Ultrawater

Operations & Maintenance

Manual

REV 3/2021

Table of Contents

General Information

1.1 Introduction

Thank you very much for choosing Lanry ultrasonic water meter. This ultrasonic water meter adopts dynamic zero point and time calibration before each measurement, which makes flow measurement more stable and accurate. Ultra-low power design, service life of up to 15 years; the whole machine does not have any moving parts, the casing is made of 304 stainless steel precision casting, higher strength, protection grade with IP68; with triple output interfaces, This guide will provides you a better understanding and usage of the Ultrawater ultrasonic water meters.

1.2 Package Contents

- Ultrawater Ultrasonic Water Meter
- User manual
- Calibration certificate
- Output communication module (including Modbus, M-bus, pulse, 4-20mA output mode in one)
- Ultrasonic water meters with DN50 and DN65 caliber are packed in cartons, and water meters above DN80 are packed in wooden cases, as shown on the box. (If there are special packaging requirements, please specify when ordering).

1.3 General Safety

Before installing a new Ultrawater ultrasonic water meter, consider the following factors:

· Do not install, operate, or maintain this flowmeter without reading, understanding, and following the instructions provided by the factory. Failure to do so may result in personal injury or property damage.

· Please read the user manual carefully before starting the installation.Observe all warnings and instructions marked on the product.

· Ultrawater ultrasonic water meters are precision parts, please handle

them gently during transportation and movement to avoid damage.

· If the product does not work properly, please refer to the user manual or contact the factory.

· There are no operator-serviceable parts in this product.

1.4 Unpacking Instructions

This product has been thoroughly inspected and tested prior to shipment and is ready for operation. After carefully unpacking the meter, inspect all contents for shipping damage before attempting to install. If here is any indication of physical damage found, immediately contact the responsible transportation service and your local Master Meter representative.

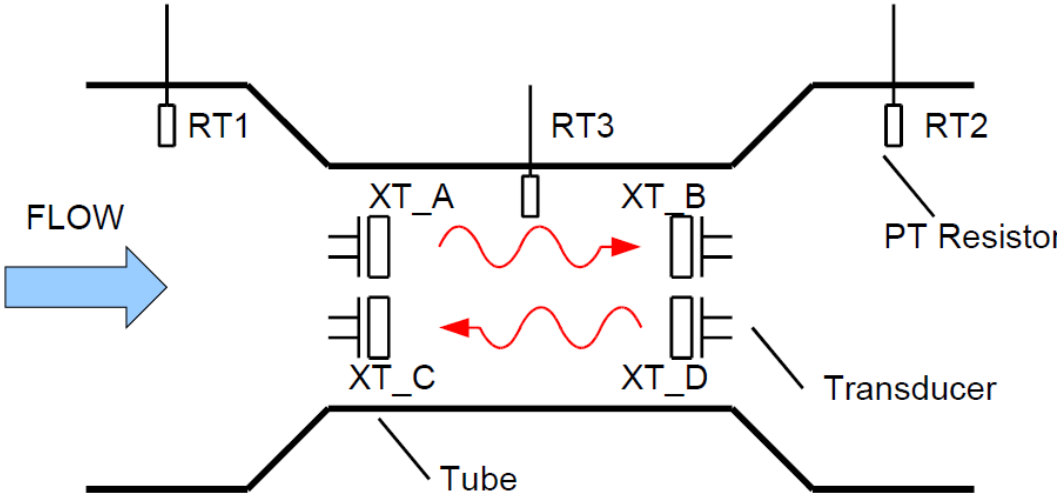
Note: *The LCD display remains active for the life of the meter. If the display is not on, this may be an indication of damage during shipment.*

1.5 Industry Standards

- Design, production and implementation conform to the National Standard of the People's Republic of China GB/T 778-2018 《Drinking Water Meter and Hot Water Meter》
- The ex-factory verification is based on the National Metrological Verification Regulation of the People's Republic of China JJG162-2009 《Cold Water Meter 》standard.

2.1 Measurement Method

A transit time ultrasonic flow meter uses ultrasonic transducers that can both send and receive signal. The ultrasonic signal is transmitted between the transducers through the fluid that pass through the flow meter. The transducers are organized so that the sound velocity will interact with the flow velocity. The sound propagation time between the transducers is measured in both directions. If there is no fluid motion the two times are ideally equal but if there is fluid velocity present the interaction with the sound velocity will cause one time, the downstream one, to decrease and the other time, the upstream one, to increase. These two times are used to calculate the flow velocity.



The Ultrawater ultrasonic flow meter is a battery-powered, precision flow meter designed for linear, bidirectional flow measurement of water.

2.2 Technical Data

Accuracy	±1%
Repeatability	0.2%
Maximum Working Pressure	232 PSI (1.6Mpa)
Liquid Temperature	32° F - 122° F (0° C to 50° C) T50
Display Operation Temperature	-13° F to 131° F (- 25° C to 55° C)
Pressure Loss Grade	△p16
Environmental Protection	NEMA 6P+ (IP68+)
Meter Body Construction	304 Stainless Steel
Flanges	ANSI 2” – 12” Round Type
Data Units	Multi-line 9 digit Liquid Crystal Display (LCD) - Programmable USG, Imperial Gallons, Cubic Feet, Cubic Meters, Acre Feet or Acre Inch for Volume and GPM, L/s,m/s or M3/h for rate of flow
Power Source	2XD Size Lithium Thionyl Chloride Batteries-15 Year Warranted life Time
Output	Modbus M-bus Pulse 4-20mA
Data Storage	Automatic storage of data for 10 years

2.3 Flow Range

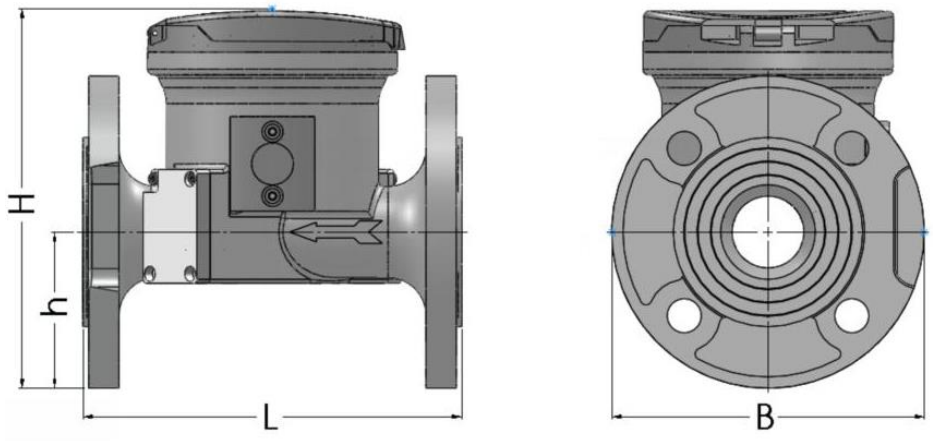
Data Sheet Table

Flow m^3/h	Diameter							
	DN50 2”	DN65 2.5”	DN80 3”	DN100 4”	DN150 6”	DN200 8”	DN250 10”	DN300 12”
Qmax	65	70	100	150	350	550	1300	1300
Q4	50	50	80	125	315	500	1250	1250
Q3	40	40	65	100	250	400	1000	1000
Q2	0.128	0.128	0.200	0.320	0.800	1.280	3.2	3.2
Q1	0.08	0.08	0.125	0.200	0.500	0.800	2	2
Qmin	0.05	0.05	0.08	0.1	0.25	0.4	1	1
R= Q3/Q1	500	500	500	500	500	500	500	500

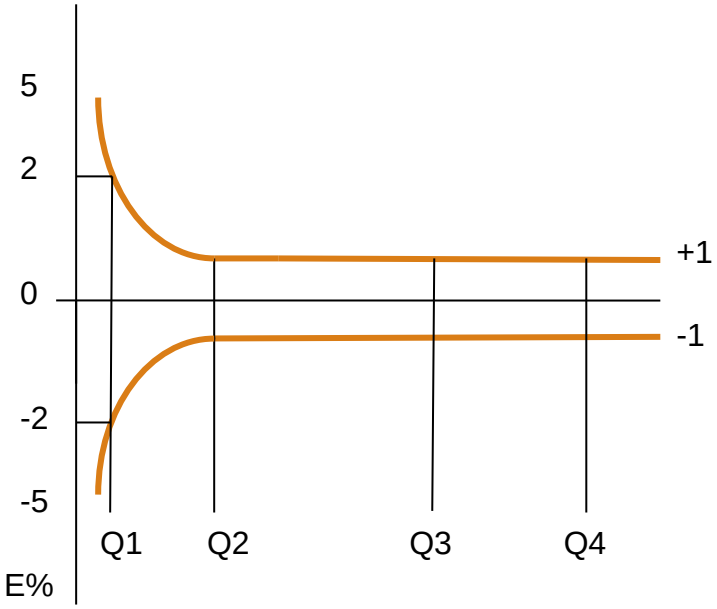
Note: *The ultrasonic water meter of each diameter of the factory, the calibration data is subject to the actual calibration certificate.*

2.4 Mechanical data

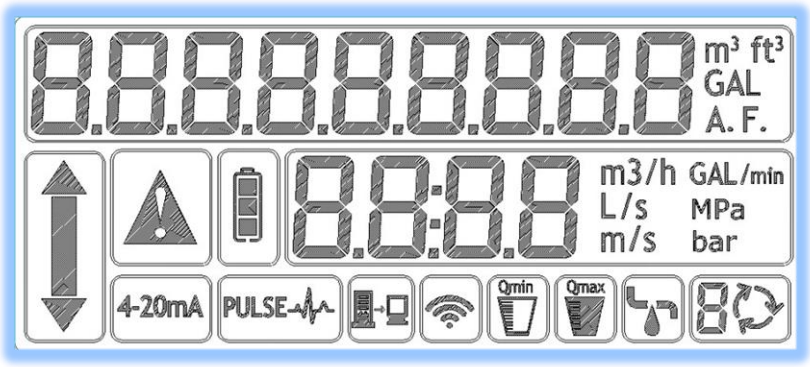
Model	Diameter							
Nominal Size	2” 50mm	2.5” 65mm	3” 80mm	4” 100mm	6” 150mm	8” 200mm	10” 250mm	12” 300mm
L-Length	8” 200mm	8” 200mm	8 7/8” 225mm	10” 250mm	12” 300mm	13 3/4” 350mm	17 3/4” 449mm	19 5/8” 499mm
B-Wigth	6 1/2” 165mm	7 1/4” 185mm	8” 200mm	8 5/8” 220mm	11 1/4” 285mm	13 1/2” 340mm	16” 406mm	19 1/4” 489mm
H-Height	7 3/4” 194mm	8 1/4” 210mm	8 1/4” 210mm	8 3/4” 223mm	11 1/8” 282mm	13” 332mm	15” 383mm	18” 456mm
h-Height	1 1/2” 40mm	3 1/2” 90mm	3 1/2” 90mm	4” 103mm	5 1/2” 140mm	6 1/2” 165mm	8” 203mm	9 1/2” 245mm
Weight	9kg	11kg	13kg	15kg	32kg	45kg	68kg	96kg



2.5 Error Curve



3.1 Display （LCD）



Flow Direction

Battery Voltage Detection

Communication

Pulse output

Loop output

GPRS NB

Minimum flow Alarms

Maximum flow Alarms

Empty Pipe /Error

m³ ft³ GAL A. F. Volume Units

m3/h GAL/min L/s MPa m/s bar Flow Rate Units

Leak

Communication baud rate selection

3.2 Display description

Ultrawater Ultrasonic water meter with Multi-line 9 digit Liquid Crystal Display (LCD)，The display of each part is as follows：

- Flow Direction：The upper arrow flows in the positive direction, while the lower arrow flows in the reverse direction.

- Battery Voltage Detection：For every 30% reduction in battery power, the icon will be reduced by one grid.

- Volume Units ： US gallons （GAL）, Cubic Feet（ft^3） Cubic Meters（m^3）, Acre Feet （A.F.）.

- Flow Rate Units ： US Gallons per Minute （GAL/min）, Liters per Second（L/s）, Cubic Meters per Hour （m^3/h）, Cubic Meters per Second （m/s）

- Communication baud rate selection：When different baud rates are selected, the numbers corresponding to different baud rates are displayed.

- When different output modes are selected, the corresponding icon will be lit.

- When the flow reaches the minimum or maximum setting, the corresponding alarm icon will light up.

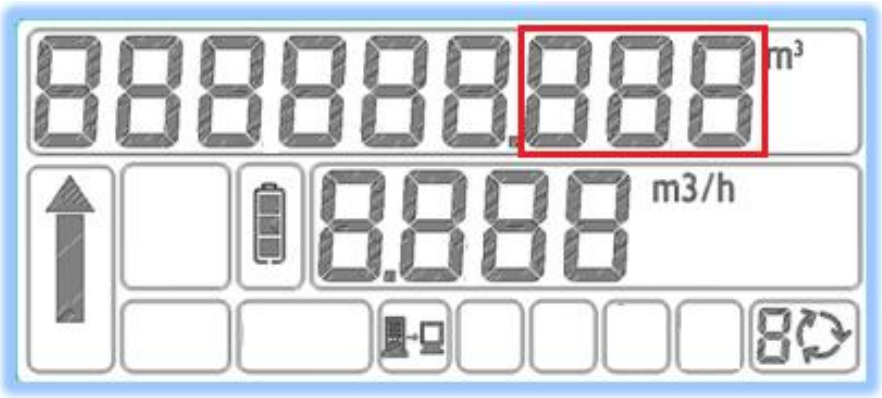
- Empty Pipe/Error：When Empty Pipe or other alarms , the icon will be lit up.

-

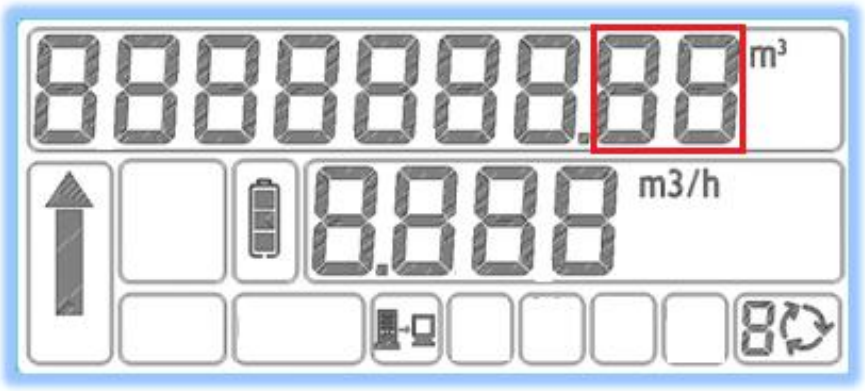
Note： *Ultrawater ultrasonic water meter is a high-precision and precise measuring instrument. It is designed with dual-channel. It has no moving parts or operation keys. All parameters are set by Modbus or M-bus. Please refer to Modbus communication for detailed setting instructions.*

3.3 Display Resolution

1) Default Display - (lowest resolution = 0.001 unit)

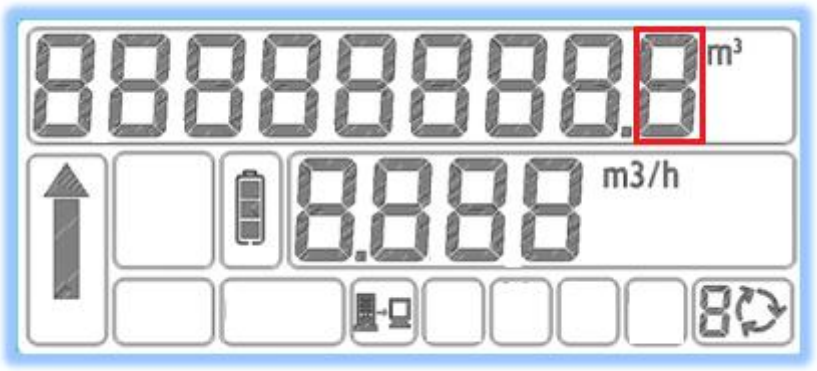


2) Optional Display - (lowest resolution = 0.01 unit)

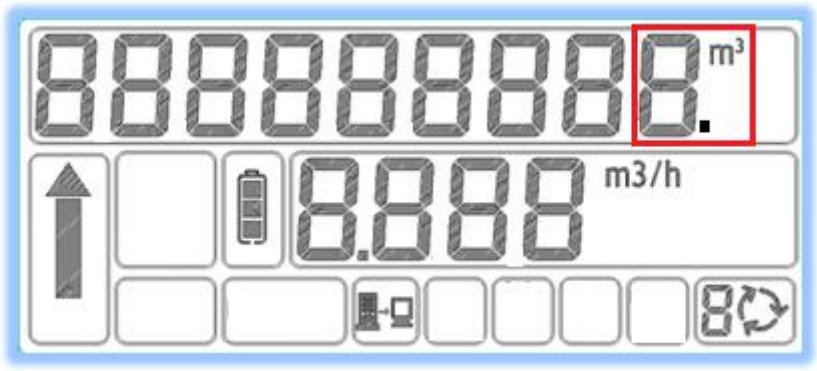


3.3 Display Resolution

3) Optional Display - (lowest resolution = 0.1 unit)



4) Optional Display - (lowest resolution = 1 unit)



3.4 Volume Display Options

a) The display resolution of cumulative traffic can be changed by Modbus. The default display resolution is 0.001 Unit.

b) Accumulated flow can choose positive accumulation, negative accumulation and net accumulation，The default display is net accumulation.

c) When the display value of minimum resolution reaches maximum, the resolution of screen display will be carried automatically, and the maximum value of display will be 999999999.

d) Volume Units of cumulative traffic can be changed by Modbus.

3.5 Communication Output Modes

Ultrawater ultrasonic water meter has three output modes. The three output modes are integrated into a communication module. The three output modes are all passive output through connecting wires. It needs external 8-24V AC/DC power supply. The output mode can be used simultaneously or separately, and the output mode can be selected by setting Modbus.

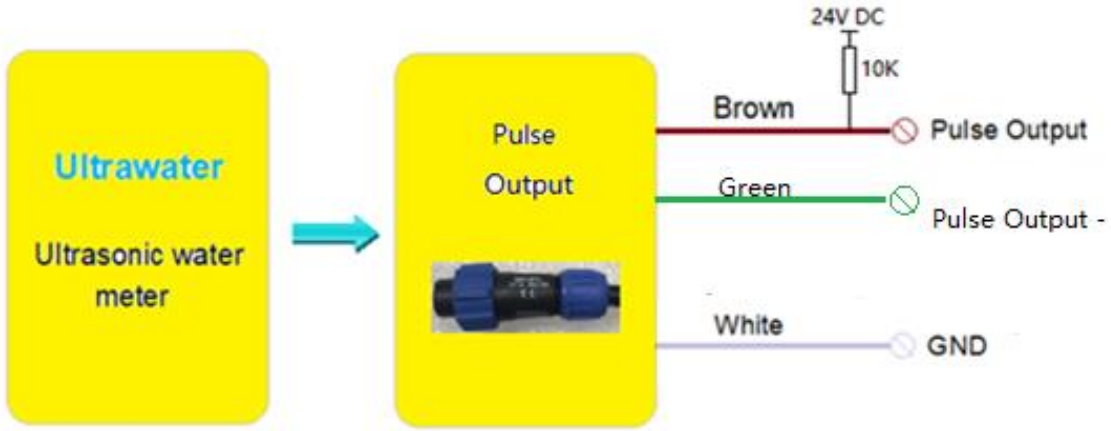
a) **Pulse Output** （See Section 3.6）
b) **4-20mA Output** （See Section 3.7）
c) **Modbus Output** （See Section3.8）

When different output modes are selected, the corresponding icon will always be illuminated.

When using pulse and current loop output for a long time, the endurance of internal battery will be seriously consumed. MODBUS output is highly recommended. If it is necessary to use pulse and current loop output, please connect 8-24v AC / DC externally, please inform when ordering.

3.6 Pulse Output（Open Drain）

Pulse Type: Open Drain that allows current loading of 200 mA, and up to 24VDC.



Pulse Module	Wire Color	Function
Output cable	Brown	Pulse Output
	Green	Pulse Output-
	White	GND

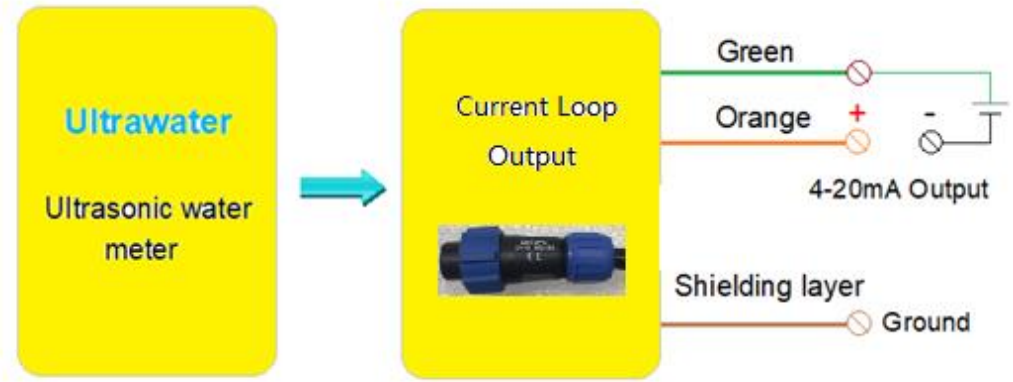
Warning: Signal connection polarity is mandatory

1、When using pulse output, please connect MODBUS first, open pulse output function through MODBUS command, and set pulse output equivalent at the same time. Refer to Modbus communication for specific settings.

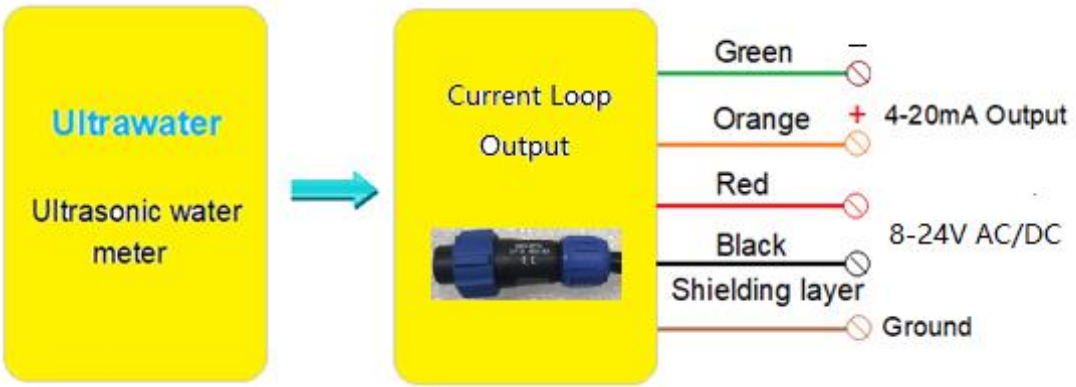
2、When 8-24v AC or DC is connected, the pulse output does not need external 24V DC and pull-up resistance.

3.7 4-20mA Output（Analog Output）

The current output is a passive 4-20 mA. 4 mA is always “0” (zero) flow and the 20 mA is factory programmable according to the customer’s requirements. (If the customer has not specified the 20 mA at the time of order, the Ultrawater will be programmed with the 20 mA at the max flow of the meter.)



Two wire system output



Four wire system output

4-20mA Module	Wire Color	Function
Output cable	Green	Current Loop+
	Orange	Current Loop-
	Red	8-24V AC/DC Power
	Black	8-24V AC/DC Power
	Shielding layer	Ground

Warning: Signal connection polarity is mandatory

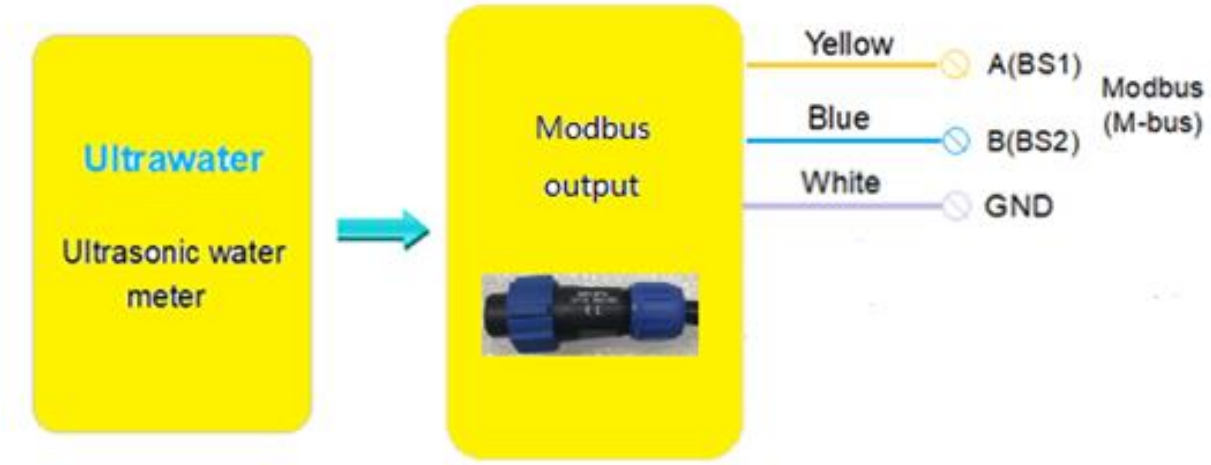
1、When using current output, please connect MODBUS first, open current output function through MODBUS command, and set current output equivalent at the same time. Refer to Modbus communication for specific settings.

2、Different current loop output forms are required. Please inform us when ordering. The factory default is two-wire output.

Note: the analog output function has been cancelled！

3.8 Modbus(M-bus) Output

Modbus Communications Factory default baud rate 9600, no check, 8-bit data, 1 stop bit.



RS485 Module	Wire Color	Function
Output cable	Yellow	RS485 A M-bus BS1
	Blue	RS485 B M-bus BS2
	White	GND

Warning: Signal connection polarity is mandatory

3.9 Modbus-RTU Communication Protocol

a) Communications Protocol

This device supports the Modbus RTU protocol as slave device and communicate with other device by RS485 in usual. It will adhere to the standard read/write message structures and its implementations, note that Modbus does not provide a suitable structure for file transfers.

The general message structure will consist of device address, function code, data payload and the checksum. Data transmission follows big-endian byte order rules.

Master Format

Device Address	Function Code	Data Payload	CRC

Device address – 1 byte field ranging from 1 to 255. Broadcast address 0.

Function code – 1 byte field with 3 read operations, 16 write operations.

Data payload – 0-N bytes with response data from the device.

CRC – 2 bytes computed mathematically.

Slave Response Format

Device Address	Function Code	Data Payload	CRC

Device Address – Echo of device address sent in master message to the device

Function code – Echo of function code sent in master message to the device

Data payload – 0-N bytes with response from device.

CRC – 2 bytes with a value computed mathematically

b) Standard Message Format

Read Holding Registers is used to retrieve measurements.

Message		
Address	1 byte	1-255
Function Code	1 byte	0x03
Data Address	2 bytes	0 to 62
Register Count	2 bytes	2 to 64
CRC	2 bytes	

Response		
Address	1 byte	1-255
Function Code	1 byte	0x03
Byte Count	1 byte	4 to 168
Data Payload	N bytes	
CRC	2 bytes	

*Byte count = 2*Register Count

Write Single Register is used to configure instrument settings.

Message		
Address	1 byte	1-255
Function Code	1 byte	16
Data Address	2 bytes	0 to 62
Register Count	2 bytes	2 to 64
Data Payload	N byte	
CRC	2 bytes	

Response		
Address	1 byte	1-255
Function Code	1 byte	16
Byte Count	1 byte	0 to 62
Data Payload	N bytes	2 to 64
CRC	2 bytes	

c) RS485 Settings

Baud rates – Support Baud rates from 4800 to 19200

Data Bits – 8 data bits (7 data bits is not valid setting for Modbus RTU)

Parity Bits – Even, Odd and None

Stop Bits – 1

Default settings will be 9600,8,N,1.

d) Modbus Registers

The below list of parameters will all be located in the holding registers.

Register address	Size (Reg)	Mode/Access	Data Type	Description
00	4	Read only	float	Velocity
02	4	Read only	float	Flow rate
04	8	Read only	double64	Net accumulation
08	8	Read only	double64	Positive cumulation
12	8	Read only	double64	Negative cumulation
16	4	Read only	hh/mm/ss	Time in BCD format
18	4	Read only	yy/mm/dd	Date in BCD format
20	4	Read only	uint	Device state
22	4	Read only	uint	ESN
24	8	Read only	double64	Net accumulation for special date
28	8	Read only	double64	Pos accumulation for special date
32	8	Read only	double64	Neg accumulation for special date
36	4	Read/Write	yy/mm/dd	Set special date in BCD format
38	4	Read/Write	uint	Display control
40	4	Read/Write	uint	Rs485 control
42	4	Read/Write	uint	User control
48	4	Read/Write	uint	RS485 Retention time
50	4	Read/Write	float	Battery level
52	4	Read/Write	float	Software version
62	4	Read only	float	Pipe lose parameter

e) Register Reading and Writing Instructions

Register address	Size (Reg)	Mode/Access	Data Type	Description
20	4	Read only	uint	Device state

- Bit 0: Current flow rate exceeds measurement range
- Bit 1: Battery is low
- Bit 2: Signal error, usually empty tube status or sensor error
- Bit 4: Accumulation overflow

Register address	Size (Reg)	Mode/Access	Data Type	Description
38	4	Read/Write	uint	Display control

- Bit [2-0]: Quantitative fractional part display digits (0-5) bits
- Bit [4-3]: Cumulative type

00: Net accumulation
01: Positive accumulation
10: Negative accumulation

- Bit [7-5]: The second line of the display shows the content selection

000: Instantaneous flow
001: Instantaneous velocity

- Bit 8: Display test, automatically restore after all lighting for 1 s
- Bit [10-9]: Cumulative unit selection

00:m3
01: ft3
10:gal
11: A.F.

- Bit [12-11]: Instantaneous flow unit selection

00:m3/h
01:l/s
10: gal/min

Register address	Size (Reg)	Mode/Access	Data Type	Description
40	4	Read/Write	uint	Rs485 control

- Bit [7-0]: Modbus communication address(1-255)
- Bit [10-8]: Serial Port Rate Selection (bps)

001:4800
010:9600
011:19200

- Bit [12-11]: Check Type Selection

00: no parity
01: odd parity
10: Even parity

Register address	Size (Reg)	Mode/Access	Data Type	Description
42	4	Read/Write	uint	User control

- Bit [1-0]: Pulse output type selection

00: Net accumulation
01: Positive accumulation
10: Negative accumulation

- Bit [4-2]: Pulse output resolution selection

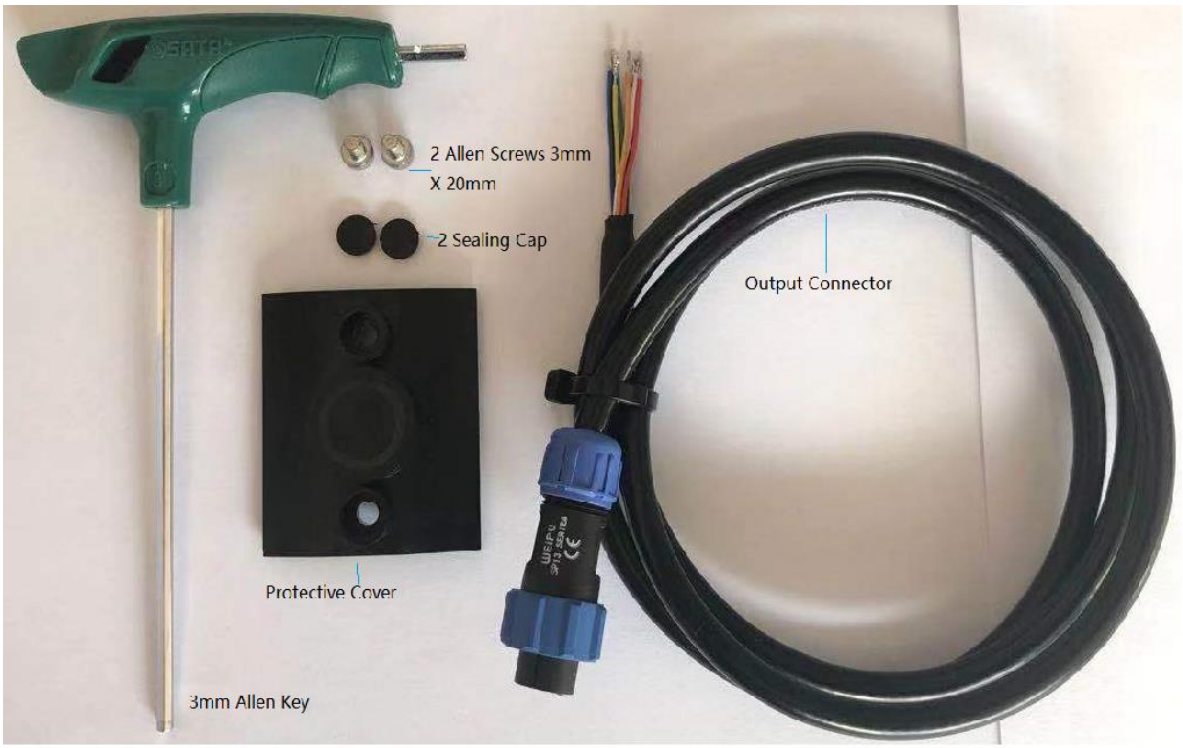
000:2ml
001: 100ml
010:1L
011:10L
100:100L
101:1m3
110:10m3
111:100m3

- Bit 5: Pulse Output Enable
- Bit 12: Positive Accumulation Enable
- Bit 13: Negative Accumulation Enable
- Bit 14: Zero Calibration Enable

3.10 Output Module Installation (Optional)

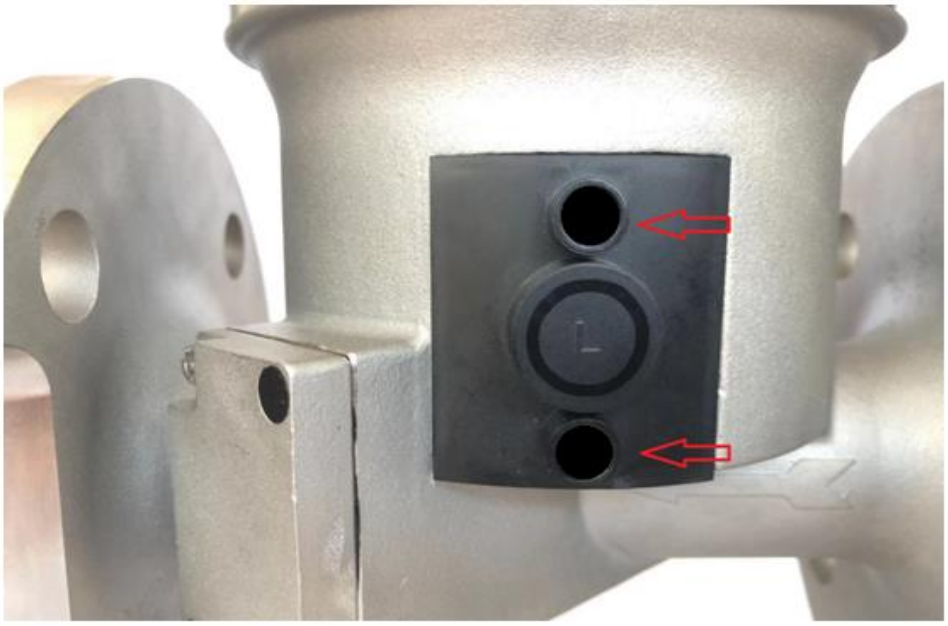
All Ultrawater water meters are shipped with either a cover plate or communication module installed on the side of each meter. Even if the meter is not going to be read by radio or some other electronic unit, it is important to leave one of these devices installed on the Ultrawater wate to prevent damage to the communication port. **Installing an Ultrawate**r **without a cover plate or communication module would void any warranty.**

If you received an Output Module separate from your Ultrawater wate, please follow the steps below to ensure proper installation of the module. Read through these instructions before attempting to remove the cover plate. Your module came as a complete installation kit with the supplies shown in Pic. 1.



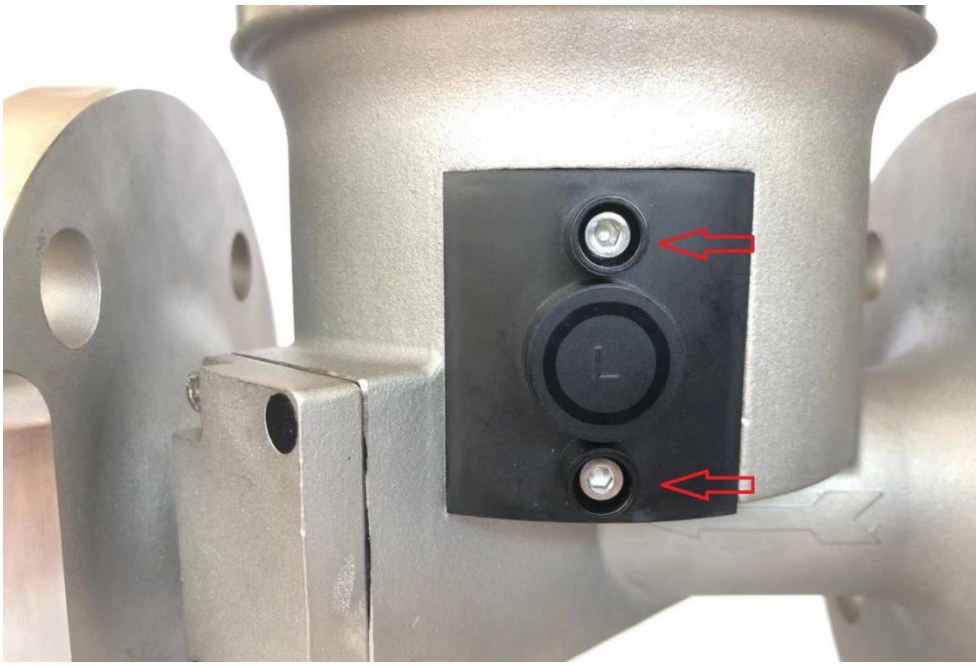
Pic.1

Step 1: Remove the Sealing Cap from the cover plate(Pic.2) .



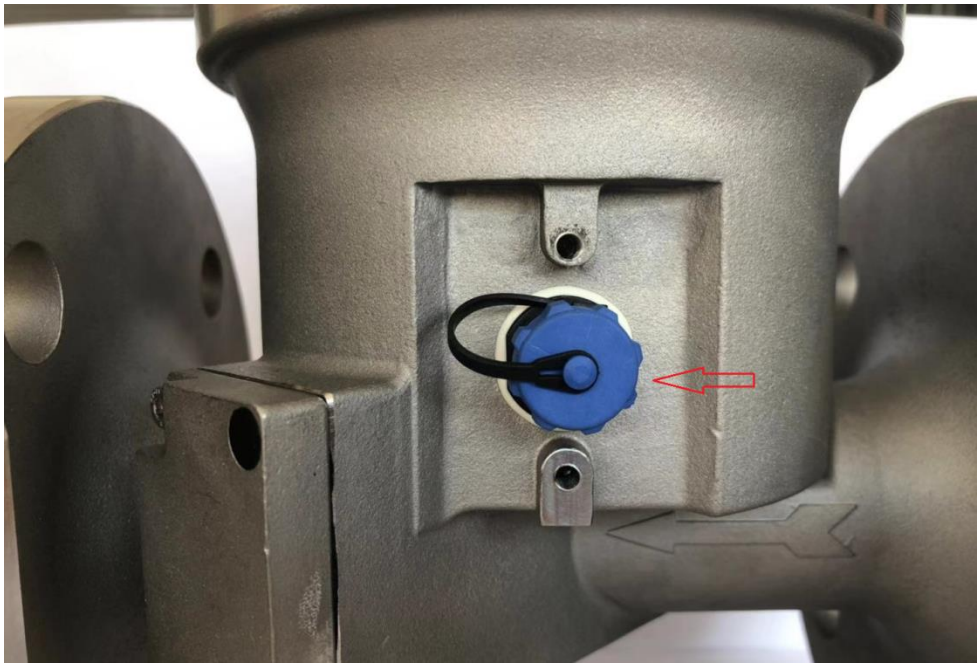
Pic.2

Step 2: Using the 3mm Allen Key provided, remove the cover plate (Pic. 3). Keep the cover plate and 3mm x 15mm screws for future use.

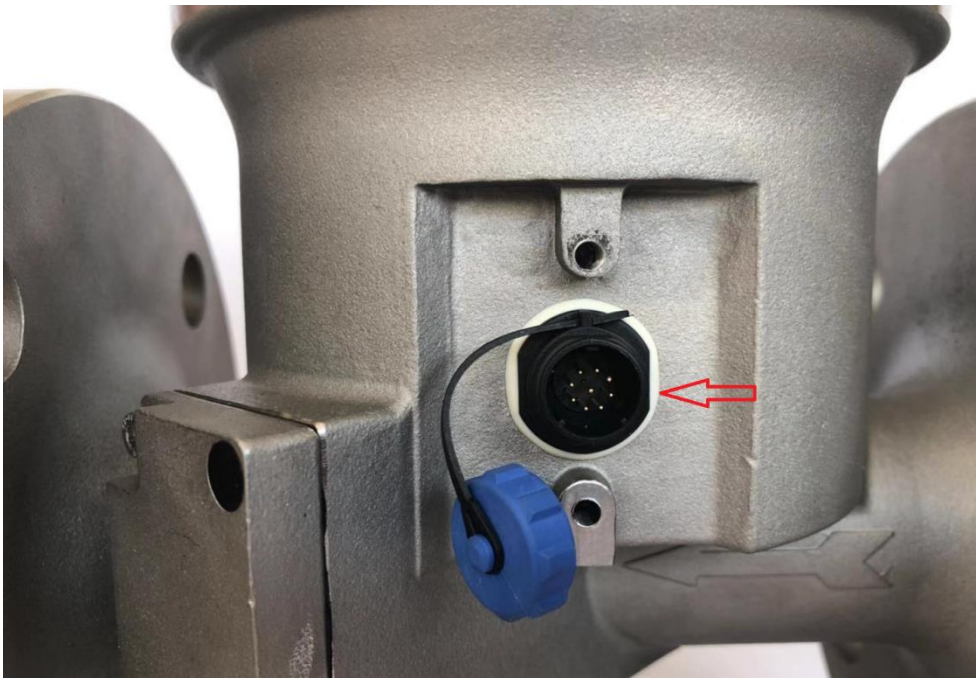


Pic.3

Step3： Please rotate the blue protective cap counterclockwise(Pic. 4)，The communication port is now exposed. (Pic. 5)



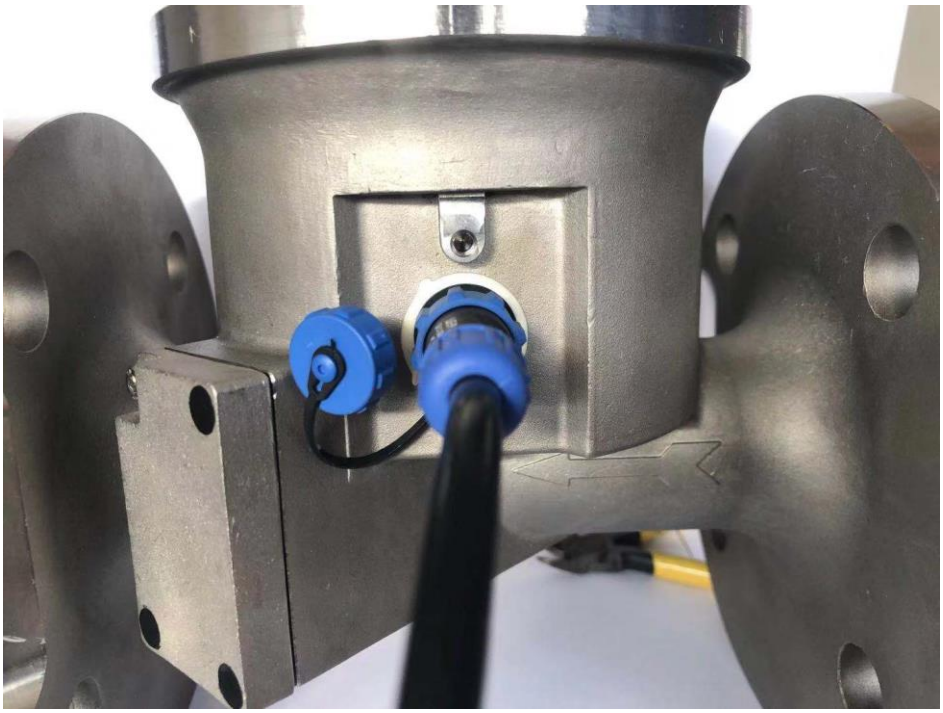
Pic.4



Pic.5

Step 4: Open the output connecting line (Pic. 6), insert the output connecting line into the output socket of the instrument (pay attention to the position of the plug and the socket locating pin). After inserting, tighten the plug of the output connecting line to ensure that the plug and the socket are well connected (Pic. 7.8.9)

Pic.6



Pic.7

Pic.8

Pic.9

Note: If at any time the Output Connector needs to be removed, take caution not to allow dirt or water into the communication port. If the module is going to be removed for an extended period of time, reinstall the cover plate and the 3mm x 20mm screws