atim cloud wireless™
PRODUCT LINE

ATIM Cloud Wireless

Metering and Monitoring MR2

User Guide

Concerned models:

ACW/SF8-MR2

ACW/LW8-MR2

LoRaWAN™

sigfox ready

ATIM Radiocommunications

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This user guide deals with the bellow references

	Product reference	Product Version
LoRaWAN	ACW/LW8-MR2	A.3
	ACW/LW8-MR1-ELEC	A.0
Sigfox	ACW/SF8-MR2	A.0
	ACW/SF8-MR1-ELEC	A.0

Document version history

Version	Date	Description	Author
1.0	03/07/2019	Creation of the ACW MR2 1 MR1-ELEC User Guide	CR + SM

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Declaration of compliance

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 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.

Prelude

This user guide describes the ATIM ACW-MR products functionalities. It explains operating, configuration and installation modes in functions of different use cases.

ACW-MR Product line

ACW-MR product line regroups different types of radio equipment which allow pulse metering, bang-bang control and fraud detection.

Each devices of this product line are available in LoRaWAN and Sigfox version and are delivered with removable batteries. They are can be parametrized through intern switches or via downlink frames on the network (exclusively on LoRaWAN version).

ACW-MR2

The ACW-MR2 is a sensor used for remote metering monitoring (gas, water, electricity, pluviometer meters…) or for remote bang-bang equipment control (eg: starting up/shutting down, opening/closing…).

This sensor can be connected up to 2 independent equipment when they are close enough, allowing devices and network plans savings.

The ACW-MR2 is delivered with two Lithium 3.6V removable batteries with a total capacity of 3500 mAh.

ACW-MR1-ELEC

The ACW-MR1-ELEC is delivered with an integrated optical sensor, this plug and play device monitores remotely the consumption of an LED optical electrical meter (eg: Linky meters, PME-PMI meters). It is delivered and pre-set to memorize the consumption index every 10 minutes and send the last 6 every hour.

Product Identification

The product identifier is visible on the exterior label on the back of the device:

Product

Product reference: Sigfox or LoRaWAN version

Hardware version, Application software/radio firmware number

Serial product number

Sigfox ID or DevEUI LoRaWAN Datamatrix

1. Technical specifications

Dimensions	177 x 55 x 55 mm	
Antenna	Integrated (¼ wave)	
Temperature	-20°C to +55°C (operating) -40°C to +70°C (storage)	
Mounts to	Wall, Mast, DIN-Rail	
Shaft Sealing	IP 65	
Battery	2 packs of 2 batteries equivalent to 14.4 Ah	
Weight	160 g	
Frequency	865 – 870 MHz	
Power	25 mW (14 dBm)	
Rate	Sigfox: 100 bps LoRaWan: 300 bit/s to 10 Kbit/s	
Consumption	Sigfox	LoRaWan
Tx Mode	60 mA	76 mA
Rx Mode	35 mA	29 mA
Standby Mode	1,5 µA	2,5 µA
Active radio current power	50mA max for 6 seconds	
Digital inputs tension	3,6V max	

2. ACW-MR2 operating mode

This paragraph describes the ACW-MR2 and ACW-MR1-ELEC operating mode, in function of the case of use.

a) "Meter reading" mode

Sensors of the ACW-MR product line have 2 inputs that can be linked to pulse metering dry contacts. ACW-MR Product line devices have 2 inputs that can be connected to dry contacts pulse emitters or to open collector for remote metering.

Two operating modes are suggested:

- Standard meter reading

The device monitors both inputs. For these inputs, it increments the index for each pulse received. Periodically (once per hour or once per day for example), it sends both indexes in the same frame.

- Eco meter reading

  The sensor does monitor only one input and it stores the index at a determined frequency (every 10 minutes for example). It transmits a periodic frame with all 6 indexes (here, every hour).
  In this operating mode, this is not possible to monitor in parallel 2 meters and only the first input may be used.

ACW-MR devices count with a third input for anti-fraud, which allows to detect if the remote device is connected. The device monitors this input every minute. In case of a state change, an alert frame with the current state will be sent. This information is contained in every periodic reading frame.

Default configuration

The MR1-ELEC is delivered in default mode: Eco meter reading with index storage every 10 minute and every hour frame emission containing the last 6 indexes.

Important Note

The Fludia optic sensor 230e, integrated to the MR1-ELEC, sends the sensor an impulsion every 5 LED blinking. The index read by the MR1-ELEC should by multiplied by 5 in order to get the real index.

The MR2 is delivered with a default configuration in Standard periodic reading with a index report every 6 hours.

b) “Bang-bang detection” mode

ACW-MR Product line sensors inputs can also be linked to dry contacts outputs for bang-bang detection. In this operating mode, if the device detects a change of state on at least one input, it will transmit a frame containing the current state of both

inputs. The bang-bang detection mode can be set up among the following configurations:

- Inputs state checking every minute
- Contact closing detection
- Contact opening detection
- Contact closing or opening detection

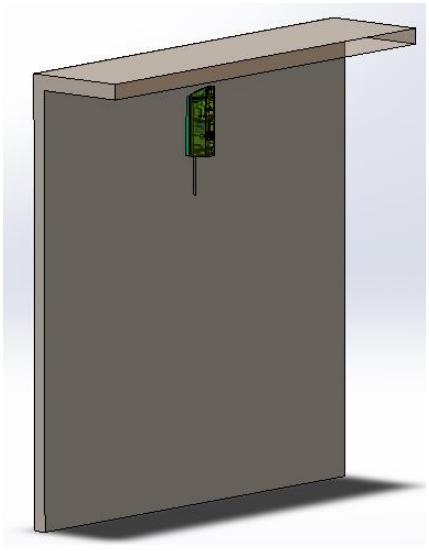
3. Installation

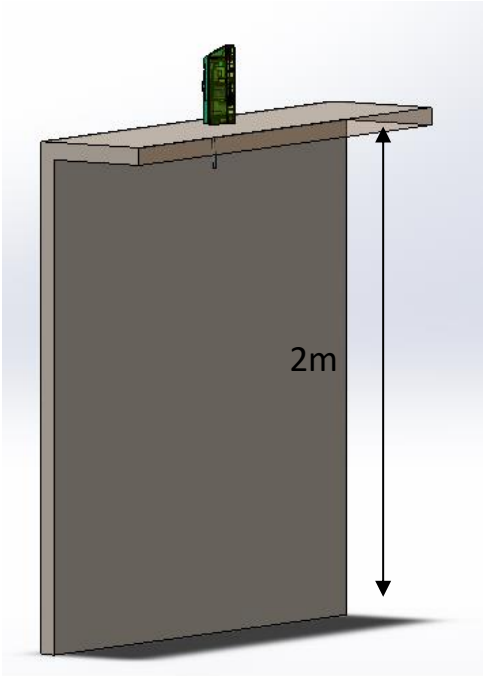
You may open the casing in order to access the configuration switches and the terminal block connection. Please insert a screwdriver in the small slot and bend downwards to lift up the internal strip (cf. photo). Then, pull the back side in order to divide the casing in two parts.

For optimized results, we advise you to install the device without any environmental obstruction, mount it at a minimal height of 2m and do not set it up close to a wall corner, ideally offset 20cm minimum. Cables must not exceed 10m long and have to be armored.

For your information, the antenna is integrated into the casing.

The casing is fixed on a plane wall or on a mast in function of the specific installation.





Batteries' polarity is shown on the printed circuit board. The positive + pole is orientated towards the terminal block, the negative – pole towards the antenna. An isolation strip is to be taken off one of the battery terminals for the first use.

In case of the addition of an extra battery; this one should be connected in parallel, in the same direction of the first ones.

Starting up phase:

From 0 to 3 seg: bootloader.

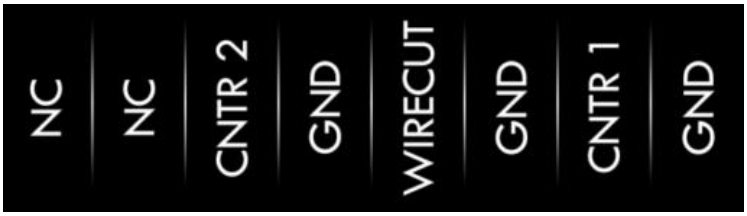
From 3 seg to 8 seg: configuration

From 8 seg to 10 seg: configuration inclusion, green LED blinks, red LED blinks if Wirecut is detected.

After 15 seg: switch to standby

From 1 min to 5 min: emission of a life frame the 1st minute then, an uplink frame every minute.

Afterwards, the life frame is sent every 4 days.



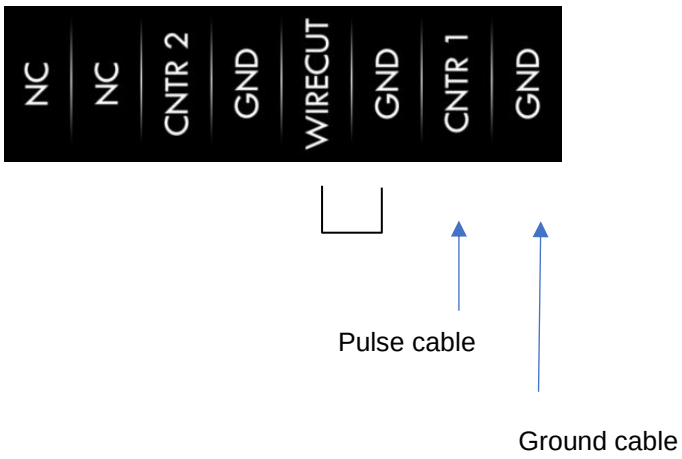
As explained before, the CNTR 1 and CNTR 2 inputs can be used for (1) pulse number counting from dry contacts pulse emitters, or (2) change of dry contact state detection.

The Wirecut input is used to monitor if the device is cabled to the external equipment.

a) Connection to a pulse meter reading

The amount of cables and their color depend on the pulse emitter type installed on the meter. Please refer to the emitter guide in order to verify the connection.

2 cables connection (pulse emitter without anti-fraud output)

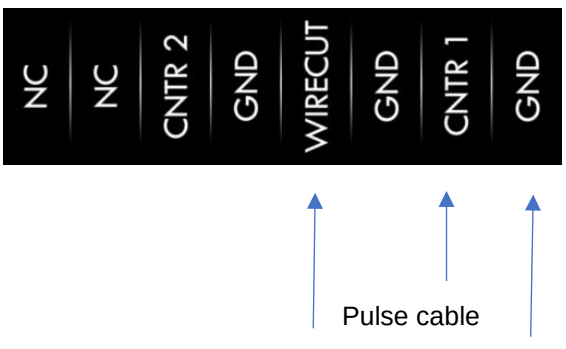


Please note that in particular cases, pulse and mass cables are undifferentiated.

Note

Disable the anti-fraud detection, connection the WIRECUT and GND inputs like shown on the diagram.

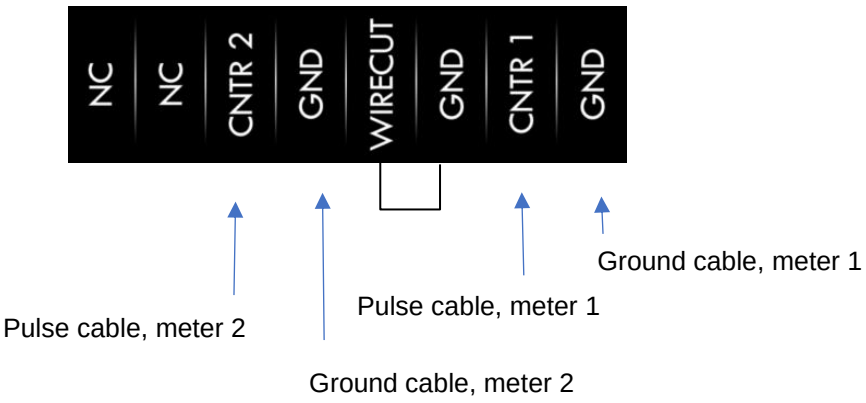
3 cables connection (pulse emitter with anti-fraud output)



b) Connection to 2 meters

The amount of cables and their color depend on the pulse emitter type installed on the meter. Please refer to the emitter guide in order to verify the connection.

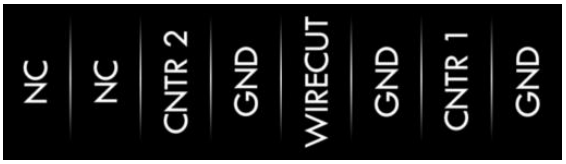
2x2 cables Connection

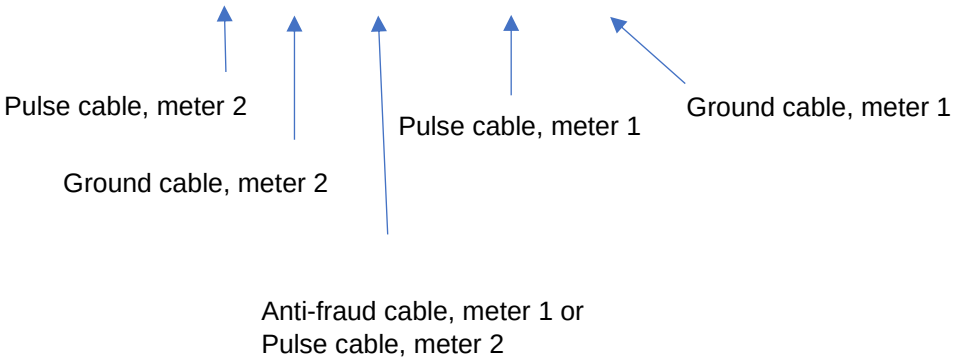


Note

Disable the anti-fraud detection, connection the WIRECUT and GND inputs like shown on the diagram.

2x3 cables Connection





4. Power failure magnet

By bringing close to the right side of the casing a magnet, you will be able to shut the power down.

The automatic emission of a life and test frame at the starting up allows to approve the onsite installation.

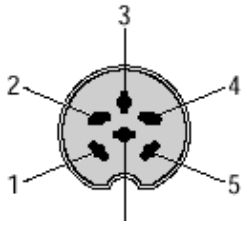
You will need to append the magnet for 30 seconds in order to restart correctly.

5. Gas meter reading connection

ATIM can provide a cable (ref. CAB/MTRGAZ1) appropriate for gas meters with a M16 IP40 connector, with the bellow characteristics:

6 armored wires cable of 20 AWG section and a length of 2 meters.

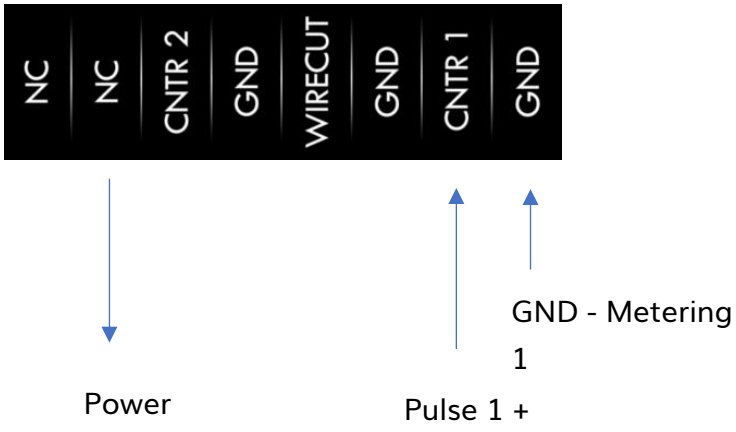
Wire	Color	Signal
1	Brown	Monitoring +
2	White	GND - Monitoring
3	Grey	Metering 2 +
4	Blue	Metering 1 +
5	Yellow	GND - Metering 2
6	Green	GND - Metering 1



DIN female connection seen from the external side

6. Optical sensor connection in « elec » mode

The ACW/XXX-MR1-ELEC reference is delivered with a preinstalled Fluidia optical sensor (4 wired cable with 30 centimeters length).



Wire	Color	Signal
2	Black	Power
7	Red	Metering 1 +
8	Green	GND - Metering 1
8	Yellow	GND - Power

Note

In MR1-ELEC mode, the « Metering 1+» signal is connected to the «Metering 1» input. Powering up an external sensor decrease the product battery life.

7. Configuration

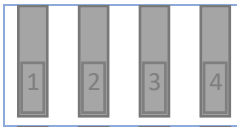
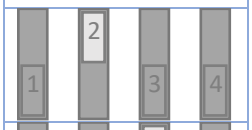
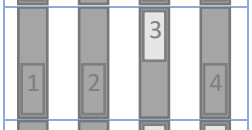
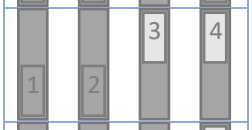
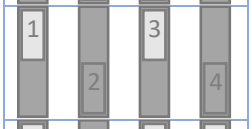
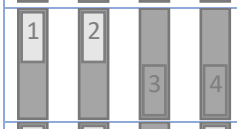
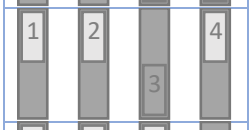
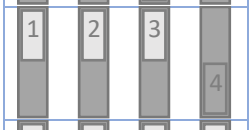
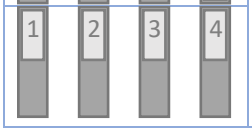
The configuration can be realized locally thanks to internal switches, or remotely through downlink frames. By default, the product uses the switch configuration until a downlink frames configuration is not done.

If a downlink configuration is applied, throughout the next restart, this setting will be used.

a) Internal DIP switches configuration

The configuration is read at the starting of the device. The following table lists the different operating modes that can be set up.

- Standard reading mode: periodic reading of both meter inputs (even if one unique input is used) with a systematic data emission.
- Change of state detection mode: state emission of both inputs when a change if state on at least one input is detected.
- ECO reading mode: periodic reading of meter 1 every X minute, with an emission every 6 readings.

ON / OFF		
	STANDARD METER READING MODE	**Radio emission period (METER READING frame): 10 min**
		Radio emission period (**METER READING frame**): **30 min**
		Radio emission period (**METER READING frame**): **1 h**
		Radio emission period (**METER READING frame**): **3 h**
		Radio emission period (**METER READING frame**): **6 h**
		Radio emission period (**METER READING frame**): **12 h**
		Radio emission period (**METER READING frame**): **24 h**
		Radio emission period (**METER READING frame**): **48 h**
	CHANGE OF STATE DETECTION MODE	Inputs state checking every minute. Radio Emission is detection of change of state **(TRIGGER frame if a contact changes).**
		Radio emission on **falling edge** **(TRIGGER frame at the contact closing).**
		Radio emission on **rising edge** **(TRIGGER frame at the contact opening).**
		Radio emission on **rising and falling edges** **(TRIGGER frame at the contact change of state).**
	ECO METER READING MODE	Radio emission period (**METER MULTI-READING frame**): **1 h** **1 Delta / 10min**
		Radio emission period (**METER MULTI-READING frame**): **3 h** **1 Delta / 30min**
		Radio emission period (**METER MULTI-READING frame**): **6 h** **1 Delta / 60min**
		NC

b) Downlink frames configuration

This functionality is available on the ACW-MR2, fulfilling the following conditions:

Version	Product Software
SIGFOX	Not available
LoRaWAN	V2.2.4 Or superior

Downlink operation mode is explained in the ATIM_ACW-DLConfig_UG_FR_v1.1 document, related to version V1.1 of Downlink protocol ATIM.

Downlink protocol ATIM V1.1, shared between all ACW Product Line devices, describes how to realize the following actions:

- Ask for an ACW products restart
- Obtain product information
- Ask for a factory settings reconfiguration
- Obtain the actual configuration parameters of a product

Specific parameters of ACW-MR2 are the one mentioned bellow:

- Life frame emission frequency

Parameter Code (1 octet)	Parameter Value (2 octets)
0x03	Possible values are: 0x04 = every 10 minutes 0x05 = every hours 0x0A = every 2 hours 0x0B = every 4 hours 0x0C = every 8 hours 0x06 or 0x09 = once a day 0x0D = every 2 days 0x0E = every 3days 0x0F = every 4 days 0x07 = every 7 days 0x08 = every 30 days

- Operating mode

Parameter Code (1 octet)	Parameter Value (2 octets)
0x0A	Possible values are: 0x00 = standard meter reading with emission every 10 minutes 0x01 = standard meter reading with emission every 6 hours 0x02 = standard meter reading with emission every hour 0x03 = standard meter reading with emission every 3 hours 0x04 = standard meter reading with emission every 30 minutes 0x05 = standard meter reading with emission every 12 hours 0x06 = standard meter reading with emission every 24 hours 0x07 = standard meter reading with emission every 48 hours 0x08 = change of state detection mode with Wirecut polling input 0x09 = change of state detection mode with radio emission on falling edge 0x0A = change of state detection mode with radio emission on rising edge 0x0B = change of state detection mode with radio emission on falling and rising edges 0x0C = ECO meter Mode reading every 10 minutes + emission every hour 0x0D = ECO meter Mode reading every 30 minutes+ emission every 3 hours 0x0E = ECO meter Mode reading every hour + emission

	every 6 hours 0x0F = N/A0x10 = Use DIP switch configuration

Reminder

By default, the product uses the DIP switch configuration until a downlink frame has been done. If a configuration via downlink has been made, at the next restart, this configuration will be used.

- Meter 1 set up

The Meter 1 index can be set on the value of your choice, within the interval from 0 to 4294967295.

Command to send	Parameter Value (4 octets)
C1050Axxxxxxxx	Possible values for xxxxxxxx (in hexadecimal): 0x00000000 to 0xFFFFFFFF

Eg: If we want to set up the index of the meter 1 over 1000, you need to send via downlink the command C1050A000003E8 (because 1000 = 3E8 in hexadecimal).

- Meter 2 set up

The indexes of meters 1 and 2 can be set on a single command, with values of your choice, within the interval from 0 to 4294967295.

Command to send	Parameter Value (4 octets)
C1090Cxxxxxxxxyyyyyyyy	Possible values for xxxxxxxx and yyyyyyyy (in hexadecimal): 0x00000000 to 0xFFFFFFFF

Eg : If we want to set up the index of the meter 1 over 1000 and the index of the meter 2 over 5000, you need to send via downlink the command C1090C000003E800001388 (because in hexadecimal 1000 = 3E8 et 5000 = 1388).

8. Sigfox – LoRaWAN frame format

Data varies in function of the emitted frame type and the operating mode (Pulse, Dry contacts, MR1-Elec). For example:

TYPE	DESCR.	FRAME FORMAT												
		octet 0 (dec)	octet 0 (hex)	octet 1 (hex)	octet 2 (hex)	octet 3 (hex)	octet 4 (hex)	octet 5 (hex)	octet 6 (hex)	octet 7 (hex)	octet 8 (hex)	octet 9 (hex)	octet 10 (hex)	octet 11 (hex)
KEEP ALIVE	Life frame	1	01	Supply voltage IDLE (mV)		Supply voltage TX (mV)		64						
METER READING	Standard meter frame	20	14	**-bit0-** WIRE CUT	Meter index 1				Meter index 2					
WIRECUT	Broken wire alert frame	55	37	**-bit0-** WIRE CUT										
TRIGGER	Change of state detection frame (Dry contacts)	9	09	00	XX									
					bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0		
					NC	NC	NC	NC	NC	WIRE CUT	Logic Level In 2	Logic Level In 1		
METER MULTI-READING LoRaWan	ECO meter mode frame (Meter 1 32 bits and 5 deltas 32 bits) LoRaWan	48	30	Index 5 **(32bits)** (Tref-50min)		Index 4 **(32bits)** (Tref-40min)		Index 3 **(32bits)** (Tref-30min)		Index 2 **(32bits)** (Tref-20min)		Index 1 **(32bits)** (Tref-10min)		Index 0 **(32bits)** (Tref)
	Test frame LoRaWan	49	31	Index meter 1 **(32bits)**										
METER MULTI-READING SIGFOX	ECO meter mode frame (Meter 1 20 bits and 5 deltas 12 bits concatenated) SIGFOX	57	39	Ref. Index (20 bits) (Tref)		Delta 1 (12bits) (Tref-10min)		Delta 2 (12bits) (Tref-20min)		Delta 3 (12bits) (Tref-30min)		Delta 4 (12bits) (Tref-40min)		Delta 5 (12bits) (Tref-50min)
		58	3A			Delta 1 (12bits) (Tref-30min)		Delta 2 (12bits) (Tref-60min)		Delta 3 (12bits) (Tref-90min)		Delta 4 (12bits) (Tref-120min)		Delta 5 (12bits) (Tref-150min)
		59	3B			Delta 1 (12bits) (Tref-60min)		Delta 2 (12bits) (Tref-120min)		Delta 3 (12bits) (Tref-180min)		Delta 4 (12bits) (Tref-240min)		Delta 5 (12bits) (Tref-300min)

Tref = moment of emission

9. Technical Support

For any further information or technical issues, you may contact our technical support team on this webpage : www.atim.com/fr/technical-support