SENSING
LABS

SenlabP

PIR-LAB-41NS©

PIR-LAB-51NS©

FIRMWARE VERSIONS 1.3 / 2.1

User guide

SENSING-LABS

VERSION 02 – REV M / JUNE 2021

Table des matières

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 SenlabP PIR-LAB-xxNS sensor is a smart LoRaWAN™ radio device equipped with **a passive infra red sensor (PIR)**, enabling human detection and has to be placed above the central axis of the passage, like a door, preferably with the sensor pointing downwards (detection up to 5m).

It allows to count the passage of people through a door and is used to collect and send frequenting statistics on a regular period (typically 30mn or 1 hour).
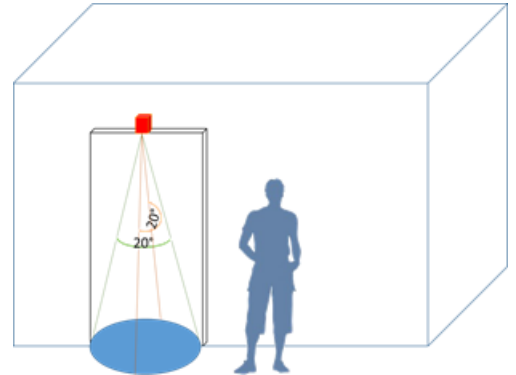
SenlabP logs the number of passage and allows 2 functional modes (see Understand the two SenlabP functional modes section for more details):

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

Check "SenlabV2" Application Note for V2.0 full specs: network migration, re-join...

> Please note that the Senlab PIR Sensor is not convenient for applications where passage counting has to be calculated at the nearest unit and more dedicated to work with a good precision within a range around 100 passages/hour
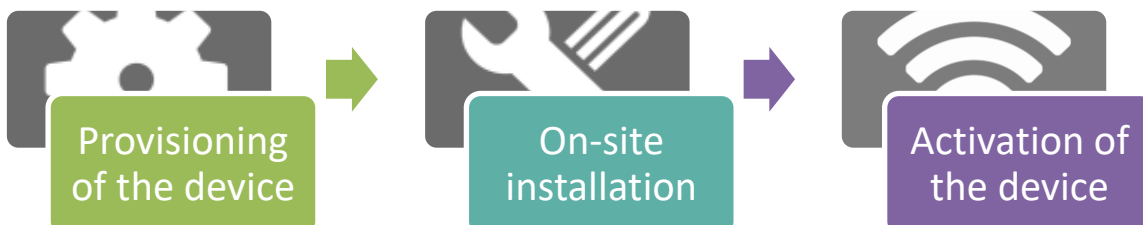>
> *--> Due to the operating mode inherent to Infra-Red technology, all passages events detected during the same 5 seconds slot will be considered as the same event and counted as 1 event.*
> *--> Detection accuracy of PIR-LAB-XXNS is 90% from 1m to 4m*

Part number	Casing type	Protection level	Dimension
PIR-LAB-41NS	Indoor v2	IP30	91.5x50x25mm (casing only) 92.1x50x25mm (sensor include)
PIR-LAB-51NS (PIR-LAB-13NS)	Outdoor	IP64	105x75x40mm (sensor include)

Indoor v2   Outdoor

3 steps are required to make your senlabP fully operational, described below.

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 : OTAA / 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)
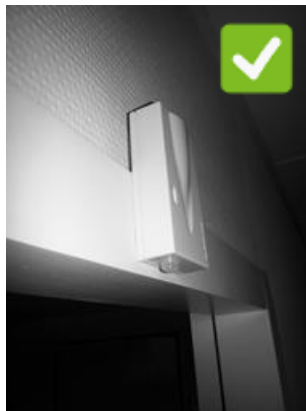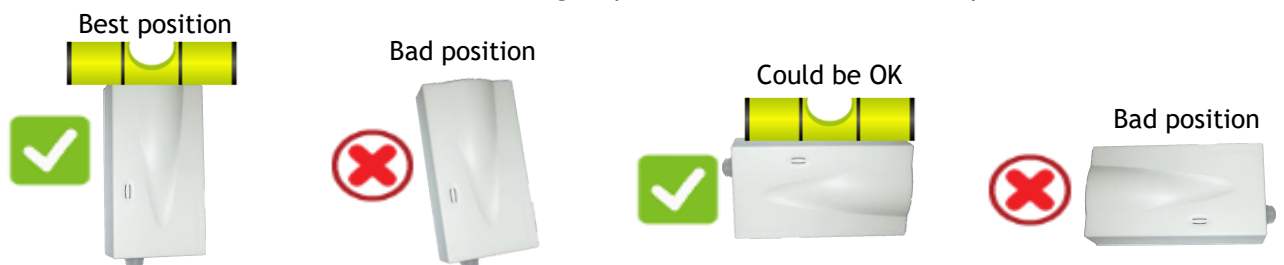
On-site installation

Device positioning

- ✓ You have first to find the best position to your Senlab
  - ✓ The Senlab PIR product is designed to be installed above a door with the sensor pointing downwards.
  - ✓ 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
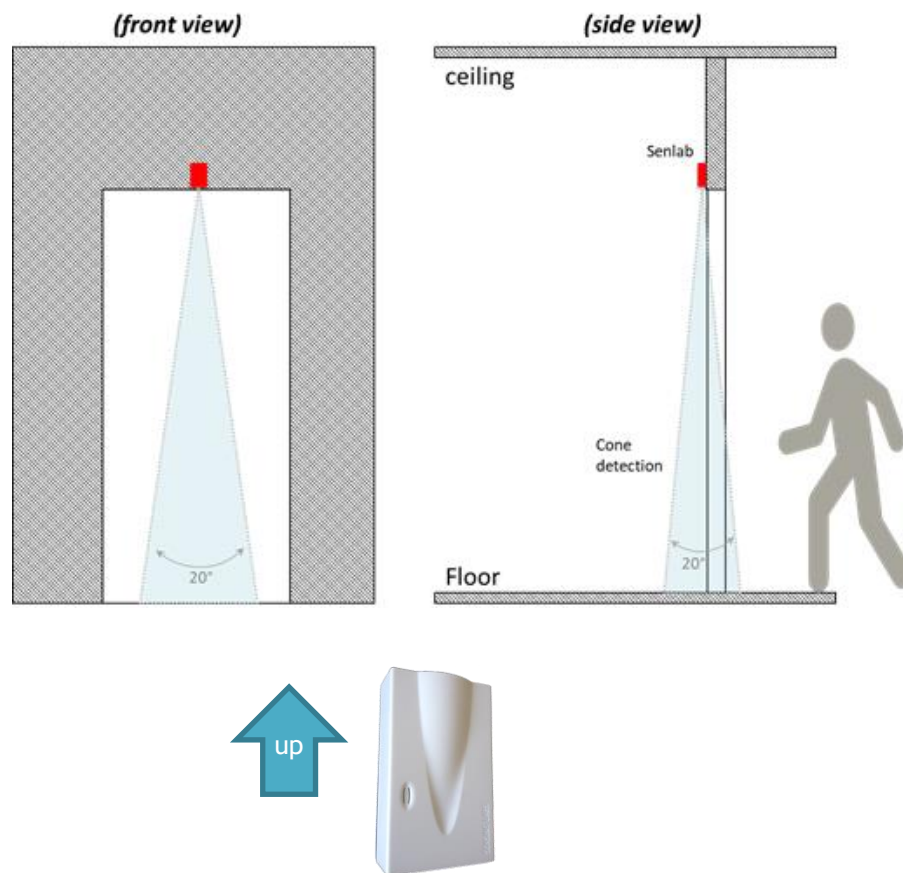

- ✓ Make sure to leave the area between the sensor and the ground clear and not obstructed by the door frame notably

- ✓ Prefer vertical position, with 0° angle (antenna part upwards)

Best position

Bad position

Could be OK

Bad position

⚠   Device is not designed for an installation above 2 meters.

Mounting type	Device mounting
Sticker mount	Stick the product to the wall or cabinet with a **strong** double-sided adhesive tape
Screw mount	*Indoor*: 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*: Use additional wall anchors reference **MC001277** from multicomp.

Refer to « Application Note Senlab installation » for full recommendation process.

⚠   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

Now the device is well physically installed, you need to activate it in order to start passage detection functionality as well as radio connection.
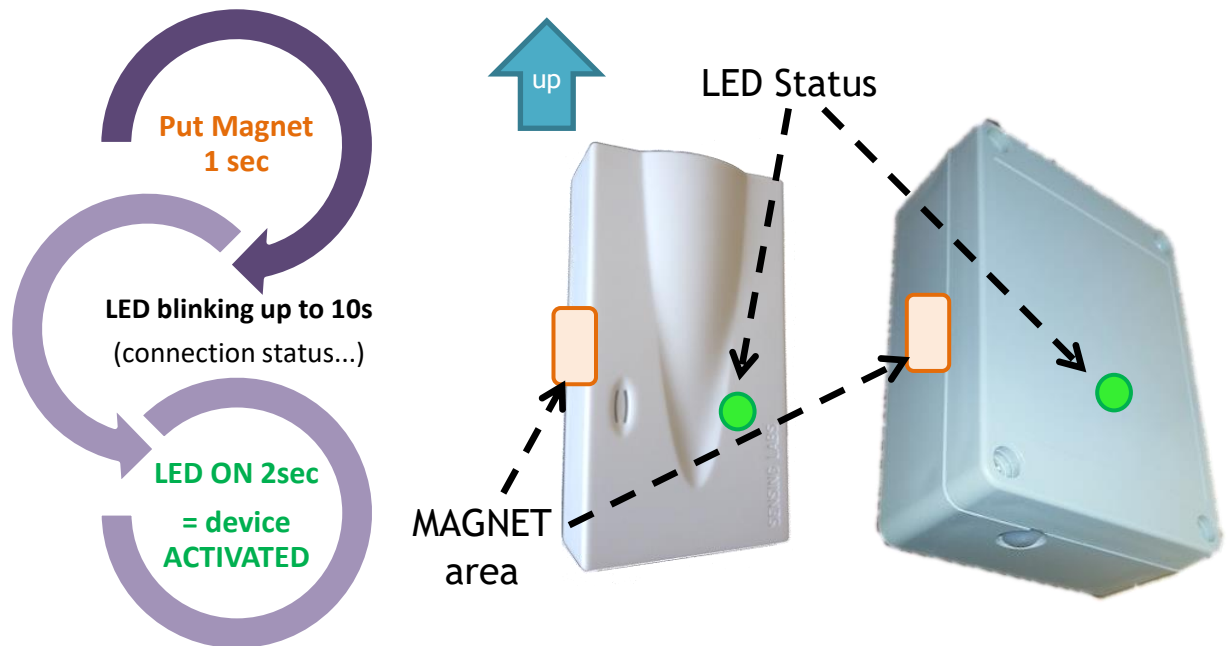
Passage detection condition

Due to the operating mode inherent to Infra-Red technology, all passages events detected during the same 5 seconds slot will be considered as the same event and counted as 1 event.

- ✓ **Counting limit:** SenlabP sensor is not able to distinguish different people in the same 5 seconds period: You have to consider that the max frequency that can be detected by the sensor is 5 sec. Below 5 seconds, there will be under counting.
- ✓ **If someone stay some seconds**, it will be counted as 1 detection. If someone stay more than 5 seconds (10 sec for example), its entry and its exit will be counted as 2 detections

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

up

LED Status

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, the PIR sensor will initialized during 12'' (LED burst blinking). 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.

On-site test process (From FW V1.3)

During the first hour after activation, the LED will turn ON 3" when passage is detected.

LED Status meaning
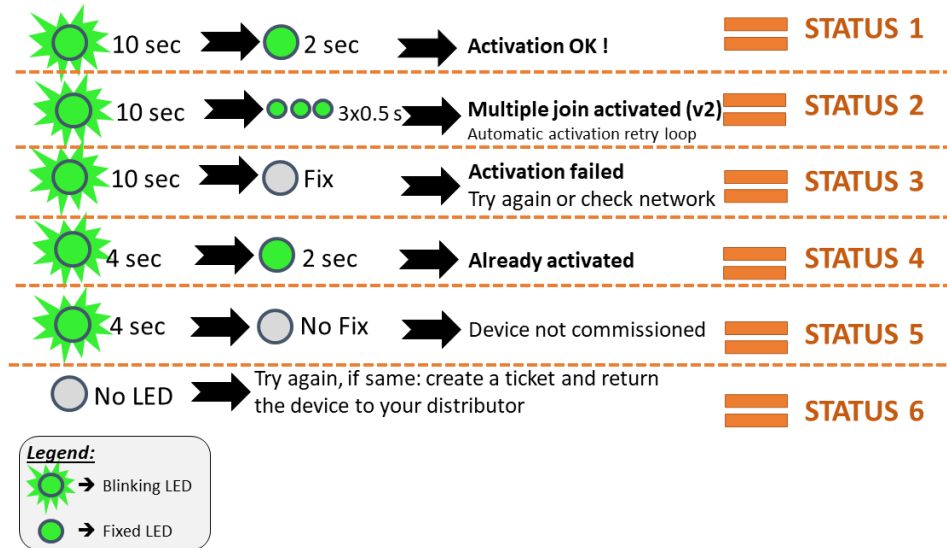
Deactivation of the device

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, then the LED stay ON for 5 seconds.
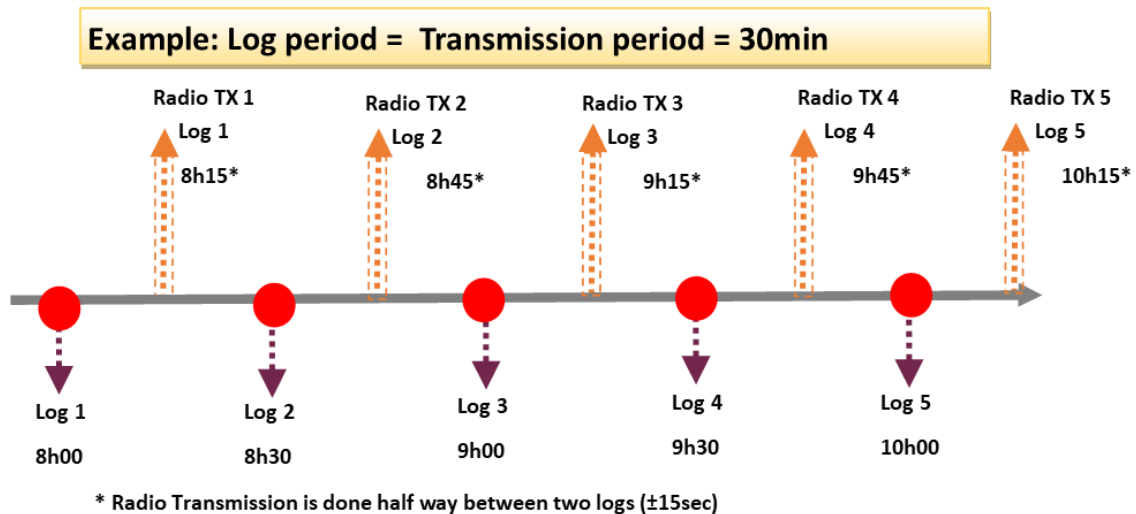
Understand the two SenlabP functional modes

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 (detection count):

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

Example: Log period = Transmission period = 30min

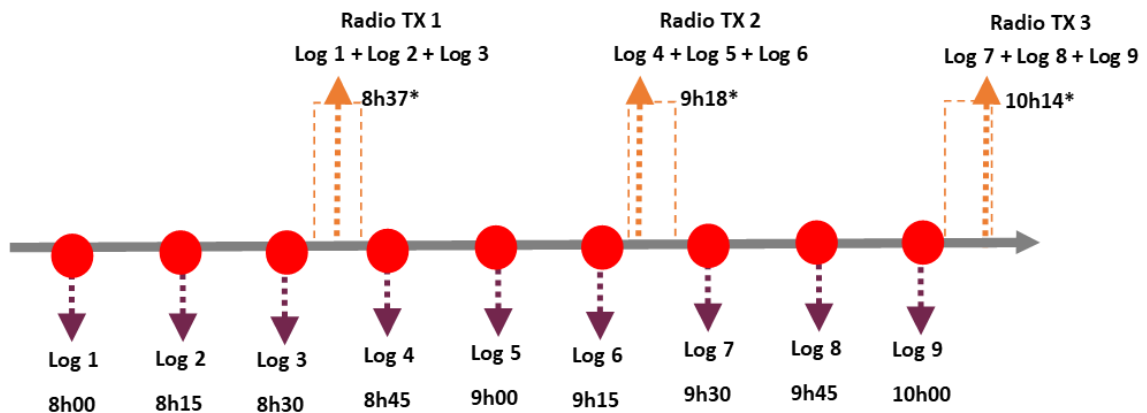| Availability	All firmware versions
Compatibility	✓ Operated network ✓ SLgatewayV1 or V2 ✓ Third part gateway with SLcodecs or manual decoding
Advantages	✓ "Manual" decoding possible (without SLcodecs) ✓ Over The Air reconfiguration
Typical use cases	✓ Monitoring of physical value(s) with slow variation
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 (detection count) in each message:

- ✓ Measure period can be configured from 1min to 24h
- ✓ Transmission period can be configured from 15min to 24h
- ✓ 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 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 SenlabP application features available in datalog mode (accessible via SLgateway or SLcodec – refer respective User Guide for more details)

Measure data

ID	Description	Type	Unit	Range
detection_count	Number of detected passage Initialized at 0 when the device is delivered.	UINT32	passage	$0…2^{32}$
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

Online describe on http://codec.slbase.io/senlabP

Parameter ID	Description	Type	Unit	Range
Datalog configuration *(ID = request_write_datalog_cfg)*				
log_period	Device will store number of detection every X minutes	UINT16	Minute	3...1440 (1440= 24h)
log_tx_period	Device will send logged measure every X minutes (must be a multiple of log_period)	UINT16	Minute	60...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 to 100% *(ID = request_reset_battery_level / 0x040100000000 on port 2)* Must be used after battery replacement only				
NO PARAMETERS				
Reset passage detection number *(ID = request_reset_raw_index / 0x040200000000 on port 2)* Will reset to 0 the current raw index				
NO PARAMETERS				
Stop application *(ID = request_stop_application / 0x010700 on port 2)*				

Warning: activation with magnet will be mandatory to reactivate the device				
NO PARAMETERS				
Get Version *(since FW V1.3)* (ID = request_get_version)				
NO PARAMETERS	Ask the device to return it configuration and FW version			

Battery replacement

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

0. Unscrew the waterproof case (for Outdoor version) & remove the internal casing
    ✓ extract the compression foam & keep the seal for reassembly
1. Open the white indoor 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
6. Send the configuration request "request_reset_battery_level" to the device, using your application, or with SLsetting (maintenance tab)

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.

V1.0.3 LoRaWan stack compliant

Senlab FW	LoRaWan stack compliant
1.1.X	V1.0.0
1.2.X / 1.3.X / 1.4.X	V1.0.1
2.0.X	V1.0.3

Nothing to configure for the user, no change for the application layer, but this information could be useful if you need to connect Senlab device to LoRaWan network.

More information on **LoRa Alliance**®

LoRaWan Adaptive Data Rate (ADR)

Senlab devices are compatible with ADR and support from DR0 (SF12) to DR5 (SF7).
For any problem with ADR, check the FAQ Senlab on Help Center.

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 +55°C

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For more information about this software:
website - http://www.sensing-labs.com
support – http://support.sensing-labs.com

Headquarters:
SENSING LABS SAS.
187 rue Hélène Boucher
34170 Castelnau-le-Lez
France