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ATIM Cloud Wireless®

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**Temperature & Hygrometry**

**TH-I**

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User Guide



Concerned models:

ACW/LW8-TH

ACW/SF8-TH



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## Document version history

Version	Date	Description	Author	Affects software version
0.1	22/10/2015	Created document	YL	
0.2	27/10/2015	Added data	YL	
0.3	12/11/2015	Installation procedure	YL	
1.0	14/11/2016	Corrected references Corrected sentence structure Corrected image Clarified frame format. Clarified precision ranges Added LoRaWAN sections	CB	
1.1	22/03/2017	Corrections	YM	
1.2	27/03/2017	Corrections Updated product visuals	YM	
1.3	26/07/2017	Merged document with data from Quick Installation Guide	CB	SF V4.0.6 & SF V5.0.3 LW V4.0.8
1.4	06/09/2017	Updated table of contents	YM	
1.5	29/09/2017	Added LoRaWAN and Sigfox downlink info relating to ATIM downlink protocol v1.0.1	YM	SF V5.0.3 LW V5.1.0
1.6	19/01/2018	Updated visuals for Sigfox and ACW platform Added 'Software version no.' field to history table	YM	SF V5.0.3 LW V5.1.0
1.7	29/03/2018	Updated periodic and Energy saver graphics Update frame format table	YM	SF V5.0.3 LW V5.1.0
1.8	23/01/2019	Evolution: battery-pack 7,2mAh QR code information added	YM	SF V5.0.3 LW V5.1.0

## Disclaimer

The information contained in this document is subject to change without warning and does not represent a commitment on the part of ATIM radiocommunications. ATIM radiocommunications provides this document 'as-is' with no warranty of any kind, express or implied, including but not limited to implied warranties of merchantability or fitness for a particular purpose. ATIM radiocommunications may make changes and/or improvements to this manual or to the product(s) or program(s) described in this manual, at any time.

## 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

### **a. 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.

### **b. 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.

### c. 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 specifications

### a. Product

Dimensions	80 x 80 x 35 mm		
Antenna	Integrated (¼ wave)		
Temperature	-20°C to +55°C (operation) -40°C to +70°C (storage)		
Mounts to	Wall		
Housing	Building automation		
Power supply	1 battery-pack 3,6V / 7,2 mAh		
Weight	100 g		
Frequency	865 – 870 MHz		
Power	25 mW (14 dBm)		
Transfer rate	Local: 1.2 to 115 kbit/s		
	Sigfox: 100 bps		
	LoRaWAN: 300 bit/s to 10 kbit/s		
Current draw	Local:	Sigfox:	LoRa:
Tx mode	60 mA	60 mA	50 mA
Standby mode	7 µA	7 µA	7 µA
Rx mode	35 mA	35 mA	18 mA

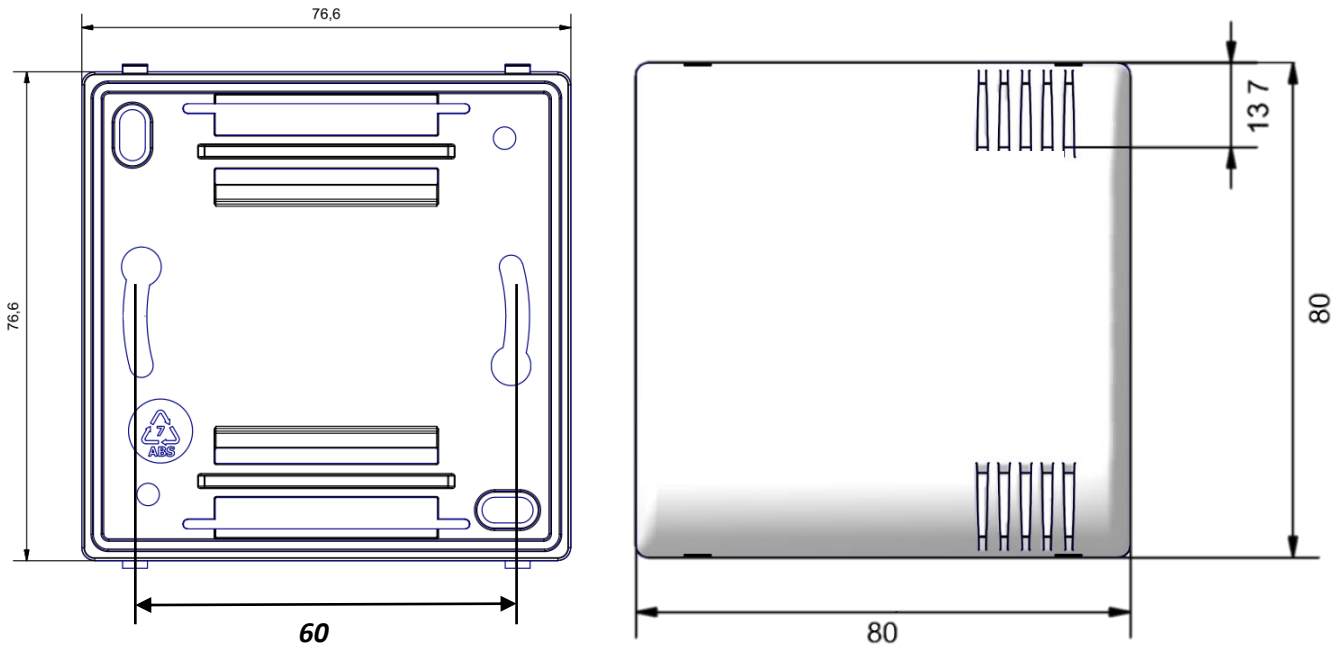
### b. Temperature and humidity sensors

The following ranges refer to the sensors used. NOTE: The product has a more restricted operating range than the sensors (see above).

Temperature	Range	-40 – +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 (12 bits)
	Precision between 0 and 80% RH	+ - 3% RH

# Housing

## a. Space requirements



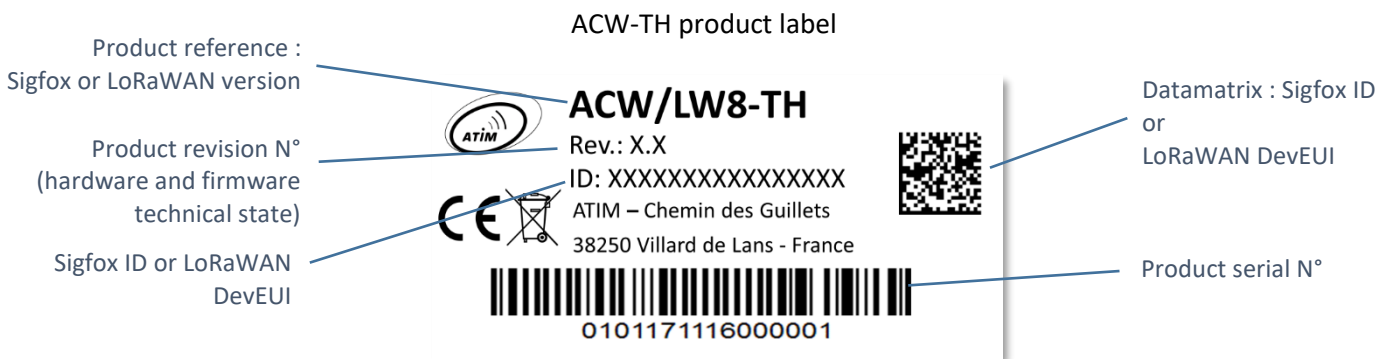
## b. Wall mounting

Your ACW-TH modem must be mounted to a flat wall using the mounting holes provided on the rear panel of the housing. Position the back of the housing on the wall, oriented in the direction shown by the arrows on the rear panel, using screws 5 mm in diameter. There is no need to open the housing; by default, the sampling period is based on one reading every 30 minutes.

## c. Identification

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

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



Each ATIM ACW product line 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.



QR Code label of an ACW-TH:



Reading this code indicates the following information:

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

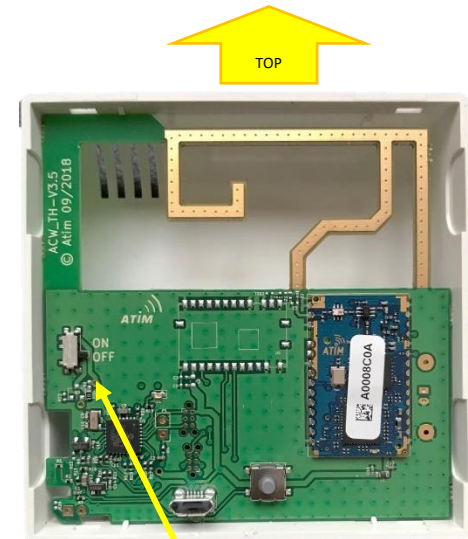
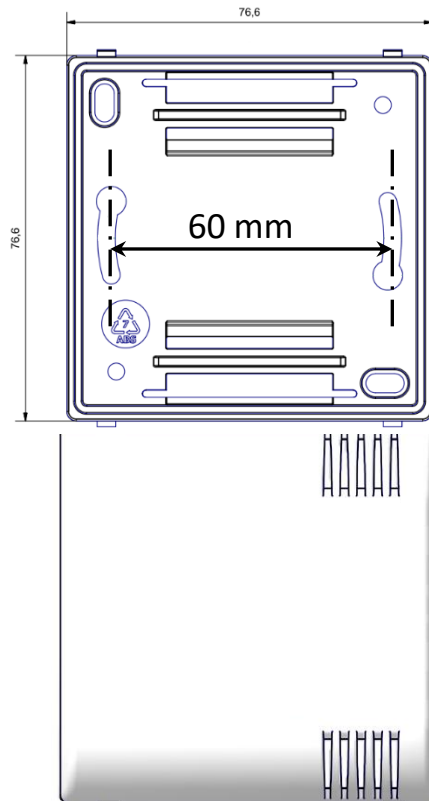
Interpretation:

ATIM	ACW/LW8-TH	C.0	190114	1	3.0	5.11	70B3D59BA0008C0A
Manufacturer name	Product reference	Revision version	Manufacturing date	Site de fabrication	Hardware version	Application firmware version	Sigfox ID or LoRaWAN DevEUI

#### d. Assembly and disassembly

The housing must be mounted to a flat, vertical wall. Place and attach the back of the housing against the wall, oriented in the direction shown by the arrows on the rear panel. Use screws 5 mm in diameter.

The ventilation holes in the cover must be on the right, as shown in this image.



**Pour mettre le produit sous tension, basculer le switch en position ON.**

Align the pins at the top of the housing base with their respective locations on the rear panel.

To separate the two panels, place a screwdriver in one of the two attachment points at the bottom\* of the front panel and press inward until the cover separates from the base.



\* The housing must only be opened from the bottom; opening it from the top may damage the circuit.

#### e. Installation

For optimal results, we recommend that you install the device away from all environmental obstructions and place it at a minimum height of 2 m. Note that the antenna is integrated into the housing. It must be mounted on a vertical surface or attached to a wall.

The product includes an integrated digital temperature and humidity sensor. Values are sampled at regular intervals, as defined with the USB configuration tool. By default, this period is set at one reading every 30 minutes, so there is no need to open the housing. A compartment for two (2) standard AA batteries lets you power your ACW-TH.

## Operation

The ACW-TH measures a temperature and humidity level at time 't' and sends the data by radio on the associated Sigfox or LoRaWAN network, depending on which model you use.

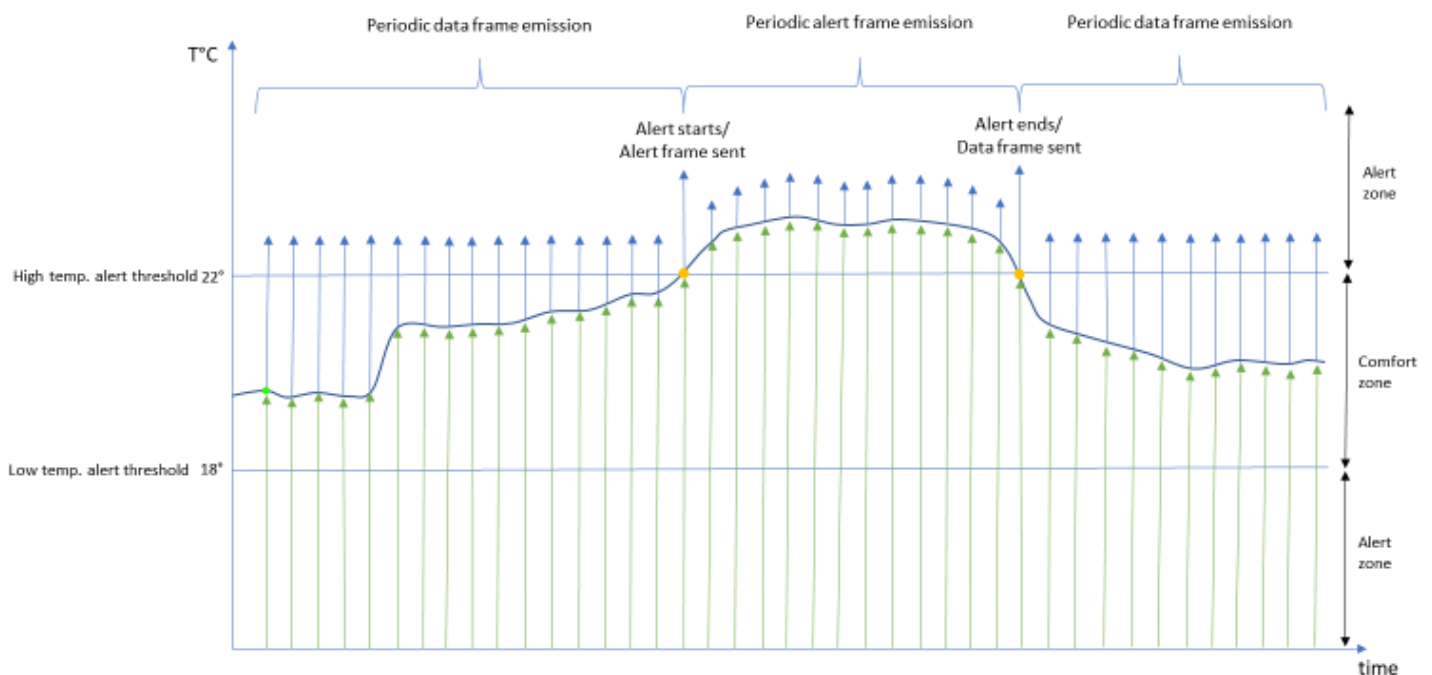
Two modes of operation are available: Periodic or Energy Saver.

### a. Periodic mode (shown as 'Periodical' in the configuration tool)

To ensure the most complete telemetry possible, temperature and humidity readings are sent on a regular and periodic basis. This makes it possible to obtain a very precise monitoring curve. In this mode, every reading is sent out by the ACW-TH. In other words, the sampling period is equal to the statement period (= interval at which readings are sent out).

This sampling and statement period is user-configurable, with a minimum value of 10 minutes.

Example of operation in Periodic mode:



On the other hand, because this mode involves regular (and potentially very frequent) radio transmissions, this mode of operation may consume large amounts of energy, leading to reduced battery life.

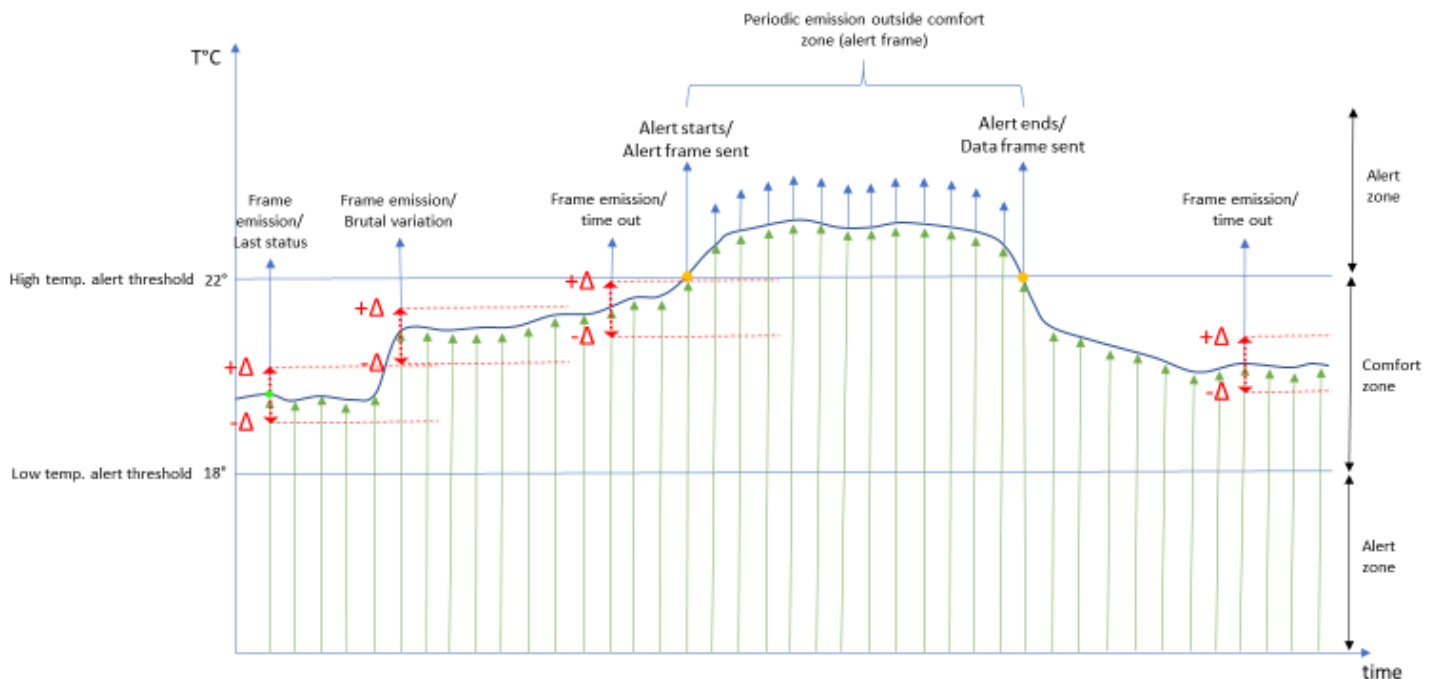
## b. Energy Saver mode

This mode of operation aims to minimise energy consumption and maximise battery life.

This mode can be configured to send out frames only under certain conditions:

- If temperature readings are stable: a frame is sent out only after a specified period of time has elapsed (timeout).
- If the temperature variation (in °C) between two consecutive readings is larger than the maximum value specified by the user.
- If an alert threshold is crossed: a frame is sent out when the temperature reading leaves or re-enters the comfort zone.

Example of operation in Energy Saver mode:



### Phases of operation:

- from 0 to 3 sec: general initialisation + USB initialisation.
- from 3 to 4 sec: radio initialisation.
- from 1 min to 5 min: send out a test frame once per minute.
- at 6 min: send out a keep-alive frame (battery information).
- at 7 min: send out a temperature/humidity frame.

Mode of operation (periodic or energy saver) specified by user

- Keep-alive frame sent once per day or once every 4 days.

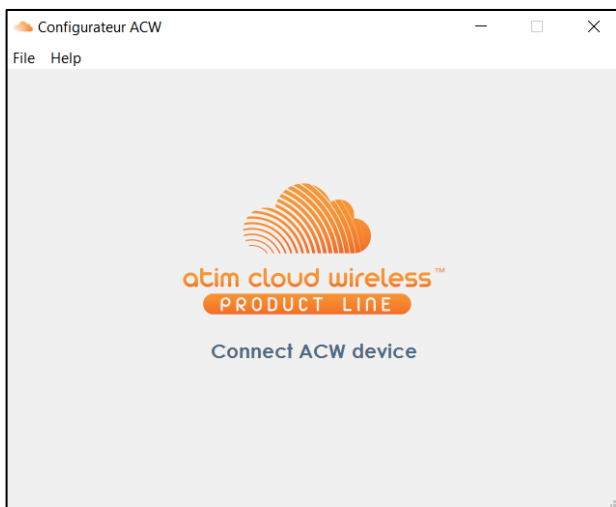
# ACW configuration tool

## a. What version of the ACW configuration tool should you use?

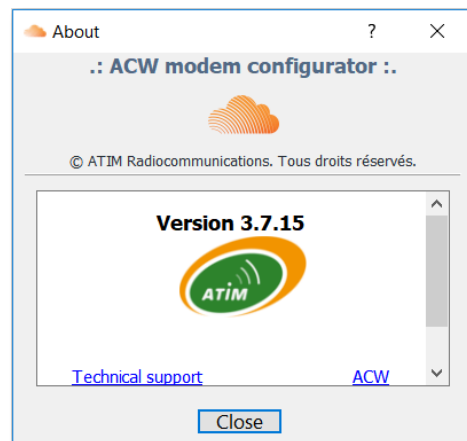
For a TH with application software version:	Use ACW configuration tool version:
Sigfox: v4.06 or earlier LoRaWAN: v4.08 or earlier	V3.7.15
Sigfox: v5.03 or later LoRaWAN: v5.10 or later	V4.0.2

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

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



When the ACW Configuration Tool is started, the stand-by window appears on the screen.



Click 'Help' at the top left of the window, then click 'About' to view the version number of the ACW Configuration Tool.

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

## b. Configuring the LoRaWAN network pairing mode:

*Applies only to ACW-TH/LW8 version.*

On LoRaWAN networks, there are two pairing methods by which a module can connect to the network.

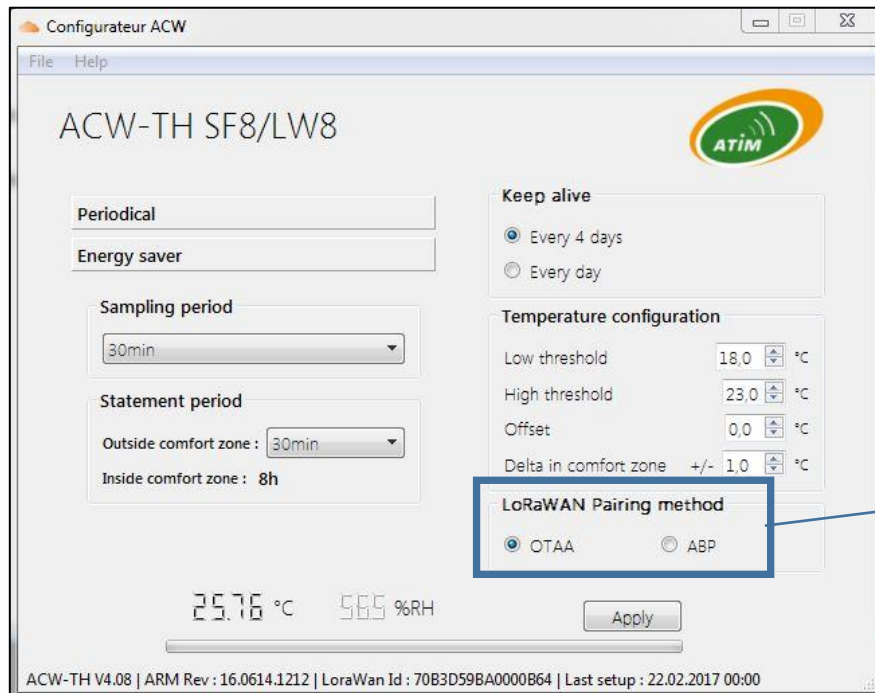
- OTAA (Over The Air Activation):

In this mode, the communication keys are assigned and transmitted over the network every time the module starts up or requests a connection. This is the mode that is configured by default.

- ABP (Activation By Personalization):

In this mode, the communication keys used are the ones loaded on the module at the factory. Every time the module starts up, these same keys are used.

When you connect the ACW-TH/LW8 via USB, the ACW configuration tool automatically detects the module's factory settings and displays them in the following window:



Select LoRaWAN network pairing method

### c. Configuring the Energy Saver mode:

Select mode of operation

Temperature and humidity sampling period

Frequency of transmission to network

ACW-TH firmware version

Radio module firmware version

Network ID

Date of last configuration

Apply settings

Keep-alive frame frequency:

Lower threshold

Upper threshold

Offset applied to each reading and to the displayed value

Difference in °C (vs. last reading sent). If outside range, send an alert

### d. Configuring periodic mode:

Select mode of operation

Temperature and humidity sampling + statement period

ACW-TH firmware version

Radio module firmware version

Network ID

Date of last configuration

Apply settings

Keep-alive frame frequency:

Lower threshold

Upper threshold

Offset applied to each reading and to the displayed value



Once the configuration is complete, do not leave the module connected via USB. This mode of operation is very energy-intensive. When you remove the USB connection without removing the battery, the module re-initialises itself and automatically returns to normal operation.

## Frame formats

### 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)
<b>Keep Alive</b>	Keep-alive frame	1	01	Supply voltage IDLE (mV)		Supply voltage TX (mV)		64
<b>Test</b>	Test frame	5	05	Counter				
<b>TH</b>	Temperature reading frame	23	17	Temperature code		Humidity code		
<b>TH</b>	Alert – reached lower threshold (°C)	15	0F	Temperature code		Humidity code		
<b>TH</b>	Alert – reached upper threshold (°C)	17	11	Temperature code		Humidity code		

The data from the sensors are decoded as follows:

$$T(^{\circ}\text{C}) = \frac{\text{TemperatureCode} \times 175.72}{65536} - 46.85$$

$$H(\%RH) = \frac{\text{HumidityCode} \times 125}{65536} - 6$$

The voltage of the device batteries is good if

Supply voltage is greater than 2.9 V.



## b. Local 868 MHz

In local point-to-point communication mode, the Modbus RTU protocol is used.

Modbus table

Modbus address	Data
<b>0x00 (0)</b>	Read logical entries b0: State of entry 1 b1: State of entry 2
<b>0x24 (36)</b>	Read temperature and humidity

Modbus functions supported

Function	Type
<b>0x03 (3)</b>	Read multiple registers
<b>0x10 (16)</b>	Write multiple registers

Decoding data



Element	Size	Description	Value
<b>Slave Id</b>	1 octet	Modbus slave ID	14
<b>Code Function</b>	1 octet	0x10 (Write multiple registers)	3
<b>Bytes count</b>	1 octet	Number of bytes to read	8
<b>Temperature</b>	2 octets	Temperature code	65fc
<b>Humidity</b>	2 octets	Humidity code	5426
<b>Blank</b>	2 octets	Blank	0
<b>Blank</b>	2 octets	Blank	0
<b>CRC</b>	2 octets	Error check code	XXXX

The data from the sensors are decoded as follows:

$$T(^{\circ}\text{C}) = \frac{\text{TemperatureCode} \times 175.72}{65536} - 46.85$$

$$H(\%RH) = \frac{\text{HumidityCode} \times 125}{65536} - 6$$

## Downlink

This feature is available on ACW-TH models that meet the following conditions:

	Application software:	Radio firmware:
<b>SIGFOX version</b>	<b>v5.0.3 or higher</b>	<b>v5931 or higher</b>
<b>LoRaWAN version</b>	<b>v5.1.0 or higher</b>	<b>v2.3.2 or higher</b>

The USB configuration of these products requires an ACW configuration tool of version **4.0.2** or higher.

The document ATIM\_ACW-DLConfig\_UG\_FR\_v1.1 explains how the downlink works with regard to version v1.1 of the ATIM Downlink Protocol.

The parameters specific to ACW-TH models are:

### a. Keep-alive frame frequency

Parameter code (Byte 1)	Parameter value (Byte 2)
<b>0x03</b>	0x00 = once per day, 0x01 = once every 4 days, 0x02 = once every 8 days

### b. Delta for comfort zone

Parameter code (Byte 1)	Parameter value (Byte 2)
<b>0x06</b>	0xYY

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

$$0xYY = \text{delta} \times 10$$

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

### c. Mode of operation

Parameter code (Byte 1)	Parameter value (Byte 2)
<b>0x07</b>	0x00 = Periodic, 0x01 = Energy Saver

### d. Lower threshold

Parameter code (Byte 1)	Parameter value (Byte 2)	Parameter value (Byte 3)
<b>0x08</b>	0xYY	0xZZ

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

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

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

#### e. Upper threshold

Parameter code (Byte 1)	Parameter value (Byte 2)	Parameter value (Byte 3)
<b>0x09</b>	0xYY	0xZZ

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

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

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

#### f. Statement period when outside the comfort zone

Parameter code (Byte 1)	Parameter value (Byte 2)
<b>0x0A</b>	0xYY
<b>0x0B</b>	0xZZ

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

The number of hours must fall between 0 and 24.

The number of minutes must fall between 0 and 59.

Note that this period must be a multiple of the sampling period.

Example:

If 0xYY = 0x01 and 0xZZ = 0x1E, the product will send out a frame every 1 hour and 30 minutes, if it is in energy saver mode and it is outside the comfort zone.

#### g. Temperature and humidity sampling period

Parameter code (Byte 1)	Parameter value (Byte 2)
<b>0x0C</b>	0xYY
<b>0x0D</b>	0xZZ

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

The number of hours must fall between 0 and 24.

The number of minutes must fall between 0 and 59.

Example:

If 0xYY = 0x02 and 0xZZ = 0x0A, the product will take a sample every 2 hours and 10 minutes.

#### h. Temperature offset

Parameter code (Byte 1)	Parameter value (Byte 2)
<b>0x0E</b>	0xYY (signed integer)

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

$$0xYY = offset \times 10$$

The offset must fall between -3.0°C and +3.0°C.

#### i. Pairing with LoRaWAN network

Parameter code (Byte 1)	Parameter value (Byte 2)
<b>0x0F</b>	0x00 = ABP 0x01 = OTAA

ABP: Activation By Personalization

OTAA: Over The Air Activation

j. Codes reserved for future developments

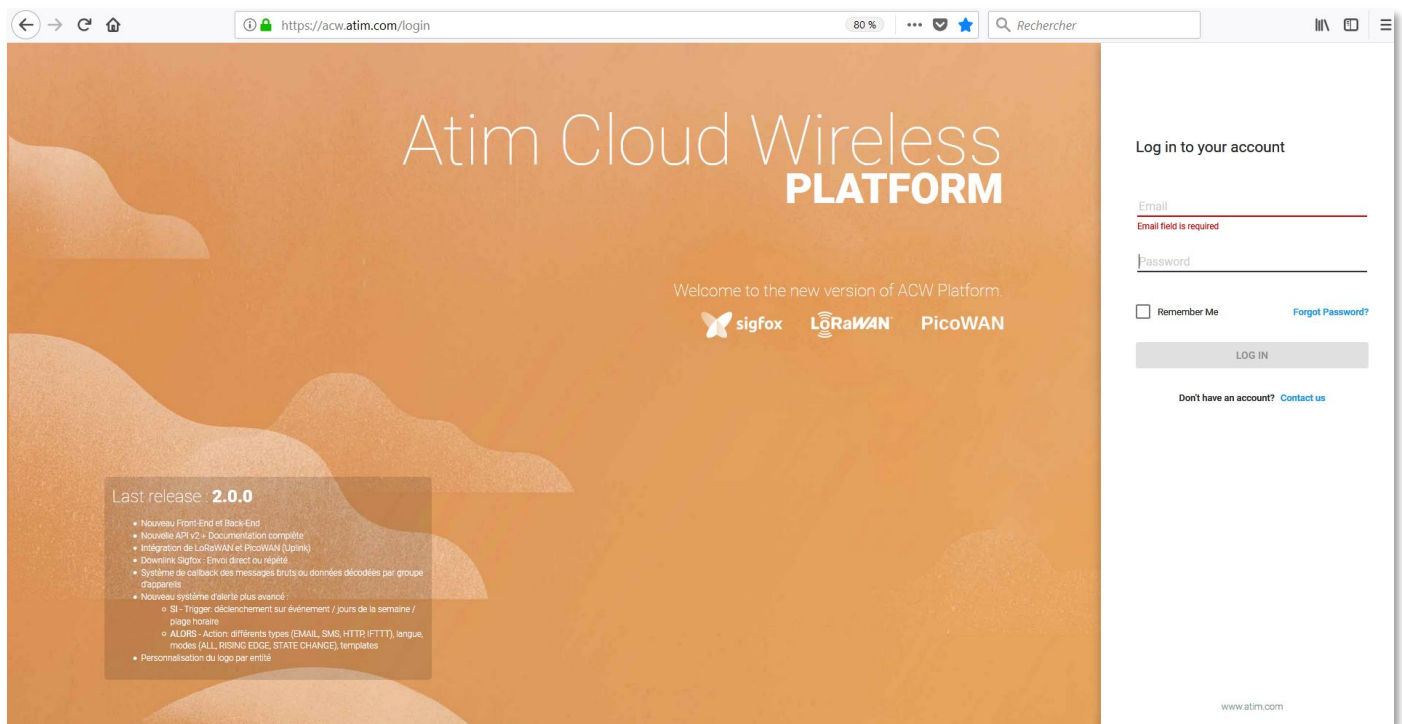
Parameter code (Byte 1)	Parameter value (Byte 2)
<b>0x10</b>	0x08
<b>0x11</b>	0x00

**IMPORTANT: DO NOT CHANGE THESE VALUES**

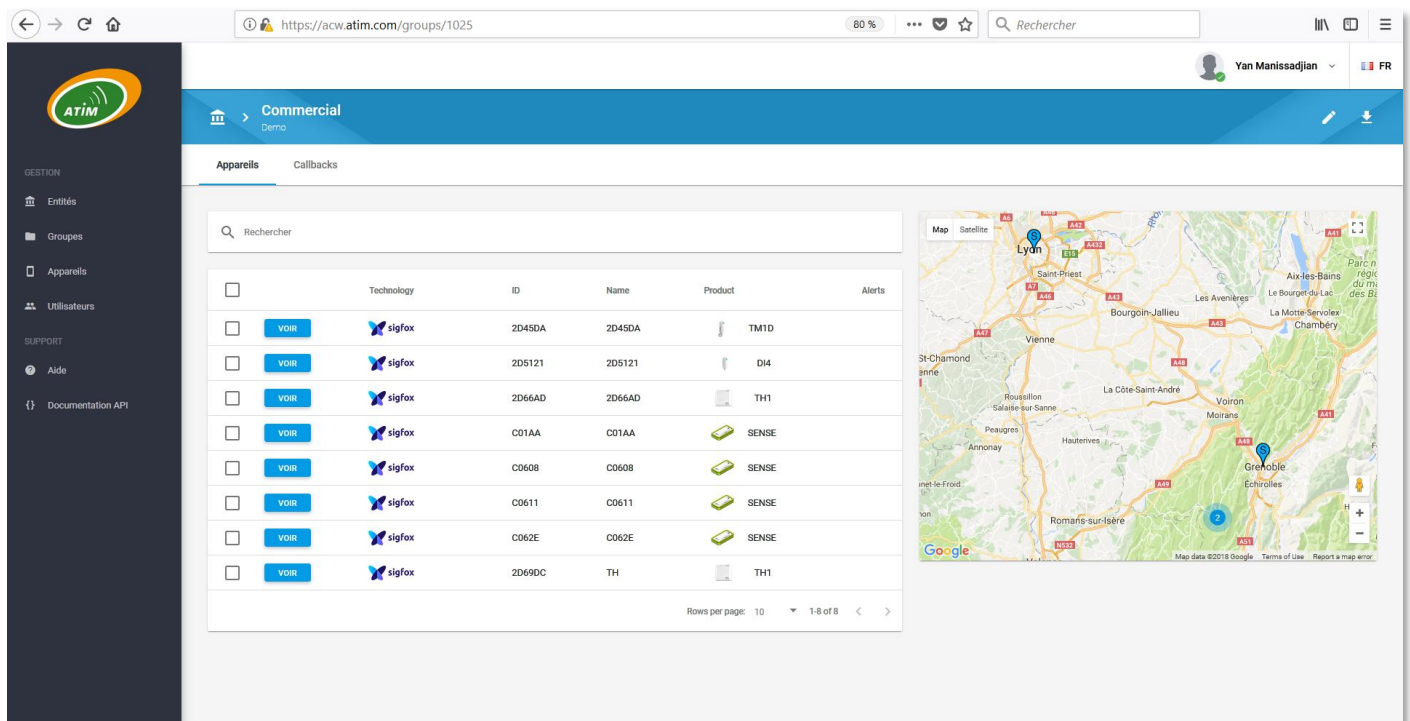
# Accessing data on the web (Sigfox and LoRa solutions)

## a. Viewing modems on the ACW platform

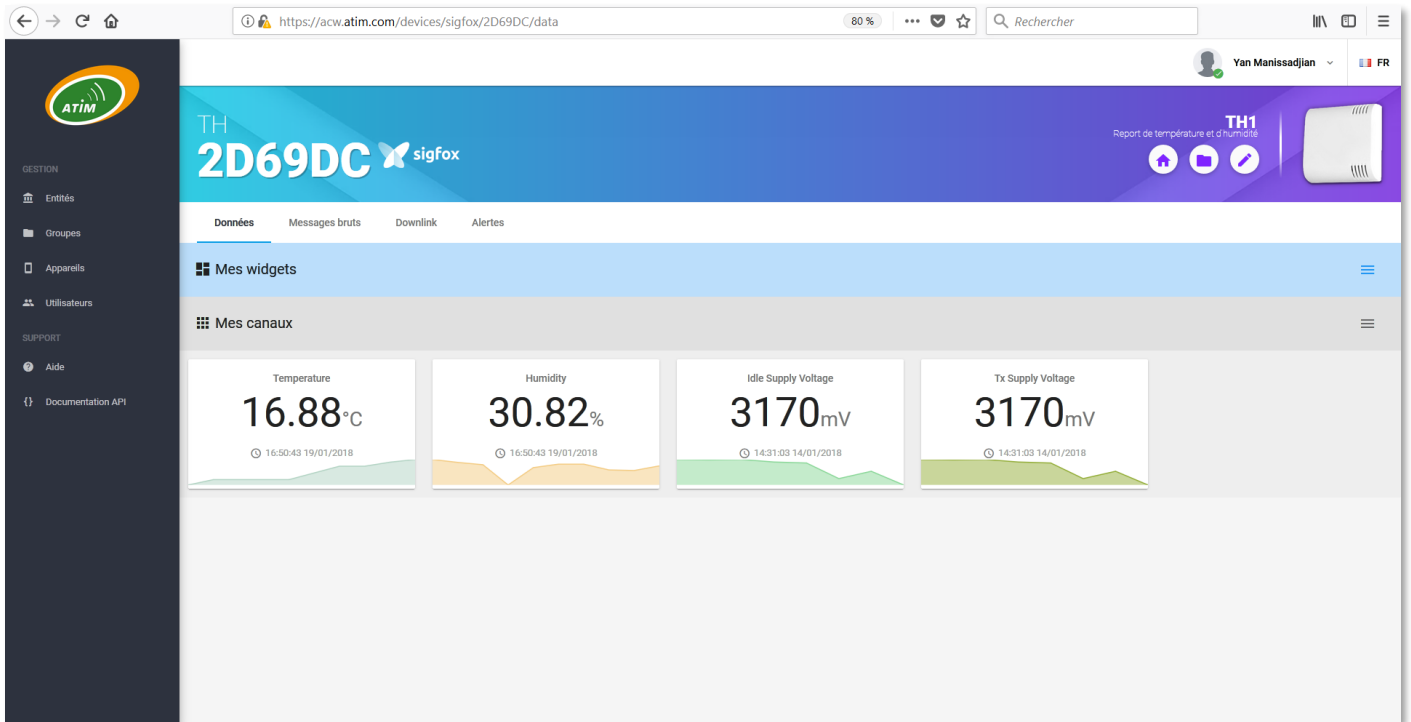
Connect to the Web platform at <http://acw.atim.com> to access all your devices and view your data. Your login credentials will be emailed to you when we send out your order.



The 'My Groups' page shows location data for all your devices after installation.



You will find all your temperature and humidity readings and battery voltages on standby and when transmitting (if you have requested that these information channels be displayed):



## b. Registering the modem on the Sigfox network

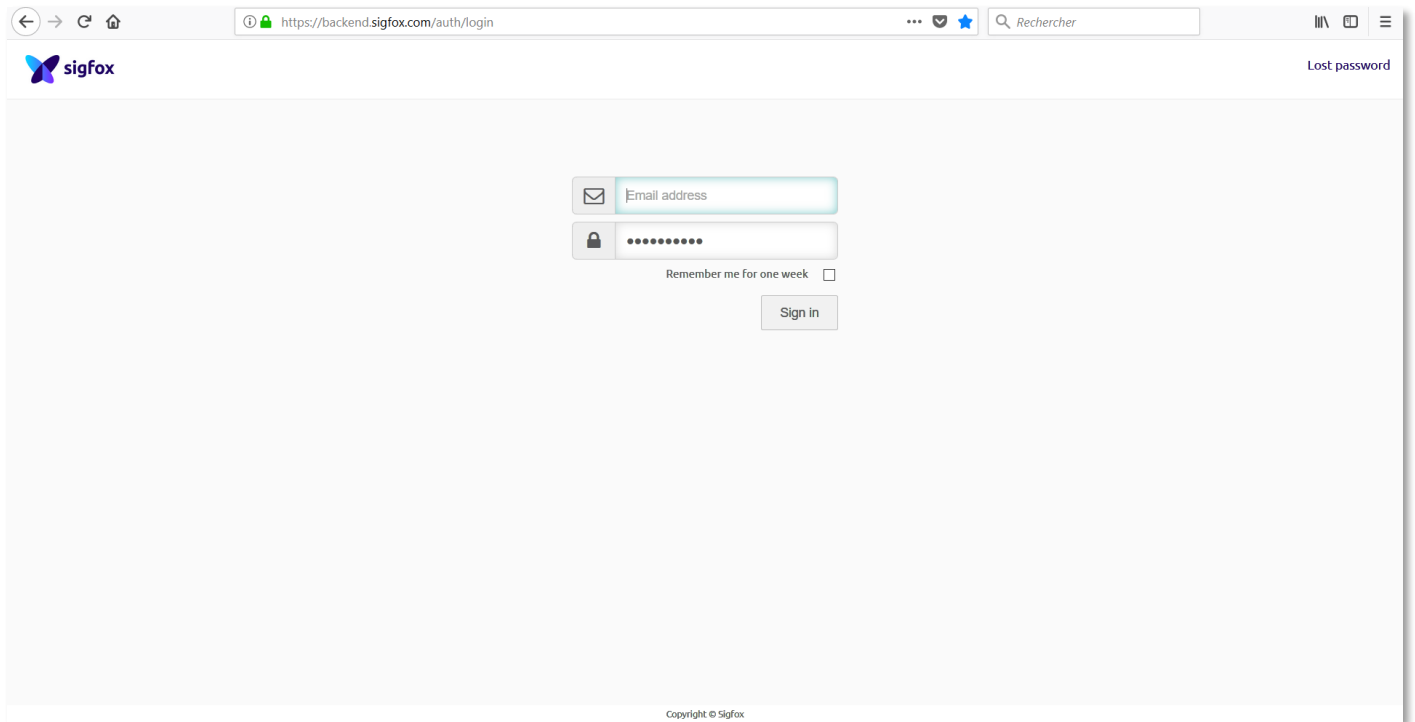
If you have signed up with ATIM for a subscription to the Sigfox network, we will take care of registering your modem/probe/sensor on the Sigfox network. However, if you have set up your subscription through Sigfox, you will need to register your device yourself through the Sigfox online portal.

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

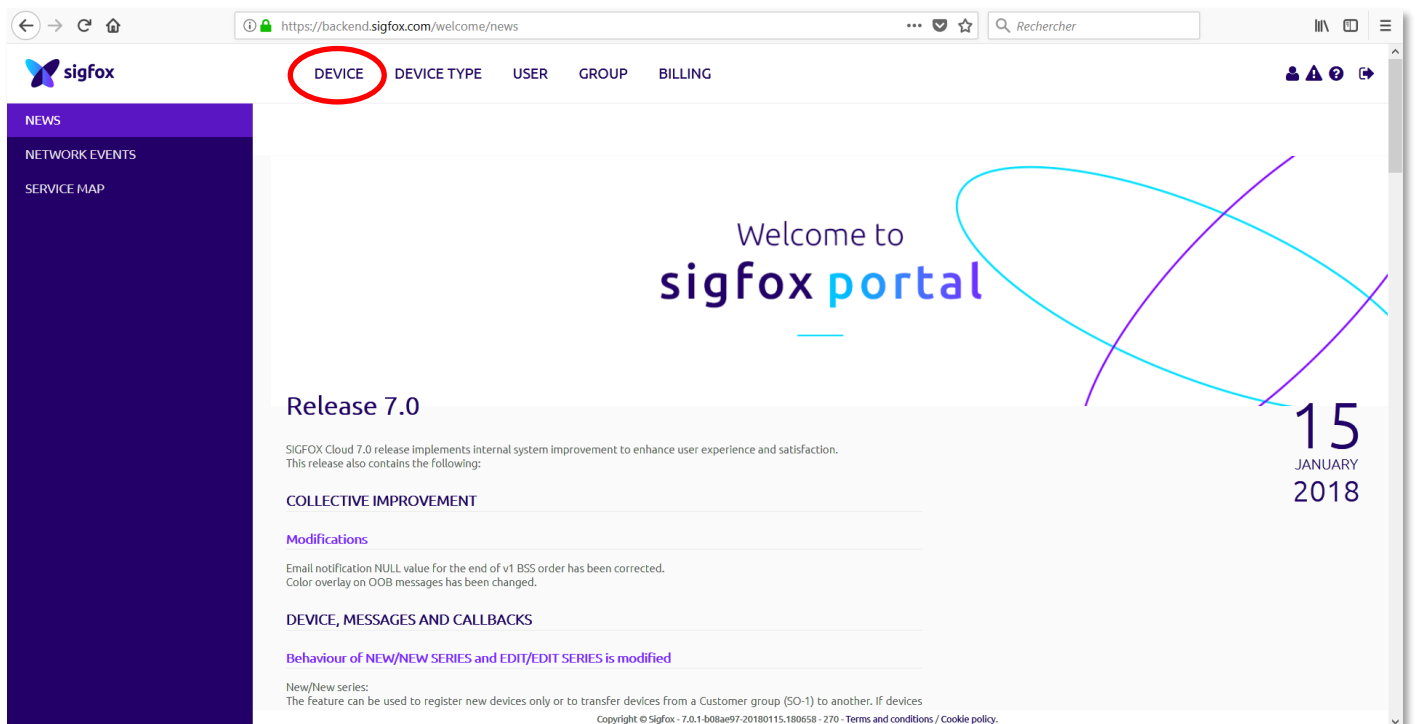
**For more details, contact Sigfox customer support directly.**

**Step 1:** Open a Web browser and go to <https://backend.sigfox.com>.

Enter the login name and password you selected when you created your Sigfox customer account:



**Step 2:** Click 'Device' at the top left:



**Step 3:** On the screen with your list of devices, click 'New':

Device - List

Count: 16112 / 16112

Id	Name	Average Rssi	Average SNR	Device type	Last seen	Communication status
79B7A8	ACW0079B7A8	98.99	52.07	V2_ACW	2018-01-19 13:43:09	●
79B7A6	ACW0079B7A6	-134.24	16.83	V2_ACW	2018-01-19 13:54:16	●
79B7A5	ACW0079B7A5	-120.33	30.68	V2_ACW	2018-01-19 13:50:47	●
79B7A4	ACW0079B7A4	-105.50	45.52	V2_ACW	2018-01-19 07:52:08	●
79B7A2	ACW0079B7A2	-122.36	28.87	V2_ACW	2018-01-19 13:23:30	●
79B79B	ACW0079B79B	-120.81	30.25	V2_ACW	2018-01-19 13:31:51	●
79B79A	ACW0079B79A	-136.33	14.78	V2_ACW	2018-01-19 13:28:20	●
79B799	ACW0079B799	-113.61	37.37	V2_ACW	2018-01-19 10:56:10	●
79B798	ACW0079B798	-132.43	18.65	V2_ACW	2018-01-15 15:31:10	●

**Step 4:** Enter the required information about the new device that you want to register in your Sigfox account:

Device - New

Device information

Identifier (hexd) 0000

Name

PAC

End product certificate

Where can I find the end product certificate?

Type ACW - Demo

Lat (-90° to +90°) 0.0

Lng (-180° to +180°) 0.0

Map Locate on map

Ok Cancel

Sigfox identifier

Sigfox PAC code

Sigfox certificate number for your product (provided by ATIM)

Select the device type under which you want to register the device

Confirm the information by clicking 'OK'

Your product is now being imported to your Sigfox account. The import may take several hours.

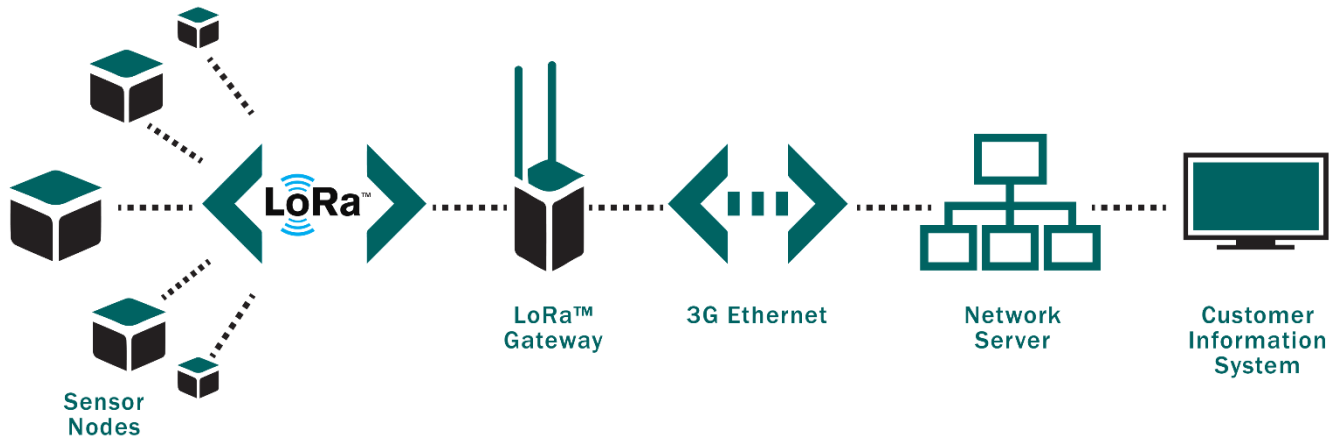
### c. Registering the modem on the LoRaWAN network

**NOTE:** by default, ACW-TH units are set up to use the ABP procedure. You can select either ABP or OTAA from a dropdown menu in the configuration tool interface. We recommend that you use OTAA mode.



The product operates in OTAA mode (over-the-air activation); when the product is switched on, it sends out a join request for a LoRa network. The device must first be provisioned on the required network, with one of the operators (such as Orange or Objenious) or existing private gateways.

A new join request may be sent by switching the device on again.



## Troubleshooting

The modem cannot be configured via USB or the configuration tool page does not refresh

- Check whether the power supply is correctly connected to the modem
- Check whether the red light is flashing
- Make sure that Windows Update is activated, the PC is connected to the Internet and driver installation has completed
- Replace the USB cable
- If you receive an 'Error writing configuration', unplug the USB cable and plug it back in

Radio data not received

- Check whether the power supply is correctly connected to the modem
- Check whether the modem has been registered on the network
- Check whether network coverage is available
- Check whether the red-light comes on when transmitting
- Check whether the red-light flashes when transmitting

Modem LED is not flashing

- Check whether the power supply is correctly connected to the modem
- Configure the modem using the USB configuration tool

## 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](http://www.atim.com/fr/technical-support)**