

ADDRA Smart Water Meter



Technical Description

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Revision History

Version	Description	Date
1.0	Original document	16.02.2019
2.0	Meter designation (sections 3) is updated WM dimensions (section 7 Design) are revised	27.02.2020
3.0	Section 8 added (Meter installation position) Section 11 (Communications) is revised	12.06.2020
3.1	WM technical characteristics (Section 1) are updated	4.05.2021
3.2	Table 10 of Section 10 (WM readings examples) added	26.07.21
3.3	Storage temperature range is updated Editorial corrections are made	20.10.21
3.4	Section 7 (Design) is updated Plastic pipe model is deleted	20.10.21
3.5	Table 6 of section 7 is updated	25.10.21
3.6	Section 10 (Indication) is revised	11.02.22
4.0	The document updated in compliance in the actual version	14.01.22
5.0	The meter nameplate picture and description are revised	19.01.22
5.1	Editorial corrections	10.02.22
5.2	Section 10 is updated. Volume resolution is added.	15.02.22
5.3	Table 1 is updated. Thread parameters added. Meter photo updated.	12.05.22
5.4	Reverse flow detection is specified	8.11.22
5.5	Table 1, section 1 updated	29.11.23
5.6	Seal information (section 7) updated	29.02.24
6.0	2 display options added (section 10)	15.03.24
6.1	Section 10 updated (legally relevant data clearly indicated)	19.03.24
7.0	Sections 2, 4.1, 4.2, 11 updated Section 14 added	8.07.24
7.1	Section 9 is updated. Meter mounting position is specified	29.07.24
8.0	Section 13 revised	14.08.24
9.0	Sections 2 and 8 are revised according to current implementation	03.10.24
9.1	Operation modes added (section 11)	05.11.24
9.2	Section 1 updated	18.07.25

Version	Description	Date
9.3	Section 2 updated	22.05.2026

1. Purpose

ADDRA smart water meter (hereinafter WM) is based on ultrasonic principle and intended for cold water consumption metering.

The water meter is compliant with OIML R49 class O and is intended for 24-hours indoor or outdoor operation. It withstands ambient air temperature from -25°C to $+70^{\circ}\text{C}$ and water temperature from 0.1°C to $+50^{\circ}\text{C}$.

Note, that freezing of water in a meter pipe is strictly forbidden.

When installing the WM, note that the meter must be protected against the damage risks due to extreme water or ambient air temperatures.

2. Technical data

Main technical characteristics are summarized in the table 1 below:

Table 1. WM technical characteristics

Characteristic	Value					
Model	WMP15		WMP20		WMP25	
Nominal diameter	DN15		DN20		DN25	
Thread	G3/4"		G1"		G1 1/4"	
Connection type	BSP					
Permanent flow rate, Q3 (m³/h)	1.6	2.5	2.5	4	4	6.3
Dynamic range Q3/Q1	R250 R400 R800	R250 R400 R800 R1600	R250 R400 R800	R250 R400 R800 R1600	R250 R400 R800	R250 R400 R800 R1600
Installation sensitivity class	U0/D0					
Sensitivity threshold (l/h)	1					
Temperature class	T30/T50 (0.1 – 50 °C)					
Storage/transportation temperature	From -25 to 70 °C					
Metrological class	Class 2					
Maximum operation pressure	1.6 MPa					
Pressure loss	Δp_{40}					
Protection class	IP68					
Environmental class	E1, M1, O					
Installation	Horizontally/vertically/at angle					
Battery	Lithium battery, up to 16 years lifetime in case of meter reading once per day					
Interfaces	Bluetooth for local access					
WAN Communication	Dual stack LoRaWAN + Wireless M-Bus Different frequency ranges: EU863-870, US902-928, AU915-928, AS923					
Non-volatile memory	Data storage not less than 10 years					
Approvals	MID, WRAS					

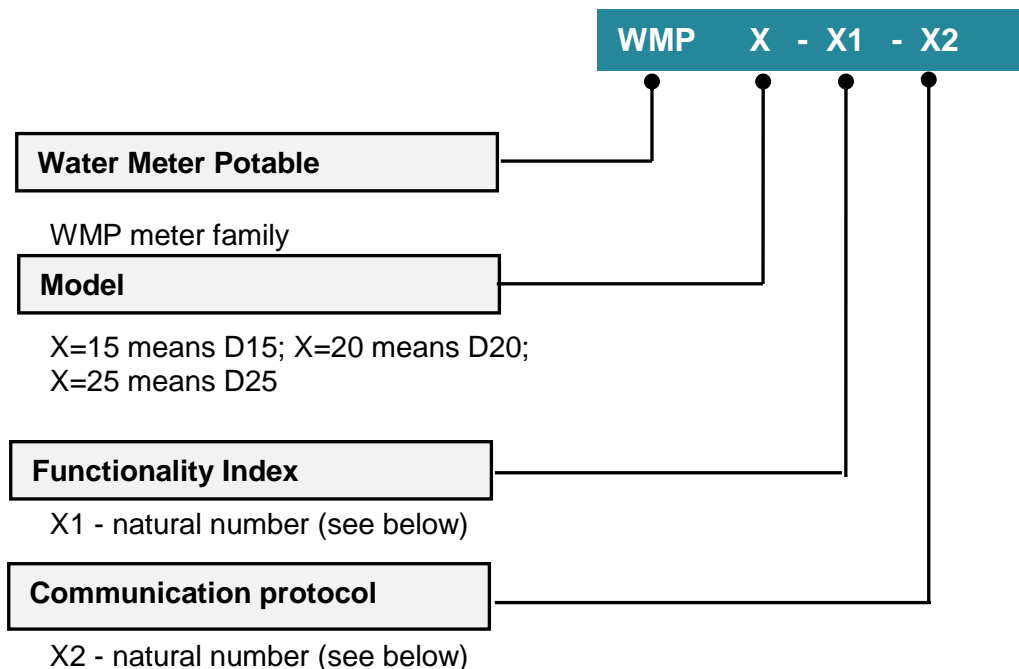
3. Standards

Table 2. Relevant standards

EN 14154-1:2005+A2:2011	Water meters - Part 1: General requirements
EN 14154-2:2005+A2:2011	Water meters - Part 2: Installation and conditions of use
EN 14154-3:2005+A2:2011	Water meters - Part 3: Test methods and equipment
EN 14154-4:2014	Water meters - Part 4: Additional functionalities
DIN EN 13757-3:2013-08	Communication systems for and remote reading of meters – Part 3: Dedicated application layer
ISO 4064-1:2017 (OIML R 49)	Water meters for cold potable water and hot water -- Part 1: Metrological and technical requirements
ISO 4064-2:2017 (OIML R 49)	Water meters for cold potable water and hot water -- Part 2: Test methods
ISO 4064-3:2017 (OIML R 49)	Water meters for cold potable water and hot water -- Part 3: Test report format
ISO 4064-4:2017 (OIML R 49)	Water meters for cold potable water and hot water -- Part 4: Non-metrological requirements not covered in ISO 4064-1
ISO 4064-5:2017 (OIML R 49)	Water meters for cold potable water and hot water -- Part 5: Installation requirements
MID Directive 2014/32/EC	Measuring Instruments Directive of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of measuring instruments
LoRaWAN® L2 1.0.4 Specification	The LoRaWAN® 276 network protocol optimized for battery277 powered end-devices.
LoRaWAN® Regional Parameters RP002-1.0.4	LoRaWAN Regional Parameters for different regulatory regions worldwide
EN 13747 family	Communication systems for meters - Wireless M-Bus communication

4. Meters designation

WMP meter family defines the family of potable water meters with different functionality developed by ADD GRUP. The following system is used to indicate the types of meters within the family:



Thus, the designation WMP is used to identify a series of meters with DN15, DN20 and DN25. Identifier “Model” determines the meter body length L_B as follows:

X1	DN15	DN20	DN25
1	$min_{L_B}=110\text{mm}$	$min_{L_B}=130\text{mm}$	$min_{L_B}=190\text{mm}$
2	$max_{L_B}=165\text{mm}$	$max_{L_B}=195\text{mm}$	$max_{L_B}=225\text{mm}$
numbers from 10 to 20	reserved for possible L_B between min_{L_B} and max_{L_B}	reserved for possible L_B between min_{L_B} and max_{L_B}	reserved for possible L_B between min_{L_B} and max_{L_B}

Identifier “Communication protocol” is the natural number identified meter RF communication protocol. Communication protocol is defined by legally non-relevant part of meter firmware. In “WMP” meter the following communication technologies can be supported:

- Wireless M-bus;
- LoRa;
- BLE;
- NFC.

5. Measurement

5.1. Measurement principle

The meter features a flow sensor based on proven ultrasonic measurement. The flow sensor is used to measure the average flow rate and estimate the difference of measured transit time between the sound signals along with and against the direction of the flow.

The flow meter is equipped with 2 ultrasonic transducers used to send sound signals with/against the flow (see Figure 1).

The meter calculates the consumed water volume based on signals from flow sensor. Measured and calculated data are stored in the meter non-volatile memory and can be presented on the meter display.

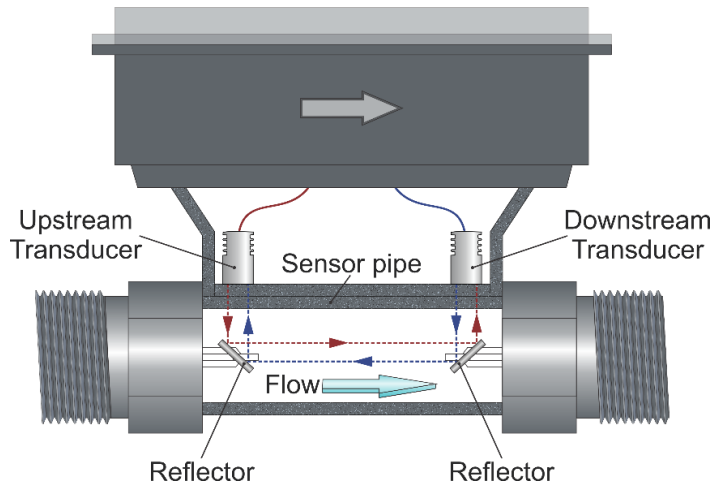


Fig.1. Measurement principle

The meter calculates water flow currently according to a fixed measuring cycle. The measurement data is captured each hour, for other measuring cycles (day, month, year) the volume is calculated. All data are saved in the appropriate register.

The WM has no moving parts and requires no maintenance. The WM is resistant to air passage. The meter measures potable water with particulates and air impurities within the accuracy class, according to the standard for the potable water and installation rules.

5.2. Registers

Each meter is identified by its serial number. The following values are registered:

Table 3. WM values

Values	Description
Volume	Current reading of accumulated water volume Format in normal mode (to be agreed with a customer) #####.### m ³ Format in test mode: ###.##### m ³
Reverse volume	Current reading of accumulated water volume in reverse direction
Clock	Actual date and time
Flow rate	Current velocity of water flow in both directions
Water temperature	Actual value of water temperature
Ambient temperature	Actual value of ambient temperature

The WM stores the historical data in three profiles. The parameter sets differ for different archives and can be negotiated as well as storage capacity.

Data storage capacity depends on the set of parameters stored in one archive record. See an example below:

Parameters set:

- Time
- AMR status
- Accumulation volume in the forward and reverse directions
- Alarm
- Media temperature

Storage capacity:

Monthly	36 months
Daily	14 months
Hourly	60 days

The water meter registers and records alarms as:

- info codes which represents water meter flags of certain alarm situations;
- alarm events in the event log with the relevant time stamp;
- special symbols on the meter display.

Event log stores up to 100 events.

All parameters are secured due to hardware and software protection:

- Metrology MCU programming (JTAG) is disabled and meter is sealed;
- Legally non-relevant software has no any interface to change these parameters.

6. Meter States

Water meter can be in one of the states described in Table 4.

Table 4. WM states

State	Description
Off	No battery operating voltage
Active	Powered. The water meter measures and displays the current parameter on the LCD. Can exchange data via BLE and WAN modem.

7. Alarms

Water meter records alarm situations as follows in Table 5.

Table 5. WM alarms

Alarm	Description
DRY	The water meter is not filled with water. In this case, there is no measurement of consumption.
REVERSE	Water flows in wrong direction. Reverse water flow more than Q1 detected
LEAK	Water flows continuously for more than configurable period (e.g. 24 hours).
BURST	The water flow is constantly high for more than configurable period (e.g. 30 minutes).
TAMPER	Indicates that the water meter has been opened.
LOWBAT	Indicates low battery. Readout messages with the battery percentage data can be sent both locally and remotely.

In case any alarm is registered the WM sends alarm notification to the Control Center.

8. Design

The meter is made from durable components:

- Ultrasonic measuring pipe – Brass.
- Housing – Composite.

The meter is equipped with soldered not-replaceable lithium battery which ensures the meter operation and communication. The battery is placed under the meter cover and is not visible.

Overall dimensions of the meter are presented in Figure 2:

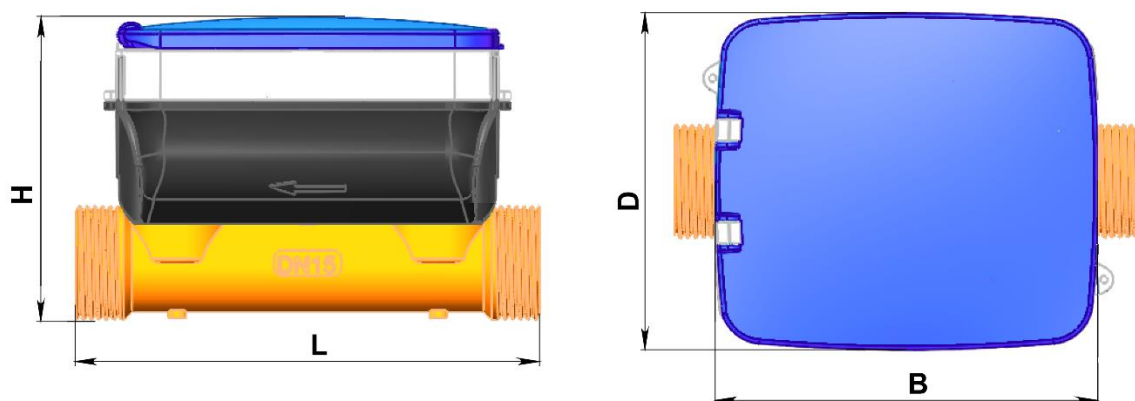




Fig.2. WM overall dimensions.

Table 6. WM dimensions for different pipe diameters

Pipe diameter	Dimensions	WM with long brass pipe	WM with short brass pipe
			
D15	L	165	110
	H	71	71
	D	80	80
	B	91	91
D20	L	195	130
	H	77	77
	D	80	80
	B	91	91
D25	L	225	190
	H	85	85
	D	80	80
	B	109	109

The meter basic parameters are placed on the face surface as illustrated below:

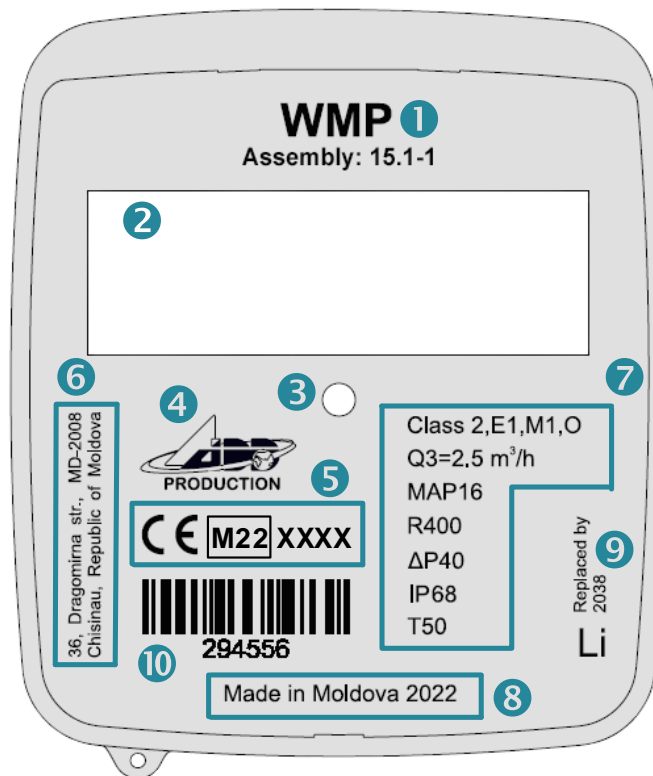


Fig.3. WM nameplate elements

Table 7. WM nameplate elements description

①	Meter model
②	Display to view consumption data and states
③	Reserved for future use
④	Meter manufacturer
⑤	CE mark accompanied with the last two digits of the year of manufacture (YY after M sign) and identification number of the notified body XXXX
⑥	Manufacturer's postal address
⑦	Technical parameters
⑧	Place of manufacturing and date
⑨	Battery expiry date
⑩	Barcode with serial number

9. Sealing and secure features.

The meter body is closed by a non-separable cover to ensure the meter complete protection. The meter cannot be accessed without visible damage of the enclosure such as breakage and cracks.

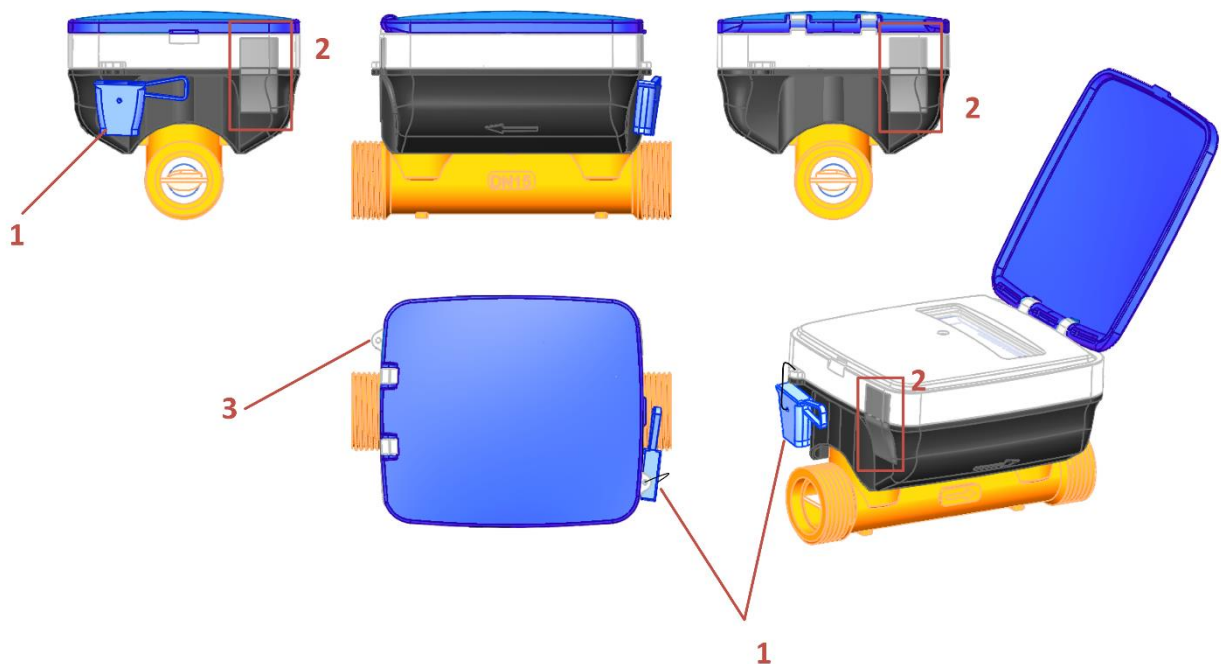


Fig.4. WM general view and sealing options.

There are several sealing options that allows the meter additional protection according to the local regulations:

- two optional security seals (pos. 1 in Fig.4). The meter design provides two holes to thread the security seal wires.
- two optional security self-destructive stickers (pos. 2 in Fig.4).

In Fig.4 see as an example of sealing positions: 3 with no seal and 1 with already installed security seal.

The meter is equipped with a meter opening tamper sensor. In case of tamper attempt, the relevant alarm is registered in the Event log and is indicated on the meter display. Information on alarms can be transmitted via WAN channel to a Control Center or can be obtained locally via BLE.

10. Meter installation position

During the meter installation, pay attention to the flow direction, which is indicated by an arrow on the meter side (see Fig. 2).

The meter can be mounted on a pipe horizontally, vertically, or at any angle (including the display down position), unless the flow direction arrow is downward.

It is recommended to mount the meter in such a way that the display can be read easily.

11. Modes of operation

The meter operates in the following modes.

Mode	Description
NORMAL	the default mode in which the meter operates while in service
TRANSPORTATION	is usually used to decrease the battery power consumption during the meter transportation (before installing on site). Main features of the transportation mode: <ul style="list-style-type: none"> - All communication channels are disconnected. - Transportation Mode is activated in initial configuration during production stage. - Transportation mode is disabled after 10 liters of water has flown (in current version).
TEST	is designed for the meter verification. When the test mode is activated: <ul style="list-style-type: none"> - Measurements occur 8 times per second whether there is water in a pipe or not. (Note that in normal mode, measurements occur 2 times per second in case there is no water and 8 times per second in the presence of water in the pipe). - Accumulated water (8.0.1.0.0.255) is displayed on LCD in ###.##### format (3 digits before the decimal point and 6 decimals). Measuring unit is m³. - Test mode is activated by a command (from the local application). The mode is disabled by timeout or a relevant command.

12. Indication

The meter features easily readable LCD to visualize measurement data, states, info codes etc.



Figure 5. LCD display segments.

In fig.5 the display test mode for two optional displays is presented when all LCD segments are active. Test mode is set using Client's application via BLE, by selecting the special test screen from the configured list of screens.






Each measurement value is accompanied by its measurement unit.

The number of decimals is configurable. The volume resolution is 0.000001 m³.

Measured values and states are cyclically displayed on the meter local LCD. The list of parameters to be displayed is configured and includes legally relevant data (consumed water volume).

Almost all the data (both screens and state symbols) are defined by legally relevant firmware. Display icons are described in Table 8. The symbols managed by legally relevant firmware are marked with an asterisk.

Table 8. Display icons

Icon	Description
	It is displayed in case of TAMPER event (attempts to open cover, etc.).
	Displayed when a LOWBAT alarm occurs (low battery).
	Appears when DRY alarm (WMV is not filled with water).
	Displayed in case of LEAK alarm (possible water leakage).
	It is displayed at the BURST alarm (possible breakthrough pipe).





















Icon	Description
	It is displayed when the threshold is reached in prepay-mode (small credit, you need to replenish the account).
	It is displayed when the water supply valve is closed . (For example, due to non-payment).
	Displayed in case REVERSE water flow is detected.
	It is displayed when detecting the flow rate of water above the sensitivity threshold of the WMV. The icon blinks in proportion to the flow rate (at least 4 distinct blink frequencies).
	It is displayed when there is connection between the meter and the internal valve
	Communication indicator - displays the status and level of the WAN channel signal For option 1 see details in Table 9

Table 9. Indicator of WAN channel signal

Communication indicator		LoRaWAN
WAN symbol is not displayed		WAN channel is disabled
Central part (“antenna”) blinks, sides (“radio waves”) do not glow		WAN modem hardware error
“Antenna” glows, “radio waves” do not glow		Not registered in the network
Symbol glows as a whole		Registered in the network, everything is OK
“Antenna” glows, “radio waves” blink		Data exchange with Control system in progress
WAN symbol is blinking as a whole		Setup error
“Radio waves” glow		Transportation mode is activated (see details in section 11)

Some examples of LCD screens are presented in Table 10.

Table 10. Water meter readings (examples)

Screen view	Description
	Software version
	Legally relevant part CRC value
	Legally non-relevant part CRC value
	Water consumption, m3
	Water flow, forward direction, L/h
	Water flow, reverse direction, L/h
	Test mode. See details in section 11.
	Transportation mode. See details in section 11.

13. Communications

The water meter can be accessed locally (via BLE) or remotely via WAN channels LoRaWAN, WM-BUS.

Operating hours of WAN channel is configurable. The list of readout data is coordinated with the Client. See actual parameters below.

13.1 Bluetooth Low Energy



Bluetooth Low Energy (BLE) is used to communicate locally with flow control valve and WM software application and to update the WM firmware.

Standard	BLE specification v5.3
Frequency range	2.4 GHz
Data exchange rate	1 Mbps
Battery	To increase the battery lifespan, BLE operation by a schedule is used. In this case BLE is available at specified time intervals

13.2 LoRaWAN



LoRaWAN provides communication at long distances with very low battery usage and ensures data collection, remote monitoring and control.

Standard	LoRaWAN specification v1.1
Frequency range	EU863-870, US902-928, AU915-928, AS923
Data exchange	Bidirectional: <ul style="list-style-type: none"> • Data from the WMV • Control commands to the WMV (for example, open/close the valve)
Data transmission interval	Configurable 12 hours recommended
Restrictions	To increase the battery lifespan, LoRaWAN operation by a schedule is used. In this case LoRaWAN is available at specified time intervals

13.3 WM-Bus



Wireless M-Bus being a robust, power efficient, long range wireless communication solution, operates in the license-free ISM bands and is used for remote communication between the meter and HES.

Standard	EN13757-4:2005
Frequency range	868 MHz
Operation modes	Supported modes: C1, T1
Data exchange	Unidirectional synchronous transmission. Transmission interval: 20 sec, configurable Interval of consumption Data is 1 hour.
Restrictions	The WMV battery lifespan essentially depends on use case (intensity) of the radio exchange via wireless M-Bus

13.4. NFC



The NFC is short-range wireless technology operating at 13.56 MHz to establish a wireless connection between a reader and a tag. NFC tag is placed in the MWV. When a reader is brought close to the tag, it can read the information stored in the meter and perform a variety of tasks.

Standard	ISO/IEC 15693
Frequency range	13.56 MHz
Data exchange	Data from WMV via a reader compliant with ISO/IEC 15693 or a smartphone
Operation distance	Few centimeters
Data exchange rate	26 Kbps
Restrictions	Not appropriate for large amount of data transfers

14. Pressure loss

The pressure loss increases with flow rate as shown in Fig.6:

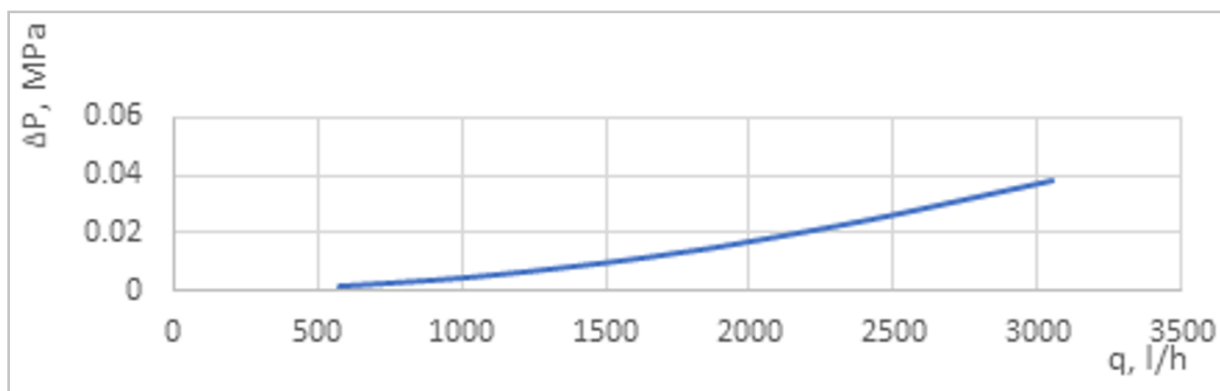


Fig.6 Pressure loss curve for DN15.

15. Firmware update

Non-relevant part of the meter firmware can be updated locally (via BLE). Custom mechanism and image file format are used. The image file is digitally signed by manufacturer to exclude modification.

Before the update is started the meter checks that the image is complete, corresponds to meter type and the digital signature is valid.

16. Security features

Encryption is used to provide confidentiality for data to be stored and transferred. WMV supports the following security schemes:

LoRaWAN:

Based on LoRaWAN® L2 1.0.4 Specification, section 4.3.3 MAC frame payload encryption (FRMPayload)

The encryption scheme features the generic algorithm described in IEEE 802.15.4/2006 Annex B [IEEE802154] using AES encryption with a key length of 128 bits. AES encryption is defined in [NIST-AES].

WM-Bus:

Based on Open Metering System Specification Vol.2 Primary Communication, Section 9. Security.

Both supported security cases are described in Table 37: encryption enabled (Security profile A) and no encryption imposed (No security profile).

The security mode is defined in [EN 13757-7:2018], 9.4.4.

OMS Security profiles

Profile	Encryption	Authentication	Key
No Security profile	No encryption (Security Mode 0) a data are transmitted plain	No MAC (MAC-Mode AT=0) b	No key
Security profile A	AES128-CBC (Security Mode 5) a, d	No MAC (MAC-Mode AT=0) b, d	128 bit persistent symmetric key (with KeyID=0)

BLE and NFC

Based on the DLMS/COSEM specifications.

Meters support the following security policies:

- Security is not imposed (default).
- All messages are authenticated.
- All messages are encrypted.
- All messages are both encrypted and authenticated.

AES-GCM-128 (Galois/Counter Mode of operation of AES-128 encryption algorithm) Security Suite ID: 0 is implemented for data encryption and authentication, and key transport methods.