ATIM Cloud Wireless

Metering / State of dry contacts MR1

User Guide

Concerned models:

ACW/SF8-MR1

ACW/LW8-MR1

LoRaWAN™

sigfox ready

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This user guide is applicable for the below references

Product references	Product version (visible on the product label)
ACW/LW8-MR1	
ACW/SF8-MR1	

Document version history

Version	Date	Description	Author
1.0	12/05/21	Document creation	FR
1.1	06/10/2021	Additions of complementary information	AJ
1.2	15/10/2021	Corrections	FR
1.3	11/04/2022	Software version vs functionalities checkup	JML
1.4	12/04/2022	Update of default parameters	FR
1.5	14/04/2022	Addition of the mounting instruction OPTO	AJ
1.6	20/04/2022	Additions of complementary information	JML

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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 compatibilities (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 environment

Except for ATIM's ATEX certified products (Example ACW-MR2-EX) intended for this use, do not use ACW radio modems in the presence of flammable gases and fumes. The use of the equipment in this environment constitutes a danger!

b. 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 waterproof enclosures can be placed outdoors but must not be immersed in water.

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

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.*

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 other 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 center 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

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.

Prelude

This guide describes the functionalities of the products of the ATIM ACW-MR range. It explains the operating, configuration, and installation modes of the products according to the different use cases.

ACW-MR product line

The ACW-MR range includes several types of radio equipment for pulse counting, change of state detection and fraud detection, each intended for different uses.

All products in the range are available in LoRaWAN and Sigfox versions and are delivered with removable batteries. They are configurable via internal switches and by sending Downlink messages from the network (only in LoRaWAN version).

ACW-MR1

The ACW-MR1 is a device used for the remote reading of meters (gas, water, electricity, rain gauge...) or for the remote detection of equipment status changes (e.g.: start/stop of equipment, opening/closing of a door, a skydome, etc...).

For remote meter reading (Smart Metering), the ACW-MR1 must be connected to a pulse meter. If your meter is not equipped with pulse outputs, many compatible pulse headers are available on the market.

In addition to its counting input, the ACW-MR1 is equipped with a dry contact input allowing to trigger transmissions in case of change of state. This input can be used as a fraud detection in case of cable cut.

The ACW-MR1 comes with a pack of 2 removable Lithium Ion 3.6V batteries, with a total capacity of 7.2Ah.

CAPT-OPTO

An optical head accessory is available for the ACW-MR1:

- a light guide to be clipped with a suction cup on any electrical equipment equipped with an LED.

Installation of the OPTO cable

a. Description of pieces

A	MR1 casing
B	Nut Tightening Stuffing box
C	Cable
D	Clamping sleeve
E	Fixing sleeve
F	Adhesive washer

b. Procedure

Fix the washer **(F)** on the location where the survey is to be carried out, so that the light signal passes through the middle in the hole. It is important to clean the area and dry it to ensure a reliable grip in the long term.

Position the part **(E)** on the washer so that the light signal is visible through the hole that goes right through it. Alignment is essential.
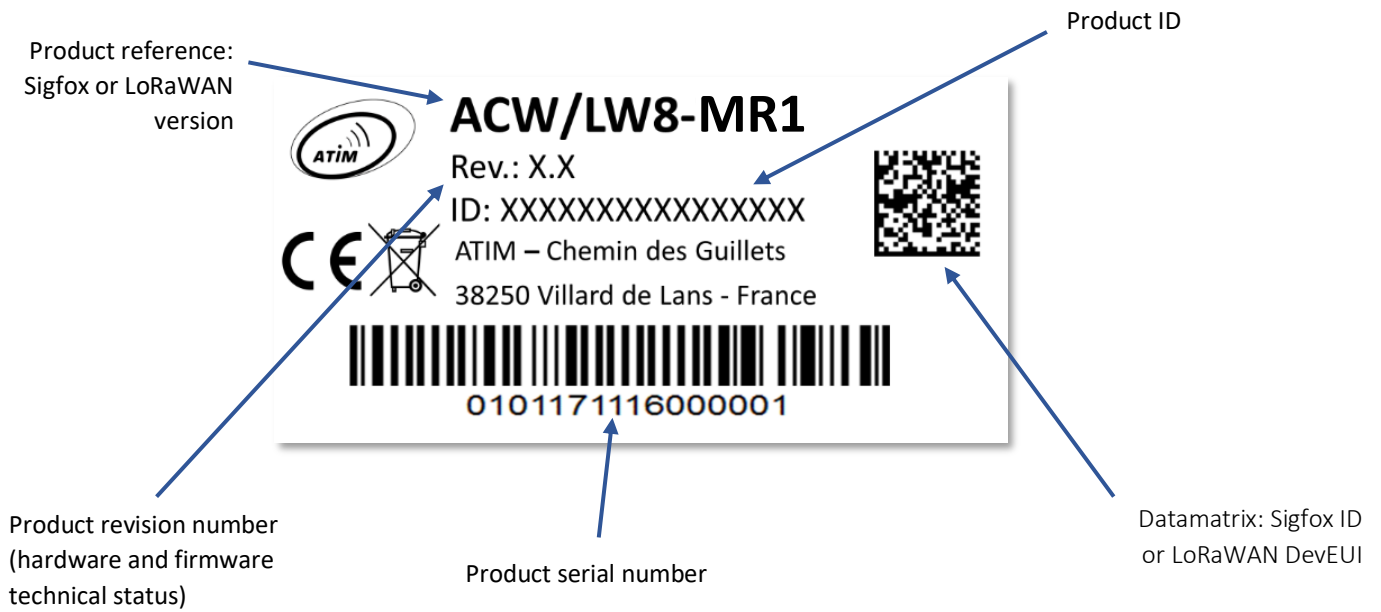
Mount the cable **(C)** in the MR1 housing **(A)**, lock the assembly by tightening the nut **(B)**.

Finally, pass the clamping sleeve over the cable **(C)**, place the other end of the cable at the bottom of the sleeve **(E)** and clip parts **(D)** & **(E)** together to exert strong pressure against the adhesive washer **(F)**.

Product identification

The sensor ID is visible on the product label on the outside as well as inside the housing next to the batteries.

Product reference:
Sigfox or LoRaWAN
version

Product ID

ACW/LW8-MR1
Rev.: X.X
ID: XXXXXXXXXXXXXXX
ATIM – Chemin des Guillets
38250 Villard de Lans - France

0101171116000001

Product revision number
(hardware and firmware
technical status)

Product serial number

Datamatrix: Sigfox ID
or LoRaWAN DevEUI

ACW-MR1 label

Technical features

Dimensions	177 x 55 x 55 mm	
Weight	160g	
Antenna	Embedded (1/4 of wave)	
Temperature	-20°C to +55°C (operation)	
	-40°C to +70°C (storage)	
Mounting	Wall, mast, DIN rail	
Power Supply	1 pack of 2 batteries, equivalent to 7.2 Ah	
Frequency	865 – 870 MHz	
Power	25 mW (14 dBm)	
Rate	Sigfox: 100 bps	
	LoRaWAN: 300 bit/s to 10 Kbit/s	
Consumption (24V)	Sigfox	LoRaWAN
Tx mode (max)	25 mA	50 mA
Rx mode (max)	17 mA	22 mA
Standby mode	2 µA	2 µA
Power supply current (radio active)	50 m max for 6 seconds	
Digital input tension	3,6 Vmax	

Operation

a. Input 1: pulse counter

The ACW-MR1 has a metering input that can be connected to a dry contact or open collector type pulse emitter for remote meter reading, and a dry contact input indicating an ON/OFF status.

Two modes of use are proposed:

1. Standard Meter reading

The sensor increments an index with each received pulse. Periodically (e.g. once an hour or once a day), it transmits the index to the radio network.

2. Eco Meter Reading

The sensor increments an index with each received pulse. Periodically (for example every 10 minutes), it memorizes the value of the index. When it has stored 6 values, it transmits them in a single frame to the radio network.

NOTE
The index value is regularly saved in non-volatile memory to not being lost in case of power loss (for example when batteries are empty). However, when a power loss is happening, the pulses received during the previous 10 minutes may be lost (in addition to the pulses received during the power loss).

b. Output copy of the pulse in Mirror mode

The ACW-MR1 is equipped with an output to copy the pulse input. This makes it possible to be easily inserted in an existing installation where there is already a pulse transmitter. In this case, the ACW-MR1 is inserted between the meter and the pulse emitter.

The output terminals are called OUT1- and OUT1+ (galvanically isolated MOSFET dry contact).

c. Input 2: dry contact – detection of change of state

This input can be connected to a dry contact for change of state detection, in on-off mode. By default, if the sensor detects a change of state on this input, it transmits an alert frame.

d. Input Optical head

The card is equipped with a phototransistor that detects the light pulses from the optical fiber if it is connected to the cable gland (ACW-MR1/OPTO mode).

Installation

It is advisable to open the box to access the terminal block. To do this, insert the screwdriver into the slot and tilt it downwards to lift the internal tab (see photo opposite).

Then pull on the back side to separate the two parts of the case.

For best results, it is recommended to install the box without environmental obstruction and to place it at a minimum height of 1m50.
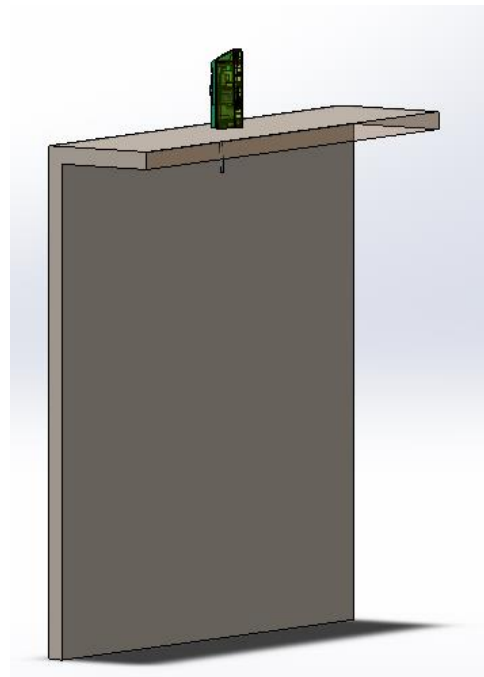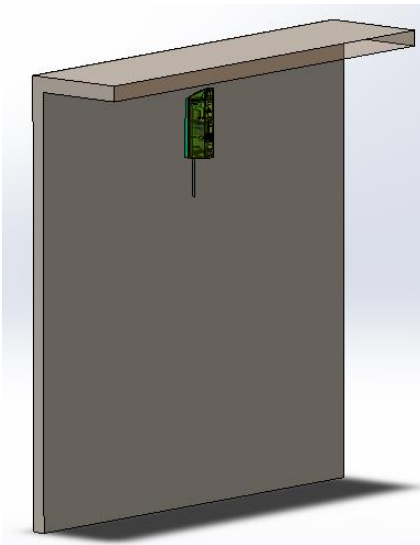
It must be mounted on a vertical support or fixed to a wall (especially not on a metal post!).

The box is fixed on a flat wall or a tube according to the type of installation desired.

The cable should not exceed 10m in length and should be shielded.

NOTE
The antenna is integrated in the housing which must be installed vertically with the cable gland facing downwards.

Wiring of the terminal block

You will find below the order of the inputs / outputs on the terminal block:

CPT1-	CPT1+	IN2-	IN2+	OUT1-	OUT1+	NC	NC

- CPT1: Meter Input,
- IN2: Dry Contact Input,
- OUT: Output, input image CPT,
- NC: Unused on this device. Do not wire.

Commissioning

The product is delivered in standby mode where it sends only the life frames.

To activate the product, press the push button for 2 seconds; the LED should blink 3 times to indicate the switch to operating mode.

You can also pass a magnet over the diamond (area indicated on the red circle).

It is also possible to activate the product remotely by downlink (see the section Configuration).

NOTE
Approaching the magnet is equivalent to pressing the push button.

Test frame emission

When the product is in its operating mode, it is possible at any time to send a test frame. To do this, you must press the push button briefly (less than 2 seconds) or pass the magnet briefly.

Periodic frames

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

NOTE
By default, this period is set to every hour.

Keep alive frames

The period of the life frames is configurable by the user, with a minimum of 10 minutes.

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

Configuration

There is no USB or Bluetooth connector on this product. The configuration is done at the factory and can only be changed via Downlink, i.e., from the customer's platform.

- In LoRaWAN, downlinks can be received by the product after each frame sending.
- In Sigfox, they can be received only when sending life frames.

The Downlink configuration frames are explained below, depending on the setting you wish to change.

Frequency of emission of the keep alive frame	
Parameter code (1 byte)	Parameter value (1 byte)
0x03	The possible values are: 0x04 = every 10 minutes 0x05 = every hour 0x0A = every 2 hours 0x0B = every 4 hours 0x0C = every 8 hours **0x06 or 0x09 = once a day (factory setting)** 0x0D = every 2 days 0x0E = every 3 days 0x0F = every 4 days 0x07 = every 7 days 0x08 = every 30 days

Operating mode	
Parameter code (1 byte)	Parameter value (1 byte)
0x0A	The possible values are: 0x00 = standard counter mode with transmission every 10 minutes 0x01 = standard counter mode with transmission every 6 hours **0x02 = standard counter mode with transmission every hour (factory setting)** 0x03 = standard counter mode with transmission every 3 hours 0x04 = standard counter mode with transmission every 30 minutes 0x05 = standard counter mode with transmission every 12 hours 0x06 = standard counter mode with transmission every 24 hours 0x07 = standard counter mode with transmission every 48 hours 0x09 = change of state detection mode with radio transmission on falling edge 0x0A = change of state detection mode with radio transmission on rising edge 0x0B = detection mode change of state with radio transmission on falling and rising edges 0x0C = ECO counter mode with reading every 10 minutes + transmission once an hour 0x0D = ECO counter mode with reading every 30 minutes + transmission every 3 hours 0x0E = ECO counter mode with reading once an hour + transmission every 6 hours

Internal resistance of inputs (CPT1+ and IN2+)	
Parameter code (1 byte)	**Parameter value (1 byte)**
0x0B	<u>The possible values are:</u> **0x00 = high impedance (factory setting)** 0x01 = pull-up 0x02 = pull-down

NOTE
The index of counter 1 can be changed to any value in the range of 0 to 4294967295.

Meter 1 settings	
Parameter code (3 bytes)	**Parameter value (4 bytes)**
C1050Axxxxxxxx	For xxxxxxxx (in hexadecimal): 0x00000000 to 0xFFFFFFFF

EXAMPLE
If you want to set the index of counter 1 to 1000, you have to send in Downlink the command C1050A000003E8 (because 1000 = 3E8 in hexadecimal).

Bounce time	
Parameter code (1 byte)	**Parameter value (1 byte)**
0x1E	Value in milliseconds, between 5 and 255. Factory setting: 50ms

Product activation
Parameter code (2 bytes)
0x010B

Format of Sigfox – LoRaWAN frame

The data vary according to the type of frame transmitted and the operating mode (Meter, On/Off, MR1-Elec).

For example:

TYPE	DESCR.	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)
											FRAME FORMAT			
KEEP ALIVE	Keep alive frame	1	01	Supply voltage IDLE (mV)		Supply voltage TX (mV)		64						
METER READING	Standard meter frame	20	14	00	Meter index 1			0x00000000						
TRIGGER	Change of state detection frame (Dry contacts)	9	09	00	XX									
					bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0		
					0	0	0	0	0	0	0	Logic Level IN2+		
METER MULTI-READING LoRaWAN	ECO mode meter frame (meter 1 6 indexes 32 bits)	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	49	31	Index cpt 1 (**32bits**)										
METER MULTI-READING Sigfox	Trame ECO mode meter frame	57	39			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)				
	(Meter 1 20 bits and 5 deltas 12 bits concatenated)	59	3B	Réf. Index (20 bits) (Tref)		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 = time of issue

Technical support

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