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# ATIM Cloud Wireless

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## Metering and Monitoring

### MR2 - ATEX

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## User Guide



Concerned models:

ACW/SF8-MR2EX

ACW/LW8-MR2EX



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## Document version history

Version	Date	Description	Author
0.2	06/04/2016	First version	YL
0.3	13/04/2016	Correction	YL
0.4	15/04/2016	Wire + ATEX	YL
0.5	09/05/2016	Ground	YL
0.6	19/05/2016	Distinction	YL
0.8	22/06/2016	LoRa reference added + join	YL
0.9	06/03/2017	Addition of SI	TDX
1.0	28/01/2020	Complete restructuring	ER

## Disclaimer

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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:



### 1 SAFETY (Article 3.1a of the 1999/5/EC Directive)

NF EN60950-1 Ed. 2006/A1:2010/A11:2009/A12:2011 (health)

EN62479: 2010 (power <20mW) or EN62311:2008 (power > 20mW)

### 2 Electromagnetic compatibility (Article 3.1b of the 1999/5/EC Directive)

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

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

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

## Environmental recommendations

### a) Explosive atmosphere



The ACW-MR2-Ex complies with the standards EN 60079-0 and EN 60079-11 ("ic").

ACW-MR2-Ex can be used in an explosive atmosphere, Zone 2, gas group IIB, T4 temperature classification for a maximum ambient temperature of 55 ° C.

Corresponding ATEX certification is  II 3 G, Ex ic IIB T4 Gc.



The ATEX certification of this ACW-MR2-EX product is only valid with the SATE LS14500EX ATEX Certified Reference Battery.

Using another type of battery can cause an explosion. The housing must be screwed to the equipment ground via the supplied bracket or a ground wire screwed to the equipment (not supplied). ATIM disclaims any liability for failure to comply with these procedures

## b) Environment

Respect the temperature ranges for storage and operation of all products. Failing to respect these guidelines could disrupt device operation or damage the equipment. ACW products in IP65 water- and dust-resistant housings may be placed outdoors, but must not, under any circumstances, be submerged.

Follow the instructions and warnings provided below to ensure your own safety and that of the environment and to protect your device from any potential damage.



**General hazard** – Failure to follow the instructions presents a risk of equipment damage.



**Electrical hazard** – Failure to follow the instructions presents a risk of electrocution and physical injury.



Direct-current symbol



**WARNING:** do not install this equipment near any source of heat or any source of humidity.



**WARNING:** for your safety, it is essential that this equipment be switched off and disconnected from mains power before carrying out any technical operation on it.



**WARNING:** the safe operation of this product is ensured only when it is operated in accordance with its intended use. Maintenance may only be performed by qualified personnel.



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.



### c) Radio

Modems in the ACW line are radio-communication modems that use the ISM (industrial, scientific and medical) bands, which may be used freely (at no cost and with no authorisation required) for industrial, scientific and medical applications.

### For a safe utilization

These devices must be connected to certified intrinsically safe equipment. Associations must be compatible with intrinsic safety.

The electrical parameters of these devices must not exceed the values given below.

Approval: INTERTEK / ATEX / IECEx / Hazardous Locations

Intrinsic safety level  G, Ex ic IIB T4 Gc

### Spark risk assessment

$U_o = 3.66V$

Capacitive part:  $C \leq 20\mu F$

Inductive Part:  $L \leq 12.3\mu H$

Rated power: 150mW  $I_{max} = 900mA$

Presence of an interface with external connected a TOR => use of resistances of blockings with 1k + 2.2k.

### Signal output

$U_i \leq 3.66$  Volt

$I_i \leq 1.3$  mA

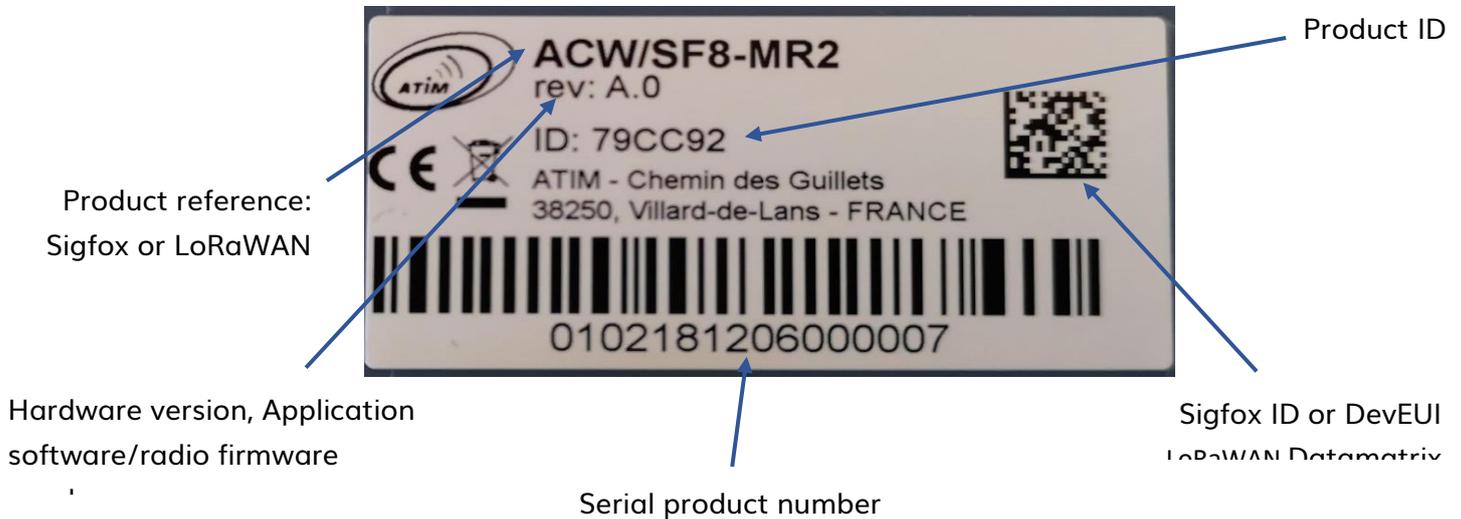
$I_i \approx 0$  (negligible)

Signal equivalent to that of the dry contact

Cable length 5 m

## Product Identification

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



## Technical specifications

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

## ACW-MR2-EX operating mode

This paragraph describes the operating mode of the ACW-MR2-EX, depending on the use case.

### a) “Meter reading” mode

The ACW-MR2-EX sensor have 2 inputs which can be connected to dry pulse measurement contacts. The ACW-MR2-EX device has 2 inputs which can be connected to dry contact pulse transmitters or to an open collector for remote measurement.

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.

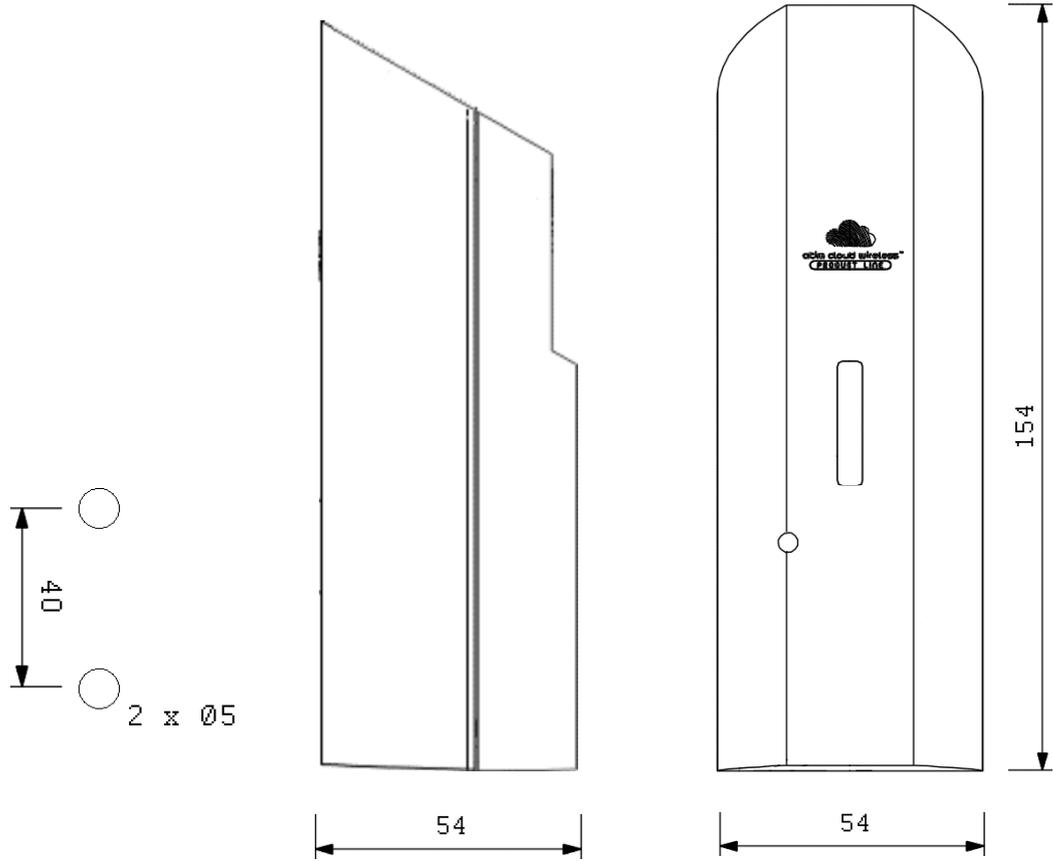
The MR2 is delivered with a default configuration in Standard periodic reading with an index report every 6 hours.

### b) “Dry contacts” mode

ACW-MR Product line sensors inputs can also be linked to dry contacts outputs for change of states 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

# Footprint



Format and template of the fixing holes of the box

Opening of the ACW case



The box must be opened to access the module configuration switches as well as the connection terminal block. To do this, insert the screwdriver in the slot and tilt down to lift the inner tab (see photo opposite). Then pull on the back side to separate the two parts of the case.

## Fixing support

In order to meet the requirements of the safety standard, it is important to connect either the wall or the product to the ground. A hole on the attachment has been provided for this use.

Fixing on a flat wall (provided):



### Special condition for safe use



The end user will take all necessary precautions to install the equipment in its final environment while maintaining the equipotentiality of the earthing, via the support provided or by a grounding cable screwed on the latter to the place indicated in the installation instructions.

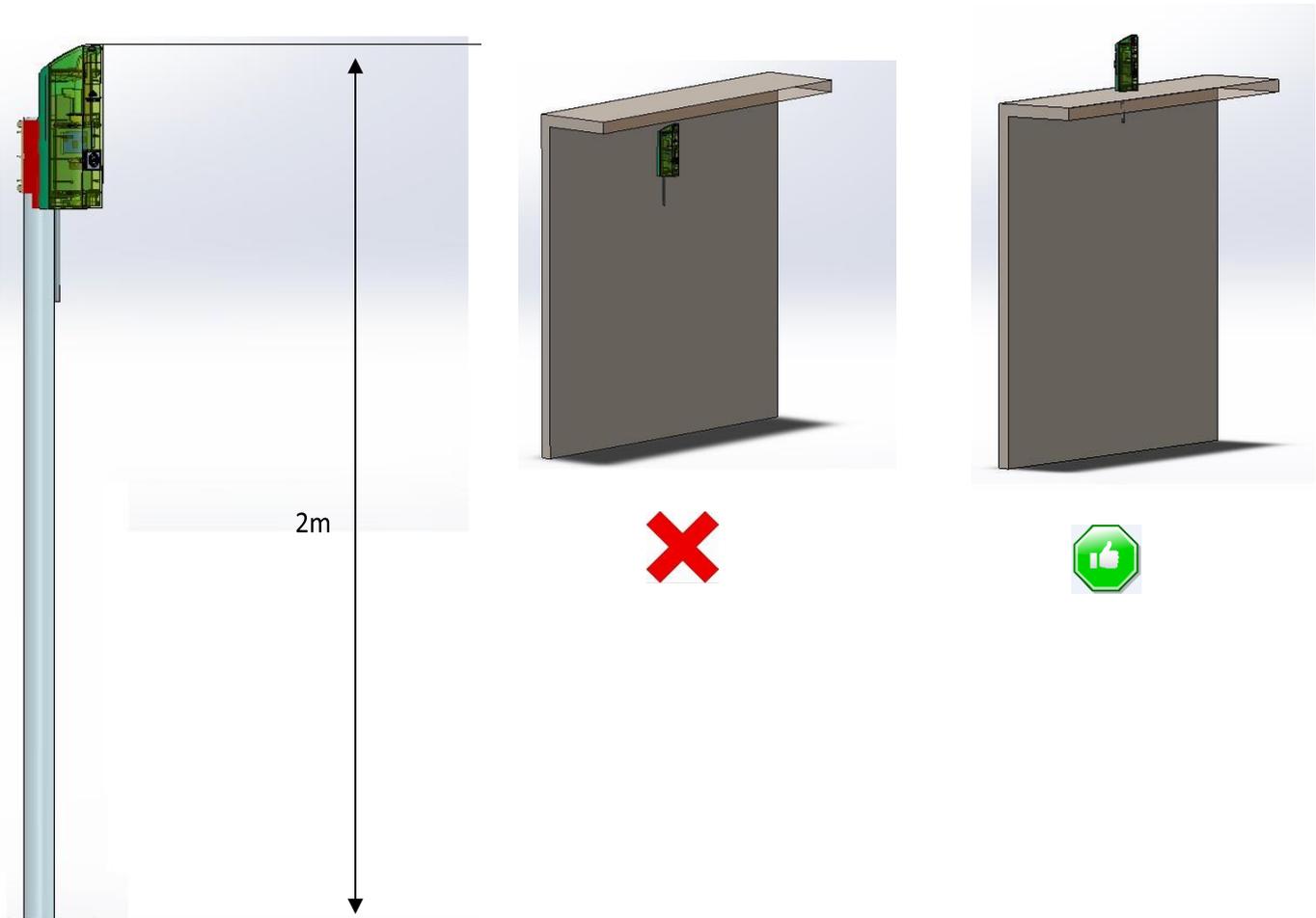


To prevent the occurrence of electrostatic discharge, the end user should be careful not to clean the equipment with a dry cloth. Favor the damp cloth.

## Implementation and positioning

Install the modem at a minimum height of 2m and not glued to the wall, ideally offset by at least 20cm the cables must not exceed 10m in length and must be shielded

For optimal results, it is advisable to place it in height and clear of any metallic obstacle in a radius of 1 meter if possible (see figures below). For information, the antenna is integrated into the box.



The magnet sensor on the right side emits a test frame to validate the installation on site.

# Product restart



A power failure is achievable by positioning a magnet near a magnetic switch placed on the power supply of the modem.

This operation can be useful to perform a restart (requires positioning the magnet for about 30 seconds).

## Modem connection

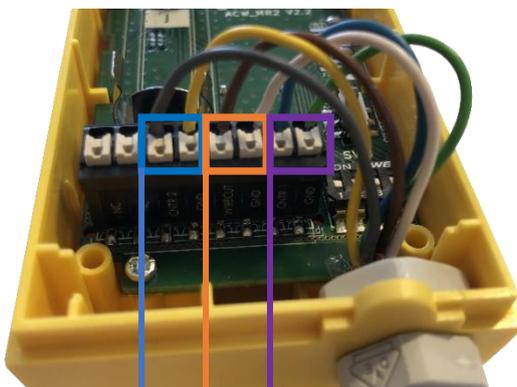
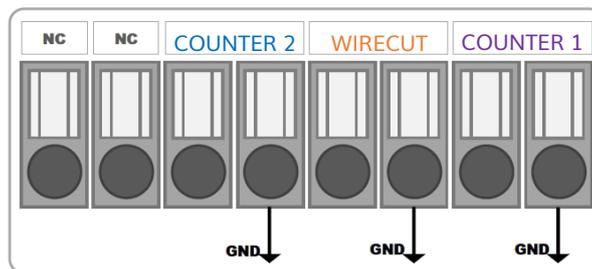


ATIM warned the use only of ATEX certified battery for the exact reference ACW-MR2Ex: SAFT - LS14500Ex.

The polarity is indicated on the printed circuit board. The + pole is oriented towards the terminal block, the pole - towards the antenna.

### Start-up phases:

- From 0 to 3 sec: bootloader.
- From 3 sec to 8 sec: AT command configuration
- From 8 sec to 10 sec: taking into account the configuration.
- From 10 sec to 15 sec: emission of a frame of life
- After 15 seconds: switch to standby



COUNTER 2  
WIRECUT  
COUNTER 1

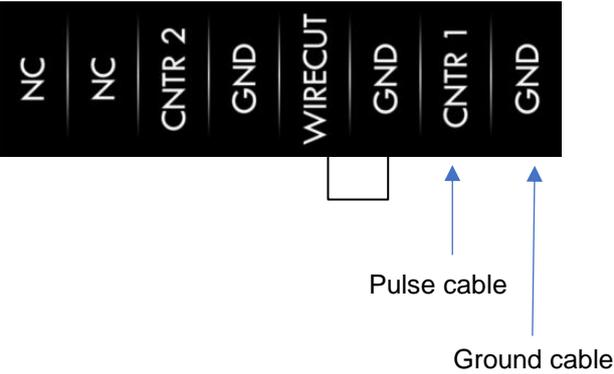
It is possible to connect:

- 1 fast counter contact type contact: **Counter 1**
- 1 'wirecut' input of dry contact type. The monitoring of this input is performed 1x / min.
  - 1 slow counter contact type contact: **Counter 2**

### 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)**

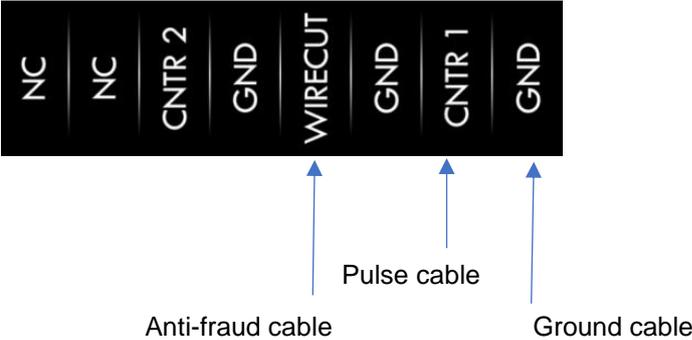


Please note that in particular cases, pulse and mass cables are undifferentiated.

**Note**

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

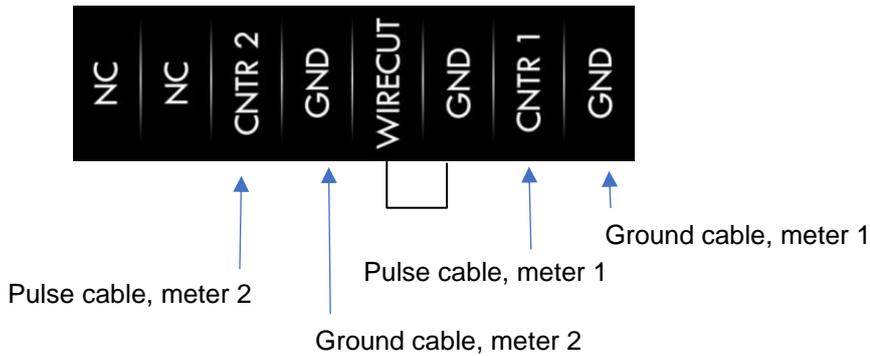
**3 cables connection (pulse emitter with anti-fraud output)**



## 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.

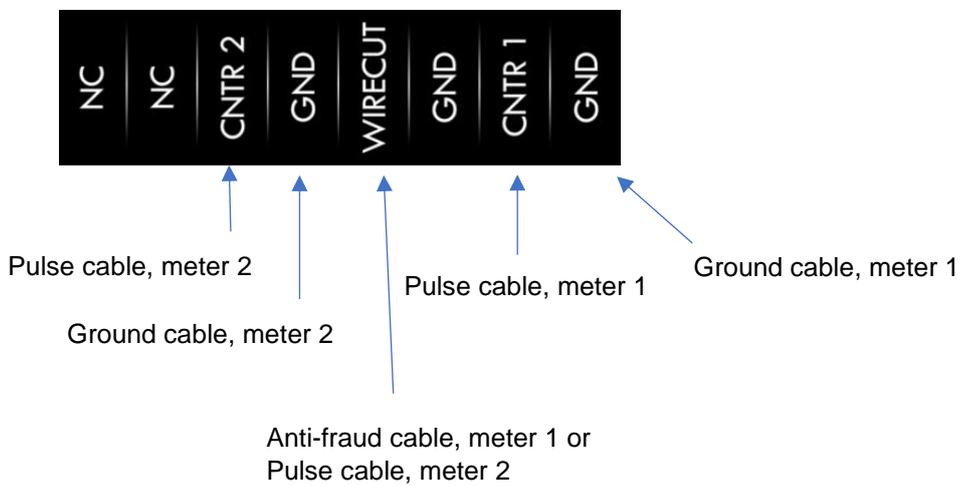
### 2x2 cables Connection



### Note

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

### 2x3 cables Connection



### c) Gas metering wire

You can connect up to two logical counter inputs. The logic input accepts a volt free dry contact or a voltage whose high level does not exceed 5Vcc (push-pull type). The 'Cable break' (or 'Fraud') input sends information if the read head or the link to your meter is removed, periodically when the meter reading is issued.



The reading heads of the counters are polarized, the wire of brown color corresponds to the mass and the white wire is the impulse input.

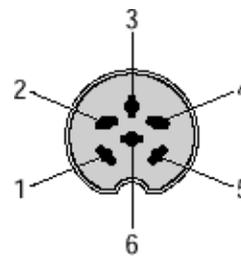
In counter mode, the index issued starts at 0 when first put into service. It is not possible to implement an offset on the ACW modem, this difference is to be taken into account at the reception (server). The counter is saved in memory when changing the battery. The maximum value of the index is 4,294,967,295, then it starts again at 0.

#### Type of cable to be used (other than CAB / MTRGAZ1):

recommended maximum length 1 meter and recommended diameter 0,9mm, strip the wire to 9mm.

ATIM can provide a cable suitable for CAB / MTRGAZ1 reference gas meters with an M16 IP40 connector, having the following characteristics:

6 AWG shielded 6-wire cable with a length of 2 meters.



**DIN socoker side view**

You can connect the wires of the cable on the terminal block, inside the box.

The wires are pre-wired according to the table below:

<b>PIN</b>	<b>COLOUR</b>	<b>SIGNAL</b>
1	Brown	Oversight +
2	White	GND - Oversight
3	Grey	Metering 2 +
4	Blue	Metering 1 +
5	Yellow	GND - Metering 2
6	Green	GND - Metering 1

## LED lights meaning

The red status indicator lights when the product is powered. After a few seconds, the green LED flashes, which means that the modem is sending its data to the network.

With each new data transmission, the led flashes briefly.

## 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 of 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.

<b>ON</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<b>STANDARD METER READING MODE</b>	Radio emission period ( <b>METER READING frame</b> ): 10 min	
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Radio emission period ( <b>METER READING frame</b> ): 30 min	
<b>OFF</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Radio emission period ( <b>METER READING frame</b> ): 1 h	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Radio emission period ( <b>METER READING frame</b> ): 3 h	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Radio emission period ( <b>METER READING frame</b> ): 6 h	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Radio emission period ( <b>METER READING frame</b> ): 12 h	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Radio emission period ( <b>METER READING frame</b> ): 24 h	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Radio emission period ( <b>METER READING frame</b> ): 48 h	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<b>CHANGE OF STATE DETECTION MODE</b>	Inputs state checking every minute. Radio Emission is detection of change of state <b>(TRIGGER frame if a contact changes).</b>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>			Radio emission on <b>falling edge</b> <b>(TRIGGER frame at the contact closing).</b>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Radio emission on <b>rising edge</b> <b>(TRIGGER frame at the contact opening).</b>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Radio emission on <b>rising and falling edges</b> <b>(TRIGGER frame at the contact change of state).</b>		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<b>ECO METER READING MODE</b>	Radio emission period ( <b>METER MULTI-READING frame</b> ): 1 h <b>1 Delta / 10min</b>	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Radio emission period ( <b>METER MULTI-READING frame</b> ): 3 h <b>1 Delta / 30min</b>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Radio emission period ( <b>METER MULTI-READING frame</b> ): 6 h <b>1 Delta / 60min</b>	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		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)
<b>0x03</b>	<u>Possible values are:</u> 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)
<b>0x0A</b>	<u>Possible values are:</u> 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.

The return to the configuration by DIP switches is achieved by sending the parameter code 0x0A with a parameter value of 0x10 (see table above).

- 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)
<b>C1050Axxxxxxx</b>	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)
<b>C1090Cxxxxxxxxyyyyyyyy</b>	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).

## Sigfox – LoRaWAN frame format

Data varies in function of the emitted frame type and the operating mode (Pulse, Dry contacts). 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-WIRECUT	Meter index 1			Meter index 2						
WIRECUT	Broken wire alert frame	55	37	-bit0-WIRECUT										
TRIGGER	Change of state detection frame (Dry contacts)	9	09	00	XX									
					bit7 NC	bit6 NC	bit5 NC	bit4 NC	bit3 NC	bit2 WIRECUT	bit1 Logic Level In 2	bit0 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

## Help

### The modem does not configure itself

- If the power supply is properly connected to the modem
- Check if the red LED flashes on power up

### Radio data is not received

- Check if the power supply is properly connected to the modem
- Check if the modem has been registered on the network
- Check if radio network coverage is available
- Check if the blue and green lights are flashing during a broadcast

### Counter index does not increment

- If the counter wires are not reversed and plugged into the terminal block
- Check if your reading head is well sized for your use (litres, m3)
- Check that the output of your meter does not exceed 5V in the case of an output push-pull

### Modem LED is not blinking

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

## Technical support

For any further information or technical issues, you may contact our technical support team on this webpage:

<https://www.atim.com/en/support-2/technical-support/>