atim cloud wireless™
PRODUCT LINE

Atim Cloud Wireless®

Leak detection

User Guide

Models concerned :

ACW/SF8-WL-I

ACW/LW8-WL-I

ACW/SF8-WL-O

ACW/LW8-WL-O

sigfox ready

LoRaWAN™

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Version history of this document

Version	Date	Description	Author	Software version concerned
0.1	06/04/2021	First draft	AJ	
0.2	07/04/2021	Corrections & addenda	FR	
1.0	15/04/2021	Draft version	FR	
1.1	06/05/2021	Ancillary Additives	FR	
1.2	30/07/2021	Patches & Additives	AJ	
1.3	20/09/2021	Update after customer feedback	AJ	
1.4	18/10/2021	Addition of English version + details	AJ	
1.5	28/02/2022	Harmonization of references and cables	MD	1.0.3
1.6	14/03/2022	Clarifications	AJ	1.0.3
1.7	28/03/2022	Generic harmonization	MD	1.0.3
1.8	04/07/2022	Add repeat frame algortihm	YLB	1.0.4
1.9	04/08/2022	Indoor ft. Buzzer version added + Optical sensing	AJ	1.0.4

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Trademarks and copyrights

Declaration of conformity

All ACW ATIM Cloud Wireless® products comply with the regulatory requirements of the R&TTE Directive 1999/5/EC Article 3:

$$CE$$

1 Safety (Article 3.1a of Directive 1999/5/EC)

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 Directive 1999/5/EC)

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

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

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

Environmental recommendations

Explosive atmosphere

Except for ATEX products intended for this purpose, do not use ACW radio modems in the presence of flammable gases and fumes. Use of the equipment in this environment constitutes a hazard.

Environment

Observe the storage and operating temperature ranges of the products. Failure to do so may result in operational disturbance and even damage to the equipment. ACW products in IP65 weatherproof enclosures may be placed outdoors but should never be immersed.
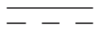
Follow the precautions and instructions listed below to ensure your safety and that of your environment and to prevent damage to your equipment.

 General Danger - If instructions are not followed, there is a risk of damage to equipment.

 Electrical hazard - If the instructions are not followed, there is a risk of electric shock and personal injury.

 Direct current symbol

 WARNING: Do not install near any heat or moisture.

 WARNING : for your safety, it is imperative that before any technical intervention on the equipment, it is switched off and not connected to the mains.

 WARNING: The safety provided by this product is only guaranteed for use as intended. Maintenance may only be carried out by qualified personnel.

 Disposal by users in private households within the European Union. This symbol on the product or its packaging indicates that this product should not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste by bringing it to a designated collection point for the recycling of electrical and electronic equipment. Separate collection and recycling of your waste at the time of disposal will help conserve natural resources and ensure environmentally and human health friendly recycling. For more information on the nearest recycling center to your home, contact the nearest city hall, the household waste disposal service, or the store where you purchased the product.

Radio

The modems of the ACW series are part of the radiocommunication modems using the ISM (Industrial Scientific Medical) bands which can be used freely (free of charge and without authorization) for industrial, scientific, and medical applications.

Technical specifications

a. Strengths

Reference	WL-I	WL-O
Protection factor	IP30	(For the version with location option)
Alert	100 dB Buzzer + LED Flashes	LED flashing
Antenna	Built-in ¼ wave	Built-in ¼ wave
Cable	Water leak detection and/or location via cable	Water leak detection and/or location via cable

WL-I with Buzzer   **WL-O without Buzzer**

ATIM_ACW-WLL_UG_EN_V1.9

b. Technical specifications

Dimensions	80 x 80 x 35 mm	
Weight	100g	
Antenna	Integrated (¼ wave)	
Temperature	-20°C à +55°C (operation) -40°C à +70°C (storage)	
Housing and Mounting	ABS – Wall Mount	
Power supply	1 Lithium battery pack 3,6V / 7,2Ah	
Radio rate Sigfox	Sigfox : 100bps / LoRa : 300 to 10kbps	
Frequency	865 – 870 MHz (Europe Zone)	
Power	25 mW (14 dBm)	
Consumption	Sigfox	LoRaWAN
Tx mode	25 mA	50 mA
Standby mode	5 µA	1 µA
Rx mode	17 mA	22 mA

Water leakage detection sensor

	Typical value	
Location accuracy	+/- 1m	(For version with location option)
Reaction time	+/- 5s	Time needed for water to penetrate the cable (independent of the reaction time of the whole product)

Housing

a. Fastening

The ACW-WL modem is mounted on a flat wall using the 4 mounting holes available at each end of the box. For best results, it is recommended to install the box at a distance from any metal object, e.g. avoid mounting it on a metal pole. As the antenna is integrated in the box, it must be mounted vertically in the right direction on a vertical support or fixed to a wall. The cable and/or the electrodes (2 screws) must always be downwards.

Identification

The product identifier is visible on the external label on the back of the product, inside on the electronic board 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).
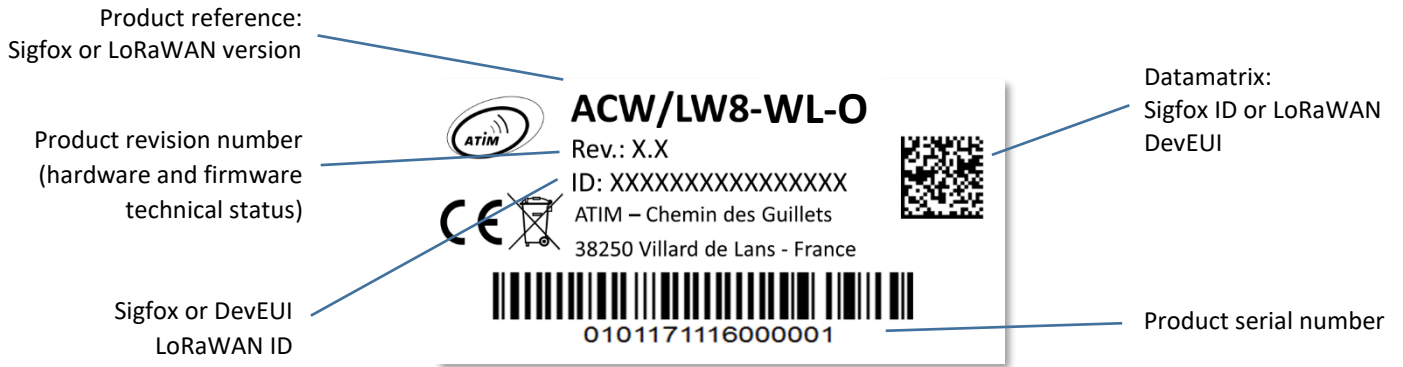
ACW-WL-O label

Each product of ATIM's ACW range has a QR Code label visible on the side of the product.

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

The reading of this code indicates the following information:

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

Meaning

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

Magnet positioning

The magnet mush be placed next to the QR Code on the left side of the device when changing modes.

When a magnet is mentioned in this guide, refer to this picture

Available versions

a. Cables

ATIM offers three cable versions to complement the ACW/WL:

The **CAB-WL** is sold by the meter and is coupled to the ACW/WL. It allows the detection of water leakage.

The **CAB-WLL** is sold by the meter and is coupled to the ACW/WL. It allows the detection and the localization of water leak.

The **CAB-WLL-OIL** is sold by the meter and is coupled to the ACW/WL. It allows the detection of heating fuel.

The **CAB-WLL-OPTO** is an optical sensor which can detect the presence on a lot of different liquids as water, oil (lubricants) and fuel. It only works on a fixed position

b. Connections and accessories

The **CAB-WLL-LEAD** is included by default with the ACW/WL. It connects the ACW/WL with the CAB-WLL or CAB-WLL-OIL cable.

The **CAB-WL-TERM**, end of line connector, is not included by default with the ACW/WL. It connects to the end of the CAB-WLL or CAB-WLL-OIL cable, thus closing the circuit.

The CAB-WL-CLIPS is an accessory for the ACW/WL to facilitate and simplify the fixing of the sensing and/or locating cable.

- Dimension: 37 x 21 x 8 mm
- Fixing: to be glued or screwed (2 holes, ⌀4mm, distance between centers 22mm)
- Material: Flexible plastic + 2 stickers

c. Summary of cable versions

	CAB-WL	Sensor cable for ACW/WL [€/meter of cable]
	CAB-WLL	Sensor cable for ACW/WL **with leakage location** [€/meter of cable]
	CAB-WLL-OIL	Sensor cable for ACW/WL **(oil-fired heating)** [€/meter of cable]
	CAB-WLL-OPTO	Optical liquid presence sensor
	CAB-WLL-LEAD	Connection cable between ACW/WLL and CAB-WLL-xx cables
	CAB-WLL-TERM	End of line plug to be connected to the last cable CAB-WLL-xx
	CAB-WL-CLIPS	Clips for sensing cable (100 pieces)

Cable installation

a. Scheme
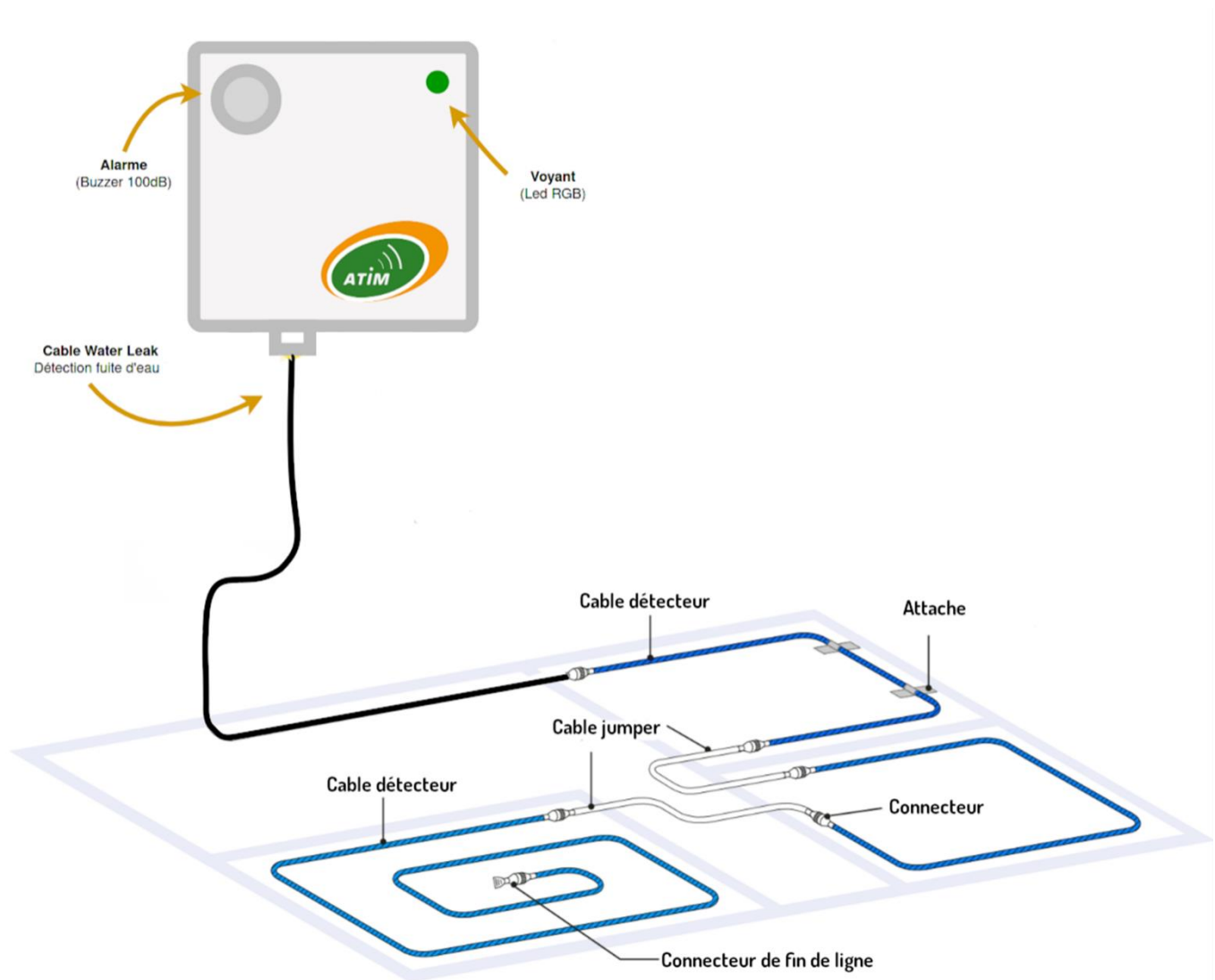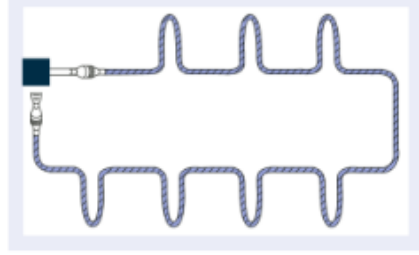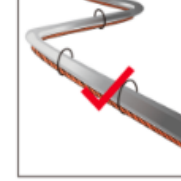
NOTE
Jumpers are cable extensions that are insensitive to the presence of water.

WARNING
Never loop the cable over itself or create contact points with conductive surfaces, as there is a risk of false positives!

b. Examples

Cover an entire area	Marginal area coverage	Covering key points
adapted to the global protection of critical areas	prevent leaks from entering the environment or spreading	key protection against major sources of leakage

Mounting clip	Adhesive cable holder	Overhead piping	Grouped with a floor stand (susceptible to interference)	Fixed with glue (cables are easily damaged)	Under the HVAC downdraft (false positive humidity)

Operation

a. Mode of operation

The new generation 2020 ACW (Atim Cloud Wireless®) products are all based on the same internal software (Firmware) and bring interesting new features such as the selection and visualization of their operating mode. To know the status of the product, you just must pass a magnet briefly (<2 sec) against the QRCODE label or on the Pepper boxes against the small diamond, which causes the LED indicator of the corresponding color to light up:

○ → ● → ● → ● → ○

○ **Deep sleep mode:** When you take the product out of its packaging, it is by default in this deep sleep mode, which optimizes the life of the batteries by avoiding their oxidation. The product does not transmit and waits patiently for you to wake it up.

● **Network pairing mode:** This mode is active as soon as the product leaves the deep sleep mode and allows the pairing to a network (automatic in case of battery change).

● **Configuration mode:** this mode is active 5 minutes after the exit of the deep sleep mode and authorizes the configuration of the product in Bluetooth thanks to the PC configurator or to the mobile application ATIM. During these 5 minutes messages are sent by radio every minute (5 "radio frames"), that allows you to check that the product works well, for example after having placed it under a cast iron manhole. After this period, the product goes into operation mode and the Bluetooth is deactivated (possibility to reactivate it via Downlink).

● **Operating mode:** this is the default mode after the product start-up phase. In this mode, the module periodically sends measurements according to the configuration applied (if the product has never been configured, the factory configuration applies, see Factory Configuration).

● **Internal fault mode:** This mode allows the normal operation of the module to be interrupted when a critical event occurs. The nature of the event can be multiple:

- Battery empty (Battery voltage < 2.2V)

- Internal error of the radio module

- System error

The entry in this mode "Internal fault" is signaled by a RED flashing of the LED of the product

If the error does not come from the radio module, the product will send 3 radio frames every 24 hours containing the error code(s) (see chapter Frame Format for error codes). In addition, the product will emit a warning light depending on the nature of the event.

Once in this mode, the module must be restarted (by disconnecting and then reconnecting the battery, by Downlink command or with the magnet) to regain normal operation.

b. Putting the product into service

◯ Unless otherwise requested, ACW products are delivered with batteries connected and set to "deep sleep" mode.

To place the product in its operating mode, hold a magnet against the QRCODE label for 6 seconds. During these six seconds, the product's LED should blink WHITE and then GREEN at the end of the six seconds to indicate that the product has been successfully switched on.

● The ACW then enters the network pairing phase. During this phase, a FUSCHIA light signal with a fade effect indicates that the search phase is in progress.

If the connection is successful, the product will emit a light signal indicating the quality of the network:

GREEN light signal: good network quality

- YELLOW light: average network quality

- ORANGE light: low network quality

- WHITE light: no information on network quality

● The module will then enter its operating mode and start sending information to the network according to the configuration.

NOTE
The LoRaWAN version, if it fails to connect, will go into simple sleep mode and make the next pairing attempt the next day and every day until it successfully joins the network.

Special case

For a Sigfox product

- To have the information on the quality of the Sigfox network (GREEN, YELLOW or ORANGE light signal), it is necessary to provide a Sigfox Downlink. It is this one which will allow to rule on the quality of the network. The product emits at startup a test Uplink described in the chapter Classic frame (frame type 0x02). If a Sigfox Downlink is provided, the information on the network quality will be sent back by the ACW (light signal). If no Downlink is provided, the ACW will always display the WHITE light signal at the end.
- If a WHITE light signal is emitted by the product at the end of the 5min pairing phase and a Downlink has been provisioned, it means that the Network is not accessible.
- If a WHITE light at the end of the 5min pairing phase is emitted by the product without a downlink having been provisioned, this has no meaning as to the quality of the network. The network quality can be good or bad (or non-existent).

For a LoRaWAN product

- In the default LoRAWAN Class A operating mode, (see Radio settings chapter), if at the end of the 5 minutes pairing phase, no network has been reached, then the product goes into standby and will restart a 5-minute pairing phase 24 hours later. So, if the product is placed in an area not yet covered by a network, the product will join it when connectivity is possible. There is no need to intervene on the product for it to join the network.

- In the LoRa/LoRAWAN Repeater Compatibility operating mode, (see chapter Radio parameters), if at the end of the 5 minutes of the pairing phase, no network has been reached, then the product emits a WHITE light signal and enters its nominal operating mode. Even if no network has been reached, it is assumed with this mode that an ATIM LoRa/LoRAWAN repeater located nearby will be able to repeat the Local frames emitted by the product in LoRAWAN frames on the network that the repeater has reached.

c. Sending a test frame

When the product is in its operating mode **(and only in this mode)**, it is possible to send a test frame (which avoids waiting for the next measurement frame) including a measurement sample.

To do this, simply move the magnet against the QRCODE label, which turns the LED GREEN and wait for it to go out before removing the magnet. The successful sending of the test frame will be indicated by a CYAN light signal.

Just before sending, a leak detection is performed, and a value of this measurement is integrated in the frame. This ensures that the cable or the electrodes are correctly installed. The test frames are identical to the alert frames. See their structure in the "Alert frames" section.

In the case of a cable without the "Distance measurement" option (yellow and black cable). The measured value should be close to zero.

d. Deep sleep

When transporting or storing the ACW-WL, it is best to place it in its deep sleep mode to limit unnecessary power consumption.

From any operating mode **(except fault mode)**, move a magnet against the QRCODE on the case for 6 seconds.

During these six seconds, the product's LED will flash the color corresponding to the operating mode and then the end of the sequence will be indicated by a WHITE fade acknowledging that the product has been put to sleep. The magnet can then be removed.

WARNING
When the operation is complete, press the button twice simultaneously to restore its main function. A white flash indicates that the manipulation was successful.

e. Passivation of batteries

All new generation ACW products include a battery depassivation feature, which prevents battery oxidation during prolonged deep sleep. This feature is automatically activated when the product enters its deep sleep mode. The product will then be woken up once a day to start the battery depassivation sequence, and then the product will return to deep sleep by itself.

Operating mode

The ACW-WL sensor periodically measures the electrical resistance between its 2 electrodes, or the 2 strands of its cable to detect a possible presence of water at the time "t" and sends these data by radio on the Radio network (Sigfox or LoRa) in case of positive result.

```
┌──────────────────────────┐
│          Start           │
└──────────────────────────┘
              │
              ▼
┌──────────────────────────┐
│     Waiting x seconds     │ ◄─────────────┐
│      [check period]       │               │
└──────────────────────────┘               │
              │                             │
              ▼                             │
┌──────────────────────────┐               │
│   Check presence of water │               │
└──────────────────────────┘               │
              │                             │
              ▼                             │
        ◇ Measurement                       │
          exceeds              no           │
          threshold? ─────────────────────┐ │
          [Threshold]                     │ │
              │ yes          ┌────────────┘ │
              ▼              │               │
┌──────────────────────────┐│  ┌───────────────────────────┐
│   Sending of alert frame  ││  │  Sending end of alert frame│
│                           ││  └───────────────────────────┘
│ + audible alert if buzzer ││              ▲
│ active, for x seconds     ││              │
│ [alarm duration].         ││              │
└──────────────────────────┘│              │
              │              │              │
              ▼              │              │
┌──────────────────────────┐│              │
│     Waiting x seconds     │◄──┐          │
│      [check period]       │   │          │
└──────────────────────────┘   │          │
              │                 │          │
              ▼                 │          │
┌──────────────────────────┐   │          │
│   Check presence of water │   │          │
└──────────────────────────┘   │          │
              │                 │          │
              ▼                 │          │
        ◇ Back to normal?   no  │          │
          [Threshold] ──────────┘          │
              │ yes                         │
              └──────────────────────────────┘
```

ATIM_ACW-WLL_UG_EN_V1.9
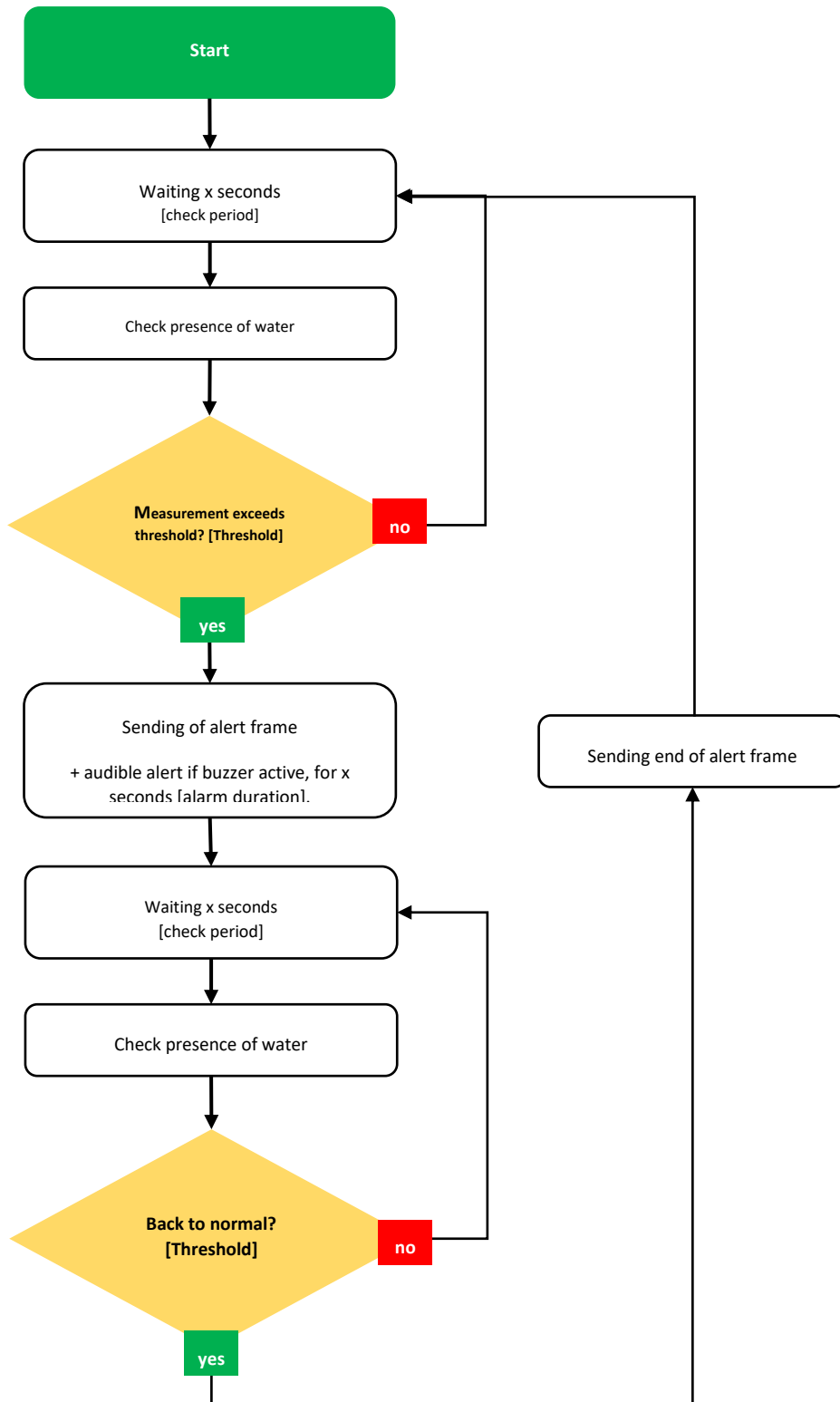
See the "ACW Configurator" section to set each of the parameters shown in the diagram.

Life frame

These are issued either once a day or once every 4 days (configurable).

NOTE
By default, the period for sending life frames is set to once a day.

Options

A buzzer can be integrated in the sensor to emit an audible signal (100dB) in case of leak detection to signal an alert.

IP66 waterproof version

There is a specific version of the leak detector dedicated to the measurement of water leaks in the ground, especially used for heating and cooling networks.

The sensor can then operate in areas where it is likely to be immersed. There is no buzzer of alarm on this version with tropicalized card.

NOTE
Product number: ACW-WL-O (O for Outdoor)

ACW Configurator

Compatible configurator versions

The following application software	ACW Configurator Version
Sigfox : V1.0.4 LoRaWAN : V1.0.4	V5.3.0 or higher

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

https://www.atim.com/en/products-configurator/

Configuration

The configuration is done via USB or Bluetooth. In the case of Bluetooth, you must restart the product, it should appear in the list of products on the home page of the configurator. Double click on it to open the ACW-WL configuration page.

ATIM_ACW-WLL_UG_EN_V1.9
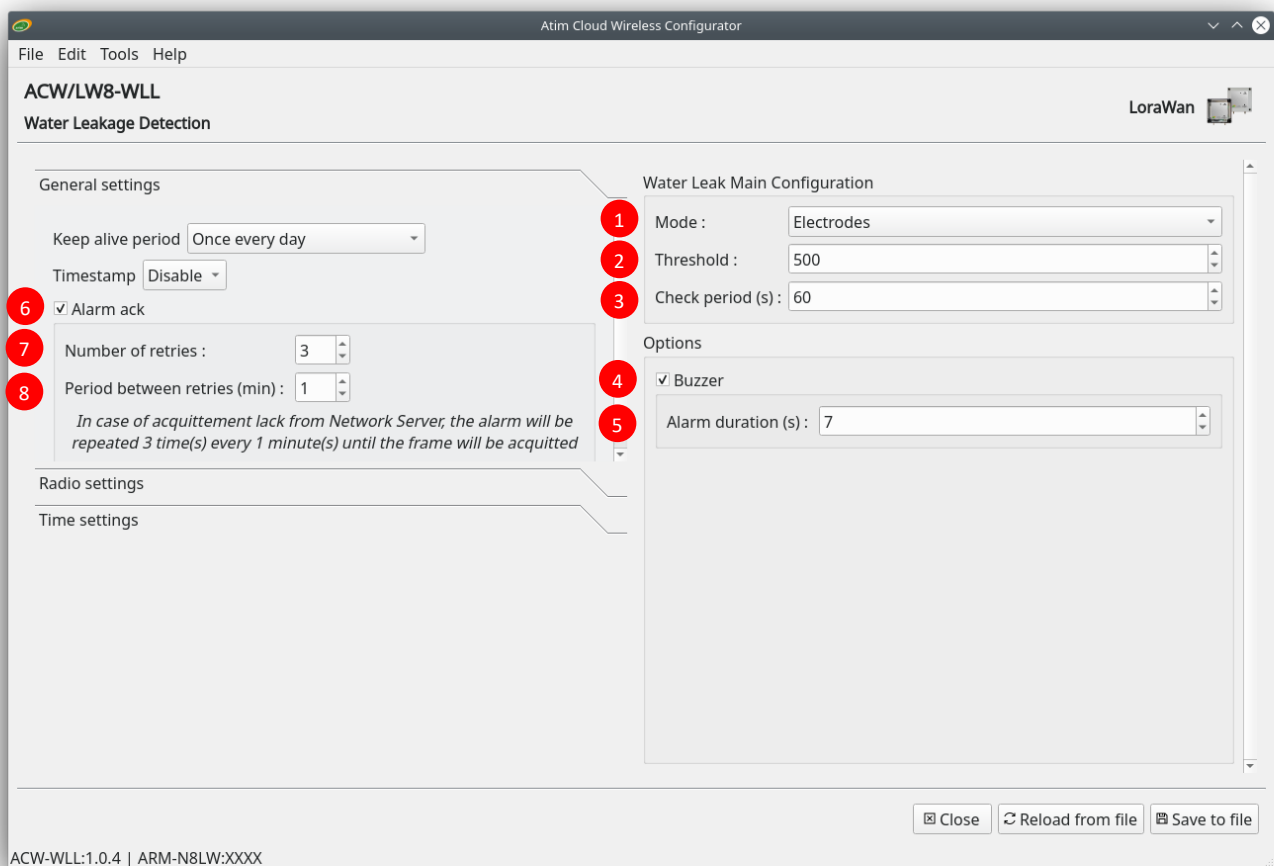
Mode [1]

Allows you to choose the operating mode of the WL: cable or electrodes.

NOTE
By default, the value is set according to the product version purchased.

Threshold [2]

Threshold of detection allows to refine the measurements in certain configurations, it must be adjusted according to the measurement values received during the test and alert frames.

During a measurement, the product measures the current leakage between the 2 strands of cables / electrodes, this value is compared to the Threshold value. If this value is exceeded, the alarm is triggered.

During the installation, immerse a part of the cable/electrodes to simulate a leak, recover the value measured in the test frames at startup (see Quick Start) then do the same with the dry cable/electrodes. Then specify a Threshold value such as:

For a cable: Dry measurement < Threshold < Submerged measurement
For the electrodes: Dry measurement > Threshold > Underwater measurement

NOTE
By default, the Threshold value is set to 500.

Check period (s) [3]

Time interval between two detections. The shorter this time, the more reactive the product will be, but the more it will consume.

NOTE
By default, the Check period (s) value is equal to 60 seconds.

Buzzer [4]

Activate/deactivate the audible alarm in case of a leak.

NOTE
By default, the value is enabled for the WL-I version.

Alarm Duration (s) [5]

Duration of said alarm.

NOTE
By default, the Alarm Duration (s) value is equal to 7 seconds.

Alarm Ack (6)

Activate alert frames acknowledgement.

> **NOTE**
> *By default, the Alarm Ack value is enabled.*
> ***Option only available in LoRaWAN***

Number of retries (7)

Number of frames forwarding attempts in case of non-acquittal.

> **NOTE**
> *By default, the Number of retries value is 3.*
> ***Option only available in LoRaWAN***

Period between retries (min) (8)

Time period between these tests.

> **NOTE**
> By default, the Period between retries value is equal to 1 minute.
> ***Option only available in LoRaWAN***

Alert/Error frame repeat (LORAWAN ONLY)

Alert and error frame (such as leak frame) are confirmed frame and requires a network server acknowledge.

In case of no acknowledge reception, the parameters (6), (7) and (8) defined the product behaviour as described on figure below:

↑ alert/error frame with acknowledge reception

↑ alert/error frame without acknowledge reception
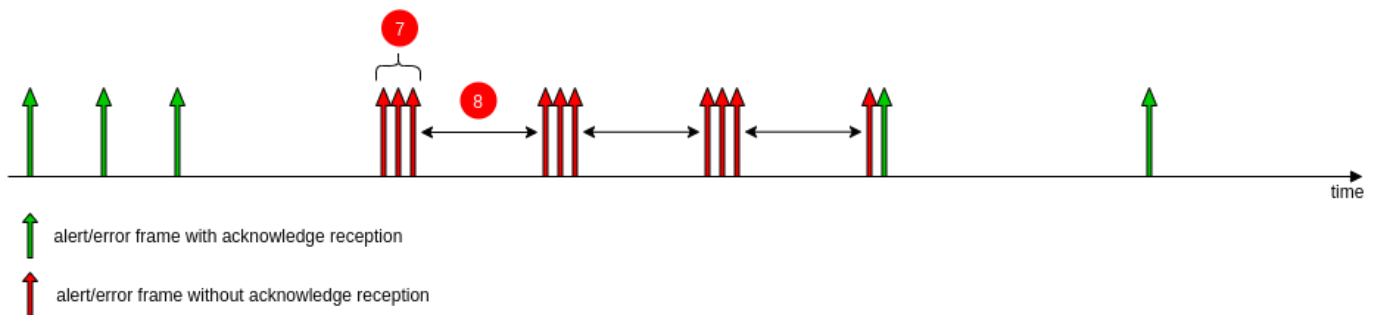
> **NOTE**
> - *If parameter (8) is different from 0, the frame will be sent until the acknowledge is received. It means no other frame will be sent during this repeat process (other frames are lost).*
>
> - *If parameter (8) egal to 0, there will be only (7) retry and then device returns to its normal behaviour, even if no acknowledge has been received.*

Frame format

a. Quick start

Here are the usual frames encountered when using the ACW-WLL. If more details are needed or the received frame does not match the frames below, continue reading below.

Test frames

Sent when the product starts up, after it has been connected to the network: **0x854A0000xxxx**

With **xxxx** the value of the signal measured by the sensor. On a test frame, it must be close to zero (0x0000) when used with a cable or close to 0x6YY (YY any value) when used with electrodes.

Alert frames

Sent when a water leak is detected: **0x8D4A0000xxxx**

With **xxxx** the signal value measured by the sensor.

End of alerts frames

Sent after an alert when no more water leakage is detected: **0x8D0A0000xxxx**

With **xxxx** the value of the signal measured by the sensor.

b. Full frame detail

General structure of the frames:

Trame Uplink			
Octet 1	**Octet 2**	**. . .**	**Octet n**
Frame header	Data specific to the frame		

There are three types of frames:

- **Classic frame; New generation:** Very close to the old frames, the difference is that you can activate the timestamp. These are for example the life frame, the error frame, the response to configuration frames, ... These last frames are common to all ACWs but it is also possible to have other independent frames for each ACW.

- **Measurement frame; New generation:** These frames are made up of samples of the different values of each of the channels that an ACW can read. The number of samples and the depth of the history will be inserted in the header beforehand.

- **Alert frame (threshold exceeded); New generation**: These frames combine a classic frame and a measurement frame. They consist of a header warning that a threshold has been exceeded, followed by the samples of each channel for which a threshold has been exceeded.

Classic frame

Octet 1 – In the lead							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
New generation = 1	Timestamp = 1 - activated 0 - disabled	Measurement frame= 0	Reserved = 0	Frame type (see below)			

If the timestamp is enabled, 4 bytes with the timestamp value will be preceded by the header (byte 1). Here are the different types of frames (Bit 0 to Bit 3):

Frame type	Data size	Frame description
0x00	--	Reserved
0x01	4 bytes	Frame of life
0x02	0 bytes	Downlink request for network test.
0x03	--	Reserved
0x04	--	Reserved
0x05	1 bytes	Test frame with counter.
0x06	Variable	(Cfg box) Response to a configuration frame.
0x07	Variable	(Cfg box) Response to a command frame.
0x08	Variable	(Cfg box) Response to an erroneous frame.
0x09	--	Reserved
0x0a	--	Reserved

0x0b	--	Reserved
0x0c	--	Reserved
0x0d	Variable	Alerts frames follow-up of the samples of the measurements of the channels in alert
0x0e	TBD	General error - TBD (memory, …)
0x0f	Variable …	Sub-frame for ACW. Depending on the ACW

Alert frame

Byte 1 – In the lead							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
New generation = 1	Timestamp (Desactivated = 0, Activated = 1)	Measurement frame= 0	Reserved = 0	Alert frame (= 0x0d)			

If the timestamp is enabled, 4 bytes with the timestamp value will be preceded by the header.

For each of the channels in alert, a header is inserted and is formed as follows:

Byte 2 - Channel Header							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Type of alert		Channel number		Type of measure			

The alert type field allows you to identify whether it is an exceedance of the high threshold, the low threshold, or a return between the thresholds. These values are defined as follows:

Alert Type	Value Description
0x00 (00b)	Return between thresholds (end of alert)
0x01 (01b)	Exceeding the high threshold (leak alert)
0x02 (10b)	Exceeding the low threshold

0x03 (11b)	Reserved

The measurement type field is identical to that of the measurement frame. The **xxxx** sample that caused the alert is then inserted afterwards.

<div align="center">

Example: **0x8D4A0000xxxx**

</div>

Frame of life

The life frame is sent at regular intervals according to the applied configuration (by default 4 days) and contains the battery levels of the product at no load (the product is doing nothing) and at load (the product is transmitting a radio frame).

Byte 1 - In the lead							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
New generation = 1	Timestamp = 0	Measurement frame = 0	Reserved = 0	Frame of life = 0x01			

After the header, there are 4 bytes, 2 for the empty battery level and 2 for the charged battery level.

The frame is thus divided as follows: 0xAABBBBCCCC

0xAA being the header of the frame (always equal to 0x81), 0xBBB the empty battery level (value in millivolts, MSB coding) and 0xCCCC the battery level in charge (value in millivolts, MSB coding)

EXEMPLE
0x81 0d24 0c68
0d24: battery level at no load = 3364 mV or 3.364 V
0c68: battery level on charge = 3176 mV or 3.176 V

Test frame

Octet 1 – In the lead							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
New generation = 1	Timestamp (Desactivated = 0, Activated = 1)	Measurement frame = 0	Reserved = 0	Test frame (= 0x05)			

Octet 2 – In the lead
0x4A

> **NOTE**
> Remaining bytes: Value measured on the sensor during the test. It must be close to zero (0x0000) if used with a cable or close to 0x6YY (YY any value) if used with electrodes.

Error frame

Octet 1 – In the lead							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
New generation = 1	Timestamp = 0	Measurement frame = 0	Reserved = 0	Error frame = 0x0e			

If the timestamp is enabled, 4 bytes with the timestamp value will be preceded by the header (byte 1).

For each of the error messages, a header is inserted and is made up as follows:

Octet 2 – In the lead error message							
Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Message index			Error message length				

The **message index field** is used to prioritize messages when several errors occur.

The **error message length** field indicates the size in bytes of the error message.

The next byte identifies the nature of the error that occurred:

Octet 3 – In the lead error message		
Error code	Type of error	Description
0x81	ERR_UNKNOWN	
0x82	ERR_BUF_SMALLER	The data table is full, impossible to write additional data
0x83	ERR_DEPTH_HISTORIC_OUT_OF_RANGE	The history depth is too large or too small for the frame
0x84	ERR_NB_SAMPLE_OUT_OF_RANGE	The number of samples is too large or too small for the frame
0x85	ERR_NWAY_OUT_OF_RANGE	The number of channels in the frame header is too large or too small
0x86	ERR_TYPEWAY_OUT_OF_RANGE	The type of measurement in the frame header is too large or too small
0x87	ERR_SAMPLING_PERIOD	Wrong sample period structure
0x88	ERR_SUBTASK_END	End of a subtask after exiting an infinite loop
0x89	ERR_NULL_POINTER	Pointer with "NULL" value
0x8A	ERR_BATTERY_LEVEL_DEAD	Critical battery level
0x8B	ERR_EEPROM	EEPROM is corrupted
0x8C	ERR_ROM	ROM is corrupted
0x8D	ERR_RAM	RAM is corrupted
0x8E	ERR_ARM_INIT_FAIL	Radio module initialization failed
0x8F	ERR_ARM_BUSY	Module is already busy (possibly not initialized)
0x90	ERR_ARM_BRIDGE_ENABLE	The module is in bridge mode, unable to send data via radio
0x91	ERR_RADIO_QUEUE_FULL	Radio queue is full
0x92	ERR_CFG_BOX_INIT_FAIL	Error when initializing the black box

0x93	ERR_KEEP_ALIVE_PERIOD	Wrong structure of life frame period
0x94	ERR_ENTER_DEEP_SLEEP	The product has gone into deep sleep mode
0x95	ERR_BATTERY_LEVEL_LOW	Low battery level
0x96	ERR_ARM_TRANSMISSION	A transmission was initialized but an error occurred
0x97	ERR_ARM_PAYLOAD_BIGGER	Message size is too large for the network capacity
0x98	ERR_RADIO_PAIRING_TIMEOUT	Unable to pair to a network before timeout
0x99	ERR_SENSORS_TIMEOUT	A timeout has been reached on the sensor
0x9A	ERR_SENSOR_STOP	The sensor did not return a value during a reading
0x9B	ERR_SENSORS_FAIL	The sensor has stopped working

Only codes 0x8A and 0x95 are followed by additional data corresponding to the battery level in millivolts. This value is coded on two bytes, the high byte first (MSB).

> **WARNING**
> *For codes from 0x81 to 0x92, the product will enter its FAULT mode and will no longer perform its measurement function. For codes from 0x93 to 0x9D, these correspond only to alarms, so the product continues to operate normally.*

Troubleshooting

Radio data is not received

- Check if the power supply is correctly connected to the modem

- Check if the modem has been registered to the network

- Check if network coverage is available

- Check if the light is illuminated when transmitting

Technical support

For any further information or technical question, you can open a ticket on our [technical support dedicated webpage](#).

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