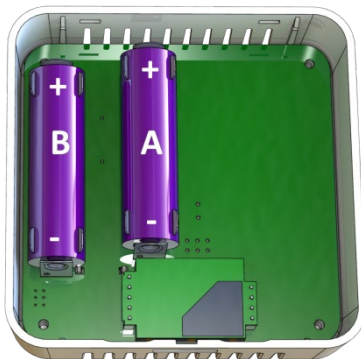
\*\* Depending on interval

## Installation

1. Remove the back panel of the sensor with a small screwdriver.



2. Install the batteries. The ERS requires one or two AA batteries. The battery type is **3.6V** Lithium Battery (ER14505). You can use one battery. For the ERS-CO<sub>2</sub> and ERS-Sound we recommend two batteries to get maximum operation time. Use battery slot A if only one battery is used.



3. Mount the pack panel on the wall using some of the six mounting holes.



4. Attach the sensor part to the back panel.



 **CAUTION**

Using batteries other than specified may result in explosion.  
Dispose of properly, observing environmental protection rules.

## Sensor configuration

All sensor settings can be configured via smartphone and Android application with NFC (Near field communication) or over the air via the network server and downlink data to the sensor. Sampling rate, spreading factor, encryption keys, port and modes can be changed. All sensor settings can be locked from the server or NFC and end users cannot read or change settings on the sensor.

## Android application

1. Download Elsys “Sensor Settings” application from Google Play Store and install it on an Android smartphone or tablet. The device must support NFC.
2. Enable NFC on the device and start the application.
3. Place your Android device on top of the NFC antenna on the sensor.



4. Remove the Android device from the sensor when the data has been updated.
5. See the help in the application for more information

## Sensor settings parameter's

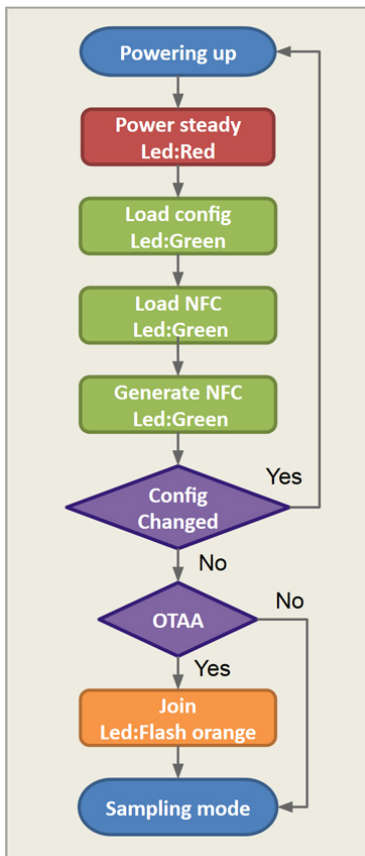
SplPer	The main time base for the sensor. This is the interval for the sensor to wake up and sample data.
PirCfg	Configuration for the motion detector. Off: PIR sensor is off Trigger: Sensor sends package on motion Count: Sensor counts motions events between two transmissions
TempPer	Temperature sample period. Value * Timebase= Sample time. Most of the time its easiest to use 1 as period and only change time base
PirPer	Value * Timebase= PIR sample time.
SendPer	Value * Timebase= Send time.
VddPer	Value * Timebase= Voltage sample time.
LightPer	Value * Timebase= Light sample time.
AppEui	Application ID (8bytes or 16 hex digits)
AppKey	Application unique key (16bytes or 32hex digits)
Ota	Join mode, "over the air activation" or "personalization". Value:true or false
DevEui	Unique ID of the sensor (8bytes or 16 hex digits)
AppSKey	Application session key.

	Application unique session key(16bytes or 32hex digits) (this is only valid if not using OTA)
NwkSKey	Network session key. Network unique session key(16bytes or 32hex digits) (this is only valid if not using OTA)
DrDef	Default data rate for the sensor. DR0→DR5
DrMax	Minimum data rate for the sensor. DR0→DR5.
DrMin	Maximum data rate for the sensor. DR0→DR (If datarate min, max, def is the same then server can't change sensor data rate)
Port	LoRa communication port
Co2Cfg	Calibrate CO2 sensor if parameter is 1. The sensor must be in fresh air (outside)
Lock	Locks or unlocks sensor settings. 0 = unlocked, anything else will lock the sensor until the same code is entered again
Plan	Active channel plan
Plans	Supported channel plans(read-only)
Subband	Channel plan subband (hybrid modes) 0 = 0-7, 1 = 8-15, etc.
Qsize	Sample queue size 0-10
Qoffset	Include offset bytes (0,1)
Qpurge	Purge sent samples from queue (0,1)

## Sensor application

### Sensor startup

When the sensor starts up it loads configuration from the internal memory and merge it with user configuration. When the configuration is done the sensor writes the new configuration to the NFC chip. The sensor always writes new configurations to the NFC chip when something changes in the sensor or if NFC data is corrupted by a NFC writer or phone. The sensor always writes new configuration to NFC chip at startup. When configuration is done the sensor tries to join the network if OTAA (Over The Air Activation) is enabled. The sensor led flashes orange when it tries to join a network. The sensor tries to join the network every 10 second and increases the join timer at every failed attempt by 10%, up to maximum 1 hour. After startup, configuration and join the sensor enters sampling mode.

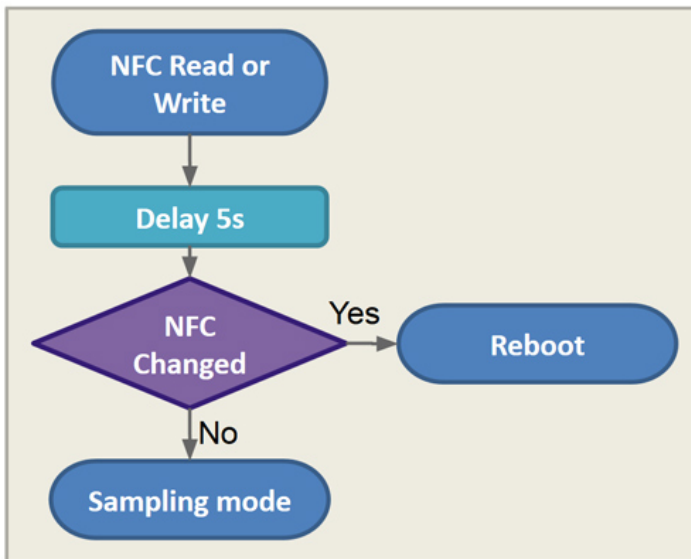


chip when something changes in the sensor or if NFC data is corrupted by a NFC writer or phone. The sensor always writes new configuration to NFC chip at startup. When configuration is done the sensor tries to join the network if OTAA (Over The Air Activation) is enabled. The sensor led flashes orange when it tries to join a network. The sensor tries to join the network every 10 second and increases the join timer at every failed attempt by 10%, up to maximum 1 hour. After startup, configuration and join the sensor enters sampling mode.

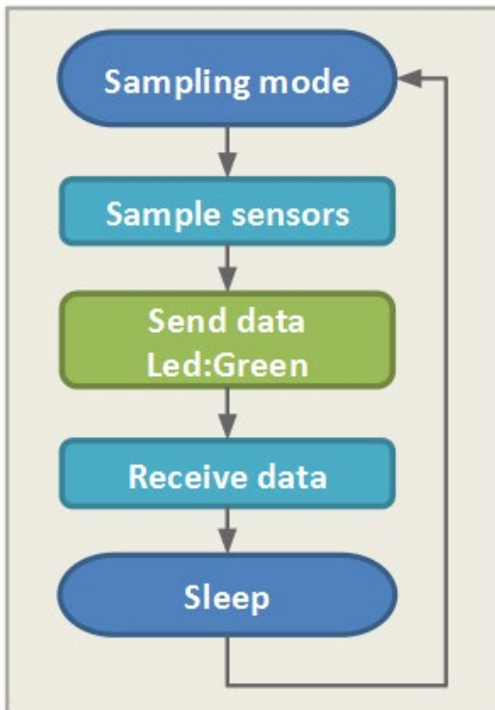


## NFC read/write

When reading or writing NFC configuration data to the sensor it starts a timer and delays its action x seconds. It delays its action because of the bad connection that can be in NFC communication. Types of bad connection can be distance, location or rapid movement. After the delay the sensor determines if the NFC data has changed or not. If the data has change the sensor reboots and starts from power up. When writing data to the sensor try to get the best connectivity as possibly. Locate the NFC antenna of the phone and sensor. Keep the 2 devices as close as possible and don't move them while writing or reading. When you have written data to the sensor, let the sensor reboot and restart before trying to write again. You can always validate your settings by reading the NFC data after the sensor has restarted.



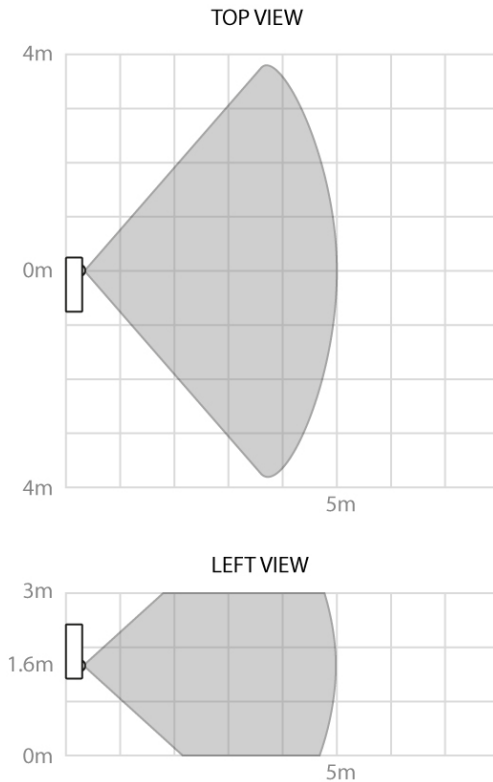
## Sampling mode



## Motion detector

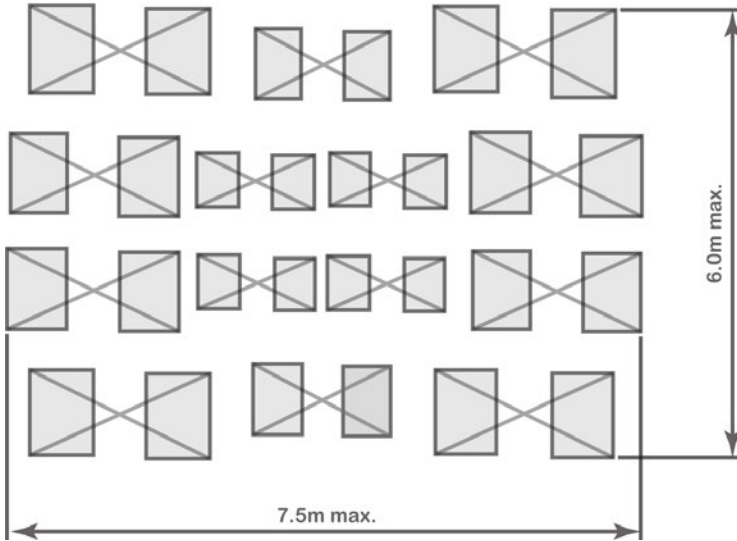
### Detection range

Detection range of the Motion Sensor is shown below. Actual range of the sensor can be influenced by environmental conditions. Avoid installing the sensor in areas where it will face direct or reflected sunlight. Avoid installing near windows, air conditioning or heating vents.



## Detection pattern

Detection pattern of the motion sensor is shown below.



## Specification

Power supply:	3.6V DC
Battery type:	AA 14505
EU directives compliance:	
Radio protocol:	LoRaWAN™
Radio frequency band:	US902-928, EU863-870, AS923, AU915-928, KR920-923
Range:	8km (SF10 868Mhz, depending on terrain and building structure)
Recommended installation height:	1.6M
Operating temperature	0-40°C
Temperature range	0-40°C
Temperature resolution	0.1°C
Temperature accuracy	± 0.5°C
Humidity range	0-100%
Humidity resolution	0.1%rh
Humidity accuracy	±2%rh
CO <sub>2</sub> range	0 - 2000ppm
CO <sub>2</sub> noise	14 ppm @ 400 ppm 25 ppm @ 1000 ppm
CO <sub>2</sub> accuracy	±50ppm ±3% of reading
Light range	4-2000 Lux
Light resolution	1 Lux
Light accuracy	±10 Lux
Sound range, mean value	35-70 dBspl
Sound range, peak value	65-99 dBspl
Sound resolution	1 dB
Sound accuracy	+ - 5 dB
Dimensions	86x86x28mm
Battery life	Up to 10 years (depends on settings)

## Regulations

### Legal Notices

All information, including, but not limited to, information regarding the features, functionality, and/or other product specification are subject to change without notice. Elsys reserves all rights to revise or update its products, software, or documentation without any obligation to notify any individual or entity. Elsys and Elsys logo are trademarks of Elektroniksystem I Umeå AB. All other brands and product names referred to herein are trademarks of their respective holders.

### Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

-- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### Non-modifications Statement:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

### Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

### Industry Canada Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

## Declaration of conformity

Hereby, Elektroniksystem I Umeå AB declares that Elsys Room Sensor is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

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