Bove® Technology

Installation & User Guide

BECO X

Ultrasonic Water Meter

i Read this Guide before installing the meter

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 BOVE TECHNOLOGY.

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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	*Bove*
Type	*BECO X*
Accuracy class	*Class 2*
MAP	*16 bar*
Max Pressure loss	*≤40kPa*
Max admissible temperature (optional)	*30℃ / 50℃ / 70℃*
Limits of temperature (Θmin and Θmax) (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:

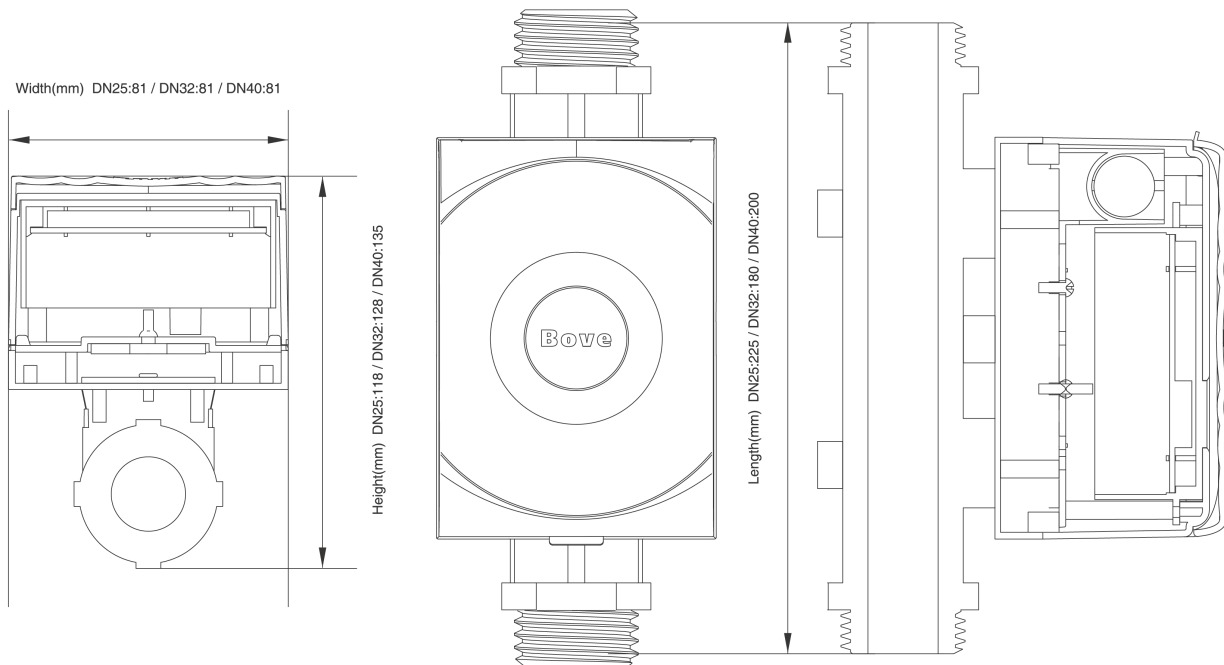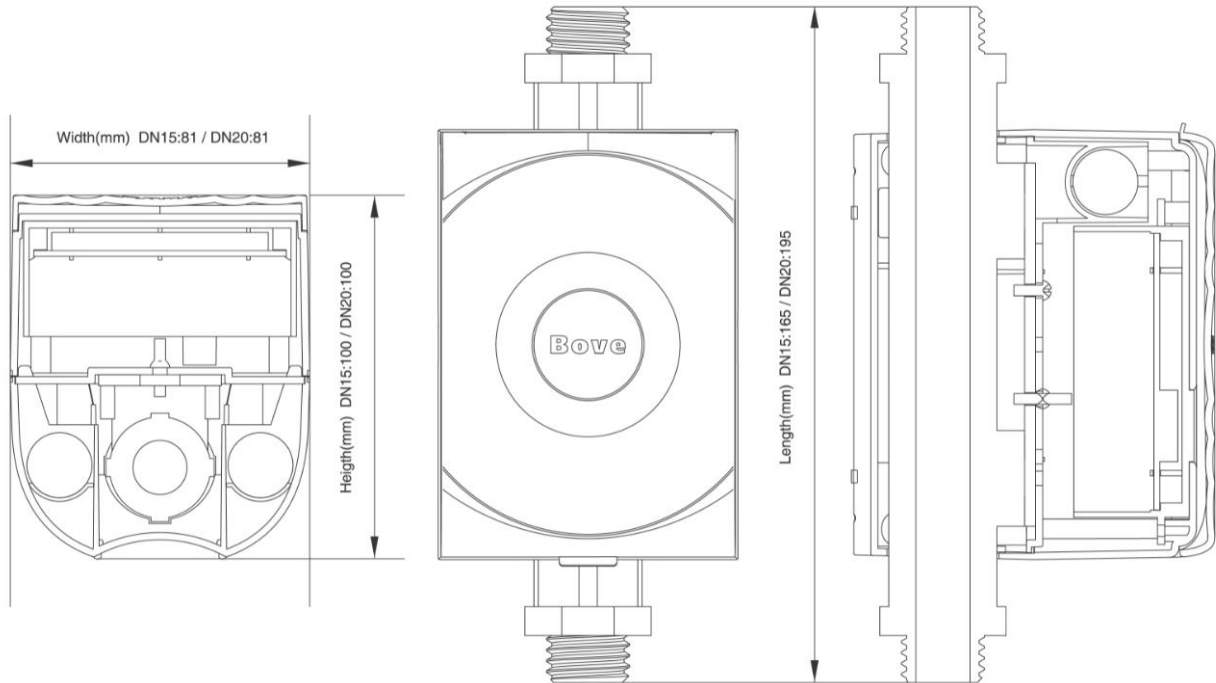| Manufacturer	Bove
Climatic and mechanical class	B
Electromagnetic Class	E1
Mechanical Class	M1
Display unit	m^3, L
Battery power supply requirements	See part: 4 Power supply
Current used	Average 20uA, Peak 4mA
Pulse input device class	N/A
Max permissible flow sensor signal (Pulse rate)	N/A
Output signal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

2.3 Completer meter

Manufacturer	Bove						
Flow Measurement							
Type	DN (mm)	Flow Rate (m³/h)			Dimensions (mm)			Connection
		Q_1	Q_2	Q_3	Length	Width	Height	— — —

Type	DN (mm)	Q_1	Q_2	Q_3	Length	Width	Height	Connection
BECO X	15	0.00625	0.01	2.5	165	81	100	G¾'
	20	0.01	0.016	4	195	81	100	G1'
	25	0.0252	0.0403	6.3	225	81	118	G1¼'
	32	0.04	0.064	10	180	81	128	G1½'
	40	0.064	0.1024	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 $Q_2 \leq Q \leq Q_4$	± 2 %(at Θ ≤ 30°C) ± 3% (at Θ > 30°C)
Maximum permissible error in lower flow rates range $Q_1 \leq Q < Q_2$	± 5%
Scale interval (m^3)	0.001
Capacity of calculator	99999,999
Type of liquid	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	$0.001m^3$
Time to LCD off	3 min.

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	120 logs (days/weeks/months)

Interface & Communication		
Output signal for normal operation	Wired communication	
	RS485/ Pulse/ M-Bus	
	Wireless communication	
	LoRaWAN/ NB-IoT/ Sigfox	
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 24/120 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

Height(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. Power supply

BECO X consists of the following combinations of batteries.

Brand	EVE/ HCB	
Type	Lithium Battery	
Model No.	ER18505	SPC
Rated capacity	4000mAh	900mAh
Rated voltage	3.6V	3.6V
Max recommended continuous operating current	130mA	500mA
Max pulse current	180mA	2000mA
Reference weight	28g	10g
Max dimension	18.7×50.5mm	15×20mm
Operating temperature	-60℃ ～ +85℃	
BECO X type	Combination	
DN15, DN20	ER18505, SPC	
DN25, DN32, DN40	ER26500, ER18505, SPC	

4. Interface & Communication

4.1 IrDA

BECO X 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.

4.2 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) 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

4.3 Pulse Output (Optional)

Pulse output for heat or volume, with 2m 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

4.4 RS-485(Optional)

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

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

4.5 LoRaWAN (Optional)

ISM Band	EU433	EU868	IN865	US915
Class	Class A			
Network Access Mode	OTAA or ABP			
Transmitting Power	12.15 dBm(max)	16 dBm(max)	30 dBm(max)	30 dBm(max)
Data transmission	Each 6h as default			

4.6 NB-IoT (Optional)

LTE Band	B3	B5	B8	B20	B28
Data transmission	Each 12h				

4.7 Sigfox (Optional)

RCZ Serial	RCZ 1	RCZ 2/4
EIRP/dBm (max)	16	24
Data transmission	Configurable	

5. Operation & Display

BECO X fitted with an easily readable LCD, including 8 digits, measuring units and information field.

The display automatically returns to LCD sleep mode 3 minutes after the latest activation of the touch button. When power on, the meter will reset and displays full screen to allow users to detect if there is any problem with the LCD.
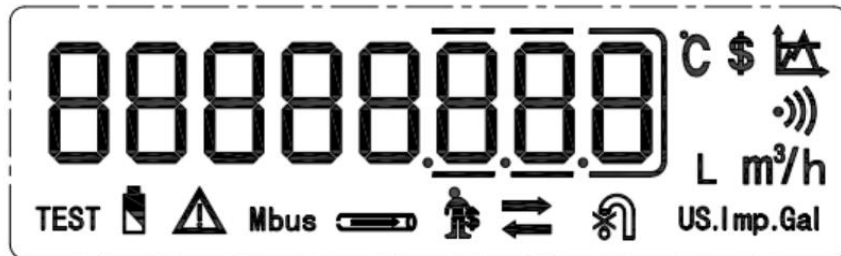
Fig. LCD Display

No.	Icon	Name	Meaning
1	TEST	Calibration mode	Under calibration
2	🔋	Low battery warming	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*

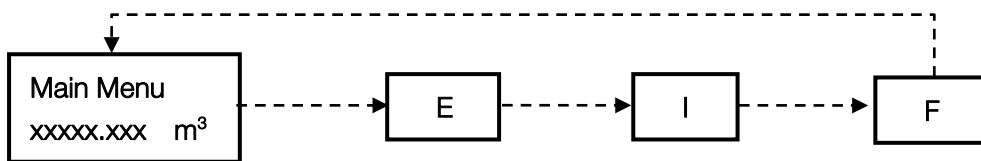## 5.1 Operations on how to display

Users may cover the button to read the meter information such as Accumulated volume, current flow rate, etc.

To save the battery, the meter switches to sleep mode (display off) if the button is not covered for approx. 3 minutes. It can be woken up by covering the button approximately 3 seconds.

The following information is displayed in order by short covering the button: accumulated flow, instant flow, date, time, accumulated working time, Meter ID, address, meter type, software version No., checksum, etc.
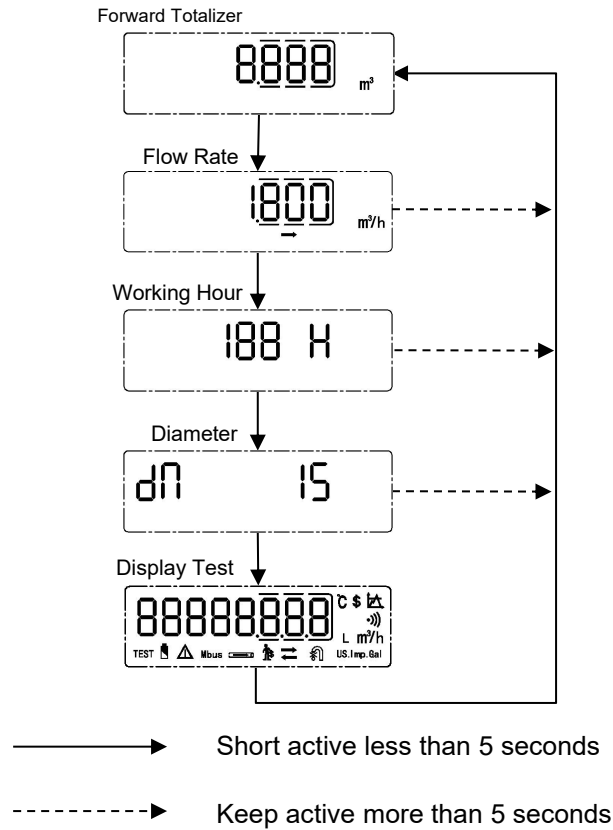
5.1.1   Menu List (User Loop)

Cover the button for 5 seconds and holding it on will bring up the four menus for users to select.

```
        ┌ - - - - - - - - - - - - - - - - - - - - - - ┐
        ↓                                             ┆
┌──────────────┐     ┌──────┐     ┌──────┐     ┌──────┐
│ Main Menu    │- -> │  E   │- -> │  I   │- -> │  F   │
│ xxxxx.xxx  m³│     └──────┘     └──────┘     └──────┘
└──────────────┘
```

- - - - - - - ▶   Keep press more than 5 seconds

5.1.2   Main Menu

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

Forward Totalizer

8888 m³

Flow Rate

1800 m³/h

Working Hour

188 H

Diameter

dN 15

Display Test

88888888

———————▶ Short active less than 5 seconds

- - - - - -▶ Keep active more than 5 seconds

5.1.3 Menu E

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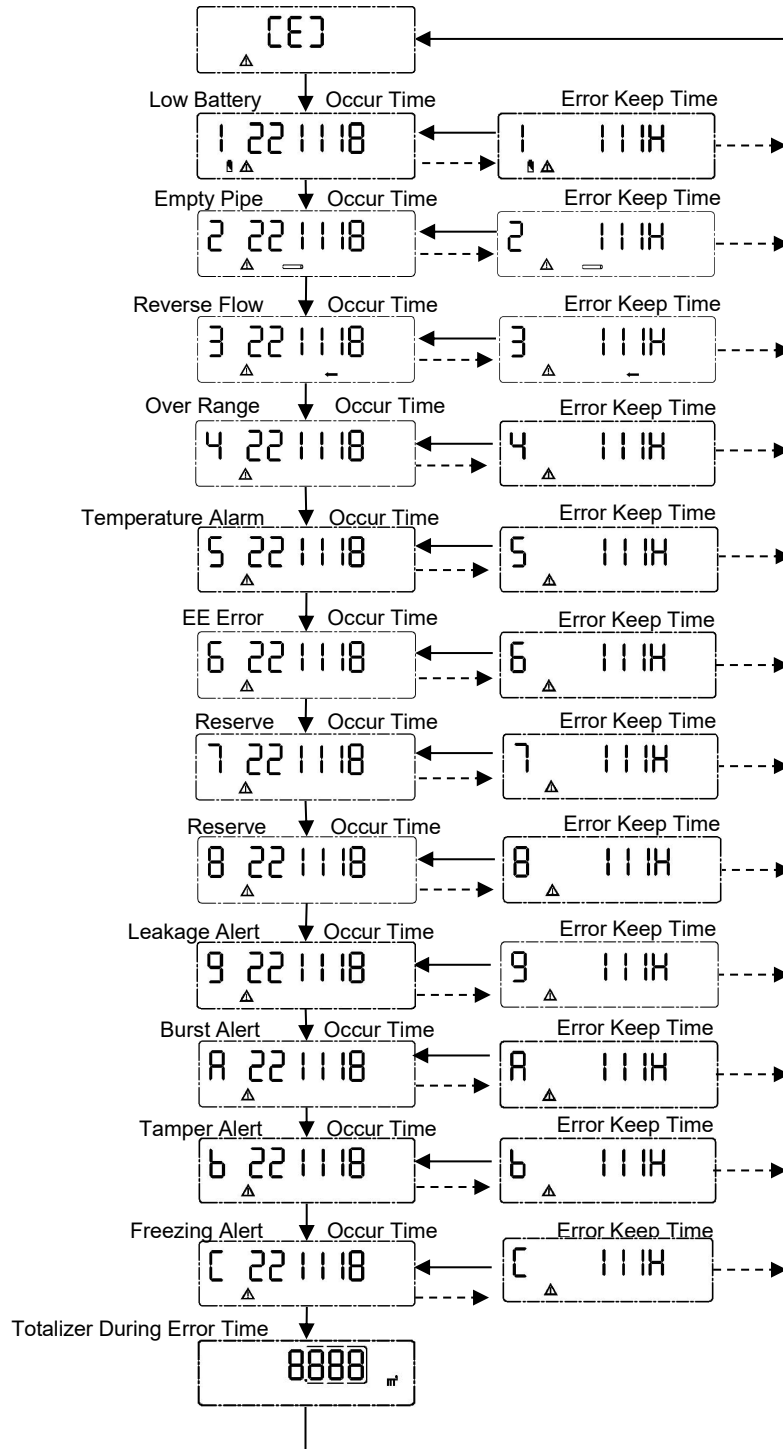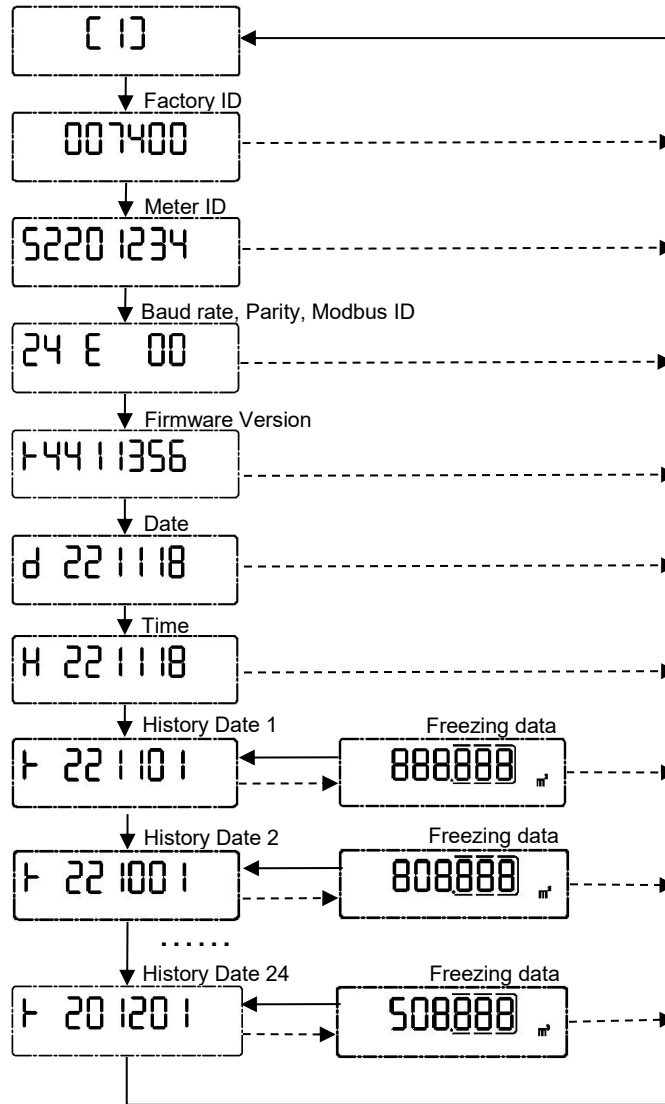

Short active less than 2 seconds

---------► Keep active more than 2 seconds

5.1.4 Menu I

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


Display	Description
[1]	
007400	Factory ID
5220 1234	Meter ID
24 E 00	Baud rate, Parity, Modbus ID
F44 11356	Firmware Version
d 221118	Date
H 221118	Time
F 22 1101	History Date 1 / Freezing data 888888 ㎥
F 22 1001	History Date 2 / Freezing data 808888 ㎥
......	
F 20 1201	History Date 24 / Freezing data 508888 ㎥

⟶ Short active less than 5 seconds

- - - - - -▶ Keep active more than 5 seconds

5.1.5 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 exit 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.
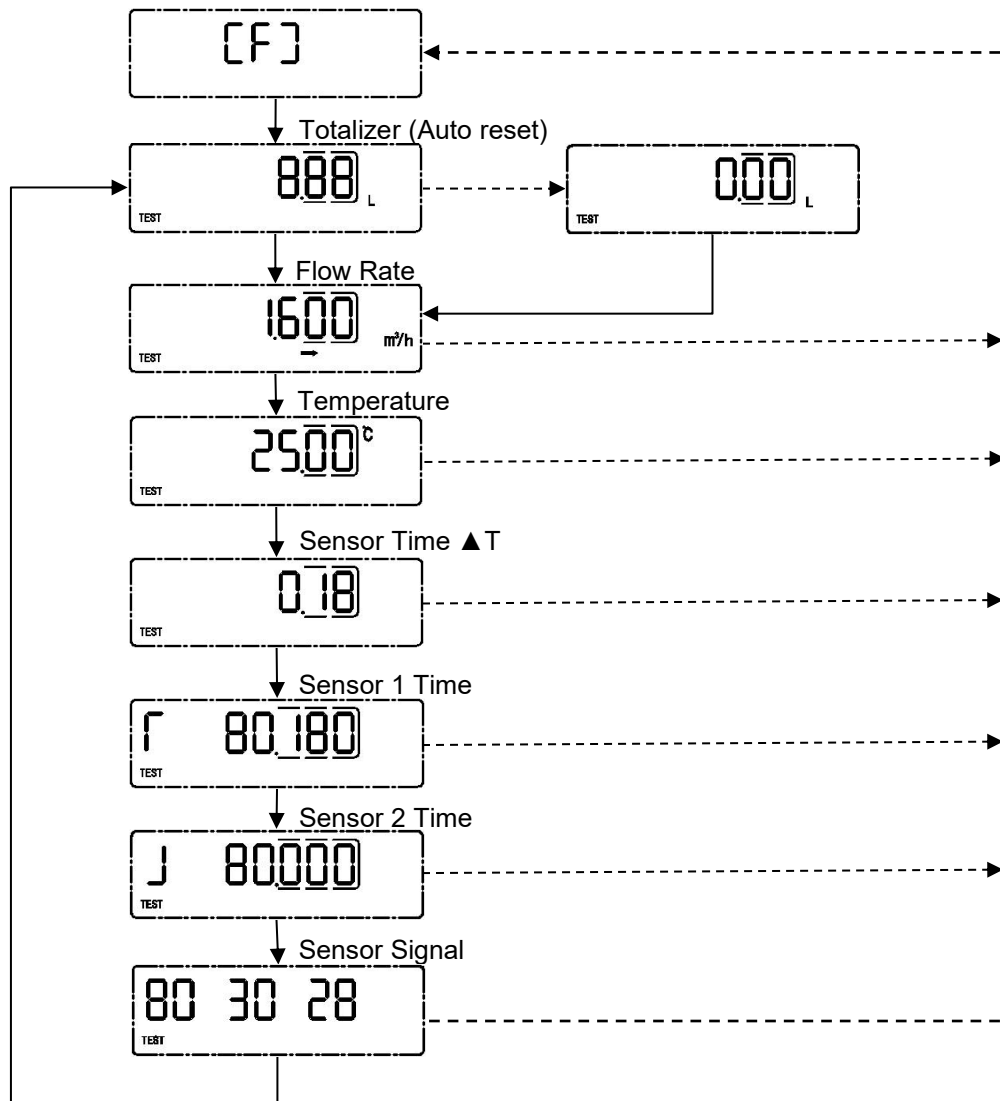
6. Error and Warning

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 bubble.
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

Corporate Profile

Bove provides comprehensive solutions on flow metering and control to over 30 countries in the globe. We design and manufacture range of flow metering solutions and IoT (internet of things) consumer products, which includes high accuracy water meter, thermal energy meter, testing bench, smart communication softwares for residential, commercial and industrial sectors. Since 2009 Bove has always been moving on the edge of technology to deliver state of the art products and solutions to customers all around the world.

A couple of our engineers are dedicated in metering and Communication industry for over 10 years, core team are previously working in Huawei, Baidu, IBM, and CitiGroup, etc. With these talents Bove are able to provide prompt services and reliable products to our global customers.

Bove is committed to address the unique challenges that the residential and industry are facing, including increasing customer demand, water scarcity, and environment conservation. With hope, honor and our hard and quality work, we are looking to future to make Bove one of the best brands in metering industry in the world.

Our Mission

To exceed our customers expectation by providing prompt, quality and reliable technology.

Our Vision

Creating an Eco Society