NEO WAVE®

Installation & User Guide

UTW19

ULTRASONIC WATER
METER
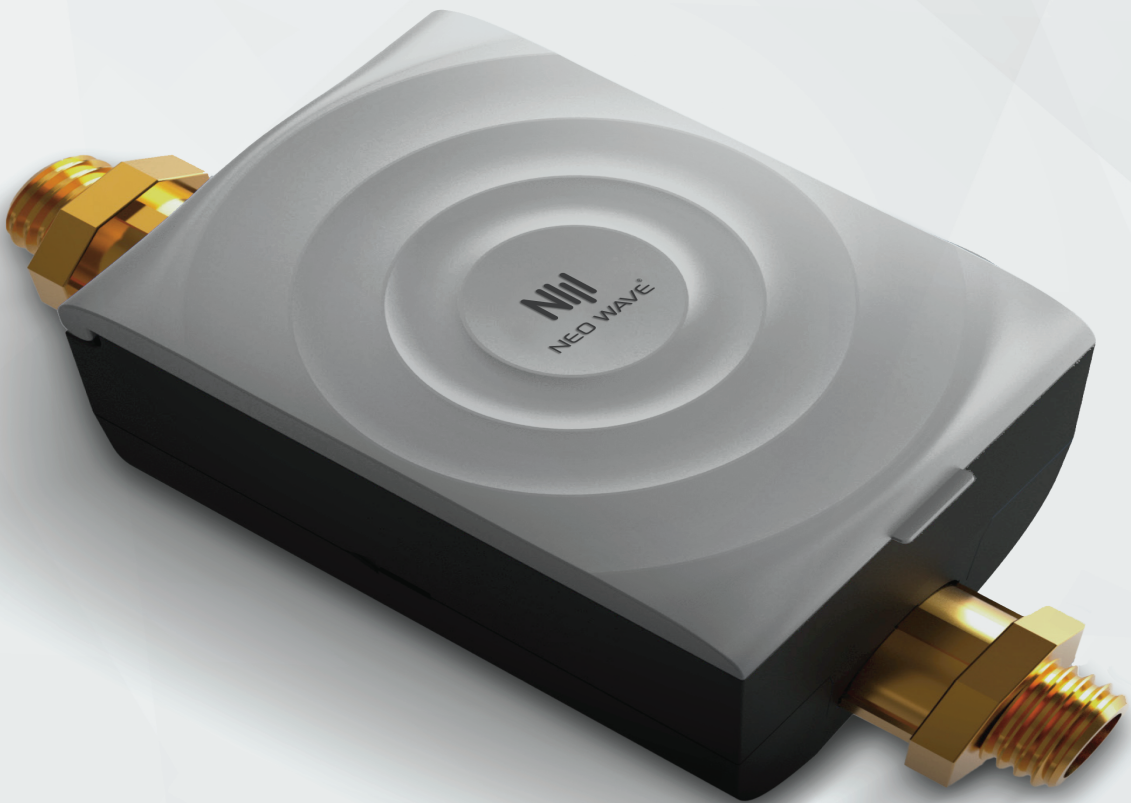
ⓘ Read this Guide before installing the meter

neowave.tech

Remote Reading Ultrasonic Water Meter, developed for residential application
Qi: 0.005–0.032m³/h
Supporting M-Bus, RS485, Pulse, LoRaWAN, NB-IoT, Sigfox

▌ Thank you for choosing our products ▌

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the meter's performance and functions.

- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact NEO WAVE.

- Copying or reproducing all or any part of the contents of this manual without the permission of NEO WAVE is strictly prohibited.

▌ CONTENT

1. General Information

Please note that the following installation conditions must be obeyed:
Pressure Requirement: MAP16.
Environmental Class: E1, M1
Installation requirement: There must be a distance of minimum 25 cm between signal cables and other installations
Note: Seal or any safety marks on the meter must not be damaged or removed, and doing so will void the warranty and calibration of the meter.

2. Technical Specification

2.1 Flow Sensor

The flow sensor is a device used to measure the velocity of flow by using the principle of ultrasound. It can measure the average velocity along the path of an emitted beam of ultrasound by averaging the difference in measured transit time between the pulses of ultrasound propagating into and against the direction of the flow. The flow measurement is based on an acoustic wave time of flight principle. The flow meter body is equipped with 2 ultrasonic transducers facing 2 acoustic reflectors.
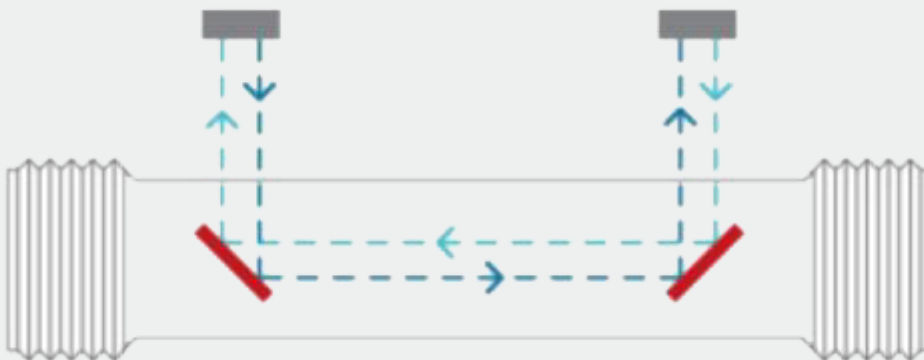
Flow sensor data:

Manufacturer	Neo Wave
Type	UTW19
Accuracy class	Class 2
MAP	16 bar
Max Pressure loss	≤40kPa
Max admissible temperature (optional)	30℃ / 50℃ / 70℃
Limits of temperature (Θ min and Θ max) (optional)	0.1-30℃ / 0.1-50℃ / 0.1-70℃

Installation requirements	*Min. 5*DN length of straight pipe before the meter, and Min. 3*DN length of straight pipe after the meter (DN is the diameter of meter)*
Basic mounting orientation and other specified orientations	*Horizontal/Vertical*
Climatic and mechanical class	*B*
Electromagnetic class	*E1*
Mechanical class	*M1*

2.2 Calculator

The calculator is a device that calculates the flow volume consumed based on signals from flow sensor. It's also the control, display and data store part for the meter.

Calculator data:

Manufacturer	*Neo Wave*
Climatic and mechanical class	*B*
Electromagnetic Class	*E1*
Mechanical Class	*M1*
Display unit	*m^3, L*
Battery power supply requirements	*See part: 4 Power supply*
Current used	*Average 20uA, Peak 4mA*
Pulse input device class	*N/A*
Max permissible flow sensor signal (Pulse rate)	*N/A*
Output signal for normal operation	*M-Bus, Infrared, RS485, LoRaWAN*
Liquid if other than water	*N/A*

2.3 Complete meter

Manufacturer		*NeoWave*					
Flow Measurement							
Type	DN (mm)	Flow Rate (m^3/h)			Dimensions (mm)			Connection
		Q_1	Q_2	Q_3	Length	Width	Height	— — —
UTW19	15	0.00625	0.01	2.5	165	81	100	G¾"
	20	0.01	0.016	4	195	81	100	G1"
	25	0.01575	0.0252	6.3	225	81	118	G1¼"
	32	0.025	0.04	10	180	81	128	G1½"

	40	0.04	0.064	16	200	81	135	G2"
Water temperature range (optional)	0.1-30℃ / 0.1-50℃ / 0.1-70℃							
Q_3/Q_1 (optional)	R125 / R160 (up to T70) R250 / R400 (up to T50)							
Accuracy	Class 2							
Maximum permissible error in upper flow rates range $Q_2 \leq Q \leq Q_4$	$\pm$ 2%(at $\Theta \leq 30℃$) $\pm$ 3% (at $\Theta > 30℃$)							
Maximum permissible error in lower flow rates range $Q_1 \leq Q < Q_2$	$\pm$ 5%							
Scale interval (m^3)	0.001							
Capacity of calculator	99999,999							
Type of liquid	Drinking Water							
Installation requirements	Min. 5*DN length of straight pipe before the meter, and Min. 3*DN length of straight pipe after the meter (DN is the diameter of meter)							
Basic mounting orientation and other specified orientations	Horizontal/Vertical							

Display & Indication

Display unit options	m^3, L
Display LCD	8-digit
Volume	$0.001m^3$

Environmental Requirement

Environmental Class	E1, M1
Ambient temperature	5 ~ 55°C (Indoor and non-condensing)
Storage temperature	-20 ~ 60°C
Protection Class	IP68
Data log	24 logs (days/weeks/months)

Interface & Communication

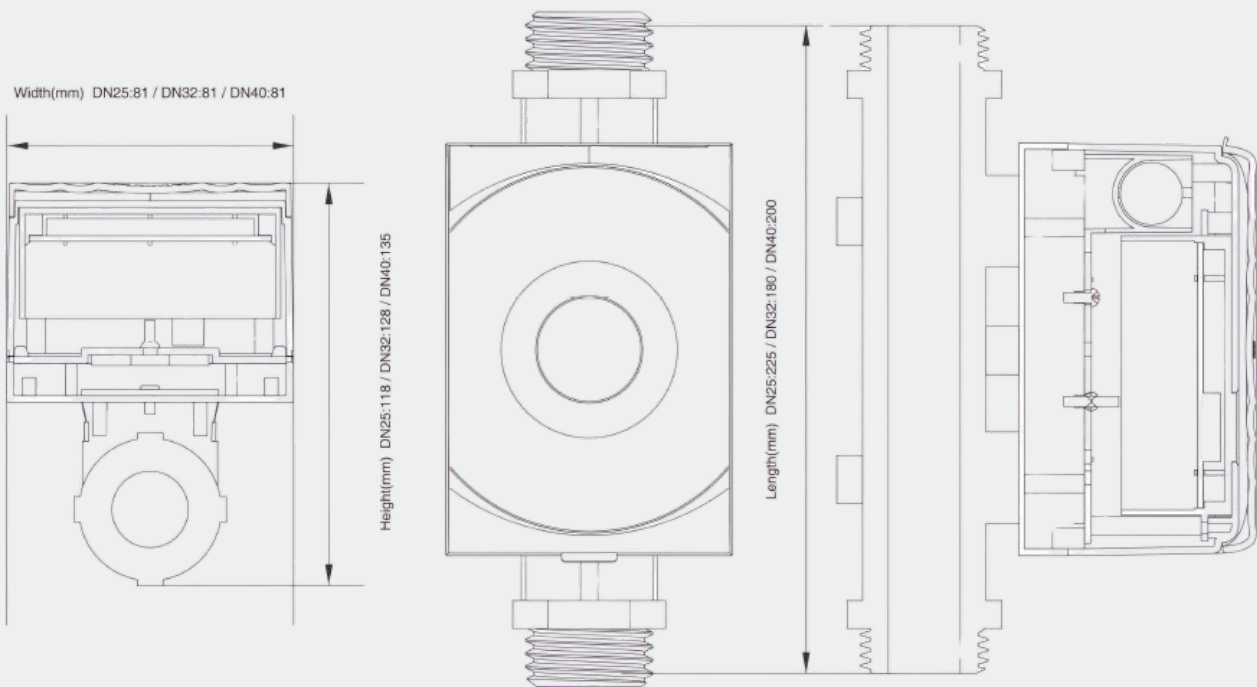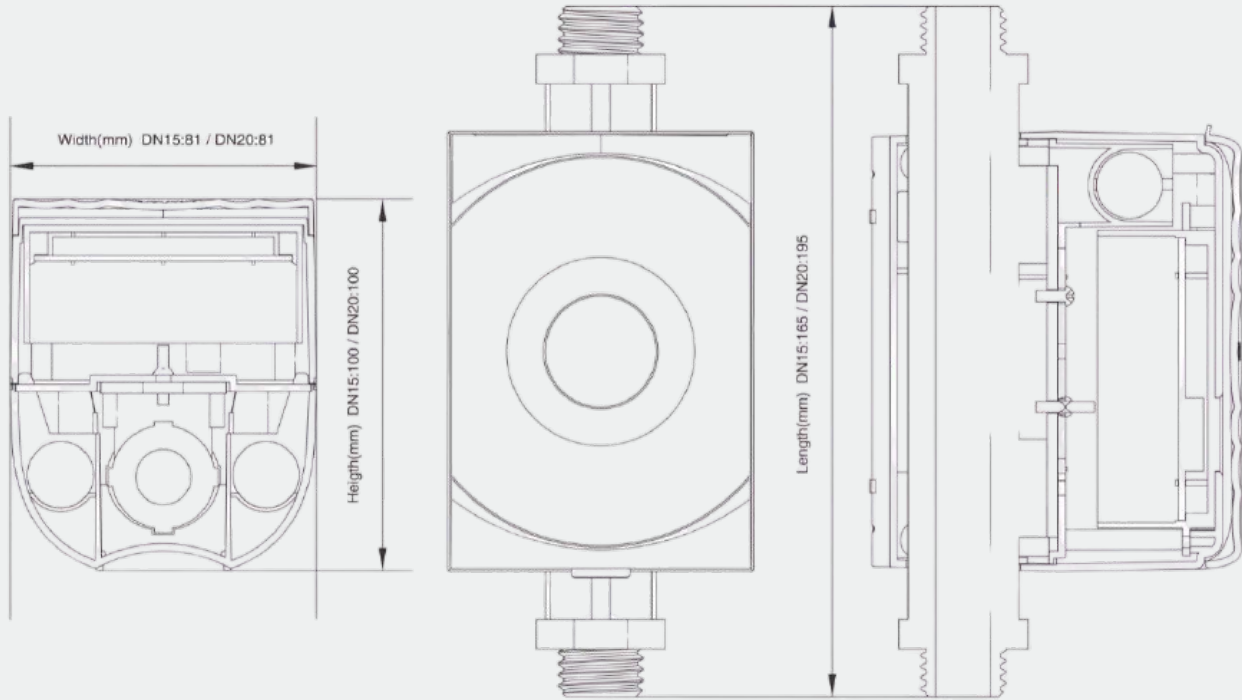|	
Output signal for normal operation	**Wired communication**
	RS485/ Pulse/ M-Bus
	Wireless communication
	LoRaWAN/ NB-IoT/ Sigfox / 4G(CAT1)
Output display/signal for testing	M-Bus/ RS485/ Infrared

Power Supply

Battery	*Lithium Battery*
Battery Life	*6 Years / 10 Years*
24V DC (optional)	*External supply for special version*
Mechanical Specification	
Top cover	*PC+ABS+UV*
Bottom cover	*PC+ABS+UV*
Flow Body	*Brass 59-1*
Flow Pipe	*PPS*

2.4 Data Storage

1	*Accumulated flow for the current month*
	Note:1 will be registered at 00:00 on the balance day, and the calculator stores the data of last 24 days/ weeks/ months.
2	*Flow correction coefficient (Only stored when manufacturing).*
3	*Meter ID*
4	*Balance Date*
	Note:2 to 4 are upgraded as per each command
5	*Accumulated flow volume*

2.5 Physical dimensions

Width(mm) DN15:81 / DN20:81

Heigth(mm) DN15:100 / DN20:100

Length(mm) DN15:165 / DN20:195

Width(mm) DN25:81 / DN32:81 / DN40:81

Height(mm) DN25:118 / DN32:128 / DN40:135

Length(mm) DN25:225 / DN32:180 / DN40:200
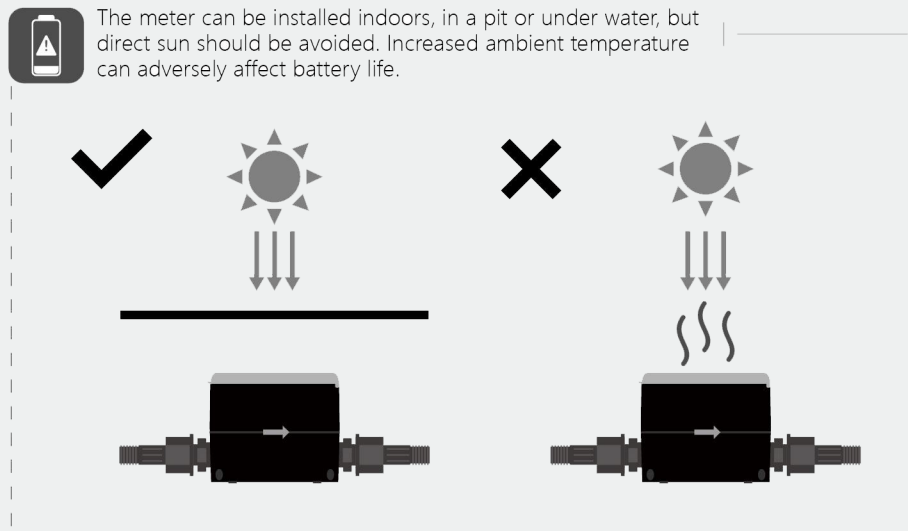
3. Installation

3.1 Requirements for installation environment

UTW19 series ultrasonic water meter has been designed for indoor installation in non-condensing environments with ambient temperatures from 5~55℃.

The meter can be installed indoors, in a pit or under water, but direct sun should be avoided. Increased ambient temperature can adversely affect battery life.

- The meter must not be under any mechanical stress when installed in the pipe.
- The meter must be protected against pressure shocks in the pipe.
- Protection class IP68 allows long-term submergence, provided that all cable unions have been correctly mounted and that the plastic cover has been properly fastened.
- Make sure the meter is installed sufficiently far away from possible sources of electromagnetic interference (switches, electric motors, fluorescent lamps, etc.).
- All control cables must be drawn separately and not parallel to e.g. power cables or other cables with the risk of inducing electromagnetic interference. There must be a distance of min. 25cm between signal cables and other installations.
- If two or more meters are to be installed shall be in parallel, the axis-center distance between two meters shall be at least 135mm minimum.

3.2 Before Installation

Prior to installation of the flow sensor, the pipe shall be thoroughly flushed out, and any dirty, stone alike items must be removed from the pipe. Cavitation in the system must be avoided. If a risk of frost exists, empty the system and, if necessary, remove the meter. If the water is soiled, fit the strainer in the pipe before the meter.

3.3 Mounting of Flow Sensor

Consider the dimensions of the water meter, and the distance with surroundings, minimum 3 cm free space.

Straight sections of 5×DN before and 3×DN after the meter are recommended, to homogenize the temperatures of water.

The meter is to be installed so that the direction of the arrow on the meter housing corresponds to the direction of flow. Avoid the collection of air bubbles in the meter during the installation process.

The connecting pipe at the two ends must be on the same horizontal level. Install horizontally only, not tilted, inclined or overhead. Install the flow sensor into horizontal or up streaming pipelines.

Do not install at highest point of piping to avoid air inside the flow sensor. The flow sensor must not be installed in the positions where swirling flow exists (swirling flow is normally caused by bending pipe), or pulsatile flow exists (pulsatile flow is normally caused by pump, therefore the flow sensor must be installed as far as possible from pump and must not be installed on the outlet of pump) or air may build up.

3.4 Mounting Step

Step 1: Flush the piping system thoroughly before mounting the meter.
Step 2: Sufficient distance.5×DN straight pipe in upstream and 3×DN straight pipe in downstream. (DN: Diameter)
.Step 3: The specific seal gasket and connector only supplied by Neo Wave Technology
Step 4: On the two sides of the meter, there should be one filter (if the water is soiled) and two shut-off valves.
Step 5: After finishing the above operations, seal the meter only if the sealing has not been done before delivery from factory.

3.5 Installation of non-return valve

The meter can be supplied with a non-return valve (if required) on request. The non-return valve must be installed on the water inlet end of meter when installing.

3.6 After the installation

The tightness must be proved by pressurizing with cold water, slowly filling the pipe on completion of the installation.

Open the shut-off valves carefully and check installation for leakage. While the piping system is operating, check whether the volume displays correctly and the temperatures display corresponding with the actual temperatures (see the display information).

When the response thresholds are exceeded and the flow rate is positive, the volume is summated.

Make the segment test, in order to display all display segments for test purposes.

The operating hours are counted from initial connection of the battery. The date is incremented daily. As a standard the meter is delivered with the local time, or destination time if required.

Power supply .4

UTW19 consists of the following combinations of batteries

Brand	EVE/ HCB		
Type	Lithium Battery		
Model No.	ER26500	ER18505	SPC
Rated capacity	8500mAh	4000mAh	45mAh
Rated voltage	3.6V	3.6V	3.6V
Max recommended continuous operating current	150mA	130mA	500mA
Max pulse current	300mA	180mA	2000mA
Reference weight	52g	28g	10g
Max dimension	26.2×50mm	18.7×50.5mm	15×20mm
Operating temperature	-55°C ～ +85°C		
UTW19 type	Combination		
DN15, DN20	ER18505, SPC		
DN25, DN32, DN40	ER26500, ER18505, SPC		

5. Interface & Communication

5.1 IrDA

UTW19 equipped with an optical interface IrDA to IEC62056-21   as a standard. In addition, one of the following options can be ordered for remote output.

5.2 M-BUS (Optional)

Cable: connected with galvanic isolation
Voltage: 50V max.
Current: M-Bus loads
Addressing: primary or secondary
Note: A higher frequency is not allowed and may result in meter malfunction!
Data transmission in the compatibility mode (= standard, one data frame) or in the full mode (3 data frames) is possible.
If the meter is equipped with "M-Bus", it is delivered with a two-wire cable, which can be lengthened with a cable 2 x 0.75mm^2 (put a distributing box). Pay attention to the proper polarity in case of the pulse output. If the meter is read out via M-bus, the allowed mean frequency of reading must not be exceeded. Any more reading is not allowed and may result in a damage to meter.

Version/Color	Pulse	M-Bus (2-wire)
Red	*Pulse*	*M-Bus*
Black	*GND*	*M-Bus*

5.3 Pulse Output (Optional)

Pulse output for heat or volume, with 2 m cable connected, with galvanic isolation
Pulse significance: 1 pulse per kWh, 1 pulse per 100 liter or 1 pulse per 0.001 Gcal
Pulse length: 100 ms (Programmable)
Heat / Volume: specify in order or change with service-software
Voltage: max. 30 V
Current: max. 30 mA
Pulse break: min. 25ms
Classification OC (acc. to EN 1434-2)
Voltage drop: ca. 1.3V at 20 mA

5.4 RS-485(Optional) ki

Cable: connected with four-core cable
Voltage: 5-24V.

Version/Color	RS-485
NRed	*VCC*
Black	*GND*
Yellow	*A*
Green	*B*

5.5 LoRaWAN (Optional)

ISM Band	*EU433*	*EU868*	*IN865*	*US915*
Class	*Class A*			
Network Access Mode	*OTAA or ABP*			
Transmitting Power	*12.15 dBm(max)*	*14 dBm(max)*	*20 dBm(max)*	*20 dBm(max)*
Data Transmission	*Each 6h as default*			

5.6 NB-IoT (Optional)

LTE Band	*B3*	*B5*	*B8*	*B20*	*B28*
Data Transmission	*Each 24h as default*				

5.7 Sigfox (Optional)

RCZ Serial	RCZ 1	RCZ 2/4
EIRP/dBm (max)	16	24
Data Transmission	Each 6h as default	Each 12h as default

5.8 4G CAT1 (Optional)

LTE Band	B1/2/3/4/5/7/8/20/28/66
Data transmission	Each 24h as default

Operation & Display .6

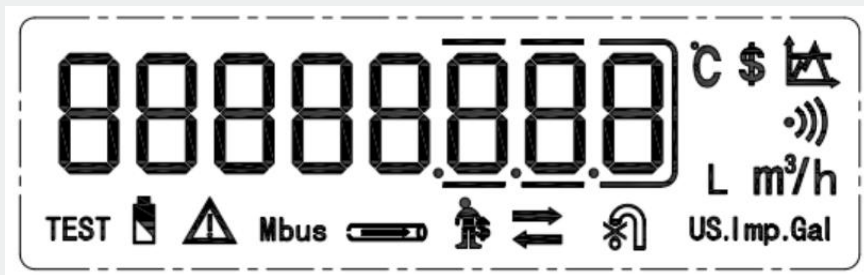UTW19 fitted with an easily readable LCD, including 8 digits, measuring units and information field

Fig. LCD Display

No.	Icon	Name	Meaning
1	TEST	Calibration mode	Under calibration
2		Low battery warning	User is reminded to replace the battery with a new one.
3		Error warning	Warnings for error
4	Mbus	Communication type	M-Bus communication
5		Pipe state	Blink means empty pipe
6		Credit alarm	Prepaid mode only

7	➡	Button indication	Button detected once appear
8	⬅	Reverse flow	Reserve
9	🚰	Valve indicate	Valve control meter only
10	US.Imp.Gal	Unit	Gal Unit
11	L m³/h	Unit	Volume and flow rate
12	·)))	Wireless communication	Reserve
13	℃	Unit	Temperature
14	$	Currency	Prepaid mode only
15	📈	Tariff	Prepaid mode only

6.1 Operations on how to display

Users may cover the photosensitive sensor to read the meter information such as accumulated volume, current flow rate, etc.

6.1.1 Menu List (User Loop)

Cover the photosensitive sensor for 5 seconds and hold it on will bring up the four menus for users to select.

– – – – – – ➤   Keep press more than 5 seconds
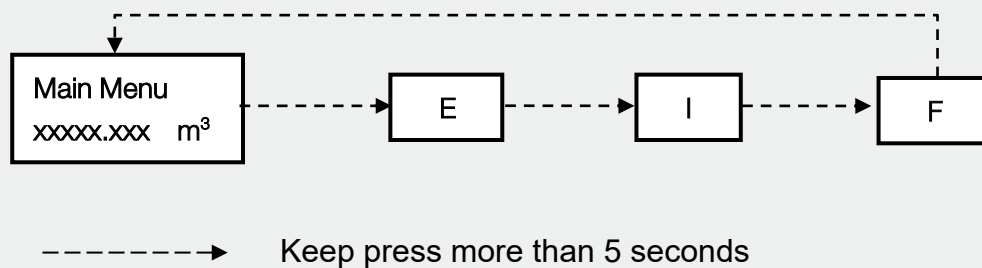
6.1.2 Main Menu

Shortly covering the photosensitive sensor to display items under the Main Menu one by one in the following order to check the measurement data:

Forward Totalizer

8.888 m³

Flow Rate

1.800 m³/h

Working Hour

188 H

Diameter

dN 15

Display Test

88888.888 ℃ $ ⋈))) L m³/h
TEST ⚠ Mbus US.Imp.Gal

→ Short active less than 5 seconds

- - - - - -▶ Keep active more than 5 seconds
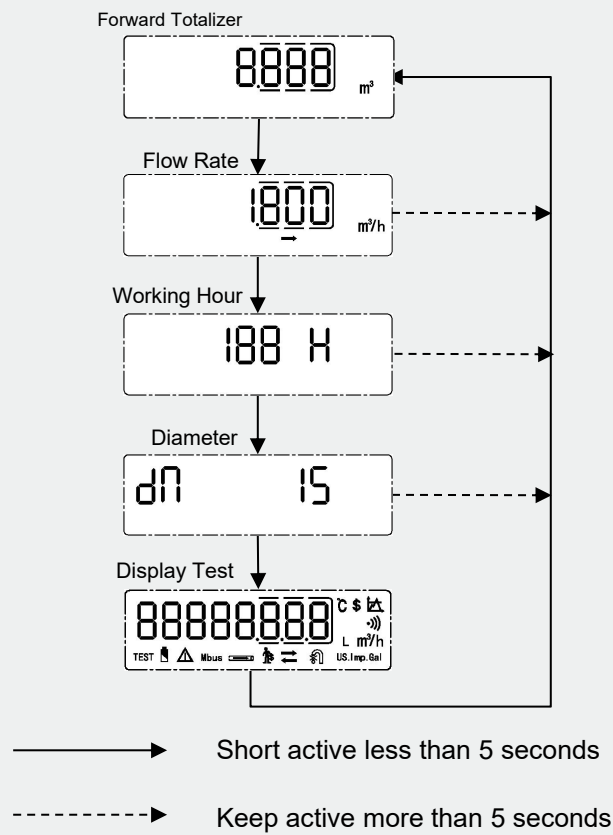
6.1.3 Menu E

Shortly covering the photosensitive sensor to display items under Menu E one by one in the following order to check the meter information:

Low Battery — Occur Time	Error Keep Time
Empty Pipe — Occur Time	Error Keep Time
Reverse Flow — Occur Time	Error Keep Time
Over Range — Occur Time	Error Keep Time
Temperature Alarm — Occur Time	Error Keep Time
EE Error — Occur Time	Error Keep Time
Reserve — Occur Time	Error Keep Time
Reserve — Occur Time	Error Keep Time
Leakage Alert — Occur Time	Error Keep Time
Burst Alert — Occur Time	Error Keep Time
Tamper Alert — Occur Time	Error Keep Time
Freezing Alert — Occur Time	Error Keep Time
Totalizer During Error Time	

⟶ Short active less than 2 seconds

- - - - - -▸ Keep active more than 2 seconds

6.1.4 Menu I

This Menu shows history date records of last 24 logs (month as example). Cover the photosensitive sensor to select the log number, then the log number, log reading will be displayed in turn.

```
                      [ 1]  ◄─────────────────┐
                       │                      │
                       ▼ Factory ID           │
                    007400  ┄┄┄┄┄┄┄┄┄┄┄┄┄┄┄►  │
                       │                      │
                       ▼ Meter ID             │
                   5220 1234  ┄┄┄┄┄┄┄┄┄┄┄┄►   │
                       │                      │
                       ▼ Baud rate, Parity, Modbus ID
                   24 E   00  ┄┄┄┄┄┄┄┄┄┄┄┄►   │
                       │                      │
                       ▼ Firmware Version     │
                   ┝44 11356  ┄┄┄┄┄┄┄┄┄┄┄►    │
                       │                      │
                       ▼ Date                 │
                   d 221118  ┄┄┄┄┄┄┄┄┄┄┄┄►    │
                       │                      │
                       ▼ Time                 │
                   H 221118  ┄┄┄┄┄┄┄┄┄┄┄┄►    │
                       │                      │
                       ▼ History Date 1     Freezing data
                   ┝ 221101  ◄──►  888888 m³  ┄┄►
                       │                      │
                       ▼ History Date 2     Freezing data
                   ┝ 221001  ◄──►  808888 m³  ┄┄►
                       │
                      ······
                       ▼ History Date 24    Freezing data
                   ┝ 201201  ◄──►  508888 m³  ┄┄►
```
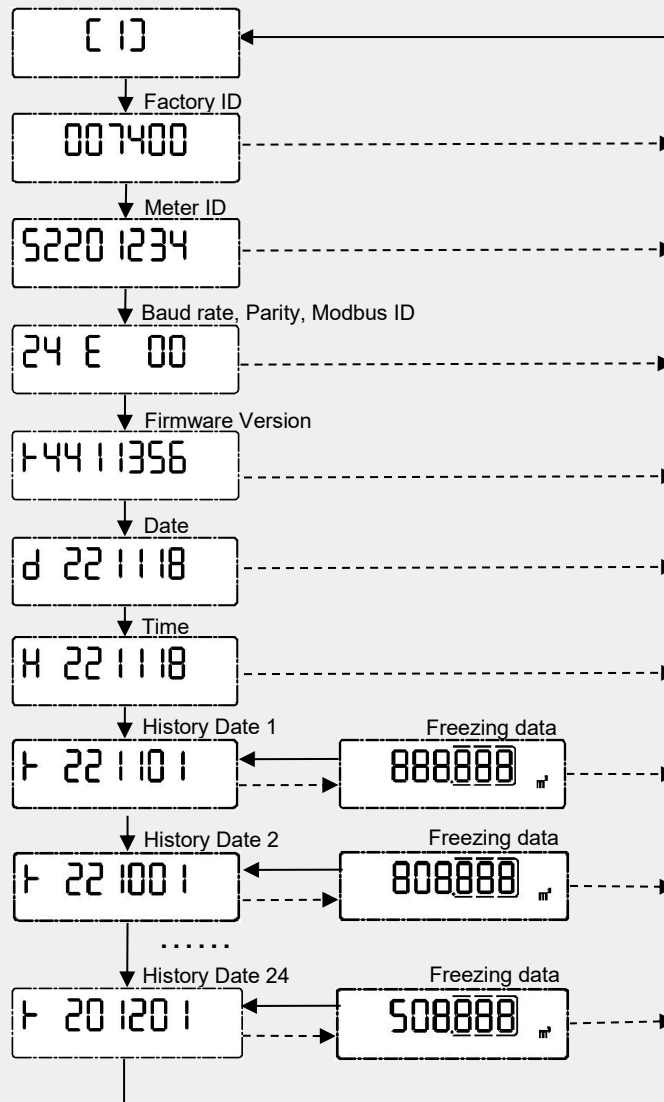
───────────────► Short active less than 5 seconds

┄┄┄┄┄┄┄┄► Keep active more than 5 seconds

6.1.5 Menu F

The following diagram shows Menu F (Calibration mode only). In F mode, accumulated flow value is able to reset automatically, when flow is zero and starts to exceed the preset value then the current accumulated value is clear to zero. Also, the value can be reset by long-covering the button (over 5 seconds). The meter exits the calibration mode if no operation for 2 hours.

Note: Preset value is pre-set to make sure zero calculation when there's no water flow in the pipe, usually the value equals to 0.1% of Q_3. **This mode is for meter flow accuracy test.**

Short active less than 5 seconds

Keep active more than 5 seconds
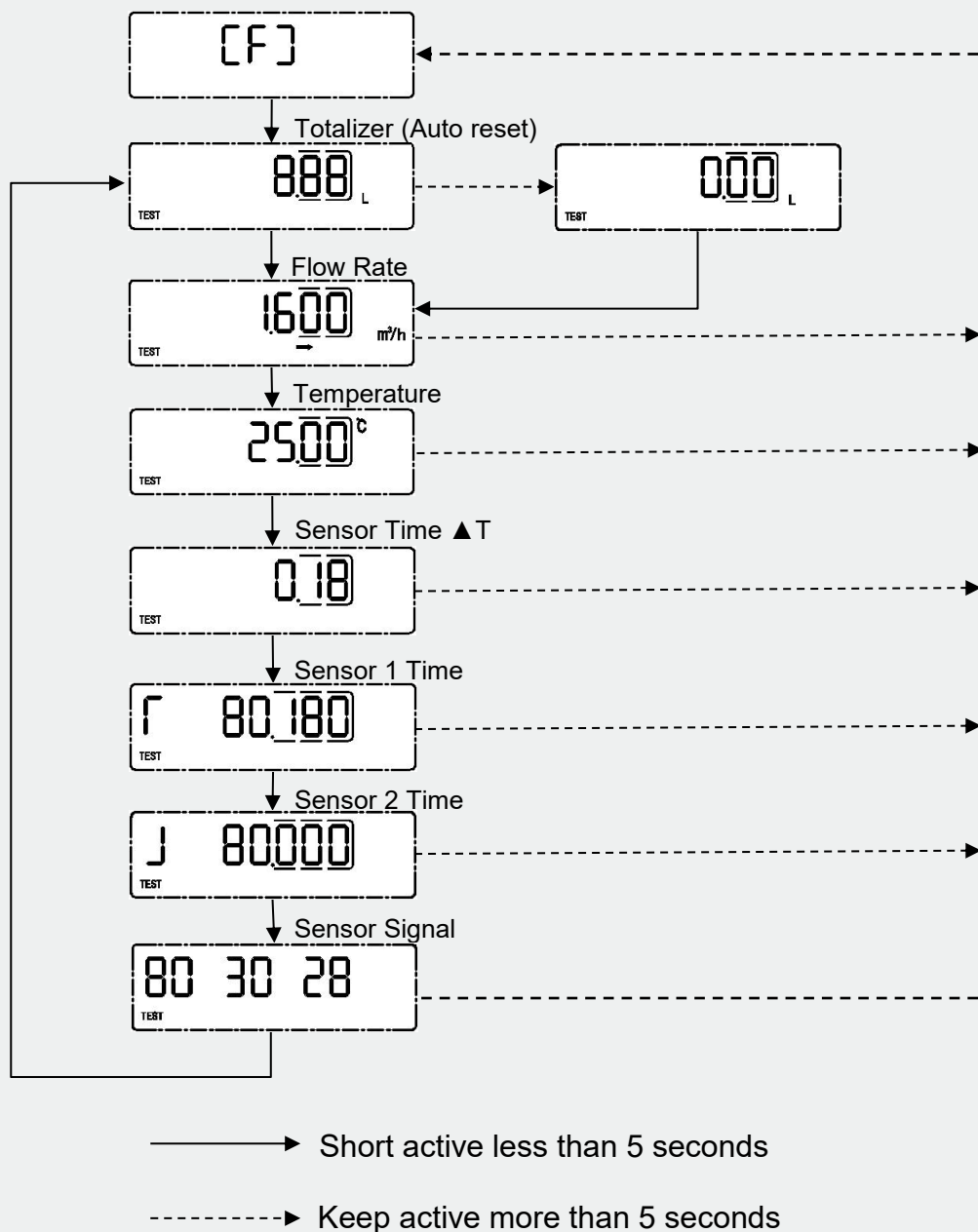
6.2 Monthly Data

The calculator stores the following values for 24 months at each end of month - Volume (meter reading)
From the month set day display, press the button shortly to enter the previous month's values. The month values can also be read out via the optical interface and other communication ports.

7. Error and Warning

The meter constantly performs self-diagnosis and can display various faults. Visual indication on the LCD display in the event of a warning. Permanent visual indication on the LCD:

Fault	Meaning	How to handle the error
1	*Low Battery*	*Communication circuit to be checked*
2	*Empty Pipe*	*Fulfill the pipe with water, no air bubbles.*
3	*Reverse Flow*	*Reverse the water pipe.*
4	*Over Range (High Instant flow rate)*	*Lower the instant flow rate, or change a higher range water meter.*
5	*Water Temperature Error*	*Lower the water temperature*
6	*EE Memory Error*	*Change circuit board.*
7	*Reserve*	*-*
8	*Reserve*	*-*
9	*Leakage Alert*	*Find leakage point*
A	*Burst Alert*	*Lower the instant flow rate, or change a higher range water meter.*
B	*Tamper Alert*	*Resolve alert or reset alert*
C	*Freezing Alert*	*Raise the water temperature*

Specification

Modbus

UTW19
ULTRASONIC WATER
METER

1. Protocol description

➢ RS485 meter reading, communication use 4 core cable
➢ RS485: A(Yellow), B(Green), power+(Red, DC7-24V), GND(Black)
➢ Load limit:64 meters
➢ Communication distance:800m
➢ Baud rate(adjustable)2400bps, EVEN, 8, 1
➢ Character interval:4ms
➢ All plaintext transmission, no encryption
➢ Check: CRC-16/modbus, $x16+x15+x2+1$

2. Modbus Command code description

2.1.Meter Reading

Mod-ID	03	RegisterID-High	RegisterID-Low	RegisterNO.-High	RegisterNO.-Low	CRC-High	CRC-Low

Request command code description:

Modbus:	0x01
Command code:	0x03
Register start ID-High:	0x00
Register start ID-Low:	0x01
Register ID numbers-High:	0x00
Register ID numbers-High:	0x26
CRC check high:	0x95
CRC check low:	0xD0

Response code description:

Modbus ID:	0x7D	
Command code:	0x03	
Register numbers:	0x4C	
Register ID 1:	0x614E	
Register ID 2:	0x00BC	0x00BC614E change to Decimal is 12345678
Register ID 3:	0x0B3B	Named Instantaneous flow 12345678L/h
Register ID 4:	0X614E	
Register ID 5:	0X00BC	0x00BC614E change to Decimal is 12345678
Register ID 6:	0x0C13	Named last month consumption 12345.678 m3, 0X0C13 means 0.001m³ (DN15-40) 0X0C15 means 0.1m³ (≥DN50)
Register ID 7:	0x614E	
Register ID 8:	0x00BC	0x00BC614E change to Decimal is 12345678
Register ID 9:	0x0C13	Named forward flow 12345.678 m3

Register ID 10:	0x614E	
Register ID 11:	0x00BC	0x00BC614E change to Decimal is 12345678
Register ID 12:	0x0C13	Named reverse flow 12345.678 m3
Register ID 13:	0x0000	Reserved
Register ID 14:	0x0000	Reserved
Register ID 15:	0x0000	Reserved
Register ID 16:	0x0000	Reserved
Register ID 17:	0x0000	Reserved
Register ID 18:	0x0000	Reserved
Register ID 19:	0x0123	Pressure, 0x0123 change to Decimal is 291, so pressure is 0.291Mpa (only for pressure meter)
Register ID 20:	0x0000	meter status register, no alarm
	0x0004	meter status register, empty alarm
	0x0020	meter status register, low battery alarm
Register ID 21:	0x614E	
Register ID 22:	0x00BC	Cumulative working time 12345678h
Register ID 23:	0x4932	Minute value is 49 and second value is 32
Register ID 24:	0x1001	Day value is 10 and hour value is 01
Register ID 25:	0x1903	Year value is 19 and month value is 03
		So, the date&time is 10/03/2019 01:49:32
Register ID 26:	0x0000	Reserved
Register ID 27:	0x0000	Reserved
Register ID 28:	0x0000	Reserved
Register ID 29:	0x0000	Reserved
Register ID 30:	0x0000	Reserved
Register ID 31:	0x0A9B	Temperature 27.15℃ (HEX to decimal)
Register ID 32:	0x0000	Reserved
Register ID 33:	0x5678	
Register ID 34:	0x1234	BCD, meter serial number is 12345678
Register ID 35:	0x0001	BCD, Modbus ID is 01
Register ID 36:	0x0000	Reserved
Register ID 37:	0x0000	Modbus Baud Rate is 9600bps

	0x0001	Modbus Baud Rate is 2400bps
	0x0002	Modbus Baud Rate is 4800bps
	0x0003	Modbus Baud Rate is 1200bps
Register ID 38:	0x0000	Version, Register ID ≤38
CRC check high:	0xxxxx	
CRC check low:	0xxxxx	CRC-16/modbus, x16+x15+x2+1

3. Change Modbus ID

CASE:

Set Modbus ID 01(HEX) send command：

Request: FE FE FE 68 20 FF FF FF FF `01 74 00` 15 0A A0 18 AA FF FF FF FF `01` 11 11 `99` 16

Response: FE FE FE 68 20 FF FF FF FF `01 74 00` 95 0A A0 18 AA FF FF FF FF `01` 11 11 `19` 16

Set Modbus ID 02(HEX) send command：

Request: FE FE FE 68 20 FF FF FF FF `01 74 00` 15 0A A0 18 AA FF FF FF FF `02` 11 11 `9A` 16

Response: FE FE FE 68 20 FF FF FF FF `01 74 00` 95 0A A0 18 AA FF FF FF FF `02` 11 11 `1A` 16

Code	Description
01 74 00	Manufacturer code need to check on the meter display (display 007401)
01/02	New modbus ID
99/9A/19/1A	Check sum from 68 20 to 11 11

NEO WAVE ®

For technical support please contact: support@neowave.tech

www.neowave.tech