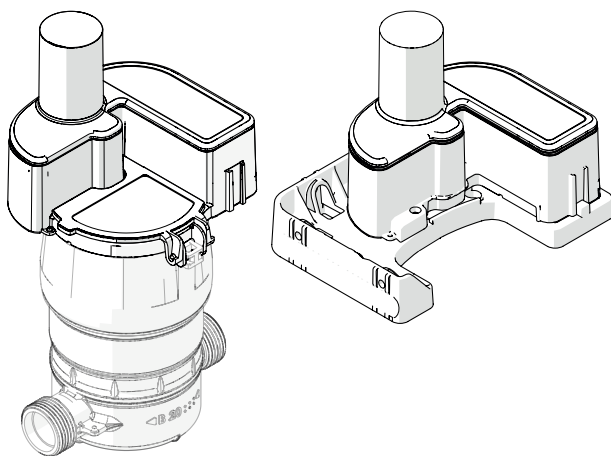


Arrow^{WAN} 2

Multiprotocol radio module



INSTRUCTIONS FOR INSTALLATION, USE AND MAINTENANCE

Translation of the original instructions.

Before installing and using the device, please read this manual carefully and keep it with the product.

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 2}** is compliant with the mandatory requirements of the following directives and standards:

- Directive 2014/53/EU (RED - Radio Equipment Directive)
- Directive 2011/65/UE and subsequent revisions (RoHS)



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



WARNING!

Images for demonstration purposes only: elements may vary.

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

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1 General information

1.1 Warnings and safety rules



WARNINGS

- This manual is the property of **Maddalena S.p.A.** and may not be reproduced or transferred to third parties: all rights reserved. It is an integral part of the product; make sure it is always with the device, even if it is sold/transferred to another owner, so that it can be consulted by the user or by personnel authorised to carry out maintenance and repairs.
- Read this manual carefully before using the device to ensure safe operation.
- The device must be used as intended by **Maddalena S.p.A.**, which is not liable for damage caused to persons, animals or property by installation, adjustment or maintenance errors or improper use of the device.
- After unpacking, ensure the delivery is intact and complete. If it does not correspond to what was ordered, contact the local distributor who sold you the device.
- The device must be installed and used in an area protected from freezing.
- The device must be protected against extreme humidity and heat: intense weather conditions can damage the battery and the device. The maximum permissible temperature during operation is 50°C.
- If in doubt about the condition and/or functionality of the device and its parts, please contact your local distributor for further information.
- Once the device has been commissioned, report any faults or malfunctions found to the product supplier.
- In the event of complete destruction of the device, with the electrolyte escaping, avoid skin and eye contact with the electrolyte. Do not inhale the vapours produced and ventilate the room adequately.
- This device is not intended for use by persons with reduced mental or motor capacities, or lack of experience and knowledge (including children), unless they are supervised by a person responsible for their safety and given appropriate instruction on how to use the device.
- The device emits radio frequency signals that may interfere with unshielded or incorrectly shielded electronic equipment, such as pacemakers, hearing aids, medical devices and other electronic devices. Consult the manufacturers of the electronic devices to solve any interference issues.

1.2 Restrictions



PROHIBITED

- Make modifications and/or attempt to repair the product. Any intervention may only be carried out by authorised personnel.
- Shorten or lengthen the pulse output cable in order not to impair meter performance.
- Leave the device exposed to the weather.
- Place the device near heat sources and expose it to direct sunlight.
- Place the device close to sources of electromagnetic interference.
- Use the device in environments where the temperature drops below 0°C.
- Open the device and/or replace the battery.
- Use solvents to clean the device.
- Dispose of the packaging material in the environment and leave it within reach of children, as it can be a potential source of danger: it must be disposed of in accordance with current legislation.
- Dispose of the device with household waste.
- Install the device near other electrical equipment as this may lead to signal disturbance.

1.3 Device description

Arrow^{WAN 2} is a compact or separate radio module for **Maddalena** water meters that detects, transmits and remotely reads consumption values and alarms using wireless transmission technology.

Arrow^{WAN 2} uses the wM-Bus and LoRaWAN protocols and is OMS and LoRa Alliance® certified.

This guarantees a high level of interoperability with various reading systems on the market, including third-party systems.

The device manages several alarms (see section "**Radio module technical specifications**").

The factory set-up can, however, be modified through the NFC port and relevant app installed on a device running the Android operating system.

The main technical features of **Arrow^{WAN 2}** are:

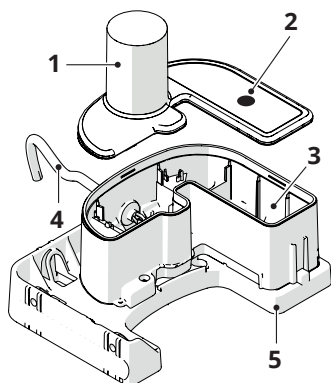
- **internal sensor** (for compact version), which detects the rotation of the meter indicator through induction (immune to magnetic interference), calculates the volume (both directions), manages alarms and memorises the data in a non-volatile memory;
- **input via four-pole cable of the following signals** (for separate version): pulses (flow meter revolutions), flow direction, anti-fraud, ground. Thanks to these data, the module calculates the volume (both directions), manages alarms and memorises the data in a non-volatile memory;
- **wireless radio communication interface**:
 - wM-Bus T1, C1 which enables remote reading in **Mobile Mode** (walk-by);
 - LoRaWAN, which enables remote reading in **Fixed Mode** (AMR);
- **lithium battery** that guarantees power for up to 15 years (depending on the set configuration).

1.4 Usage limits

The product may only be used with compatible meters and in accordance with the corresponding limits of use (see section "Radio module technical specifications").

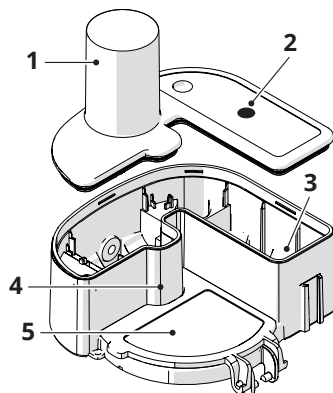
1.5 Structure

1.5.1 Separate version



- 1 Antenna
- 2 NFC
- 3 Battery
- 4 Four-pole cable
- 5 Bracket

1.5.2 Compact version

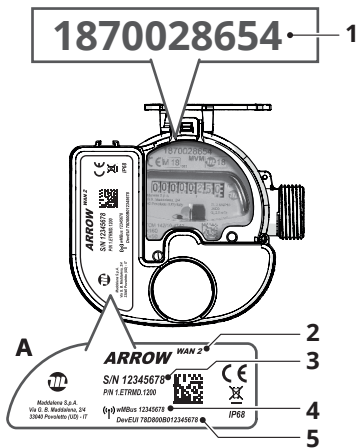


- 1 Antenna
- 2 NFC
- 3 Battery
- 4 Meter interface (two-way inductive sensor)
- 5 Protective cover

1.6 Identification

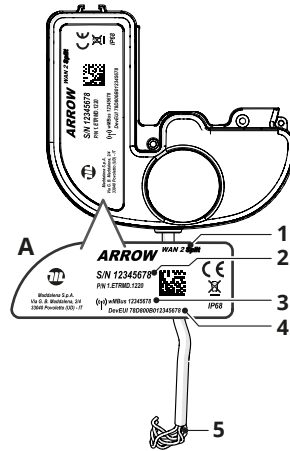
The **Arrow^{WAN 2}** module, identified by the label (A), is strictly associated with a single meter. Two elements are required for this association, performed during installation: the serial number of the mechanical meter and the serial number of module **Arrow^{WAN 2}**.

1.6.1 Compact version



- 1 Meter serial number (compact version)
- 2 Model
- 3 Eight-digit serial number of module **Arrow^{WAN 2}**
- 4 wM-Bus serial number
- 5 DevEUI identifier

1.6.2 Separate version



- 1 Model
- 2 Eight-digit serial number of module **Arrow^{WAN 2}**
- 3 wM-Bus serial number
- 4 DevEUI identifier
- 5 White: Impulse input. Yellow: flow direction. Green: anti-fraud. Brown: Ground.

1.7 Radio module technical specifications

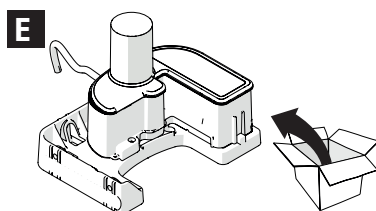
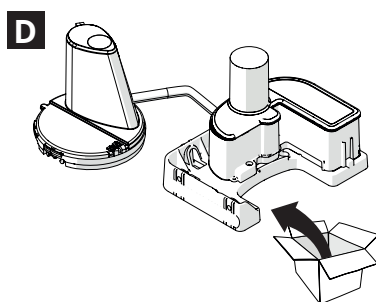
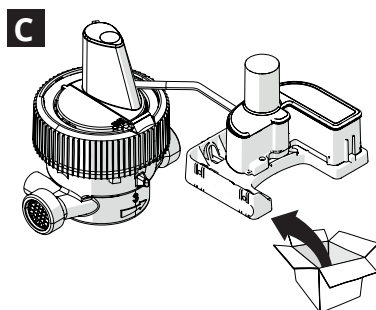
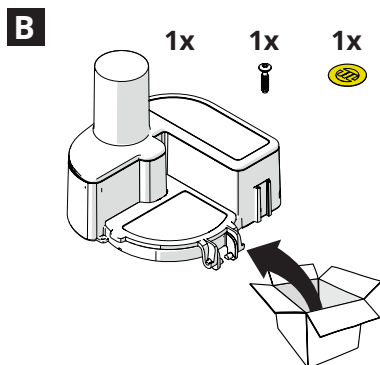
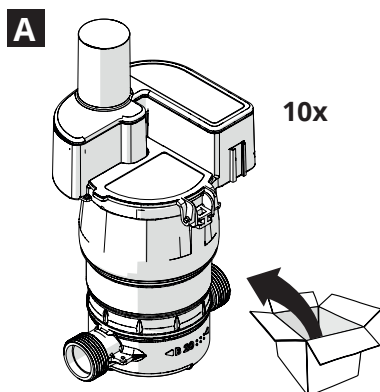
Features		Description
	compact	separate
Sensor	3-coil inductive (bidirectional)	impulse input
Maximum pulse frequency	< 4.0 Hz	< 12.5 Hz (impulse minimum duration 40ms)
Compatible meters	MVM volumetric meters	Open-drain transistor switch, reed switch, any type of open/closed switch, ≤ 250 Ohm closure resistor
Sensor resolution	1L (DN<40); 10L (DN40)	Configurable
Alarms	Consumption exceeded, no consumption, reversed meter, backflow, leakage, flat battery, magnetic tampering, mechanical tampering	
Configuration	Through the Android via NFC port (ISO 15693)	
Power supply	Lithium-ion battery	
Battery lifespan	Up to 15 years (depending on set configuration)	
Certifications/ Approvals	CE in compliance with European standards	
	RED 2014/53/EU, 2011/65/UE and subsequent revisions (RoHS)	
Ra-dio	Standard	LoRaWAN™ v. 1.03 class A
		wM-Bus (EN 13757), OMS
	Modes	LoRa SF7-12, BW125-500, CR=4/5
		wM-Bus T1, C1
	Operating frequency range	863 to 870 MHz
	Transmission power	max 14dBm
	Transmission distance	up to 15 km in LoRaWAN™
		up to 500 m in wM-Bus
	Radio equipment class	class 1
	Data sent	LoRaWAN™ (OTAA) - measurement data transmission (alarms, hourly/daily consumption) twice a day - supervision data transmission (alarms, device status information) once a week
		wM-Bus - Tiny frame (default): current volume, date and time, volume on billing date, billing date, errors
		- Short frame: current volume, volume on billing date, meter serial number, alarms - Long frame (in C1 mode only): same as short frame with the addition of values from the last 12 months
	Factory configuration	Single mode: wM-Bus or LoRaWAN
		Dual mode: wM-Bus and LoRaWAN
Environmental conditions	Storage temperature: -20°C – +60°C	
	Operating temperature: -10 °C – +55 °C	
Protection rating	IP68	
Dimensions	115 mm (Ø) x 190 mm (h)	

2 Installation

2.1 Receipt of the product

Arrow^{WAN 2} modules are supplied in two different formats:

- A 10-piece pack, already assembled on the meter (compact version)
- B 1-piece pack with 1 screw and 1 anti-tamper seal (compact version)
- C Variable pack depending on meter dimensions, already connected to the sensor and mounted on the meter (separate version)
- D 1-piece pack, already connected to the sensor (separate version)
- E 1-piece pack, with four-pole free wire (separate version)



WARNING!

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



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 Assembly on meter (compact version)

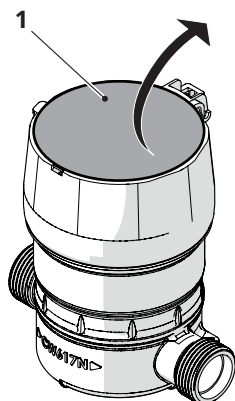


WARNING!

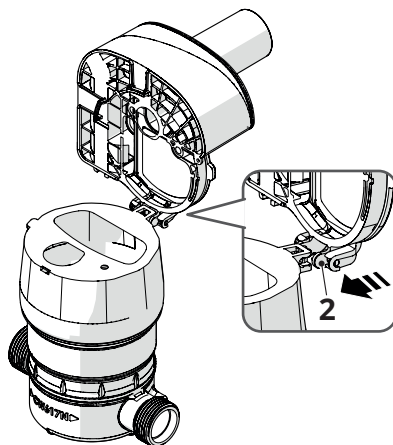
Only authorised and suitably trained personnel with sufficient technical experience may install and operate the device.

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

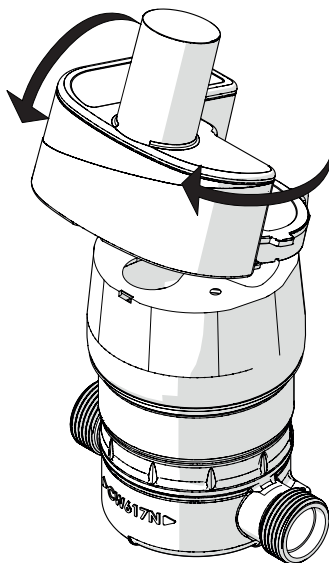
- Where present, remove the protective cover (1) on the meter. Clean the surface around the indicator.



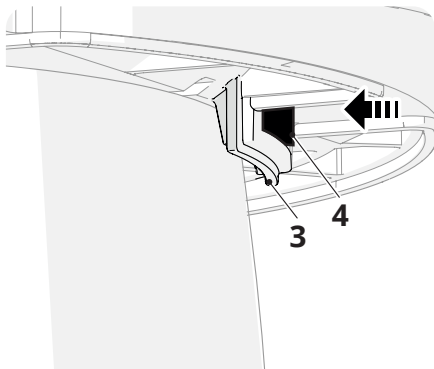
- Attach the **Arrow^{WAN 2}** module (2) to the relevant housing.



- Lower the module and offset it.



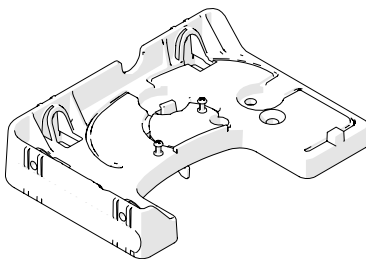
- Attach the eyelet (3) to the catch (4) and realign the module.



2.3 Fixing to a bracket (separate version)

The **Arrow^{WAN 2}** module is supplied with a fixing bracket.

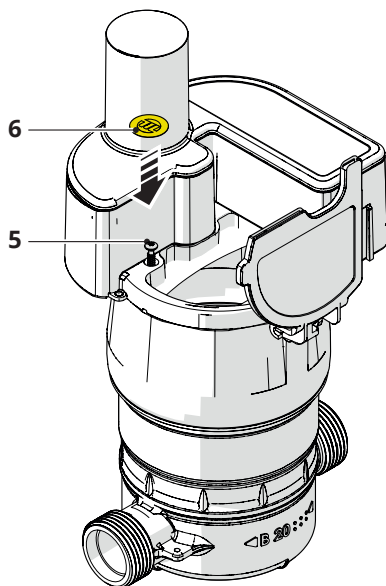
The bracket can be used for mounting on the wall or on a pipe.



WARNING!

Do not apply pressure to force the eyelet in.

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



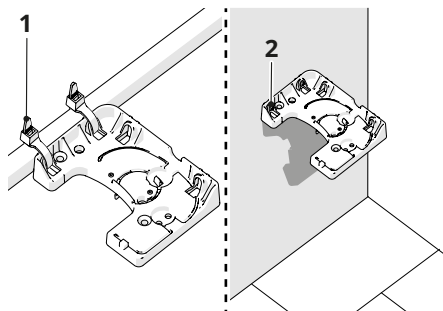
WARNING!

The **Arrow^{WAN 2}** module (separate version) can be fitted on the meter E-BULK.

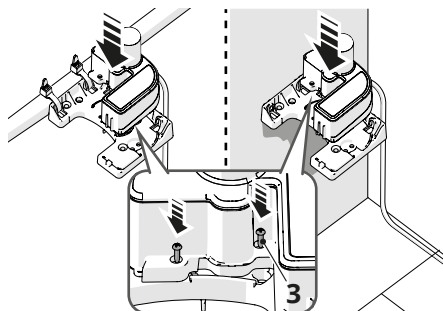
Only authorised and suitably trained personnel with sufficient technical experience may install the device on the E-BULK meter.

In all cases, to install:

- Connect the bracket to the desired support with:
 - Cable ties (1) for installation on pipes;
 - Screws (2) for wall installation.



- Position the module on the template marked on the bracket;
- Fix the module using the two screws (3) provided.



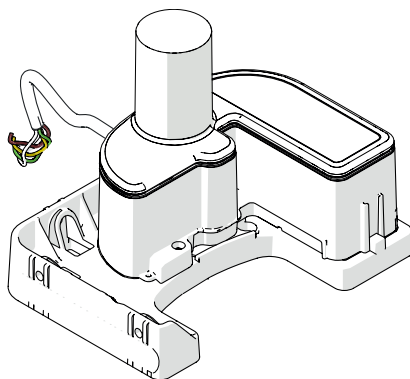
WARNING!

Cable ties and wall screws are not provided.

2.4 Wiring with sensor (separate version)

The **Arrow^{WAN 2}** module is supplied with an earthed four-pole cable:

- White: impulse input. Impulse signal for both the outflow and backflow.
- Yellow: flow direction. Contact closed = backflow.
- Green: anti-fraud. Contact open = fraud.
- Brown: Ground. Common ground signal.



3 Use

The normal operating phase is remote reading of meters through radio modules. In AMR (fixed) mode, each radio module transmits the reading at a programmable frequency. In mobile mode (Walk-By/Drive-By), the radio module emits a data frame with the measurements. To receive the radio module signal, hold a suitable receiver near the meter. The fixed (AMR) system reads data automatically.



WARNING!

Reading of data can be performed using various software. Please consult the metering operator for more information on the specific use of reading software.

Factory Configuration	Single mode	Dual mode	
	wM-Bus	wM-Bus	LoRaWAN
Data sent	Tiny frame C1 (default): current volume, date and time, volume on billing date, billing date, errors	Tiny frame C1 (default): current volume, date and time, volume on billing date, billing date, errors	Date and time, daily consumption up to 7 previous days, alarms
Transmission time	08:00 - 18:00	08:00 - 18:00	00:00 - 24:00
Transmission frequency	16 sec	30 secs	2 per day
Encryption	active	active	native
Alarms (default)	backflow (100 litres), suspected leak (observation frequency 15 min / observation period 48 hours), max flow rate (disabled)		
Battery Duration	15 years	15 years	

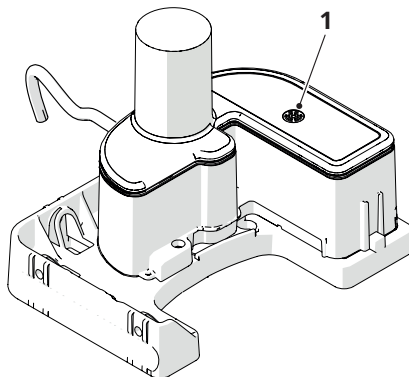
3.1 Synchronisation of mechanical reading

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

The radio module is activated via the NFC (1) port located below the label next to the module antenna, using the Android app available on Google Play Store.



The NFC interface can be used to download the latest device data, even when the battery is flat.



WARNING!

It is necessary to use a smartphone with the Android operating system and the relevant app provided by **Maddalena S.p.A.**. The app must be installed and set correctly before proceeding with the activation of **Arrow^{WAN 2}**.

4 Maintenance

4.1 Battery

The radio module is fitted with a lithium battery that cannot be recharged or replaced.

The typical lifespan of the battery is 15 years, calculated using factory set-up and with 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 on the data transmission frequency you choose to 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

It is forbidden to use abrasive products, methyl alcohol, hydrochloric acid (35%), sodium bicarbonate (10%), tricresyl phosphate, benzol, concentrated ethanol, toluol, industrial petrol, methylisobutylketone, acrylonitrile, cosmetic solvents, sodium hydrate (10%), ammonium hydrate (10%), nitric acid (40%), potassium dichromate, acetone, diesel naphtha, petrol.

4.3 Disposal

The device is made from various materials such as metals, plastics, and electrical and electronic components. It must be disposed of in accordance with current local regulations on industrial and special waste. It must not be disposed of with household 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.



[illegible]



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