

AXIOMA METERING UAB

## ULTRASONIC WATER METER QALCOSONIC W1



**TECHNICAL DESCRIPTION, INSTALLATION MANUAL AND USER GUIDE**  
PE\_QW1\_V04\_US

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## SAFETY INFORMATION

### Before beginning installation works you must to read this document and follow its instructions

The meter is powered from the battery (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 194 °F.

- 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.

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

- The meter can be used at ambient temperature: 5 °F ... 158 °F
- Storage and transportation temperature: -13°F...158 °F (drained flow part)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## 1 APPLICATION FIELD

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.

Climatic environmental conditions: Temperature range: from 5 °F ... 158 °F;  
Humidity: condensing,

Mechanical environment class: M1  
Electromagnetic environment class: E2

**Ordering code combination of the meter \*:**

Meter	QALCOSONIC W1		QW1	-□-	-□-	-□-	-□-
Type							
<b>The ratio R (Q<sub>3</sub>/Q<sub>1</sub>):</b>			<b>Code</b>				
250			1				
315			2				
400			3				
800			4				
<b>Nominal flow rate, gpm</b>	<b>Overall length L, inch</b>	<b>End connections</b>	<b>Code</b>				
7,0	3,1"	G 3/4	11				
7,0	4,1"	G 3/4	12				
7,0	4,3"	G 3/4	13				
7,0	6,5"	G 3/4	14				
7,0	6,7"	G 3/4	15				
11,0	3,1"	G 3/4	21				
11,0	4,1"	G 3/4	22				
11,0	4,3"	G 3/4	23				
11,0	6,5"	G 3/4	24				
11,0	6,7"	G 3/4	25				
11,0	4,1"	G1	31				
11,0	4,3"	G1	32				
11,0	5,1"	G1	33				
11,0	6,5"	G1	34				
11,0	7,5"	G1	35				
17,6	4,1"	G1	41				
17,6	4,3"	G1	42				
17,6	5,1"	G1	43				
17,6	6,5"	G1	44				
17,6	7,5"	G1	45				
<b>Communication interface type:</b>			<b>Code</b>				
RF 915 MHz			2				
<b>Communication protocol:</b>			<b>Code</b>				
LORA WAN			X1				
<b>Extra communication interface:</b>			<b>Code</b>				
None			0				
Mbus			1				
Wired pulse output			2				
<b>Temperature class:</b>			<b>Code</b>				
Temperature class T 30			1				
Temperature class T 30/90			2				
Temperature class T 90			3				
Temperature class T 50			4				

## 2 TECHNICAL DATA

Ratio of the permanent flow rate to the lower limit of the flow-rate (selectable by the user):

$Q_3/Q_1=250$  ,  $Q_3/Q_1 = 315$ ,  $Q_3/Q_1 = 400$ ,  $Q_3/Q_1 = 800$

The technical data of the meter are provided in Table 1.1.

1.1. Table

Nominal flow rate, gpm	Dyna mic range	Maximum flow rate, gpm	Minimum flow rate, gpm	Transitional flow rate, gpm	Starting flow rate, gmp	Joining to the pipeline (Thread – G)	Overall length L, inch	Pressure loss class $\Delta p$ (bar x 100)
7,0	250	8,80	0,028	0,044	0,004	G $\frac{3}{4}$	3,1"	$\Delta p$ 25
7,0	250	8,80	0,028	0,044	0,004	G $\frac{3}{4}$	4,1"	$\Delta p$ 25
7,0	250	8,80	0,028	0,044	0,004	G $\frac{3}{4}$	4,3"	$\Delta p$ 25
7,0	250	8,80	0,028	0,044	0,004	G $\frac{3}{4}$	6,5"	$\Delta p$ 25
7,0	250	8,80	0,022	0,035	0,004	G $\frac{3}{4}$	6,7"	$\Delta p$ 25
7,0	315	8,80	0,022	0,035	0,004	G $\frac{3}{4}$	3,1"	$\Delta p$ 25
7,0	315	8,80	0,022	0,035	0,004	G $\frac{3}{4}$	4,1"	$\Delta p$ 25
7,0	315	8,80	0,022	0,035	0,004	G $\frac{3}{4}$	4,3"	$\Delta p$ 25
7,0	315	8,80	0,022	0,035	0,004	G $\frac{3}{4}$	6,5"	$\Delta p$ 25
7,0	315	8,80	0,022	0,035	0,004	G $\frac{3}{4}$	6,7"	$\Delta p$ 25
11,0	250	13,76	0,044	0,070	0,004	G $\frac{3}{4}$	3,1"	$\Delta p$ 40
11,0	250	13,76	0,044	0,070	0,004	G $\frac{3}{4}$	4,1"	$\Delta p$ 40
11,0	250	13,76	0,044	0,070	0,004	G $\frac{3}{4}$	4,3"	$\Delta p$ 40
11,0	250	13,76	0,044	0,070	0,004	G $\frac{3}{4}$	6,5"	$\Delta p$ 40
11,0	250	13,76	0,044	0,070	0,004	G $\frac{3}{4}$	6,7"	$\Delta p$ 40
11,0	400	13,76	0,027	0,044	0,004	G $\frac{3}{4}$	3,1"	$\Delta p$ 40
11,0	400	13,76	0,027	0,044	0,004	G $\frac{3}{4}$	4,1"	$\Delta p$ 40
11,0	400	13,76	0,027	0,044	0,004	G $\frac{3}{4}$	4,3"	$\Delta p$ 40
11,0	400	13,76	0,027	0,044	0,004	G $\frac{3}{4}$	6,5"	$\Delta p$ 40
11,0	400	13,76	0,027	0,044	0,004	G $\frac{3}{4}$	6,7"	$\Delta p$ 40
11,0	250	13,76	0,044	0,070	0,004	G1	4,1"	$\Delta p$ 25
11,0	250	13,76	0,044	0,070	0,004	G1	4,3"	$\Delta p$ 25
11,0	250	13,76	0,044	0,070	0,004	G1	5,1"	$\Delta p$ 25
11,0	250	13,76	0,044	0,070	0,004	G1	6,5"	$\Delta p$ 25
11,0	250	13,76	0,044	0,070	0,004	G1	7,5"	$\Delta p$ 25
11,0	400	13,76	0,027	0,044	0,004	G1	4,1"	$\Delta p$ 25
11,0	400	13,76	0,027	0,044	0,004	G1	4,3"	$\Delta p$ 25
11,0	400	13,76	0,027	0,044	0,004	G1	5,1"	$\Delta p$ 25
11,0	400	13,76	0,027	0,044	0,004	G1	6,5"	$\Delta p$ 25
11,0	400	13,76	0,027	0,044	0,004	G1	7,5"	$\Delta p$ 25
17,6	250	22	0,070	0,110	0,008	G1	4,1"	$\Delta p$ 40
17,6	250	22	0,070	0,110	0,008	G1	4,3"	$\Delta p$ 40
17,6	250	22	0,070	0,110	0,008	G1	5,1"	$\Delta p$ 40
17,6	250	22	0,070	0,110	0,008	G1	6,5"	$\Delta p$ 40
17,6	250	22	0,070	0,110	0,008	G1	7,5"	$\Delta p$ 40
17,6	400	22	0,044	0,070	0,008	G1	4,1"	$\Delta p$ 40
17,6	400	22	0,044	0,070	0,008	G1	4,3"	$\Delta p$ 40
17,6	400	22	0,044	0,070	0,008	G1	5,1"	$\Delta p$ 40
17,6	400	22	0,044	0,070	0,008	G1	6,5"	$\Delta p$ 40
17,6	400	22	0,044	0,070	0,008	G1	7,5"	$\Delta p$ 40
17,6	800	22	0,022	0,035	0,008	G1	4,1"	$\Delta p$ 40
17,6	800	22	0,022	0,035	0,008	G1	4,3"	$\Delta p$ 40
17,6	800	22	0,022	0,035	0,008	G1	5,1"	$\Delta p$ 40
17,6	800	22	0,022	0,035	0,008	G1	6,5"	$\Delta p$ 40
17,6	800	22	0,022	0,035	0,008	G1	7,5"	$\Delta p$ 40

Working temperature range:

Meter temperature class T 30

(32 °F....86 °F)

Meter temperature class T 50

(32 °F....122 °F)

Meter temperature class T 30/90

(86 °F....194 °F)

Meter temperature class T 90

(32 °F....194 °F)

Maximum admissible working pressure (Pressure class)	16 bar (MAP16)
Flow profile sensitivity class	U0 D0
Volume measurement unit's	GAL
Resolution of a displaying device	1 GAL
Displaying range	999999999 GAL

### Display (LCD)

The device is equipped with 2- lines LCD (Liquid Crystal Display):

Upper line - 9-digits for displaying measured volume of water:  
Readings in normal mode: GAL.

Lower line - 5-digits for displaying current flow rate, GPM, and special symbols for displaying operation modes.

In the case of battery discharge, all integral readings and archive data shall be saved for at least 16 years and can be accessed by connecting a power battery in the operating condition.

### Data recording and storage

In its memory, the meter accumulates an archive of hourly, daily, and monthly-measured parameters. Archive data can be read only by remote data reading means (see Paragraph 6.5). The monthly data archive parameters which are also additionally showed on the display are specified in Paragraph 6.3.1. The following parameters of each hour, day, and month are accumulated in the memory of the meter:

1	Integral volume of water
2	Integral volume of water in the forward direction
3	Informational flow in the reverse direction
4	Maximum flow rate value and date
5	Info (Status) code
6	Total operating time
7	Operating time without error

Data logger capacity:

up to 1480 h – 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 even if device is disconnected from power supply not less than 16 years.

### External communication modules and interfaces

Integrated in meter:

Optical interface

It is intended for data reading via Mbus protocol, parameterizing of meter, and for outputting optical pulses in the test (verification) mode. It is activated by sending 1 s. pulse sequence (5 minutes after the end of communication is automatically deactivated).

NFC (Near-field communication interface)

It is intended for data reading.

Ordered interface (to be specified when ordering the meter; one options can be selected only):

- RF 915 MHz

The data can be transmitted using the following protocols:

- LORA WAN;

The interfaces are intended for data reading and meter parametrisation. The meter is configured for being powered only from the internal battery, and the time of communication through the additional interfaces is automatically limited to save the battery – up to 20 minutes per month. Unused communication limit is 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).

### Power supply

(one of following, dependently on meter configuration):

- one or two internal AA-size 3.6 V lithium (Li-SOCl<sub>2</sub>) batteries with a service life of at least 16 years.

### Mechanical data :

Dimensions of meter, not more than 2,95“ x 3,03“ x 7,48“ (G1“,L190),

Weight:

End connections (overall length)	Weight of meter, not more than, kg
G3/4“ (3,1“)	0,3
G3/4“ (4,1“)	0,3
G3/4“ (4,3“)	0,3
G3/4“ (6,5“)	0,3
G3/4“ (6,7“)	0,3
G1“ (4,1“)	0,4
G1“ (4,3“)	0,4
G1“ (5,1“)	0,4
G1“ (6,5“)	0,4
G1“ (7,5“)	0,4

### Operation conditions

Enclosure protection class:

IP68

Operating conditions:

- ambient temperature 5 °F to 158 °F;
- 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.

## 3 OPERATING PRINCIPLE

The flow measuring principle is based on ultrasonic measurement method. The ultrasonic signal along the measuring section moves many times before, and the flow downstream between the ultrasonic sensors have to perform transmitter and receiver functions. From the resulting time difference the flow rate is calculated and indicated in display

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

- High stability in measuring water volume and detection characteristics of overload;
- Calculation of the maximum values and their storage in archive;
- Storage of data necessary for reports on set day yearly and monthly;
- Archive data storage time 36 months
- Detection of fault
- Displaying of values of parameters (optional) and displaying of info codes
- Verification and service functions.

## 4 MARKING AND SEALING

### Marking

There are following information on the front panel of the calculator of the meter - required certificate number, manufacturer's trade mark, type of meter, year of manufacture and serial number, permanent flow rate

and dynamic range, temperature class, where it differs from T30, 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.

The following is indicated on the housing of meter:

- the type of connection (thread or relative diameter);
- the flow direction.

### **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 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, there are provided holes in the meter body (See Annex B)

## **5 INSTALATTION**

### **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 to 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.

### **Check 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;
- set day of year and month;
- customer number
- internal clock time

*Note. The transport mode will turn off automatically (the possibility to change configuration parameters will be turned off) when the meter starts operation and the volume integrator has accumulated more than 10 litres.*

### **Mounting**

The temperature of the working environment should not be higher than 158 °F.

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 (in order to prevent disturbance of its working environment conditions).

Sizes and mounting dimensions of meter are provided in Annex A.

The straight pipelines in upstream and downstream the meter is not necessary (flow profile sensitivity class U0 D0).

It is recommended to install meters in pipelines as far as possible from pumps, partitions, and elbows.

Water meters may be in all positions (either horizontally, vertically or inclined). Mandatory condition: in the operating mode, the pipe must have a pressure of not less than 30 kPa and the pipe must be fully filled with water.

Direction of the arrow on the meter must match with the flow direction in pipeline.

In order 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 with regard to the thickness of gaskets.

It is recommended to select meter installation place as far as possible from potential sources of vibration (for example, pumps).

The gaskets must match with the pipe diameter. During the installation gasket must be exactly centered with the center of the pipe cross-section to avoid sticking out gaskets inside the pipe.

### Checking of installation and parameter setting

If the meter is installed correctly, when there is flow, the display of the meter should display flow readings. It is necessary to check whether the meter is installed in the correct direction, whether there is no air in the system.

## 6 OPERATION

### Display functions

The water meter is equipped with 2- lines LCD (Liquid Crystal Display): Upper line - 9-digits for displaying measured volume of water; Lower line - 5-digits for displaying current flow rate and special symbols for displaying operation modes



Flow arrows:

↑	- flow is flowing forward
↓	- flow is flowing backwards*
arrow is not displayed	- flow does not flow

**Remark:** \* for reverse flow, the meter shows backflow GAL and an error code is also sent, due to backflow. The direct water volume summation record remains unchanged.

Special symbols:

Symbol	Description
漏水	Leakage
发射器	Radio transmitter is active
管道	Pipeline is empty
破裂	Pipe is cracked (Burst)
故障	Fault (error)
电池	Battery replacement time

The symbol  is shown when there is a significant meter operation error. For the Info code, see the LCD menu item 1.7 (Paragraph „Menu structure“).

### Menu structure

Menu structure in normal mode is presented in Fig. 6.1.

Meter menu items are switches automatically. Individual items, excepted total volume and Info status code can be disabled during installation. Error code displayed only when an error occurs in meter work. In normal mode this item is skipped.

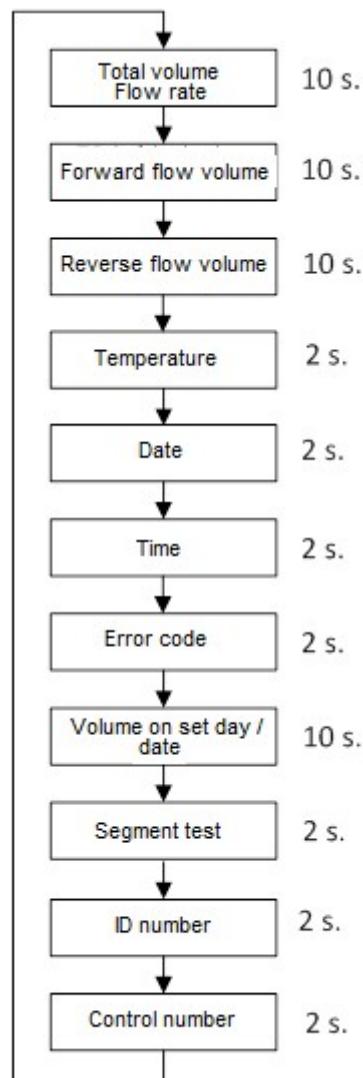
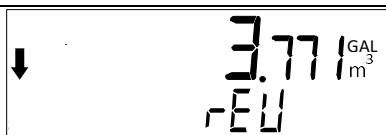
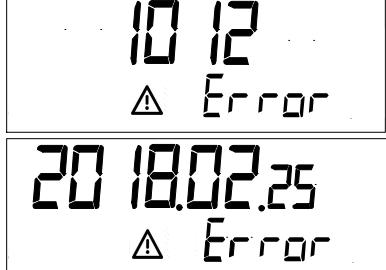
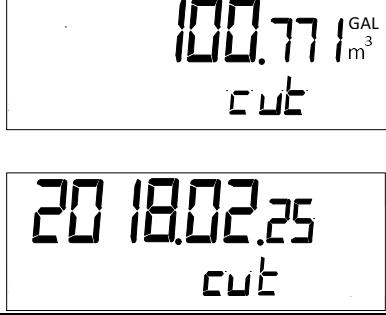
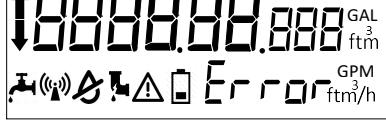


Fig. 6.1. Menu structure in normal mode

## Viewing the readings in normal mode (User menu)

Remark: Here the full list of shown parameters is represented. For the specific meter it can be reduced

ID	Parameter	Value (example)	Remarks
1.1	Total volume, Flow rate		
1.2	Forward flow volume		
1.3	Informational volume flowing in reverse direction		
1.4	Water temperature value		
1.5	Date		
1.6	Real - time		
1.7	Info code and error occurrence date		Changes each 1 second
1.8	Accumulated volume on set day /date		
1.9	Segment test		Changes each 1 second

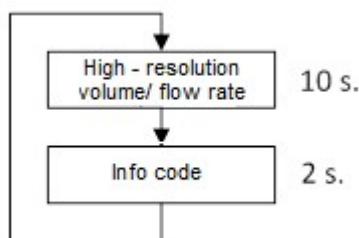
1.10	User identification number		
1.11	Control number		

The indication of irrelevant parameters can be turned off. Also, parameters that are not relevant to the set meter configuration will not be indicated.

The indication of parameters can be turned on or off by means of the configuration programme „W1 TOOL“ through the optical interface when installing the meter (if the meter is in the transport mode).

### Viewing the readings in verification (test) mode

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



**Fig. 6.2.** Menu structure in verification (test) mode

### Volume readings in verification mode

Parameter	Value (example)	Remark
High-resolution integrated volume	 	Updated every 10 second. Flow-rate value and inscription „tEST“ are changes every second

### Info (Status) codes

Operating Status are encoded by a 4-digit code:

Code number	Description	
nXXX	0 - Normal operation 1 - Reconfiguration warning 2 - No consumption 4 - Damage of meter housing 8 - Calculator's hardware failure detected	
XnXX	0 - Normal operation	
	1 - Leakage	
	2 - Pipe is cracked (Burst)	
	4 - Optical communication temporarily stopped	

	8 - Low battery (less than 12 months lifetime left)	
XXnX	0 - Normal operation 4 - Hardware failure detected 8 - Hardware failure detected	
XXXn	0 - Normal operation 1 - No signal; the flow sensor is not filled with water 2 - Reverse flow 4 - Flow rate is greater than 1,25·Maximum flow (indicated $q = 1,25 \cdot \text{Maximum flow}$ ) 8 - Freeze alert	

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

- 3 - corresponds errors 2 + 1
- 5 - corresponds errors 4 + 1
- 7 - corresponds errors 4 + 2 + 1
- 9 - corresponds errors 8 + 1
- A - corresponds errors 8 + 2
- B - corresponds errors 8 + 2 + 1
- C - corresponds errors 8 + 4
- D - corresponds errors 8 + 4 + 1
- E - corresponds errors 8 + 4 + 2
- F - corresponds errors 8 + 4 + 2 + 1

### Verification (test) mode control

In verification (test) mode it is possible to achieve precise results within short measuring time.  
In the test mode, the meter:

- indicates the increased resolution of flow values;
- forms energy or volume pulses through the optical interface;

Volume pulse values (via optical interface) in verification mode „TEST“ are presented in Table 6.2

Table 6.2

Permanent flow rate	Volume Pulse value, gal/imp
7,0	0,026
11,0	0,052
17,6	1,056

Using an optical head and PC with W1 TOOL software the meter verification mode (TEST) can be activated.

Optical head should be connected to the computer USB interface. After placing optical head on the meter with the special holder and opening the program start up window, PC port number (to which optical head is connected) is entered in the field „Com Port“. Click „Wake up meter“ button, then click the „Enter test mode“ button. When the meter TEST mode is activated, meter readings are displayed with resolution of 1 ml. Optical pulse output of meter is used or volume indications can be read directly from LCD.

### Ending of verification mode

Using an optical head and PC with W1 TOOL software the meter verification mode (TEST) is returned to the operating mode. After opening the program startup window, click „Wake up meter“, then click „Enter user mode“. The meter returns to the normal mode. The meter returns to its normal mode automatically, 24 hours after activation of TEST mode.

## 7 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.

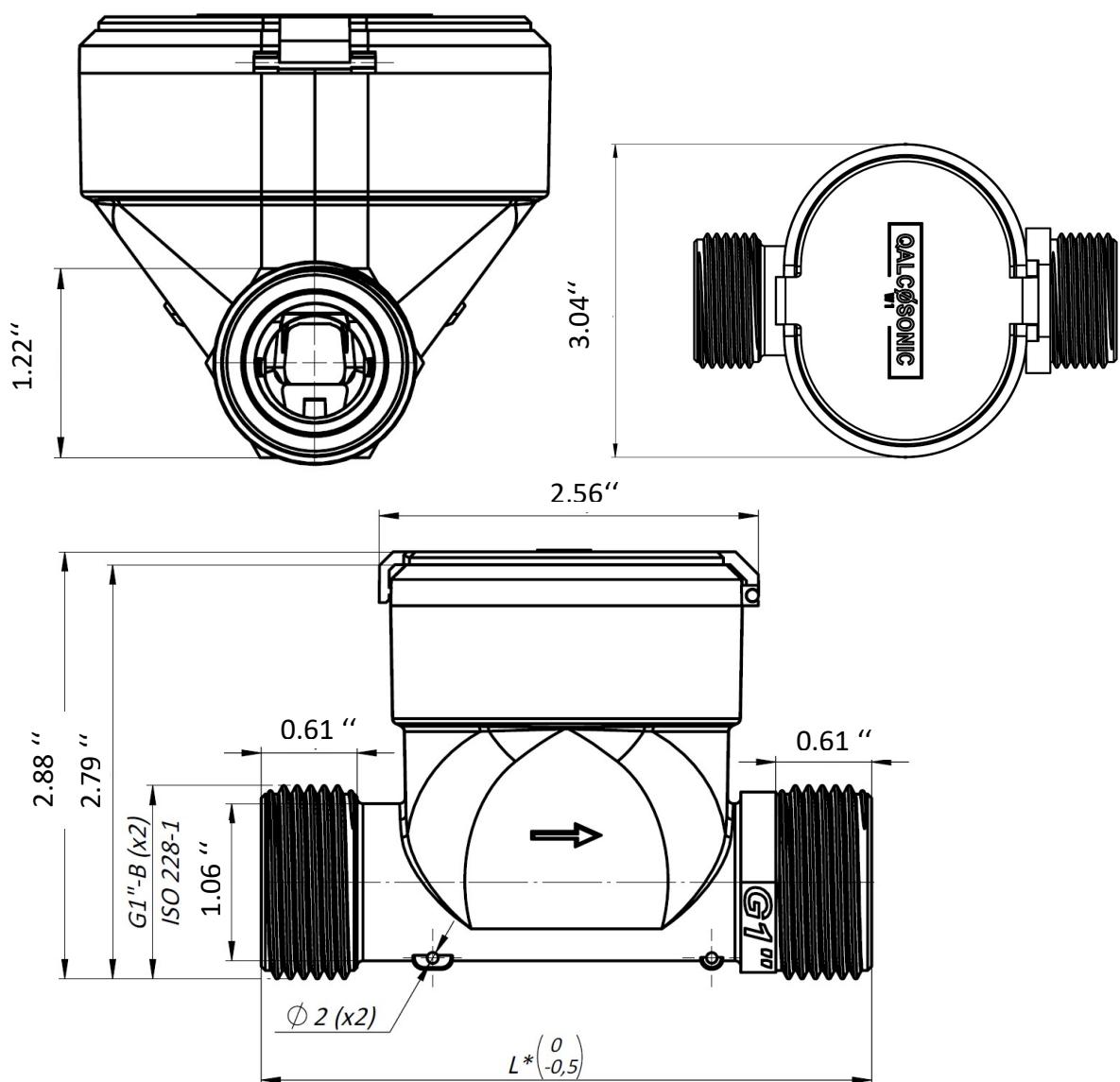
Storage and transportation temperature: -13°F...158 °F (drained flow part)

Humidity: not more than 93%.

### Annex A

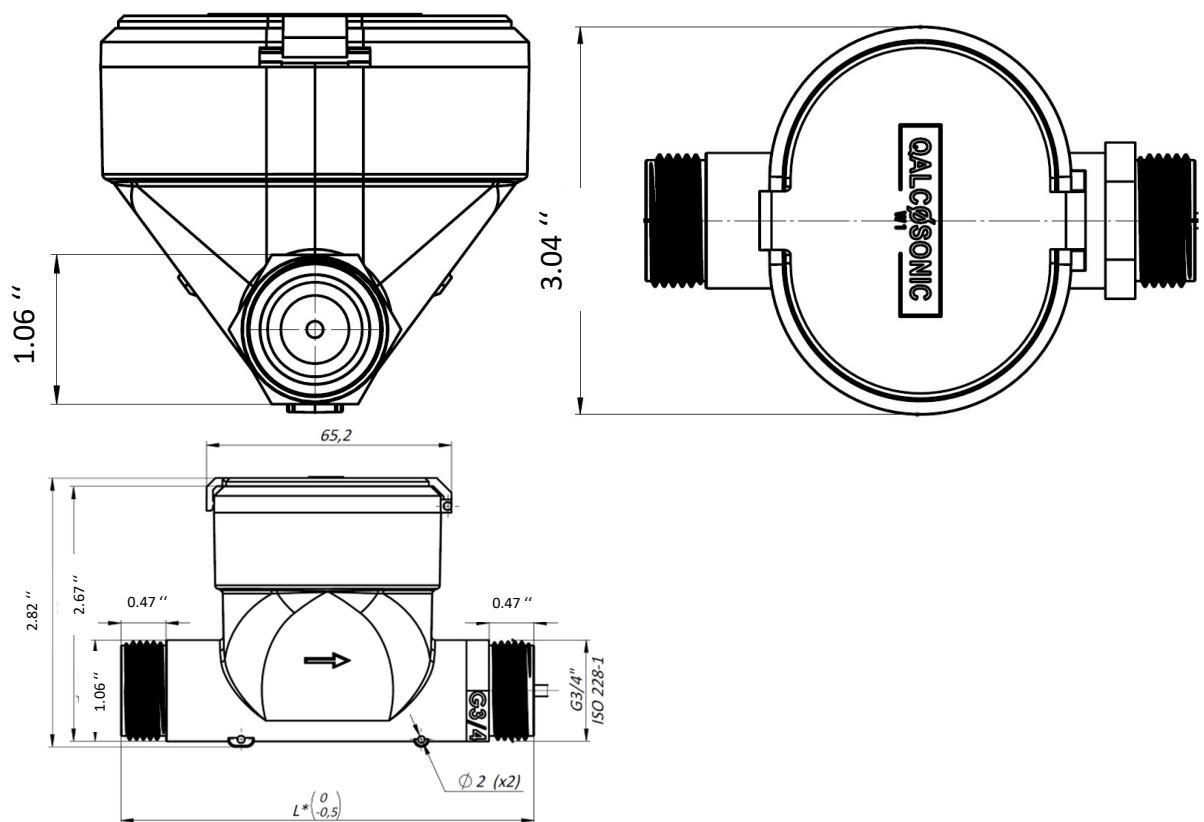
#### Sizes and dimensions of water meter QALCOSONIC W1

##### A.1 G1":



Model	L, mm
G1" L105	4.1"
G1" L110	4.3"
G1" L130	5.1"
G1" L165	6.5"
G1" L190	7.5"

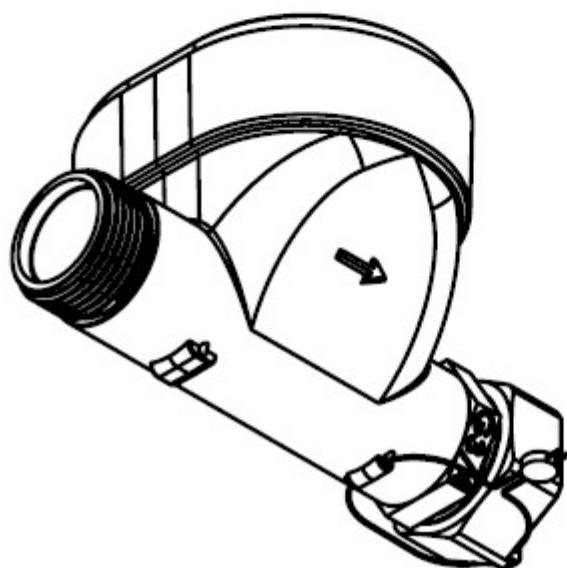
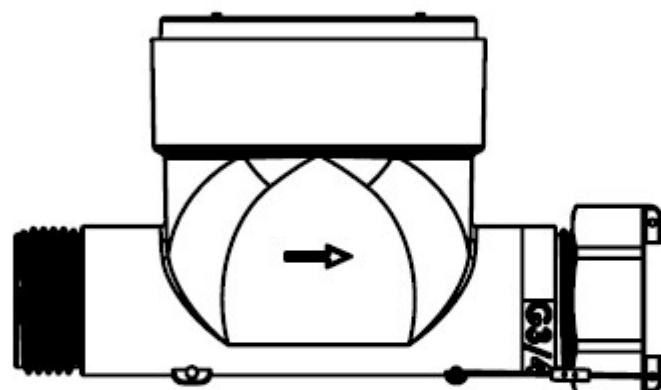
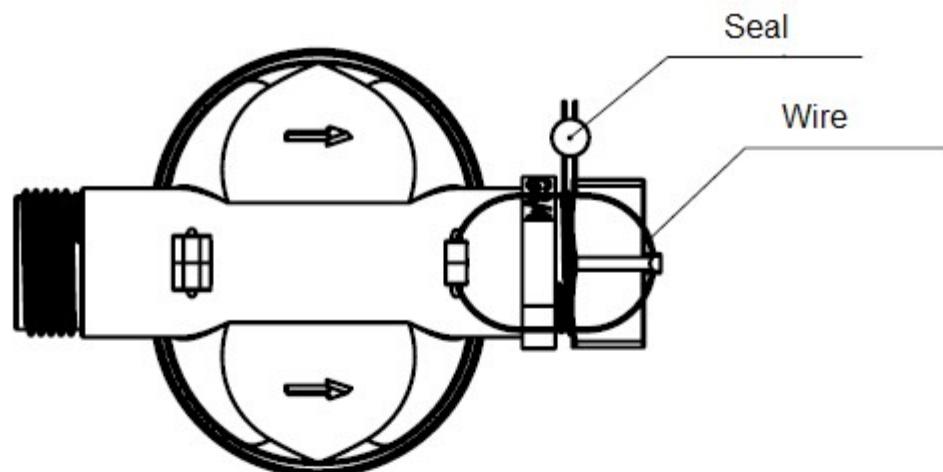
**A.2 G3/4":**



Model	L, mm
G3/4" L80	3.1"
G3/4" L105	4.1"
G3/4" L 110	4.3"
G3/4" L165	6.5"
G3/4" L170	6.7"

## Annex B

Example of sealing of water meter after installation



## **WARRANTY**

Manufacturer gives the 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 - 12 months from bringing into operation, but not more than 18 months from manufacturing date.

Manufacturer's address:

Axioma Metering UAB, Veterinaru str. 52, Biruliskes, Lithuania  
tel. +370 37 360234; fax. +370 37 360358.