
Atim Cloud Wireless

Multi sensor

LTEM

User's guide



Models concerned:

ACW/LTEM-CNT

ACW/LTEM-DA

ACW/LTEM-T



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Version history of this document

Version	Date	Description	Author
1.0	10/06/2020	Document creation	JA

Disclaimer of liability

The information contained in this document is subject to change without notice and does not represent a commitment on the part of ATIM.

Trademarks and copyrights

ATIM, ACW ATIM Cloud Wireless®, ARM Advanced Radio Modem® are registered trademarks of ATIM Sarl in France. Other trademarks mentioned in this document are the property of their respective owners.

Declaration of conformity

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



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

a. Explosive atmosphere

With the exception of the ACW-ATEX range, do not use ACW radio modems in the presence of flammable gases or fumes. Use of the equipment in this environment constitutes a hazard.

b. Environment

Observe product storage and operating temperature ranges. Failure to comply with these instructions could disrupt operation and even damage the equipment.

Follow the precautions and instructions below to ensure your safety and that of your environment, and to prevent damage to your equipment.



General danger :- If the 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.



WARNING : do not install near sources of heat or moisture.



WARNING : for your own safety, before carrying out any technical work on the equipment, it must be disconnected from the mains.



WARNING : do not install near sources of heat or moisture.



This symbol on the product or its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste by taking it to a designated collection point for the recycling of electrical and electronic appliances. Separate collection and recycling of your waste at the point of disposal will help conserve natural resources and ensure recycling that respects the environment and human health. For more information on your nearest recycling center, contact your local town hall, your household waste disposal service or the store where you purchased the product.

Technical data

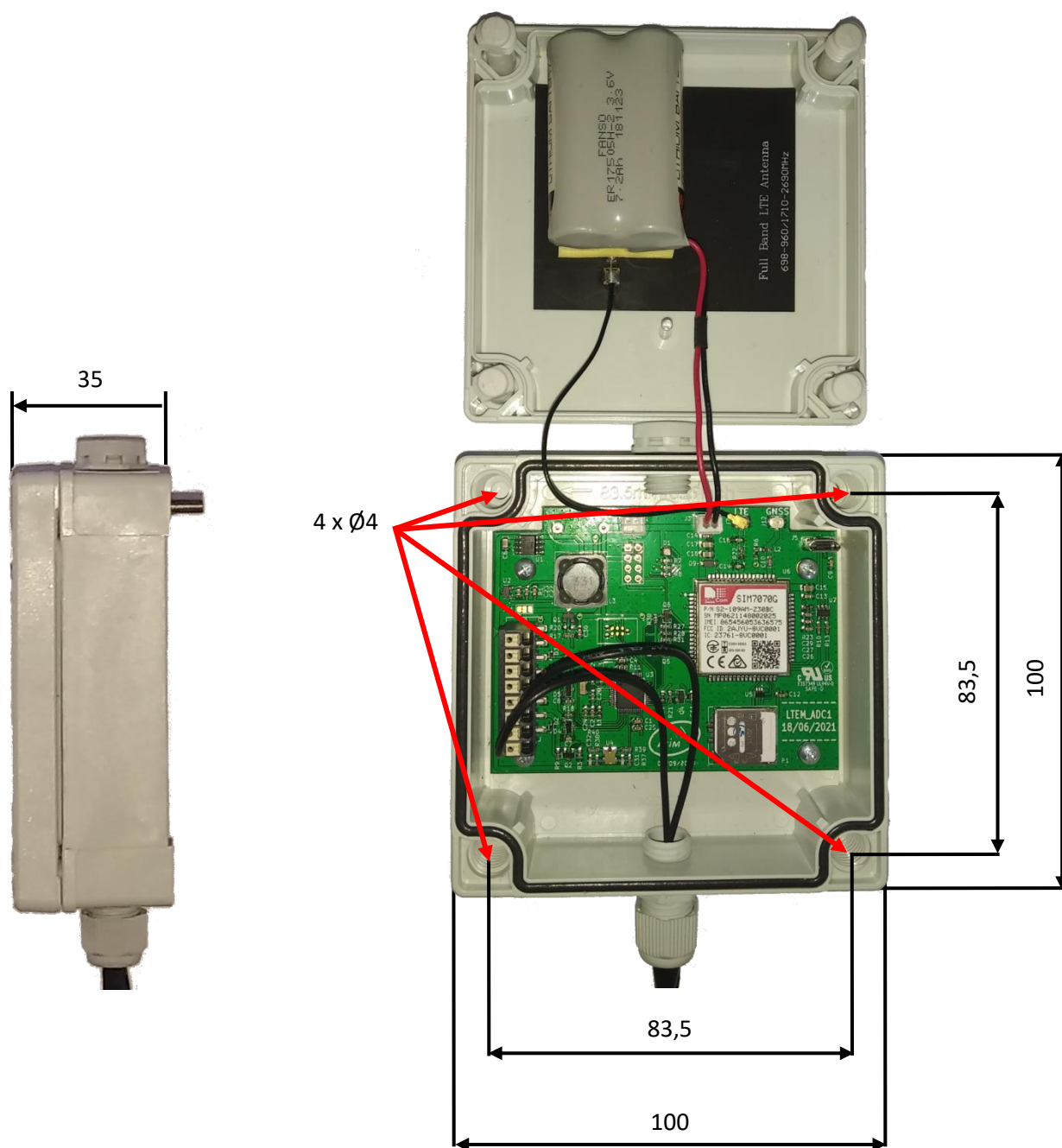
a. Product

Dimensions	100 x 100 x 35 mm
Antenna	Integrated (patch type)
Temperature	0°C to +50°C (Operation)
	0°C to +30°C (storage)
Mounting	Wall
Box	IP 66**
Power supply	2 x Lithium A batteries [ER18505M] [ER18505M]
Poids	220 g
Frequency	800 – 1800 MHz
Power	21 dBm (Class 5 type)
Flow	LTE-M : 1Mbit bits/s
Emission current	LTE-M: 400 mA max - 200 mA continuous
Sleep mode	30 μ A*

* Standby power consumption may vary depending on the state of charge of the super capacitor.

** Opening and closing the modem casing and connecting the sensor may alter the protection rating.

Dimensions



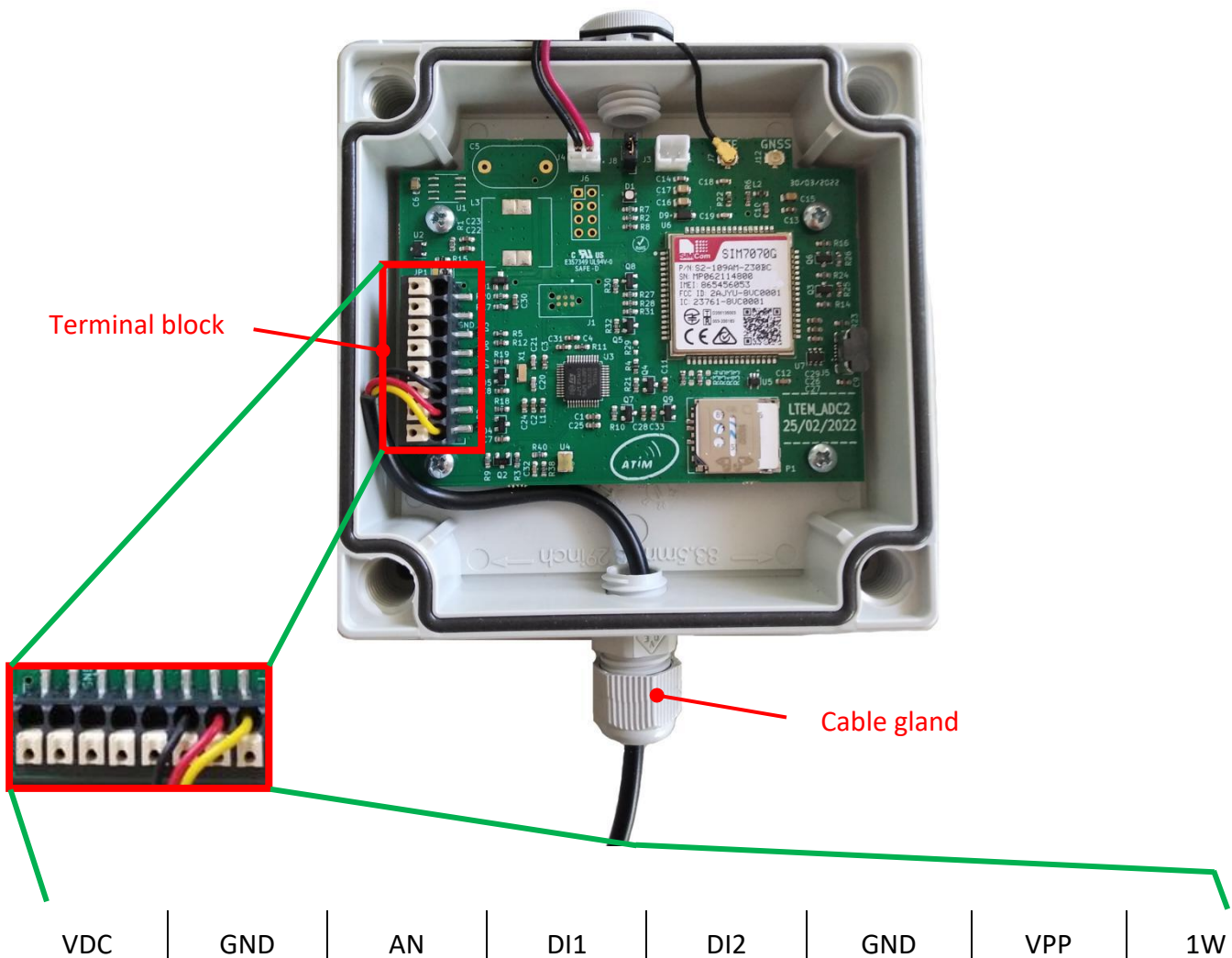
Minimum cable diameter in cable gland : 3mm

Maximum cable diameter in cable gland : 7mm

Product commissioning

a. Sensor connection

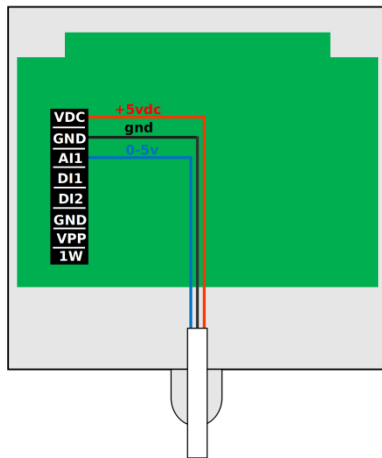
- If the LTE-M modem is supplied without a sensor, it can be connected to terminal block J2 on the circuit board.
- The sensor cable must first be inserted into the housing via the cable gland. Ensure that the cable runs to the left of the terminal block, so as not to obstruct the passage of the battery when closing the housing.
- The cable gland is limited to a cable diameter of between 3 and 7mm.
- The modem's IP rating cannot be guaranteed if the sensor is not connected during manufacture.



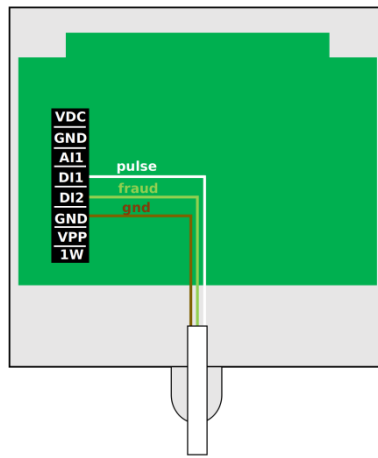
Terminal	Description
VDC	External power supply (+5VDC or +12VDC)
GND	Ground
AN	Analog measurement input
DI1	Digital input 1
DI2	Digital input 2
GND	Ground

VPP	1WIRE power supply
1W	1wire data

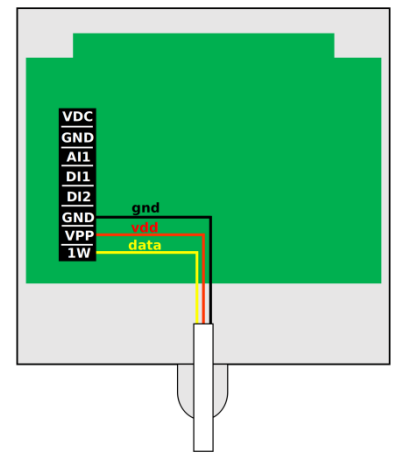
b. Connection examples



LEFOO T3000 0-5V]
level sensor



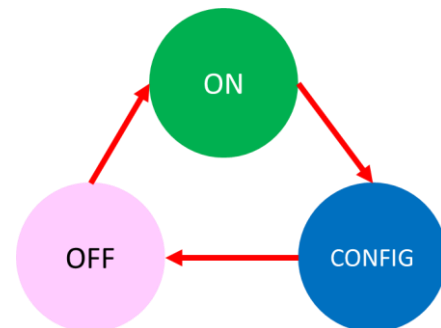
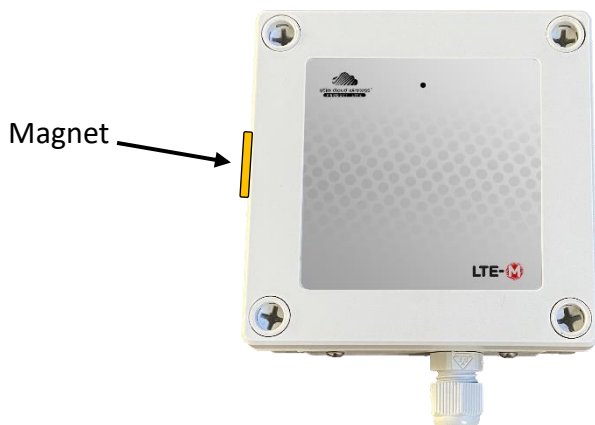
[DIEHL IZAR] Pulse I water flow
sensor



Temperature sensor [DS18B20
1wire] [DS18B20 1wire

c. Operating mode

If the magnet is held for more than 2 seconds on the location indicated by the QR code, the operating mode will change according to the order defined below :



To find out the status of the product, simply pass a magnet briefly (<2 sec) over the above location, causing the LED to light up in the corresponding color.

- **OFF** mode : Modem off (default mode)
- **ON** mode : The modem is activated and sends MQTT data frames
- **CONFIG** mode : The modem connects to the configuration server

Once the mode has been changed, the modem processes an associated function. The LED then lights up continuously while the function is being processed, for example :

- In **ON** mode, the modem starts sending a life frame before going into standby mode until the next frame is sent (PSM for Power Sleep Mode).
- In **CONFIG** mode, the module connects to a server to download the latest configuration.

When the modem is processing one of these functions (green LED on), it is impossible to change modes.

d. Product commissioning

The modem is delivered in **OFF** mode. To switch it on, move the magnet until you see the **GREEN** LED (**ON** mode).

The modem then connects to the LTE-M network and the remote MQTT broker, retrieves any configuration (MQTT subscribe) and sends a message (MQTT publish), before disconnecting and registering with PSM.

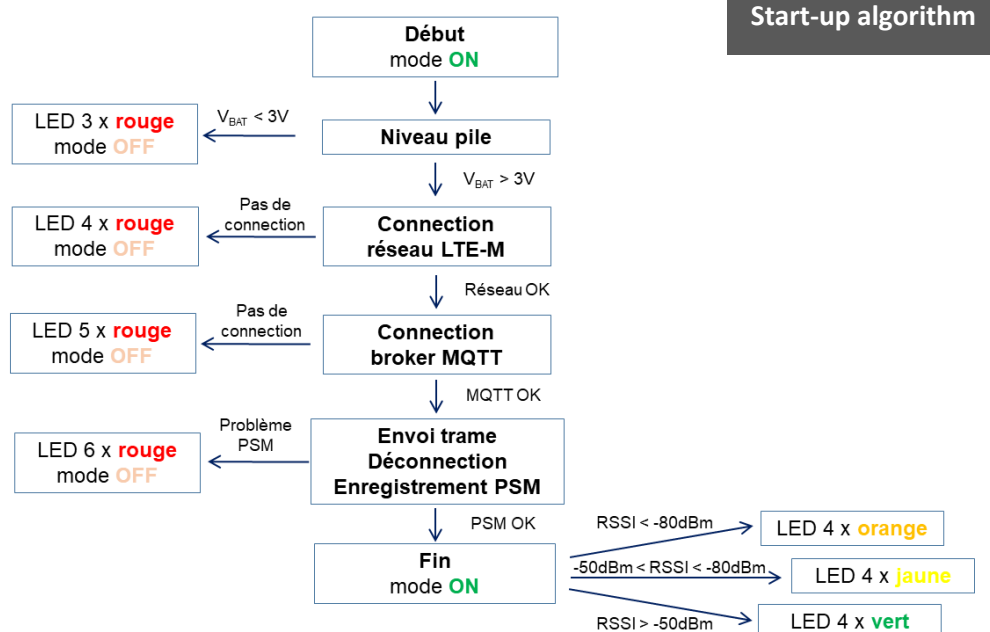
When the modem is properly connected, the LED flashes and gives an indication of the strength of the signal received :

- 4x times** in **GREEN** if RSSI > -50dBm
- 4x times** in **YELLOW** if RSSI is between -60dBm and -80dBm
- 4x times** in **ORANGE** if RSSI < -60dBm

If a step is not carried out correctly, the LED flashes **RED**:

- 3x** if battery voltage is too low (below 3V)
- 4x times** if network connection is impossible
- 5x times** if the MQTT broker cannot be reached
- 6x times** if the modem fails to reach PSM mode

In all four error cases, the start-up phase is considered incomplete, the modem automatically switches to **OFF** mode and the **RED** LED remains lit until the magnet is used.



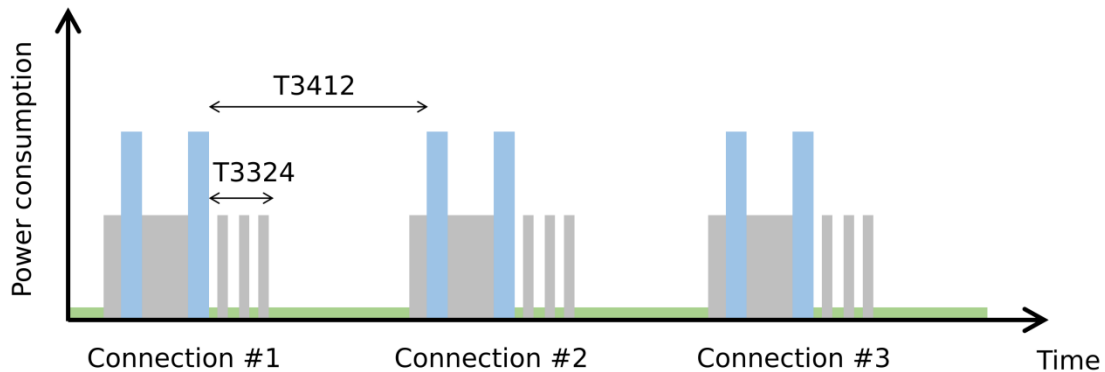
Frame format

When the modem is in **ON** mode, it operates in PSM (Power Sleep Mode), connecting to the network at regular intervals to send MQTT frames.

Between two connections, the modem is in standby mode to minimize power consumption.

The period between two transmissions (T3412) is adjustable.

The graph below shows the consumption curve for three network connections :



Blue areas represent data transmission periods, the most power-hungry periods (150mA average).

Gray areas represent data reception periods (40mA average).

The **green zones** represent standby periods, which consume the least power (around 30uA).

In addition, the modem takes regular sensor readings. The period between two readings is adjustable.

Each reading is stored in a table, which is then sent in a frame when the modem is connected to the network.

The size of the table makes it possible to store and send the last 100 readings.

Analog sensor

The raw value [0-4095] is stored directly in the reading table.

Case of a pulse sensor

The current index value is sent to a separate field in the table. Due to the large size of the index (up to 4,294,967,296), only index differences are stored in the table.

Case of a DS18B20 temperature sensor

The temperature value in degrees Celsius, with 1 decimal digit, is stored in the table.

Integration

When the modem is connected to the network, it publishes MQTT requests to an external broker.

To enable connection to the broker, all MQTT identifiers and any TLS security certificates must be set up on the modem.

Two integrations are currently available:

1. ATIM Cloud Wireless® platform
2. Live Objects platform.

a. ATIM Cloud Wireless platform

When **ACW** integration is selected, the **life frame** format is as follows:

```
{  
  "IMEI": "861340040029330",  
  "RSRP": -115,  
  "RSRQ": -16,  
  "RSSI": -66,  
  "SINR": 11,  
  "VOLTAGE": 3437,  
  "FPERIOD": 4,  
  "MPERIOD": 10,  
  "CNT": 1  
}
```

The **IMEI** number identifies the modem.

RSSI (received signal strength indicator) is a signal strength indicator.

SINR (signal noise ratio) is the signal-to-noise ratio.

VOLTAGE is the last battery voltage measured in mV.

FPERIOD is the period between two frames in minutes.

MPERIOD the period between two measurements in minutes.

CNT is a counter incremented with each life or reading frame.

Analog sensor

Pulse sensor

13

DS18B20 temperature sensor

```
{
  "CNT":2,
  "MPERIOD":10,
  "IDX":183,
  "TAB":
    [
      18.2,17.5,17.6,17.6,17.5,17.5,17.5,17.5,17.4,17.4,17.5,17.5,17.4,17.4,
      17.4,17.4,17.4,17.4,17.3,17.3,17.3,17.3,17.3,17.3,17.3,17.3,17.3,17.3,
      17.3,17.3,17.3,17.3,17.3,17.3,17.3,17.3,17.3,17.4,17.3,17.4,17.4,17.4,
      17.4,17.4,17.4,17.4,17.4,17.4,17.4,17.4,17.4,17.5,17.5,17.5,17.5,17.5,
      17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.5,17.6,17.6,17.6,17.6,
      17.6,17.6,17.6,17.6,17.6,17.6,17.6,17.6,17.6,17.6,17.6,17.6,17.7,17.7,17.7,
      17.7,17.7,17.7,17.8,17.8,17.8,17.8,17.8,17.8,17.8,17.8,17.8,17.8,17.8,
      17.8,17.8
    ]
}
```

The **CNT** field is the frame counter, incremented each time a reading or life frame is sent.

The **MPERIOD** field is the period between two measurements in minutes.

The **TAB** table is filled in each time a measurement is taken.

The **IDX** field is the current index or pulse counter.

b. Live Objects platform (Orange)

When **Liveobjects** integration is preferred, the format of **life frames** published in MQTT is as follows:

```
{
  "model": "atim-sample",
  "value": {
    "IMEI": "861340040029330",
    "RSRP": -115,
    "RSRQ": -16,
    "RSSI": -66,
    "SINR": 11,
    "VOLTAGE": 3437,
    "FPERIOD": 4,
    "MPERIOD": 10,
    "CNT": 1
  }
}
```

An additional model parameter is then available to identify modems under **Live Objects**.

Under the platform it is possible to view published MQTT frames in the **Data** messages (Uplink) menu that correspond to the content of the "value" field in the above frame.

The screenshot displays the Orange Live Objects web interface. The top navigation bar includes links for Orange Business Services, Orange Developer, Hardware, Couverture LoRa, Couverture LTE-M, and Blog. The main header shows the 'Datavue Live Objects' logo and a navigation menu with 'Tableau de bord', 'Parc', 'Données', 'Alarmes', and 'Administration'. The 'Parc' menu is active, showing a list of devices. The selected device is 'um:lo:nsid:mqtt:myDevice', and the 'Data messages (Uplink)' menu item is highlighted. The main content area shows the MQTT data messages for this device. It includes a date and time selector (DD/MM/YYYY HH:MM:SS), a stream ID (um:lo:nsid:mqtt:myDevice), and a maximum number of uplinks (100). Below this, a table displays the MQTT frames. The table has columns for Date, Payload, État de décodage, and Tags. The payload is a JSON object containing various parameters like IMEI, RSRP, RSRQ, RSSI, SINR, VOLTAGE, FPERIOD, MPERIOD, and CNT.

Date	Payload	État de décodage	Tags
12/01/2022 09:32:46	{ "IMEI": "861340040029330", "RSSI": -74, "SINR": 8, "VOLTAGE": 3533, "T3412": 8640, "T3412EXT": 0, "T3324": 16, "ITR": 0, "CNT": 1 ... }	-	-
12/01/2022 09:21:17	{ "IMEI": "861340040029330", "RSSI": -75, "SINR": 11, "VOLTAGE": 3501, "T3412": 9720, "T3412EXT": 0, "T3324": 16, "ITR": 0, "CNT": ... }	-	-
12/01/2022 08:48:16	{ "IMEI": "861340040029330", "RSSI": -73, "SINR": 10, "VOLTAGE": 3541, "T3412": 8280, "T3412EXT": 0, "T3324": 16, "ITR": 0, "CNT": ... }	-	-
12/01/2022 05:54:36	{ "IMEI": "861340040029330", "RSSI": -73, "SINR": 12, "VOLTAGE": 3544, "T3412": 8280, "T3412EXT": 0, "T3324": 16, "ITR": 0, "CNT": ... }	-	-
12/01/2022 03:12:36	{ "IMEI": "861340040029330", "RSSI": -75, "SINR": 11, "VOLTAGE": 3551, "T3412": 8280, "T3412EXT": 0, "T3324": 16, "ITR": 0, "CNT": ... }	-	-
12/01/2022 00:24:46	{ "IMEI": "861340040029330", "RSSI": -78, "SINR": 12, "VOLTAGE": 3550, "T3412": 8280, "T3412EXT": 0, "T3324": 16, "ITR": 0, "CNT": ... }	-	-

Configuration

Modem functional parameters can be modified via Downlink from the ATIM Cloud Wireless or Live Objects platforms.

On the other hand, MQTT identification and APN parameters require the use of the ATIM configurator.

On both platforms, configuration changes will take effect the next time the modem sends a frame.

a. Downlink

On the first device page of the ACW platform, the Measure Period in minutes and the Frame Period in hours can be adjusted:

LTEM865456053640601 > Device

IMEI : 865456053640601

LTE-M

RSRP -93 dBm
RSSI -69 dBm
SINR 2 dB

3511 mV



Last index

48

FRAME PERIOD (HOURS)

Value

4

MEASURE PERIOD (MIN)

Value

5

INDEX CHANGE

from 06/08/2022 16:37 to 06/10/2022 16:37 ✓

Date	Frame #	Last index	Measure period	t	t-1	t-2	t-3	t-4	t-5	t-6	t-7	t-8	t-9
6/10/2022 12:25:20 PM	10	48	5	0	0	0	0	0	0	0	0	0	0
6/10/2022 10:15:20 AM	9	-	5	-	-	-	-	-	-	-	-	-	-
6/10/2022 8:20:22 AM	8	48	5	0	0	0	0	0	0	0	0	0	0
6/10/2022 4:15:24 AM	7	48	5	0	0	0	0	0	0	0	0	0	0
6/10/2022 12:10:25 AM	6	48	5	0	0	0	0	0	0	0	0	0	0
6/9/2022 8:05:27 PM	5	48	5	0	0	0	0	0	0	0	0	0	0
6/9/2022 4:00:29 PM	4	48	5	0	0	0	0	0	0	0	0	0	0
6/9/2022 11:55:33 AM	3	26	5	0	0	0	0	0	0	0	7	0	0
6/9/2022 10:53:30 AM	2	19	4	0	0	0	11	0	0	0	0	0	0
6/9/2022 9:50:49 AM	1	-	4	-	-	-	-	-	-	-	-	-	-

On the Live Objects platform, it is also possible to edit the period for measuring and sending frames via the Commands menu (Downlink).

To do this, fill in the fields as shown in the example below, where the requested sending period is 5 hours:

**Datavenue**
Live Objects

Tableau de bord **Parc** Données Alarmes Administration

Centre d'aide ATIM_001

Parc > urn:lo:nsid:mqtt:myDevice > Commandes (Downlink) > Enregistrer une nouvelle co...

<<

Supervision

Identité

Data messages (Uplink)

Commandes (Downlink)

Firmwares

Configurations

Journal

↑ Auto-created device (mqtt / urn:lo:nsid:mqtt:... - urn:lo:nsid:mqtt:myDevice)

Enregistrer une nouvelle commande

* champ obligatoire

MQTT

Requête * configuration

Argument

tag"configuration_t3412"⁽¹⁾

data"5"

(1): Une valeur décrivant une chaîne de caractères au format JSON sera fournie comme telle en argument de la commande. Si les guillemets de début et de fin font partie de la chaîne de caractères à envoyer, il faut échapper ceux-ci par \" et en ajouter d'autres autour.

Durée max de l'état PENDING *

▼

Jours

▼

Heures

▼

Minutes?

Niveau d'acquittement *

☒ Aucun

☐ Applicatif (Equipement a répondu) ?

AnnulerValider

18

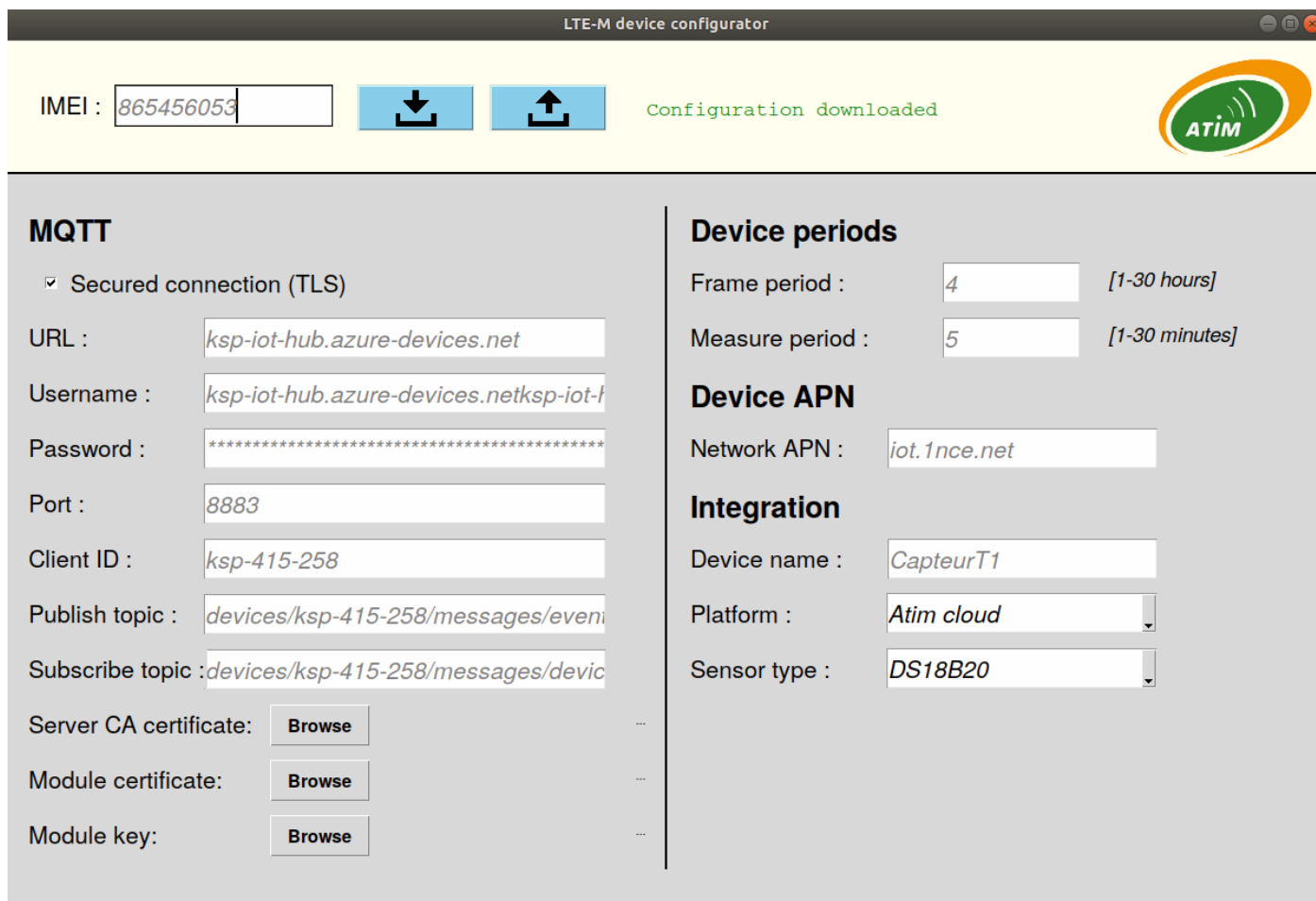
ATIM_ACW-LTEM_UG_EN_V1.0

b. Configurator

When the ATIM configurator is launched, the program first checks the Internet connection in order to connect to the remote configuration server.

If the connection with the server has been established, the identifiers of the modem to be configured (IMEI, etc.) can be entered before clicking on the download arrow. .

The current parameters are then displayed in the various fields :



Identifiers can then be edited and, if required, certificates can be loaded to secure the MQTT connection.

The parameters can then be updated by clicking on Upload. .

Technical support

For any information or technical question, please open a ticket on our dedicated [support web page](#).



Appendix

Certificat CA Live Objects

-----BEGIN CERTIFICATE-----

MIIE9DCCA9ygAwIBAgIQCF+UwC2Fe+jMFP9T7aI+KjANBgkqhkiG9w0BAQsFADBh
MQswCQYDVQQGEwJVUzEVMBMGA1UEChMMRGlnaUNlcnQgSW5jMRkwFwYDVQQLExB3
d3cuZGlnaWNlcnQuY29tMSAwHgYDVQQDExdEaWdpQ2VydCBHbG9iYWwgUm9vdCBH
MjAeFw0yMDA5MjQwMDAwMDBaFw0zMDA5MjMyMzU5NTlaMFkxCzAJBgNVBAYTAIVT
MRUwEwYDVQQKEwxEaWdpQ2VydCBJbmMxMzAxBgNVBAMTKkRlZ2lDZXJ0IEdsb2Jh
bCBHMiBUTFMgUINBIFNIQTl1NiAyMDIwIENBMTCCASIwDQYJKoZIhvcNAQEBBQAD
ggEPADCCAQoCggEBAMz3EGJPprtjb+2QUlbfSd7ehJWivH0+dbn4Y+9lavyYEEV
cNsSAPonCrVXOFt9slGTcZUOakGUWzUb+nv6u8W+JDD+Vu/E832X4xT1FE3LpxDy
FuqrIvAxIhFhaZAmunjZlx/jfWardUSVc8is/+9dCopZQ+GssjoP80j812s3w WPc
3kbW20X+fSP9kOhRBx5Ro1/tSUZUfyyIxfQTnJcVPAPooTncaQwywa8WV0yUR0J8
osicfebUTVSvQpmowQTCd5zWSOTOEeAqgJnwQ3DPP3Zr0UxJqyRewg2C/Uaoq2yT
zGJSQnWS+Jr6Xl6ysGHIHx+5fwmY6D36g39HaaECAwEAAaOCaA4wggGqMB0GA1Ud
DgQWBBR0hYDAZsffN97PvSk3qgMdvu3NFzAfBgNVHSMEGDAWgBROIIQgGJXm427m
D/r6uRLtBhePOTAObgNVHQ8BAf8EBAMCAYYwHQYDVR0lBBYwFAYIKwYBBQUHAwEG
CCsGAQUFBwMCMBIGA1UdEwEB/wQIMAYBAf8CAQAwdgYIKwYBBQUHAQEeAjBoMCQG
CCsGAQUFBzABhhhhodHRwOi8vb2Nzc5kaWdpY2VydC5jb20wQAYIKwYBBQUHMAKG
NGh0dHA6Ly9jYWNLcnRzLmRlZ2lDZXJ0LmNvbS9EaWdpQ2VydEdsb2JhbFJvb3RH
Mi5jcnQwewYDVROfBHQwcjA3oDWgM4YxaHR0cDovL2NybdMuZGlnaWNlcnQuY29t
L0RpZ2lDZXJ0R2xvYmFsUm9vdEcyLmNybdA3oDWgM4YxaHR0cDovL2NybdQuZGl
naWNlcnQuY29tL0RpZ2lDZXJ0R2xvYmFsUm9vdEcyLmNybdAwBgNVHSAEKTAnMAcG
BWeBDAEBMAgGBmeBDAECATAIBgZngQwBAglwCAYGZ4EMAQIDMA0GCSqGSIb3DQEB
CwUAA4IBAQB1i8A8W+//cFxrivUh76wx5kM9gK/XVakew44YbHnT96xC34+IxZ20
dfPJCP2K/lHz8p0gGgQ1zvi2QXmv/8yWXpTTmh1wLqIxi/ulzH9W3xc3l7/BjUOG
q4xmfrnti/EPjLXUVa9ciZ7gpyptsqNjMhg7y961n4OzEQGsIA2QlxK3KZw1tdeR
Du9Ab21cO72h2fviyy52QNI6uyy/FgvqvQNbTpg6Ku0FUAcVkzzxOZGUWkgOxtNK
Aa9mObm9QjQc2wgd80D8EuuiPKuK1fyeWSm4w5VsTuVP61gM2eKrLanXPdtWlIb
1GHhJRLmB7WqlLLwKPZhJl5VHPgB63dx

-----END CERTIFICATE-----

-----BEGIN CERTIFICATE-----

MIIDjjCCAnagAwIBAgIQAzrx5qcRqaC7KGSxHQn65TANBgkqhkiG9w0BAQsFADBh

MQswCQYDVQQGEwJVUzEVMBMGA1UEChMMRGlnaUNlcnQgSW5jMRkwFwYDVQQLExB3
d3cuZGlnaWNlcnQuY29tMSAwHgYDVQQDEXdEaWdpQ2VydCBHbG9iYWwgUm9vdCBH
MjAeFw0xMzA4MDExMjAwMDBaFw0zODAxMTUxMjAwMDBaMGExCzAJBgNVBAYTAIVT
MRUwEwYDVQQKEwxEaWdpQ2VydCBJbmMxGTAXBgNVBAsTEHd3dy5kaWdpY2VydC5j
b20xIDAeBgNVBAMTF0RpZ2lDZXJ0IEdsb2JhbCBSb290IEcyMIIBIjANBgkqhkiG
9w0BAQEFAAOCAQ8AMIIBCgKCAQEAuzfNNNx7a8myaJCtSnX/RrohCgiN9RIUyfuI
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MrY=
-----END CERTIFICATE-----