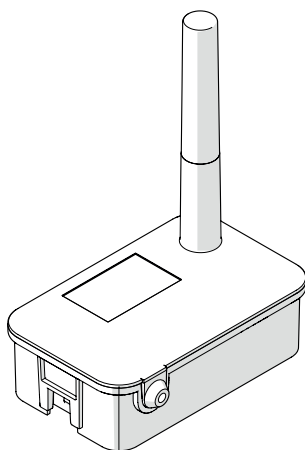


Arrow^{WAN}

wM-Bus 169 MHz radio module
LoRaWAN 868 MHz radio module



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.

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}** 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)



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

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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 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

Arrow^{WAN} is a radio module with pulse input compatible with **Maddalena** water meters and with those of other brands. The device allows for measuring, transmitting and remotely reading the consumption values and the alarms using a wireless transmission technology.

Arrow^{WAN} is available in two versions: **Arrow^{WAN} 169** and **Arrow^{WAN} 868**. The two versions differ for their transmission frequency (respectively 169 MHz and 868 MHz) and for the protocol used.

Arrow^{WAN} 169 uses the wM-Bus transmission protocol and also conforms to AFNOR E17Z v2.

Arrow^{WAN} 868 uses the LoRa protocol and is certified by LoRa Alliance®. This guarantees a high level of interoperability with various reading systems on the market, including third-party systems.

The following alarms are managed: excessive consumption (configurable parameters), backflow (limit set and configurable), leak (configurable parameters), device generic alarm, battery almost flat (below 10%) and mechanical fraud (removal).

The factory set-up can nonetheless be modified:

- through the NFC port and relevant app installed on a device with Android operating system;
- =- through the NFC port and relevant app via a suitably formatted configuration file installed on the module.
- OTA if **Arrow^{WAN}** is already active and connected to the fixed network.

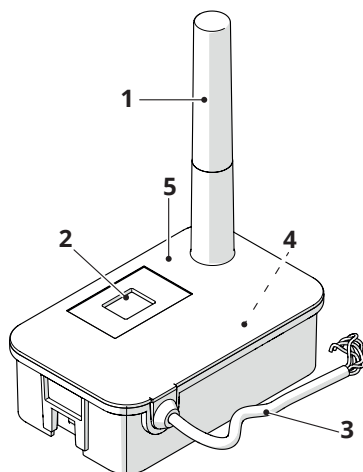
The main technical specifications of the **Arrow^{WAN}** design are:

- **input via four-pole cable of the following signals:** pulses (flow meter revolutions), flow direction, anti-fraud, earth. Thanks to this data, the module calculates the volume (both directions), manages alarm situations and memorises the data in a non-volatile memory;
- **wireless radio communication interface:**
 - **Arrow^{WAN} 169** wM-Bus N2 (a, b, c, d, e, f) conforming AFNOR E17Z V2 which allows for remote reading in both scenarios, **mobile** (walk-by) and **fixed** (AMR);
 - **Arrow^{WAN} 868** LoRa t 868 MHz which allows for remote reading in **fixed** mode only (AMR);
- **lithium battery** which guarantees a power supply for up to 15 years. For **Arrow^{WAN}** 169 MHz in **fixed** mode and default parameter configuration.

1.4 Usage limits

The product may be used exclusively with compatible sensors and in accordance with the corresponding usage limits (see the “**Technical specifications**” paragraph).

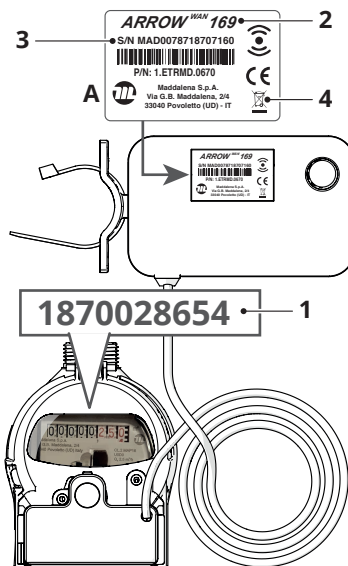
1.5 Structure



- 1 Antenna
- 2 NFC
- 3 Four-pole wire
- 4 Battery
- 5 Protective cover

1.6 Identification

The **Arrow^{WAN}** 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}**.



- 1 Serial number of the meter
- 2 Model
- 3 Eight-digit serial number of module **Arrow^{WAN}**
- 4 WEEE compliance mark

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 Technical specifications

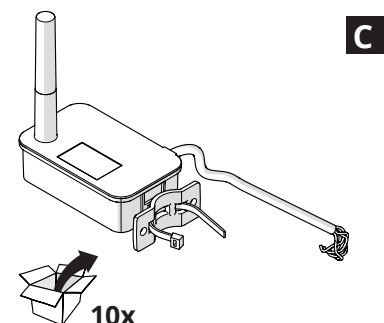
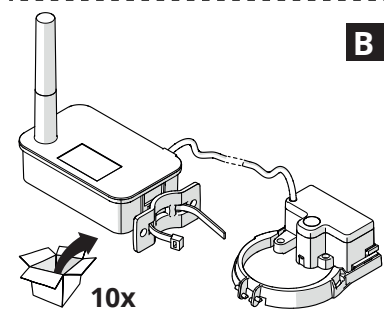
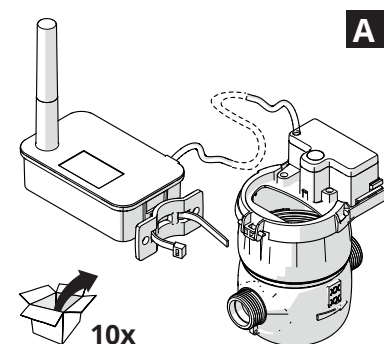
Features	Description
Maximum pulse frequency	8 Hz nominal. Configurable up to 250 Hz
Compatible meters	Open drain transistor switch, reed switch, any type of open/closed switch
Minimum pulse width	35 ms nominal. Configurable up to 10 ms
Alarms	Excessive consumption, backflow, leak, device generic alarm, battery almost flat, mechanical fraud
Configuration	Through the Android via NFC port (ISO 15693) and OTA
Power supply	Lithium-ion battery
Maximum input voltage	30V
Maximum current through pull-up resistor	4uA
Battery lifespan	Up to 15 years
Certifications/Approvals	CE in compliance with European standards. RED 2014/53/EU, RoHS2 (EU) 2017/2102
Radio	Standard
	Arrow^{WAN} 868: LoRaWAN v. 1.02 Class A
	Arrow^{WAN} 169: EN13757 and AFNOR E17Z v2
	Modes
	Arrow^{WAN} 868: LoRa SF7-12, BW125-500, CR=4/5
	Arrow^{WAN} 169: WMBUS N2 (a, b, c, d, e, f)
	Operating frequency range
	Arrow^{WAN} 868: 863 at 876 MHz
	Arrow^{WAN} 169: 169.400 MHz at 169.475 MHz
	Radiated power
	25 dBm max (Arrow^{WAN} 169)
	14 dBm max (Arrow^{WAN} 868)
	Range
	Arrow^{WAN} 868: up to 15 km in LoRaWAN
	Arrow^{WAN} 169: up to 1.5 km in wM-Bus
Radio	Reference standards
	EN 13757, AFNOR E17z, LoRaWAN specification
	Radio equipment class
	class 1
	Arrow^{WAN} 868:
	- transmission of 3 measurement frames per day (hourly and daily consumption, alarms)
	- transmission of 1 supervision frame per week (alarms, status of the device)
	Arrow^{WAN} 169:
	- transmission of 3 measurement frames a day (hourly and daily consumption, alarms) in fixed mode
	- transmission of 3 measurement frames per day (hourly and daily consumption, alarms) in mobile mode
	- transmission of 1 supervision frame per week (alarms, status of the device)
Environmental conditions	Storage temperature: -20°C – +60°C
	Operating temperature: -10 °C – +55 °C
Protection rating	IP68
Dimensions	123 mm (L) x 72.4 mm (W) x 143.5mm (H)

2 Installation

2.1 Receipt of the product

Arrow^{WAN} modules are supplied in three different configurations:

- A Package with 10 pieces, already connected to the sensor and mounted on the meter
- B Package with 10 pieces, already connected to the sensor
- C Package with 10 pieces, with free four-pole wire



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 Assembly on the sensor



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.



WARNING!

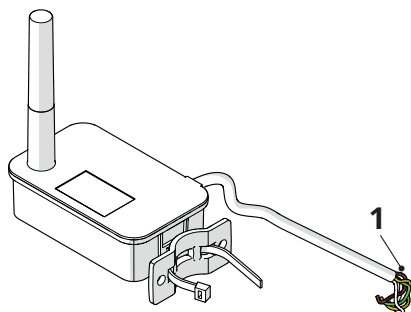
When purchasing configuration "B" (with module connected to the sensor), refer to the manual of the sensor (QuadraPlus, Flow-Pulse or Reed) for the connection to the meter.



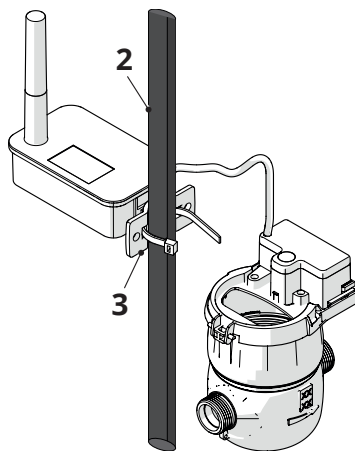
WARNING!

When purchasing configuration "C" (with free four-pole wire), the latter must be connected to a sensor or external pulse generator, by appropriately connecting the wires.

- The **Arrow^{WAN}** module is supplied with a four-pole cable with earth (1)
 - White: pulse input. Pulse signal for both the delivery and return flow.
 - Yellow: flow direction. Contact closed = return flow.
 - Green: anti-fraud. Contact open = fraud.
 - Brown: earth. Common earth signal.



- Fasten **Arrow^{WAN}** to a pipe (2) using the clip (3) supplied as an accessory. When installing the device on buried manholes, secure it as close as possible to the surface.



WARNING!

To mount the sensor on the meter, refer to the manual of the sensor possessed.

3 Use

The fully operational phase involves remote meter reading via the radio modules. In AMR (fixed) mode, each radio module transmits the reading with a programmable frequency (default: 3 transmissions per day). In mobile mode (Walk-By/Drive-By), the radio module emits a data web with the measurements when it receives a call from the reading kit **Maddalena**. To receive the signal of the radio module, go near the meter with an appropriate receiver, or if a fixed (AMR) reading system is present, the data is collected automatically.



WARNING!

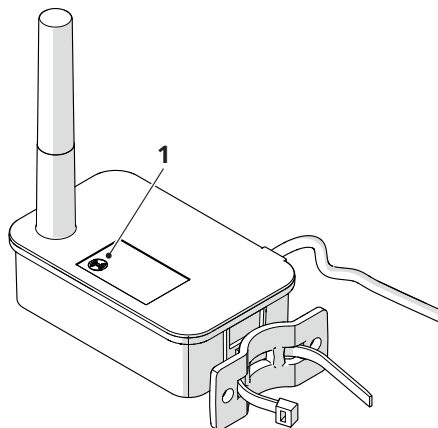
Reading of data can be performed using various software. Please consult the metering operator for more information on the specific use of reading software.

3.1 Synchronisation of mechanical reading

The radio module stores the volume recorded via an external 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 through the NFC port located under the small label showing the "entry point" logo located beside the module's antenna.



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}**. Refer to the app's manual for the details.



WARNING!

To activate the **Arrow^{WAN} 169** module, set the radio type in wM-Bus

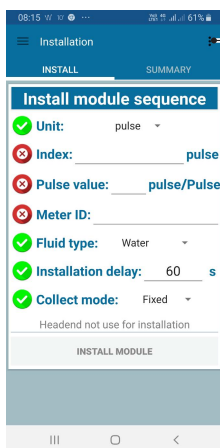
To activate the **Arrow^{WAN} 868** module, set the radio type in LoRa.

To set the type of radio, click on the three dots at the top right-hand side (2) and choose SETTINGS. Check that the correct radio type (wM-BUS or LoRa) was selected in the "Application Mode" field. Moreover, make sure that the "Headend Mode" is not flagged, since the **Arrow^{WAN}** radio does not use this option.



WARNING!

When changing the type of radio, it is necessary to close the app and repeat the login



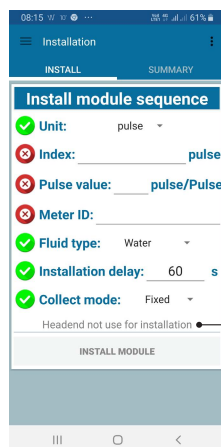
During activation, 3 parameters are requested: the serial number of the mechanical meter, the pulse weight and the reading of the volume measured by the meter expressed in litres.

Once these preliminary operations have been completed, proceed as follows:

- Enable the smartphone's audio function;
- Open the "Wirgrid NFC" application;
- Enter the "Login" and "Password";
- Verify that the correct radio was set in the "Application mode" field under SETTING;
- Place the smartphone above the radio module (3) to allow the NFC communication;



- Wait for the "beep". This will signal that the NFC communication is active. At this point, the smartphone can be moved;
- Make sure that "Headend not use for installation" (4) appears on the display;



- Enter the missing parameters (indicated with a red icon);
 - “Index” (reading of the mechanical meter)
 - “Pulse value” (pulse weight: varies in relation to the associated meter)
 - “Meter ID” (serial number of the mechanical meter associated with the radio)
- If necessary, modify the entered default parameters (indicated with a green icon) “Fluid type”, “Installation delay”, “Collect mode”;



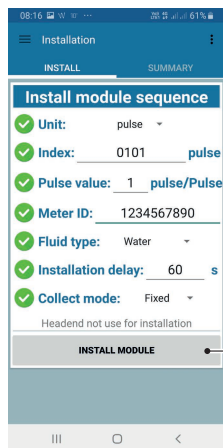
WARNING!

The “Collect mode” parameter is set by default to “Fixed”.

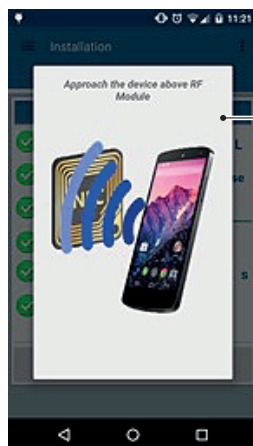
If module **Arrow^{WAN} 169** is activated, the radio type can be set to “Fixed” (AMR mode for fixed network), “Mobile” (mobile reading mode) or “Both” (AMR mode for fixed network and mobile reading mode)

If module **Arrow^{WAN} 868** is activated, the radio type can be set solely to “Fixed” (AMR mode for fixed network)

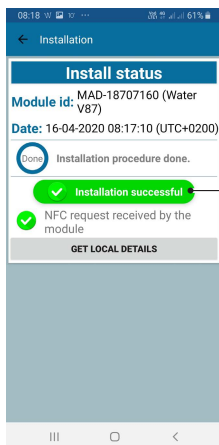
- Place the smartphone above the radio module to allow the NFC communication;
- Click “INSTALL MODULE” (5) once all the parameters have been inserted correctly;



- Wait for the activation (6) to terminate;



- Once completed, the “Installation successful” (7) message will appear.



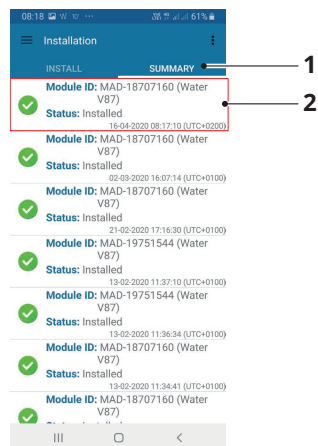
WARNING!

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

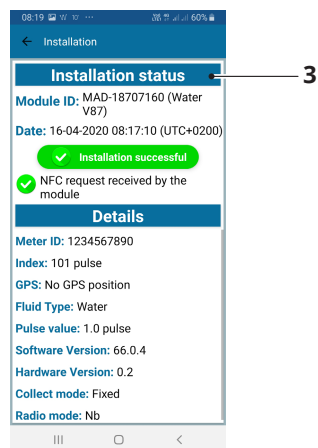
3.3 Verification of the entered parameters

Use the “Summary” function to verify that the “module serial number”, “reading” and “pulse weight” values have been entered correctly.

From the “Install” menu, click “Summary” (1) to view the information of the installed modules (2).



Clicking an item from the list of installed modules (2) allows for viewing the details (3) relative to the installation.



WARNING!

If the displayed parameters are not correct, the radio module’s activation can be repeated (see the “**Activating the radio module**” paragraph).

3.4 Troubleshooting



WARNING!

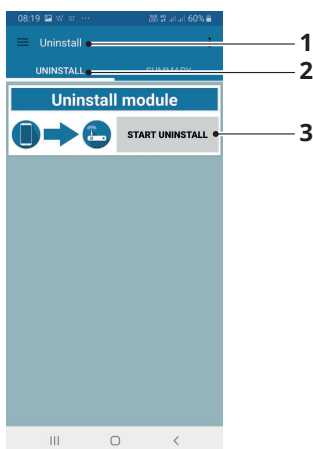
For a complete list of alarms, please refer to the specific manual.

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
The radio module transits empty fields or the transmitted data is frozen	Sensor defective or with flat battery or cut cable	Contact the manufacturer
NFC connection failure	No or difficult connection to the NFC port	Place the smartphone so that its NFC port is above that of the radio module.
		With some smartphones that have a weak NFC antenna, the operation could be difficult or impossible.
		Try with a different phone model.
Module activation error	No or difficult connection to the NFC port	Place the smartphone so that its NFC port is above that of the radio module.
		With some smartphones that have a weak NFC antenna, the operation could be difficult or impossible.
		Try with a different phone model.
	Failed installation of the json configuration file in the app folder	Install the configuration file on the smartphone as explained in the app manual.

3.5 Deactivating the radio module

To deactivate the **Arrow^{WAN}** module, proceed as described below:

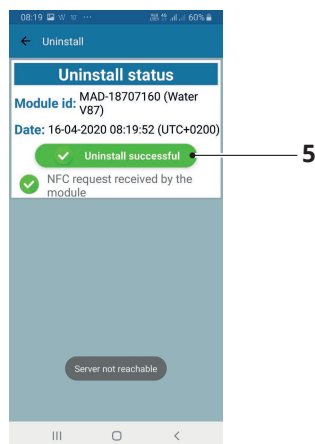
- Open the "Wirgrid NFC" application;
- Access the "Uninstall" menu (1);
- Click on "UNINSTALL" (2);
- Place the smartphone above the radio module to allow the NFC communication;
- Click on "START UNINSTALL" (3);



- Wait for the deactivation (4) to terminate;



- Once completed, the "Uninstall successful" (5) message will appear;



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.

Its useful life varies between 12 (**Arrow^{WAN} 169** mobile + fixed) and 15 years (**Arrow^{WAN} 169** fixed, three transmissions per day of the measurements plus one weekly transmission on the status of the module) with the factory set up in 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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