atim cloud wireless™
PRODUCT LINE

ATIM Cloud Wireless®

# Temperature & Hygrometry
# TH-O

## User Guide

Model concerned:

ACW/LW8-THO

ACW/SF8-THO

LoRaWAN™

sigfox ready

ATIM Radiocommunications

Chemin des Guillets

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## Document version history

| Version | Date | Description | Author | Concerned software version |
|---|---|---|---|---|
| 0.1 | 22/10/2015 | Document creation | YL | |
| 0.2 | 27/10/2015 | Data addition | YL | |
| 0.3 | 12/11/2015 | Installation procedure | YL | |
| 1.0 | 14/11/2016 | References correction.<br>Syntax correction.<br>Picture correction.<br>Frame format clarification. Accuracy range clarification.<br>LoRaWAN parts addition. | CB | |
| 1.1 | 22/03/2017 | Corrections | YM | |
| 1.2 | 27/03/2017 | Corrections, Visual products update | YM | |
| 1.3 | 26/07/2017 | Merging the document with Quick Installation Guide data | CB | SF V4.0.6 &<br>SF V5.0.3<br>LW V4.0.8 |
| 1.4 | 06/09/2017 | Table of Contents update | YM | |
| 1.5 | 29/09/2017 | Add info downlink Sigfox and LoRaWAN related to the ATIM protocol downlink V1.0.1 | YM | SF V5.0.3<br>LW V5.1.0 |
| 1.6 | 19/01/2018 | Sigfox Visual Update and ACW Platform<br>Add info Soft version number in tracking table | YM | SF V5.0.3<br>LW V5.1.0 |
| 1.7 | 29/03/2018 | Periodic graphics and eco-energy modes updates.<br>Frames format table update. | SC | SF V5.0.3<br>LW V5.1.0 |
| 1.8 | 14/02/2019 | Evolution: battery-pack 7,2mAh<br>QR code info addition | YM | SF V5.0.3<br>LW V5.1.0 |

## Disclaimer

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## Trademarks and copyright

ATIM radiocommunications®, ACW ATIM Cloud Wireless® and ARM Advanced Radio Modem® are registered trademarks of ATIM SARL in France. The other trademarks mentioned in this document are the property of their respective owners.

## Declaration of compliance

All ACW Atim Cloud Wireless® products comply with the regulatory requirements of the R&TTE Directive (1999/5/EC), article 3:

**1 SAFETY** (Article 3.1a of the 1999/5/EC Directive)

NF EN60950-1 Ed. 2006/A1:2010/A11:2009/A12:2011 (health)

EN62479: 2010 (power <20mW) or EN62311:2008 (power > 20mW)

**2 Electromagnetic compatibility** (Article 3.1b of the 1999/5/EC Directive)

EN 301489-3 v1.4.1, EN 301489-1 V1.9.2

**3 Efficient use of the radio frequency spectrum** (Art.3.2 of the 1999/5/EC Directive)

ETSI EN300 220-2 v2.4.1 and EN300 220-1 v2.4.1

## Environmental recommendations

### Explosive atmosphere

Except for the ACW-ATEX line specifically intended for this purpose, do not use ACW radio modems in the presence of flammable gases or fumes. Using the equipment in such an environment constitutes a safety hazard.

### Environment

Respect the temperature ranges for storage and operation of all products. Failing to respect these guidelines could disrupt device operation or damage the equipment. ACW products in IP65 water- and dust-resistant housings may be placed outdoors, but must not, under any circumstances, be submerged.

Follow the instructions and warnings provided below to ensure your own safety and that of the environment and to protect your device from any potential damage.

***General hazard*** *– Failure to follow the instructions presents a risk of equipment damage.*

***Electrical hazard*** *– Failure to follow the instructions presents a risk of electrocution and physical injury.*

*Direct-current symbol*

***WARNING****: do not install this equipment near any source of heat or any source of humidity.*

***WARNING****: for your safety, it is essential that this equipment be switched off and disconnected from mains power before carrying out any technical operation on it.*

***WARNING****: the safe operation of this product is ensured only when it is operated in accordance with its intended use. Maintenance may only be performed by qualified personnel.*

*Waste disposal by users in private households within the European Union. This symbol appears on a product or its packaging to indicate that the product may not be discarded with another household waste. Rather, it is your responsibility to dispose of this product by bringing it to a designated collection point for the recycling of electrical and electronic devices. Collection and recycling waste separately at the time you dispose of it helps to conserve natural resources and ensure a recycling process that respects human health and the environment. For more information on the recycling centre closest to your home, contact your closest local government office, your local waste management service or the business from which you purchased the product.*

## Radio

Modems in the ACW line are radio-communication modems that use the ISM (industrial, scientific and medical) bands, which may be used freely (at no cost and with no authorisation required) for industrial, scientific and medical applications.

# Technical features

## a. Product

| | | |
|---|---|---|
| ***Dimensions*** | 100 x 100 x 35 mm | |
| ***Antenna*** | Integrated (¼ wave) | |
| ***Temperature*** | -20°C à +55°C (operating mode)<br>-40°C à +70°C (storage) | |
| ***Mount*** | Wall | |
| ***Power supply*** | 1 battery-pack 3.6V / 7.2 mAh | |
| ***Weight*** | 200 g | |
| ***Frequency*** | 865 – 870 MHz | |
| ***Power*** | 25 mW (14 dBm) | |
| ***Rate*** | Sigfox: 100 bps<br>LoRaWan: 300 bit/s to 10 Kbit/s | |
| ***Consumption*** | Sigfox | LoRaWan |
| **Tx mode** | 60 mA | 50 mA |
| **Sleep mode** | 7 µA | 7 µA |
| **Rx mode** | 35 mA | 18 mA |

## b. Temperature and humidity sensors

The following ranges refer to the sensor used. WARNING, the product has a smaller operating range than the sensors (see above).

| | | |
|---|---|---|
| Temperature | Range | -40 to +125°C |
| | Resolution | 0.01°C 14 bits |
| | Precision from -40°C to -10°C | -0,7°C / +0,9°C |
| | Precision from -10°C to 85°C | +/- 0,3°C |
| | Precision from 85°C to 125°C | -0,7°C / +0,9°C |
| Humidity | Range | 0% RH – 100% RH |
| | Resolution | 0.025% RH RMS on 12 bits |
| | Precision between 0 and 80 %RH | +/- 3% RH |

# Casing

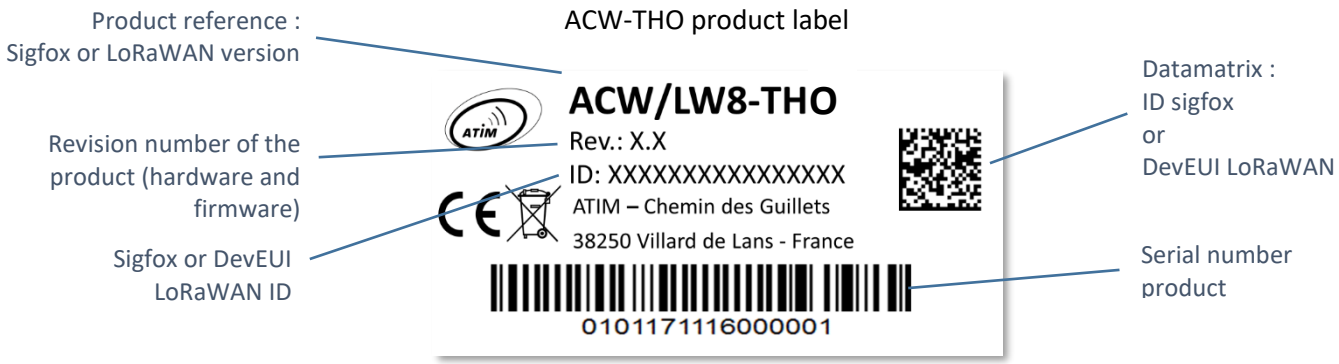
## a. Mounting

ACW-THO modems are fixed on a flat wall using the 4 fixing holes available at each end of the case. For best results, it is recommended to install the case without environmental obstruction and to place it at a minimum height of 2m. For information, the antenna is integrated into the box. It must be mounted on a vertical support or attached to a wall.

## b. Identification

The product identifier is visible on the outer label on the back of the product, on the inside of the electronic board and in the status bar of the configuration software.

For LoRaWAN modems the communication keys are automatically given by the network ("Over The Air Activation", or OTAA pairing).




Each product in the ATIM ACW range has a QR Code label visible either on the side or on the front of the product.

This QR code can be easily read with any 2D barcode reader application on a smartphone.

Reading this code indicates the following information:

ATIM|ACW/LW8-THO|C.0|190114|1|3.0|5.11|70B3D59BA0008C0A

Interpretation:

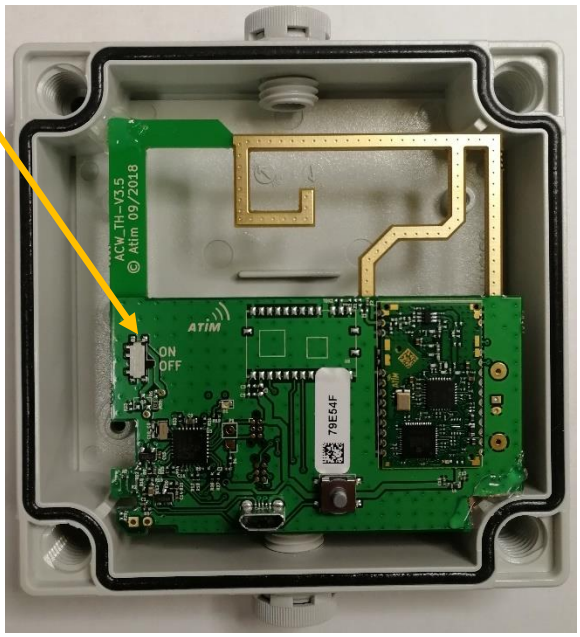
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ATIM | ACW/LW8-THO | C.0 | 190114 | 1 | 3.0 | 5.11 | 70B3D59BA0008C0A |
| Manufacturer name | Product reference | Revision number | Date of manufacture | Manufacturing site | Hardware version | Application firmware version | Sigfox ID or DevEUI LoRaWAN |

# Operating mode

To turn on the product, switch the switch to the ON position.

The ACW-THO sensor measures a temperature and humidity rate at the instant "t" and sends this data by radio to the associated Sigfox or LoRaWAN network, depending on the model used.

Two modes of use are available, periodic or eco-energy.

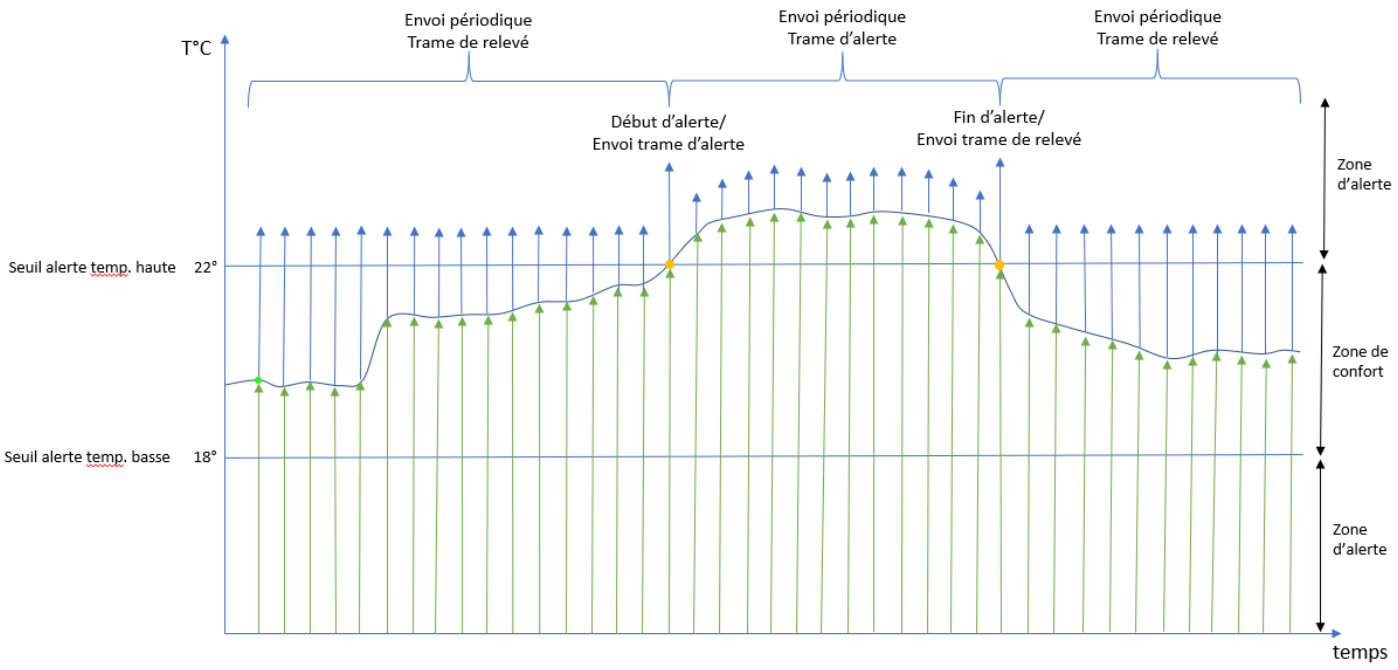



## a. Periodic mode (called « periodical » in the configurator)

For a complete telemetry, a temperature and hygrometry reading is sent periodically and regularly. This provides a very accurate tracking curve. In this mode each report is sent by the ACW-THO. The "Sampling period" is therefore equal to the "Statement period".

This period of reading and emission is adjustable by the user, with a minimum of 10 minutes.

Example of periodic mode operation:




On the other hand, because of the regularity of the radio emissions with a potentially high emission frequency, this mode of operation can prove to be energy consuming and to impact the life of the batteries.

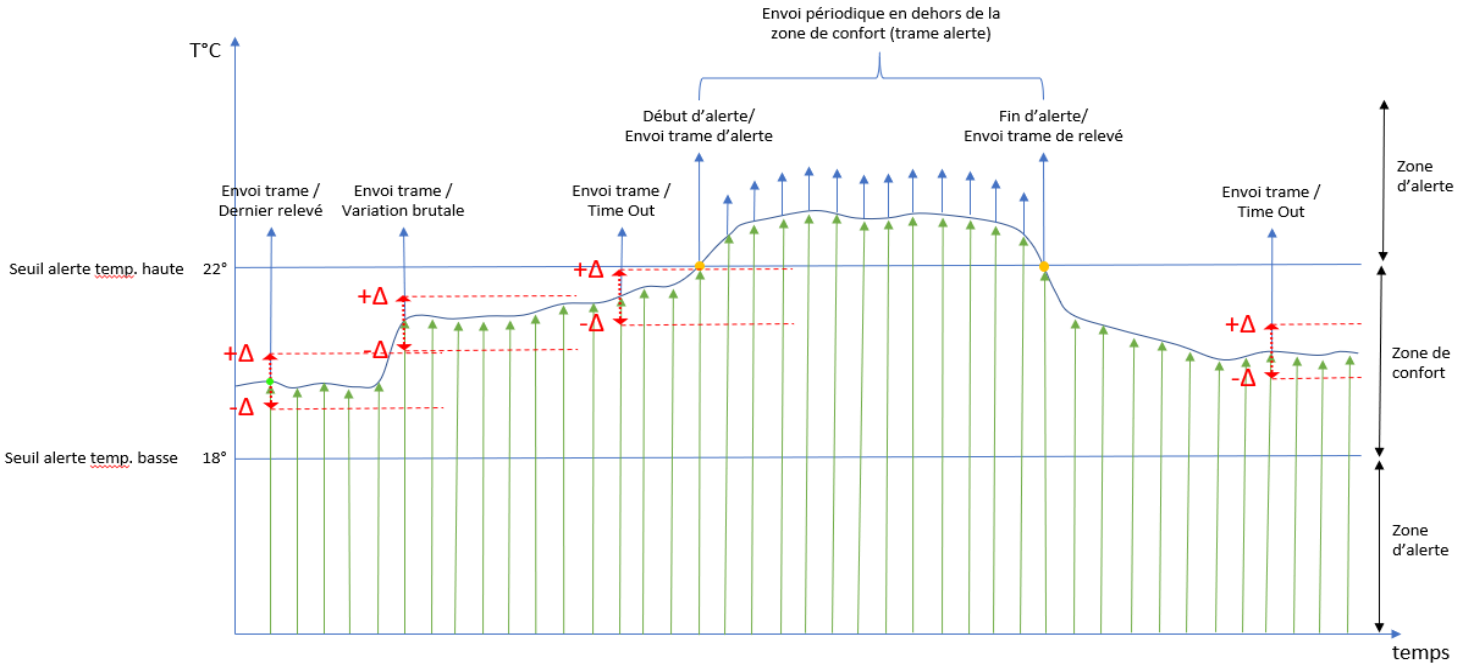
## b. Eco-energy (called « energy saver » in the configurator)

This mode of operation favors energy saving and promotes battery life.

This mode makes it possible to emit a frame only in certain cases:

- If the temperatures recorded are stable: transmission of a frame only after a defined period (time out).
- If, between two consecutive readings, the variation of T ° C is greater than a maximum amplitude defined by the user.
- If a warning threshold is crossed: emission of a frame as soon as the temperature read leaves the comfort zone or when it returns to it.

Example of Eco-energy operating mode:




Phases of operations:

- from 0 to 3 sec: general initialization + USB initialization.
- from 3 to 4 sec: radio initialization.
- from 1 min to 5 min: emission of a test frame every minute.
- at 6th min: emission of a keep alive frame (battery information).
- at 7th min: emission of a temperature / humidity frame.

of operation (periodic or eco-energy) defined by the user

- Life frame emitted once a day or once every 4 days.

# ACW configurator

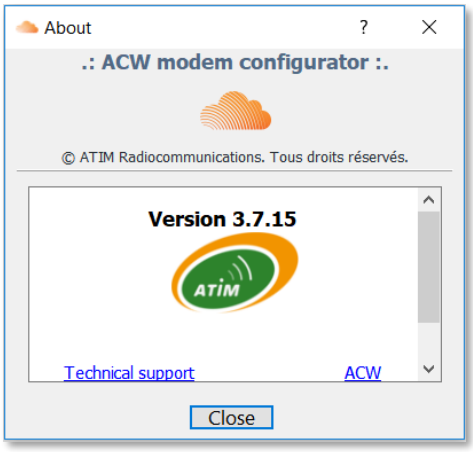
## a. Which ACW configurator version to use?

| For a TH with the following application software version: | Use the ACW configurator version below: |
|---|---|
| Sigfox: V4.06 or lower<br>LoRaWAN: V4.08 or lower | V3.7.15, or upper |
| Sigfox: V5.03 or upper<br>LoRaWAN: V5.10 or upper | V4.0.2, or upper |

Download and install the configuration software '' setupACW.exe '' at:

http://www.atim.com/fr/support/telecharger/

When launching the ACW Configurator, the waiting window appears on the screen.




Click "Help" at the top left of the window and then "About" to view the version number of the ACW Configurator.

Then open the plastic case of your ACW-THO module and connect it to your computer with a mini-USB cable.

## b. LoRaWAN network pairing configuration

Only applies to the ACW-THO / LW8 version.

On LORAWAN networks, there are two methods of pairing to allow a module to connect to the network.

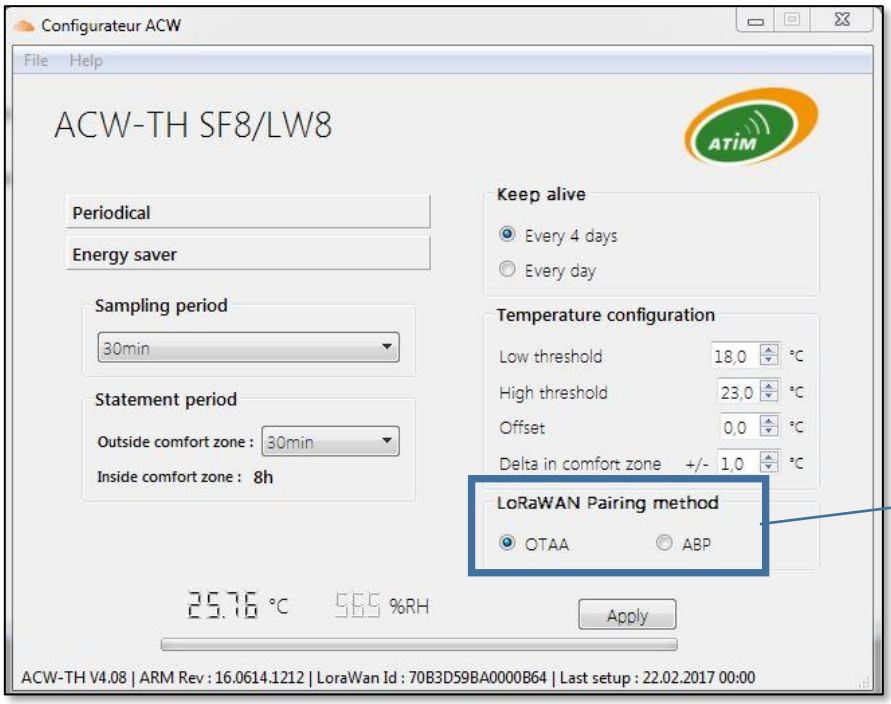
- OTAA (Over The Air Activation):

In this mode, the communication keys are assigned and transmitted by the network each time the module is started or requested to connect. This is the mode that is set by default.

- ABP (Activation By Personalization):

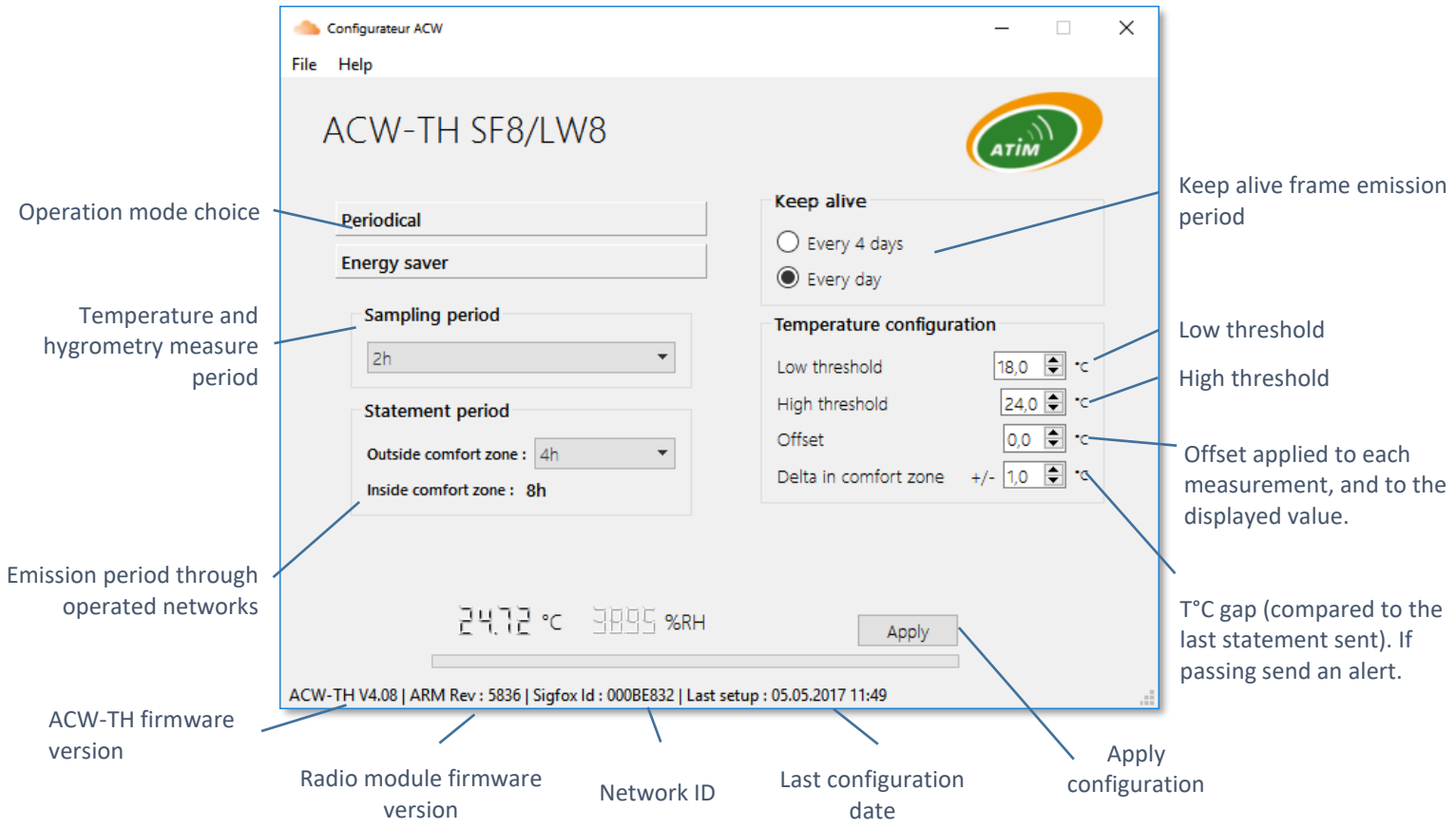
In this mode, the communication keys used are those shipped from the factory in the module. Each time the module is started, the same keys are used.

When you connect the ACW-THO / LW8 to USB, the ACW Configurator automatically detects the factory settings of the module and displays them in the following window:

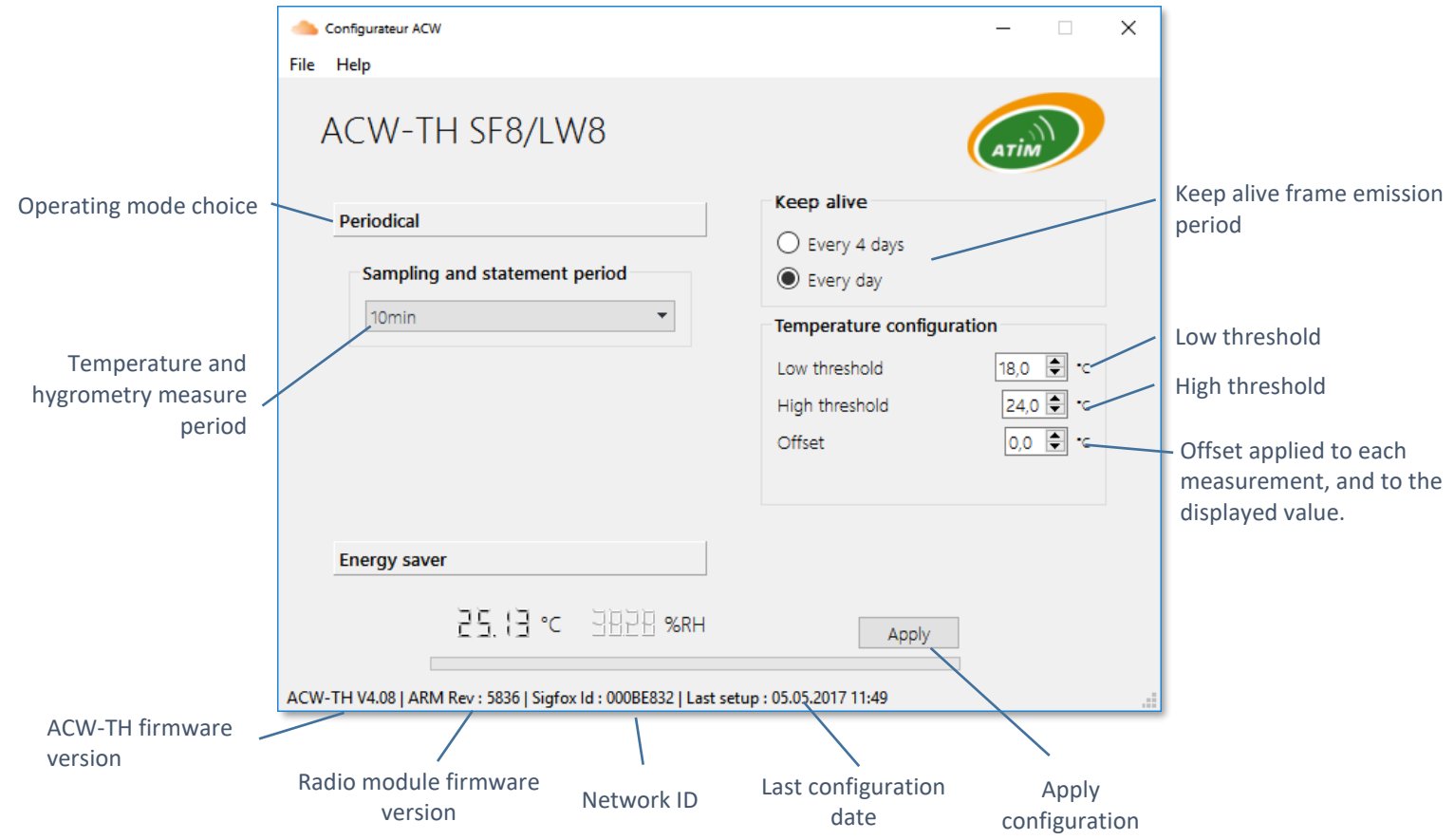



LoRaWAN pairing mode choice

## c. Eco-energy mode configuration (Energy saver)




## d. Periodic mode configuration



Once the configuration is complete, do not leave the module connected to USB. This mode of operation is very energy intensive. When you remove the USB link without disconnecting the battery, the module resets and automatically returns to normal operation.

## Frames format

### a. Sigfox and LoRaWAN

| Type | Description | Frame format | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | octet 0 (dec) | octet 0 (hex) | octet 1 (hex) | octet 2 (hex) | octet 3 (hex) | octet 4 (hex) | octet 5 (hex) |
| **Keep Alive** | Keep alive frame | 1 | 01 | Supply voltage IDLE (mV) | | Supply voltage TX (mV) | | 64 |
| **Test** | Test frame | 5 | 05 | Counter | | | | |
| **TH** | Temperature frame | 23 | 17 | Temperature code | | Humidity code | | |
| **TH** | Over lower T°C threshold passing alert | 15 | 0F | Temperature code | | Humidity code | | |
| **TH** | Over higher T°C threshold passing alert | 17 | 11 | Temperature code | | Humidity code | | |

The sensor data is decoded as follows:

$$\mathrm{T(°C)} = \frac{\mathrm{Temperature}Code \times 175.72}{65536} - 46.85$$

$$\mathrm{H(\%RH)} = \frac{\mathrm{Humidity}Code \times 125}{65536} - 6$$

The battery voltage of the products is good if Supply voltage is greater than 2.9V.

### b. Local 868MHz

In point-to-point or point-to-multipoint local communication mode, the Modbus RTU protocol is use

#### Modbus table

| Modbus adress | Data |
|---|---|
| **0x00 (0)** | Digital inputs reading<br>b0: Input 1 state<br>b1: Input 2 state |
| **0x24 (36)** | Temperature and humidity reading |

#### Supported Modbus features

| Function | Type |
|---|---|
| **0x03 (3)** | Multiple registers reading |
| **0x10 (16)** | Multiple registers writing |

#### Data decoding

| Element | Size | Description | Value |
|---|---|---|---|
| **Slave Id** | 1 octet | Modbus slave ID | 14 |
| **Code Function** | 1 octet | 0x10 (Write multiple registers) | 3 |
| **Bytes count** | 1 octet | N° of octet to read | 8 |
| **Temperature** | 2 octets | Temperature code | 65fc |
| **Humidity** | 2 octets | Humidity code | 5426 |
| **Blank** | 2 octets | Blank | 0 |
| **Blank** | 2 octets | Blank | 0 |
| **CRC** | 2 octets | Error control code | XXXX |

The sensor data is decoded as follows:

$$\mathrm{T}(°\mathrm{C}) = \frac{\mathrm{Temperature}Code \times 175.72}{65536} - 46.85$$

$$\mathrm{H}(\%\mathrm{RH}) = \frac{\mathrm{Humidity}Code \times 125}{65536} - 6$$

## Downlink

**This feature is available on ACW-THO that meets the following requirements:**

| | Software | Radio firmware |
|---|---|---|
| **SIGFOX version** | **V5.0.3**<br>**Or upper** | **V5931**<br>**Or upper** |
| **LoRaWAN version** | **V5.1.0**<br>**Or upper** | **V2.3.2**<br>**Or upper** |

The USB configuration of these products requires an ACW configurator in version 4.0.2 or higher.

The operation of the downlink is explained in the document ATIM_ACW-DLConfig_UG_FR_v1.1, relating to version V1.1 of the Downlink ATIM protocol.

The parameters specific to ACW-THO are as follows:

a. Keep alive frame emission frequency

| | Parameter value (Octet 2) |
|---|---|
| **0x03** | 0x00 = once a day,<br>0x01 = once every  days,<br>0x02 = once every 8 days. |

b. Confort zone Delta

| Parameter Code (Octet 1) | Parameter value (Octet 2) |
|---|---|
| **0x06** | 0xYY |

For a delta in ° C, with a precision in tenth of ° C, 0xYY is calculated as follows

$$0xYY = delta \times 10$$

Delta must be between + 0.3 ° C and + 10.0 ° C.

c. Operating mode

| Parameter Code (Octet 1) | Parameter value (Octet 2) |
|---|---|
| **0x07** | 0x00 = Periodic,<br>0x01 = Energy saver |

d. Lower threshold

| Parameter Code (Octet 1) | Parameter value (Octet 2) | Parameter value (Octet 3) |
|---|---|---|
| **0x08** | 0xYY | 0xZZ |

For a threshold in ° C, with a precision in tenth of ° C, 0xYY and 0xZZ are calculated as follows:

$$0xZZYY = \frac{(seuil + 46.85)}{175.72} \times 65536$$

The threshold must be between -20.0 ° C and + 50.0 ° C.

### e. Higher threshold

| Parameter Code (Octet 1) | Parameter value (Octet 2) | Parameter value (Octet 3) |
|---|---|---|
| **0x09** | 0xYY | 0xZZ |

For a threshold in ° C, with a precision in tenth of ° C, 0xYY and 0xZZ are calculated as follows:

$$0xZZYY = \frac{(threshold + 46.85)}{175.72} \times 65536$$

The threshold must be between -20.0 ° C and + 50.0 ° C.

### f. Emission period outside the confort zone

| Parameter Code (Octet 1) | Parameter value (Octet 2) |
|---|---|
| **0x0A** | 0xYY |
| **0x0B** | 0xZZ |

The transmission period will be every 0xYY hours and 0xZZ minutes.

The hours must be between 0 and 24 hours.

The minutes must be between 0 and 59 min.

Be careful, this period must be a multiple of the measurement period.

**Example**

Si 0xYY = 0x01 et 0xZZ = 0x1E, le produit émettra toutes les 1h30, s'il est paramétré en mode économie d'énergie et qu'il se trouve en dehors de la zone de confort.

### g. Temperature and hygrometry periodic measure

| Parameter Code (Octet 1) | Parameter value (Octet 2) |
|---|---|
| **0x0C** | 0xYY |
| **0x0D** | 0xZZ |

The measurement period will be every 0xYY hours and 0xZZ minutes.

The hours must be between 0 and 24 hours.

The minutes must be between 0 and 59 min.

**Example**

If 0xYY = 0x02 and 0xZZ = 0x0A, the product will take a measurement every 2h10.

### h. Temperature offset

| Parameter Code (Octet 1) | Parameter value (Octet 2) |
|---|---|
| **0x0E** | 0xYY (entier signé) |

For an offset in ° C, with a precision in tenth of ° C, 0xYY is calculated as follows

$$0xYY = offset \times 10$$

The Offset must be between -3.0 ° C and + 3.0 ° C.

### i. LoRaWAN network pairing

| Parameter Code (Octet 1) | Parameter value (Octet 2) |
|---|---|
| **0x0F** | 0x00 = ABP<br>0x01 = OTAA |

ABP : Activation By Personalization

OTAA : Over The Air Activation

### j. Codes reserved for future upgrades

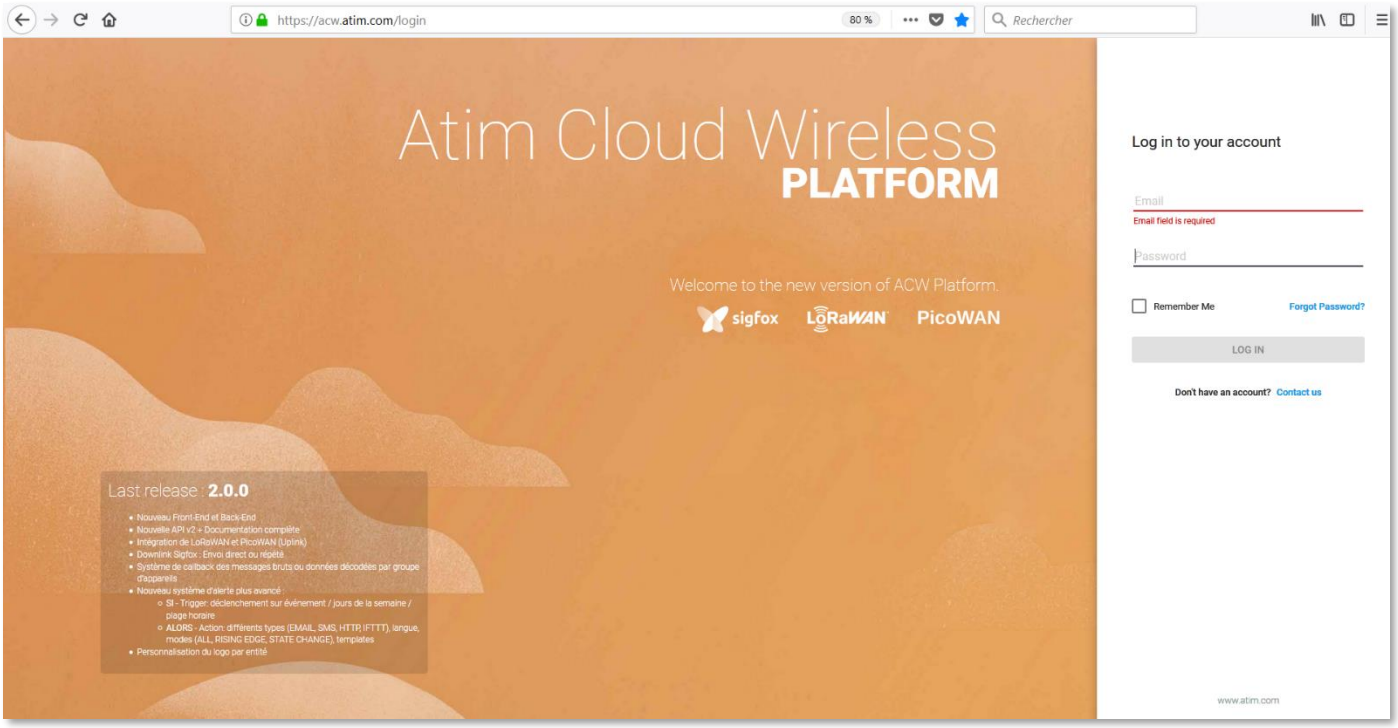
| Parameter Code (Octet 1) | Parameter value (Octet 2) |
|---|---|
| **0x10** | 0x08 |
| **0x11** | 0x00 |

**Warning: DO NOT MODIFY THESE VALUES**

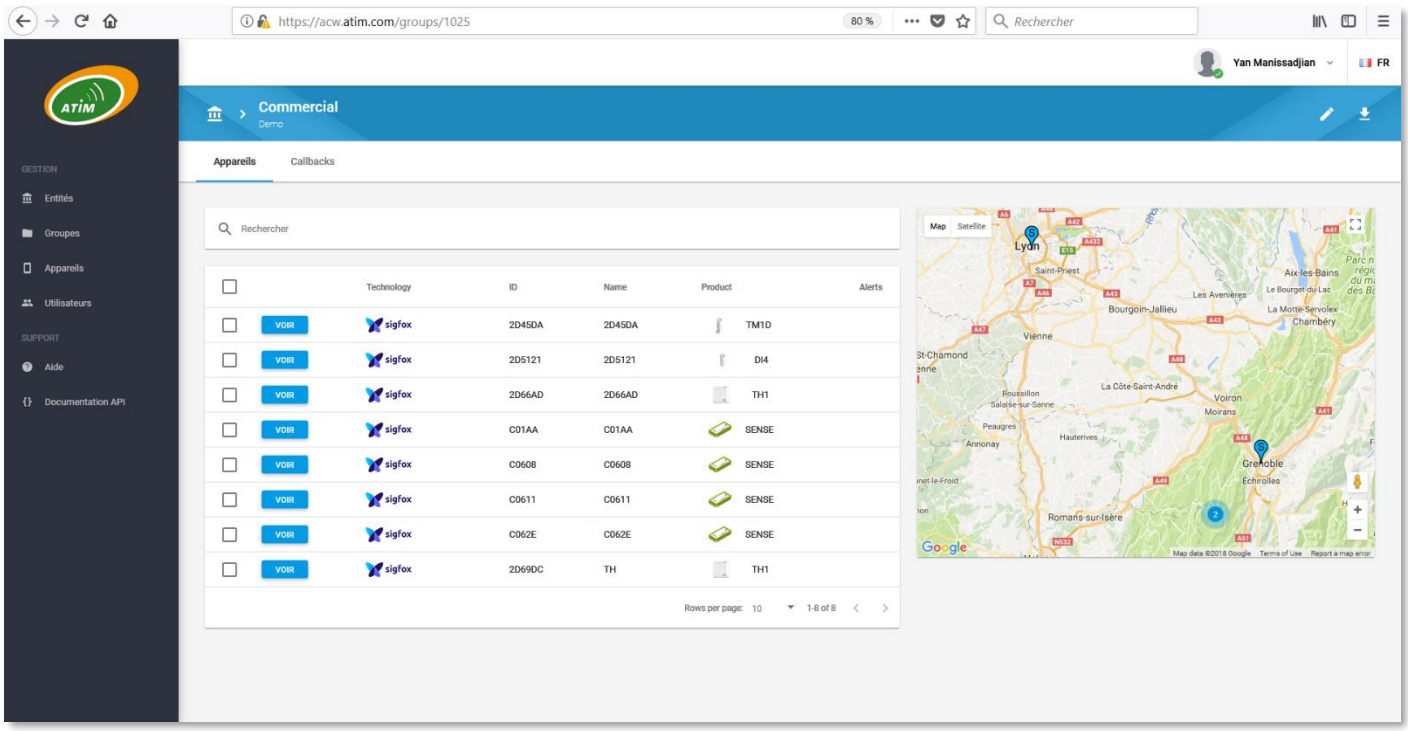
# Access to data on the web (Sigfox and LoRa solutions)

## a. ACW Cloud Wireless® platform modem visualization

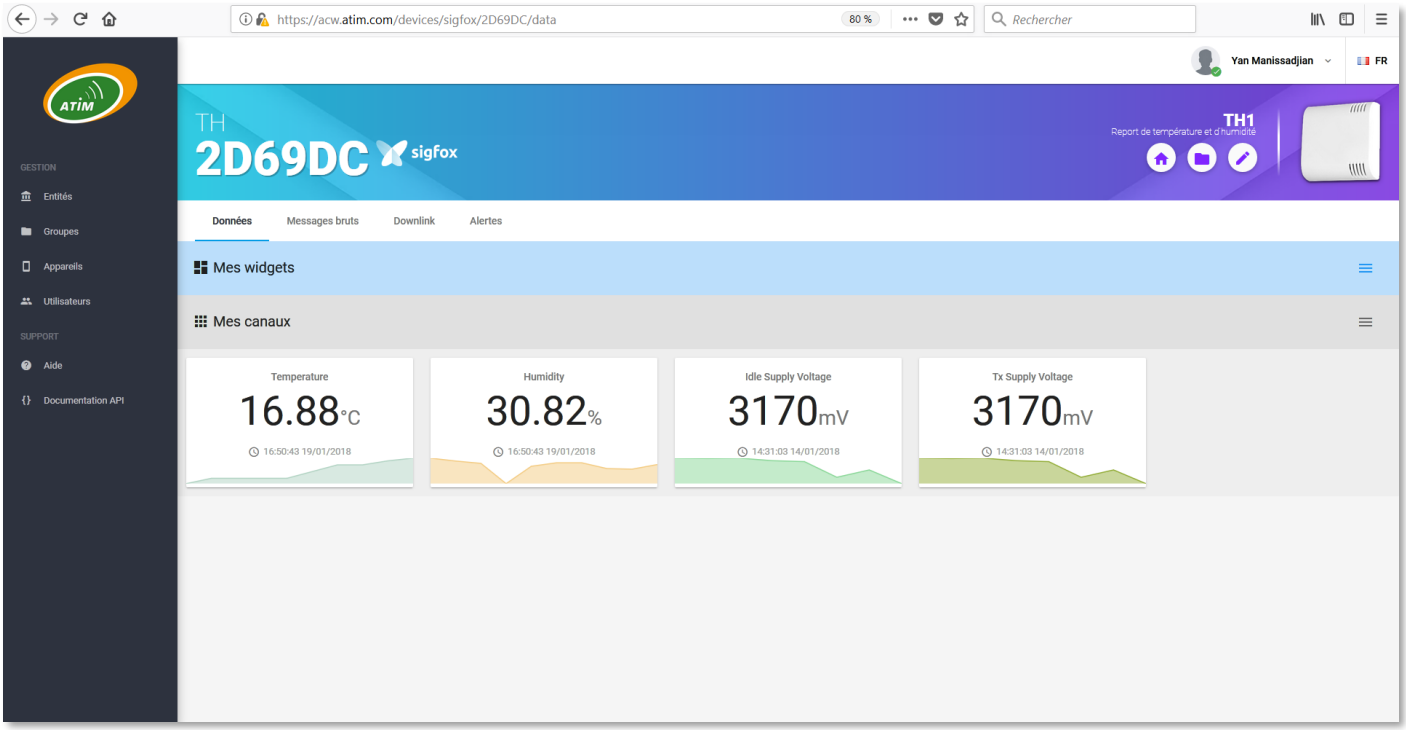
Log on to the web platform [http://acw.beta.atim.com](http://acw.beta.atim.com) to access your devices and view your data. Your login details will be provided by email to the shipping of your order.




In the page "My groups" you will find all your geolocated devices according to your installation.



You will find your temperature and humidity readings, as well as the standby and transmit battery voltages (if you requested the display of these information channels):




## b. Modem registration on Sigfox network

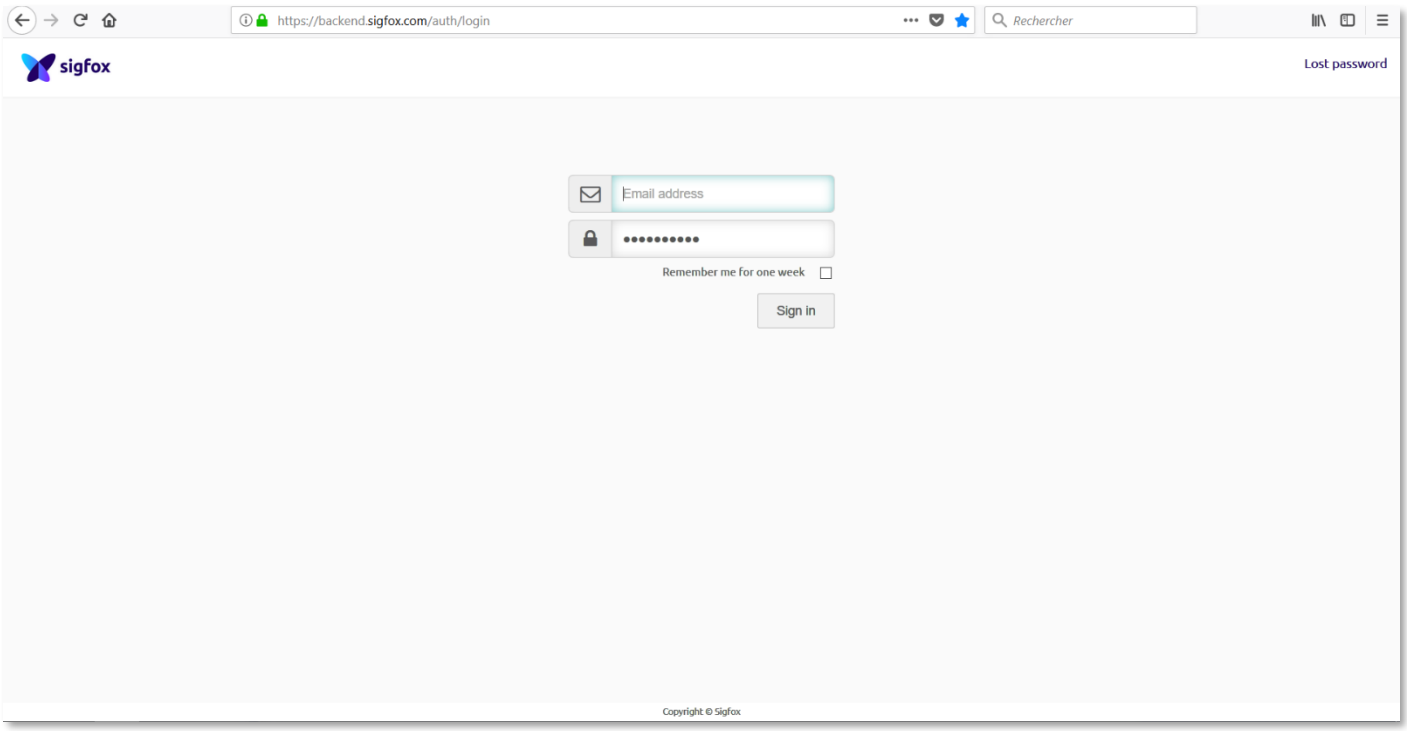
If you have subscribed to a Sigfox network subscription with ATIM, we will register your modem / sensor / sensor on the Sigfox network. On the other hand, if you have subscribed to your Sigfox subscription, you will need to register your device yourself on Sigfox's online portal.

Here is a quick procedure to register your product on the Sigfox network.

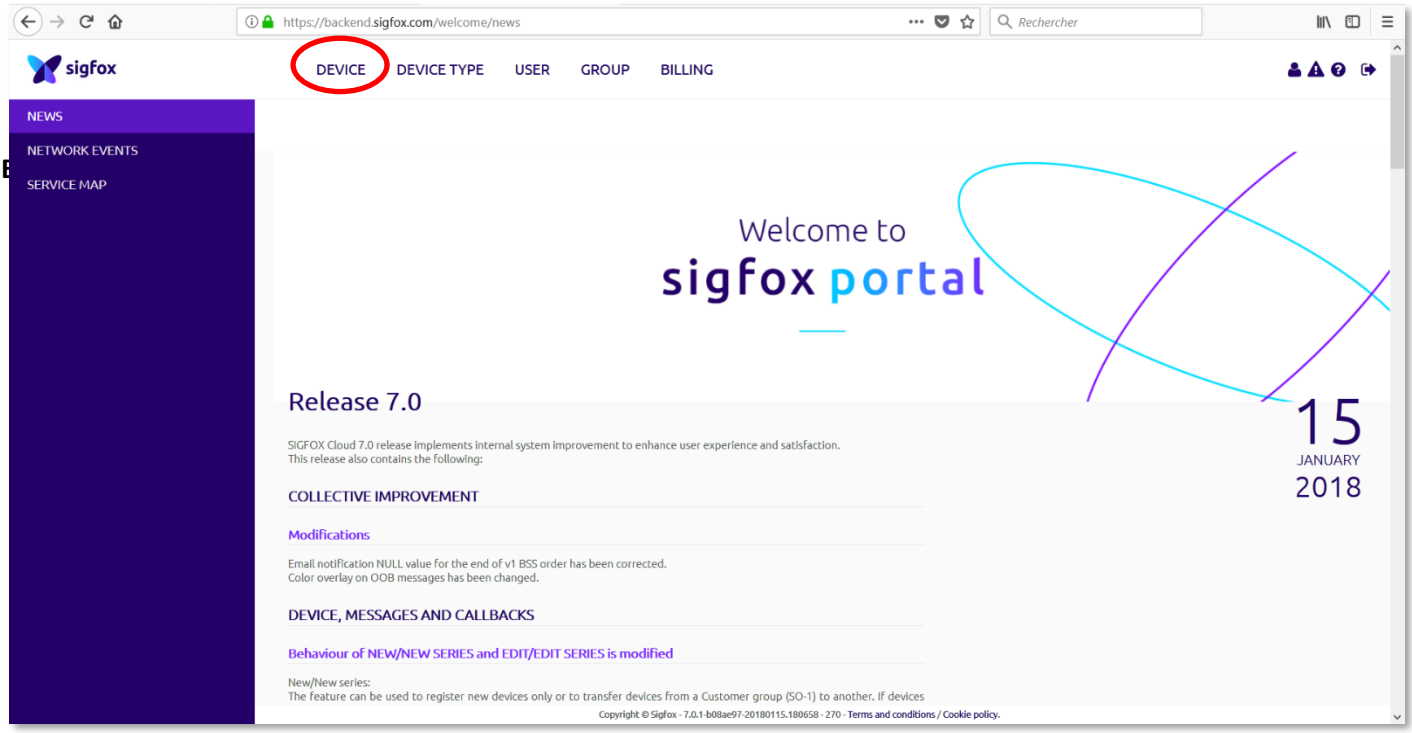
**For more details, contact Sigfox customer support directly.**

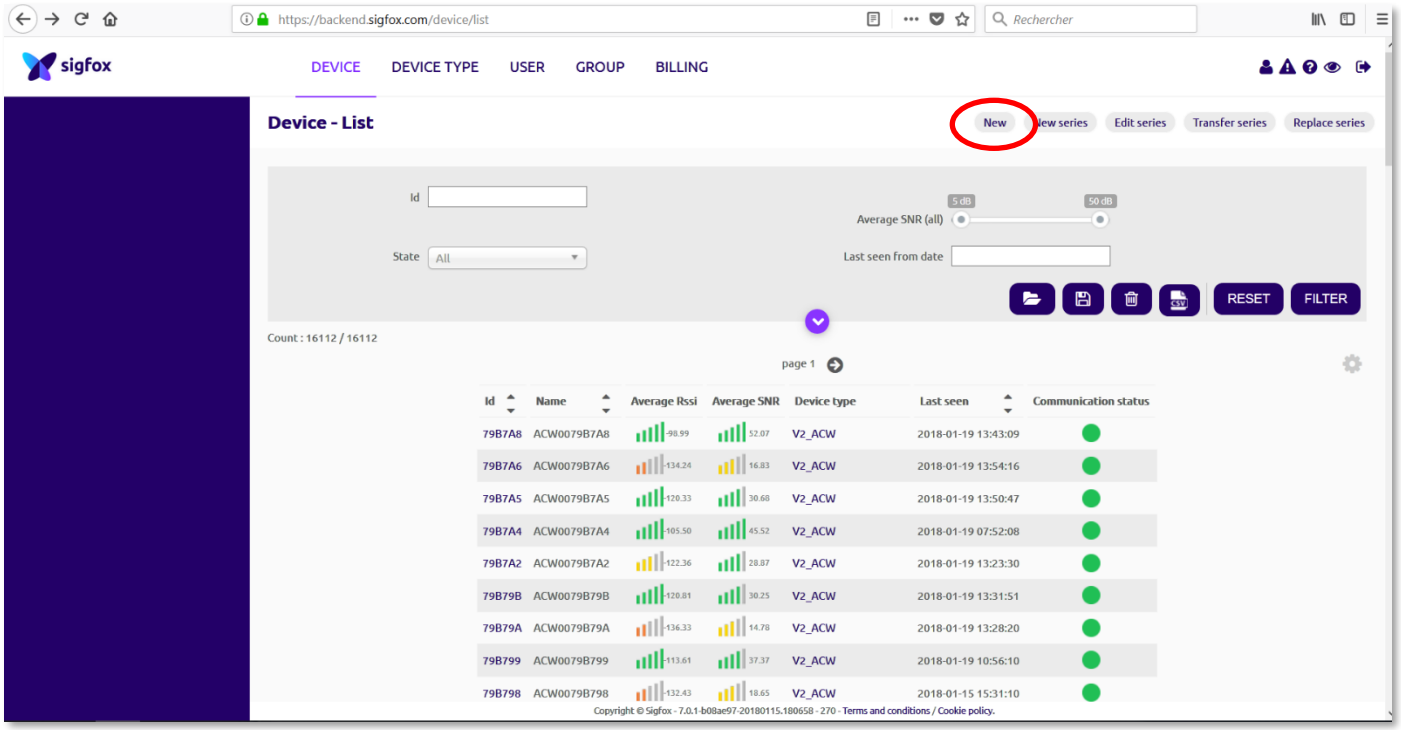
**Step 1:** Open an Internet browser and go to https://backend.sigfox.com.

Enter your login and password when creating your Sigfox customer account:

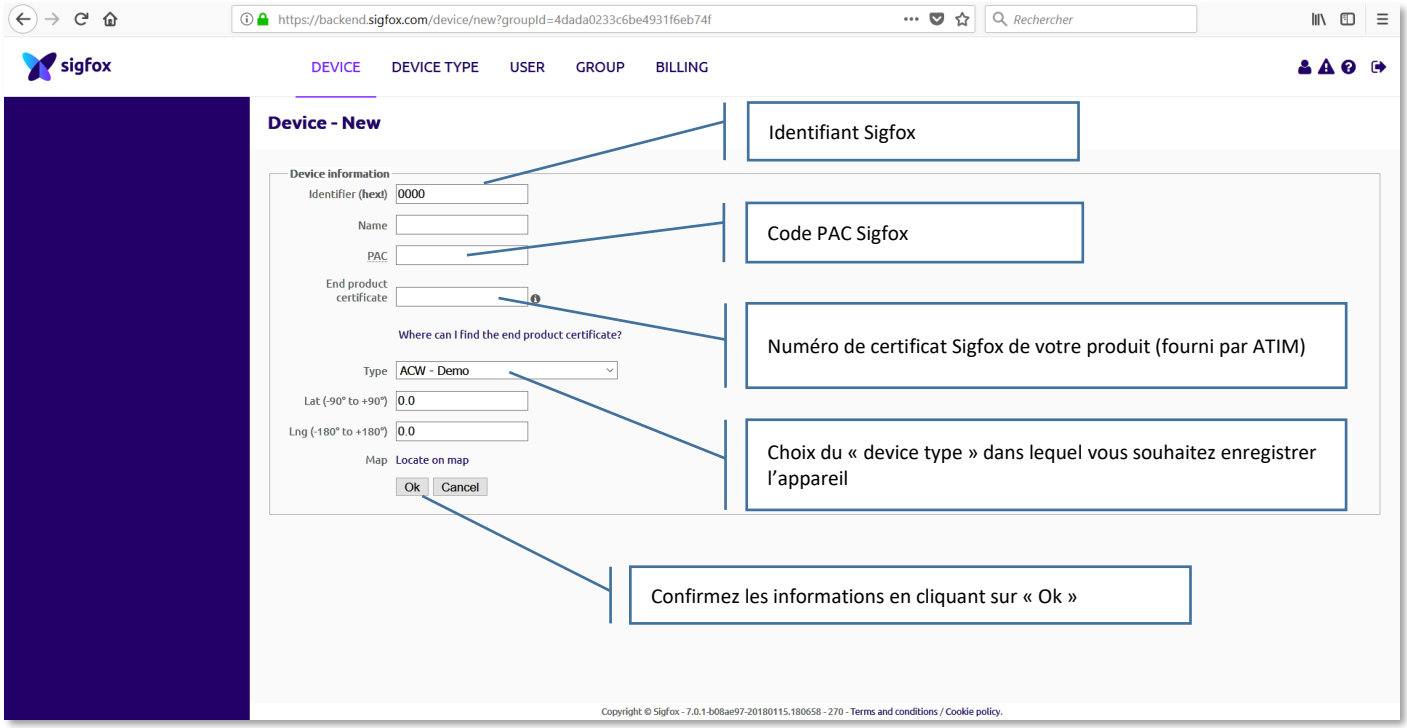



**Step 2:** Click on "device" at the top left:






**Step 4:** Fill in the information of the new device you want to register to your Sigfox account:




Your product is now being imported into your SIGFOX account. The import may take several hours.

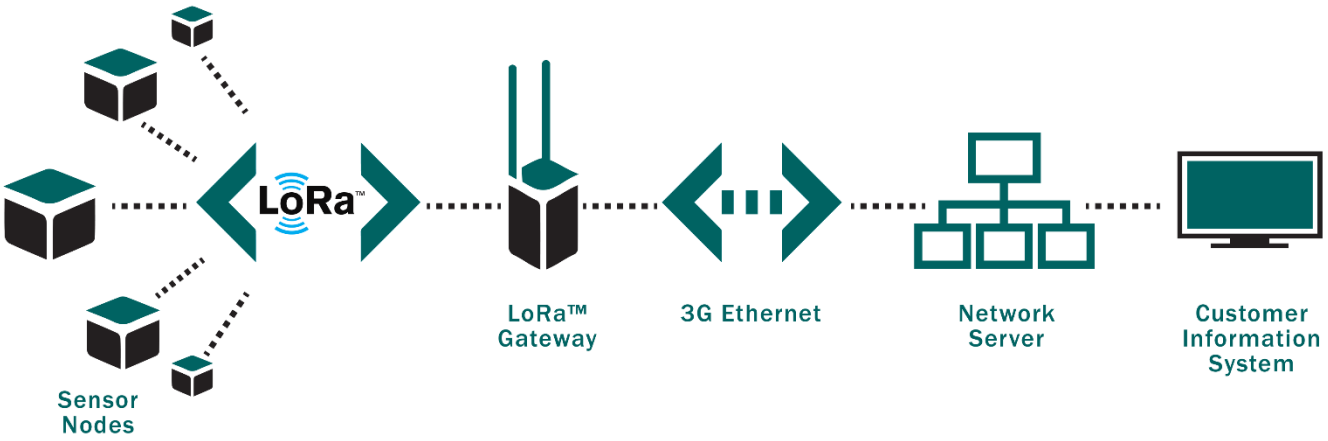
### c. Modem registration on LoRaWAN network

**Warning**

By default the ACW-TH are in ABP procedure. The choice between ABP and OTAA is available through a drop-down menu on the configurator interface. It is advisable to use the OTAA mode.

The product operates in OTAA (over the air activation), when powering up the product a call request (join request) to a LoRa network is issued. The device must first be provisioned on the required network, at one of the operators (Orange or Objenious for example) or existing private gateways.

A new pairing request can be made by powering the device back on.



# Help

## The modem is not configured via USB or the configurator page does not update

- Check if the power supply is properly connected to the modem
- Check if the light is flashing
- Check that "Windows Update" is enabled, that the PC is connected to the Internet and that the driver installation is complete. Also check that your version of the configurator is up to date (Menu File -> Update).
- Replace the USB cable
- In case of Failed to write the configuration, unplug and reconnect the USB cable

## Radio data is not received

- Check if the power supply is properly connected to the modem
- Check if the modem has been registered on the network
- Check if radio network coverage is available
- Check if the red light is illuminated during an emission
- Check if the green light is flashing during a broadcast

## Modem LED does not flash

- Check if the power supply is properly connected to the modem
- Configure the modem using the USB configurator

# Technical Support

For any information or technical problems, you can contact our technical support by e-mail and phone:

**www.atim.com/fr/technical-support**