AXIØMA METERING

Real needs.

Real solutions.

Smart ultrasonic water meter

Qalcosonic W1

Technical description

Installation manual and user guide

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EU Declaration of Conformity

AXIOMA Metering UAB, Veterinarų str. 52, Biruliškių k., Kaunas district, Lithuania, hereby declares that the water meter QALCOSONIC W1 conforms to the essential requirements of the following Directives:

2014/32/EU Directive 2014/32/EU 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 (recast).

2014/30/EU Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (recast).

2014/35/EU Directive 2014/35/EU 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 electrical equipment designed for use within certain voltage limits.

2014/53/EU Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment.

2011/65/EU Directive 2011/65/EU of the European Parliament and of the council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronical equipment.

2006/66/EC Directive 2006/66/EC of the European Parliament and of the council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC.

2012/19/EU Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE).

(EU) 2015/863 Commission Delegated Directive (EU) 2015/863 of 31 March 2015 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances.

EU-Type Examination Certificate No: LT-1621-MI001-034 rev.16

Quality System Certificate No: KS-1621-MP-003.24

The Notified Body: Laboratory of Heat Equipment Research and Testing of the Lithuanian Energy Institute, Lithuania, Notified Body Number 1621.

For EU Customers only – WEEE Marking
Marking of electrical and electronic equipment in accordance with Article 14 (2) of Directive 2012/19/EU. It is prohibited to dispose a meter marked with this sign into an unsorted municipal waste container together with other waste! This symbol on the product indicates that it will not be treated as household waste. It must be handed over to the applicable take-back scheme for the recycling of electrical and electronic equipment. For more detailed information about the recycling of this product, please contact your local municipal office.

Safety Information

Before beginning of installation works you must read this document and follow its instructions.

The meter is battery-powered (3.6 V), risk factors during the meter installation and service fluid flowing within flow sensor with inner pressure up to 1,6 MPa and temperature up to 90°C.

- Only qualified technical personnel may install and maintain water meters. Personnel must be familiar with appropriate technical documentation and general safety instructions. It is necessary to follow general safety requirements during installation and maintenance process.
- Safety guarantees at installation and service of meter is:
  - Hermetic fitting of primary flow sensor into the pipeline.
  - Reliable fastening of water meter at installation.

WARNING!
Mounting of the sub-assemblies of water meter is permissible only after ensuring of absence of fluid and pressure in the pipeline.

- The meter can be used at ambient temperature: -15°C ... +70°C

CAUTION:
If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

- Storage and transportation temperature: -25°C ... +70°C (drained flow part)

1. Technical Regulation Requirements

Ultrasonic water meter QALCOSONIC W1 is designed for measurement of cold and hot water consumption.
The meter corresponds to essential requirements of the Technical Regulation requirements Annexes I and MI 001.
The meter complies with the requirements of European Standards EN ISO 4064, requirements of OIML R49-1 and WELMEC 7.2.

Climatic Environmental Conditions:

Temperature range: from -15°C to +70°C
Humidity: condensing
Mechanical environment class: M1
Electromagnetic environment class: E2

2. Technical Data

Ratio of the permanent flow rate to the lower limit of the flow rate (selectable by the user):
Q_3/Q_1 = 80, Q_3/Q_1 = 160, Q_3/Q_1 = 250, Q_3/Q_1 = 315, Q_3/Q_1 = 400, Q_3/Q_1 = 800, Q_3/Q_1 = 1000

The technical data of the meter is provided in Table 1.1

Table 1.1

Permanent flow rate Q_3, m³/h	Ratio R Q_3/Q_1	Overload flow rate Q_4, m³/h	Minimum flow rate Q_1, m³/h	Transitional flow rate Q_2, m³/h	Starting flow m³/h	Connection to the pipeline (Thread – G)	Overall length L, mm	Pressure loss class Δp (bar x 100): without filter / with filter strainer
1,6	80	2,00	0,0200	0,0320	0,001	G ¾	80[1], 105[1], 110, 115[1], 165, 170	For forward and reverse flow: Δp 16 / Δp 16
1,6	160	2,00	0,0100	0,0160	0,001			
1,6	250	2,00	0,0064	0,0102	0,001			
1,6	315	2,00	0,0051	0,0081	0,001			
1,6	400	2,00	0,0040	0,0064	0,001			
2,5	80	3,125	0,0313	0,0500	0,001	G ¾	80[1], 105[1], 110, 115 [1], 165, 170	For forward flow: Δp 25 / Δp 25 For reverse flow: Δp 25 / Δp 40
2,5	160	3,125	0,0156	0,0250	0,001			
2,5	250	3,125	0,0100	0,0160	0,001			
2,5	400	3,125	0,0063	0,0100	0,001			
2,5	500	3,125	0,0050	0,0080	0,001			
2,5	800	3,125	0,0031	0,0050	0,001			
2,5	80	3,125	0,0313	0,0500	0,002	G1	105, 110[1], 130, 165, 190	For forward and reverse flow: Δp 16 / Δp 16
2,5	160	3,125	0,0156	0,0250	0,002			
2,5	250	3,125	0,0100	0,0160	0,002			
2,5	400	3,125	0,0063	0,0100	0,002			
4,0	80	5,00	0,0500	0,0800	0,002	G1	105, 110[1], 130, 165, 190	For forward flow: Δp 25/ Δp 40 [2] For reverse flow: Δp 25 / Δp 40
4,0	160	5,00	0,0250	0,0400	0,002			
4,0	250	5,00	0,0160	0,0256	0,002			
4,0	400	5,00	0,0100	0,0160	0,002			
4,0	500	5,00	0,0080	0,0128	0,002			
4,0	800	5,00	0,0050	0,0080	0,002			
6,3	80	7,875	0,0788	0,1260	0,003	G1 ¼	260	For forward and reverse flow: Δp 25 / Δp 40
6,3	160	7,875	0,0394	0,0630	0,003			
6,3	250	7,875	0,0252	0,0403	0,003			
6,3	400	7,875	0,0158	0,0252	0,003			
6,3	500	7,875	0,0126	0,0202	0,003			
6,3	800 [3]	7,875	0,0079	0,0126	0,003			
10	80	12,50	0,1250	0,2000	0,003	G1 ¼	260	For forward flow: Δp 63 / Δp 63 For reverse flow: Δp 63 / N/A [4]
10	160	12,50	0,0625	0,1000	0,003			
10	250	12,50	0,0400	0,0640	0,003			
10	400	12,50	0,0250	0,0400	0,003			
10	500	12,50	0,0200	0,0320	0,003			
10	800 [3]	12,50	0,0125	0,0200	0,003			
10	1000 [3]	12,50	0,0100	0,0160	0,003			
6,3	80	7,785	0,0788	0,1260	0,005	G1 ½	260	For forward and reverse flow: Δp 16 / Δp 16
6,3	160	7,785	0,0394	0,0630	0,005			
6,3	250	7,785	0,0252	0,0403	0,005			
6,3	400	7,785	0,0158	0,0252	0,005			

10	80	12,50	0,1250	0,2000	0,005	G1 ½	260	For forward and reverse flow: Δp 25 / Δp 25
10	160	12,50	0,0625	0,1000	0,005			
10	400	12,50	0,0250	0,0400	0,005			
10	500	12,50	0,0200	0,0320	0,005			
10	800 [3]	12,50	0,0125	0,0200	0,005			
10	80	12,50	0,1250	0,2000	0,010	G2	300	For forward and reverse flow: Δp 16 / Δp 16
10	160	12,50	0,0625	0,1000	0,010			
10	250	12,50	0,0400	0,0640	0,010			
16	80	20,00	0,2000	0,3200	0,010	G2	300	For forward and reverse flow: Δp 16 / Δp 16
16	160	20,00	0,1000	0,1600	0,010			
16	250	20,00	0,0640	0,1024	0,010			
16	400	20,00	0,0400	0,0640	0,010			
16	500	20,0	0,0320	0,0512	0,010			
16	800 [3]	20,00	0,0200	0,0320	0,010			
25	80	31,25	0,3125	0,5000	0,010	G2	300	For forward and reverse flow: Δp 16 / Δp 25
25	160	31,25	0,1563	0,2500	0,010			
25	250	31,25	0,1000	0,1600	0,010			
25	400	31,25	0,0625	0,1000	0,010			
25	500	31,25	0,0500	0,0800	0,010			
25	800 [3]	31,25	0,0313	0,0500	0,010			
16	80	20,00	0,2000	0,3200	0,016	DN50	200	For forward and reverse flow: Δp 16 / Δp 25
16	160	20,00	0,1000	0,1600	0,016			
16	250	20,00	0,0640	0,1024	0,016			
16	400 [3]	20,00	0,0400	0,0640	0,016			
25	80	31,25	0,3125	0,5000	0,016	DN50	200	For forward and reverse flow: Δp 25 / Δp 63
25	160	31,25	0,1563	0,2500	0,016			
25	250	31,25	0,1000	0,1600	0,016			
25	400	31,25	0,0625	0,1000	0,016			
25	500	31,25	0,0500	0,0800	0,016			
25	800 [3]	31,25	0,0313	0,0500	0,016			
40	80	50,00	0,5000	0,8000	0,016	DN50	200	For forward and reverse flow: Δp 63 [5]
40	160	50,00	0,2500	0,4000	0,016			
40	250	50,00	0,1600	0,2560	0,016			
40	400	50,00	0,1000	0,1600	0,016			
40	500	50,00	0,0800	0,1280	0,016			
40	800 [3]	50,00	0,0500	0,0800	0,016			

Note:

[1] meters are produced only in the A design version

[2] for meters Q_3 = 4 m³/h, threaded end connection G1, L = 190mm, when installed the filter strainer, the pressure loss class Δp 40 is valid. For all other lengths of meter Q_3 = 4 m³/h with filter, the pressure loss class Δp 25 applies.

[3] this flow ratio is only valid for meters with temperature class T30.

[4] meters Q_3 = 10 m³/h, threaded end connection G 1 ¼ and with reverse flow measurement function are installed only without filter-strainer.

[5] meters DN50, Q_3 = 40 m³/h are installed only without filter strainer

Meter temperature class	Water temperature range:
T 30	(0,1ºC ... 30ºC)
T 50	(0,1ºC ... 50ºC)
T 70	(0,1ºC ... 70ºC)
T 30/70	(30ºC ... 70ºC)
T 30/90	(30ºC ... 90ºC)
T 90	(0,1ºC ... 90ºC)

- Maximum admissible working pressure (pressure class) 16 bar (MAP16)
- Flow profile sensitivity class U0 D0
- Unit of volume measurement: m^3 (on LCD display)
- Resolution of a displaying device 0,001 m^3
- Displaying range 999999,999 m^3

The maximum permissible error (MPE) on volumes delivered at flow rate between the transitional flow rate Q_2 (included) and the overload flow rate Q_4 (included) is:

- When water temperature ≤ +30 ºC ± 2 %
- When water temperature > +30 ºC ± 3 %

The maximum permissible error (MPE) on volumes delivered at flow rate between the minimum flow rate Q_1 (included) and the transitional flow rate Q_2 (excluded) for water having any temperature is 5%.

If the flow rate exceeds the maximum value Q_4, error (status) code „Overflow" is present and calculations are:

- When the flow rate $Q \leq 1.2 \times Q_4$, the flow rate measurement and calculations are continued.
- When the flow rate $Q > 1.2 \times Q_4$, calculations are performed using $1.2 \times Q_4$ flow rate value.

2.1 Display (LCD)

The device is equipped with 2-line LCD (Liquid Crystal Display). Upper line with 9-digits for displaying measured volume of water:

- Readings in User mode: m^3 (three digits after decimal point).
- Readings in Test (verification) mode: m^3 (six digits after decimal point).

Lower line with 5-digits for displaying current flow rate in m^3/h and special symbols for displaying operation modes.

In the case of battery discharge, all integral readings and archive data shall be saved for up to 16 years and can be accessed at the meter manufacture's base by connecting a power battery in the operating condition.

2.2 Data Recording and Storage

The meter stores an archive of hourly, daily, and monthly values in its memory. Archive values, specified in Paragraph 6.3, can be shown on the display.

The meter stores values of the following parameters hourly, daily, and monthly:	
1	Integral of water consumption
2	Integral of water consumption in the forward direction
3	Integral of water consumption in the reverse direction
4	Minimum and Maximum flow rate value and date
5	Error (Status) code
6	Total operating time
7	Operating time without error
8	Minimum, maximum, and average temperature

Data logger capacity:

- Up to 1480 hours for hourly records.
- Up to 1130 days for daily records.
- Up to 36 last months for monthly records.

Archive data storage time not less than 36 months. Storage time of measured integrated parameters in not less than 16 years, even if device is disconnected from power supply.

2.3 Alarms

Qalcosonic W1 meter has an integrated system that informs about certain alarms, which are indicated as an error code on LCD and transmitted as a status byte within data telegrams. Some of them are critical and could be sent immediately over LoRa or NB – IoT.

List of alarms:

- **Leakage** (occurs when constant flow rate within 24 hours is more than 0.25/0.5/1% of Q3). Disappears after 1 hour, if constant flow rate within that hour is less than configured value.
- **Burst** (occurs when constant flow rate within 60 minutes is more than 5/10/20% of Q3). Disappears after 32 seconds, if constant flow rate within that period of time is less than configured value.
- **Freeze** (occurs when water temperature is lower than 2/3/4/5°C for 5 minutes). Disappears after 5 minutes, if water temperature is higher than configured value.
- **Reverse flow** (occurs when meter detects negative flow that is equal to starting flow for 1 minute). Disappears after 1 minute if reverse flow is stopped.
- **Empty pipe** (occurs approx. 30 seconds after the absence of water). Disappears immediately (up to 30 seconds) if meter detects water without air or air bubbles.
- **Tamper** (occurs when meter is opened or damaged).
- **Hardware or software failure.**
- **Low battery** (occurs when approx. battery lifetime is less than 12 months).
- **Communication temporarily blocked** (only on meter's LCD).
- **Overflow** (occurs when flow rate is higher than Q4).
- **No consumption** (occurs when there was no water usage for the last 3/7/30 days).

Nominal flow rate Q3, m³/h	Leakage threshold, m³/h			Burst threshold, m³/h		
	0,25 %	0,5 %	1 %	5 %	10 %	20 %
1,6	0,004	0,008	0,016	0,08	0,16	0,32
2,5	0,00625	0,0125	0,025	0,125	0,25	0,50
4,0	0,010	0,020	0,040	0,20	0,40	0,80
6,3	0,01575	0,0315	0,063	0,315	0,63	1,26
10	0,025	0,050	0,100	0,50	1,00	2,00
16	0,040	0,080	0,160	0,80	1,60	3,20
25	0,0625	0,125	0,250	1,25	2,50	5,00
40	0,100	0,200	0,400	2,00	4,00	8,00

Communication type	Display		wMBus		LoRa WAN				NB – IoT			
Type of alarm	Error code		Status byte		Status byte		Critical alarm message		Status byte		Critical alarm message	
	Default	Optional	Default	Optional	Default	Optional	Default	Optional	Default	Optional	Default	Optional
Leakage	X		X		X		X		X		X	
Burst	X		X		X		X		X		X	
Freeze	X		X		X		X		X		X	
Negative flow	X		X		X			X	X			X
Empty pipe	X		X		X				X			
Tamper	X		X		X		X		X		X	
Calculator's hardware error	X		X		X				X			
Hardware error	X		X		X				X			
Software error	X		X		X				X			
Low battery (< 12 months)	X		X		X				X			
Communication temporarily blocked	X											
Overflow	X											
No consumption		X						X				X

2.4 External Communication Modules and Interfaces

The optical interface is integrated in the Qalcosonic W1 meter by default. It is intended for data reading, changing parameters of meter and for outputting optical pulses in the Test (verification) mode.

It is activated by sending a 1 second pulse sequence (5 minutes after the end of communication it is automatically deactivated).

There is also NFC (Near Field Communication) interface integrated by default. It is intended for data reading only.

Available communication modules for data transmission (only one option may be selected when placing the order):

- RF 868 MHz
- RF 433 MHz
- RF 915 MHz
- NB – IoT (frequency bands B1, B3, B5, B8, B20, B28)

Data in Qalcosonic W1 meter can be transmitted using the following protocols:

- wMBus T1
- wMBus T2
- LoRa WAN
- CoAP

Internal Credit System

All external communication interfaces are intended for data reading and meter parametrization. The meter is produced for being powered only from the internal battery. To save the battery, a communication credit system is implemented into the meter. Time of communication through additional interfaces (optical communication) is automatically limited to save the battery (up to 20 minutes per month). Unused communication limits are summed up. If the limit is expired, the interface is blocked, and the new time limit of communications will start only after the change of the hour (16 seconds for each next hour). If the device configuration has never been changed, the credit system will never be used up.

Alarm credits: when a particular error occurs, the device sends an alarm telegram, which consumes 1 credit. The meter has a maximum reserve of 30 credits, which means that it can send up to 30 alarm telegrams in one day. Alarm credits automatically refill by 1 credit in 24 hours. Credits above 30 units are not summed up.

Radio credits: every data telegram consumes a different amount of credits, depending on many factors: payload type, spreading factor (LoRa WAN/T1), communication type, amount of stored archive values, etc. Radio credits are refilled every minute by a certain amount. Telegrams could not be sent (communication is temporarily blocked) if the remaining amount of credits is less than necessary for sending one telegram.

Under normal circumstances, if the configuration after manufacturing has not been changed from the customer's side, the credits should not be depleted at all, except NB-IoT devices which also depend on telco provider's radio coverage conditions.

2.5 Meter Pulse Output

Pulse output in Test mode via optical interface

The meter sends pulses through the optical communication interface.
Obtaining pulses through optical interface are available only in Test mode and it depends on the nominal flow rate Q3. It might be used during verification for automatic metrology reading. Available values are specified in the table below:

Nominal flow rate Q^3, m^3/h	1,6	2,5	4,0	6,3	10	16	25	40
Pulse value, l/pulse	0,001	0,002	0,004	0,005	0,010	0,015	0,020	0,025
Connection thread	G ¾	G ¾; G1	G1	G1 ¼; G1 ½	G1 ¼; G1 ½; G2	G2; DN50	G2; DN50	G2; DN50

2.6 Power Supply

The meter is powered by one or more internal non-replaceable batteries with a service life of up to 16 years. Accurate battery lifetime depends also on data transmission frequency. Device can have one of the following options depending on configuration:

For G ¾ or G1 connection type meters (A design version):

- Two internal “AA" connection type 3.6 V lithium (Li-$SOCl_2$) batteries
- Two internal "AA" size + one "A23" size 3.6 V nominal voltage lithium (Li-$SOCl_2$) batteries

For G ¾ or G1 connection type meters (B design version):

- One internal “C” size + one “A23” size 3.6 V nominal voltage lithium (Li-$SOCl_2$) batteries
- Two internal "AA" size + one "A23" size 3.6 V nominal voltage lithium (Li-$SOCl_2$) batteries

For G1 ¼ or G1 ½ connection type meters:

- Two internal "AA" size + one "A23" size 3.6 V nominal voltage lithium (Li-$SOCl_2$) batteries
- One internal "C" size + one "A23" size 3.6 V nominal voltage lithium (Li-$SOCl_2$) batteries

For G2 or DN50 connection type meters:

- One internal "D" size + one "A23" size 3.6 V nominal voltage lithium (Li-$SOCl_2$) batteries

2.7 Maximum Transmitting Power

Maximum radio frequency power transmitted for NB-IoT communication type:

Operating band		Frequency range (UL) MHz	Max conducted output power dBm
LTE (NB-IoT)	B3	1710 – 1785	23
LTE (NB-IoT)	B8	880 – 915	23
LTE (NB-IoT)	B20	832 – 862	23
LTE (NB-IoT)	B28	758 – 803	23

Maximum radio frequency power transmitted for LoRa WAN communication type:

- 20 dBm for US, AS, AU, IN regions.
- 14 dBm for EU region.

2.8 Mechanical Data

The maximum dimensions of the biggest Qalcosonic W1 water meter are 170 mm x 139 mm x 200 mm. This applies to DN50 meter with 200 mm length. Weight of different sizes of Qalcosonic W1 meters (without accessories) are shown In the table below:

END CONNECTIONS (OVERALL LENGTH)	WEIGHT OF METER, NOT MORE THAN, KG
G ¾ (80, 105, 110, 115, 165, 170 mm) G ¾ (110n, 165n, 170n mm)	0,30
G1 (105, 110, 130, 165, 190 mm) G1 (105n, 130n, 165n, 190n mm)	0,40
G1 1/4'' (260 mm)	0,82
G1 1/2'' (260 mm)	0,95
G2'' (300 mm)	1,00
DN50 (200 mm)	1.78

2.9 Operation Conditions

Operating conditions:

- Ambient temperature form -15°C to 70°C
- Relative humidity up to 100%, condensing
- Atmospheric pressure 86 kPa to 106.7 kPa

Installation:	Indoor or outdoor
Mechanical environment class:	M1
Electromagnetic environment class:	E2
Enclosure protection class:	IP68 conformant DN15-DN50 meters (Note: DN15-20 meters approved for 30 days submersion in 1 meter depth, but this submersion shall not be applied for more than 30 days per 1 year)

3. Operating Principle

The flow measuring principle is based on ultrasonic measurement method. Flow rate is calculated using time difference results many times, and time of flight upstream and downstream is used for these calculations. Calculated flow rate is indicated in the meter's LCD.

Water meter performs all necessary measurement and data storage functions. Below are the most important:

- Static flow measurement – no moving parts, no wear and tear
- Very high metering accuracy
- Eliminates measuring deviations caused by sand, suspended particles or air pockets
- Long-term measurement stability and reliability
- 9 digits, multi-line LCD. Total volume and instantaneous flow rate indication at the same time
- No straight pipe run needed
- Bi-directional flow measurement
- Installation in any position

Total volume can be calculated in 2 following ways:

- **Default:** Total volume is calculated using only forward flow measurement. Reverse volume is stored in a separate register (for informational purposes only).
- **Optional:** Total volume is calculated by subtracting reverse volume from forward volume. The reverse volume is stored in a separate register. In this case reverse flow measurement must be calibrated at the factory, so that it could have metrological verification.

4. Marking and Sealing

4.1 Marking

The following information is engraved on the meter cover: EU-type examination certificate number, manufacturer's trademark, distributor logo (if applicable), type designation of meter, year of manufacture and serial number, permanent flow rate Q_3 and ratio (Q_3/Q_1) preceded "R", temperature class, maximum admissible working pressure (MAP), pressure loss class, installation sensitivity class of the meter, latest date by which the meter shall be replaced, software version number, IP code, QR code or barcode communication interface NB-IoT (if present on the meter).

The following is indicated on the housing of the water meter:

- Type of connection (thread size)
- Flow direction

4.2 Sealing

The meter casing is imperceptibly closed. Any unauthorized opening of the housing is impossible without damaging. Additional manufacturer protection is not applied. The manufacturer's warranty does not apply if the upper cover is opened or the connection between upper cover and the housing is damaged. When the upper sealed cover is opened, the safety button that is installed in the meter body is activated and an error code appears on the meter display.

For sealing of meter after installation, the holes in the meter's body should be used (See Annex D). Holes for sealing the meter with a threaded connection after installation are provided in the housing of the meter.

For the meter with flanges DN50, one mounting screw is sealed after installation.

5. Installation

5.1 General Requirements

Prior to installing the meter, it is necessary:

- To check the complete set of the meter with that specified in the technical documentation.
- To check for any visible mechanical defects.
- To check the configuration of the meter and change it if necessary.

The meters may only be installed by qualified specialists in accordance with the requirements of this document and the meter installation design.

5.2 Checking Configuration of the Meter

Prior to installing the meter, it must be verified whether its configuration complies with the requirements for the specific facility, and it must be changed if necessary.

The following parameters are verified (the factory settings for the meter are their standard ones):

- Volume measurement units
- Displayed volume resolution (point position)
- Additional customer serial number (if applied)
- Internal clock time (with optical head and special tools)

Note:
The transportation mode will turn off and radio will be activated automatically when the meter starts operation, and the volume totalizer has accumulated more than 10 litres.

5.3 Checking Installation and Parameter Settings

If the meter is installed correctly, when there is water flow, the display of the meter should display flow readings.

It is necessary to check whether the meter is installed in the correct direction, also – whether there is no air in the system.

5.4 Mounting

The temperature of the working environment should not be higher than 70°C. No special requirements are established for the free space around the meter. It is important that nearby installations or structures do not rest against the housing of the meter and do not interfere with reading the data from the display. The meter should be installed at a safe distance from other devices emitting heat or strong electromagnetic field (to prevent disturbance of its working environment conditions). Sizes and mounting dimensions of the meter are provided in Annex A and B.

Straight pipelines in upstream and downstream from the meter are not required (flow profile sensitivity class is U0 D0). Water meters may be installed in all positions (either horizontally, vertically, or inclined). Mandatory condition: pipe must be pressurized to not less than 30 kPa. For proper preparation the pipe must be filled with water.
The direction of the arrow on the meter must match the flow direction in pipeline. Lateral tension force should be avoided, pipe ends must be aligned together.
To avoid stresses in the pipelines, the distance between the meter connection points in the meter installation place shall correspond to the total length of meter regarding the thickness of gaskets. It is recommended to select a meter installation place as far as possible from potential sources of vibration (for example, pumps).
The gaskets must match the pipe diameter. During the installation, the gasket must be exactly centred with the centre of the pipe cross-section to avoid sticking out gaskets inside the pipe.

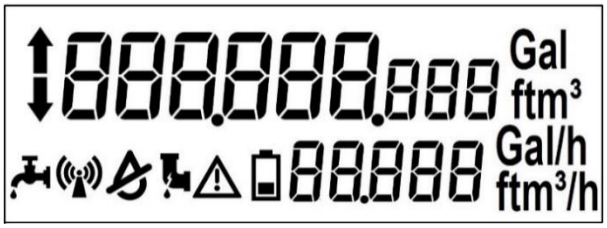
End connections (overall length)	Tightening torque (Max), Nm (rubber EPDM)
DN15	25
DN20	30
DN25	35
DN32	35
DN40	35
DN50	40 (for the flange bolts)

6. Operation

6.1 Display Functions

The meter is equipped with a 2-line LCD (liquid crystal display):

- Upper line with 9-digits for displaying measured volume of water.
- Lower line with 5-digits for displaying current flow rate and special symbols for displaying various events.



Flow arrow meanings:

↑	Forward flow
↓	Reverse flow*
Arrow is not displayed	No flow

* – for reverse flow case, the meter shows reverse flow rate and error code.

Special symbols on LCD:

Symbol	Description
	Leakage
	Radio transmitter is activated
	Empty pipe
	Pipe is cracked (Burst)
⚠	Error (Status)
	Low battery

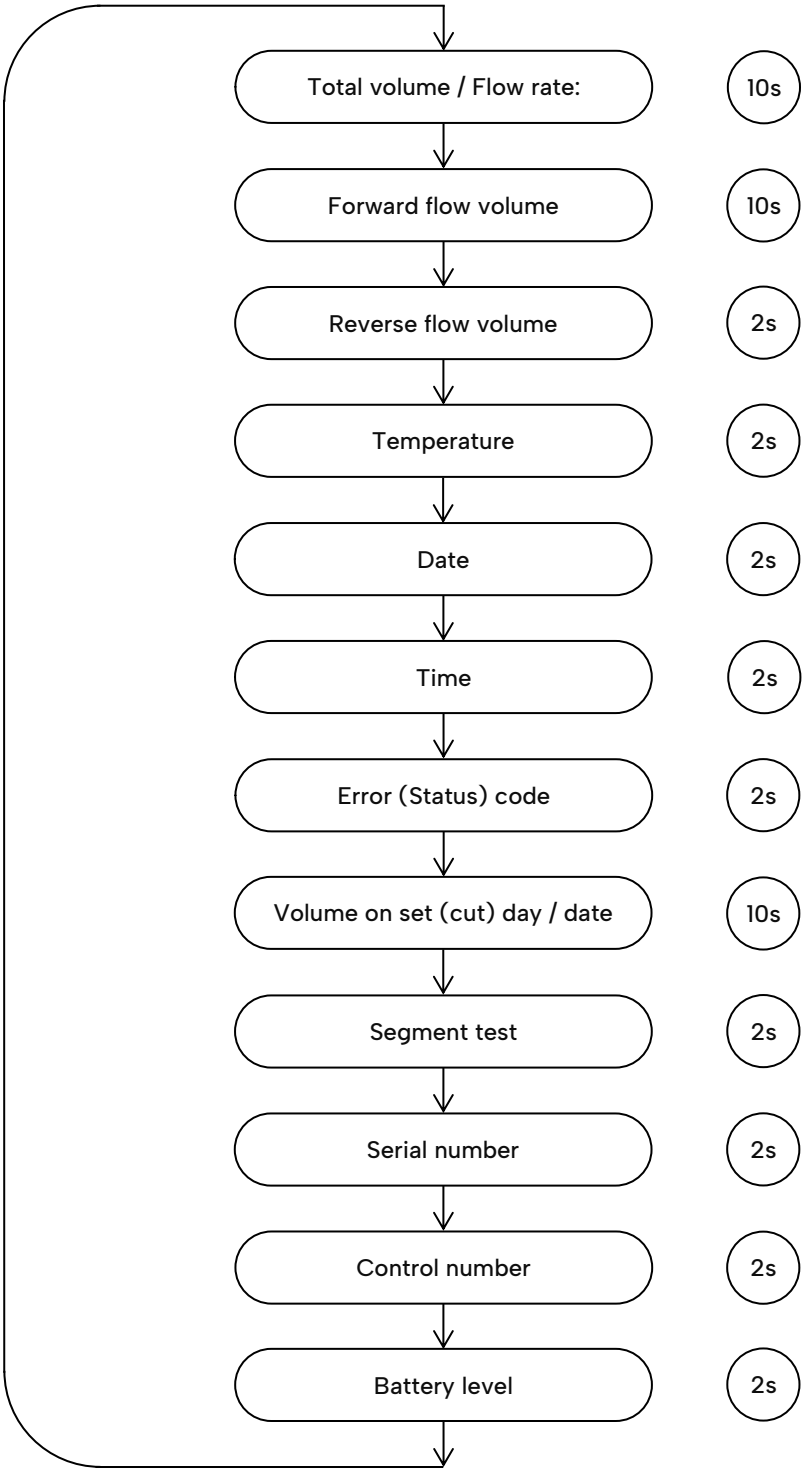
Error symbol ⚠ is shown when there is a significant operation error. For the Info code, see the LCD menu (Paragraph „Menu structure").

6.2 Menu Structure

The menu structure in complete mode is presented in Fig. 6.1.

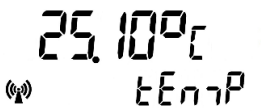
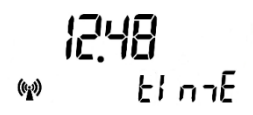
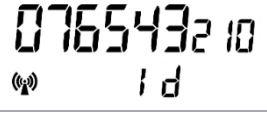
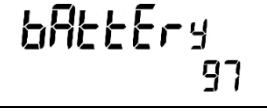
Meter menu stages switch automatically. Individual stages, except of total volume and error (status) code, could be disabled during installation. Error code is displayed only when an error occurs. If there are no errors detected by the meter, then the error code is not displayed. By default, meter LCD shows error code and total volume / flow rate stages.

Figure 6.1 Menu structure in User mode



6.3 Viewing the Readings in Complete Mode (User Menu)

Remark: here the full list of parameters is presented. By default, only error (status) code and total volume / flow-rate stages are enabled.

ID	Parameter	Notes	Value (Example)
1.1	Total volume, Flow rate		
1.2	Forward flow volume		
1.3	Reverse flow volume*		
1.4	Water temperature		
1.5	Date		
1.6	Real time		
1.7	Error (status code)		
1.8	Accumulated volume on set day /date		
1.9	Segment test	Changes every 1 second	
1.10	User identification number		
1.11	Control number		
1.12	Calculated battery level, percentage		

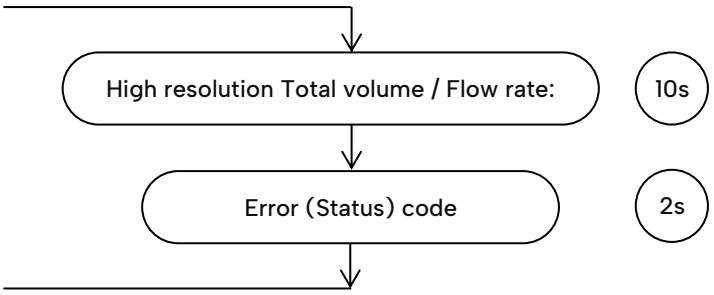
* – Reverse flow volume can be calculated with metrological verification if it was ordered by the customer and calibrated in the factory (optional).

Display of irrelevant parameters can be turned off. Also, parameters that are not relevant to the specific meter configuration will not be indicated. Indication of specific parameters can be turned on or off by means of meter configuration tools.

6.4 Viewing the Readings in Verification (Test) Mode

Menu structure in verification (test) mode is presented in the Fig 6.2.

Figure 6.2 Menu Structure in Verification (Test) Mode



High resolution has 6 decimal digits. Flow rate resolution remains the same.

6.5 Volume Readings in Verification (Test) Mode

Parameter	Value (Example)	Remarks
High resolution integrated volume	000052381 m³ 00.100 m³/h	Updated every 10 seconds. Resolution increased to 6 decimal numbers.

6.6 Error (Status) Codes

Operating status is encoded by a 4-digit code on LCD:

Code Number	Description	
nXXX	0 – Normal operation	
	2 – No consumption	⚠
	4 – Damage to meter housing (tamper)	⚠
	8 – Calculator's hardware failure detected	⚠
XnXX	0 – Normal operation	
	1 – Leakage	
	2 – Burst (pipe is cracked)	
	4 – Communication is temporarily blocked*	⚠
	8 – Low battery (less than 12 months of lifetime is left)	
XXnX	0 – Normal operation	
	4 – Software failure detected	⚠
	8 – Hardware failure detected	⚠
XXXn	0 – Normal operation	
	1 – Empty pipe (pipe is not filled with water or air is detected)	
	2 – Reverse flow	⚠
	4 – Overflow (flow rate is greater than Q4)	⚠
	8 – Freeze alert	⚠

* – Error is displayed only for meters with LoRa WAN communication type. For NB-IoT devices only optical communication credits are regarded.

Active info codes are added if there is detected more than one error. Then the summary indicated info code will be as follows:

3 – corresponds error code 2 + 1
5 – corresponds error code 4 + 1
6 – corresponds error code 4 + 2
7 – corresponds error code 4 + 2 + 1
9 – corresponds error code 8 + 1
A – corresponds error code 8 + 2
B – corresponds error code 8 + 2 + 1
C – corresponds error code 8 + 4
D – corresponds error code 8 + 4 + 1
E – corresponds error code 8 + 4 + 2
F – corresponds error code 8 + 4 + 2 + 1

6.7 Verification (Test) Mode Control

Test mode is used for verification process as it allows to achieve precise test results within short measuring time. In this mode, total volume is indicated in increased resolution, also optical pulses are generated through optical interface. Exact pulse values are described in 2.5 paragraph.
Test mode can be activated by using optical head and configuration software. The optical head should be connected to the computer's USB interface.
The optical head must be placed in a special holder and placed on the meter. It is necessary to run the program and specify the correct COM port number to which the USB cable is connected.
In Test mode, the total volume value is displayed with a resolution of 0.xxxxxx (six decimal places).
Also, the meter will return to its normal mode automatically in 24 hours after activation of Test mode.

7. Verification

Metrological control of meter parameters is performed according to requirements defined in EN ISO 4064-1.

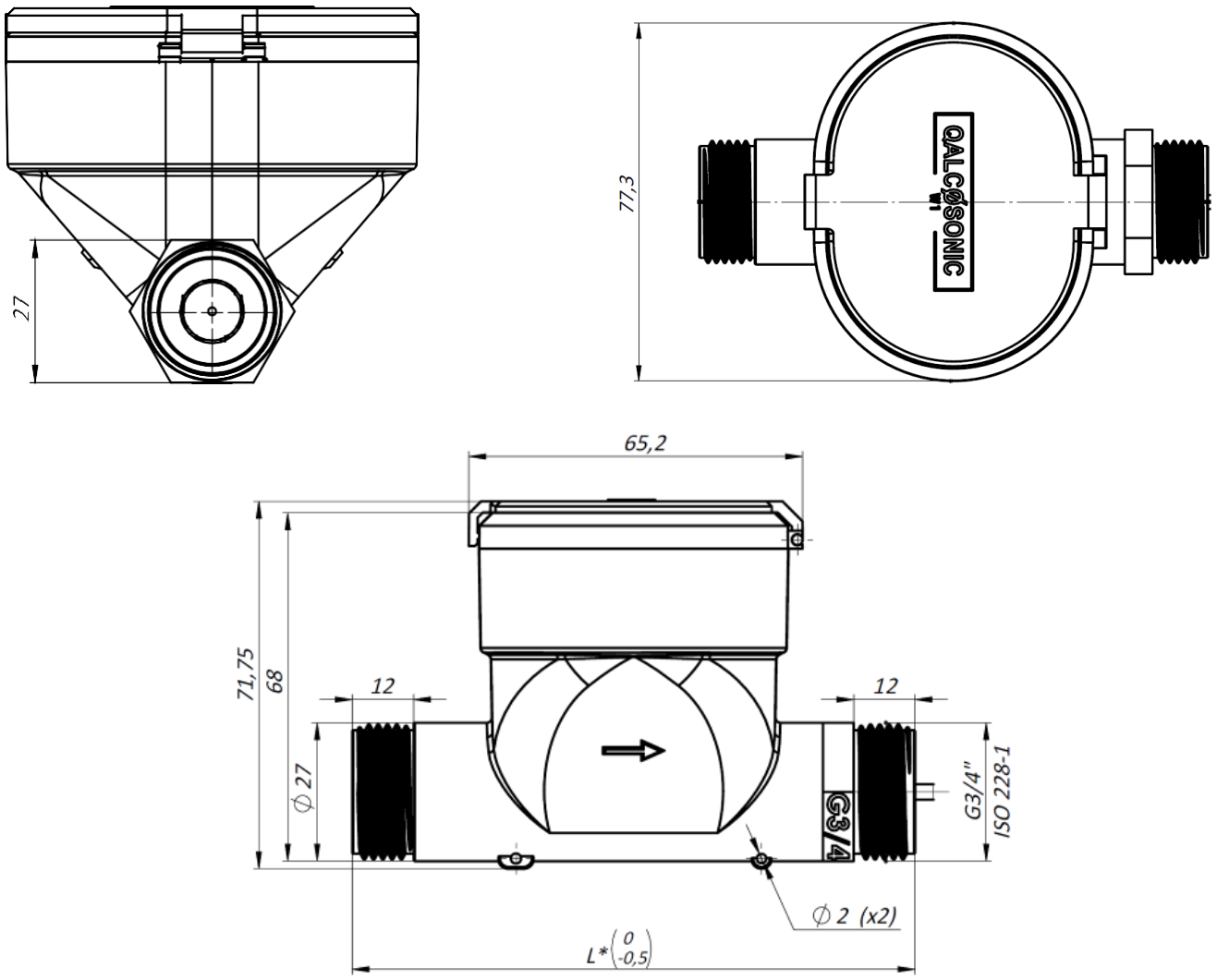
8. Transportation and Storage Requirements

Packed meters may be transported in any type of covered vehicle. Equipment should be anchored reliably to avoid shock and possibility to shift inside vehicle. Meters should be protected against mechanical damage and shock. No aggressive chemical substances should be stored together because of corrosion hazard.

- Storage and transportation temperature: from -25°C to 70°C (drained flow part)
- Humidity: not more than 93%

Annex A.1 G ¾

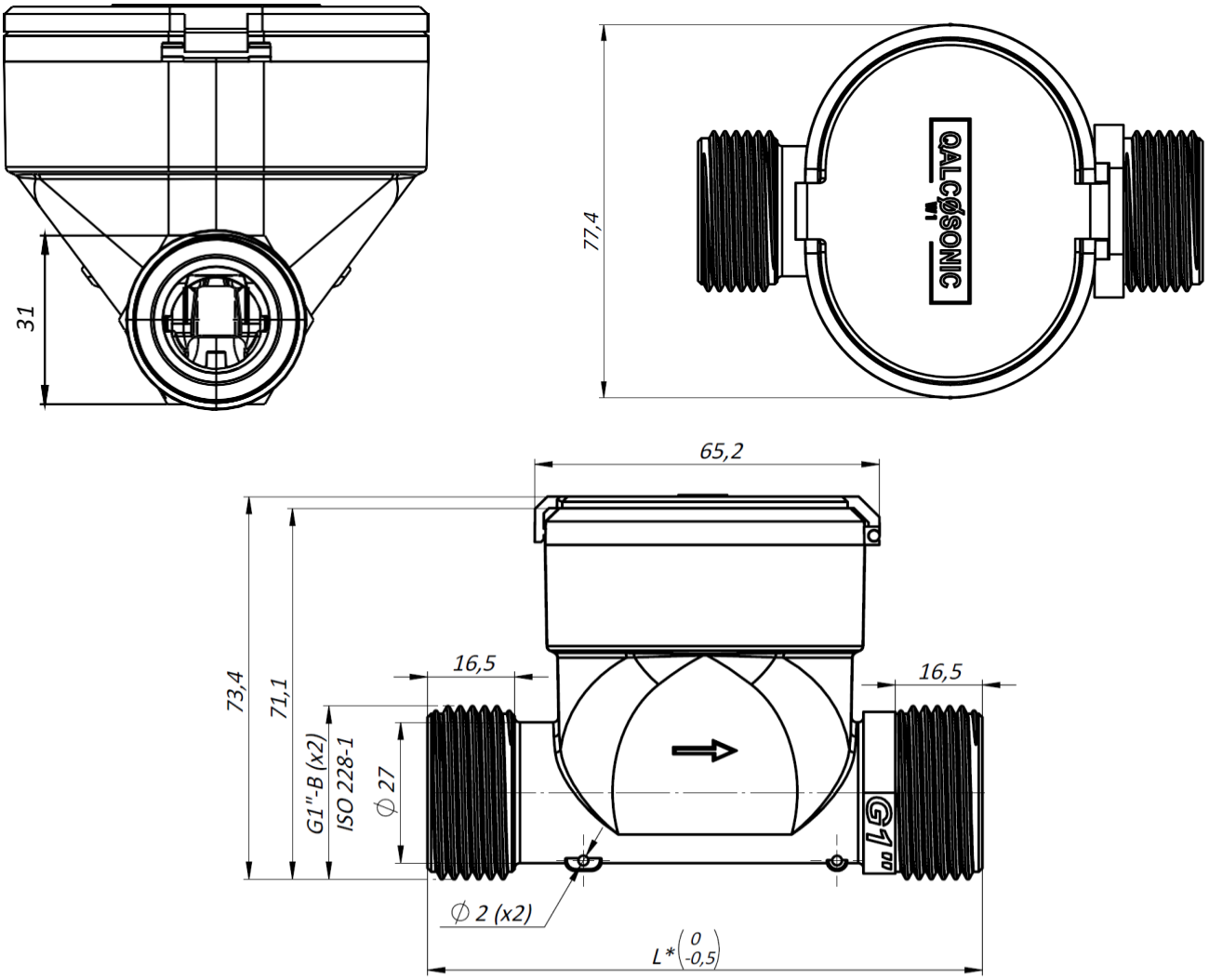
Sizes and dimensions of water meter QALCOSONIC W1
A.1 G ¾:



Model	L, mm
G ¾ L80	80
G ¾ L105	105
G ¾ L110	110
G ¾ L115	115
G ¾ L165	165
G ¾ L170	170

Annex A.2 G1

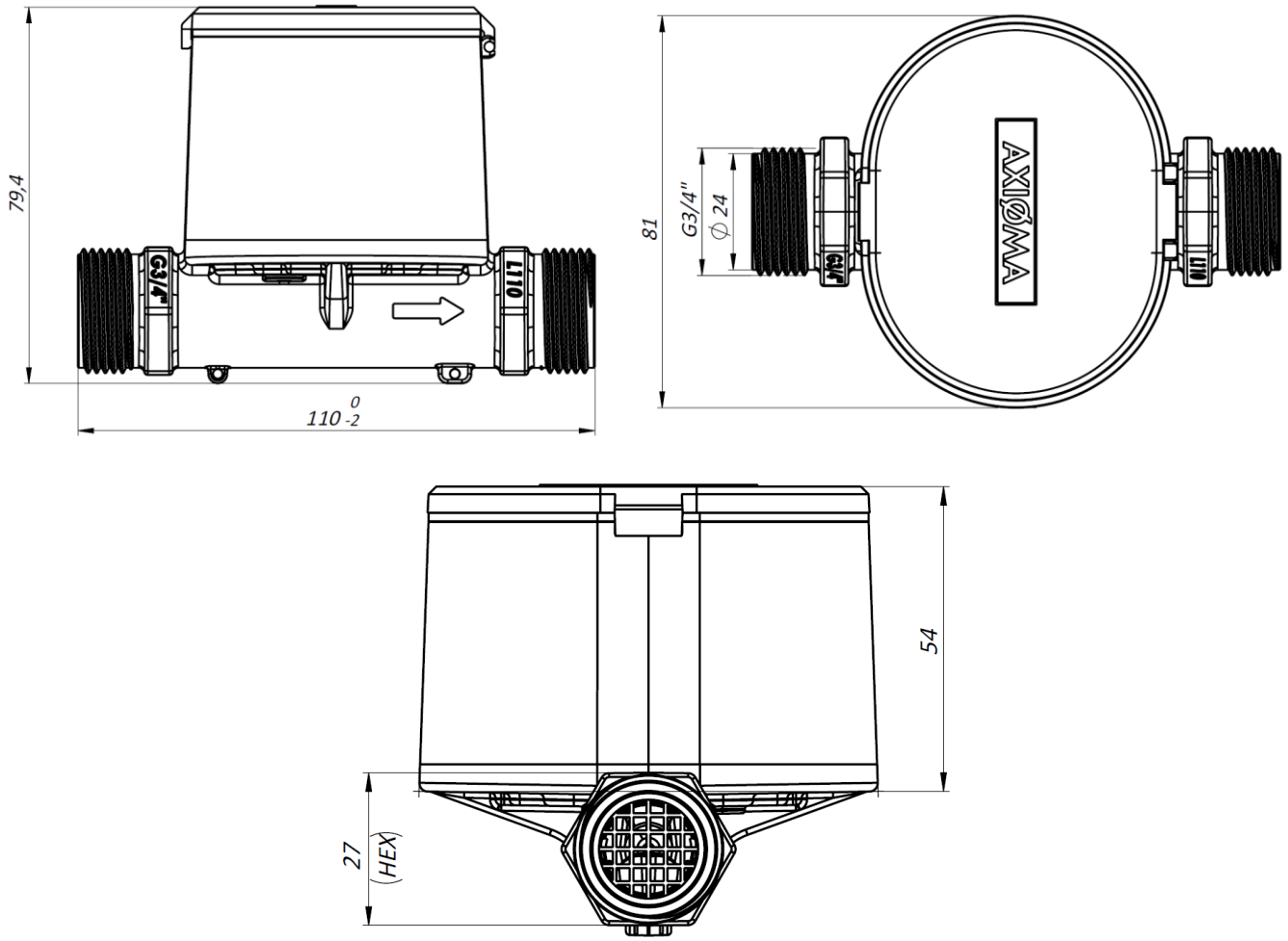
A.2 G1:



Model	L, mm
G1 L105	105
G1 L110	110
G1 L130	130
G1 L165	165
G1 L190	190

Annex B.1 G ¾

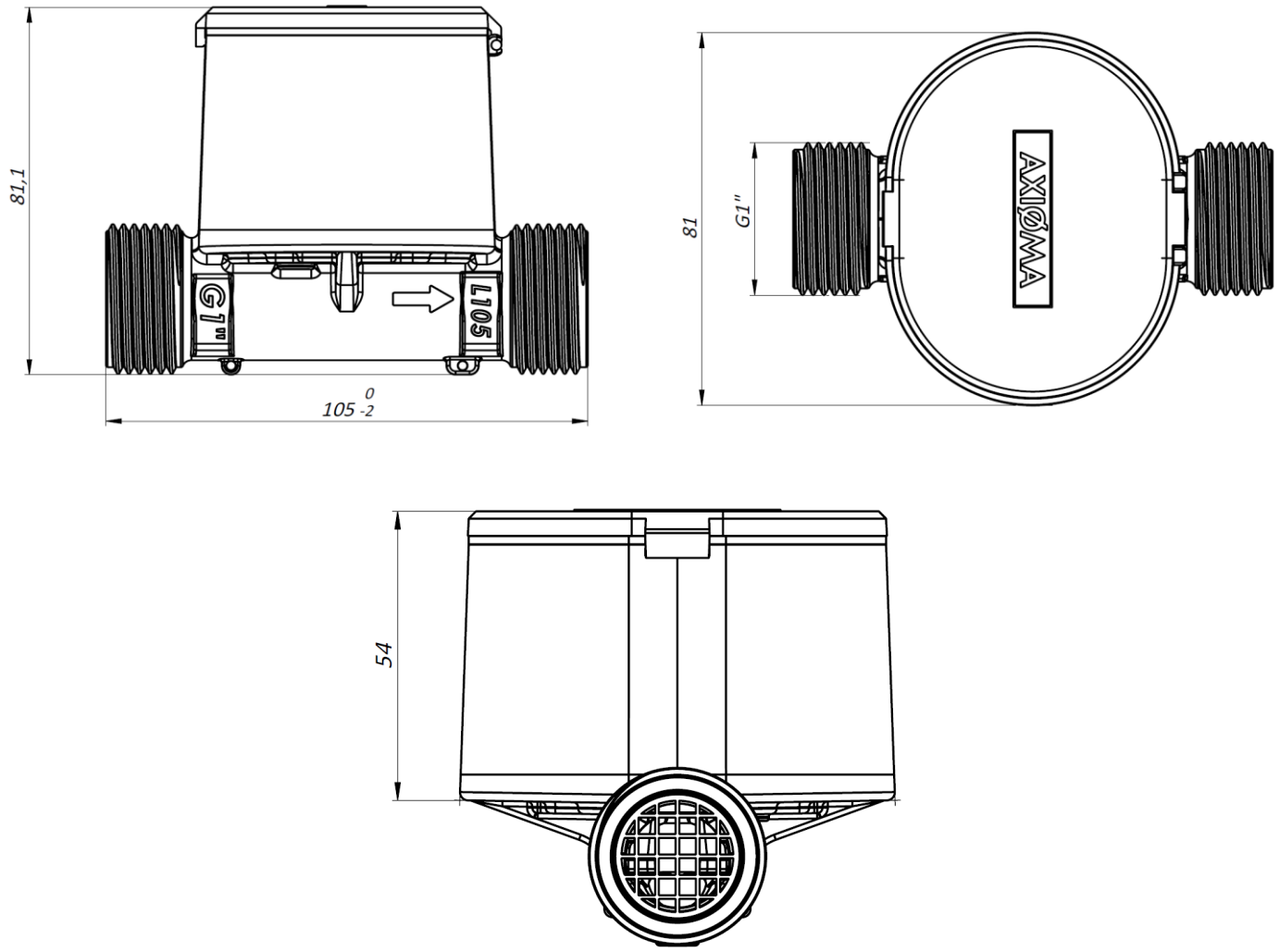
B.1 G ¾:



Model	L, mm
G ¾ L110n	110
G ¾ L165n	165
G ¾ L170n	170

Annex B.2 G1

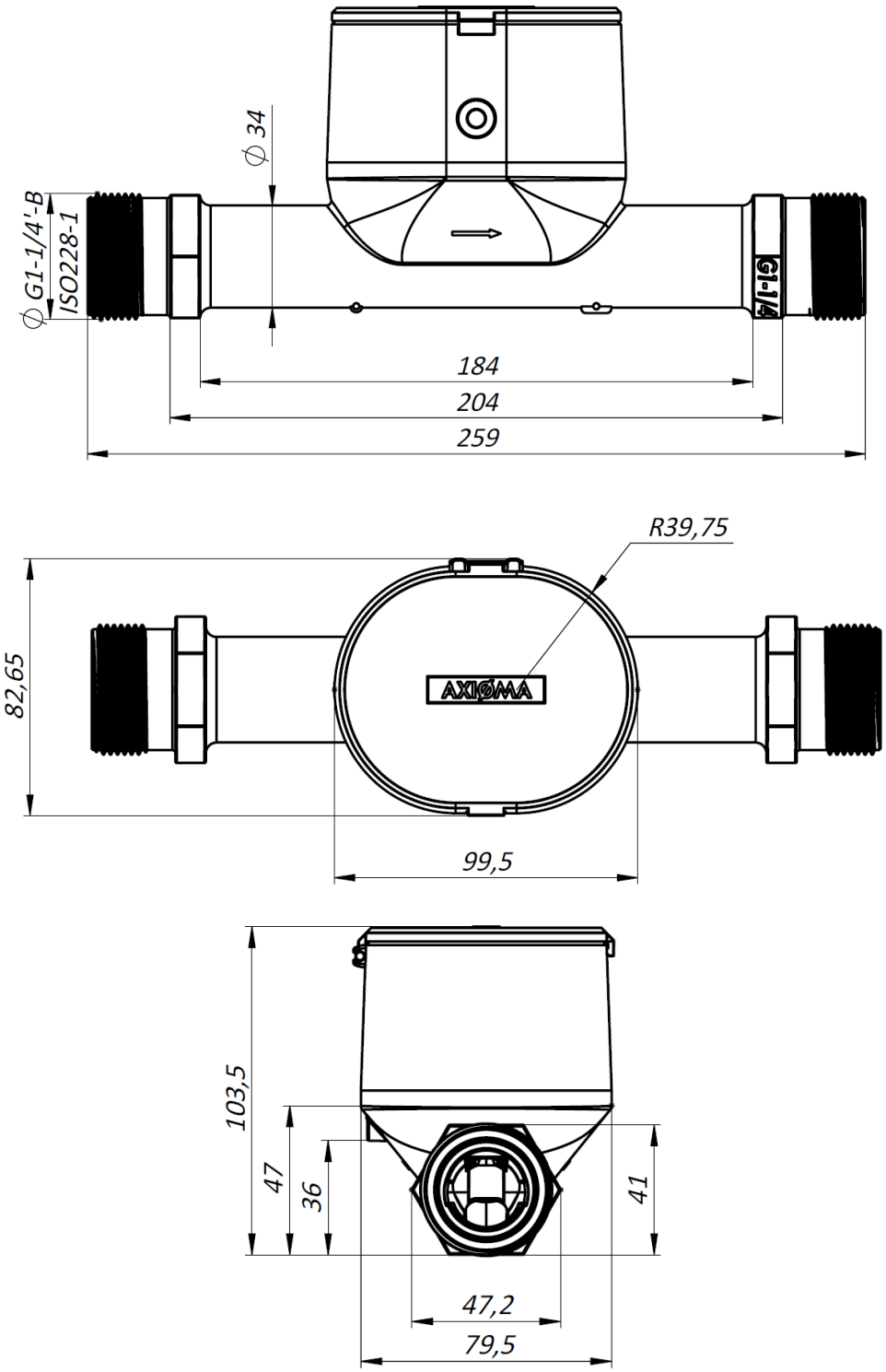
B.2 G1:



Model	L, mm
G1 L105n	105
G1 L130n	130
G1 L165n	165
G1 L190n	190

Annex C.1 G ¼

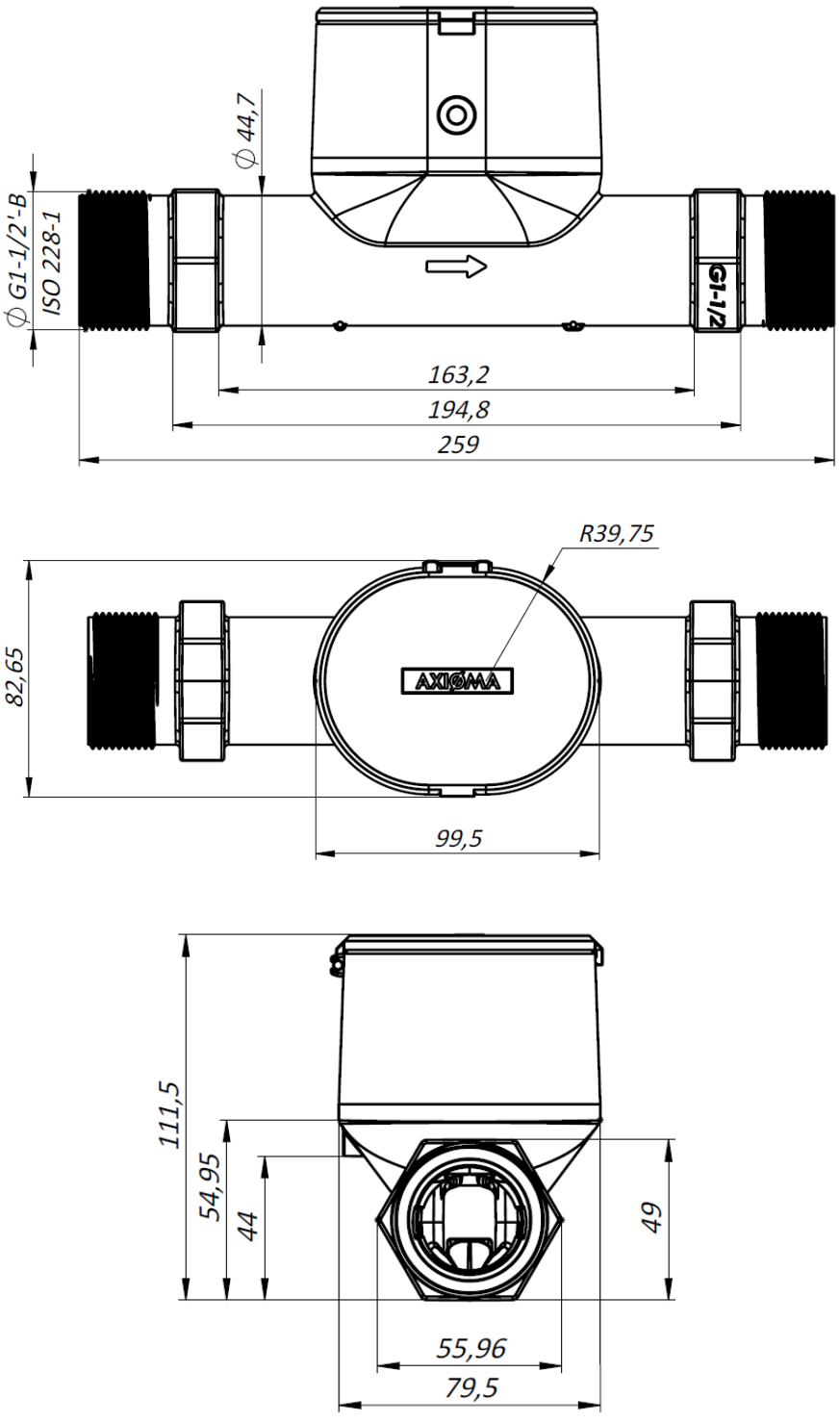
C.1 G ¼:



Model	L, mm
G1 ¼ L260	260

Annex C.2 G1 ½

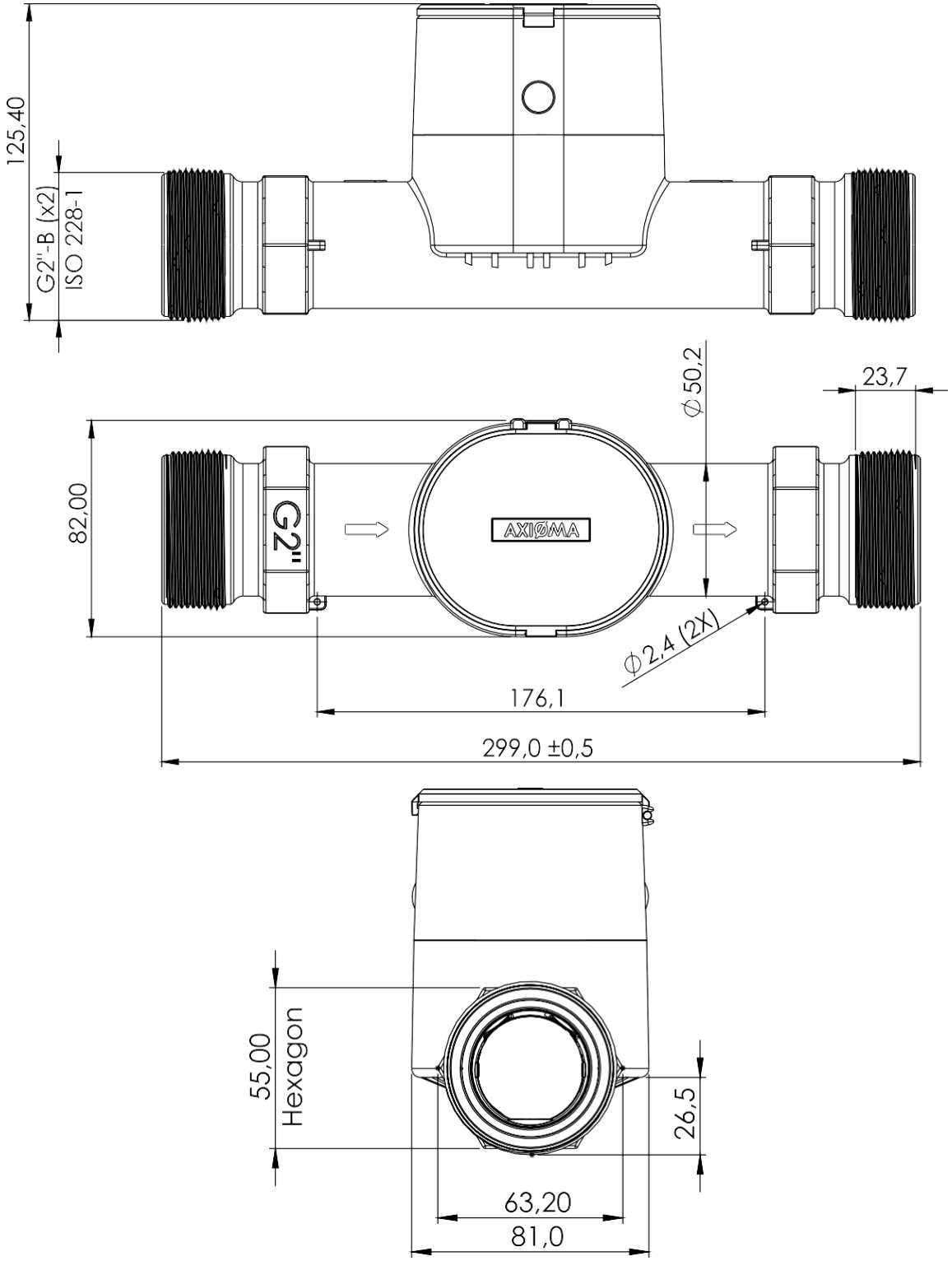
C.2 G1 ½:



Model	L, mm
G1 ½ L260	260

Annex C.3 G2

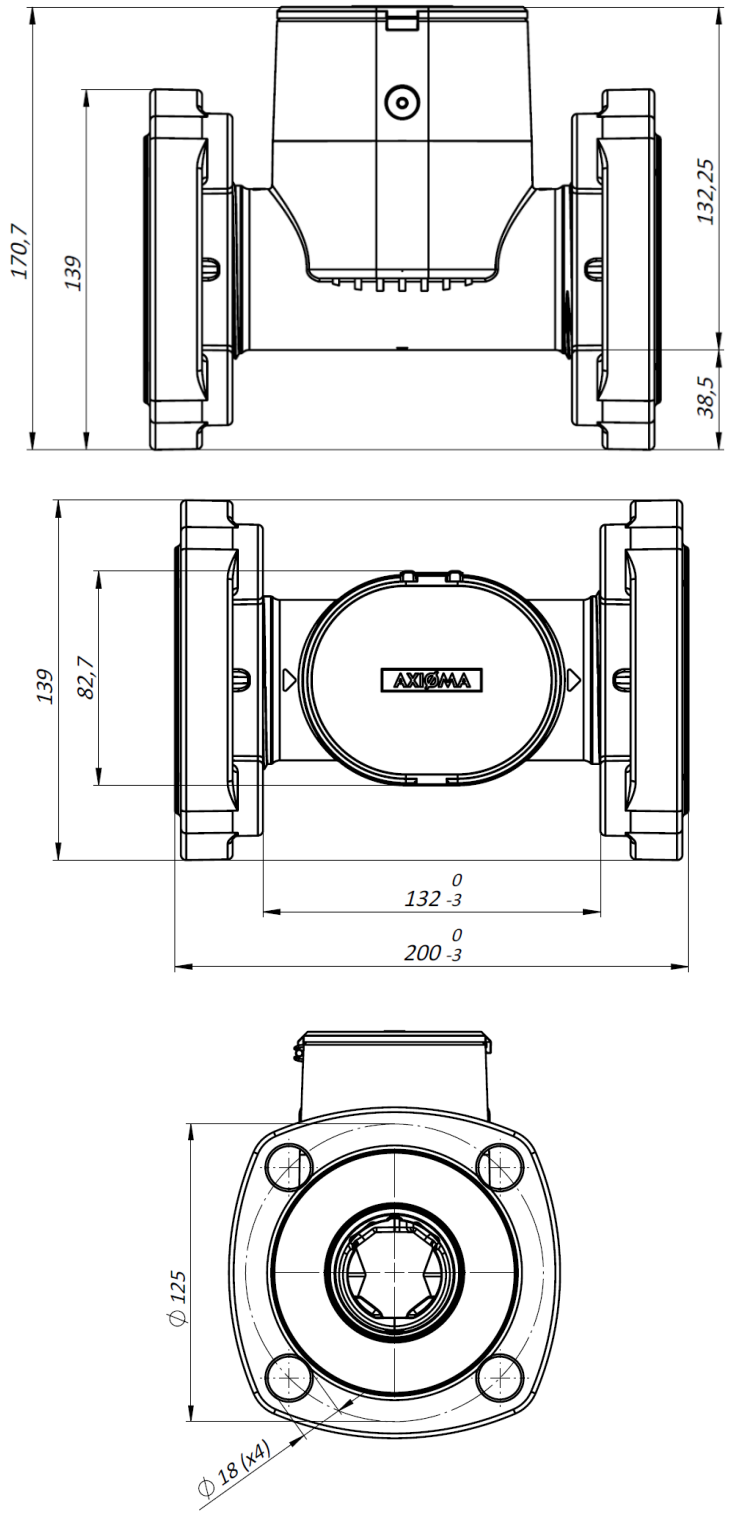
C.3 G2:



Model	L, mm
G2 L300	300

Annex C.4 DN50

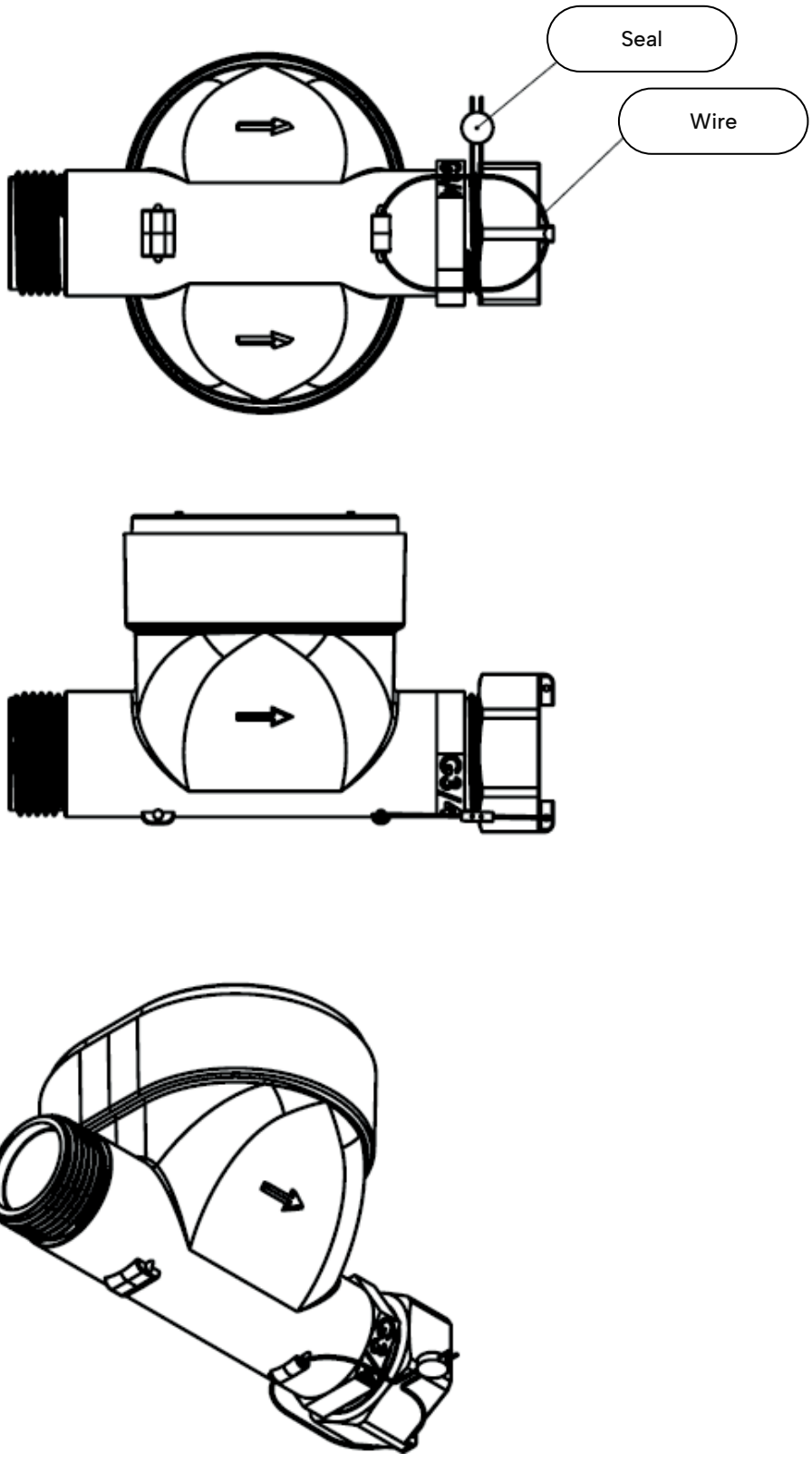
C.4 DN50:



Model	L, mm
G2 ½ L200	200

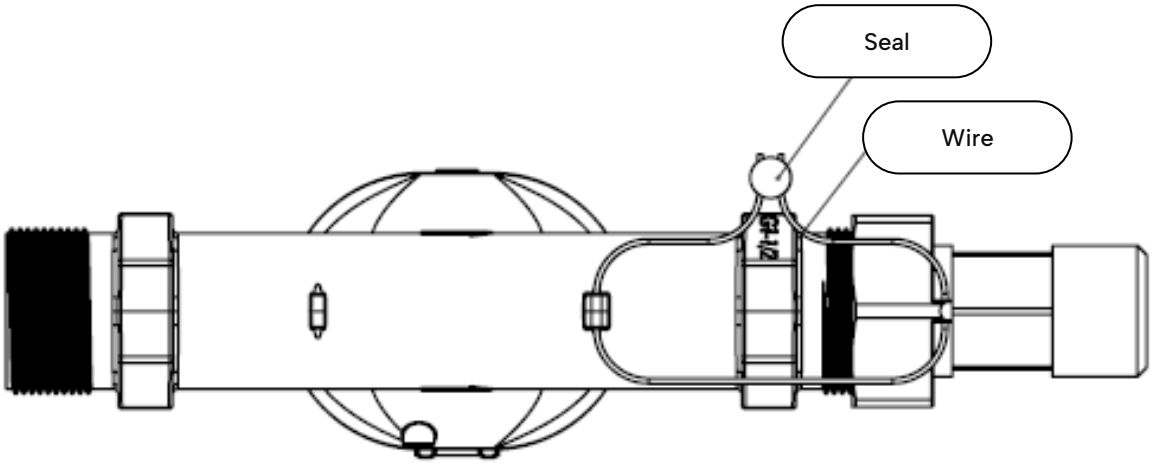
Annex D.1 G ¾

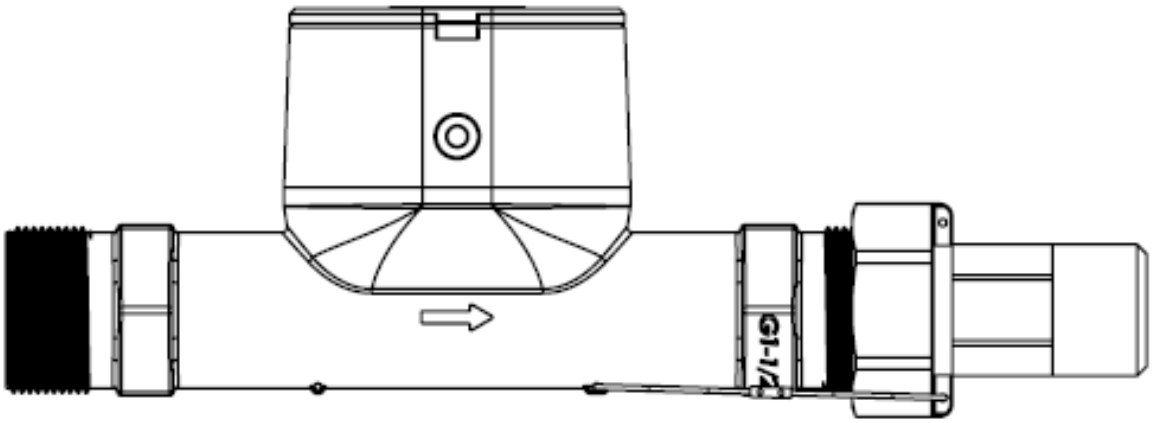
Example of sealing water meter after installation.
D.1 G ¾:

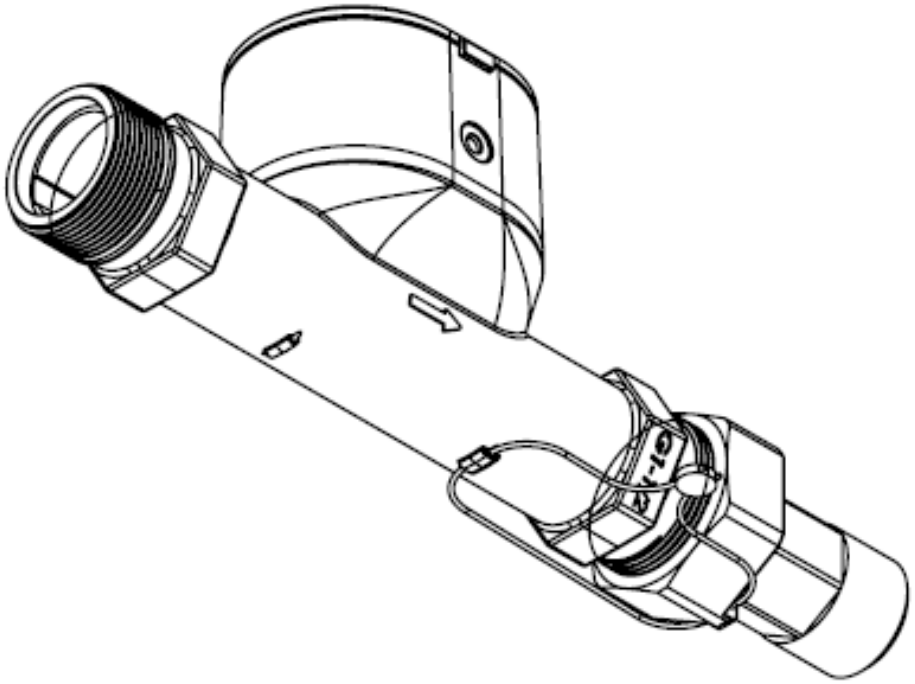


Annex D.2 G1 ¼

D.2 G1 ¼:

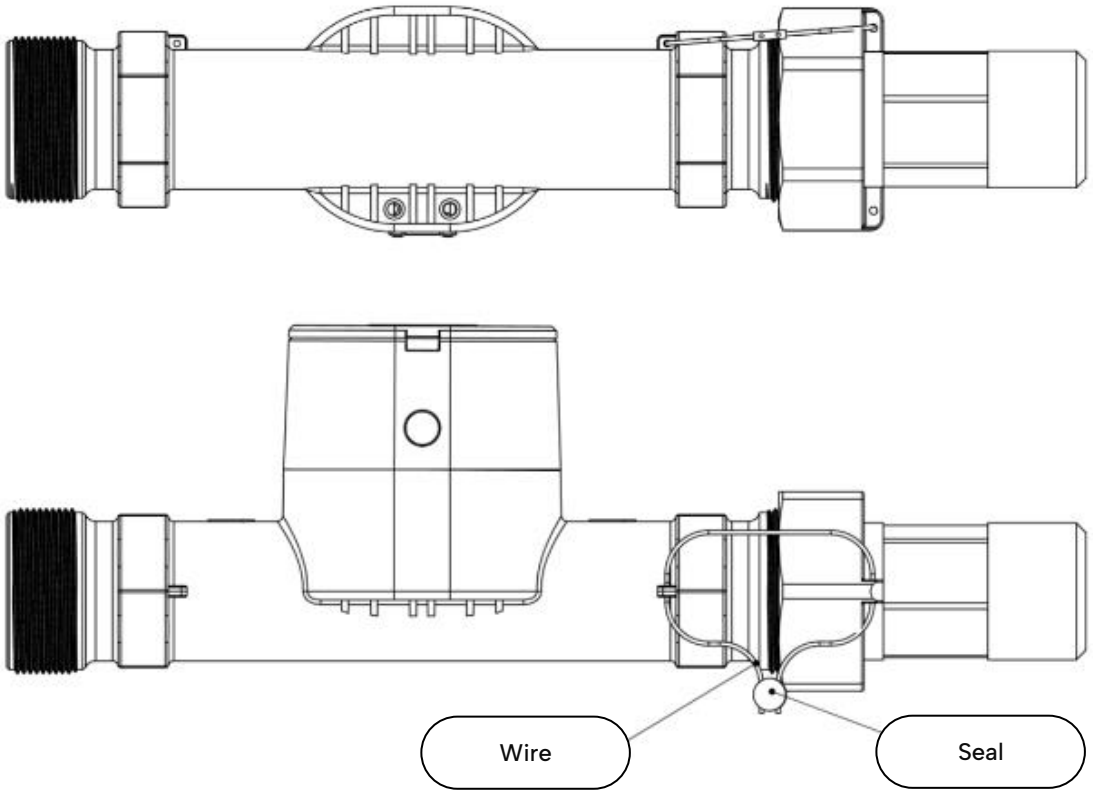


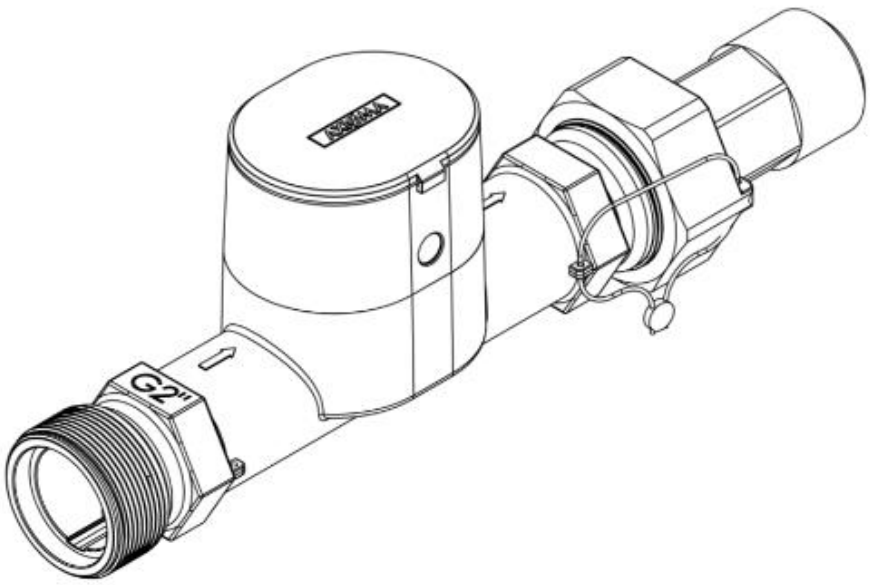




Annex D.3 G1 ½

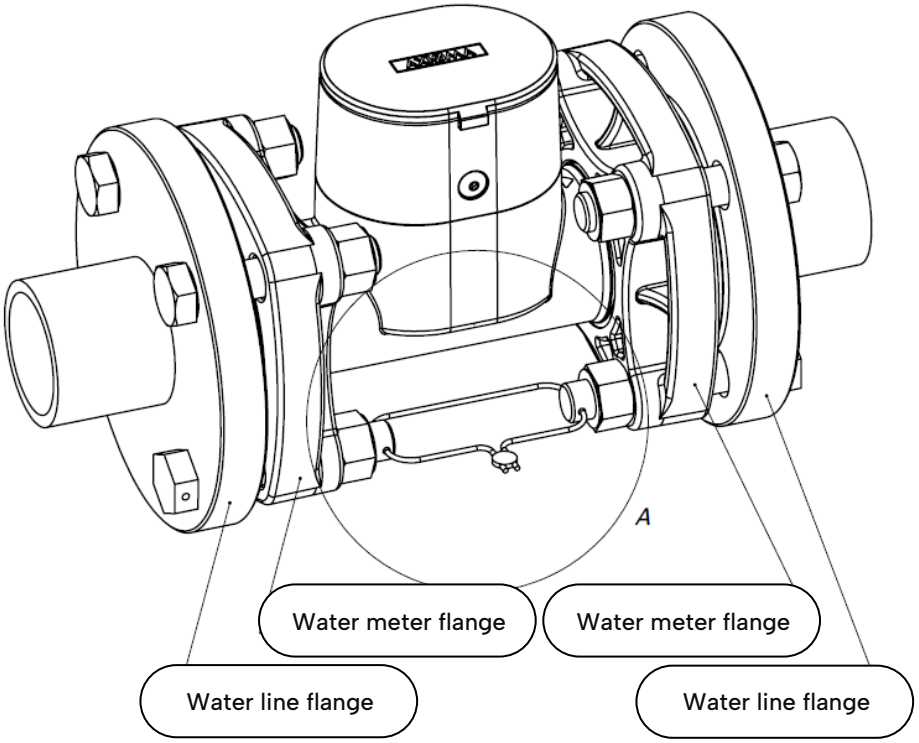
D.3 G1 ½:

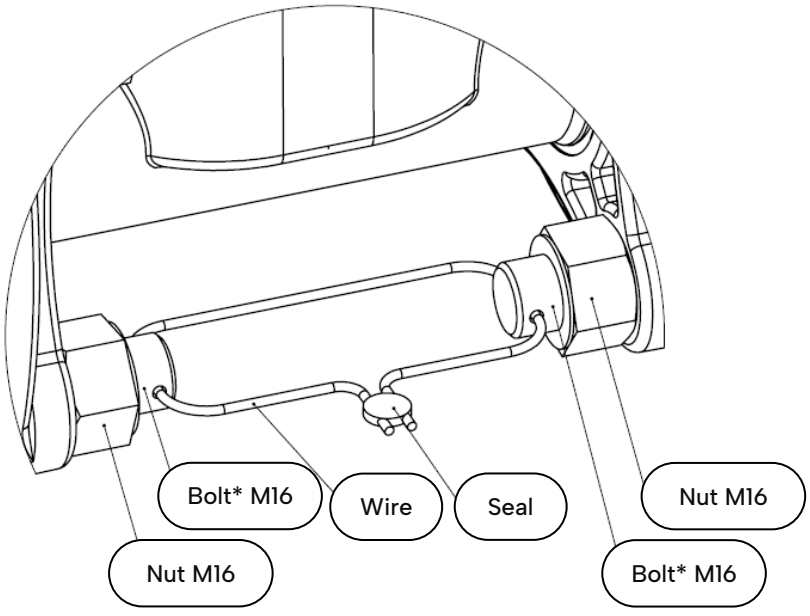




Annex D.4 DN50

D.4 DN50:





* – special bolt with a drilled hole for wire attachment.
(special nuts with a drilled hole can also be used if desired)

Warranty

Manufacturer gives warranty that meter parameters will meet the technical requirements, listed in the paragraph 2 of this document, if transportation, storage, and operation conditions will be followed.

Warranty period – 6 years from manufacturing date.

MANUFACTURER'S ADDRESS:

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