Siargo Ltd.

LR1100 / LR1200 series

Liquid Flow Meters

User Manual VA.0

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Liquid Flow Meters

With MEMS thermal time-of-flight sensing technology

LR1100 / LR1200 Series

User Manual

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Attention !

- Please carefully read this manual prior to operating this product.
- Do not open or modify any hardware which may lead to irrecoverable damage.
- Do not use this product if you suspect any malfunctions or defection.
- Do not use this product for corrosive media or in a strong vibration 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 for electrical safety, and even it operates at a low voltage, any electrical shock might lead to some unexpected damages.
- The liquid to be measured should be clean and free of particles, as even light particles may be accumulated inside the tiny flow channel that may result in inaccuracy in metrology, clogging, or other irrecoverable damage.
- Do not apply for any unknown or non-specified liquids that may damage the product.
- Be cautious for the bubbles or cavitation inside the fluid, visible or invisible that may lead to inaccuracy or erroneous outputs.

Table of Contents

1. Overview

All contact information can be found at the end of this manual.

This manual provides essential information for the LR1100 / LR1200 series of liquid flow meters for flow measurement applications. The product performance, maintenance, and troubleshooting, as well as the information for product order, technical support, and repair, are also included.

The LR1100 / LR1200 liquid flow meters are manufactured with the ultrasonic detection technology that offers very high precision at large dynamic ranges.

2. Receipt / unpack of the products

Upon receipt of the products, please check the packing box before dismantling the packing materials. Ensure no damages 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 informed. For any further actions, please refer to the return and repair section in this manual.

If the packing box is intact, proceed to open the packing box, and you shall find the product (either the meter or the sensor formality per the actual order), as shown below.

Figure 2.1: LR1100 / LR1200 liquid flow meter

Please check immediately for the integrity of the product if any abnormality is identified, please notify the distributor/sales representative or manufacturer as soon as you can. If any defects are confirmed, an exchange shall be arranged immediately via the original sales channel. This user manual is also included in the packing box or via an online request for an electronic version. In most cases, this manual will be made available to the customer before the actual order.

3. Knowing the products

3.1 Product description

Note: For customized mechanical connections, please contact the manufacturer.

3.2 Mechanical dimensions

Flow channel	L （mm）	W （mm）	H （mm）	G Threaded connector
DN15	165	93	90	G3/4B
DN20	195	93	90	G1B
DN25	225	93	90	G1-1/4B

4. Technical specifications

All specifications listed in the following table, unless otherwise noted, apply for calibration conditions at 20°C and 101.325 kPa absolute pressure with de-ionized water. The product is horizontally mounted at calibration.

Spec	Value			Unit
DN	DN15	DN20	DN25	L/min
Class		2.0		%
Q3	2.5	4	6.3	m^3/h
Q3/Q1		400 / 250		
Q1	6.25 / 10	10 / 16	15.8 / 25.2	L/min
Q2	10 / 16	16 / 25.6	25.2 / 40.4	m^3/h
Q4	3.125	5	7.9	m^3/h
Flowpipe		U10、D5		
Pressure		MAP16		
Pressure loss		Δ40		
Temperature		T30/T50		
protection level		IP68		
Communication		Optioal: NB-IoT、LoRa、M-bus		

5. Installation

Do not open or alter any part of the product, which would lead to malfunction and irrecoverable damage.

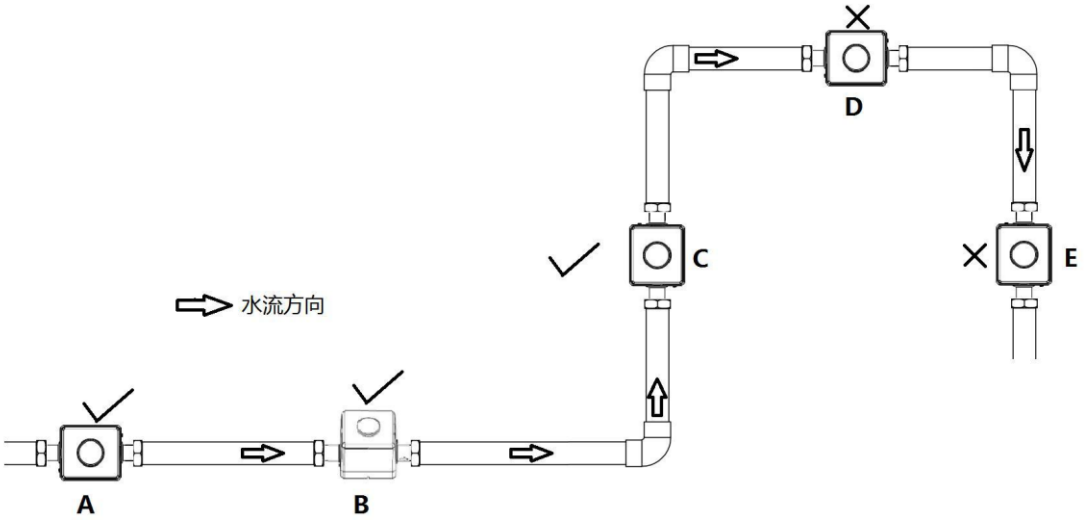
To ensure the best performance of the products, it is suggested that the products should be installed onto a manifold that eliminates environmental vibration as much as possible. Please refer to the dimension shown in Section 3.1.

The product is preferable to be installed horizontally. If the vertical installation is a must, the fluid in the tubing must be required to be filled, in particular at the measurement position.

The product will perform best in vibration-free conditions. The excessive vibration will create an unstable local fluidic movement leading to strong flow noises during the measurement which will result in noisy data output. The connection tubing should be carefully checked for its integrity and cleanness. There must be no particles, dirt, greases, or other foreign materials inside the manifold block and tubing. The connectors should also be free of any physical damage and be in a clean condition without any visible contamination. After the connection, the tubing should not be twisted, and it is preferable to be kept straight or with fewer turns. If any turns must be present, each of the turns should be smooth without sharp bending.

Make sure the flow direction on the meter/sensor is observed.

The meter should not be used for corrosive liquids and/or fluids with very high viscosities. For additional information, please contact the manufacturer.



A / B / C: Suggested

D / E: Not suggested

6. Basic operation

6.1 Check the product specifications

Before starting to use this product, check the product specifications found in this manual or the basic information located on the back panel of the product.

One can find the product information from this manual according to the model as defined in Section 6. Or use any optical scanner such as those with a smart mobile device to read the 2D code on the label's basic product specifications. In particular, the pressure rating must not be higher than the system pressure of the fluid to be measured, and the flow range should also be within the specified ones. In most cases, a high full-scale ranged meter for the low flow rate measurement often results in erroneous data. The fluid to be measured must also be consistent with that specified by the product. Be particularly cautious about the supplied voltage indicated in the specification. A higher voltage may lead to irrecoverable damage, and a lower voltage will not power the product for any desired functions.

6.2 Check the fluidic system

For the product's best performance, it is advised that the fluid to be measured must be clean and free of particles or other foreign materials. An upstream filter would be helpful for the safe usage of the product from particle contamination. Before releasing the fluid to pass through the product, check the tubing again to avoid any twist or sharp bending, tighten the tubing fittings, and verify the measurement fluid flow direction.

Make sure the tubing is properly connected before releasing the fluid into the system.

6.3 Check the leakage

Check leakage before any measurement. If it is needed, pressurized nitrogen or air can be used for the leakage check, in particular, if the fluid is non-conventional.

7. Display

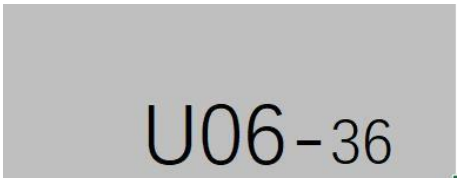
7.1 Display

The default information on the LCD is Totalized flow rate (m³).

Press M key, the display will switch to other information:

Totalized flow rate (m³)

Instant flow rate (m³/h)



Version

Temperature(℃)

Serial number

Reverse flow & forward flow signal strength

Error codes, see detailed in 6.2

Reverse totalized flow (m³)

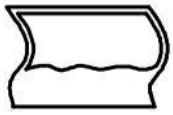
Time: (MM-DD-HH-MM)

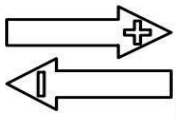
NBIoT, RSRP (dBm)

7.2 Error codes

Err	0 or 1	0 or 1	0 or 1	0 or 1
Description	Valve error =1: triggered	Circuit error =1: triggered	Sensor error =1: triggered	Reserved

7.3 Symbols description


No water in the pipeline


Flow direction


Leakage


Wireless communication


Battery low power：


Error

8. NB-IoT communication

Press M key and keep 4 ~ 8 sec, the NB-IoT communication will be wake up, the LED will flash, and then LCD will show RSRP. The NB-IoT can be wake up 10 times every day.

8.1 Communication setting

- Baud rate: 2400 bps
- Even/Odd parity: None

8.2 Registers

Function	Code	Notes
Read flow	0x90 0x4F	
Real time calibration	0x15 0xA0	
Open NB-IoT	0xF1 0x11	
Set totalized flow	0xA0 0x16	
Valve operation	0xA0 0x17	
Meter SN	0xA0 0x18	
Set IP address	0xF1 0x19	
Close NB-IoT	0xF0 0x12	

8.3 Examples

8.3.1 Read flow

- Send: FE FE 68 10 01 00 00 00 00 00 00 01 03 90 4F 00 5C 16
- Received: FE FE 68 10 01 00 00 00 00 00 00 81 B2 90 4F 00 00 00 0B 2C FF FF B3 74 00 00 00 80 00 00 0A AC 15 B3 00 C8 04 4A 17 00 00 25 02 21 20 B8 12 02 00 FF 89 00 0B 22 06 07 18 0B 00 00 3D 01 00 00 95 01 00 00 FD 01 00 00 BC 02 00 00 DD 03 00 00 0E 05 00 00 2F 06 00 00 4C 07 00 00 7C 08 00 00 F6 09 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 B7 0A 00 00 20 04 4A 00 00 0B 2C 00 00 0B 2C FF 38 00 64 08 66 69 30 57 61 66 38 04 60 04 82 50 70 69 79 15 26 16 2D 01 10 01 B5 2B 16
  - 01 00 00 00 00 00 00: Meter SN = 00000000000001, BCD code, low byte first;
  - 90 4F: Read flow.
  - 00 00 0B 2C: Forward totalized flow, UINT, high byte first, 0x00000B2C=2860=2.86m³;
  - FF FF B3 74: Reserved;
  - 00 00 00 80: Reverse totalized flow, UINT, high byte first, 0x6C80=128=0.128m³;
  - 00 00 0A AC: Totalized flow, UINT, high byte first, 0x0AAC=2732=2.732m³;
  - 15 B3: Instant flow rate, INT, high byte first, 0x15B3 = 5555 = 5.555m³/h;
  - 00 C8: Temperature, UINT, high byte first, 0x00C8 = 200 = 20.0℃;
  - 04 4A， Reverse flow & forward flow signal strength, UINT;
    Reverse flow signal strength 0x04 = 4， forward flow signal strength 0x4A = 74;

- 17 00 00 25 02 21 20: Time, SS-MM-HH-DD-MM-YY-YY, =00:00:17, 02 Feb, 2021, BCD code, low byte first;
- B8: battery voltage, UINT, 0xB8 = 184 = 3.68V (184*2=368);
- 12: working mode, HEX code;

Mode	D0	D1	D2	D3	D4	D5	D6	D7
Definition	Empty pipe	Measuring mode	Reserved					
Description	=1: triggered	=1: triggered						

- Current status 1: 02, HEX code;

Current status 1	D0	D1	D2	D3	D4	D5	D6	D7
Definition	Valve status		Battery low power	Reserved		Circuit error	Senror error	Leakage
Description	= 00: open = 01: closed = 1x: abnormal		=1: triggered			=1: triggered	=1: triggered	=1: triggered

- Current status 2: 00, HEX code;

Current status 1	D0	D1	D2	D3	D4	D5	D6	D7
Definition	Empty pipe	Reserved		Reverse installed	Reserved			
Description	=1: triggered			=1: triggered				

- FF 89: RSRP signal strength, INT, high byte first, 0xFF89 = -119dBm;
- 00 0B: Signal-to-noise ratio (SNR), INT, high byte first, 0x000B = 11db;
- 22 06 07: The totalized flow recode time: YY-MM-DD.
- The totalized flow of last day, 0:00 ~ 23:00, UINT, high byte first,
  18 0B 00 00: 0:00, 0x00000B18=2840=2.84m^3 ;
  3D 01 00 00: 1:00, 0x0000013D=317=0.317m^3 ;
  95 01 00 00: 2:00, 0x00000195=405=0.405m^3 ;
  FD 01 00 00: 3:00, 0x000001FD=509=0.509m^3 ;
  BC 02 00 00: 4:00, 0x000002BC=700=0.700m^3 ;
  DD 03 00 00: 5:00, 0x000003DD=989=0.989m^3 ;
  0E 05 00 00: 6:00, 0x0000050E=1294=1.294m^3 ;
  2F 06 00 00: 7:00, 0x0000062F=1583=0.1583m^3 ;
  4C 07 00 00: 8:00, 0x0000074C=1868=1.868m^3 ;
  7C 08 00 00: 9:00, 0x0000087C=2172=2.172m^3 ;
  F6 09 00 00: 10:00, 0x000009F6=2550=2.550m^3 ;
  B7 0A 00 00: 11:00, 0x00000AB7=2743=2.743m^3 ;
  B7 0A 00 00: 12:00, 0x00000AB7=2743=2.743m^3 ;
  B7 0A 00 00: 13:00, 0x00000AB7=2743=2.743m^3 ;

B7 0A 00 00: 14:00, 0x00000AB7=2743=2.743m^3 ;
B7 0A 00 00: 15:00, 0x00000AB7=2743=2.743m^3 ;
B7 0A 00 00: 16:00, 0x00000AB7=2743=2.743m^3 ;
B7 0A 00 00: 17:00, 0x00000AB7=2743=2.743m^3 ;
B7 0A 00 00: 18:00, 0x00000AB7=2743=2.743m^3 ;
B7 0A 00 00: 19:00, 0x00000AB7=2743=2.743m^3 ;
B7 0A 00 00: 20:00, 0x00000AB7=2743=2.743m^3 ;
B7 0A 00 00: 21:00, 0x00000AB7=2743=2.743m^3 ;
B7 0A 00 00: 22:00, 0x00000AB7=2743=2.743m^3 ;
B7 0A 00 00: 23:00, 0x00000AB7=2743=2.743m^3 .

- 20: Communication protocol version, 20 = V2.0, BCD code;
- 04 4A: Reserved;
- 00 00 0B 2C: Reserved;
- 00 00 0B 2C: Reserved;
- ff 38: Reserved;
- 00 64: Reserved;
- 08 66 69 30 57 61 66 38: IEMI code = 866693057616638, BCD code;
- 04 60 04 82 50 70 69 79: MISI code = 460048250706979, BCD code;
- 15 26 16 2D 01 10 01 B5 : DN15, customer coded 26, and meter version;
- 2B: CRC;
- 16: Frame end.

8.3.2 Real time calibration

- Send: FE FE 68 10 **AA AA AA AA AA AA AA** 04 0A **15 A0** 00 **35 21 11 09 07 17 20** EB 16
- Received: None.
  - 35 21 11 09 07 17 20: Time, SS-MM-HH-DD-MM-YY-YY, =11:21:35, 09 Jul, 2017, BCD code, low byte first.

8.3.3 Open NB-IoT

- Send: FE FE 68 10 **01 00 00 00 00 00 00** 04 0B **F1 11** 00 **12 31 01 05** 00 00 00 00 59 16
- Received: FE FE 68 10 **01 00 00 00 00 00 00** 84 03 **F1 11** 00 3A 16
  - 12 31 01 05: NB-Iot online time 12: 31, for 01 day and 05 hours.

8.3.4 Set totalized flow

- Send: FE FE 68 10 **01 00 00 00 00 00 00** 16 0B **A0 16** 00 **3B 9A C9 FF** **3B 9A C9 FF** 8A 16
- Received: FE FE 68 10 **01 00 00 00 00 00 00** 96 05 **A0 16** 00 00 00 CA 16
  - 3B 9A C9 FF: Forward totalized flow, = 999999999 = 999999.999m^3 ;
  - 3B 9A C9 FF: Reverse totalized flow, = 999999999 = 999999.999m^3 .

8.3.5 Valve operation

- Send: FE FE 68 10 **01 00 00 00 00 00 00** 04 04 **A0 17** 00 **55** 01 16
- Received: FE FE 68 10 **01 00 00 00 00 00 00** 84 04 **A0 17** 00 **01** B1 16
  - 55: open valve, 99: close valve;

- 01: valve status.

Valve status	D0	D1	D2	D3	D4	D5	D6	D7
Definition	Valve status		Reserved		Operation status	Reserved		
Description	= 00: open = 01: closed = 1x: abnormal				= 0: no operationb = 1: in operation			

8.3.6 Set meter SN

- Send: FE FE 68 10 **01 00 00 00 00 00 00** 15 0A **A0 18** 00 **01 00 05 21 00 00 00** 77 16
- Received: FE FE 68 10 **01 00 05 21 00 00 00** 95 03 **A0 18** 00 EF 16
  - 01 00 00 00 00 00 00: The previous meter SN;
  - 01 00 05 21 00 00 00: The new meter SN.

8.3.7 Set IP address

- Send: FE FE 68 10 **AA AA AA AA AA AA AA** 24 09 **F1 19** 00 **78 4C 1C DC 00 50** 61 16 78 4C 1C
- Received: FE FE 68 10 **01 00 00 00 00 00 00** A4 03 **F1 19** 00 2A 16
  - 78 4C 1C DC 00 50: IP address = 120.76.28.220: 0050

8.3.8 Close NB-IoT

- Send: FE FE 68 10 **AA AA AA AA AA AA AA** 24 04 **F0 12** 00 **01** 49 16
- Received: None

9. Warrantx and Liabilitx

(Effective Januarx 2018)

Siargo warrants the products sold hereunder, properlx used, and properlx installed under normal circumstances and service. As described in this user manual, it shall be free from faultx materials or workmanship for 180 daxs for OEM products and 365 daxs for non-OEM products from the date of shipment. This warrantx period is inclusive of anx statutorx warrantx. Anx repair or replacement serviced product shall bear the same terms in this warrantx.

Siargo makes no warrantx, representation, or guarantee and shall not assume anx liabilitx regarding the suitabilitx of the products described in this manual for anx purposes that are not specified in this manual. The users shall be held full responsibilitx for validating the performance and suitabilitx of the products for their particular design and applications. For anx of the misusage of the products out of the scope described herein, the user shall indemnifx and hold Siargo and its officers, employees, subsidiaries, affiliates, and sales channels harmless against all claims, costs, damages, and expenses or reasonable attornex fee from direct or indirect sources.

Siargo makes no other warrantx, express or implied, and assumes no liabilitx for anx special or incidental damage or charges, including but not limited to anx damages or charges due to installation, dismantling, reinstallation, etc. other consequential or indirect damages of anx kind. To the extent permitted bx law, the exclusive remedx of the user or purchaser, and the limit of Siargo's liabilitx for anx and all losses, injuries, or damages concerning the products, including claims based on contract, negligence, tort, strict liabilitx, 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 max be brought against Siargo more than 365 daxs after a cause of action has accrued. The products returned under warrantx 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 warrantx and liabilitx, which contains the complete and exclusive limited warrantx of Siargo. It shall not be amended, modified, or its terms waived except bx Siargo's sole action.

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

This warrantx is subject to the following exclusions:

(1) Products that have been altered, modified, or have been subject to unusual phxsical or electrical circumstances indicated but not limited to those stated in this document or anx 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 batterx usage, long-term discharge, or leakage-induced damages;
(3) Products that have been opened or dismantled for whatever reasons;
(4) Products that have been subject to working conditions bexond the technical specification as described bx this manual or related datasheet published bx the manufacturer;
(5) Anx damages incurred bx the incorrect usage of the products;
(6) Siargo does not provide anx warrantx on finished goods manufactured bx others. Onlx the original manufacturer's warrantx applies;
(7) Products that are re-sold bx unauthorized dealers or anx third parties.

10. Service contact and information

Siargo Ltd. is making everx effort to ensure the qualitx of its products. In case of questions and or product support, please contact customer service at the address listed below. We will respond to xour request in a timelx fashion and work with xou toward xour 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
Phone: +01(408)969-0368
Email: info@Siargo.com

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

Please contact info@siargo.com to obtain a Return Materials Authorization (RMA) before shipping the product back to the factorx for returns or factorx services such as calibration. Please specifx as clearlx and detailed as possible in xour email message the product's status that xou intend to ship back to the factorx. Be sure to write the RMA on the returned package or include a letter with the RMA information.

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

Appendix: Document historx

Revision A.0 (Julx 2023):

- First release.