Siargo Ltd.

Ultrasonic Water Meter VA.0.02

Model LR1100

www.Siargo.com

Ultrasonic Water Flow Meter

For residential water metering with IoT

LR1100 Series

User Manual

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Attention!

- Please carefully read this manual before operating this product.
- Do not open or modify any hardware that may lead to irrecoverable damage.
- Do not use this product if you suspect any malfunctions or defects.
- Use this product only for residential water applications and do not use it in a vibrational environment.
- Use this product according to the specified parameters.
- Only the trained or qualified personnel shall be allowed to perform product services.

Use with caution!

- Be cautious of electrical safety, even if it operates at a low voltage; any electrical shock might lead to some unexpected damage.
- The water to be measured should be from the city utility application. Do not apply this meter for any other purpose.
- This product is designed for city water metering. It is intended to have the operation as simple as possible. However, training of the operator should be performed before use.
- The products are enabled with IoT, excellent for data safety and reliability. Some knowledge of the system is required for the proper implementation of communication.

Table of Contents

1 Overview

This ultrasonic water meter series is designed for residential water metering or city utility meter management. The products are built with the ultrasonic phase difference measurement approach with solid-state transducers that offer high accuracy and long-term stability. The technology requires no moving parts, which means it will not lead to mechanical degradation compared to conventional water meters. The products are built in full compliance with the International Water Meter Standard ISO4064-1:2014 and other relevant regulatory requirements.

This series of products features an extensive dynamic measurement range and excellent low-flow detection capability, enabling the recovery of leakage issues from mechanical meters and significantly reducing pressure loss due to mechanical moving parts. The products have been certified with IP68 protection to ensure safe operation for the required applications and working environments. The onboard data storage can store the basic meter performance data for up to 24 months. They are further built with tamper protection and can be extended for other water metering applications, such as water resource intake monitoring, farmland irrigation, and industrial process monitoring.

The products have very low power consumption. They are operated with a C-cell lithium-ion battery for a guaranteed operation time of more than five years. The meter features a built-in LCD and is equipped with a default remote data enabled for IoT communication, utilizing a state-of-the-art LoRaWAN IoT communication module. Please specify the operating frequency band for your region when you place the order. Other IoT options, such as NB-IoT, CAT-M, and BTLE, are available upon request.

2 Receipt / unpack of the products

Upon receipt of the products, please check the packing box before dismantling the packing materials. Ensure no damage during shipping. If any abnormality is observed, please contact and notify the carrier who shipped the product, and inform the distributors or sales representatives if the order is not placed directly with the manufacturer. Otherwise, the manufacturer should be notified as well. Please refer to this manual's return and repair section for any further actions.

If the packing box is intact, open it to find the flow meter inside. Some accessories may or may not be included in your order.

Note: The battery is not installed and included in the shipped product due to transportation requirements. However, a battery cable is usually shipped with the package.

Please immediately check the integrity of the product and the accessories, if any. If any abnormality is identified with your order, please notify the distributor/sales representative or manufacturer as soon as possible. If any defects are confirmed, an exchange shall be arranged immediately via the original sales channel. (Note: the LCD screen shall not be lit until the battery is installed or the power cable is plugged in.) This user manual shall also be included in the packing box or via an online link for an electronic version. In most cases, this manual shall be made available to the customer before the actual order.

The meter is designed to operate with low power, utilizing a single C-cell lithium-ion battery. Check the meter face for basic specifications, such as flow range, particularly the LoRaWAN band, and ensure it will work in the region where you plan to install the product.

3 Knowing the products

3.1 Product description

3.2 LCD description

The LCD displays all the information measured by the product. Some symbols are reserved for future upgrades and will not be lit during the operation. The following table details the meaning of each of the symbols.

Symbol		Symbol	
m³	Totalized flow	88°C	Temperature
m³/h	Instant flow		Leakage
	Battery status	Err-01	Error

3.3 Mechanical dimensions

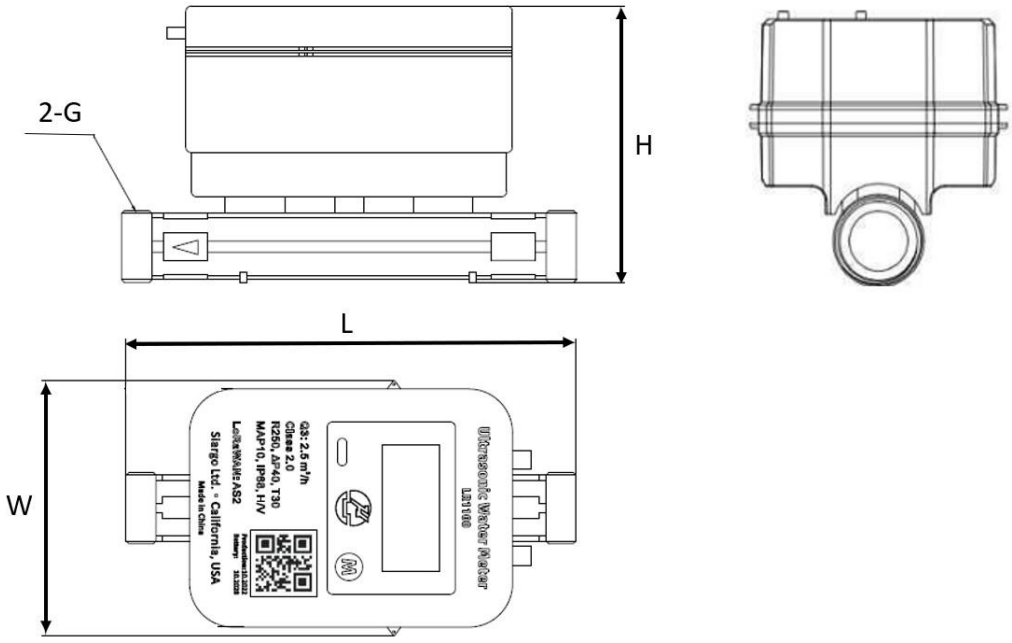


Figure 3.3.1. LR1100 mechanical dimensions

Table 3.3.1. Available pipe sizes and corresponding dimensions.

Pipe diameter (mm)	L (mm)	W (mm)	H (mm)	Thread
DN15	165	95	92	G-3/4B
DN20	195	95	95	G-1B
DN25	225	95	102	G-1 1/4B

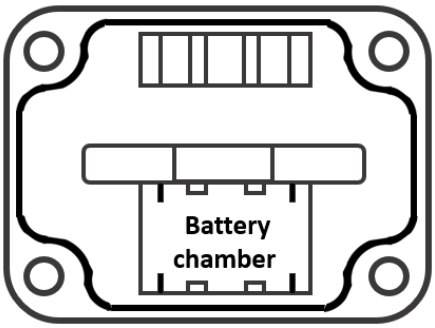
4 Installation

4.1 Installation requirements

1) Read this manual carefully before proceeding with the installation. Injury or damage may occur if the proper procedure is not followed.
2) Be careful and apply all precautions for an electronic device while handling it.
3) Do not dismantle any parts except for those concerning the battery installation. Follow 4.2 – battery installation procedures, step by step.
4) Before installing the meter, the pipeline must be cleaned. A filter must be installed before the water inlet of the ultrasonic water meter. The filter must be cleaned and maintained regularly to prevent debris from damaging the meter.
5) It is recommended to install valves at both ends of the meter to facilitate future maintenance.
6) The proper model of the meter should be selected based on the flow rate instead of the pipe diameter.
7) LCD must not be immersed in water.
8) The meter must be regularly verified following the local standards. If needed, the battery replacement must be done by trained personnel.
9) For additional precaution, a water meter box could be applied for protection.
10) Trained or qualified technicians must perform meter calibration, maintenance, and repairs.

4.2 Battery installation

1) Open the meter cover by unscrewing the four screws from the bottom of the meter body, then install the battery. The battery must be a C-cell lithium-ion battery with safety approval. The battery chamber is shown below:

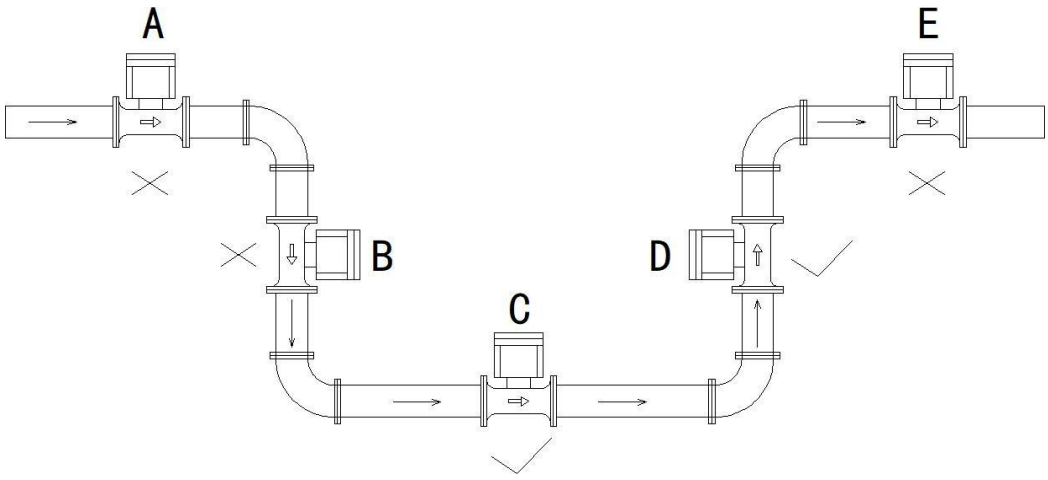


2) A battery cable with the terminal is supplied with the shipment. Use the terminal to connect the battery to the PCB. Note: the cable may also have a capacitor attached for safety reasons.

3) After the battery is installed and secured inside the battery chamber, the LCD of the meter should light up. Check the LCD to make sure it works.

4) Close the cover and tighten it with the screws that were unscrewed from the meter body while opening the cover.

4.3 Installation location and precautions



Schematic diagram of the installation

1) The product must be installed either horizontally or vertically, and the arrow on the meter body shows the flow direction. Do not reflux the water to avoid impurities that might damage the product. If the meter is installed vertically, the direction of water flow must be upward.

2) Positions C and D are recommended for the installation. The product should be installed in the lower portion of the upward part of the pipeline so that the pipe section will maintain sufficient back pressure and not produce bubbles.

3) Positions A, B, and E are not recommended for installation. The pipeline inlet may create a complicated flow profile at position A, while position B is the downward pipeline for which the back pressure is low, often leading to bubbles. Position E is the pipeline's highest point and has a high chance of bubbles, resulting in abnormal measurement data.

5 Operation and MENU description

5.1 Check the product specifications

Before starting to use this product, check the specifications in this manual or the basic information on the front panel.

Detailed product information can be found in Section 7. Be particularly cautious about the supplied voltage indicated in the specification. For optimal product performance, it is recommended to install the filter before the meter, ensuring the water being measured is clean and free of particles and other foreign materials.

5.2 Check the leakage

Check water leakage before any measurement.

5.3 Power the meter and digital data connection

Although this product complies with the CE-required EMC regulations, it also requires the product to be used according to the standard electrical device practice. Be sure to select a battery with safety features and ensure it is within its expiration date. Do not use batteries without a known manufacturer and expiration date.

The default digital communication is LoRaWAN. Please refer to the communication protocol section for detailed information.

5.4 MENU description

5.4.1. User mode:

1) After long pressing the button on the A1 "Alarm" display page for 3 seconds, the display menu will show sequentially among A1, A2, and A3. When released, it enters the corresponding menu, and pressing the button allows one to scroll through the menu to display its contents.

2) Main display menu A1: Cumulative flow (m3), instant flow (m3/h), serial number, and cumulative alarm time (h).

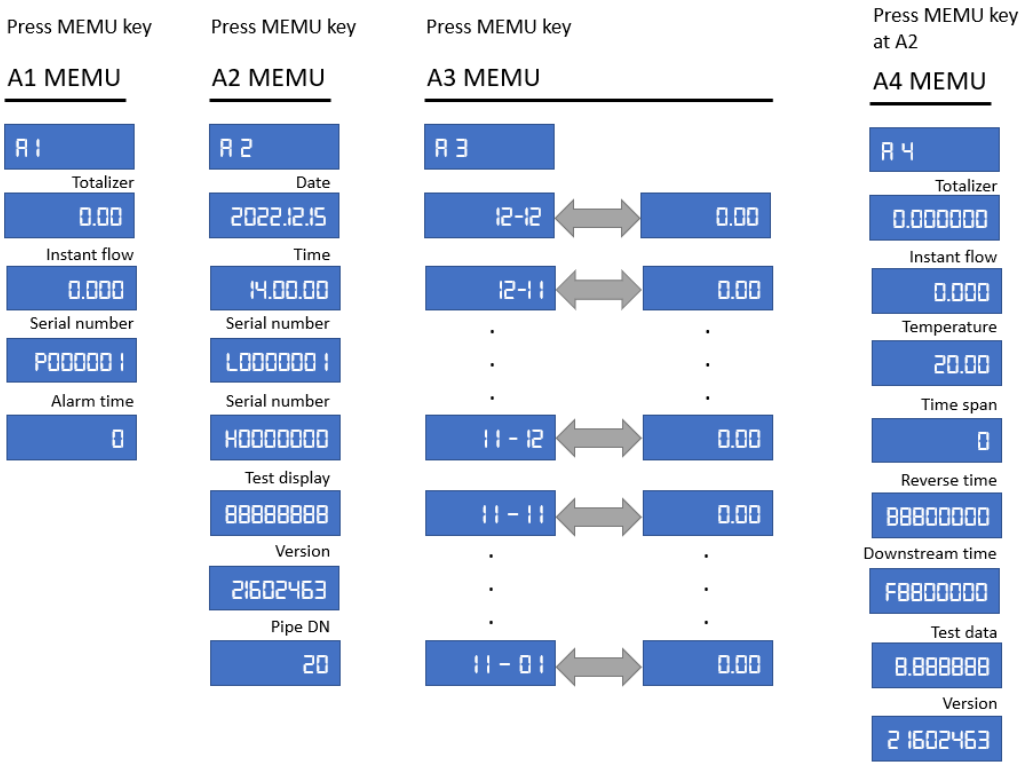
3) Main display menu A2: current date, current time, serial number (a total of 14 digits), full display test, version number, pipe diameter, and serial port baud rate.

4) Main display menu A3: The monthly traffic consumption value for the previous 24 months is automatically displayed alternately between the month and the value.

5.4.2. Verification or testing mode:

1) After long pressing the button on the A1 "Alarm" display page for 3 seconds, the display menu will sequentially display A1-A2-A3, releasing the button when displaying A2, which will enter the A2 menu. After pressing and holding the button for 3 seconds on the version number page, the display menu will show between A1-A4. Releasing the button when displaying A4 will enter the A4 menu. A4 is the verification/testing mode. When the button is pressed, the content scrolls under the same menu. After four (4) hours, no operation will automatically exit the verification mode.

2) Main display menu A4: Cumulative flow (m^3), instant flow (m^3/h), temperature (°C), time difference, reverse time, downstream time, test data, and version number.



5.5 Wireless or IoT data communication

The product has LoRa wireless data transmission to ensure data safety and reliability.

LoRaWAN communication:

- LoRaWAN RF transmit power: 21.2 dBm
- LoRaWAN receive sensitivity: -140 dBm
- LoRaWAN communication range (in the open area and inside the metal cover): 5600m, antenna 2 m above the ground
- Battery lifespan (data transmission frequency of 01 time/day) > five years
- LoRaWAN Class: Class A and support C
- LoRaWAN operation mode: OTAA

Data upload format

Field 1	Field 2	Field 3	Field 4
Totalized flow (4 bytes)	Reverse flow (4 bytes)	Status (1 byte)	Status (1 byte)

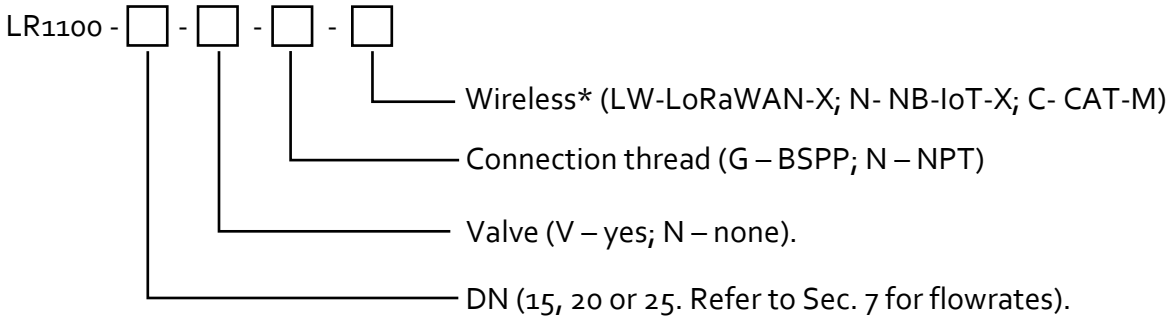
Example:
Date packet: 00 00 0B 2C 00 00 6C 80 02 00
Totalized flow: 00 00 0B 2C: HEX high bit first – 00000B2C = 0xB2C = 2860 = 2.860 m^3
Reverse flow: 00 00 6C 80: HEX high bit first – 00006C80 = 0x6C80 = 27776 = 27.776 m^3
Status 1: 02
Status 2: 00

Status

Status 1	D0	D1	D2	D3	D4	D5	D6	D7
Definition	Valve		Battery			Circuitry error	Sensor alarm	
Note	00: open; 01: close; 1x: abnormal.		1: low			1: error	1: Alarm	
Status 2	**D0**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**
Definition	No water			Installation error				
Note	1: No water			1: reversed				

6 Product selection

The product part number comprises the product model number, DN, and wireless communication options. The current default option is LoRaWAN. Refer to the following for details.



Note – For wireless communication, "X" indicates the country/region where the products will be installed. For LoRaWAN, please refer to the following web for frequency/band information: https://www.thethingsnetwork.org/docs/lorawan/frequencies-by-country/

Some selected countries are listed below:

Brazil	AU915-928
Indonesia	AU923-925 (AS2)
Italy	EU863-870 / EU433
Malaysia	AU920-923 (AS1)
Mexico	US902-928
Taiwan	AU923-925 (AS2)
Vietnam	AU923-925 (AS2)

7 Technical specifications

Unless otherwise noted, all specifications in the following table apply for calibration conditions at 20°C and 101.325 kPa absolute pressure with air. The product is horizontally mounted during calibration.

	Value	Unit
Accuracy	Level 2	
Range ratio	R200/R400	
Pipe size	15 / 20 / 25	mm
Maximum pressure	1.0	MPa
Working environment	Class A	
Temperature	T30 (default) or T50	
Upstream sensitivity	U3	
Downstream sensitivity	D0	
Safety class	Grade C	
EMC	Level E2	
Communication	LoRaWAN / Infrared /NB-IoT	
Power supply	Lithium-ion battery C-cell (3.6V).	
Protection	IP68	
MENU access	Front key	
LCD contents	Totalizer, instant flow rate, and status	
Data storage	EEPROM, 24 months' totalized flow	
Sampling rate	4	kHz
Average power consumption	<100	μA

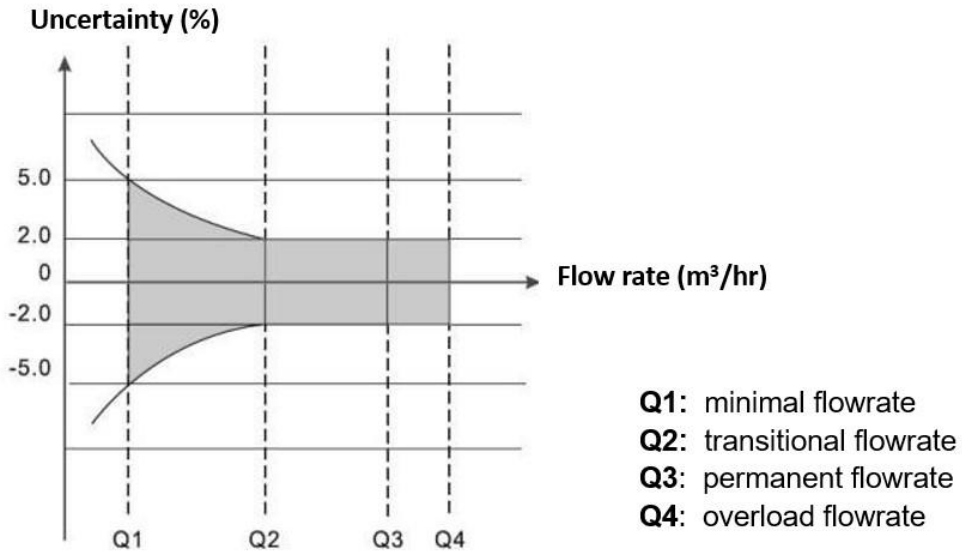
R200 flow parameters:

DN (mm)	Qs (L/hr)	Q1 (L/hr)	Q2 (L/hr)	Q3 (m^3/hr)	Q4 (m^3/hr)
15	2.4	13.0	20.0	2.500	3.125
20	4.0	20.0	32.0	4.000	5.000
25	6.4	32.0	50.0	6.300	7.875

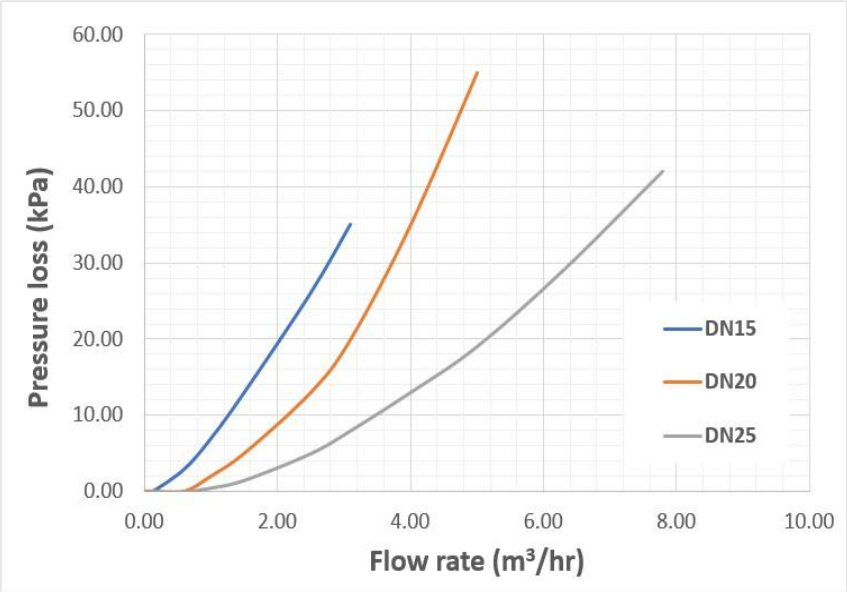
R400 flow parameters:

DN (mm)	Qs (L/hr)	Q1 (L/hr)	Q2 (L/hr)	Q3 (m^3/hr)	Q4 (m^3/hr)
15	2.4	6.0	10.0	2.500	3.125
20	4.0	10.0	16.0	4.000	5.000
25	6.4	16.0	25.0	6.300	7.875

7.1 Performance uncertainty curve



7.2 Pressure loss



7.3 Transport storage

The transportation and unpacking of the products should not be subject to severe mechanical impact. They should be transported and stored in the environment specified in Section 7, i.e., the products should be stored in the original packaging, the ambient temperature at the storage ranges from -5 °C to 40 °C, and the relative humidity does not exceed 70%. There must be no corrosive gas in the air.

8 Technical notes for the product performance

Measurement principle

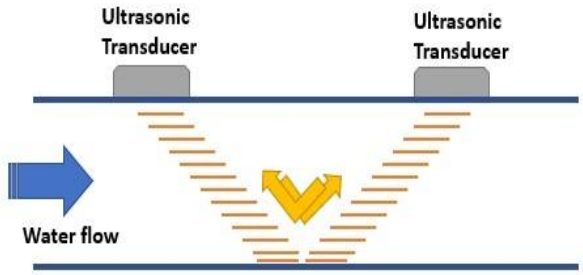


Figure 8.1. Measurement approach illustration.

The products utilize the state-of-the-art solid-state ultrasonic transient time measurement principle. A pair of ultrasonic transducers is placed outside the water flow channel wall, and both transducers transmit ultrasonic waves in the direction of the other transducer. The velocity or the time of ultrasonic waves reaching another transducer will increase or decrease depending on whether the ultrasonic wave is in or against the water flow direction. Therefore, the ultrasonic wave travel time difference is proportional to the water flow velocity. The water flow rate can be calibrated and measured by precisely gauging the ultrasonic wave travel time difference with a metrological reference standard.

Since water volume change is trivial under normal working conditions of the residential water supply, the ultrasonic water meter is an attractive technology for application in recent years. The technology has an extensive dynamic range capable of solving the industry's leakage-related metrology issue. Remote data is also becoming readily available with today's IoT technologies.

9 Warranty and Liability

(Effective January 2018)

Siargo warrants that the products sold hereunder will be used appropriately and installed correctly under normal circumstances and service conditions. As described in this user manual, it shall be free from faulty materials or workmanship for 180 days for OEM products and 365 days for non-OEM products from the date of shipment. This warranty period includes any statutory warranty, and any repaired or replaced product shall bear the same terms in this warranty.

Siargo makes no warranty, representation, or guarantee and shall not assume any liability regarding the suitability of the products described in this manual for any purposes that are not specified. The users shall be held fully responsible for validating the performance and suitability of the products for their particular design and applications. For any misuse of the products out of the scope described herein, the user shall indemnify and hold Siargo and its officers, employees, subsidiaries, affiliates, and sales channels harmless against all claims, costs, damages, and expenses or reasonable attorney fees from direct or indirect sources.

Siargo makes no other warranty, express or implied, and assumes no liability for any special or incidental damage or charges, including but not limited to any damages or charges due to installation, dismantling, reinstallation, etc., or consequential or indirect damages of any kind. To the extent permitted by law, the exclusive remedy of the user or purchaser and the limit of Siargo's liability for any and all losses, injuries, or damages concerning the products, including claims based on contract, negligence, tort, strict liability, or otherwise shall be the return of products to Siargo, and upon verification of Siargo to prove to be defective, at its sole option, to refund, repair or replacement of the products. Regardless of form, no action may be brought against Siargo more than 365 days after a cause of action has accrued. The products returned under warranty to Siargo shall be at the user or purchaser's risk of loss and will be returned, if at all, at Siargo's risk of loss. Purchasers or users are deemed to have accepted this limitation of warranty and liability, which contains the complete and exclusive limited warranty of Siargo. It shall not be amended, modified, or its terms waived except by Siargo's sole action.

This manual's product information is believed to be accurate and reliable at the time of release or when made available to the users. However, Siargo shall assume no responsibility for any inaccuracies and/or errors and reserves the right to make changes without further notice for the relevant information herein.

This warranty is subject to the following exclusions:

(1) Products that have been altered, modified, or have been subject to unusual physical or electrical circumstances, as indicated, but not limited to those stated in this document or any other actions which cannot be deemed as proper use of the products;
(2) Products that have been subject to chemical attacks, including exposure to corrosive substances or contaminants. In the case of battery usage, long-term discharge, or leakage-induced damage;
(3) Products that have been opened or dismantled for whatever reason;
(4) Products that have been subject to working conditions beyond the technical specification as described by this manual or related datasheet published by the manufacturer;
(5) Any damages incurred by the incorrect usage of the products;
(6) Siargo does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies.
(7) Products that unauthorized dealers or any third parties resell.

10 Service contact

Siargo Ltd. is making every effort to ensure the quality of its products. In case of questions and or product support, please get in touch with customer service at the address listed below. We will respond to your request in a timely fashion and will work with you toward your complete satisfaction.

Customer service and all orders should be addressed to

Siargo Ltd.
4677 Old Ironsides Drive, Suite 310,
Santa Clara, California 95054-1857, USA
Tel: +1(408)969-0368
Email: Info@Siargo.com

For orders, please provide an accurate and complete postal address. Siargo will not ship to P.O. Boxes or via a third party.

For further information and updates, please visit www.Siargo.com.

Appendix I: Document history

Revision VA.0.02 (August 2025)

- Corrections.

Revision VA.0.01 (July 2023)

- Update contact address.

Revision VA.0 (November 2022)

- First release.