

CERTIFIKÁT EÚ SKÚŠKY TYPU

EU – type examination certificate

Číslo dokumentu: **SK 17-MI001-SMU052** **Revízia 6**
Document number: **SK 17-MI001-SMU052** **Revision 6**
Document number: **SK 17-MI001-SMU052** **Revision 6**
Revízia 6 nahrádza certifikát zo dňa 9. novembra 2021
Revision 6 replaces the certificate issued by November 9, 2021
Revízia 6 nahrádza certifikát zo dňa 9. novembra 2021
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V súlade s: prílohou č. 2, Modul B nariadenia vlády Slovenskej republiky č. 145/2016 Z.
In accordance with: **prílohou č. 2, Modul B nariadenia vlády Slovenskej republiky č. 145/2016 Z.**
In accordance with: **prílohou č. 2, Modul B nariadenia vlády Slovenskej republiky č. 145/2016 Z.**
z. o sprístupňovaní meradiel na trhu v znení nariadenia vlády SR č. 328/2019
Z. z., ktorým sa preberá smernica Európskeho parlamentu a Rady 2014/32/EU
o harmonizácii právnych predpisov členských štátov týkajúcich sa
sprístupnenia meradiel na trhu
Annex II, Module B to Government Ordinance of the Slovak Republic No. 145/2016 Coll. Relating to the making available on the market of measuring instruments as amended by Government Ordinance of the Slovak Republic No. 328/2019 Coll., which implemented the Directive 2014/32/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments

Žiadateľ/Výrobca: **INTEGRA METERING**
Issued to (Manufacturer): **INTEGRA METERING**
Issued to (Manufacturer): **INTEGRA METERING**
12 Rue Fontgrasse, 31700 Blagnac, France

Druh meradla: **Vodomer (MI-001)**
Type of instrument: **Vodomer (MI-001)**
Type of instrument: **Vodomer (MI-001)**
Water meter (MI-001)

Označenie typu: **TSO**
Type designation: **TSO**

Základné požiadavky: príloha č. 1 a príloha č. 3 Vodometry (MI-001) k nariadeniu vlády SR
Essential requirements: **príloha č. 1 a príloha č. 3 Vodometry (MI-001) k nariadeniu vlády SR**
Essential requirements: **príloha č. 1 a príloha č. 3 Vodometry (MI-001) k nariadeniu vlády SR**
č. 145/2016 Z. z. v znení nariadenia vlády SR č. 328/2019 Z. z.
Annex No. I and Annex No. III Water meters (MI-001) to Government Ordinance of the Slovak Republic No. 145/2016 Coll. as amended by Government Ordinance of the Slovak Republic No. 328/2019 Col.

Platnosť do: **28. septembra 2027**
Valid until: **28. septembra 2027**
Valid until: **28. septembra 2027**
September 28, 2027

Notifikovaná osoba: **Slovenský metrologický ústav 1781**
Notified body: **Slovenský metrologický ústav 1781**
Notified body: **Slovak Institute of Metrology 1781**

Dátum vydania: **20. apríla 2023**
Date of issue: **20. apríla 2023**
Date of issue: **April 20, 2023**

Základné charakteristiky, popis meradla a podmienky schválenia sú uvedené v prílohe, ktorá je súčasťou tohto certifikátu. Certifikát vrátane prílohy má spolu 12 strán.

Essential characteristics, instrument description and approval conditions are set out in the appendix hereto, which forms the part of the certificate. The certificate including the appendix contains 12 pages.



Viliam Mazúr
zástupca notifikovanej osoby
representative of notified body

Poznámka: Tento certifikát EÚ skúšky typu môže byť rozmnožovaný len celý a nezmenený. Bez podpisu a odtlačku pečiatky je neplatný.
Note: This EU-type examination certificate shall not be reproduced except in full. Certificates without signature and stamp are not valid.

History of the Certificate

Issue of the Certificate	Date	Modification
SK 17-MI001-SMU052, Revision 0	September 29, 2017	Initial certificate
SK 17-MI001-SMU052, Revision 1	January 4, 2018	New nominal diameter (DN20)
SK 17-MI001-SMU052, Revision 2	June 4, 2019	New nominal diameter (DN25), Reverse flow measurement, Software version and checksum, Class of electromagnetic environment
SK 17-MI001-SMU052, Revision 3	November 8, 2019	New nominal diameter (DN32, DN40, DN50), climatic environments change
SK 17-MI001-SMU052, Revision 4	February 11, 2021	New pipe lengths
SK 17-MI001-SMU052, Revision 5	November 9, 2021	New pipe lengths BOM update
SK 17-MI001-SMU052, Revision 6	April 20, 2023	Adding alternative temperature class T30, ratio R160 (for DN40 and DN25), software update - version 1.09

1 Instructions and standards used within assessment
1.1 Generally binding instructions

Meter type was examined in terms of request for given type provisions Government Ordinance of the Slovak Republic No. 145/2016 Coll. relating to the making available on the market of measuring instruments as amended by Government Ordinance of the Slovak Republic No. 328/2019 Coll., which implemented the Directive 2014/32/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments as later amended (next Government Ordinance).

Requirements are set out in Annex No. 1 and Annex No. 3 Water Meters (MI-001) to Government Ordinance of SR No. 145/2016 Coll. as amended by Government Ordinance of the Slovak Republic No. 328/2019 Coll.

1.2 Technical specification used:

OIML R 49-1:2013	Water meters intended for the metering of cold potable water and hot water. Part 1: Metrological and technical requirements
OIML R 49-2:2013	Water meters intended for the metering of cold potable water and hot water. Part 2: Test methods
OIML R 49-3:2013	Water meters intended for the metering of cold potable water and hot water. Part 3: Test report format
EN ISO 4064-1: 2017	Water meters for cold potable water and hot water. Part 1: Metrological and technical requirements
EN ISO 4064-2: 2017	Water meters for cold potable water and hot water. Part 2: Test methods
EN ISO 4064-3: 2014	Water meters for cold potable water and hot water. Part 3: Test report format
EN ISO 4064-5: 2017	Water meters for cold potable water and hot water. Part 5: Installation requirements
WELMEC Guide 7.2: 2022	Software Guide



2 Type marking

Ultrasonic water meter – TSO

Meter is made in following subgroups:

Type of meter	Temperature class	Classes	Nominal Diameter
TSO	T30, T50	M1 ⁽¹⁾ O ⁽²⁾ E2 ⁽¹⁾	DN15, DN20, DN25, DN32, DN40, DN50

3 Description of measuring instrument

Meter name: Ultrasonic water meter

Type marking: TSO

Description of operating principle instrument design:

The TSO is a family of ultrasonic water meters which has been designed for measuring of flow and delivered water quantity.

Ultrasonic water meter (Picture No. 1) consists of:

- measurement box (IP 68 electronic module composed with two layers of PCB: one is measurement board, which includes INTEGRA METERING ultrasonic chip; one is for user board, which realizes customized display and advanced communication functions),
- meter body (designed with high hydrodynamic performance, very low-pressure loss with reduction of diameter and resistance to corrosion),
- transducer (two transducers with 4 MHz frequency).

The new design in this revision of ultrasonic water meter TSO is designed to measure reverse flow.



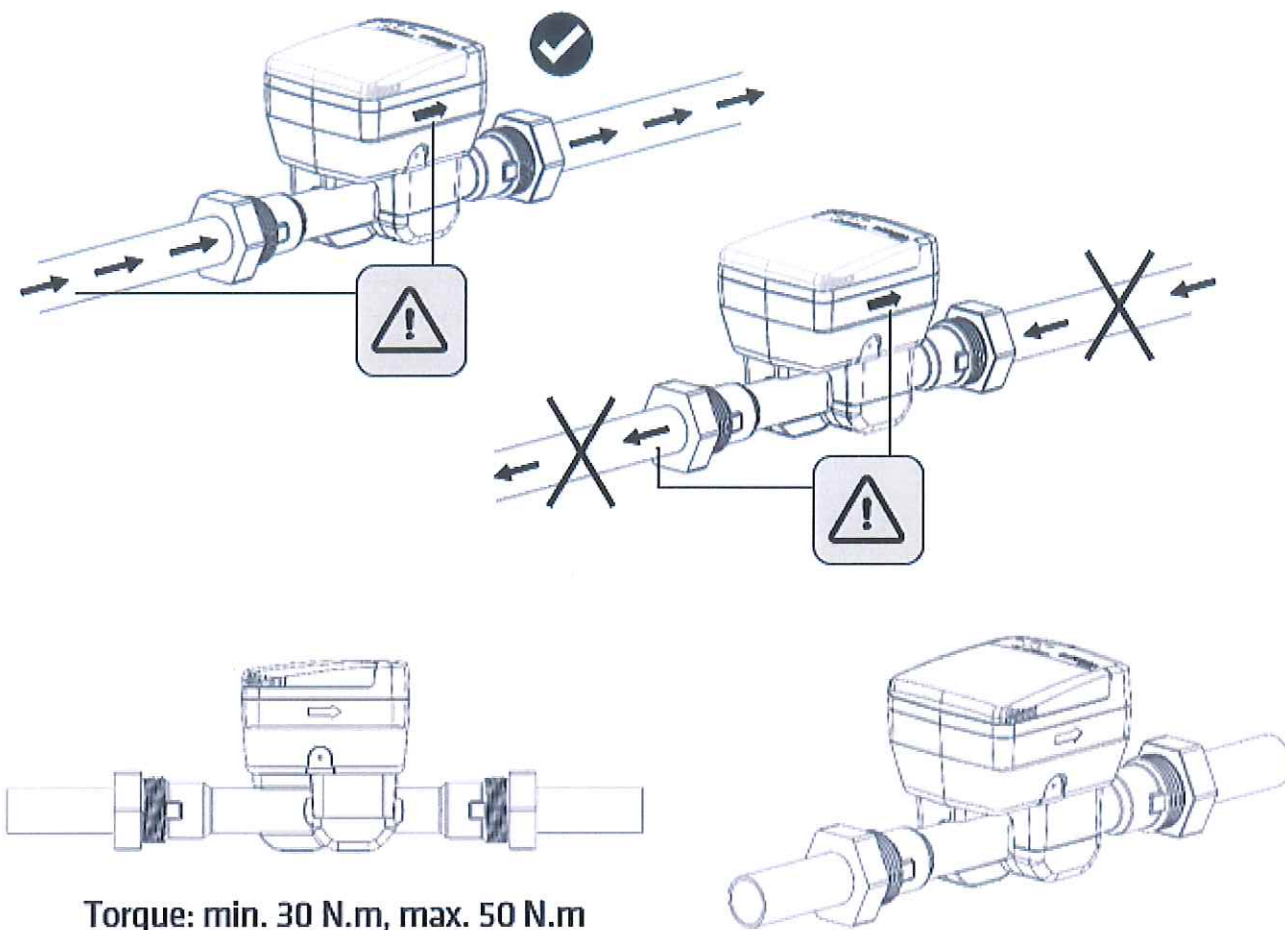
Picture No.1 Ultrasonic water meter TSO

¹ according to Government Ordinance of the Slovak Republic, Annex No. 1

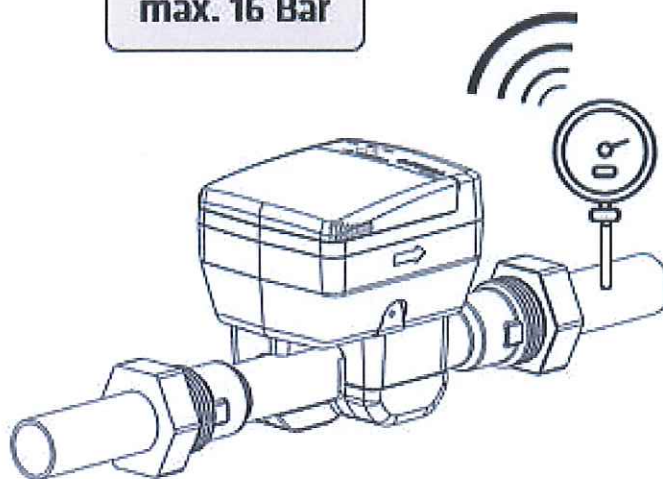
² according to EN ISO 4064-1:2017 and OIML R 49-2:2013



Water meters can operate in horizontal or vertical position without consequences on accuracy. Pipes must always be filled with water when the device is counting. Follow illustrations below for instructions on mounting the sensor (Picture No. 2).



max. 16 Bar



Picture No.2 Instructions on mounting the sensor

3.1 Description of subgroups

Marking: TSO

DN: DN15, DN20, DN25, DN32, DN40, DN50

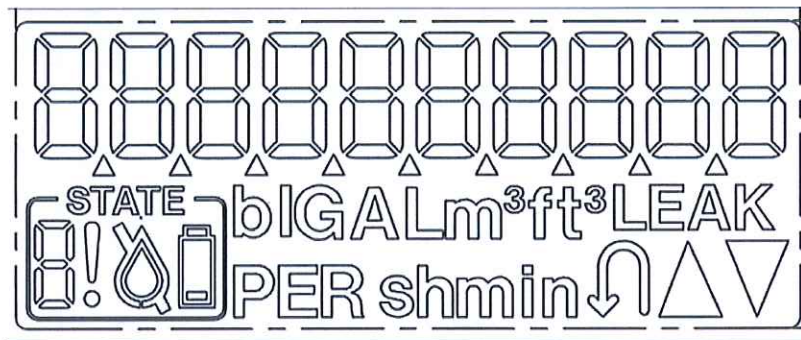
3.2 Flow sensor

The structure of flow sensor is shown in the drawings according to item 3.5 of this Annex.

Flow sensor consists of measuring tube with 2 inner sensitive transducers. The tube is of brass. Connections of flow sensor are male thread.

3.3 Measurement box






The measurement box is the electronic part of the water meter. The main part is the embedded ASIC designed by INTEGRA METERING, which generates 4 MHz excitation on transducers, the response is then processed by the converter which is converted to flow on the display of the water meter. Following data are available: Instantaneous flow rate and index. A pulse output is also available.







Picture No.3 LCD Screen

3.4 Display functions

When water is inside the pipe, the LCD screen (Picture No. 3) reads flow as follows:

Net volume Units : m3, L			
Forward volume Same units		Reverse volume With "-" Sign Same units	
Actual flow rate (if reverse flow "-" Sign) Units : m3/h, L/h		Metrology F/W version & Checksum	

Every 120 seconds, the following sequence will be inserted. The sequence frequency can be set at factory (no user configuration).

5	All Segments "ON"		1 s
6	All Segments "OFF"		1 s
7	Metrology FW version + Checksum "ON"		4 s
8	All Segments "OFF"		1 s

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3.5 Principle of operation

The ultrasonic water meter uses two ultrasonic transducers that can both send and receive sound. The sound is transmitted between the transducers through the water that goes through the meter. The sound propagation time between the transducers is measured in both directions. If there is no fluid motion, the propagation times in two directions are ideally the same. But if there is fluid motion, it will cause the downstream time to decrease and the upstream one to increase. The difference of two propagation time could be used to calculate the flow velocity. Then the flow rate can be calculated thanks to the section of the pipe.

3.6 Technical documentation

A number of drawings of technical documentations are listed in the following list:

Drawing Number	Title	Drawing Number	Title
ALA 102101-06A ALA 102101-01A ALA 102111-04A ALA 102111-06A	pipe DN15 L110	ALB 102101-01A ALB 102111-03A ALB 102111-06A ALB 102611-06A	Pipe DN 20 L190
ALA 104001	Cork	ALB 104002	Box DN 20
ALA 104002	Box DN15	ALC 104002	Box DN 25
ALA 104003 ALA 104000	Screen cover (2 lists)	ALC 102101-01A ALC 102111-04A ALC 102111-05A ALC 102111-06A	Pipe DN 25 L260
ALA 104004	Battery holder	ALD 104002	Box DN 32
ALA 105001	Hood	ALD 102101-01A ALD 102111-01A ALD 102111-06A	Pipe DN 32 L260
ALA 105002 or ALA 505002	Lid PW	ALE 104002	Box DN 40 and DN 50
ALA 102411-06A	Pipe DN15 L115	ALE 102111-07A	Pipe DN 40 L300
ALA 102511-06A	Pipe DN15 L130	ALF 102101-01A ALF 102111-01A ALF 102111-07A	Pipe DN 50 L300
ALA 102611-06A	Pipe DN15 L135	ALA 102211-06A	Pipe DN15 L165
ALA 102711-06A	Pipe DN15 L145	ALA 102311-06A	Pipe DN15 L170
ALA 102911-06A	Pipe DN15 L190	ALB 102511-06A	Pipe DN20 L130

Drawing Number	Title	Drawing Number	Title
ALB102211-06A ALB 102201-01A	Pipe DN20 L220	ALC 102211-06A	Pipe DN25 L150
ALB 102411-06A	Pipe DN20 L165	ALB 102311-06A	Pipe DN20 L105
ALF 102211-07A	Pipe DN50 L270	ALC 102611-06A	Pipe DN25 L175
ALA 102811-06A	Pipe DN15 L160		

All drawings, schemes and technical documentations used during the conformity assessment are saved in document No. NO-362/17, NO-362/17/2, NO-415/19, NO-425/19, NO-493/21, NO-519/21 and NO-585/23.

4 Basic technical characteristics

Type marking		TSO
Nominal diameter DN	mm	15, 20, 25, 32, 40, 50
Indicating range	m ³	999 999
Resolution of the reading	m ³	0,0001
Maximum admissible pressure	-	MAP16
Working pressure range	bar	from 0,3 to 16
Temperature class	-	T30, T50
Flow profile sensitivity classes	-	U0 / D0
Position	-	H, V
Climatic and mechanical environments	-	Outdoor /from -10°C to 70°C/ mech. class M1
Electromagnetic environments	-	E2



4.1 Additional technical characteristics

Environmental protection (IP Code)	IP 68					
Power source	Lithium Battery, 3.6 V (2 non-replaceable batteries), 15 years lifetime No external AC/DC connection for Wired M-BUS Capacity: 17Ah - 2 x C type 3.6 VDC; Lithium Battery, 3.6 V (1 non-replaceable battery), 10 years lifetime No external AC/DC connection for LORA					
Outputs	Pulse output, with pulse coefficient to be programmed at order, LORA, wired M-BUS, open collector, wireless M-BUS 434 MHz, wireless M-BUS 868 MHz					
Connection	Thread G¾”B	Thread G1”B	Thread G1¼”B	Thread G1½”B	Thread G2”B	Thread G2½”B
Display	LCD, 10 digits					
Software	Type P, Risk class C, extension L, T, S (Welmeq Guide 7.2)					
Software version and checksum	1.04; checksum 49D8 1.06; checksum 1FCF 1.09; checksum EE0B (EE0BBECF)					

5 Basic metrological characteristics

The maximum permissible error (accuracy class):

$$\pm 5 \% (Q_1 \leq Q < Q_2);$$

$$\pm 2 \% (Q_2 \leq Q \leq Q_4) \text{ for water temperature (from 0.1 to 30) } ^\circ\text{C};$$

$$\pm 3 \% (Q_2 \leq Q \leq Q_4) \text{ for water temperature greater than 30 } ^\circ\text{C}.$$

Nominal diameter			DN15		DN20				DN25				
Length ID*	-	-	15L1 to 15L10		20L2, 20L3		20L1	20L4 to 20L6		25L0, 25L1, 25L2			
Connection	-	mm	15		20				25				
Measuring Range	Q_3/Q_1	-	250	500	250	500	250	500	250	500	160	250	500
Minimum flow rate	Q_1	L/h	10	5	10	5	16	8	16	8	25 / 62,5	25,2	12,6 / 20
Transitional flow rate	Q_2	L/h	16	8	16	8	25,6	12,8	25,6	12,8	40 / 100	40,3	20,2 / 32
Permanent flow rate	Q_3	m ³ /h	2,5		4				4 / 10		6,3	6,3 / 10	
Overload flow rate	Q_4	m ³ /h	3,125		5				5 / 12,5		7,875	7,875 / 12,5	
Pressure loss class	-	-	Δp 25		Δp 40		Δp 25		Δp 25				
Ratio	Q_2/Q_1	-	1,6										

Nominal diameter			DN32		DN40		DN50	
Length ID*	-	-	32L1		40L1		50L0, 50L1	
Connection	-	mm	32		40		50	
Measuring Range	Q_3/Q_1	-	500		160	500		500
Minimum flow rate	Q_1	L/h	20		100	32		50
Transitional flow rate	Q_2	L/h	32		160	51,2		80
Permanent flow rate	Q_3	m ³ /h	10		16		25	
Overload flow rate	Q_4	m ³ /h	12,5		20		31,25	
Pressure loss class	-	-	Δp 25					
Ratio	Q_2/Q_1	-	1,6					

*See table in 10.1 installation data

6 Results of conformity assessment

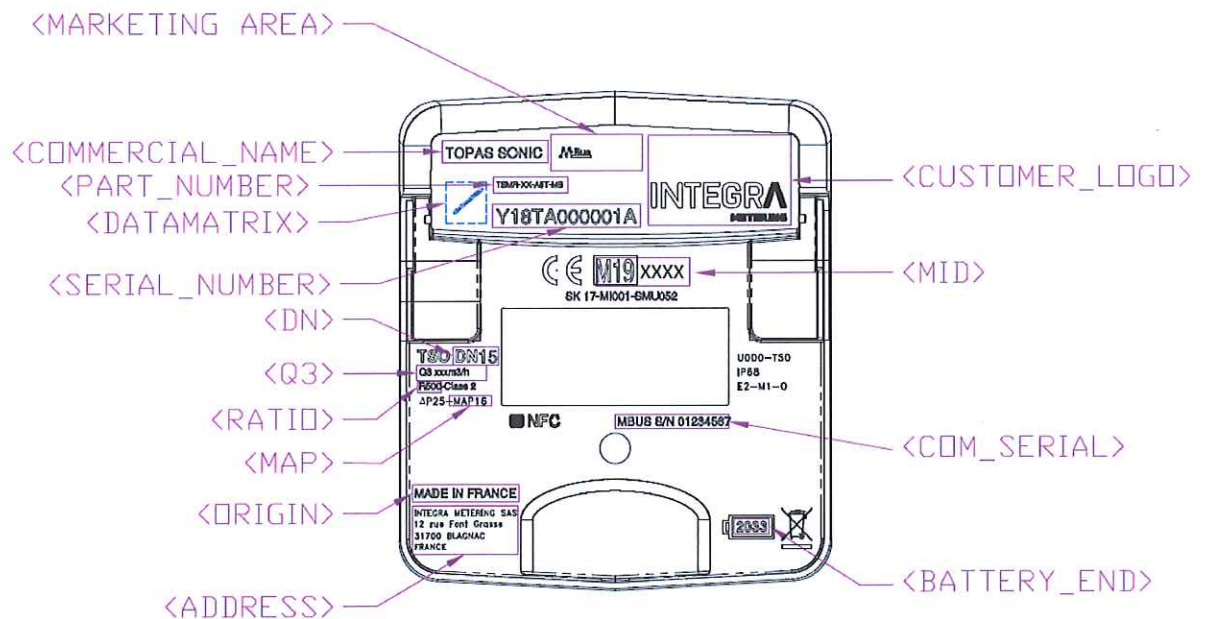
The results of tests, assessments and evaluations given in the evaluation report No. NO-585/23/B/ER dated April 18, 2023 give sufficient evidence, that the technical design of the measuring instrument – Ultrasonic water meter type TSO is in compliance with the technical requirements of the Slovak Republic Governmental Ordinance No. 145/2016 Coll, relating to the making available on the market of measuring instruments as amended by Government Ordinance of the Slovak Republic No. 328/2019 Coll, Annex No. 1 and Annex No. 3 Water Meters (MI-001) and with the requirements determined in EN ISO 4064-1:2017, respectively OIML R49-1:2013, which are relevant for this type of meter.



7 Data placed on the measuring instrument

On the shroud, the dial of the indicating device (shown in Picture No. 4) or on an identification plate of every water meter or in the product documentation minimum the following data should be marked:

- a) producer’s name, registered trade name or registered trade mark and contact postal address
- b) type of the Ultrasonic water meter
- c) measuring unit m³
- d) numerical value of Q_3 and ratio Q_3/Q_1
- e) production number and the year of production
- f) number of EU-type examination certificate and conformity mark
- g) the highest admissible pressure if it differs from 1 MPa
- h) flow direction
- i) the temperature class where it differs from T30
- j) class of pressure loss if it differs from Δp_{63}
- k) class of climatic and mechanical environment
- l) flow profile sensitivity classes
- m) class of electromagnetic environment
- n) for a non-replaceable battery: the latest date by which the meter shall be replaced



Picture No.4 Marking for TSO



8 Conditions of conformity assessment of measuring instruments produced with type approval

Ultrasonic water meter put onto the market in line with the procedure of conformity assessment according to the Annex No.2 (Module D or F) of the Governmental ordinance should be in compliance with the technical description by the item 3 of this report and at test should be in compliance with the requirements determined in OIML R 49-1:2013 and EN ISO 4064-1:2017, Metrological test is performed by testing equipment which should be in compliance with the requirements determined in EN ISO 4064-2:2017 and water at temperature $20\text{ °C} \pm 5\text{ °C}$ at the following flowrates:

- a) Minimum flowrate $Q_1 \leq Q \leq 1,1Q_1$
- b) Transitional flowrate $Q_2 \leq Q \leq 1,1Q_2$
- c) Permanent flowrate $0,9Q_3 \leq Q \leq Q_3$

A metrological test may only be performed by a producer, or a notified body respectively in line with the conformity assessment procedure according to the Annex No.2 (Module D or F) of the Governmental ordinance respectively. Measures asked for providing measuring instrument integrity

9 Measures asked for providing measuring instrument integrity

9.1 Identification

Ultrasonic water meter should be in compliance with the description provided on item 3 of this Annex and should be in compliance with the marking specified the item 7 of this Annex. The number given to the EU-type examination certificate is put at each piece of the measuring instrument.

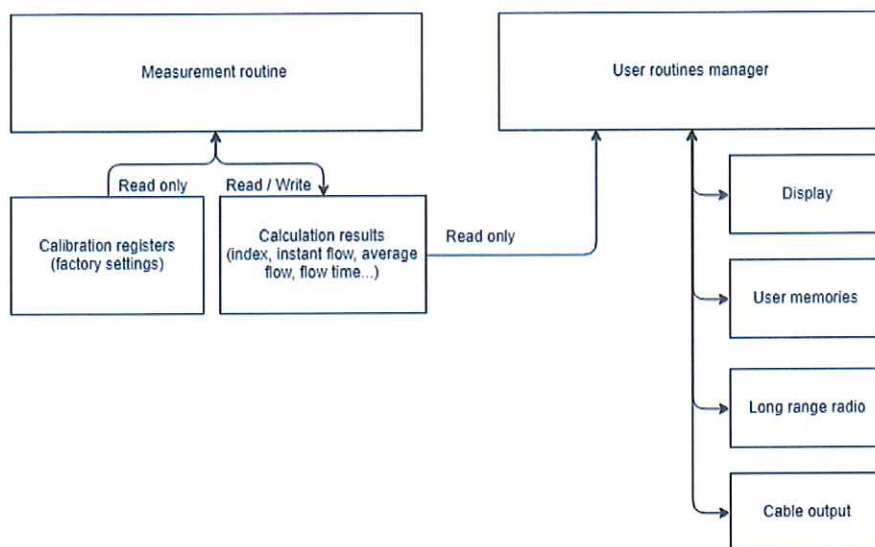
Emplacement of the conformity mark is determined by § 15 of the Governmental ordinance.

9.2 Sealing of the measuring instrument

Ultrasonic water meter shall be sealed before the conformity assessment according to the Annex No.2 (Module D or F) of the Governmental ordinance sealed by following sealing marks. The TSO does not have specific seals since the screen cover is impossible to remove due to the potting of the inside of the flowmeter. Removing hood will be detectable by dead clip design.

The software is sealed by a password different for each water meter produced. The legal parameters are stored on a read-only memory. The legally relevant software is identified by a CRC-16 and CRC-32. The user software is not identified by a CRC. (Picture No.5).





Picture No.5 Global software overview

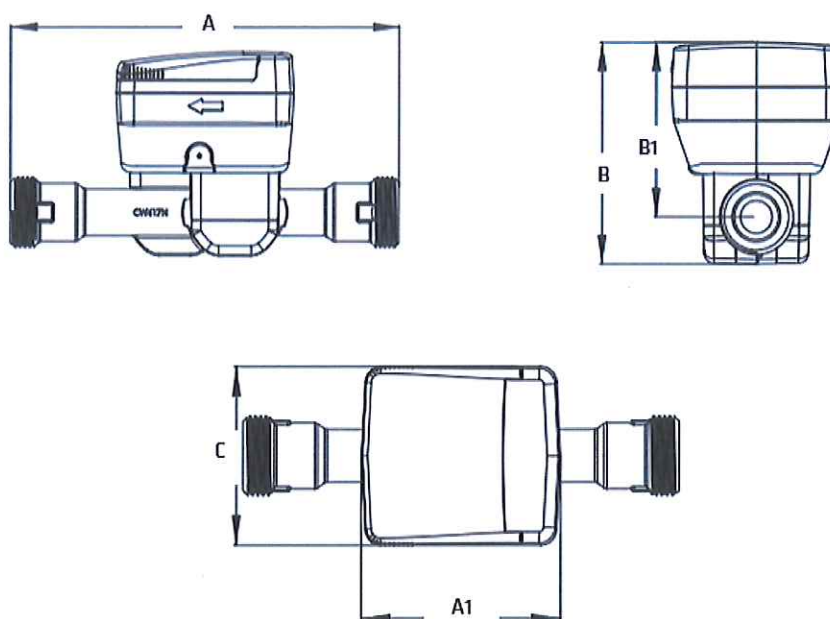
10 Requirements for installation, especially conditions of usage

10.1 Installation data

Nominal diameter (DN)	25	25	25	32	40	50	50
Length ID	25L0	25L1	25L1	32L1	40L1	50L0	50L1
Total length (A) – [mm]	150	175	260	260	300	270	300
Height (B1) – [mm]	77	77	77	77	77	77	77
Total height (B) – [mm]	98	98	98	101	107	115	115
Width (C) – [mm]	76	76	76	76	76	76	76
Housing Length (A1) – [mm]	87	87	87	87	87	87	87
Weight [kg]	1	1,1	1,5	1,5	1,9	2,3	2,4

Nominal diameter (DN)	15									
Length ID	15L1	15L2	15L3	15L4	15L5	15L6	15L7	15L8	15L9	15L10
Total length (A) – [mm]	110	115	130	135	145	160	165	170	175	190
Height (B1) – [mm]	77	77	77	77	77	77	77	77	77	77
Total height (B) – [mm]	98	98	98	98	98	98	98	98	98	98
Width (C) – [mm]	76	76	76	76	76	76	76	76	76	76
Housing Length (A1) – [mm]	87	87	87	87	87	87	87	87	87	87
Weight [kg]	0,8	0,8	0,9	0,9	0,9	1	1	1	1	1

Nominal diameter (DN)	15			20		
Length ID	20L1	20L2	20L3	20L6	20L4	20L5
Total length (A) – [mm]	130	165	190	105	190	220
Height (B1) – [mm]	77	77	77	77	77	77
Total height (B) – [mm]	98	98	98	98	98	98
Width (C) – [mm]	76	76	76	76	76	76
Housing Length (A1) – [mm]	87	87	87	87	87	87
Weight [kg]	0,9	1	1	0,8	0,9	1



Picture No. 6 Installation dimensions

10.2 Installation requirements

The Ultrasonic water meter is introduced into the operation by a worker having a certificate for this activity performance. Water meter can be put into use after a construction in line with this report and with the producer`s document “Instruction of installation and conditions of use of ultrasonic water meters”. A measuring instrument should be installed in direction of water flow arrow marked on the meter body.

10.3 Conditions of use

The measuring instrument should be used within the recommendations of a producer.



Assessment done by: Ing. Viliam Mazúr

