

Installation & User Guide

# B12 VI-B

## Ultrasonic Heat Meter



Read this Guide before installing the  
meter

## ■ Thank you for choosing our products ■

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## 1. General Information

Please note that the following installation conditions must be obeyed:

Pressure Requirement: PN16.

Environmental Class: E1, M1

Installation requirement: There must be a distance of minimum 25 cm between signal cables and other installations

If medium temperature is below 10°C or above 90°C in flow sensor, It's recommended that the calculator be wall-mounted.

**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.

### Key Information:

Flow Sensor	Registers the amount of district heating water in m <sup>3</sup> /h circulating through the heating system. Θ: 3°C~150°C
Temperature Sensors	Placed in forward and return pipes sense the cooling, by the difference between in flow and out flow temperatures. Θ: 1°C~150°C
Calculator	Calculates heat energy consumption based on flow volume and temperature loss of heating water. Δ Θ: 3K~95K
Electromagnetic Environment	E1 (housing/light industry). The meter's control cables must be drawn at min. 25 cm distance to other installations.
Mechanical Environment	M1 (fixed installation with minimum vibration).
Climatic Environment	The meter must be installed in environments with non-condensing humidity as well as in closed locations (indoors). The ambient temperature must be within 5~55°C.
Maintenance and Repair	The district heating supplier can replace temperature sensor and battery. The flow sensor must not be separated from the calculator. B12 VI-B Series must be connected to a temperature sensor pair type Pt1000.

Battery for Replacement	B12 VI-B Series can be fitted with ER18505 or ER26500 with operating time of 6/10/15 years replaceable.
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## 2. Technical specification

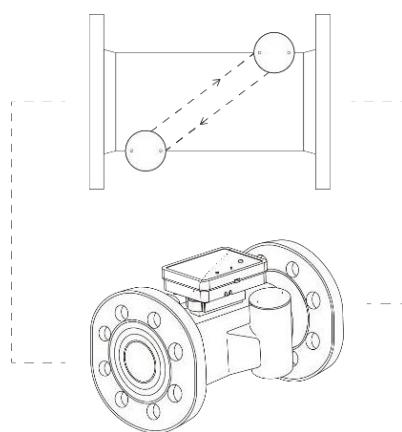
### 2.1 Complete meter

Model	Diameter	Nominal Flow Rate	Maximum Flow Rate	Minimum Flow Rate	Flange Outer Diameter	Length	Connection
	DN (mm)	Qp (m³/h)	Qs (m³/h)	Qi(m³/h)	mm	mm	
B12 VI-50	50	15	30	0.3	165	200	4×M16
B12 VI-65	65	25	50	0.5	185	200	4×M16
B12 VI-80	80	40	80	0.8	200	225	8×M16
B12 VI-100	100	60	120	1.2	220	250	8×M16
B12 VI-125	125	100	200	2	250	250	8×M16
B12 VI-150	150	150	300	3	280	300	8×M20
B12 VI-200	200	200	400	4	335	345	12×M20
B12 VI-250	250	400	800	8	405	445	12×M24
B12 VI-300	300	600	1200	12	460	500	12×M24
B12 VI-350	350	800	1600	16	520	500	16×M24
B12 VI-400	400	1000	2000	20	580	500	16×M27
B12 VI-450	450	1200	2400	24	640	500	20×M27
B12 VI-500	500	1500	3000	30	715	500	20×M30
B12 VI-600	600	2000	4000	40	840	600	20×M33
Temperature		Range:1°C - 150°C, Δ T: 3k - 95k					
Temperature Sensor		A pair of PT1000 platinum resistor					
Metro-logical Class		Class 2					
Maximum Operation Pressure		1.6Mpa					

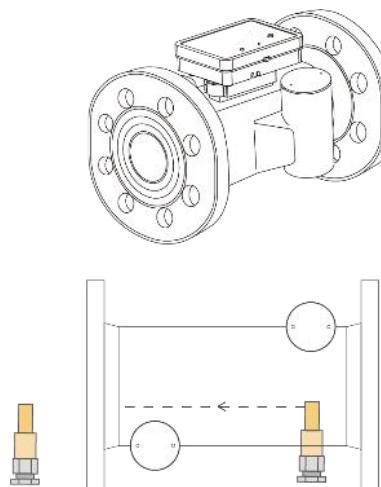
Pressure Loss	P<25kPa at Qp
Pressure Stage	PN16
Protection Class	IP65
Power supply	3.6VDC, lithium battery, 6-10-16 years lifetime option. 5~24V DC power supply(optional)
Data Storage	<ul style="list-style-type: none"> <li>24 months history data, accumulated heat energy and volume, etc.</li> <li>Total heat energy, volume, running hours, etc.</li> </ul>
Operating Temperature	0.1°C - 55°C
Interface & Communication	<ul style="list-style-type: none"> <li>M-Bus</li> <li>Optical port</li> <li>Pulse Output / Pulse Input</li> <li>RS-485</li> <li>LPWAN (LoRaWAN, Sigfox)</li> <li>4G(CAT1)</li> </ul>
Installation	Horizontal or Vertical
Display and Indication	<ul style="list-style-type: none"> <li>Unit: kWh, MWh, GJ (optional)</li> <li>LCD: 8-digit (back illumination)</li> <li>Accumulated: 0.1kWh-9999999.9kWh.</li> </ul>
Standard Compliance	<ul style="list-style-type: none"> <li>EN1434</li> <li>EN13757</li> </ul>

## 2.2 The main consist unit of B12 VI-B Series Ultrasonic Heat Meters

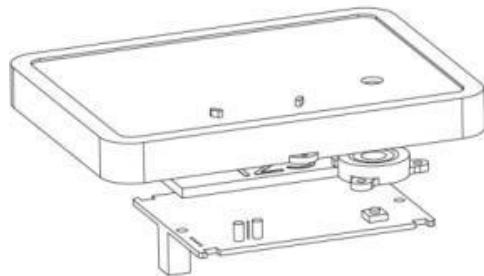
2.2.1 Ultrasonic Flow Metering Unit: Ultrasonic flow meter measures by the transfer of ultrasound signals between transducers with the help of mirrors.



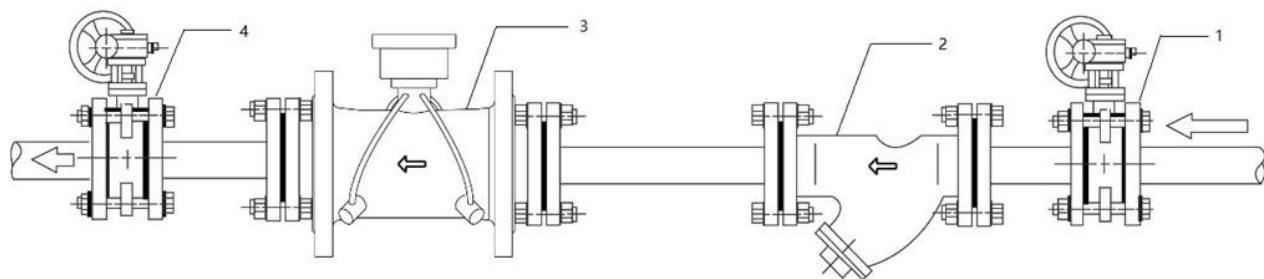
2.2.2 Temperature Metering Unit: PT1000 type heat sensors are used which they are calibrated, certified. If input water temperature metering prob is integrated with the meter body where flow meter is, thus the output water temperature metering prob is mounted to a suitable point on the network return water direction. Also meter could be installed in out flow position. Default cable length is 1.5m, but 3m length is also available as per request.



2.2.3 Calculator Unit: It is the unit that process energy calculation by the flow rate data received from flow rate metering unit and temperature data received from temperature metering unit. Its calibration is performed in software at factory. Calculated energy and other information is displayed on the LCD when button is pushed. These information may be remotely read via optical port and communication unit.



### 3. Installation

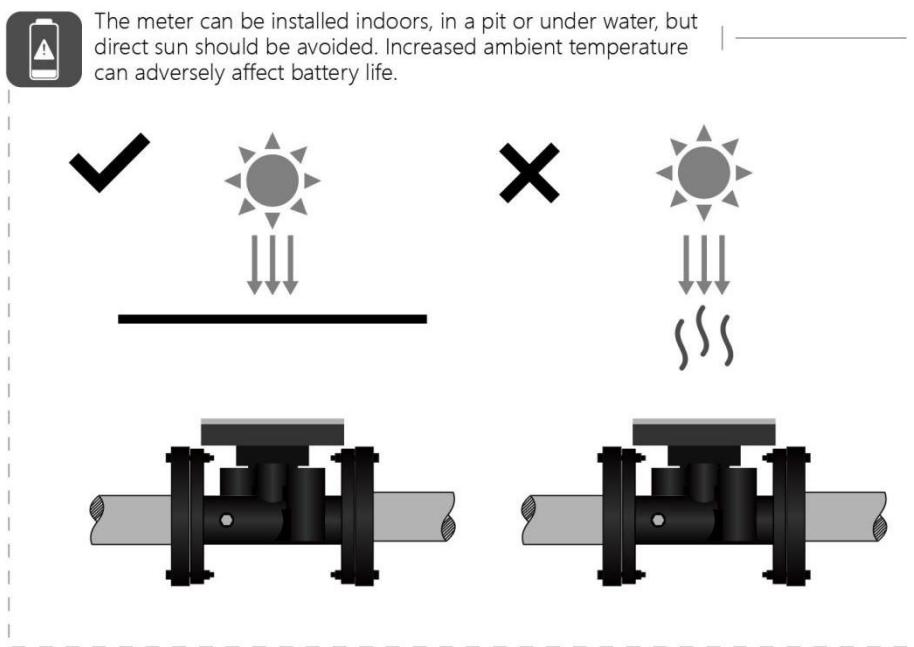


Installation diagram

No.	Description
1	Valve Inlet
2	Strainer
3	Water Meter
4	Valve Outlet

### 3.1 Requirements for installation environment

B12 VI-B Series has been designed for indoor installation in non-condensing environments with ambient temperatures from 5~55°C.



- 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

The pipe must be completely cleaned before installing the ultrasonic heat meter to prevent the debris from damaging the heat meter.

Ultrasonic heat meter is an expensive precision instrument. Care must be taken when transporting. It is forbidden to directly lift the meter head or sensor line; it is strictly

prohibited to approach a higher temperature heat source (such as electric welding to prevent battery explosion and injury and damage to the instrument).

The installation position of the ultrasonic heat meter should pay special attention. The heat meter should be avoided to be installed at the upper end of the pipeline (there will be bubbles in the pipe), avoiding installation near the elbow (which will generate vortex flow), and should be kept away from pumps and other equipment (which will cause pulsating flow); The connecting pipe at the upstream and downstream of the ultrasonic heat meter shall be the same as the diameter of the heat meter and shall not be reduced in diameter.

The direction indicated by the arrow on the surface of the ultrasonic heat meter is the direction of heat flow and shall not be reversed.

It is recommended that the front end of the ultrasonic heat meter be equipped with a strainer of the corresponding diameter; the valve is installed in front of the meter and it can be separated from the meter body for future maintenance and repair.

### 3.3 Common error installation examples

If the flange on the pipe is welded, the position reserved for welding is too large, or the unevenness of the flange welding has an angle with the flange of the meter. Do not forcibly tighten the bolt now otherwise the body may be broken. The correct approach should be removed and reinstalled (as shown in Figure A).

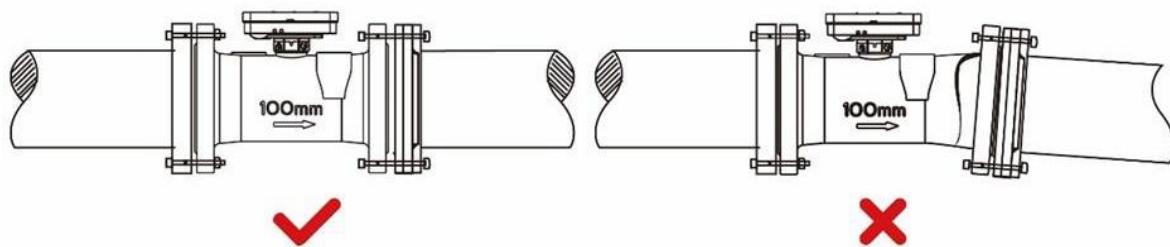


Figure (A)

When the meter is installed horizontally, the direction of the calculator should be upwards. If the direction of the calculator is facing to the side, the two transducers will not be on one level, and the transducer at the high point may collect air. The measurement is not accurate or not measure (as shown in Figure B).

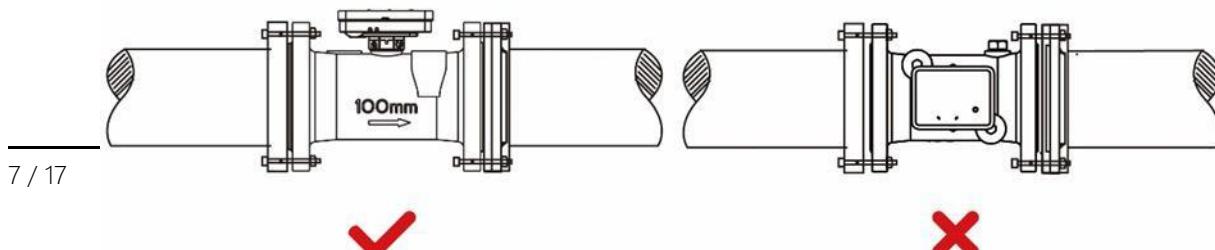


Figure (B)

When the meter is installed vertically, it must be installed on the straight pipe with the heat flow upwards. Because the pipe with the downward flow of heat is affected by the gravity of the center of the earth, the heat in the pipe cannot be filled. This may result in inaccurate metering or even cause the meter don't measure (Shown in Figure C).

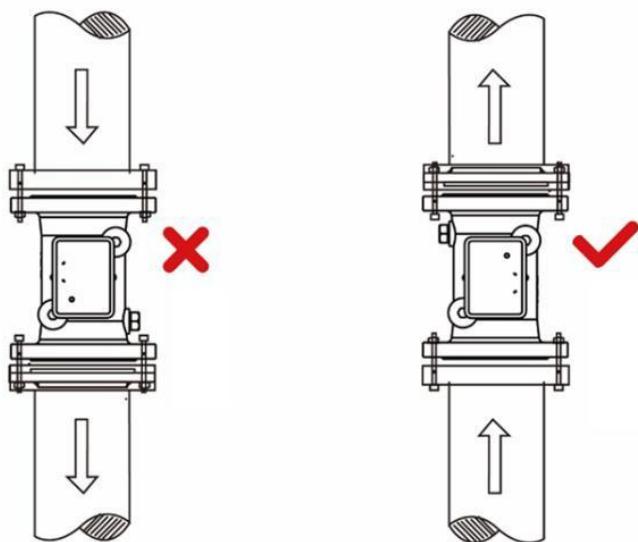


Figure (C)

When installing at the "U" tube, install the meter at the lowest position, because the pipe may accumulate air in the high place, causing the meter to be inaccurate or not measure. (Shown in Figure D).

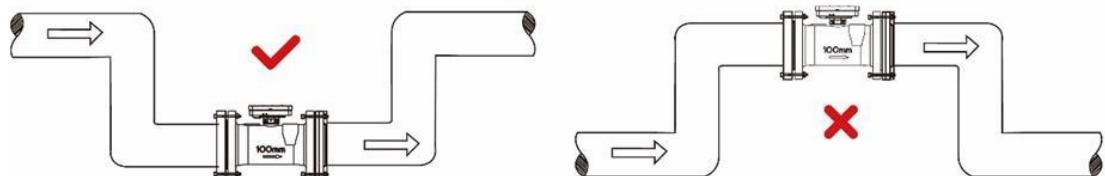


Figure (D)

When the meter is installed at the elbow, it must be ensured that the distance between the

front straight pipe is  $\geq 5$  pipe diameter and the rear straight pipe is  $\geq 3$  pipe diameter. Otherwise, the meter may not measure (as shown in Figure E).

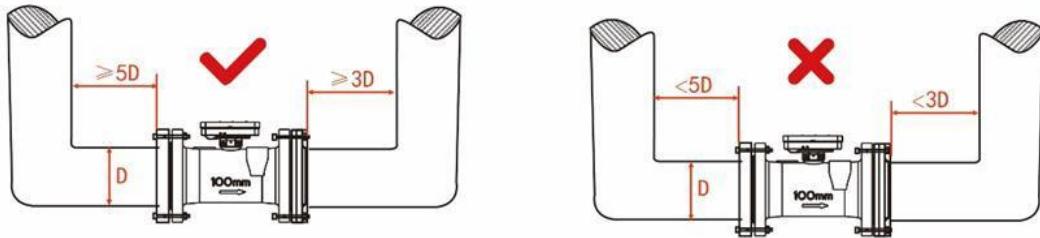


Figure (E)

When installing valves or other objects in front of the meter, it must be ensured that there is a distance of  $\geq 5$  times the diameter between the meter and the object, otherwise the meter may not be metered; (as shown in Figure F).

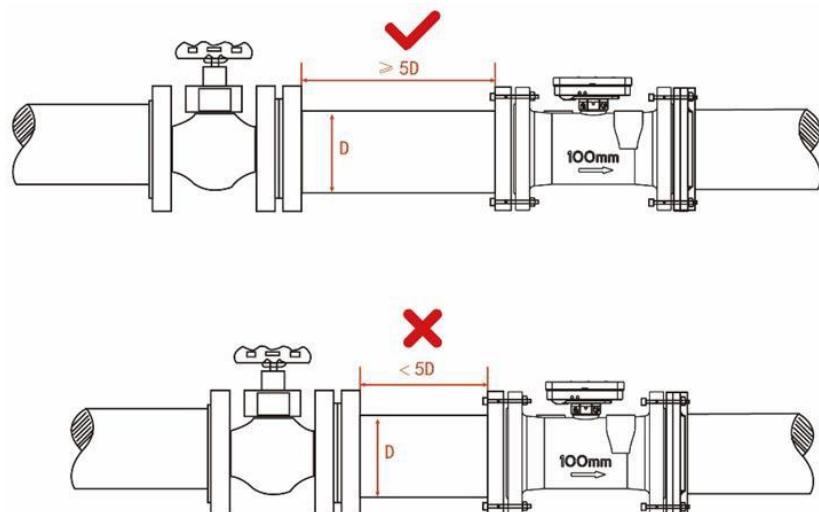


Figure (F)

### 3.4 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 heat inlet end of meter when installing.

### 3.5 After the installation

The tightness must be proved by pressurizing with cold heat, 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 display 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 sum-mated.

Make the segment test, in order to displays 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.

## 4. Power Supply

B12 VI-B Series can be fitted with one ER18505 or ER26500 with operating time of 6 or 11 or 15 years respectively.

Brand	EVE	
Type	Lithium Battery	
Model No.	ER18505	ER26500
Rated capacity	4000mAh	8500mAh
Rated voltage	3.6V	
Max recommended continuous operating current	130mA	150mA
Max pulse current	180mA	300mA
Reference weight	28g	52g
Max dimension	18.7×50.5mm	
Operating temperature	-55°C ~ +85°C	

## 5. Interface & Communication

### 5.1 Optical port

B12 VI-B Series are all equipped with an optical interface IrDA to IEC62056-21 as a standard.

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In addition, one of the following options can be ordered for remote output.

## 5.2 M-BUS

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<sup>2</sup> (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.

The M-Bus or pulse variant of the meter is supplied with a 2-wire cable with wire end ferrules.

Version/Color	Pulse	M-Bus (2-wire)
<i>Red</i>	<i>Pulse</i>	<i>M-Bus</i>
<i>Black</i>	<i>GND</i>	<i>M-Bus</i>

## 5.3 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

## 5.4 RS-485(Optional)

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

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

## 5.5 LoRaWAN (Optional)

ISM Band	EU433	EU868	IN865	US915
Class	<i>Class A</i>			
Network Access Mode	<i>OTAA or ABP</i>			
Transmitting Power	12.15 dBm(max)	14 dBm(max)	20 dBm(max)	20 dBm(max)
Data transmission	<i>Each 4h</i>			

## 5.6 Sigfox (Optional)

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

## 5.7 4G CAT1 (Optional)

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

## 6. Operation & Display

B12 VI-B Series is fitted with an easily readable LCD, including 8 digits, measuring units and information field.

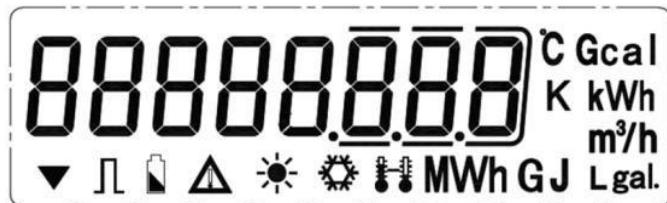


Fig.I LCD Full Display

No.	Icon	Name	Meaning
1	▼	Calibration mode	Under calibration
2	□	Pulse	Pulse output
3	■	Low battery warming	User is reminded to replace the battery with a new one.
4	▲	Error warning	Warnings for error
5	●	Heat	Accumulated heat consumption
6	●●	Temperature of inflow water	Accumulated cold consumption
7	●●●	Temperature of in/outflow water	Water temperature in/return pipe

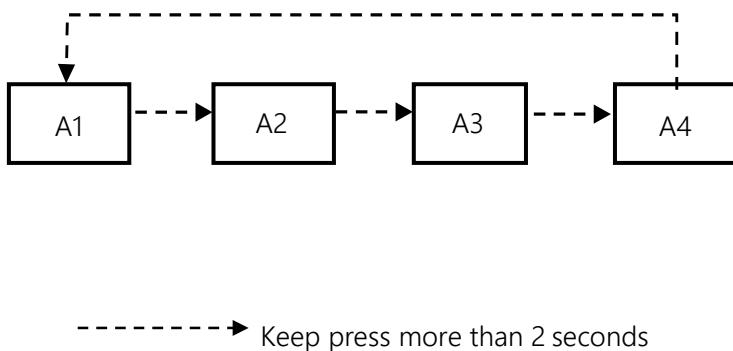
### 6.1 Operations on how to display

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

The following information is displayed in order by short pressing the button: temperature in, temperature out, temperature difference, instant flow rate, cumulative flow volume, instant heat power, cumulative heat consumption, date, time, continuous working time, meter ID, software ID, type ID, M-bus address, etc.

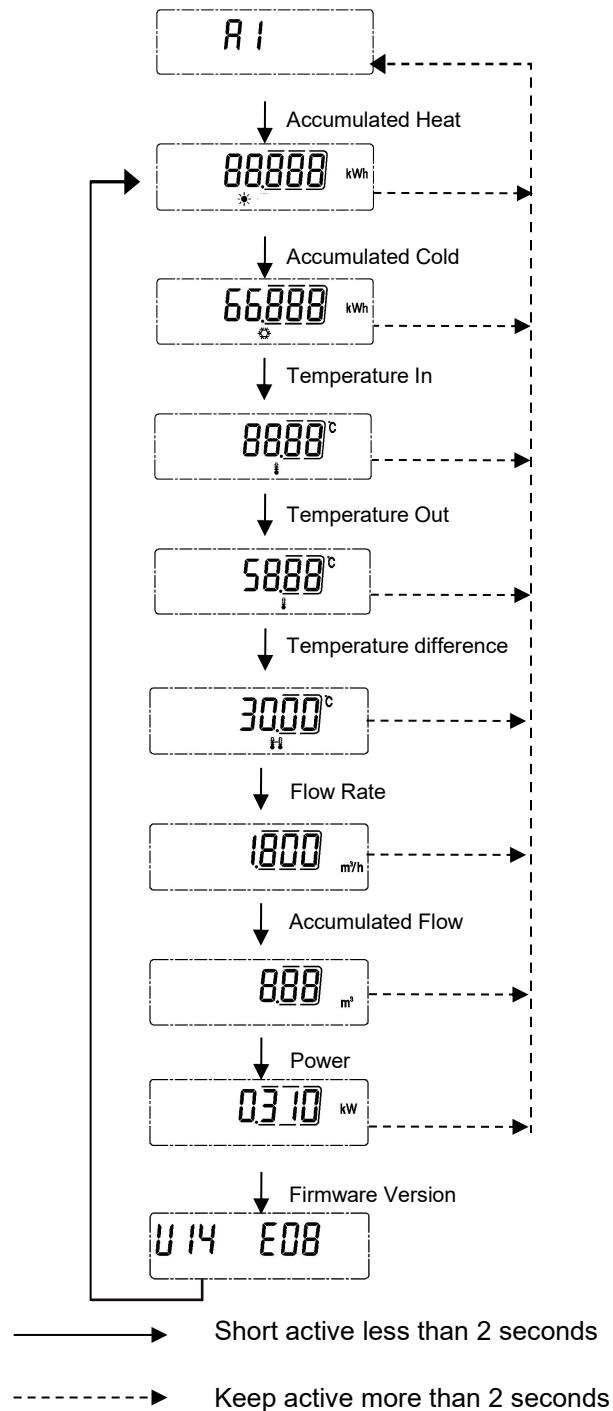
#### 6.1.1 Menu List (User Loop)

Pressing the button for 2 seconds and holding it on will bring up the four menus for users to select.



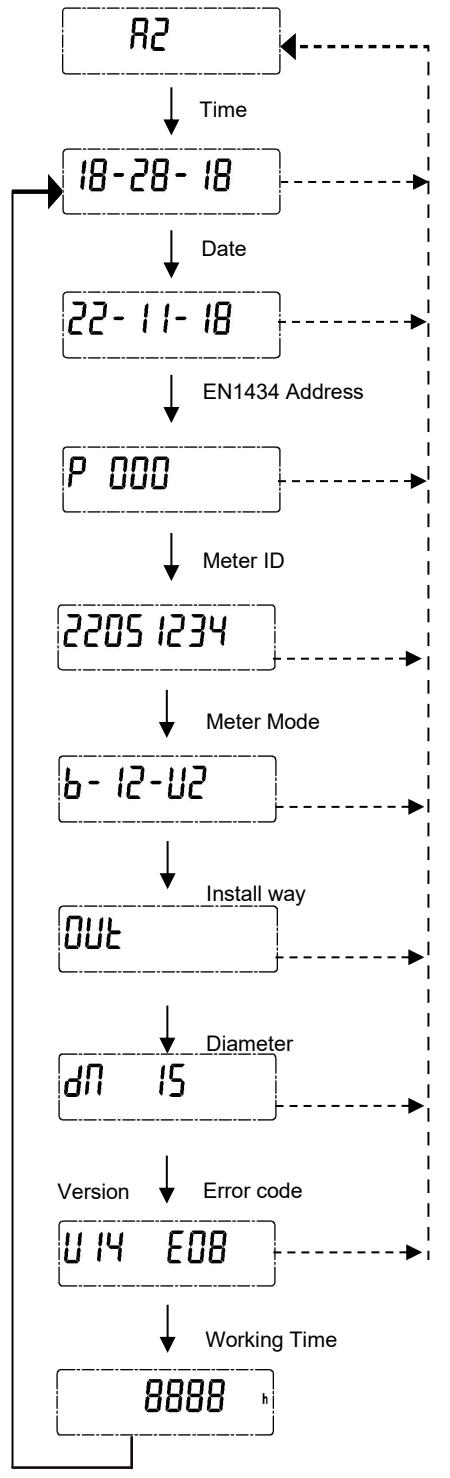
#### 6.1.3 Menu A1

Shortly pressing the button to display items under Menu A1 one by one in the following order to check the measurement data:



#### 6.1.4 Menu A2

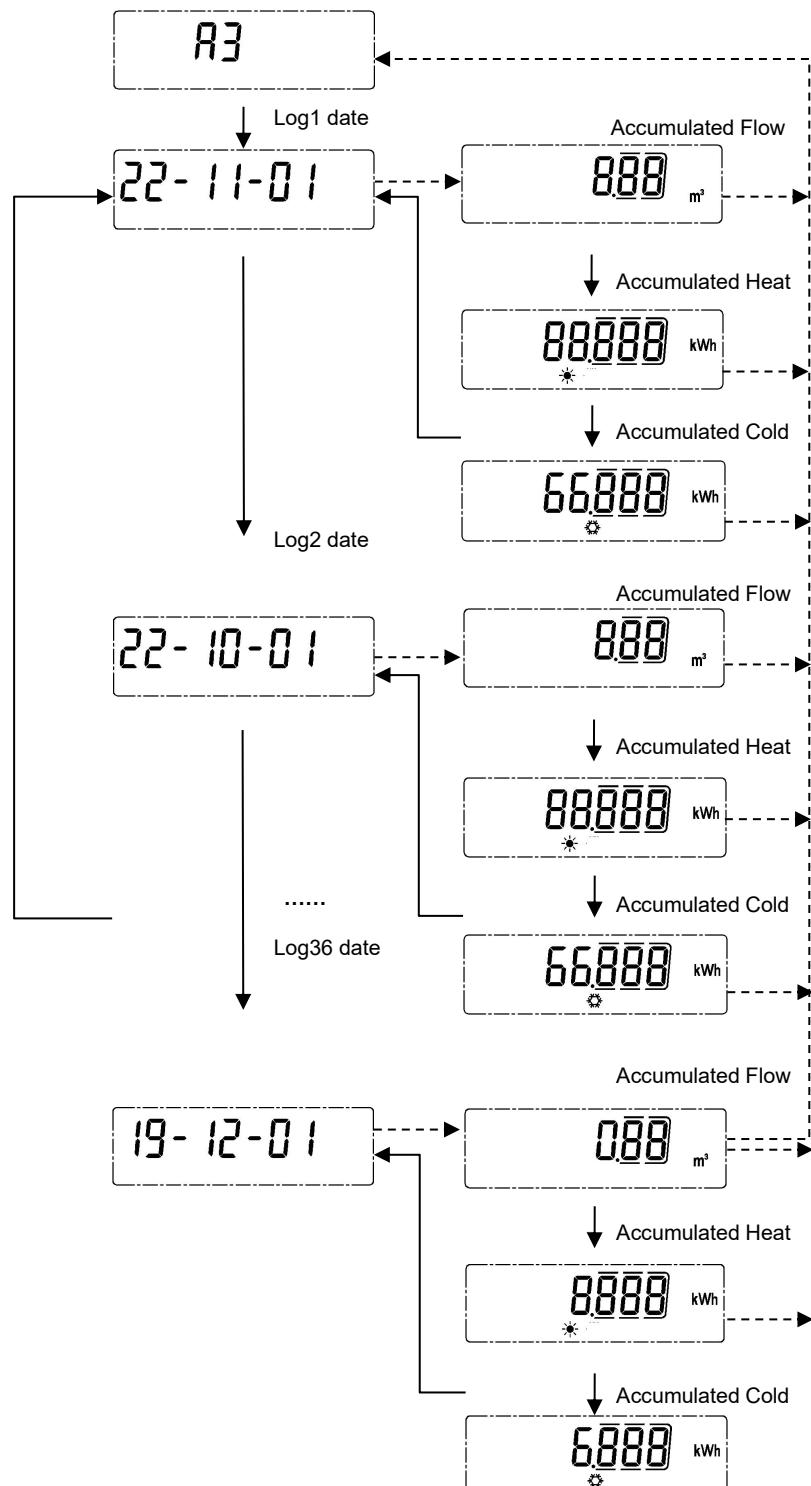
Shortly pressing the button to display items under Menu A2 one by one in the following Order to check the meter information.



→ Short active less than 2 seconds  
 - - - → Keep active more than 2 seconds

## 6.1.5 Menu A3

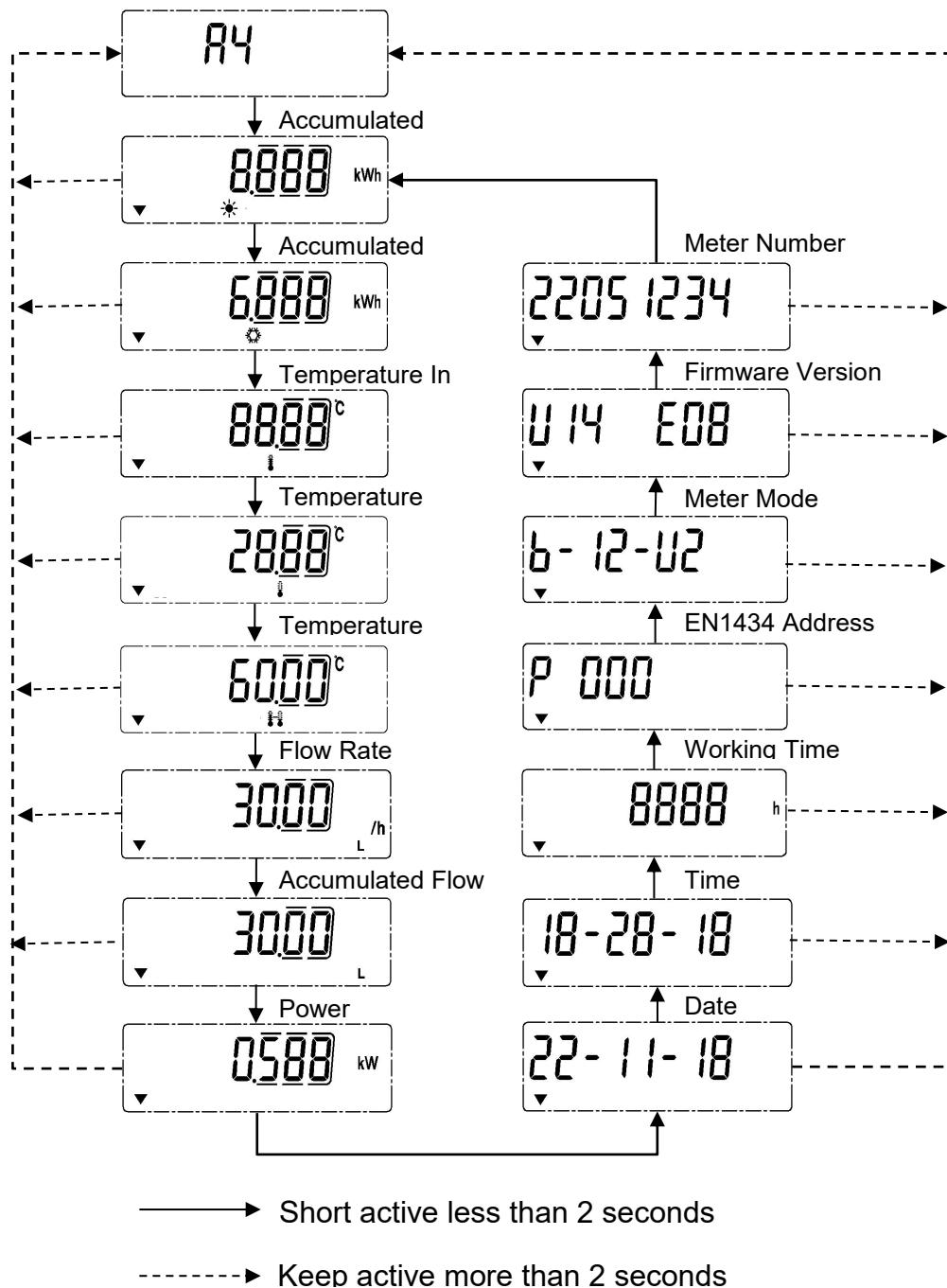
This Menu shows history date records of last 36 months. Click the button to select the month, then the month, monthly flow and monthly heat consumption will be displayed in turn.



- Short active less than 2 seconds
- Keep active more than 2 seconds

## 6.1.6 Menu A4

The content are similar to Menu A1, but for calibration only. The following diagram shows Menu A4 (Calibration mode only).



## 6.2 Monthly Data

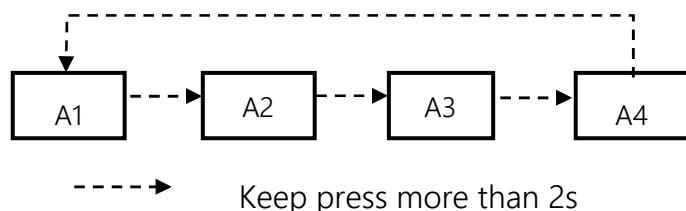
The calculator stores the following values for 36 months at each end of month

- Volume (meter reading)
- Heat Energy (meter reading)
- Cold Energy (meter reading)

From the month set day display, press the service button for 2s to enter the previous month's values.

The month values can also be read out via the optical interface.

## 6.3 Display structure



1.0 A1	2.0 A2	3.0 A3	4.0 A4
1.1 Accumulated heat	2.1 Time	3.1 Accumulated flow	4.1 Accumulated heat
1.2 Accumulated cold	2.2 Date	last month	4.2 Accumulated cold
1.3 Water-in temperature	2.3 Meter address	3.2 Accumulated heat	4.3 Water-in temperature
1.4 Water-out temperature	2.4 Meter ID	last month	4.4 Water-out temperature
1.5 Temperature difference	2.5 Model	3.3 Accumulated cold	4.5 Temperature difference
1.6 Instant flow	2.6 Install type	last month	4.6 Instant flow
1.7 Accumulated flow	2.7 Diameter and factor	.....	4.7 Accumulated flow
1.8 Instant power	2.8 Software version	3.106 Accumulated flow last 36 months	4.8 Instant power
1.9 Version number	error and code	3.107 Accumulated heat last 36months	4.9 Date
	2.9 Working time	3.108 Accumulated cold last 36 months	4.10 Time
			4.11 Accumulated working time
			4.12 Meter address
			4.13 Meter model
			4.14 Software version
			4.15 Meter ID

Fig. Display Structure

## 7. Error and Warning

### 7.1 Error Display

The meter constantly performs self-diagnosis and can display various faults. Visual indication on the LCD display in the event of an error.

Error code	Meaning	How to handle the error
<i>E01</i>	Low battery	Contact service
<i>E08</i>	Empty pipe	Check the pipe if stop water supply or

		the meter in storage
<i>E09</i>	Low battery + Empty pipe	Contact service
<i>E40</i>	Temperature is lower than 3°C	Check the storage temperature
<i>E41</i>	Low battery + Temperature is lower than 3°C	Contact service
<i>E48</i>	Empty pipe + Temperature is lower than 3°C	Check the storage temperature
<i>E49</i>	Low battery + Empty pipe + Temperature is lower than 3°C	Contact service

## 7.2 Warnings

Permanent visual indication on the LCD:

- 1) Fault / failure of ultrasonic or temperature measurement
- 2) Low temperatures (below 3 °C)
- 3) Air in the measuring path, no volume measurement
- 4) Low battery Warning Icons:

Low battery warning		It appears on the LCD screen if the battery voltage falls off to 2.7V. When the battery voltage increases back to over 2.7V, the icon disappears. Battery self-checking commits every 30s.
Faulty Icon		It appears when the following faults are sensed: 1: temperature is lower than 3°C 2: temperature is higher than 95°C 3: temperature sensor with short circuit 4: temperature sensor with open circuit 5: memory errors 6: blank pipe

### 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 tap, smart communication software 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.

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