

# **Sens'it Discovery**

## Payload Structure

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# 1. About this document

This document describes how messages of the Sens'it 3 are formatted.

Only devices with the Sens'it Discovery firmware version 3.1.0 and upper are concerned by this document.

# 2. Messages Protocol

- An **uplink** message uses the **data payload** structure.
- An **uplink with downlink** request message uses the **data payload** structure followed by the **config payload** structure (actual configuration of the device).  
The device sends a downlink request every 24 hours.
- A **downlink** message uses the **config payload** structure (new configuration to set in the device).

## 3. Data Payload

### 3.1. Structure






The size of the data payload is **4 bytes**.

Some bit fields of the structure depend on the active mode of the device.  
The active mode is encoded on the bits 7 to 3 of the byte 1.






**Byte 0:** (same for all the modes)

b7	b6	b5	b4	b3	b2	b1	b0
Battery Level					Reserved (0b110)		






**Byte 1:**

	b7	b6	b5	b4	b3	b2	b1	b0
	0 = Standby Mode					Button Alert Flag	Spare (0b00)	
	1 = Temperature Mode						Temperature MSB	
	2 = Light Mode						Spare (0b00)	
	3 = Door Mode						Door Status	
	4 = Vibration Mode						Vibration Status	
	5 = Magnet Mode						Magnet Status	

**Byte 2:**

	<b>b7</b>	<b>b6</b>	<b>b5</b>	<b>b4</b>	<b>b3</b>	<b>b2</b>	<b>b1</b>	<b>b0</b>
	Firmware Version Major Increment				Firmware Version Minor Increment MSB			
	Temperature LSB							
	Brightness MSB							
	Event Count MSB							
								
								

**Byte 3:**

	<b>b7</b>	<b>b6</b>	<b>b5</b>	<b>b4</b>	<b>b3</b>	<b>b2</b>	<b>b1</b>	<b>b0</b>
	Firmware Version Minor Increment LSB		Firmware Version Patch Increment					
	Humidity							
	Brightness LSB							
	Event Count LSB							
								
								

### 3.2. Battery Level

*Battery Level* is sent independently of the active mode.

In order to convert the payload value into Volts, use the following formula:

$$\text{Battery Voltage (V)} = (\text{Battery Level} \times 0.05) + 2.7$$

### 3.3. Button Alert Flag

*Button Alert Flag* is sent independently of the active mode.

It is set to 1 when the user has double-pressed the button, otherwise it is set to 0.

### 3.4. Temperature

*Temperature* is only sent when the active mode value is 1.

In order to convert the payload value into °C, use the following formula:

$$\text{Temperature (°C)} = \frac{\text{Temperature} - 200}{8}$$

### 3.5. Humidity

*Humidity* is only sent when the active mode value is 1.

In order to convert the payload value into %, use the following formula:

$$\text{Relative Humidity (\%)} = \frac{\text{Humidity}}{2}$$

### 3.6. Brightness

*Brightness* is only sent when the active mode value is 2.

In order to convert the payload value into lux, use the following formula:

$$\text{Brightness (lux)} = \frac{\text{Brightness}}{96}$$

### 3.7 Door Status

*Door Status* is only sent when the active mode value is 3.

Door status	Meaning
0	The calibration of the Door mode has not been done.
1	Unused value
2	Door is closed.
3	Door is open.

### 3.8. Vibration Status

*Vibration Status* is only sent when the active mode value is 4.

Vibration status	Meaning
0	No vibration detected.
1	A vibration is detected.
2	Unused value
3	Unused value

### 3.9. Magnet Status

*Magnet Status* is only sent when the active mode value is 5.

Magnet status	Meaning
0	No magnet detected.
1	A magnet is detected.
2	Unused value
3	Unused value

### 3.10. Event Count

*Event Count* is only sent when the active mode value is 3, 4 or 5.

*Event Count* is incremented every time an event is triggered by the device. This value is reset to 0 after a message is sent or the mode is changed.

For event description, see paragraph 4.2.

## 4. Config payload

### 4.1. Structure

The size of the config payload is **8 bytes**.

#### Byte 0:

b7	b6	b5	b4	b3	b2	b1	b0
Message Period		Magnet Mode Flag	Vibration Mode Flag	Door Mode Flag	Light Mode Flag	Temp. Mode Flag	Standby Mode Flag

#### Byte 1:

b7	b6	b5	b4	b3	b2	b1	b0
Spare (0b00)		Temperature Low Threshold					

#### Byte 2:

b7	b6	b5	b4	b3	b2	b1	b0
Spare (0b00)		Temperature High Threshold					

#### Byte 3:

b7	b6	b5	b4	b3	b2	b1	b0
Humidity Low Threshold				Humidity High Threshold			

#### Byte 4:

b7	b6	b5	b4	b3	b2	b1	b0
Limitation Flag	Brightness Threshold						

#### Byte 5:

b7	b6	b5	b4	b3	b2	b1	b0
Vibration Acceleration Threshold							

#### Byte 6:

b7	b6	b5	b4	b3	b2	b1	b0
Spare (0b00)		Vibration Blank Time		Vibration Debounce Count			

#### Byte 7:

b7	b6	b5	b4	b3	b2	b1	b0
Reset bit	Door Open Threshold			Door Close Threshold			



## 4.2. Mode Flags

Each mode has its own **Mode Flag** that allows configuration of the way messages are sent for this mode.

If this flag is set to **1**, the device will send a message every *Message Period*.

If this flag is set to **0**, the device will send a message when an **event** is triggered.

### Event definition:

- In **Standby** mode, no event can be triggered so any message will be sent.
- In **Temperature** mode, an event is triggered when a *Temperature or Humidity Threshold* is crossed.
- In **Light** mode, an event is triggered when the *Brightness Threshold* is crossed.
- In **Door** mode, an event is triggered on a transition: “*open → closed*” or “*closed → open*”.
- In **Vibration** mode, an event is triggered on a transition: “*not detected → detected*” and, if the end of vibration detection is enabled (see paragraph 4.8), on transition: “*detected → not detected*”.
- In **Magnet** mode, an event is triggered on a transition: “*not detected → detected*” or “*detected → not detected*”.

If the **Standby** mode is configured with its flag to **1**, a message with an empty payload will be sent every *Message Period*. This message makes it possible to get the device position given by the Sigfox Atlas geolocation service.

## 4.3. Message Period

The message period is the duration between two messages when the mode is configured in periodic data emission.

Message Period	Meaning
0	A message is sent every 10 minutes.
1	A message is sent every 1 hour.
2	A message is sent every 6 hours.
3	A message is sent every 24 hours.

## 4.4. Temperature Thresholds

The *Temperature High & Lower Thresholds* make it possible to trigger an event when the temperature enters or exits the configured range.

They are encoded with a step of **1°C** and an offset **-9°C** that allow a range **from -9°C to +54°C**.

## 4.5. Humidity Thresholds

The *Humidity High & Lower Thresholds* make it possible to trigger an event when the temperature enters or exits the configured range.

They are encoded with a step of **4%** and an offset **+30%** that allow a configurable range **from 30% to 90%**.

## 4.6. Brightness Threshold

The *Brightness Threshold* make it possible to trigger an event when the brightness cross the configured threshold.

It is encoded with a step of **5 lux** and an offset **+1 lux** that allow a configurable range **from 1 lux to 636 lux**.

## 4.7. Vibration Acceleration Threshold & Debounce Count

*Vibration Acceleration Threshold* configures the level of acceleration required to detect a movement.

*Vibration Debounce Count* is the number of upper-threshold samples required to trigger a vibration event. The sample rate is **1.5625 Hz**.

**Example of Vibration Sensitivity configuration:**

<b>Sensitivity</b>	<b>Acceleration Threshold</b>	<b>Debounce Count</b>
Very little sensitivity	0x10	0x03
Not very sensitive	0x08	0x02
Standard	0x04	0x02
Sensitive	0x03	0x01
Very sensitive	0x01	0x01

## 4.8. Vibration Blank Time

The *Vibration Blank Time* is used to set the minimal duration between two vibration event detections.

If this parameter is set to 0, the device triggers a vibration event at the start and at the end of a movement.

<b>Vibration Blank Time</b>	<b>Meaning</b>
0	End of vibration detection mode
1	10 seconds
2	30 seconds
3	60 seconds

## 4.9. Door Thresholds

The *Door Open Threshold* parameter configures the minimal opening angle of the door to trigger a *door open* event.

The *Door Close Threshold* parameter configures the maximal opening angle of the door to trigger a *door closed* event.

### Example of Door Sensitivity configuration:

Sensitivity	Open Threshold	Close Threshold
Not very sensitive	12	4
Standard	7	4
Sensitive	2	4

## 4.10. Limitation Flag

Setting the *Limitation Flag* to 0 will disable the RF duty cycle on message sending.

**This must only be done for test purpose.**

RF duty cycle depends on local regulation.

## 4.11. Reset Bit

If the *Reset Bit* is set to 1, the device will overwrite its actual configuration by the default configuration after a device reset.