

Portable Doppler flowmeter



Users Manual

1. Product introduction



The product measures the flow rate according to the principle of ultrasonic Doppler effect, and can measure the water level through the pressure sensor and the temperature sensor to measure the water temperature. The shell is made of PVC plastic, which can effectively waterproof and seal. The internal power supply is 12V rechargeable battery.

- 1) Adopts the Modbus communication protocol, the use of RS485 bus to communicate with handsets.
- 2) Underwater sensor installation is convenient. With metal base fixing device, easy installation.
- 3) Equipment all adopt the electronic design, wide voltage power supply, low power consumption, no mechanical parts. It has the advantages of accurate measurement and stability, high reliability and strong anti-interference.
- 4) Application range. It can be used in various water environments from tap water to Yellow River water.

2. Product principle

Principle of Doppler flowmeter: When the ultrasonic source and the observer do relative motion, the frequency received by the observer will be different from the frequency of the ultrasonic source. Therefore, relative to the ultrasonic transducer moving with the water small particles, small bubbles will also make the transducer receive frequency change, and with the increase of the water suspension motion speed and increase, thus measured Doppler frequency shift, also measured the Doppler current meter in the water flow rate. Multiply that by the cross-sectional area

of the channel, wait for the traffic information.

It is mainly used in irrigation channels, municipal sewer pipes, hydrological basins and other occasions. Especially suitable for the occasion of low water level, water level more than 15 cm can work. In the regular pipeline and channel, the water depth is measured by the pressure sensor on the current meter, the velocity is measured by the ultrasonic sensor, and the flow is calculated.

Because the Doppler velocity measurement needs to use the speed of sound propagation in water, and the speed of sound propagation in water is closely related to the water temperature, so the built-in temperature sensor is used for temperature measurement, thus correcting the sound speed.

The liquid level depth is measured by a pressure sensor, which measures the distance between the position of the velocity sensor and the liquid surface.

There are trapezoidal, rectangular, circular channel profile models in the memory of the handheld computer, which can be convenient to calculate the flow of common channels.

3.Product technical index

3.1 Performance parameter

Table 1 Measurement indicators

Internal volume	Range	Precision
Velocity range (m/s)	0.02 m/s ~ 5.00 m/s	$\pm 1.0\% \pm 1 \text{ cm/s}$
Velocity measurement resolution	1mm/s;	
Water temperature measurement (°C)	-10°C to 60°C	$\pm 1 \text{ (}^\circ\text{C)}$
Depth measurement range (m)	0.05 m ~ 10 m	
Instantaneous flow range:	1 L/s ~ 99.99 m ³ / s	
Cumulative flow	0.1 m ³ ~ 999,999 m ³	

Table 2 Performance specifications

Electrical content	Range	Remarks
Operating voltage (V)	7.2V to 15V	DC
Flow loss (mA)	≤ 65 milliamps (instant of launch)	12V power supply
Working water depth (m)	8 seconds	
Data update cycle (s)	0.15 m ~ 50 m	default

3.2 Other parameters

1. Built-in rechargeable battery, charging a continuous use time: 24 hours;
2. Handheld storage: 32M bytes, RS232 serial port read storage data;
3. Default cable length: 10m;
4. stainless steel measuring bracket height 2 meters;
5. LCD display for 128*128 lattice.
6. Length, width and height of the suitcase: 72cm * 32cm * 26cm

4. Instrument function and key introduction

4.1 Location and Functions of the jack on the host shell

The handset has two sockets, one with three cores, for powering the internal rechargeable battery. One is a five-pin socket for the underwater Doppler current meter.

RS232 Socket hole: Standard serial port socket at the bottom of the DB9 for communication with the computer.

Host display screen: The rectangular box on the upper part of the mobile phone is the display screen, where data and operation interface are displayed.

Host operation panel: The lower part of the host is the operation panel for the user to operate and control the instrument.

4.2 Introduction to Buttons

The instrument is equipped with six types of function keys, as shown below:

1. Power on/Power Off key I/O: When power on operation, I/O is power on/power off key, long press for 3 seconds, release, power on.

When shutdown operation, you must return to the initial main interface, long press for 3 seconds, release, LCD screen off, confirm shutdown.

2. ▲ and ▼ : can work sampling time, working interval time, parameter input, up and down moving position and other operations;
3. Return key ESC: You can return to the previous screen.
4. Confirm ENTER: Confirm or save the entered parameter.
5. Number key: There are 0, 1, 2, 4, 5, 6, 7, 8, 9 ten number input key, used for various number Settings.
6. Delete key DEL key: Deletes some data.

5. Instrument connection

1. Ac (First use) : Take out the battery charger

Insert the DC plug into the charging jack (three-core jack) on the handheld, and the other end of the AC plug into the AC

220V socket. During the charging process, it is recommended to turn off the mobile phone. Observe the LED indicator on the charger to see if it is full. After it is full, the indicator will turn green.

Note: It is recommended for the first use to be fully charged before use.

2. Before the instrument is used, the velocity sensor must be connected with the water handheld host into a complete system. After the current meter is put into the measuring water, the five-core plug at one end of the cable is inserted into the five-core socket of the machine, and the instrument can work normally.

6. Operation Instructions

6.1 Power-on and power-off operations

Boot operation, I/O key is power on/off key, long press I/O key for 5 seconds, release, start. To shut down, you must return to the initial main interface, long press the I/O key for 5 seconds, release, LCD screen off, confirm shutdown. After the device is powered on, the company logo and product model are displayed. Then press ENTER. The following main screen is displayed:

Main interface

1. Set parameters
2. Collect data
3. Record query

Under the menu of the main interface, there are three types of functions: setting, collection and query.

6.2 Setting Parameters

From the main menu, click 1 to enter Parameter Setting. The parameter setting screen is displayed. As follows:

1. Time setting
2. Set zero
3. Liquid level compensation
4. Channel selection
5. Set the address
6. Sampling interval

1. Time setting

Input year, month, day, hour, minute and second to complete the time setting. The device comes with a special real-time clock button battery, when the device is shut down, the year month, day, minute and second continue to run. Resetting is usually not required.

2. Set zero

Customers can set the starting point of zero flow rate, such as measuring instrument measured data bit 0.02cm/s. If you want to change this flow rate to zero, you can input 0.02cm/s on this interface. The flow rate can be calculated from 0.02cm/s. Generally, the value is set to 0.

3. Liquid level compensation

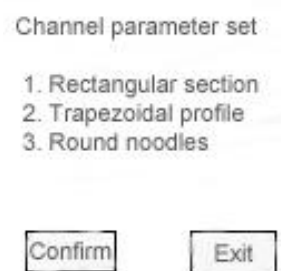
In practice, the installation position of the Doppler current meter is not necessarily at the bottom of the canal, but at the position that can represent the overall velocity of the canal. For example, when the installation is 30 centimeters away from the bottom of the canal, the water depth measured on the Doppler current meter is actually the distance from the water surface to the installation position. Therefore, to enter the compensation value of the liquid level, the

installation point is 30 centimeters away from the bottom of the canal, it is necessary to enter 0.3 meters at the level compensation. When calculating the true depth of the canal, the real depth of the canal can be obtained by adding the depth measured by the Doppler current meter to the compensation value of the liquid level.

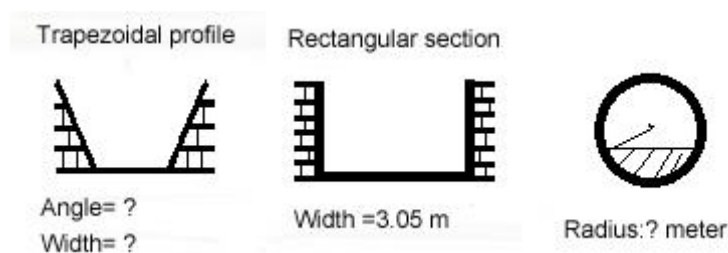
Level compensation

Compensation value: m

4.Channel selection



They are rectangular section, trapezoidal section and circular section



You can go to the corresponding screen to set the corresponding parameters.

5. Address setting

Users can set corresponding numbers for different locations when measuring velocity at different locations. When storing data, the numbers will be stored together with the data for subsequent identification and observation.

6. Sampling interval

The working interval between two measurements of the current meter can be set. (This setting is to reduce device power consumption)

6.3 Measurement and data display Operations

From the main menu, click 3 to enter Parameter Setting. The parameter setting screen is displayed. As follows:

Velocity of flow
Liquid level
Flow per second
Accumulative

Under this interface, the current flow rate can be changed. To store, press the Enter key, can be the current time, site, flow rate, liquid level, instantaneous flow, cumulative flow into the memory.

6.4 Record Query Operations

From the main menu, click 3 to enter Parameter Setting. The parameter setting screen is displayed. As follows:

Stored data query

1. Query data
2. Understand the data
3. Transfer data to a PC

1. Select 1. On the Query page, you can view historical data, including the site ID, storage time, flow rate, liquid level, traffic in seconds, and accumulated traffic. Press ESC to exit.

Site number

Velocity of flow

Liquid level

Flow per second

Accumulative

2. Select 2 Query Data Clearing The Data Clearing screen is displayed. Press Enter to clear all historical data that cannot be restored.

Stored record

Data clear or not

If yes, press ENTER

If no, press ESC

Note When deleting data, it takes several minutes because 32 MB bytes of data is large. Do not power off the computer. The following message is displayed:

Stored record

Deleting

Please hold on...

After data is deleted, the interface is deleted:

Stored record

Delete complete!

Please exit

3. Enter the data transmission PC, and when the phone is connected to the computer through the DB9 serial port (baud rate: 115200, data bit: 8, stop: 1), all the historical data can be sent to the serial port assistant, convenient for users to check.

6.5 Operation Example

Assumption: If the channel profile is trapezoidal, the Doppler current meter is placed 0.15 m from the river bottom. The measurement site label is 01, and the sampling interval is 15 seconds)

1. At the first operation, enter the parameter setting interface.

You can set the current time.

Setting Zero The default value is 0. You do not need to change it without special requirements. The level compensation is

set to 0.15m.

Then Enter the channel selection, select ladder, and press Enter to enter the parameter setting screen, set the corresponding bottom length and Angle, press ESC to exit after setting.

The address setting screen is displayed, set the address number to 01, and press ESC to exit. The sampling interval screen is displayed. Set the sampling interval to 15S and press ESC to exit.

After setting parameters, press ESC to return to the home screen. On the data collection screen, you can view the real-time flow rate, liquid level, flow rate in seconds, and accumulated flow rate.

On this screen, if you want to save the current data, press Enter manually. Press Enter once to save the data. Press DEL to clear parameters on the current screen and start measurement again.

7.Installation requirements

1. Because the air guide cable contains the air guide pipe, it can not be bent excessively to prevent it from breaking; Do not take the air guide cable as the rope of the current meter, and drag the Doppler current meter with the air guide cable;
2. The circular ultrasonic transducer in front of the probe can not be impacted and scratched;
3. The probe of the instrument should avoid being exposed to the sun for a long time, so as not to cause failure due to too high temperature;
4. The use of acoustic Doppler flowmeter in places with large sediment concentration should regularly clean the silt on the ultrasonic transducer and pressure sensor to prevent the silt from blocking the pressure sensor.

8.Daily maintenance and repair of instruments

1. After each use of the underwater sensor, it should be cleaned with fresh water and dried with cloth immediately, put back in the original carrying case, and all parts should be put back in place.
2. The cable of the instrument prevents scratches or punctures of sharp instruments.
3. Instruments and equipment should be placed in ventilated and dry places, and should be away from corrosive substances, instruments and equipment should not be stacked heavy objects.
4. When the battery is used for the first time or is not used for a long time, it should be charged (be sure to use the charger supporting the instrument to charge).
5. When used in rainy days, be sure to prevent the portable host from getting directly in the rain.