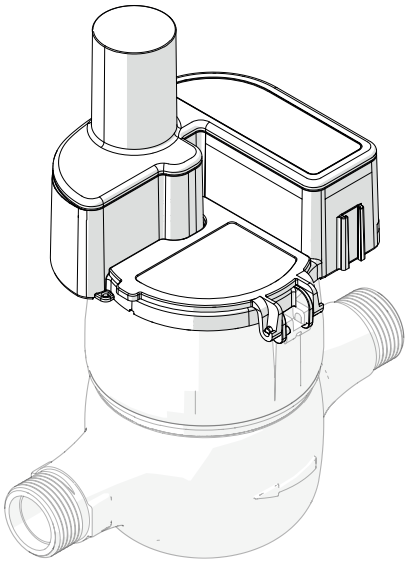
maddalena®
METERING EXPERTISE

Arrow^{WAN} NB-IoT

4G radio module / NB-IoT



INSTRUCTIONS FOR INSTALLATION, USE AND MAINTENANCE

Translation of the original instructions.

Before installing and using the device, carefully read this manual and store it together with the product.

EN

Code 500083C - 06/2021 - R1

Symbols used in this manual and relative meaning

WARNING!
Indicates particularly important information.

DANGER!
Identifies actions that may lead to injury or damage to the device if not performed correctly.

PROHIBITED
Indicates actions that MUST NOT be performed.

Compliance

Maddalena S.p.A. declares that **Arrow**[WAN] **NB-IoT** is compliant with the mandatory requirements of the following directives and standards:
- Directive 2014/53/EU (RED - Radio Equipment Directive)
- Directive 2011/65/EU (RoHS)

CE

The full declaration of EU compliance is available from the following website: **www.maddalena.it**.

Warranty

Conditions of sale and warranty
The conditions of sale and warranty are available on the website **www.maddalena.it**.

Warranty limitations
Maddalena S.p.A. declines all responsibility, with immediate invalidation of the warranty in relation to:
- Damage or defects caused by transport or loading/unloading
- Incorrect installation caused by a failure to observe the instructions provided
- Use for purposes other than those indicated in this manual
- Use by unqualified or untrained personnel

Contents

1 General information

1.1 Warnings and safety rules

WARNINGS

- This manual is the property of **Maddalena S.p.A.** and reproduction or transfer to third parties of the contents of this document is prohibited. All rights reserved. This document represents an integral part of the product; ensure that it is always together with the product, even in case of sale/transfer to another owner, allowing its consultation by the user or authorised maintenance or repair personnel.
- Carefully read this manual before using the device to ensure safe operation.
- The device must be used as defined by **Maddalena S.p.A.**, that holds no responsibility for damage to persons, animals or property due to installation, adjustment or maintenance errors or improper use of the device.
- Once the packaging has been removed, check that the product is intact and complete. If the contents do not correspond to the order, consult the local distributor that sold the device.
- The device should not be installed and used in contexts where it will be exposed to atmospheric agents.
- The device must always be protected from extreme humidity and heat. Penetration of humidity and intense heat may damage the battery and the device.
- If there are any doubts regarding conditions/functions of the device and related parts, please contact the local distributor for further information.
- Once the device is in use, report any anomalies or faults encountered to the product supplier.
- In case of complete destruction of the device with leakage of the electrolyte, avoid contact with the eyes and skin, do not inhale fumes produced, and sufficiently ventilate the room.
- The device emits radio signals that may interfere with un-shielded electronic devices or those improperly shielded, such as pacemakers, hearing aids, medical devices and other electronic devices. To resolve any interference problems, consult the manufacturers of the relative electronic devices.
- This device is not for use by persons with reduced physical or mental capabilities, or those without appropriate experience and knowledge (including children), unless supervised by a person responsible for their safety and following adequate training in how to use the product.

1.2 Restrictions

PROHIBITED

- Modify and/or attempt to repair the product. All repairs must be performed exclusively by authorised personnel.
- Leave the device exposed to atmospheric agents.
- Place the device near to heat sources or expose it to direct sunlight.
- Install the device near other electrical equipment as this may lead to signal disturbance.
- Open and/or replace the battery.
- Use solvents to clean the device.
- Incorrectly dispose of packaging material and keep it out of children's reach as it may represent a hazard. Disposal must be performed in line with applicable laws.
- Dispose of the device as domestic waste.

1.3 Device description

ArrowWAN **NB-IoT** is a compact radio module for **Maddalena** series MVM and MVM Plus C water meters that enables measurement, transmission and remote reading of the consumption values and alarms using wireless technology.
ArrowWAN **NB-IoT** is a compact radio module supporting cellular communications on the 4G/NB-IoT network with a wide range of functions.

The radio module **Arrow**WAN **NB-IoT** is installed in conjunction with the MVM series meters and acquires information via the integrated bidirectional inductive sensor.

The device is self-powered by an extended long-life non-rechargeable lithium battery capable of operating for over 10 years; this time may vary depending on the communication modes applied.

The advantages of using **Arrow**WAN **NB-IoT** on cellular networks with licensed bands for smart metering applications are manifold:

- zero operating costs for walk-by or drive-by readings;
- zero investment and maintenance costs for a private communications network;
- maximisation of reachability results through the use of LTE Cat. NB1/NB-IoT mobile communication networks in a multi-operator configuration (technology already widely deployed and consolidated in the territory).

Arrow[WAN] **NB-IoT** is supplied dormant. Activation is carried out following installation. Once active, it operates with the default configuration. It can be reprogrammed via the control centre to generate wake-up calls at desired intervals, e.g. for specific consumer data collection campaigns for fraud detection, system and/or maintenance data acquisition, etc.
In order for a communication with the control centre to be considered valid, the device receives the closing message required by the protocol.
If this message is not received, the equipment performs retries on the basis of the set configuration (number of attempts and standby time between one attempt and the next), so as to maximise the possibility of data exchange without having to wait for the next wake-up time.

The device is capable of handling a wide range of data, including:
- the total volume totalizer;
- the minimum and maximum flow rate in the set time unit (e.g. daily);
- the measured reverse flow volume in the set time unit
- the alarm for suspected leakage in the system;
- system diagnostics, such as battery status, signal levels, etc.

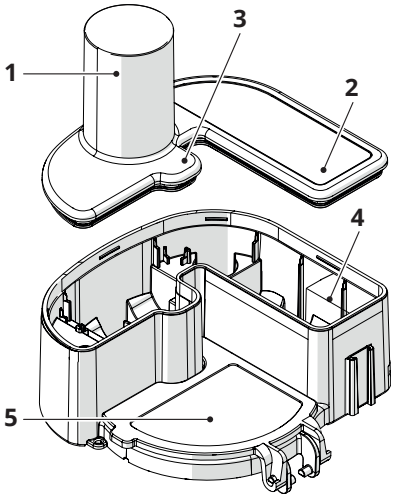
The factory set-up can nonetheless be modified:
- through the NFC port and relevant app installed on a device with Android operating system;

The main technical specifications of the **Arrow**[WAN] **NB-IoT** design are:
– **internal sensor** that identifies rotation of the pointer on the meter using the principle of induction (immune to magnetic interference), calculates the volume (in both directions), manages alarms and stores data in a non-volatile memory;
– **wireless radio communication interface**:
  - NB-IoT communication technology (Cat. NB1);
  - Bidirectional data protocol according to UNI/TS 11291-3 standard;
– **Lithium battery** that guarantees power for up to 10 years.

1.4 Usage limits

The product may be used exclusively with compatible meters and in line with the corresponding usage limits (see paragraph “**Meter technical specifications**”).

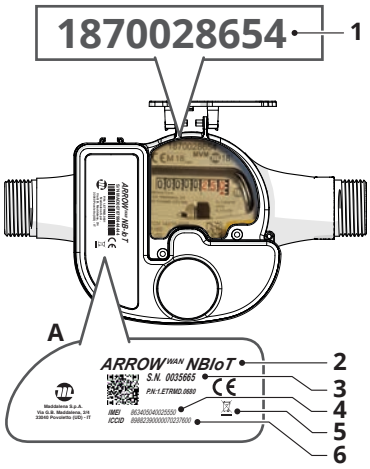
1.5 Structure



1 *Antenna*
2 *NFC*
3 *Meter interface (two-way inductive sensor)*
4 *Battery*
5 *Protective cover*

1.6 Identification

The **Arrow**WAN **NB-IoT** module, identified by the label (A), is strictly associated with a single meter. Two elements are required for this association, performed during installation: the serial number of the mechanical meter and the serial number of module **Arrow**WAN **NB-IoT**.



1 *Serial number of the meter*
2 *Model*
3 *Eight-digit serial number of module* ***Arrow***WAN ***NB-IoT***
4 *IMEI code*
5 *WEEE compliance mark*
6 *ICCID code*

The serial number can be read on the label of the module itself. Moreover, it is sent with every transmission together with the serial number of the mechanical meter to which it is associated.

1.7 Meter technical specifications

Features		Description
Sensor		Inductive dual coil (two-way)
Compatible meters		Series MVM and MVM Plus C volumetric meters
Sensor resolution		1L (DN<40); 10L (DN40)
Alarms		Tampering, reverse flow, leakage, overflow, battery under 10%
Configuration		Through Android APP via NFC port (ISO 15693) and BT/NFC sensor
Power supply		Lithium-ion battery
Battery lifespan		Up to 10 years
Certifications/Approvals		CE in compliance with European standards.
		RED Directive 2014/53/EU, EMC Directive 2014/30/EU, RoSH2 Directive 2011/65/EU, ETSI EN 301 489-1, ETSI EN 301 489-52, ETSI EN 301 908-1, ETSI EN 301 908-13, EN 62311
Radio	Standard	4G LTE / Cat NB1
	Measurement data standards	CTR, UNI/TS 11291-3
	Operating frequency range	B8 and B20
	Radiated power	max 23dBm
	Range (in an urban context)	3 / 6 km
	Reference standards	3GPP Rel 13
	Radio equipment class	class 1
	Data sent	- transmission of 2 measurement frames per month (daily consumption, alarms)
Environmental conditions		Storage temperature: -20°C – +60°C
		Operating temperature: -10 °C – +55 °C
Protection rating		IP68
Dimensions		105 mm (Ø) x 90 mm (h)

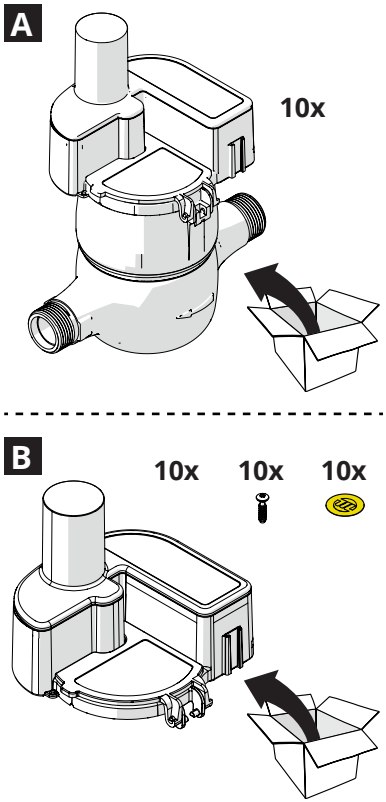
2 Installation

2.1 Receipt of the product

Arrow[WAN] **NB-IoT** modules are supplied in two different formats:

A Package containing 10 pieces, already mounted on the series MVM meter

B Package containing 10 pieces with 10 screws and 10 anti-fraud seals



WARNING!
The instruction manual is an integral part of the device and should be carefully read and stored.

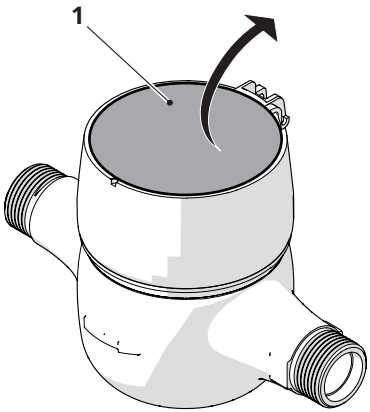
PROHIBITED
Packaging material must be properly disposed of and kept out of children's reach as it may represent a hazard. Disposal must be performed in line with applicable laws.

2.2 Fitting on meter

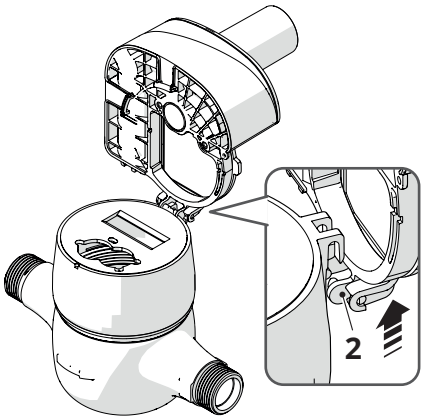
WARNING!
Installation and management of the device is permitted solely by authorised and appropriately trained personnel equipped with sufficient technical experience.

Authorised personnel: specialised installer or plumber, assigned by the metering operator.

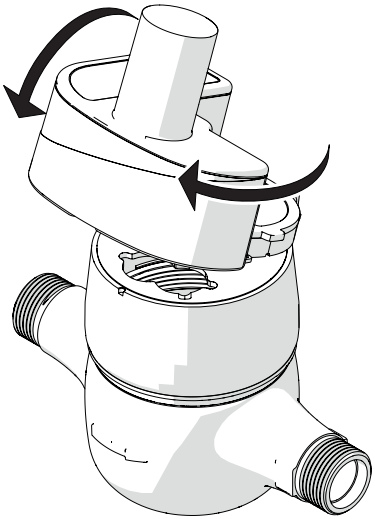
– If present, remove the protective cover (1) of the meter and clean the surface near the pointer.



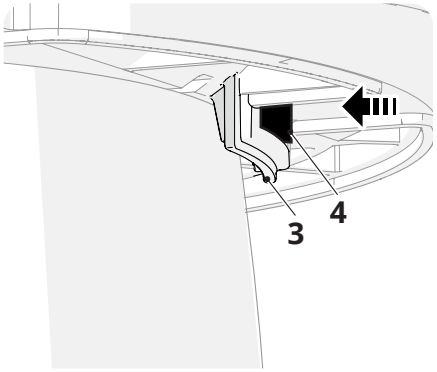
– Attach the **Arrow**[WAN] **NB-IoT** module (2) to the relevant housing.



– Lower the module and offset it.

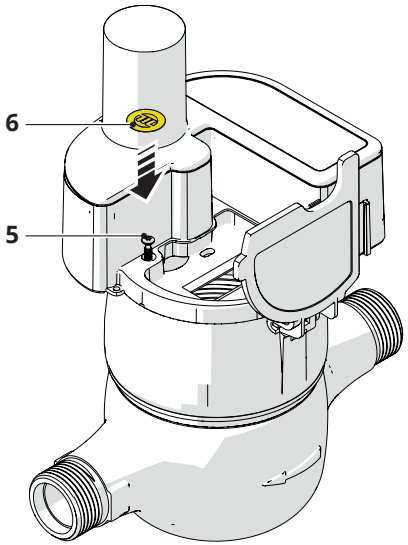


– Attach the eyelet (3) to the catch (4) and realign the module.



WARNING!
Do not apply pressure to force the eyelet in.

– Fasten the module using the screw (5) and apply the anti-fraud seal (6).



3 Use

The normal operating phase is remote reading of meters through radio modules. In standard mode, each radio module transmits the reading at a programmable frequency (default: 2 transmissions per month).
The measurement data collected and stored by the module is sent via 4G / NB-IoT cellular connection to the customer's data centre.
After being activated, the radio module is completely autonomous.

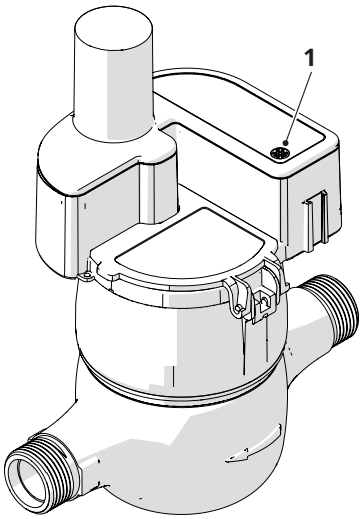
WARNING!
Please refer to the accounting manager for specific usage information on the reading software.

3.1 Synchronisation of mechanical reading

The radio module stores the volume recorded via an inductive sensor. The module is set-up in the factory with initial volume at zero.
If the meter on which the radio module is installed has a reading other than “zero”, it may be appropriate to synchronise reading of the mechanical meter and that of the radio module using the programming kit. Simply read the value in litres on the meter and set the reading using the activation software (refer to the “**Activating the radio module**” paragraph).

3.2 Activating the radio module

Activation of the radio module is via the NFC port located under the small label with the "entry point" logo (1) located next to the module antenna.



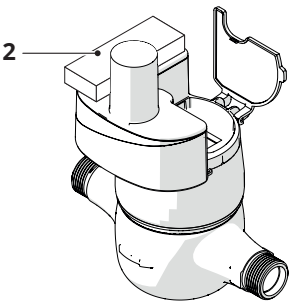
WARNING!
Smartphone with Android operating system and BT/NFC interface required
The app must be installed and set correctly before proceeding with the activation of **Arrow**WAN **NB-IoT**.
Refer to the app’s manual for the details.

The re-installation procedure allows the device to be configured after being mounted on a meter.
The procedure can be performed if the device is in hibernation, normal operation or maintenance mode.

The radio module is activated using:
- **Android tablet** on which an APP specifically developed to support activation operations is installed;
- **BT/NFC sensor** which allows communication between tablet and radio module. Communication is via:
  - **Bluetooth** (between tablet and sensor)
  - **NFC** (between sensor and radio module)

Sensor and radio module must always remain connected during operations.

Once these preliminary operations have been completed, proceed as follows:
- Switch on the sensor BT/NFC and pair it with the tablet (Bluetooth pairing);
- open the programming application;
- enter "Login" and "Password";
- verify the settings by following the programming procedure provided by **Maddalena S.p.A.**;
- place the (2) sensor above the radio module to enable NFC communication;



- the SMAQ installation app and the SMAQ manual with details of the procedure are available at https://**www.maddalena.it**/gestione-software.

WARNING!
The radio module is pre-configured. To change the settings, refer to the manual of the activation and programming app.

3.3 Verification of the entered parameters

WARNING!
For the specific procedure please refer to the SMAQ App manual available at https://**www.maddalena.it**/gestione-software.

3.4 Troubleshooting

FAULT	CAUSE	SOLUTION
The radio module is not transmitting	Electrical or electronic devices interfere with the signal	Move devices to a sufficient distance away
		Move the receiver closer
	Battery empty	Contact the manufacturer
NFC connection failure	No or difficult connection to the NFC port	BT/NFC interface is not correctly positioned. Check position and try again
		Connection to the BT/NFC interface via Bluetooth is difficult. Check the pairing and try again. Alternatively, reduce the distance between the tablet and the sensor
		The probe is not associated with the tablet via BT
Module activation error	Lack of cellular coverage or error in control centre parameters	Remove any metal shielding in the vicinity
		Replace the module with a SIM from another operator and recheck the coverage
		Check and re-enter control centre parameters
	No response from the control centre	Check that the control centre parameters are correct

WARNING!
For a complete list of alarms, please refer to the specific manual.

3.5 Deactivating the radio module

WARNING!
For the specific procedure please refer to the SMAQ App manual available at https://**www.maddalena.it**/gestione-software.

WARNING!
The deactivation can be carried out at any time. The radio will remain in hibernation mode until the next activation.

4 Maintenance

4.1 Battery

The radio module is equipped with a 3.6 V lithium-thionyl chloride (Li-SOCl2) battery that is not rechargeable but can be replaced.

The service life is 12 years (three measurement transmissions per month) with the factory settings under the following operating conditions:
- between -10°C and +0°C for 10% of lifespan
- between 0°C and +30°C for 80% of lifespan
- between +31 °C and +55 °C for 10% of lifespan

WARNING!
Humidity and intense heat may damage the battery and reduce its lifespan.

The radio module calculates the residual lifespan of the battery on the basis of stored parameters, such as estimated consumption of the electronic board in stand-by mode, transmitter consumption and number of transmissions performed.
Battery life depends largely on the frequency of data transmission set.

4.2 Cleaning

No particular cleaning procedures are required. However, the installation area should be kept clean and periodic checks should be performed to ensure the required environmental conditions are met.

PROHIBITED
Use of abrasive products, petrol or trichloroethylene is not permitted.

4.3 Disposal

The device is composed of materials of various nature including metal, plastic and electrical and electronic components. It must be disposed of in compliance with applicable local laws regarding special and industrial waste. The device cannot be disposed of as domestic waste.

At the end of the product's life, ensure safe removal and responsible disposal of components, including recycling of batteries, in compliance with applicable environmental laws in the country of installation.

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