SENSING LABS

SenlabH

THY-LAB-xxNS©

FIRMWARE VERSIONS 1.2.X / 1.3.X

User guide

SENSING-LABS

VERSION 02 – REV H / JUNE 2018

Table of contents

Thank you for your choosing our Senlab product!
We hope you will find the instructions on this user manual clear and easy to follow.

General overview

The Senlab THY (SenlabH) sensor is a smart LoRaWAN™ radio device with a high precision temperature/humidity sensor (see table for accuracy).

SenlabH logs the temperature and the relative humidity of the air (RH) and allows 2 functional modes (see Understand the 2 SenlabH functional modes section for more details):

- **Basic** (also called "Standard"): Periodic "log and transmit"
- **Datalog**: Periodic logs (up to 24 logs) and "all in one" transmission

The indoor version is designed for office comfort monitoring, whereas, the outdoor version is made for harsh environment use.

Threshold detection is available for temperature (refer to

Temperature threshold overrun section).

Part number	TH Probe	Measure *Ranges*	Casing type	Protection level	Dimension
THY-LAB-14NS	50cm cable	*-45°C to +125°C* 0%RH to +100 %RH	Outdoor	IP67	102x56x35mm probe: 41.3mm Ø18.3mm
THY-LAB-61NS	Inside	*0°C to +55°C* 20%RH to +80 %RH	Indoor v1	IP30	85x53x25mm
THY-LAB-41NS	Inside	*0°C to +55°C* 20%RH to +80 %RH	Indoor v2	IP30	91.5x50x25mm

Part number	Measure	Typical accurancy	Conditions
THY-LAB-14NS	Temperature	±0.2°C	+5°C to +60°C
	Temperature	±0.5°C	-40°C to +5°C and +60°C to +125°C
	Relative Humidity	±1,80 %RH	+15°C to +40°C and +15%RH to +80 %RH
	Relative Humidity	±3 %RH	0°C to +15°C and 0%RH to +80 %RH 40°C to +70°C and 0%RH to +80 %RH
THY-LAB-61NS **THY-LAB-41NS**	Temperature	±0.3°C	0°C to +55°C
	Relative Humidity	±2 %RH	10°C to +55°C and 20%RH to +80 %RH

Indoor v1   Indoor v2   Outdoor
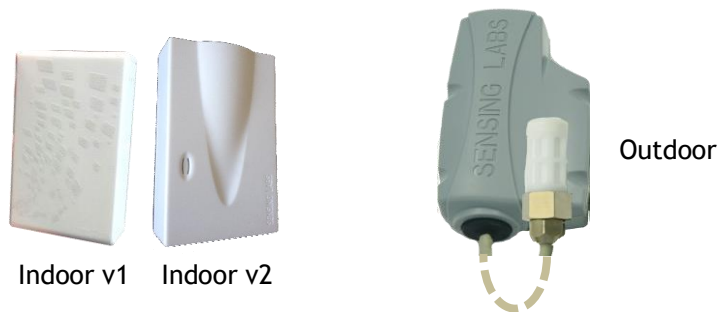
Warning, take care to respect the operating conditions of the senlab itself:
3 steps are required to make your SenlabH fully operational, described
below. - outdoor version : -20°C to +70°C
- indoor version : 0°C to +55°C and 20%RH to 80%RH (non-condensing)
Warning, not for use in salt water or other corrosive environments.

Provisioning of the device   On-site installation   Activation of the device
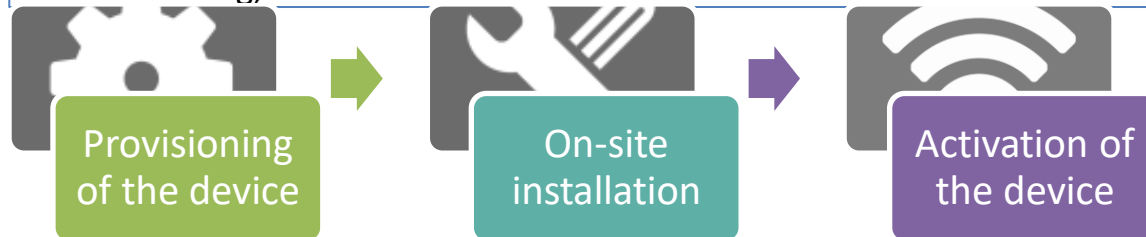
Provisioning of the device

You have to be sure that your **Senlab device has been well commissioned** to be able to reach your LoRaWAN network.

✓ Contact if needed your distributor to get your Senlab configuration
✓ Required information for provisioning the device into your LoRa system are listed in the following table:

> ⚠ Warning, don't unprovision device from your system before stopping it!
>
> (refer application features to stop the application via RF)

|	devEUI	appEUI	appKey	appSkey	NwkSkey	netId	devAddress
Case 1 : OTAA / PUBLIC Typical configuration for Network Operator based architecture	X	required	required				
Case 2 : ABP / PUBLIC Typical configuration for Private mono gateway network	X			required	required		required
Case 3 : ABP / PUBLIC Sensing-Labs SLgateway V2 configuration (local network)	X	Optional*		Optional*	Optional*	Optional*	Optional*

(*) If asked when ordering, devices are already provisioned into your SLgateway. If not, you need these parameters.

➢ Network & Application configuration of Senlab device can be done:
  o At factory (for minimal batch of 1000 devices)
  o By your distributor (more often)
  o By yourself (if you have your own SLsetting tool)
➢ Please refer to parameter list described into the Application features chapter to fit to your use case and get a "Plug&Play" device.
➢ **All application configuration can also be dynamically adjusted Over The Air** (via downlink request)
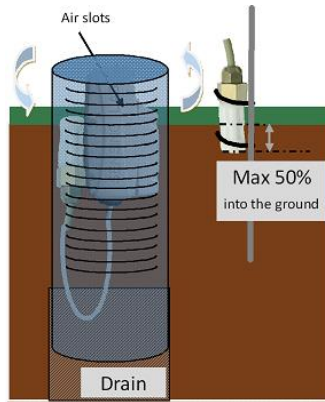
On-site installation

A natural airflow over the sensor is needed: keep free area around the probe.
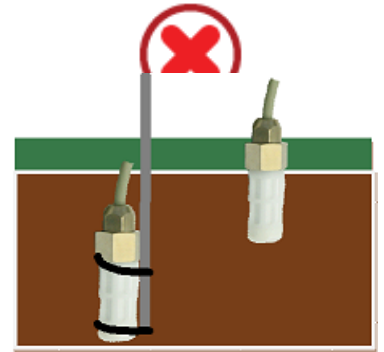
EXTERNAL PROBE INSTALLATION (THY-LAB-14NS)
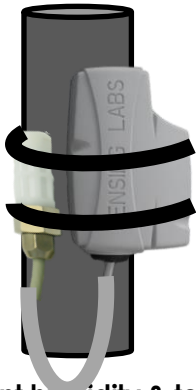
Ambient humidity & temperature

➢ Keep free area around the probe
➢ Mounting on a post for example

On the soil surface

➢ Take care to keep airing zone around the probe

Into the ground

➢ No free area around the probe

INDOOR INSTALLATION (THY-LAB-41NS)

DEVICE POSITIONING

You have first to find the best position to your Senlab:
✓ Prefer vertical position (***antenna part upwards*** as on following pictures)
✓ Avoid positioning the external cable pulled vertically under the device (prefer coiled positioning or use the rear gutters for outdoor version)

✓   Avoid direct sun light exposure or heater system proximity

⚠ For best radio performance:

- Positioned the upper part of the device upwardly in a free space area
- avoid positioning the Senlab against a metallic element

DEVICE MOUNTING

Device type	Device mounting
All versions	Stick the product to the wall or cabinet with a double-sided adhesive tape
Indoor versions	Screw the rear side of the product to the wall with countersunk screws make sure the screw heads don't exceed from the plastic side once installed
Outdoor versions	Use plastic cable ties with screw mount

Refer to « Application Note Senlab installation » (download link) for full recommendation.

Now the device is well physically installed and plugged, you can start the activation process.

Activation of the device

To activate the Senlab device, you have to use a magnet (min pulling force 1Kg).

Put Magnet 1 sec

LED blinking up to 10s
(connection status...)

LED ON 2sec
= device ACTIVATED

Status LED

MAGNET area
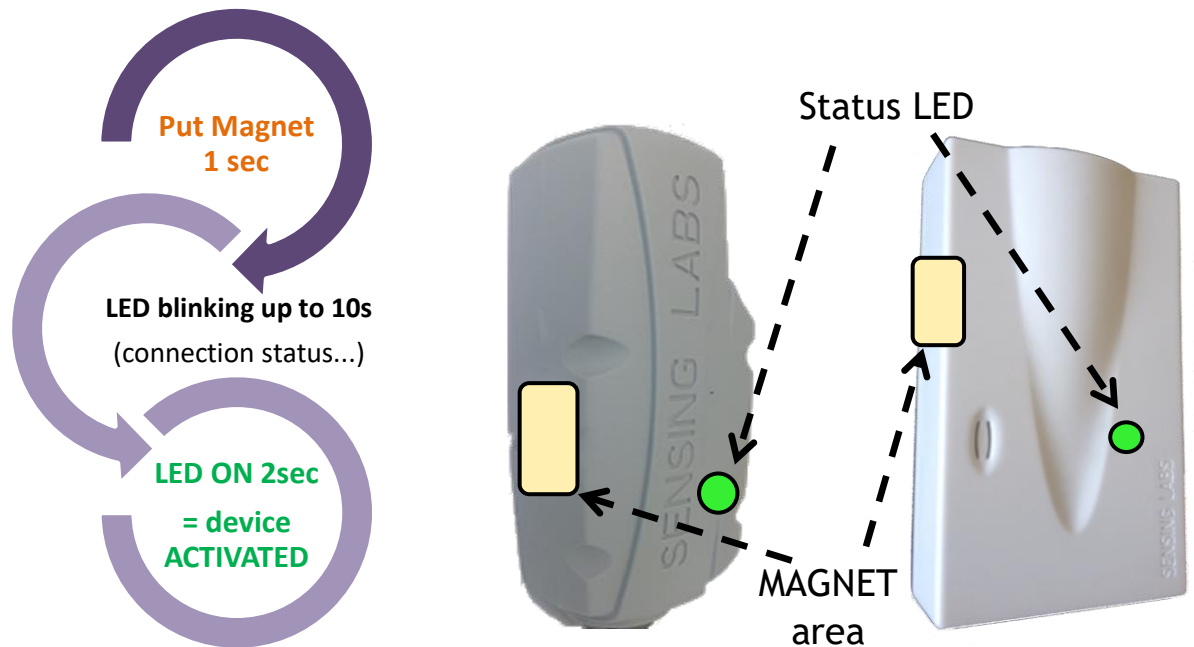
✓ Remove the magnet as soon as the LED flashes!
✓ If activation fails (No solid LED ON 2sec), Senlab will come back in storage mode.
✓ After successful activation, device will automatically send its START message

> Once activated, if you pass the magnet one more time, the device will indicate its activation status after 3s LED blinking:
>
> --> Solid LED ON 2sec will confirm that device is activated

Deactivation of the device

If you decide to deactivate Senlab, no more transmissions will be sent → That means that you need a physical access to the Senlab to active it again.
Many ways are possible:
 ➢ **Over the Air**: by sending the downlink request "STOP application" (via your LoRaWAN system)
 ➢ **With physical access (with SLsetting tool)**: by using SLsetting "disconnect" action
 ➢ **With physical access (only for test devices)**: By holding the magnet during 20 seconds until the LED stay ON for 5 seconds.
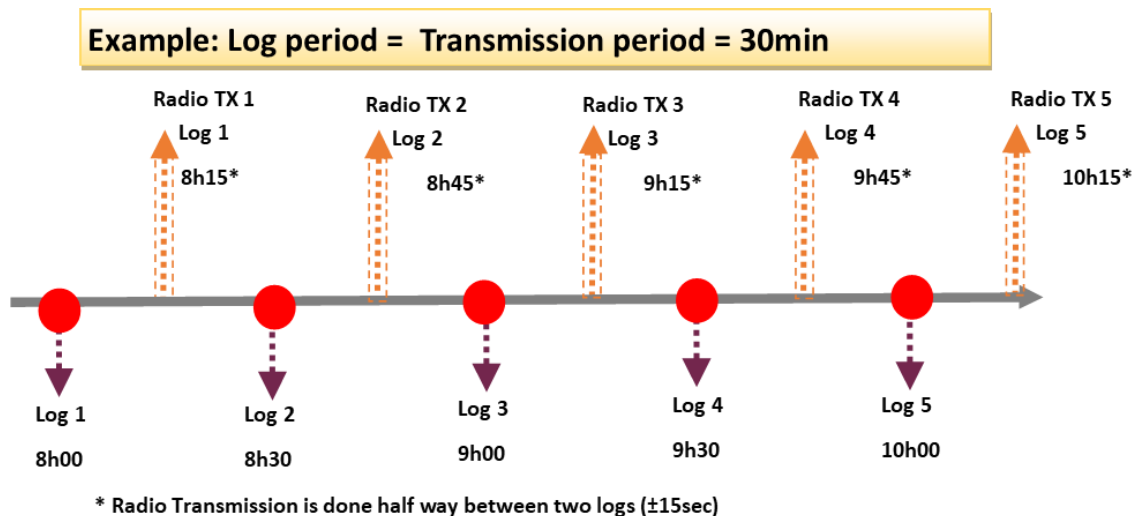
Understand the 2 SenlabH functional modes

It is important to understand all modes in order to choose the best one to fit with your use case and environment.
All modes are switchable from one to each other Over The Air or with SLsetting tool.

Basic mode (or standard mode)

This mode allows to transmit periodically 1 measure (temperature and humidity):

✓ Measure period can be configured from 3min to 24h (Tx < 10min is for test only)
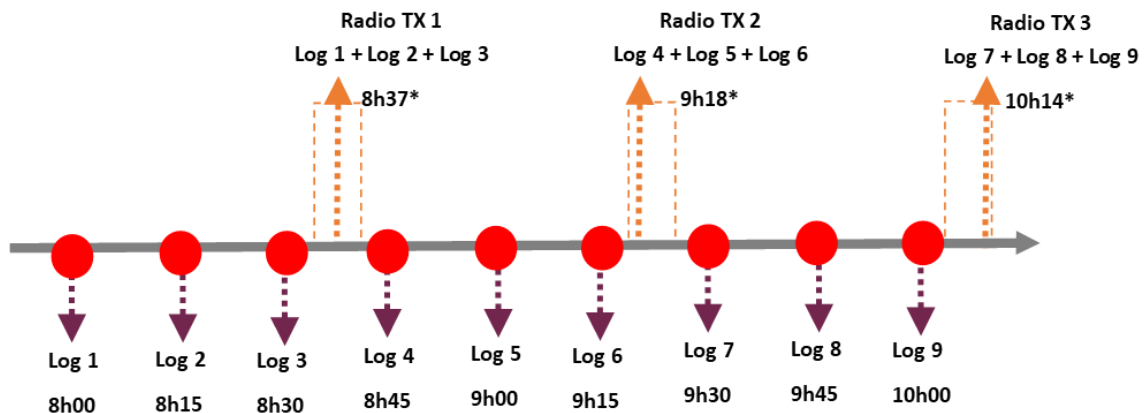

Availability	All firmware versions
Compatibility	✓ Operated network ✓ SLgatewayV1 or V2 ✓ Third part gateway with SLcodecs or manual decoding
Advantages	✓ "Manual" decoding possible (without SLcodecs) ✓ Over The Air reconfiguration
Typical use cases	✓ Monitoring of physical value(s) with slow variation
What to configure?	✓ Measure period (the transmission period will be the same)
How to get applicative data?	✓ All SLgateway's APIs: refer to SLgateway user guide ✓ SLcodec : refer to SLcodec help ✓ By decoding payload yourself: **Refer to « Application Note SenlabMessageFormat »**

Datalog mode

This mode allows to transmit up to 23 periodic measures (temperature and humidity) in each message:

- ✓ Measure period can be configured from 1min to 24h
- ✓ Transmission period can be configured from 3min to 24h (Tx < 10min is for test only)
- ✓ Possibility to activate a "log redundancy" feature to integrate previous logs in current transmission (*ex: TX2 will contains logs n°1 to 6 and TX3 logs n°4 to 9*)

Example: Log period = 15min / Transmission every 3 logs (≈45min)

Radio TX 1	Radio TX 2	Radio TX 3
Log 1 + Log 2 + Log 3	Log 4 + Log 5 + Log 6	Log 7 + Log 8 + Log 9
8h37*	9h18*	10h14*

Log 1	Log 2	Log 3	Log 4	Log 5	Log 6	Log 7	Log 8	Log 9
8h00	8h15	8h30	8h45	9h00	9h15	9h30	9h45	10h00

* Radio transmission is done « randomly » between the last log and the next one

Availability	All firmware versions
Compatibility	✓ Operated network ✓ SLgatewayV1 or V2 ✓ Third part gateway with SLcodecs
Advantages	✓ Log precision up to 1 log every minute and transmission by "datalog" to optimized battery life time ✓ Log redundancy feature to recover not received message Over The Air reconfiguration
Typical use cases	✓ Monitoring of physical value(s) with fast variation ✓ Important battery life time
What to configure?	✓ Measure period ✓ Transmission period (multiple of measure period)
How to get applicative data?	✓ All SLgateway's APIs: refer to SLgateway user guide ✓ SLcodec: refer to SLcodec help

Application features (datalog mode)

This chapter describes the SenlabH application features available in datalog mode (accessible via SLbase or SLcodec – refer respective User Guide for more details)

Measure data

ID	Description	Type	Unit	Range
temperature	Measured temperature	FLOAT	°C	-47...+128
humidity	Measured relative humidity	INT8	%	0…100
battery_current_level	Battery level of the device	UINT8	%	1…100

Event data

ID	Description	Type	Unit	Range
start_event	Happens when device is restarted on the field	BOOL	-	-

Configuration requests

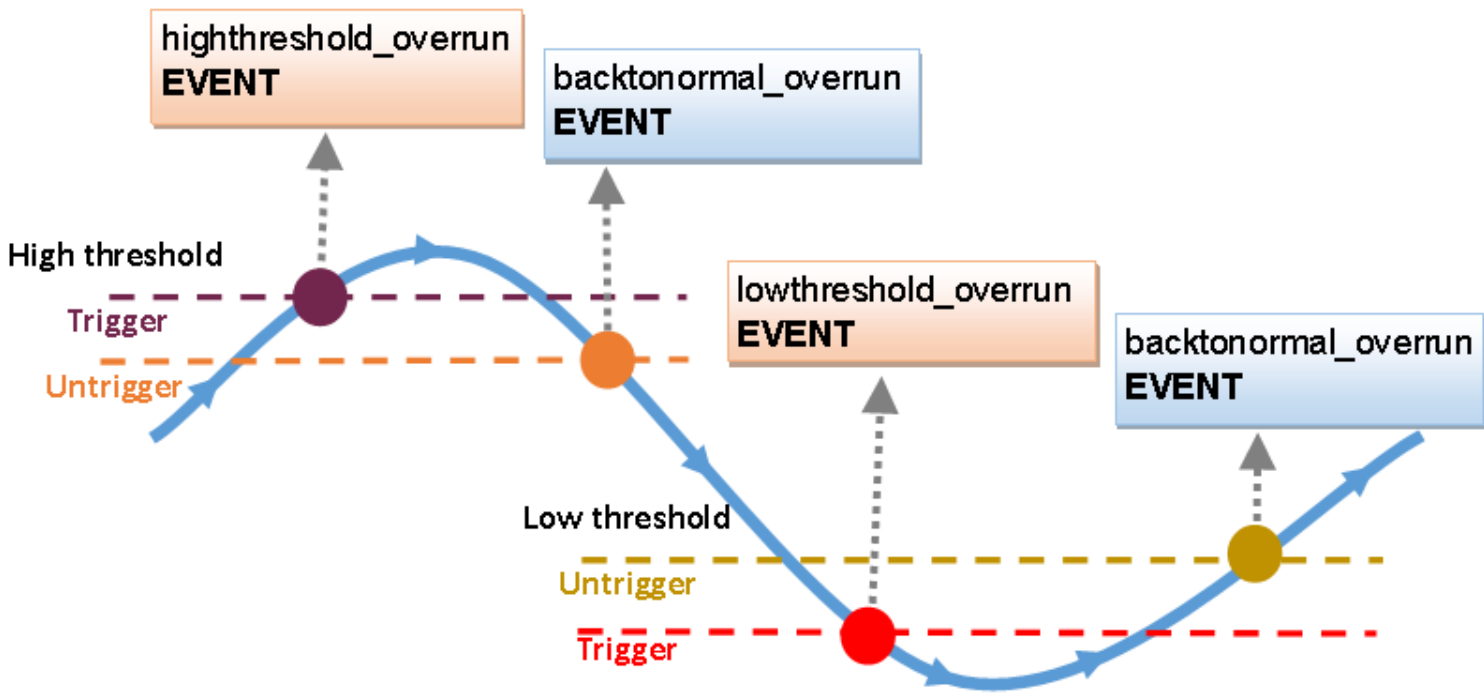| Parameter ID	Description	Type	Unit	Range
Datalog configuration (ID = request_write_datalog_cfg)				
log_period	Device will measure every X minutes	UINT16	Minute	1...1440 (1440= 24h)
log_tx_period	Device will send logged measure every X minutes (must be a multiple of log_period)	UINT16	Minute	3...1440
log_tx_random_activation (optional)	Maximize device datalog reliability	BOOL	-	-
redundancy_factor	Log-redundancy **(since FW V1.3)** Send the X n-1 last log(s) with the last log(s)	UINT8	-	1-12
Reset battery level (ID = request_reset_battery_level) *Must be used after battery replacement only*				
NO PARAMETERS				
Stop application **(ID = request_stop_application)** ***Warning: activation with magnet will be mandatory to reactivate the device***				
NO PARAMETERS				

> ⚠ In order to take advantage of Senlab datalog mode, you need to use SLcodecs tool.
> - Refer to the "SLCodecs Application Note" or contact us to get more information about SLcodecs integration and usage.

Temperature threshold overrun (datalog mode only)

SenlabH embed a feature to monitor thresholds overrun. You can activate independently a high and a low thresholds, with specific trigger & untrigger temperature values.
- ✓ **Important: Threshold overrun is checked only at log measurement period**
  - ➢ It's recommended to configure device with a small log period (<=10min) and an important transmission period (>10 log per transmission)
  - ➢ ex: log every 1 min and tx every 20 min **or** log every 5 min & tx every hour
- ➢ Threshold overrun feature is available for all SenlabH devices:
  - o Since V1.1 version for THY-LAB-61NS / THY-LAB-41NS
  - o Since V1.3.1 version for THY-LAB-14NS (external probe)
  - o Threshold overrun can be configured directly into SenlabH during commissioning step (SLsetting) since V1.3 firmware.

Configuration requests

Parameter ID	Description	Type	Unit	Range
	Start High Threshold detection (ID = request_start_highthreshold_detection)			
highthreshold_trigger_temp	Temperature value to detect high threshold overrun	FLOAT	°C	-47…+128
highthreshold_untrigger_temp	Temperature value to detect high threshold overrun (< to high trigger value and > to low untrigger value)	FLOAT	°C	-47…+128

	Start Low Threshold detection (ID = request_start_lowthreshold_detection)			
lowthreshold_trigger_temp	Temperature value to detect low threshold overrun	FLOAT	°C	-47...+128
lowthreshold_untrigger_temp	Temp. value to undetect low threshold overrun (> to low trigger value and < high untrigger value)	FLOAT	°C	-47...+128
	Stop High Threshold detection (ID = request_stop_highthreshold_detection)			
NO PARAMETERS				
	Stop Low Threshold detection (ID = request_stop_lowthreshold_detection)			
NO PARAMETERS				

Event data

ID	Description	Type	Unit	Range
highthreshold_overrun	Event notified if high threshold value has been overrun	BOOL	-	true
lowthreshold_overrun	Event notified if low threshold value has been overrun	BOOL	-	true
backtonormal_overrun	Event notified if temperature come back under high untrigger value or upper low untrigger value	BOOL	-	true

Battery replacement (Indoor version only)

Replacement battery must by a Lithium 3,6V AA type with 50mA min of supported continuous current → Contact your distributor to get original battery reference.

Indoor V1 will lost the activation status during the battery replacement, so the process is:

1. Open the casing
2. Remove the old battery
3. Put the new battery
4. Close the casing
5. Activate the device (see "Activation of the device" chapter)
6. Send the configuration request "request_reset_battery_level" to the device, using your application

Indoor V2 have the capability to keep activation status during a few minutes, so the process is:

1. Open the casing
2. Remove the old battery and, **during the same minute**, put the new battery
3. Check if the device activation is still OK (see "Activation of the device" chapter)

4. In case activation lost, you need to activate the device again
5. Close the casing
7. Send the configuration request "request_reset_battery_level" to the device, using your application

ATTENTION:

EN: There is a risk of explosion if the battery is replaced by an incorrect type. Dispose of used batteries according to instructions.

FR: Il y a risque d'explosion si la batterie est remplacée par une batterie de type incorrect. Mettre au rebut les batteries usagées conformément aux instructions.

Technical characteristics

ISM Radio bands usage

Senlab globally communicates over frequencies in the 865-870MHz radio band with a maximum transmission power of 25mW e.r.p (+14dBm e.r.p).

More precisely, the following table describes the different sub-bands, as defined per Annex 1 of ERC Recommendation 70-03 (13 October 2017), which can be used by Senlab:

	Frequency Band	Power	Spectrum Access
h1.3	865-868MHz	25mW e.r.p	1% duty-cycle
h1.4	868-868.6MHz	25mW e.r.p	1% duty-cycle

Note that 1% duty-cycle for sub-band h1.3 is allowed by ERC/REC 70-03 Annex 1 Note 5 as its usage is limited to 865-868MHz.

Electrical safety

All circuits are SELV (Safety extra low voltage), including interface circuits which are only used for measurement (signals without power, these circuits are considered LPS).

Ambient temperature of use

The ambient temperature of use depends of the version:

Indoor version	From 0°C to +55°C
Outdoor version	From -20°C to +70°C

Legals

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Headquarters:
SENSING LABS SAS.
CAP OMEGA,
rond point Benjamin Franklin
34960 Montpellier cedex 02 – France