



User Guide | PULSE ARF8230CRA | Sigfox RC1

≡ Document version	V1.0
⊙ Product/Service	PULSE
≡ Area	Sigfox RC1
⊙ Etat	Terminé

PRODUCTS AND REGULATORY INFORMATION



This User Guide applies to the following product:
PULSE ARF8230CRA Sigfox RC1

Reference: ARF8230CRA

App version: 1.1.0

DOCUMENT INFORMATIONS	
Title	PULSE ARF8230CRA Sigfox RC1 - User Guide
Type	Implementation
Version	1.0.0

DOCUMENTATION GUIDE

PREAMBLE

DISCLAIMER

TECHNICAL SUPPORT

RECOMMENDATIONS

INTRODUCTION

[https://s3-us-west-2.amazonaws.com/secure.notion-static.com/14b231ea-5086-43fb-9090-78b06c9a2d42/EU_declaration_of_conformity\(_PULSE_Sigfox_IP68_ARF8230CR\).pdf](https://s3-us-west-2.amazonaws.com/secure.notion-static.com/14b231ea-5086-43fb-9090-78b06c9a2d42/EU_declaration_of_conformity(_PULSE_Sigfox_IP68_ARF8230CR).pdf)

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1. PRODUCT PRESENTATION

NOTE

The PULSE can only be started or restarted using a magnet.

1.1. General Description

The PULSE is a plug-and-play sensor that allows for the monitoring of multi-fluid consumption and the detection of anomalies such as leaks and excessive consumption.

This product can interface with any gas, electricity, water, or thermal meter, as well as other equipment (such as a rain gauge or odometer) that has a pulse output (dry contact interface or open collector input).

Thanks to its IP68 protection rating, the PULSE is capable of operating in any type of environment.

The product periodically emits meter data with or without a history. It also enables fraud detection, leak detection, and flow rate calculation with options for transmitting notifications when high or low thresholds are exceeded.

The transmitter's configuration can be accessed by the user locally via a USB-C port or remotely through the network.

The PULSE is powered by a replaceable internal battery.

This product is compatible with Adeunis' KARE Device Management platform and the KARE+ Over-The-Air update service for sensor fleets. This Adeunis sensor management offering allows for optimizing operating costs by intervening on-site at the right time and avoiding unnecessary travel, ensuring the proper lifespan and adjusting the configuration of the products, and increasing end customer satisfaction by enabling continuous service delivery.



NOTE

We have implemented a new SIGFOX stack. This now induces a bidirectional exchange when the sensor is activated.

To enable this exchange, you must configure the "Downlink Mode" parameter to "DIRECT" in the device type attached to the sensor.

This setting has no effect on the lifetime of the product or the SIGFOX subscription used.

Downlink data

Downlink mode: **DIRECT**

Expression must either include hexadecimal encoded bytes (ex: deadbeefcafebab) or the following variables: - {time} 4 bytes - {tapld} 4 bytes - {rssl} 2 bytes - {roaming} 1 byte

Downlink data in hexa: {tapld}0000{rssl}

1.2. Features

- Two 3-wire meters or one 5-wire meter can be connected.
- Fraud and leak detection.
- Meter flow rate monitoring.
- Local or remote configuration.
- Periodic modes with or without history.
- Data logging for optimizing battery life.
- Redundancy for improved service continuity.
- Configurable lifespan.
- Integrated mounting system: DIN rail, tube, wall, collar.

NOTE

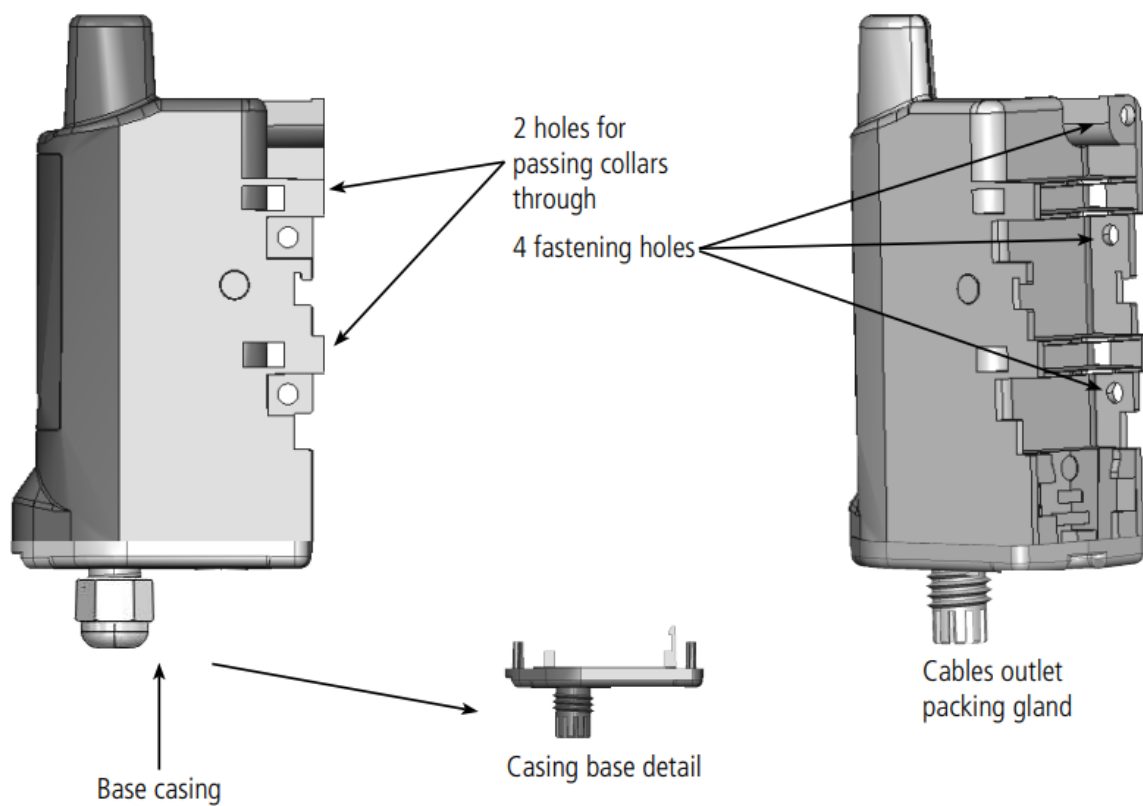
The PULSE can transmit meter readings but does not power them.

1.3. Package Contents

The product is delivered in a cardboard package and includes the following items:

- Upper casing, electronic board, casing soleplate, and 2 Torx 10 screws for the soleplate.
- Cable gland locknut and 2 cable gland seals.

1.4 Casing presentation



1.4.1 Environmental Conditions and Protection Rating

The product enclosure has been tested to ensure a certain level of dust and water resistance.

- For dust: Level 6 guarantees complete dust tightness.
- For water: Level 8 guarantees at least water resistance up to one meter for 1 hour.

Therefore, we can guarantee the water resistance of our IP68 enclosure for immersions less than or equal to this duration. Any use of our sensor outside the criteria mentioned above cannot be guaranteed by Adeunis.

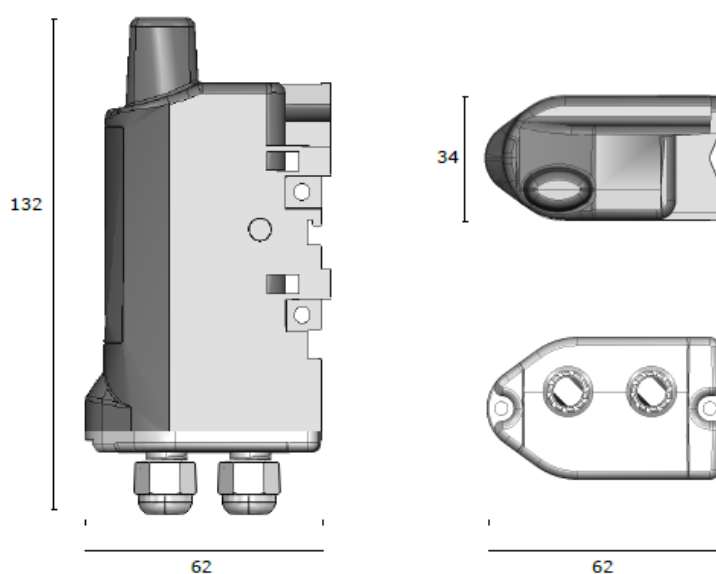


NOTE

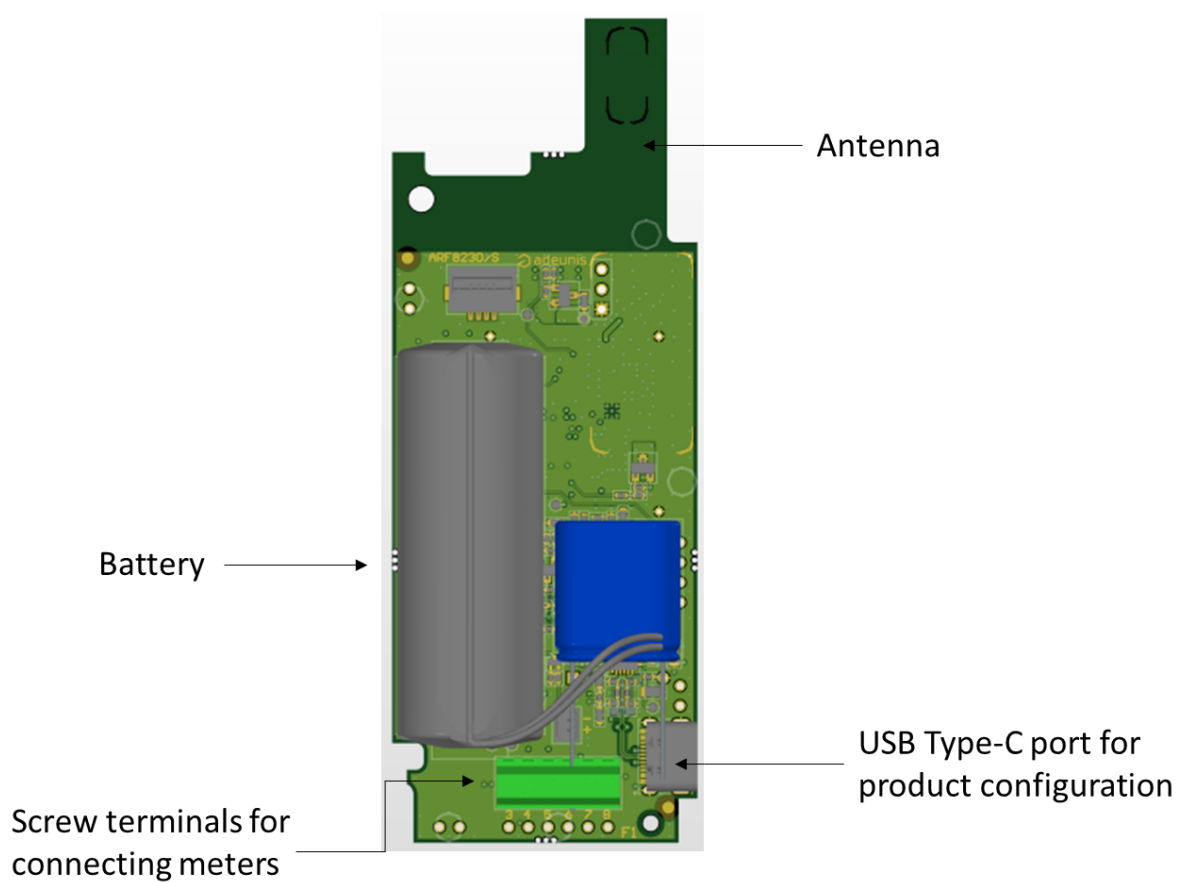
The IP68 protection rating does not guarantee protection against condensation due to ambient humidity and temperature variations. Prolonged exposure to high-temperature variations and/or high relative humidity can lead to premature product failure.

1.5 Dimensions

Values in millimeters



1.6 Electronic card



1.7 Operation of the LEDs

Mode	LED red state	LED green state
Product in Park mode	OFF	OFF
Magnet detection process (1 to 6 seconds)	OFF	ON from detection of the magnet up to a maximum of 1 sec
Product start (after detection of the magnet)	OFF	Rapid flashing 6 cycles, 100 ms ON / 100 ms OFF
Low battery level	Flashing 500 ms ON every 60 seconds	
Switching to the Command mode	Continuously lit	Continuously lit
Product faulty (return to factory)	Fixed ON	

1.8. Power Supply

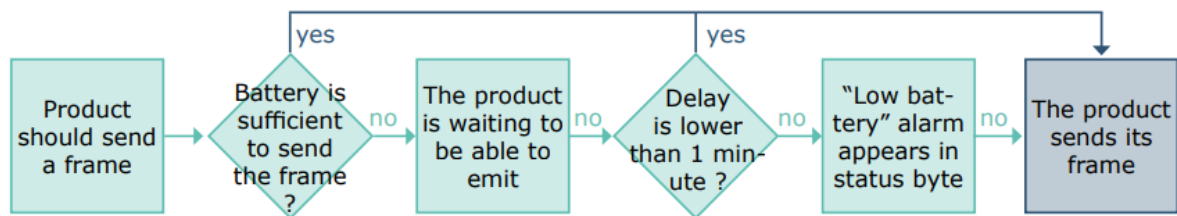
1.8.1 Power Supply Type

The PULSE should be powered by a FANSO ER18505H battery (maximum current 200 mA).

- The USB-C port cannot be used to recharge the battery.

1.8.2 Low battery management

When the product detects that the battery is not anymore in capacity to deliver the energy needed to send a frame (extreme temperatures or end-of-life of the battery) it waits to be in capacity to transmit. If it detects that the delay generated is longer than 1 minute it informs the user via the "battery low" flag in the status byte of each frame.



The battery low alarm is switching off if the battery is replaced or when the temperature conditions are favorable for the proper functioning of the battery.

2. Technical Specifications

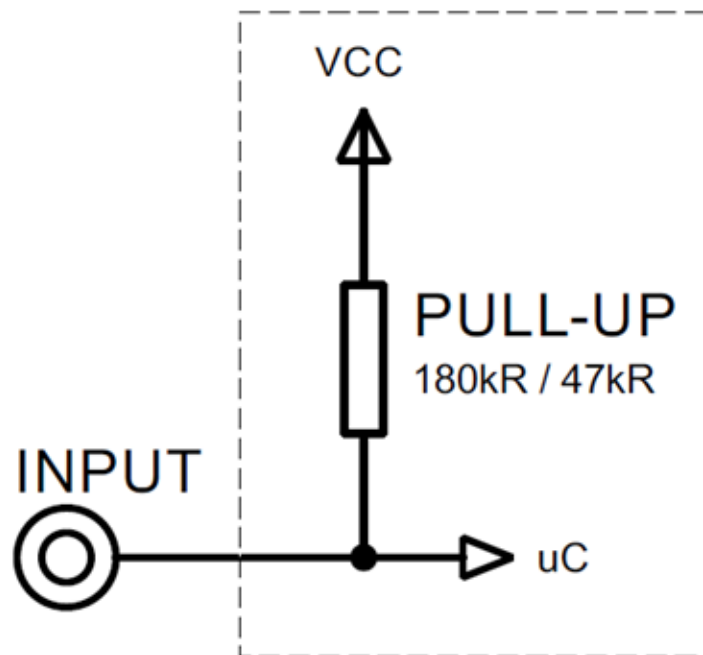
2.1 General characteristics

Mechanical Specifications	
Dimensions	132 × 62 × 34mm
Weight	103 g
Enclosure	IP68 Indoor/Outdoor use
Mounting System	DIN rail, tube, wall, collar
Electrical Specifications	
Supply Voltage	3.6V nominal
Power Supply	FANSO ER18505H 3.6V Battery (max current 200 mA)
Battery Capacity	4000 mAh
Operating Conditions	
Operating range	-25°C / +70°C
Altitude during operation	2000 m or less

RF Specifications	
Sigfox Region	RC1
Max Transmit Power	+14 dBm
Application Port (downlink)	1

2.2 PULSE Signal Input Interface

The block diagram is as follows



Maximum Absolute Values	Unit
Minimum Input Voltage	-0.7 V
Maximum Input Voltage	3.6 V

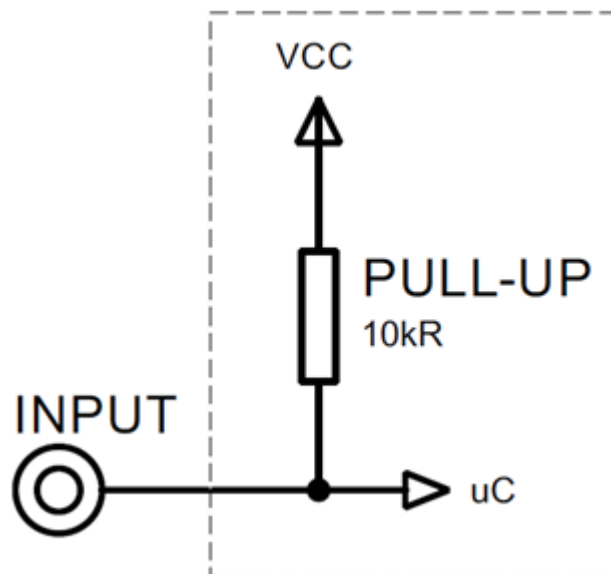
Electrical Specifications		Unit
Minimum Input Voltage	0	V
Maximum Input Voltage	3.3	V

Electrical Specifications		Unit
Equivalent Input Resistance	180	kΩ (Water)
	47	kΩ (Gas)
Input Frequency	<100	HZ
High-Level Input Current Consumption	0	μA
Low-Level Input Current Consumption	28	μA (Water)
	99	μA (Gas)

Values above the maximum absolute values will damage the product.

2.3 Fraud Signal Input Interface

The block diagram is as follows



Maximum Absolute Values	Unit
Minimum Input Voltage	-0.7 V
Maximum Input Voltage	3.6 V

Electrical Specifications		Unit
Minimum Input Voltage	0	V
Maximum Input Voltage	3.3	V
Equivalent Input Resistance	10 47	kΩ
Input Frequency	<100	HZ
High-Level Input Current Consumption	97	μA
Low-Level Input Current Consumption	330	μA

Values above the maximum absolute values will damage the product.

2.4 Sensor compatibility

Examples of sensors tested by Adeunis (non-exhaustive list):

Type	Name	Type of sensor
Water	Itron Flodis	Cyble Sensor V2
Water	Wehrle TRK-HYX / ETK-EAX	Wehrle Modularis
Water	Sappel-Diehl Aquarius/Altair	IZAR Pulse 3 & 4 Fils
Gas	Elster BK	Elster IN-Z63
Electricity		Fludia FM250E et FM250M
Electricity	Socomec Countis E00	
Thermal	Itron CF Echo II	

Depending on the mission profile of your product, we recommend contacting us for further assistance.

3. PRODUCT AUTONOMY

Operating conditions :

Storage maximum of the product: 1 year maximum.

Calculations performed at a temperature of 20°C

Based on 500 pulses/day with a PULSE configured for the monitoring of a water counter without Pull-up

Sending period	Number of meters	Autonomy (years)
144 frames/day	1	< 1
144 frames/day	2	< 1
96 frames/day	1	< 1
96 frames/day	2	< 1
48 frames/day	1	1.6
48 frames/day	2	1.6
24 frames/day	1	2.9
24 frames/day	2	2.8
12 frames/day	1	5.1
12 frames/day	2	4.8
6 frames/day	1	7.9
6 frames/day	2	7.2
4 frames/day	1	9.7
4 frames/day	2	8.8
2 frames/day	1	12.7
2 frames/day	2	11.1

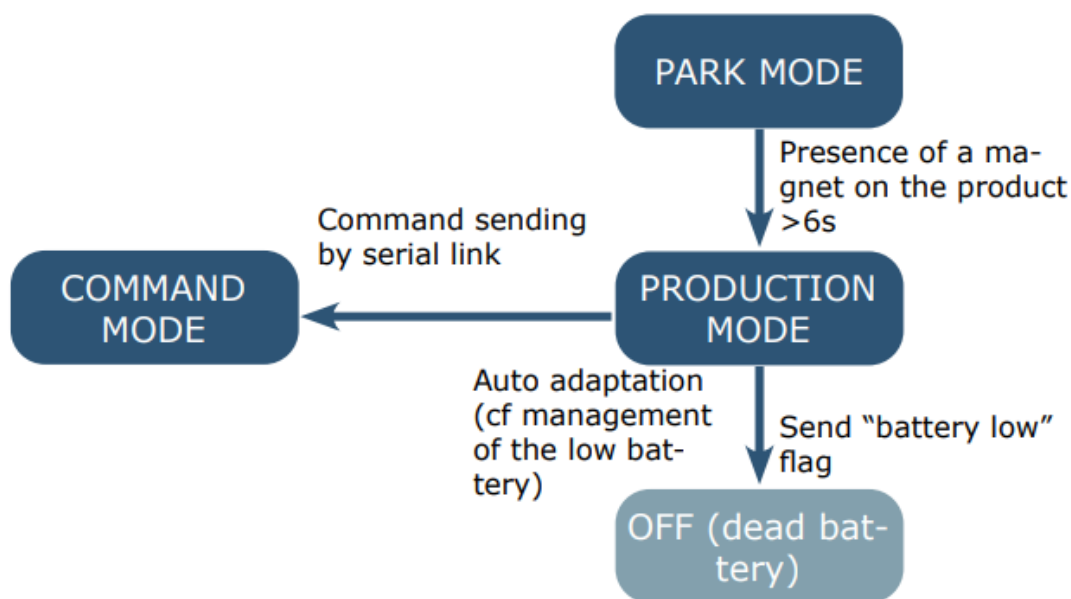
The above values are estimations based on certain conditions of use and environment. They do not represent a commitment on the part of Adeunis.

4. PRODUCT OPERATION

4.1 Global Operation

Important: Adeunis use the most significant byte first format.

The product has several operating modes:



4.1.1 PARK mode

The product is delivered in PARK mode, it is in standby mode and its consumption is minimal. To switch the product out of the Park* Mode pass a magnet across it for a duration higher than 6 seconds. The green LED illuminates to indicate the detection of the magnet and then flashes quickly during the product starting phase.

The device then sends its configuration and data frames.

4.1.2 COMMAND mode

This mode allows you to configure the registers of the product.

Please note that it is necessary to install the official Silabs driver, which is available here: **Silabs USB to UART Bridge VCP Drivers**.

To enter this mode, you need to connect a cable to the USB-C port of the product and use the IoT Configurator.

To exit this mode, you can either use the disconnect function in the IoT Configurator or disconnect the USB-C cable. The product will then return to its

previous mode, either PARK or PRODUCTION.

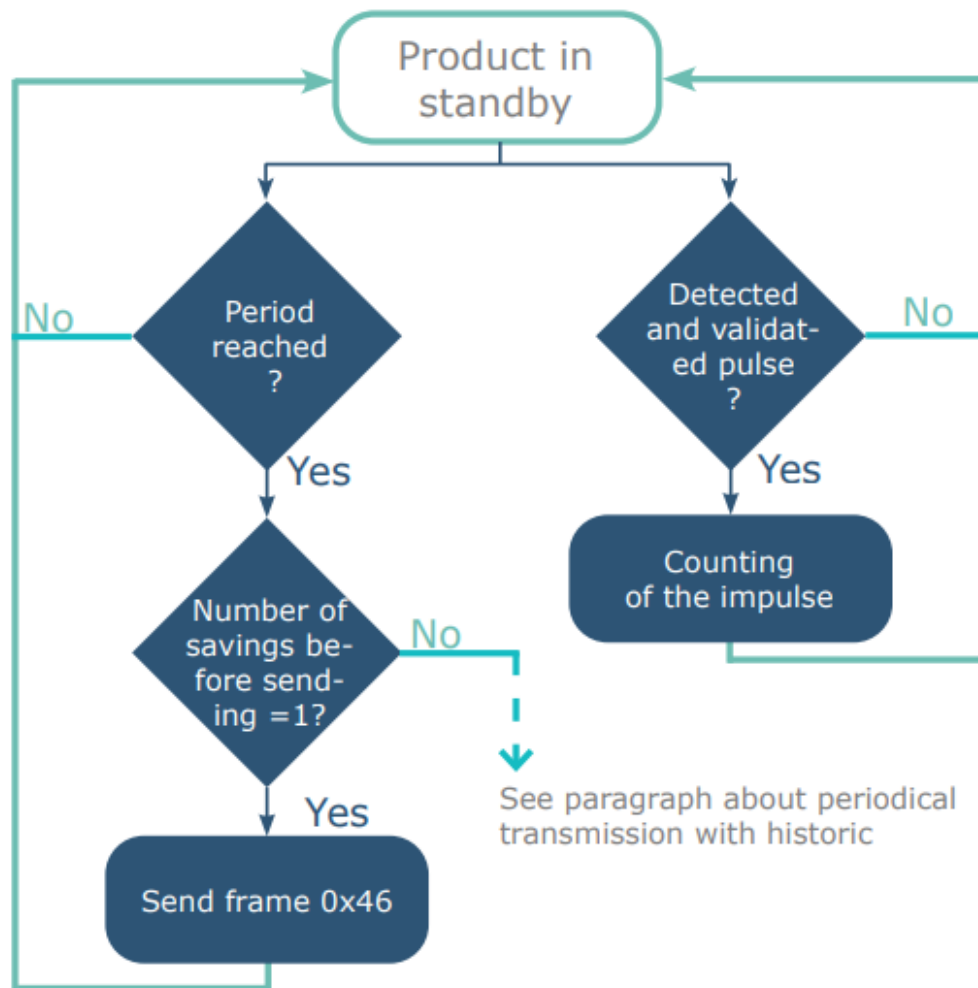
4.1.3 PRODUCTION mode

This mode allows the user to operate the product in its final use. It should allow a maximum of autonomy to the product.

4.2 Application operation

4.2.1 Periodic transmission

The product allows the measurement and the periodic transmission of the values of the sensors according to the following diagram:



The settings associated with this mode of operation are:

- Transmission frequency (register S301)
- Historisation period of the data (register S321)
- Enabling and Configuring inputs (register S320)
- Anti-bounce timer period (registers S322)

Example :

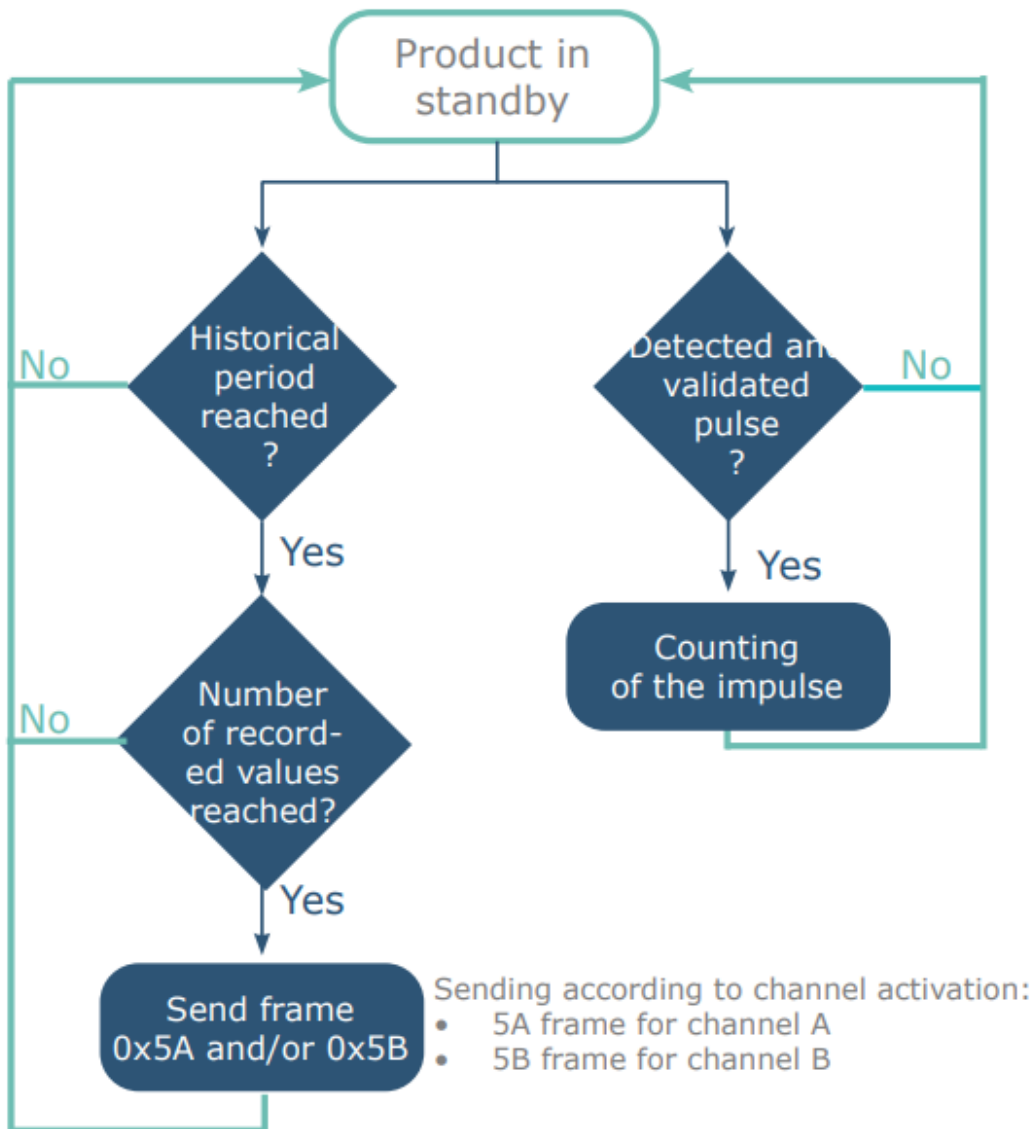
Register	Value encoding	Value	Result
S301	Decimal	1	Number of historisation (savings) to be done before sending
S321	Decimal	43200	Period of historisation/saving of the data (43200× 2 seconds =

Register	Value encoding	Value	Result
			24h).
S320	Hexadecimal	0x39	Channel A : • Activated • Meter other than gas • Tamper input activated Channel B : • Activated • Gas meter • Tamper input disabled
S322	Hexadecimal	0x57	Anti-rebound : • Channel A = 500ms • Channel B = 100ms

N.B: for a periodical transmission without historisation of the data, S301 must be equal to 1.

4.2.2 Periodic transmission with history

The product allows the accumulation of several successive meter values before the periodic transmission of the set of values according to the following scheme :



The parameters associated with this mode of operation are:

- Enabling and Configuring inputs (register 320)
- Historisation period (register S321)
- Sending frequency (S301)
- Anti-bounce timer period (registers S322)

Example :

Register	Value encoding	Value	Result
S320	Hexadecimal	0x39	Channel A : • Activated

Register	Value encoding	Value	Result
			• Meter other than gas • Tamper input activated Channel B : • Activated • Gas meter • Tamper input disabled
S301	Decimal	4	Sending every 4 historisations (saving)
S321	Decimal	300	Historisation of the data every 10 minutes (300×2 seconds=600 seconds).
S322	Hexadecimal	0x57	Anti-rebound : • Channel A = 500ms • Channel B = 100ms

The maximum number of samples per frame is 4 samples.

4.2.3 Periodic transmission with redundancy

The product enables to add redundancy in the frame with historisation (cf scheme here under). Thanks to redundancy the product will memorize a certain number of data and send them again in the next frame.

The parameters associated with this mode of operation are:

- Historisation period (register 321) and sending frequency (register 301)
- Enabling and Configuring inputs (register 320)
- Number of data to be repeated (register 340).

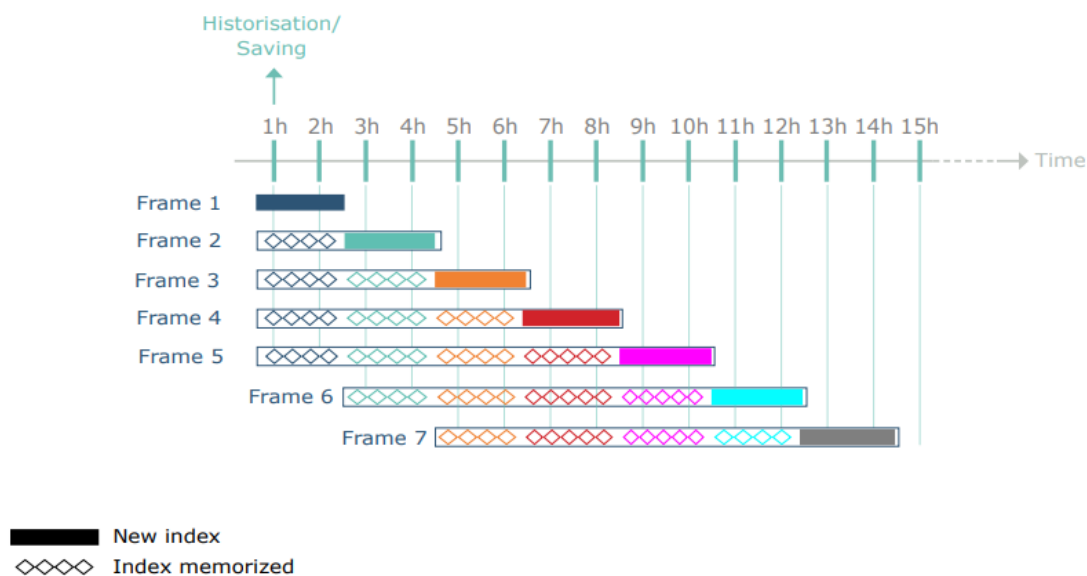
Example with redundancy:

Register	Encoding	Value	Result
S320	Hexadecimal	0x39	Channel A : • Activated • Meter different than gas • Tamper input activated Channel B : • Activated • Gas meter

Register	Encoding	Value	Result
			Tamper input deactivated
S301	Decimal	2	Sending every 4 historisations (saving)
S321	Decimal	1800	Historisation of the channel A and channel B index every hours (1800×2seconds = 60 minutes)
S322	Hexadecimal	0x57	Anti-rebound : - Channel A = 500ms - Channel B = 100ms
S340	Decimal	2	2 redundant data per frame

In this example:

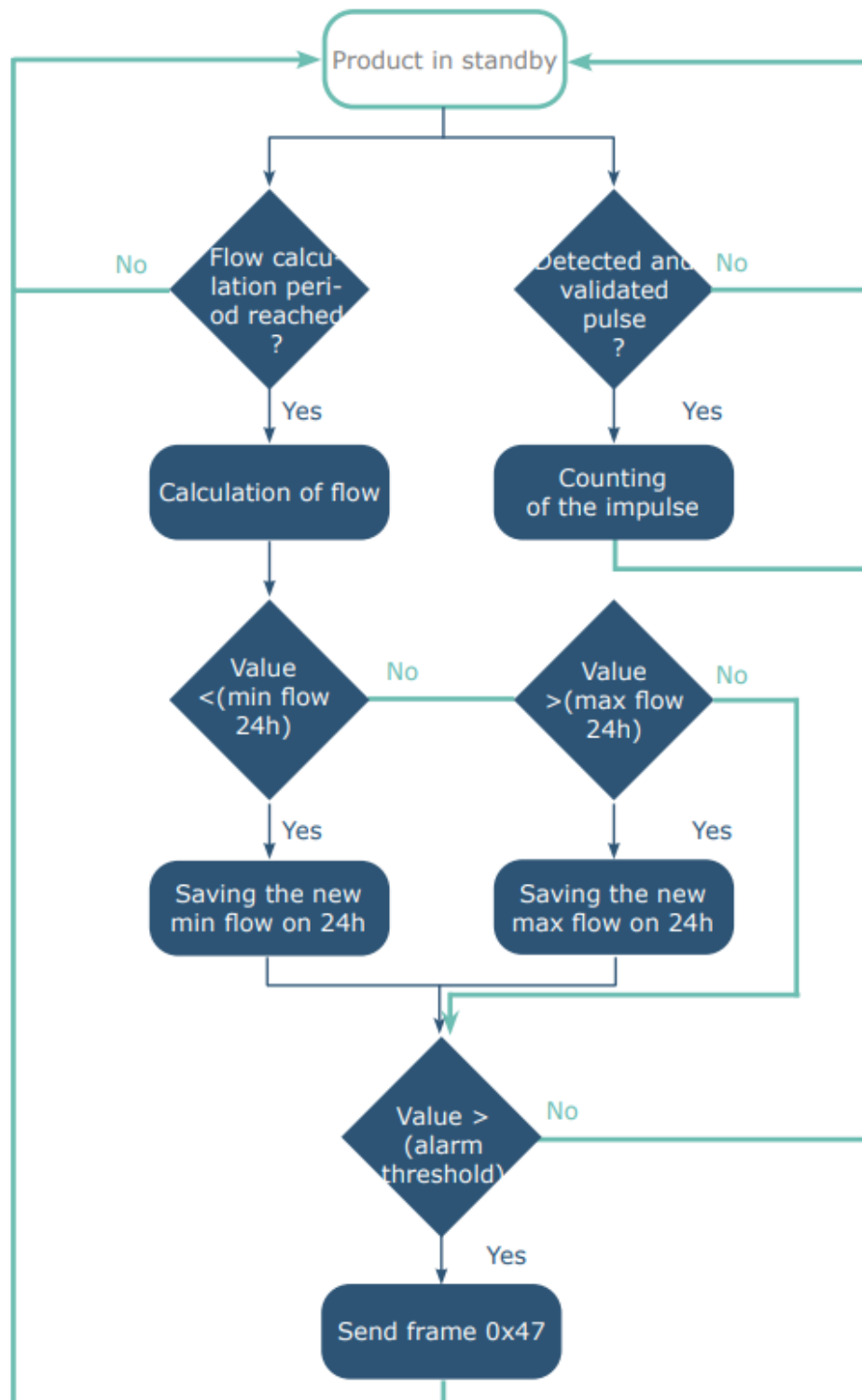
- 1 historisation of the index each hours (1800×2seconds = 60 minutes)
- 1 sending every 2 savings so every 2 hours
- The 2 channel of the product are activated so the 2 periodic frame are sent (0x5A et 0x5B)
- When it is possible, the product will send for each channel the 2 recent index and the last 2 index memorized



The maximum number of samples per frame is 4 samples.

4.2.4 Flow threshold alarm transmission

The product allows the detection of the exceeding of a flow threshold for each counting entry according to the following scheme:



The flow rate corresponds to the number of pulses of the flow calculation period divided by the same period. It is expressed in pulses / hour.

The alarm message (frame 0x47) is transmitted once, there is no new transmission if the flow rate returns above the threshold as long as the alarm remains active. The alarm is automatically deactivated after the daily frame is sent.

The settings associated with this mode of operation are:

- Enabling and Configuring inputs (register 320)
- Anti-bounce timer period (register S322)
- Flow calculation period (register S325)
- Alarm thresholds (registers S326 and S327)

Example :

Register	Value encoding	Value	Result
S320	Hexadecimal	0x39	Channel A : • Activated • Meter other than gas • Tamper input activated Channel B : • Activated • Gas meter • Tamper input disabled
S322	Hexadecimal	0x57	Anti-bounce : • Channel A = 500ms • Channel B = 100ms
S325	Decimal	60	Flow calculation period (channels A and B) = 60min
S326	Decimal	10 000	Flow alarm threshold (channel A) = 10,000 pulses per hour
S327	Decimal	30 000	Flow alarm threshold (channel B) = 30,000 pulses per hour

4.2.5 Tamper detection

The product allows detection of state change on the tamper input of each channel (rising edge detected on the input normally held to ground).

The product wakes up regularly (according to the periods defined in registers S332 and S334) and

checks the status of the tamper input of each of the channels having active fraud detection.

The tamper alarm is stored if there are several successive detections (configurable in registers S333

and S335) and transmitted within the next daily frame.

The alarm is automatically deactivated after the daily frame is sent.

The settings associated with this mode of operation are:

- Enabling and Configuring inputs (register 320)
- Fraud detection period 1 (register 332)
- Threshold for fraud detection 1 (register S333)
- Fraud detection period 2 (register 334)
- Threshold for fraud detection 2 (register S335)

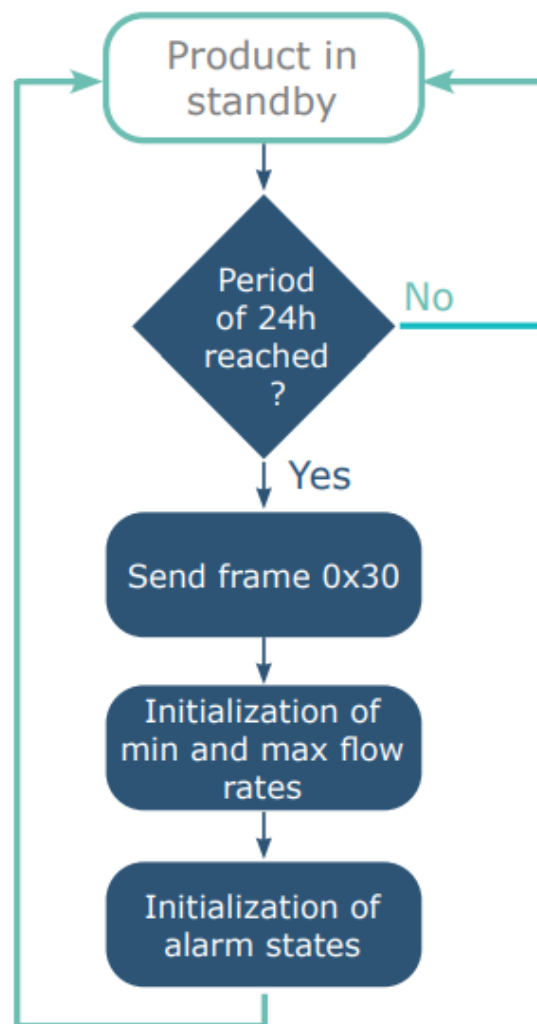
Example :

Register	Value encoding	Value	Result
S320	Hexadecimal	0x39	Channel A : • Activated • Meter other than gas • Tamper input activated Channel B : • Activated • Gas meter • Tamper input disabled
S332	Decimal	2	Scan period for A-channel tamper input is $2 \times 10s$ = 20s
S333	Decimal	3	Tamper detection threshold for A-channel = 3 (positive scans of B-channel tamper before triggering the tamper alarm)
S334	Decimal	2	Scan period for B-channel tamper input is $2 \times 10s$

Register	Value encoding	Value	Result
			= 20s
S335	Decimal	3	Tamper detection threshold for B-channel = 3 (positive scans of B-channel tamper before triggering the tamper alarm)

4.2.6 Transmitting a Daily Frame

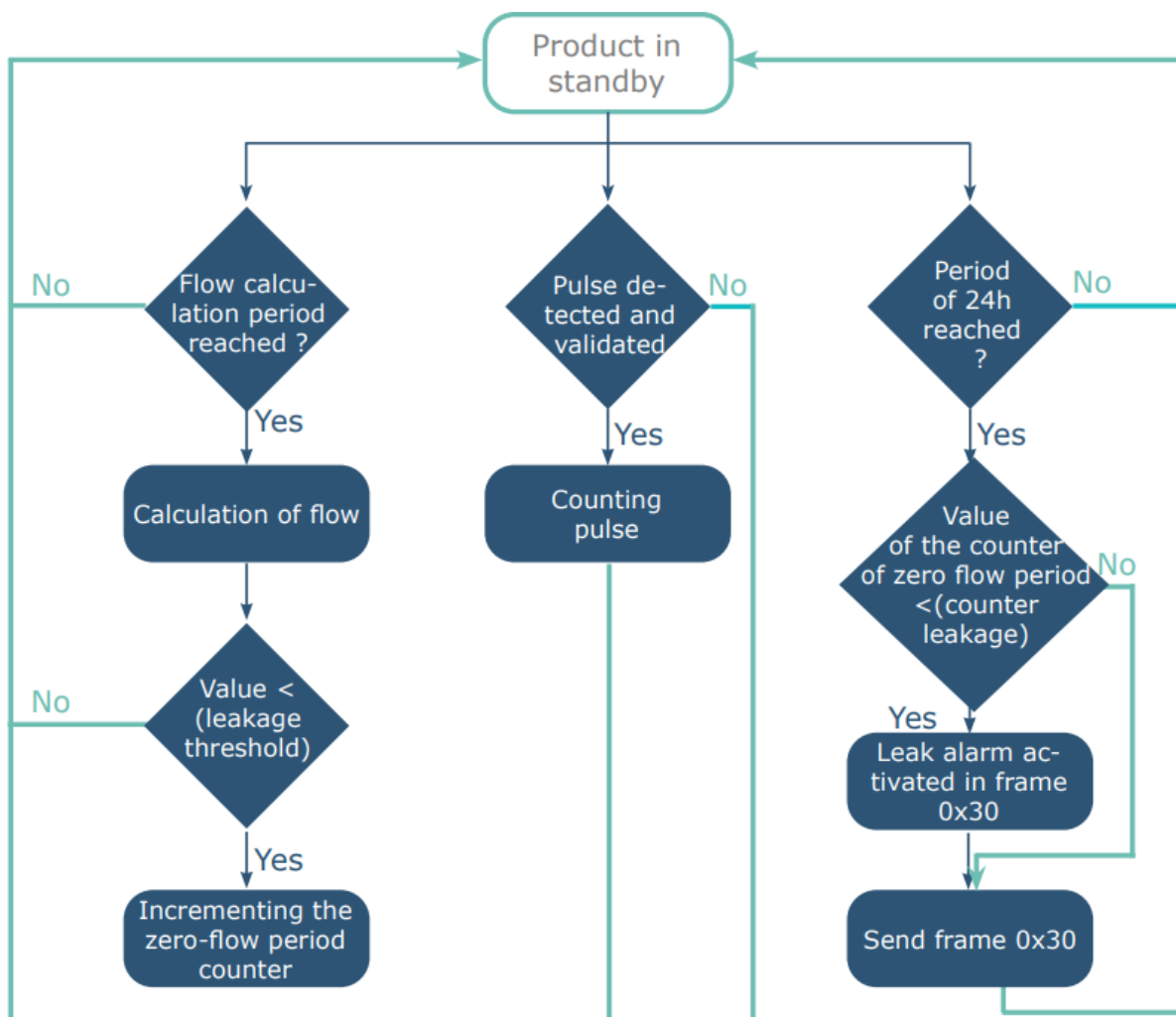
The product transmits every 24 hours a daily frame (0x30) according to the following diagram :



The transmission period of the daily frame is fixed (24 hours) and not configurable.

4.2.7 Leaks detection

The product allows leak detection on each count input as shown in the following diagram:



The flow rate corresponds to the number of pulses of the flow calculation period divided by the same period. It is expressed in pulses / hour.

The leak detection is performed by analyzing a number of occurrences (configurable by register: S330 and S331) where the calculated flow rate is less than a leakage threshold (configurable by register: S328 and S329).

The associated leak alarm is stored and transmitted with the next daily frame. The alarm is automatically deactivated after the daily frame is sent.

The settings associated with this mode of operation are:

- Enabling and Configuring inputs (register 320)
- Anti-bounce timer period (register S322)
- Flow calculation period (register S325)
- Leak thresholds (registers S328 and S329)
- Null flow period counters (S330 and S331)

Example :

Register	Value encoding	Value	Result
S320	Hexadecimal	0x39	Channel A: • Activated • Meter other than gas • Tamper input activated Channel B : • Activated • Gas meter • Tamper input disabled
S322	Hexadecimal	0x57	Anti-bounce : • Channel A = 500ms • Channel B = 100ms
S325	Decimal	60	Flow calculation period (channels A and B) = 60min
S328	Decimal	10	Leak threshold (channel A) = 10 pulses par hour
S329	Decimal	0	Leak threshold (channel B) = 0 pulse par hour
S330	Decimal	3	Daily periods number under the leak threshold (channel A) = 3
S331	Decimal	5	Daily periods number under the leak threshold (channel B) = 5

In this example, all the periods during which the flow rate on the channel A is less than 10 pulses / hour are considered as periods of zero flow. If the total daily number of zero flow periods is less than 3 then it is considered that there is a leak on the channel A.

5. REGISTERS ET FRAMES

To know the content of the registers and of each frames (uplink and downlink) of the product, refers to the TECHNICAL REFERENCE MANUAL of the PULSE product, available on the adeunis website: <https://www.adeunis.com/en/produit/pulse-impulse-interface/>

6. CONFIGURATION AND INSTALLATION

To configure the product, it is recommended to use the IoT Configurator (android and Windows application).

- Google Play : <https://play.google.com/store/apps/details?id=com.adeunis.IoTConfiguratorApp>
- Windows 10: <https://www.adeunis.com/telechargements/>

To configure the product using AT Command or install the product, please refers to the INSTALLATION GUIDE Adeunis available on the website.

7. PREPARATION

7.1. Dismantling the case

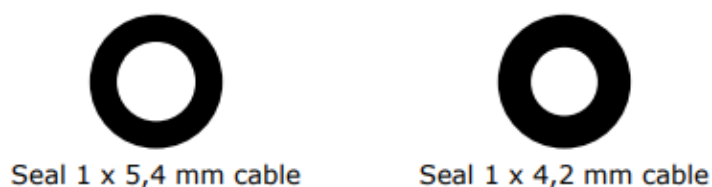
The product is supplied disassembled such that the lower electronic part can be accessed. This part is where the meter or meters are connected to the

screw terminals and where the micro USB port for configuration of the device. Once connection of the meters has been finalized and configuration carried out, the case may be closed.

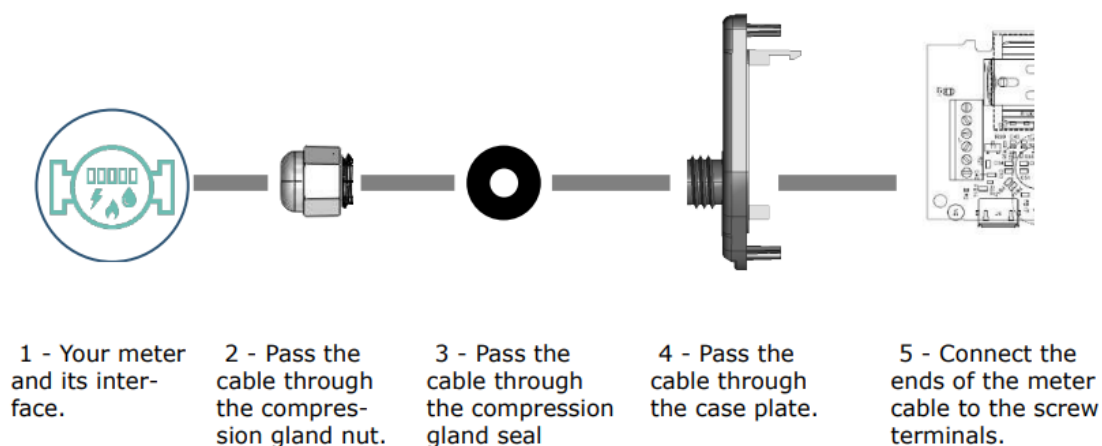
7.2. Installation of the compression seal

Before connecting your meter cables to the product's screw terminals, you must insert the compression gland nut and the appropriate seal for your configuration.

2 types of seals are supplied with the PULSE: for a 5 mm diameter cable and for a 4 mm diameter cable.



Assembly procedure:





NOTE

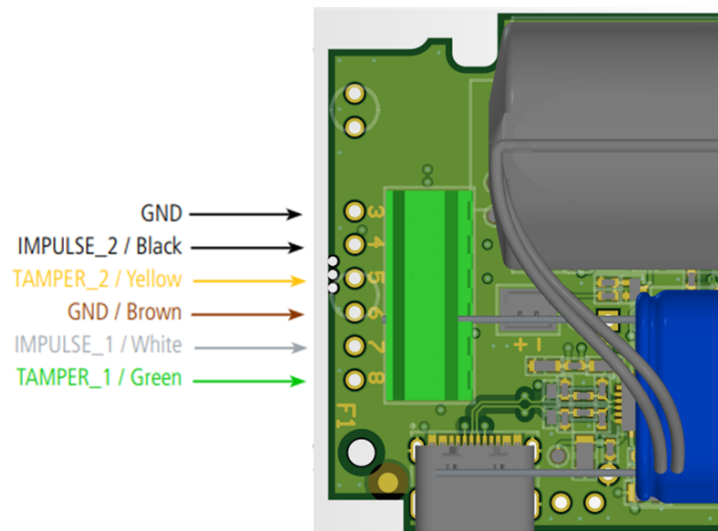
When reassembling the enclosure, fully tighten the cable glands, then tighten the screws using a PZ.1 bit, applying a tightening torque of $0.6 \text{ Nm} \pm 0.05$. Correct tightening ensures even compression of the seal and maintains the IP68 protection rating; excessive tightening may create unnecessary mechanical stress and lead to cracking.

7.3 Mounting the counters on the screw terminals

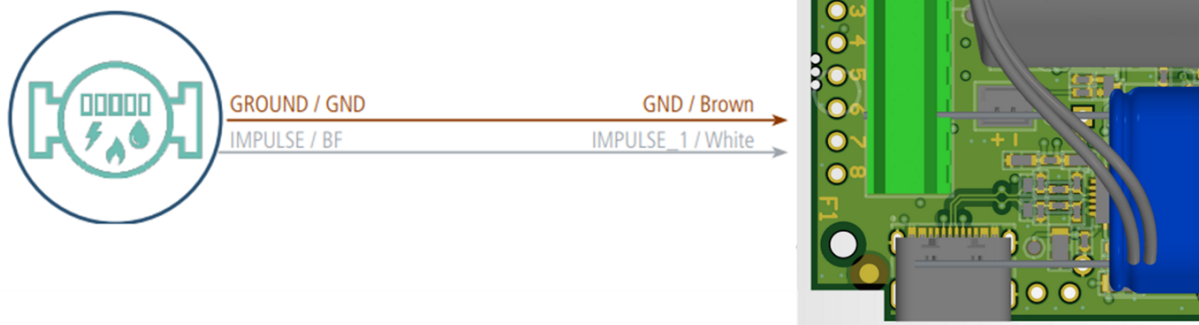
Once the nut and packing seal are installed, the strands of the meter cable can be connected to the screw terminals of the product.

Below is the identification of each terminal block:

Note: Up to 2 meters of the same type can be used in parallel. Below is a description of the terminal blocks:

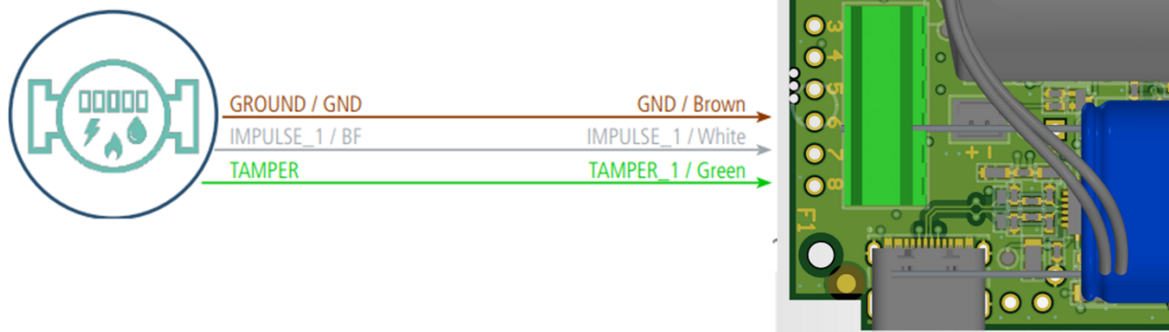


Meter with 2-wire output



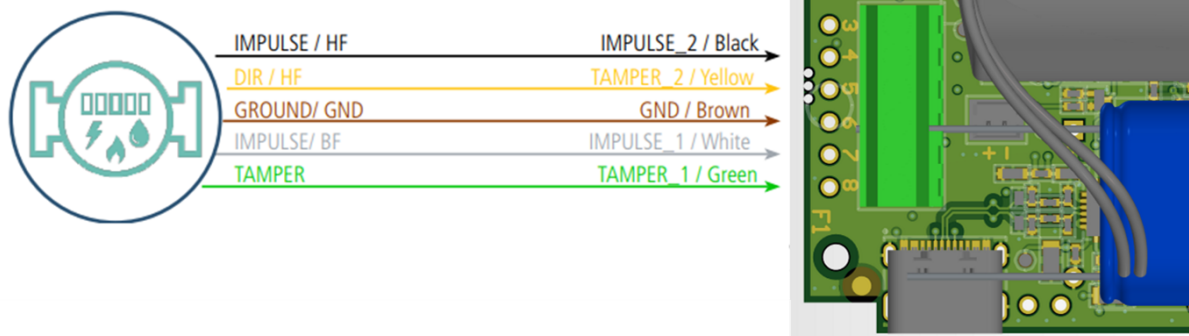
In this configuration, it is necessary to deactivate the input TAMPER of channel A (register 320 bit 3 = 0) and preferably deactivate channel B (register 320 bit 4=0) which is not used.

Meter with 3-wire output



In this configuration, it is preferred to activate input TAMPER of channel A (register 320 bit 3 = 1) and deactivate channel B (register 320 bit 4=0) which is not used.

Meter with 5-wire output



In this configuration, the 2 inputs (A & B) must be activated (register 320 bits 0 and 4 = 1). The combination of the pulse counts on inputs A & B (IMPULSION_1 & IMPULSION_2) allows to know the quantities measured in the 2 directions. The activation of signals FRAUDE_1 & FRAUDE_2 (register 320 respectively bit 3 and 7 = 1) allows to generate alarms of fraud and wrong flow direction.

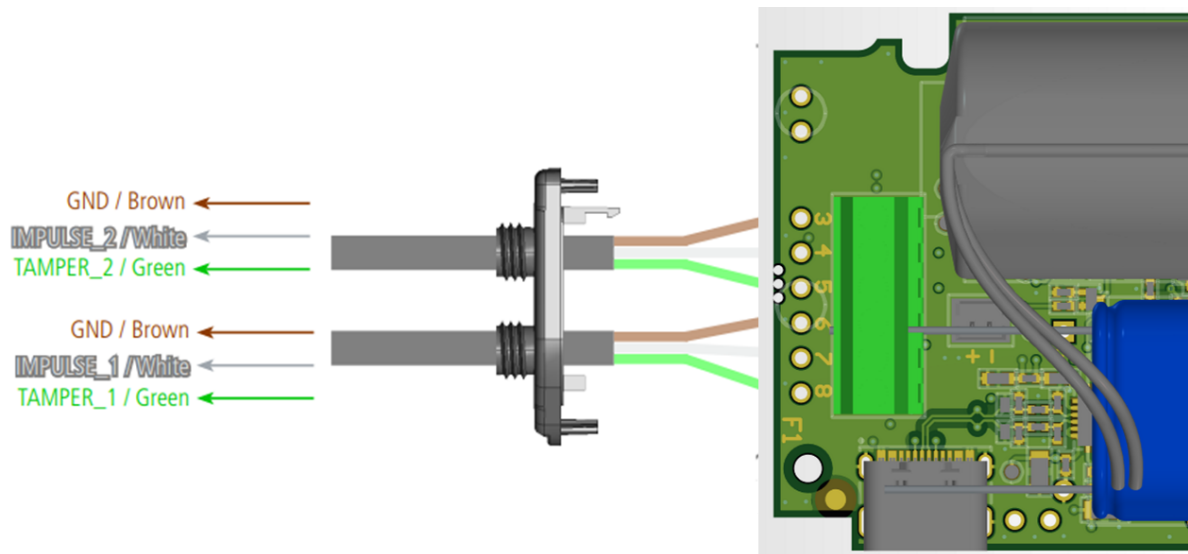


NOTE

When reassembling the enclosure, fully tighten the cable glands, then tighten the screws using a PZ.1 bit, applying a tightening torque of $0.6 \text{ Nm} \pm 0.05$. Correct tightening ensures even compression of the seal and maintains the IP68 protection rating; excessive tightening may create unnecessary mechanical stress and lead to cracking.

7.4. 6 wires cable version

A version of the PULSE is proposed with 2 cables of 70 cm with 6 wires already linked to the terminal blocks. Here under the explanations of the colors:



NOTE

When reassembling the enclosure, fully tighten the cable glands, then tighten the screws using a PZ.1 bit, applying a tightening torque of $0.6 \text{ Nm} \pm 0.05$. Correct tightening ensures even compression of the seal and maintains the IP68 protection rating; excessive tightening may create unnecessary mechanical stress and lead to cracking.

8. DOCUMENT HISTORY

Version	Content
V1.1.0	Creation