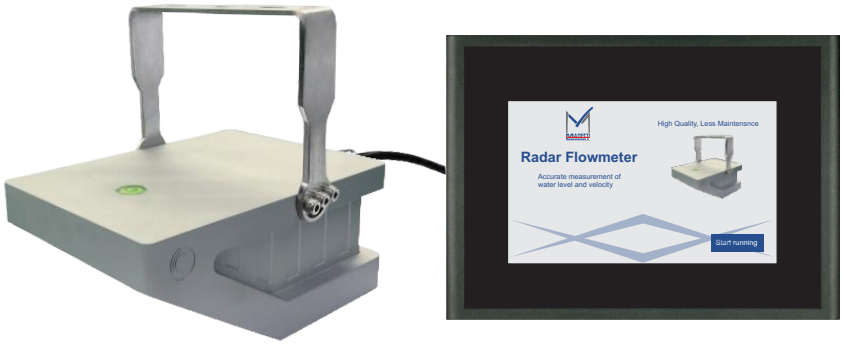
Flowmeter and Touch Screen Integrated Machine

Operational Manual

Model: MDFD10



1. Product Overview

1.1 Introduction

The radar flow meter is a water level and flow velocity detection instrument using microwave technology, which combines the mature radar water level meter and radar flow velocity meter measurement technology.

This product can effectively monitor the water level, flow rate and flow change status, and provide accurate flow information for monitoring units.

1.2 Application scope

(1) Flow measurement of river courses, open channels, reservoir gates, mountainous rainstorm floods, etc.

(2) Flow measurement of water delivery channels in irrigation areas such as lateral canal, field ditch and sublateral canal

(3) Flow measurement for urban flood control, urban rain and sewage pipe network outlets, and inspection wells.

1.3 Product Features

(1) High reliability, high precision, high resolution;

(2) Non-contact measurement, not easily corroded by sewage, not affected by sediment, and can even be used in complex water environments with pollutants or sediments;

(3) Ultra-low power consumption, ultra-low operating current and on-duty current, more suitable for unattended sites powered by solar energy;

(4) The radar antenna has good directivity, small beam angle, concentrated energy, and stronger anti-interference performance, which greatly improves the measurement accuracy and reliability;

(5) Frequency modulation working mechanism, extremely low transmission power, harmless to human body and environment;

(6) Waterproof and lightning protection design, suitable for various extreme weather environments, and work stably around the clock;

(7) There are two working modes: command acquisition and interval acquisition;

(8) The standard Modbus communication protocol conforms to international common standards, the transmission process is simple, and the adaptability is high. It is suitable for a variety of acquisition terminals or host computers; , combined, modularized;

(9) Small appearance, easy installation and maintenance.

2.Technical Parameters

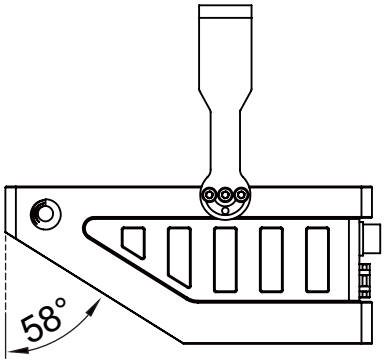
Application		Radar non-contact measurement, Bluetooth function; integrated output of flow, velocity and water level; suitable for small fluctuation of surface flow measurement.
Water level parameter	Water level radar range	45m
	Water Level Radar Accuracy	±1mm
	Water level radar frequency	80GHz
	Water Level Radar Antenna Type	Planar Microstrip Array Antenna
	Velocity radar to water surface distance	0.2~45m
	Water Level Radar Beam Angle	8°
Flow rate parameter	Velocity Radar Measuring Range	0.1~21m/s
	Velocity Radar Accuracy	8.8mm/s
	Current Radar Transmission Frequency	24GHz
	Velocity Radar Beam Angle	12°X12°
	Shell Material	Aluminium
	Operating Temperature	-40~70
General parameter	Working Humidity	≤95%
	Applications	Still water or moving water can be used
	Collection Interval	5s~24h can be set
	Signal Output	RS485 Modbus communication protocol
	Bluetooth Function	Optional
	Supply Voltage	6~30V DC
	Working Current	≤55mA(@12V)
	Pitch Angle	30°~70°

3.Installation

3.1 installation instructions for radar flowmeters

Since the speed measurement is realitive to the change of the installation angle, a higher signal-to-noise ratio can be obtained by adjusting the installation bracket. The recommended installation angle is 58°.

Figure1 MDFD10 58°angle installation



3.2 Typical installation

Please pay attention to the following items to ensure that the radar flowmeter can be installed correctly.

1. If the river bridge bracket is installed, please select a suitable installation location on the bridge.
2. If the river pole is installed, please select the appropriate length of the cross bar.
3. If the irrigation canal pole is installed, please install it directly above the middle of the canal.

Figure2
Rectangular irrigation canal pole installation

Precautions for installation and debugging:

Choose mounting brackets of different specifications according to the situation to ensure that the radar flowmeter will not shake when the wind speed is high. If the radar flowmeter shakes, it will affect the measurement accuracy.

According to the installation conditions on site, try to install the radar flowmeter facing upstream.

3.3 Description of installation location

The following is an example of installing on a bridge to illustrate the importance of the installation location. The three installation positions are shown in the figure.

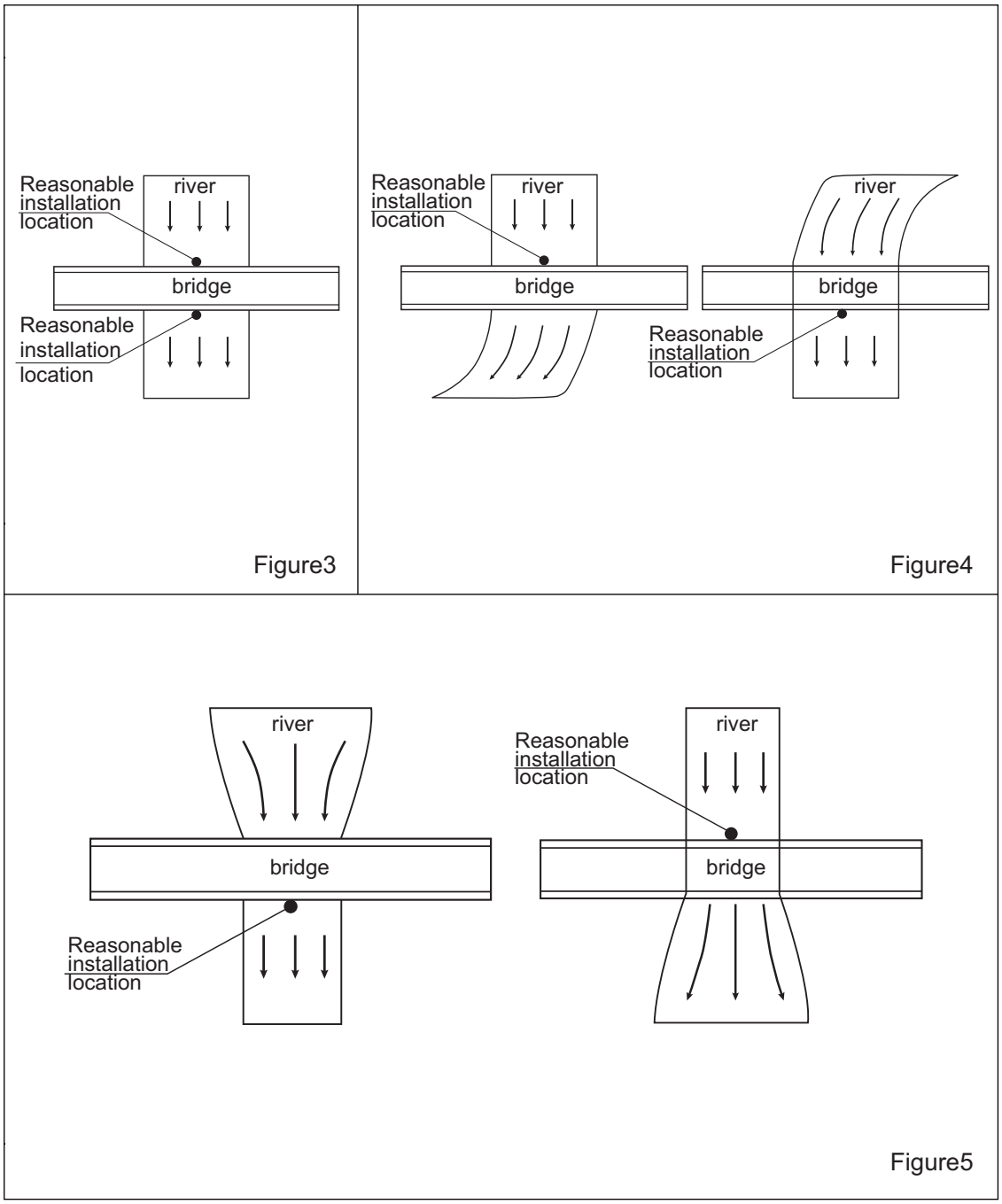


Figure 11 shows that the radar flowmeter can be installed both upstream and downstream of the river, and it is generally recommended to install upstream (installation in the upstream: (1). not affected by fixed buildings; (2). the impact of rainfall on it will be relatively small); Figure 12 and Figure 13 show that the water surface of the river detected by the radar flowmeter should be stable. If the width of the river and the flow direction change, resulting in an unstable water surface velocity, it will affect the measurement of the river. Among them, Figure 12 reflects that when the direction of the river changes, the radar flowmeter should point to the direction where the river has not changed; Figure 13 reflects that when the width of the river changes, the radar flowmeter should point to the direction where the river width does not change significantly. direction of change. Therefore, in order to avoid bending and width changes facing the river, downstream installation can be selected depending on the specific situation. This is what needs to be paid attention to during engineering installation.

3.4 Radar flowmeter beam angle

Select the appropriate installation height according to the beam angle of the radar flowmeter.

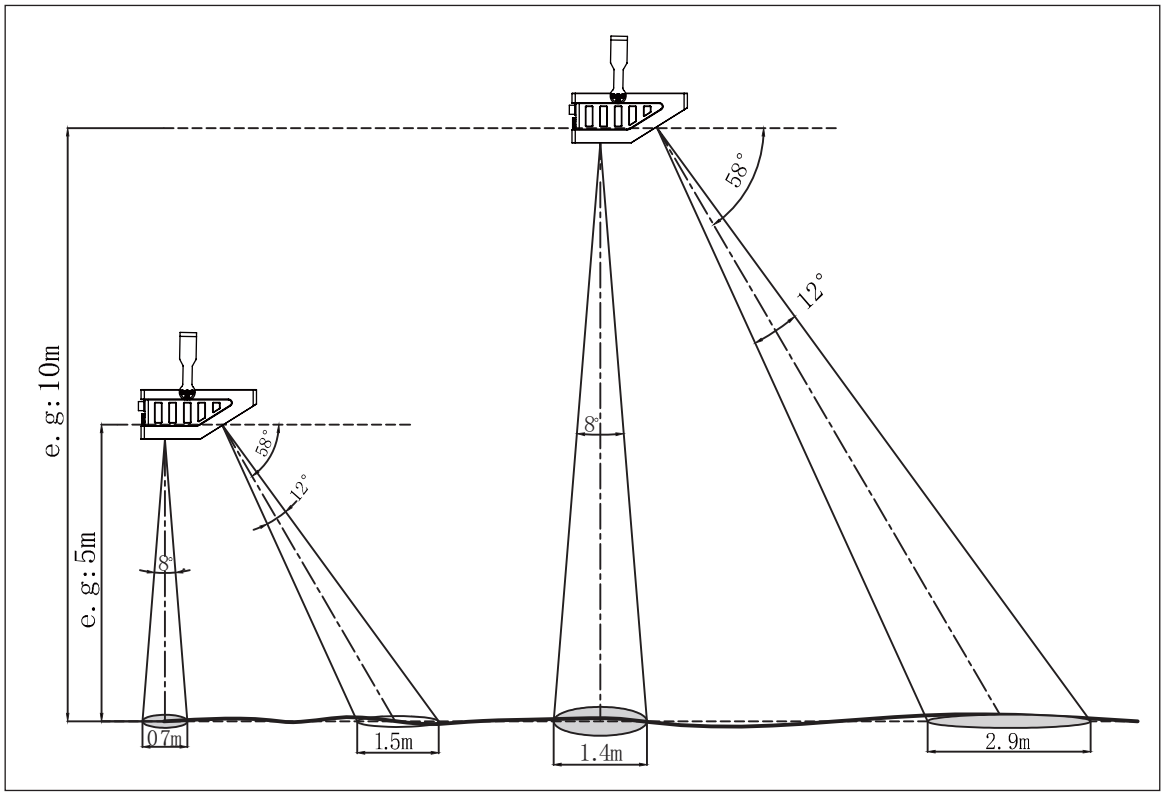


Figure6 Radar flowmeter beam angle

Water level radar beam angle 8°
Velocity radar beam angle 12°×12°
The velocity meter is at an angle of 58° to the horizontal

4.Electrical Connection

4.1 Connection

Connect with MDFD10 through RS-485 bus, the default parameters are as follows:

Baud rate:

- 9600 (can be modified);
- data bits: 8;
- stop bit: 1;
- Parity: None.

The connection method is as shown in the figure. It is recommended to use DC 12V power supply.

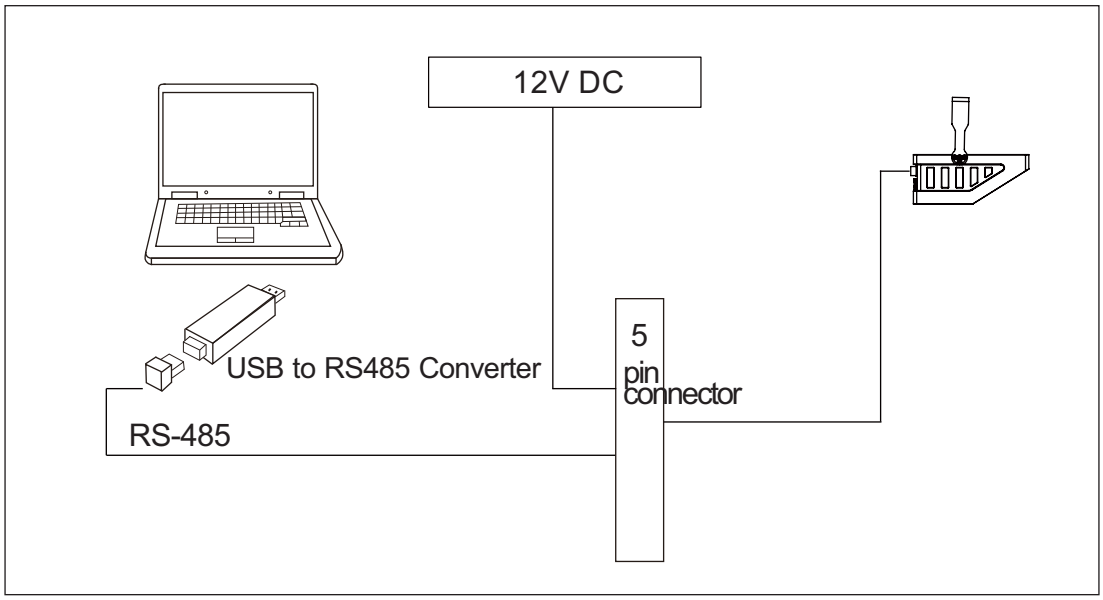


Figure7 Connection method

4.2 Electrical Connection Diagram

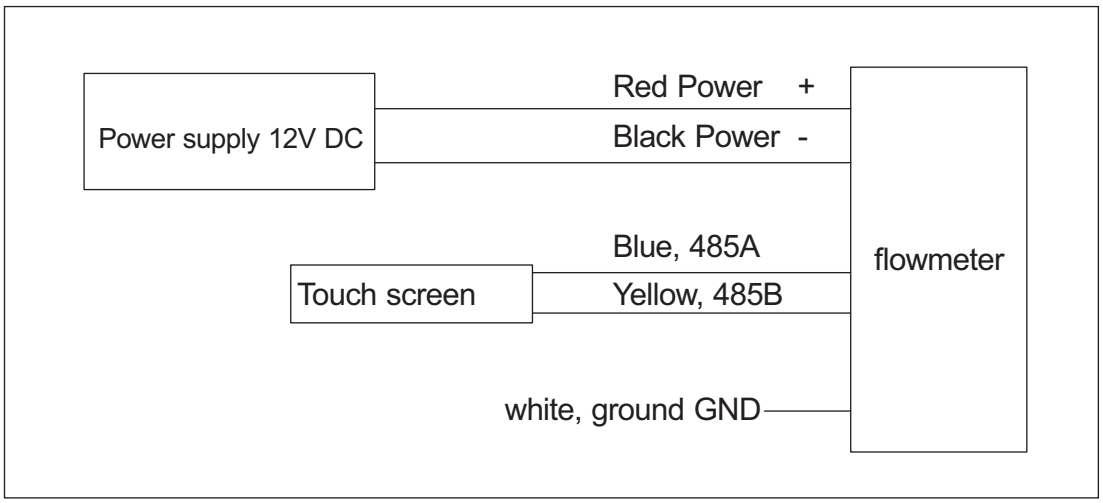


Figure8 Electrical connection diagram

5. Commissioning

5.1 Serial communication commissioning

5.1.1 Flowmeter communication protocol

Hardware interface: RS485
Communication protocol: Standard Modbus
Baud rate: 9600
Data format: 8N1
Checksum: CRC16

(1) Information frame format and description
The command format of the host is composed of the slave address, function code, register address, read points and CRC code as shown in table 1.

Sent from the host:	Station Add. (1B)	Function code (1B)	Holding Register(2B)	Read number(2B)	CRC(2B)
	01	03/06	00 XX	00 XX	XX XX

Table 1.Host command

(2) The host command explained in details:
Slave address: 0~99;
Function code: 03 get value from the slave holding register of the sensor(instrument);
06 modify the value from the slave holding register of the sensor(instrument);
Start address of Holding Register: Two bytes, see chart 3 for details
Read numbers: Two bytes, if the host need a 16-bit integer, set it as 0001;
and read 32-bit integer data, set itas 0002.
CRC code: check code, two bytes
There are 2 kind of ways for the slave responses. When the function code is 03, a slave responseconsists of station address, data length, data area and CRC code, as shown in table 2; when the function code is 06, the slave response shares the same format with host command, as shown in table 1.

Slave response:	Station Add.(1B) 01	Function code(1B) 03	Return data length n	Data(nB)	CRC(2B)
				XX XX XX ...	XX XX

Table 2.Slave response

Station address: one byte, back with the address sent from the host.
Function code: one byte, back with the function code sent from the host.
Number of the bytes in response data: the number of bytes in data following.
Data: related data sent back based on the host command, with high byte at the front and low byte following.
CRC: check code, with two bytes.

Register address	Description (multiple registers can be read continuously)
0x001E	Read the current water level value (16 bit integer data) in cm (read-only)
0x001F	Read the current flow rate value (16 bit integer data) in mm/s (read-only)
0x0020	Read the current flow value (16 bit integer data) in m3/s (read-only) Note: Not recommended, please use 0x002F to read the flow data
0x0021	Read the cumulative flow value (32-bit unsigned integer data, with the high byte first), in m3 (read-only)
0x0023	Flowmeter address (read and write)
0x0024	Slot weir mode: 0X01 circular slot 0X02 rectangular slot 0X03 trapezoidal slot 0x04-U slot (read-write)
0x0025	Pipe radius in cm (read and write)
0x0026	The width of rectangular groove in cm (read and write)
0x0027	Lower bottom width of trapezoidal groove in cm (read and write)
0x0028	The upper and bottom width of trapezoidal groove in cm (read and write)
0x0029	Trapezoidal groove height in cm (read and write)
0x0031	Read the cumulative flow value (floating point data, high byte first), in m3 (read-only)
0x002A	Read the empty height of the water level gauge, in cm
0x002B	Reading/writing range of water level gauge, unit: cm
0x002C	Read/write low range of water level gauge, unit: cm
0x002D	Read/write the deviation value of instantaneous flow, unit: m3/s
0x002E	Read the working status of the instrument; Normal: 3; Current meter definition byte BIT0, normal BIT0=1, failure BIT0=0; Water level gauge definition byte BIT1, normal BIT1=1, failure BIT1=0;
0x002F	Read the instantaneous flow value (floating point data, low byte first), in m3/s (read-only)

Table 3 Register Address Description

5.2 Host computer software

The parameters of the radar flowmeter can be configured, adjusted and diagnosed through the host computer software.

5.2.1 Computer Software

Install the computer software software, click to enter, the login interface is as shown in the figure below:

Figure9 PC software login interface

Log in to the host computer software through the user name and password to enter the main interface.

5.2.2 Software interface

After the communication connection is successful, the software enters the parameter setting interface, including the tool bar, parameter setting, status indication, instrument curve, echo data and other information. The information in the status bar is updated in real time, and the rest of the information needs to be manually read or changed and then saved manually. After the parameters are read or saved successfully, a prompt box will pop up. The interface is shown in the figure below:

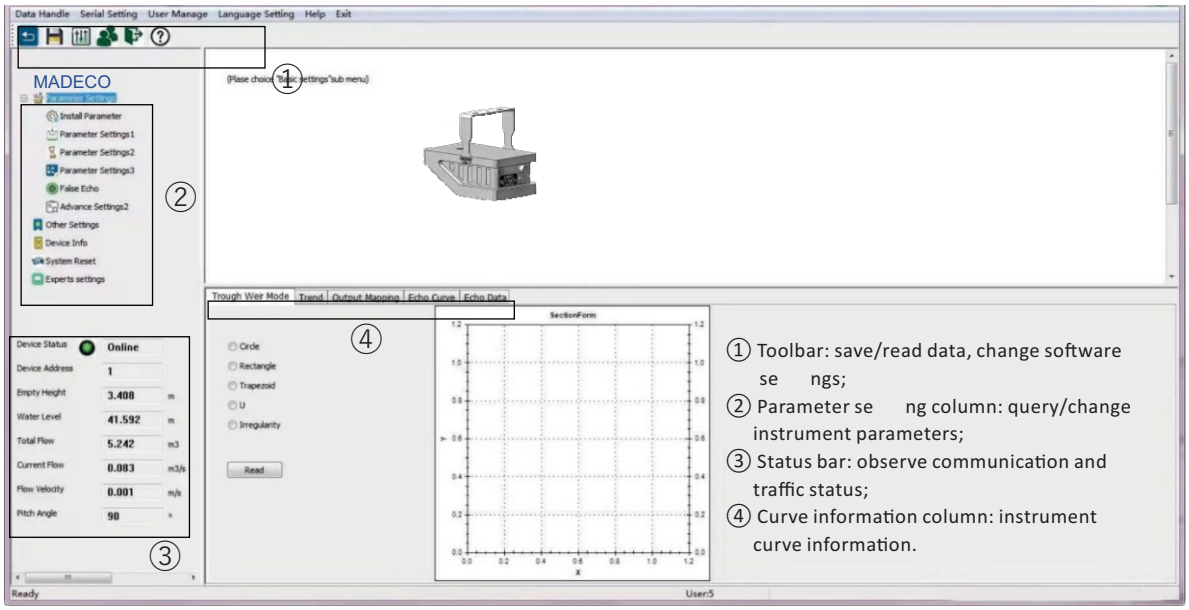


Figure10 Software interface

5.2.3 Parameter configuration

(1) The interface in the figure below shows the installation parameters and slot and weir modes. Select the corresponding slot and weir mode and parameter settings according to the on-site installation, and the interface is shown in the figure below:

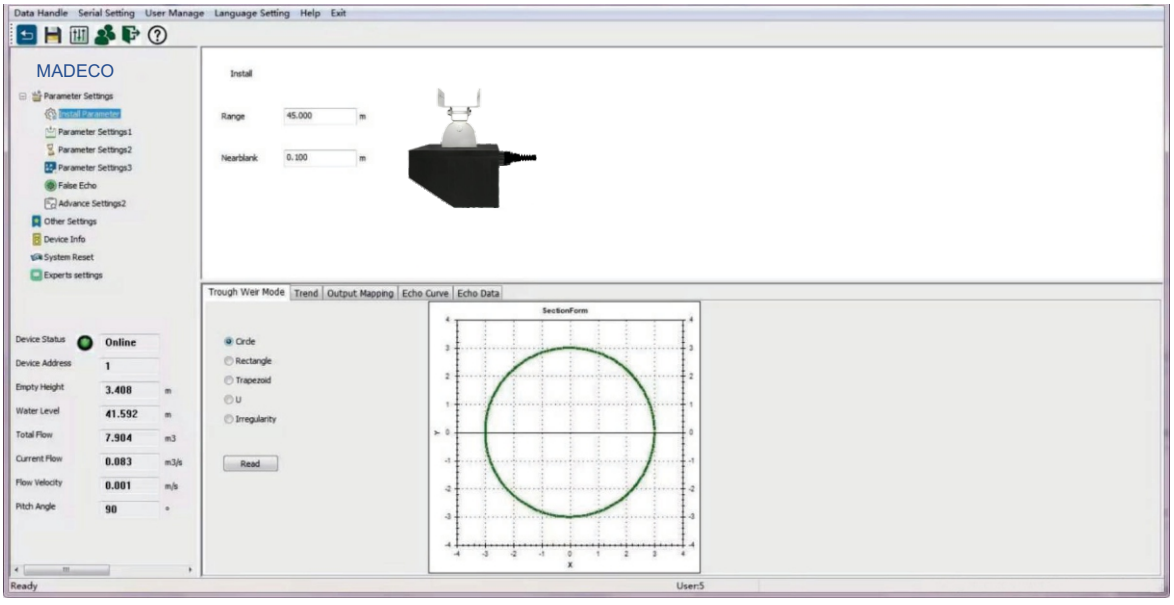


Figure11 Installation parameters and slot and weir modes

(2)The following interface shows parameter setting 1 and material trend. The material trend interface can read the water level signal curve, the flow velocity signal curve and the instantaneous flow signal curve separately, or at the same time, just check the corresponding check boxes, the interface is shown in the following figure:

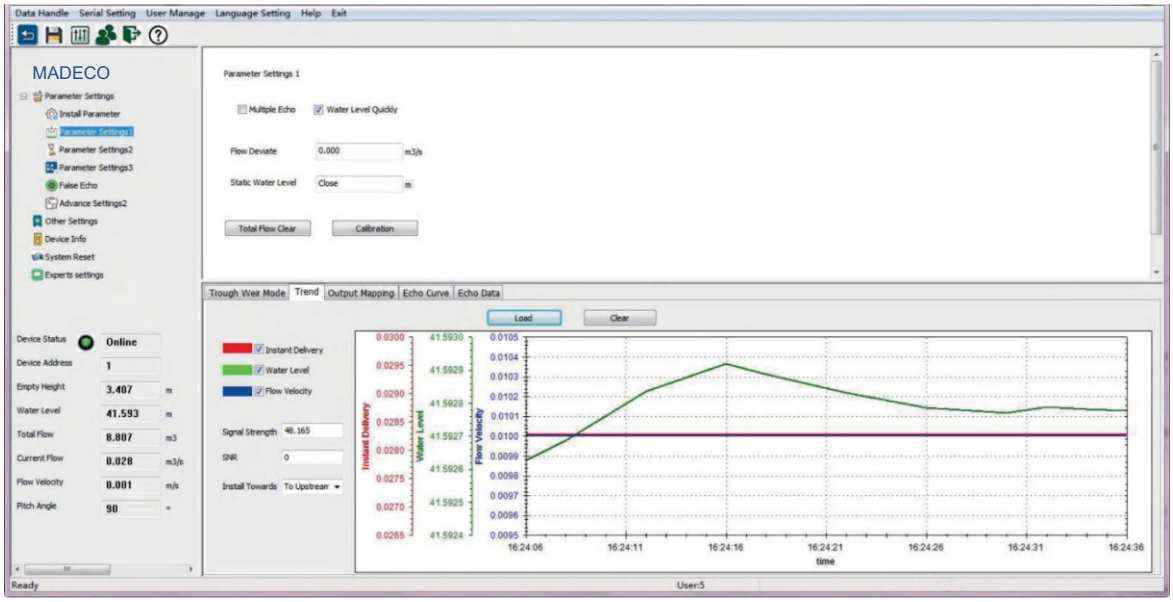


Figure12 Parameter setting 1 and material trend

(3) The parameter setting 2 interface mainly includes the flow rate parameter configuration and the flow rate parameter reading of the current instrument status. Select the corresponding parameter setting according to the on-site installation. The interface is shown in the figure below:

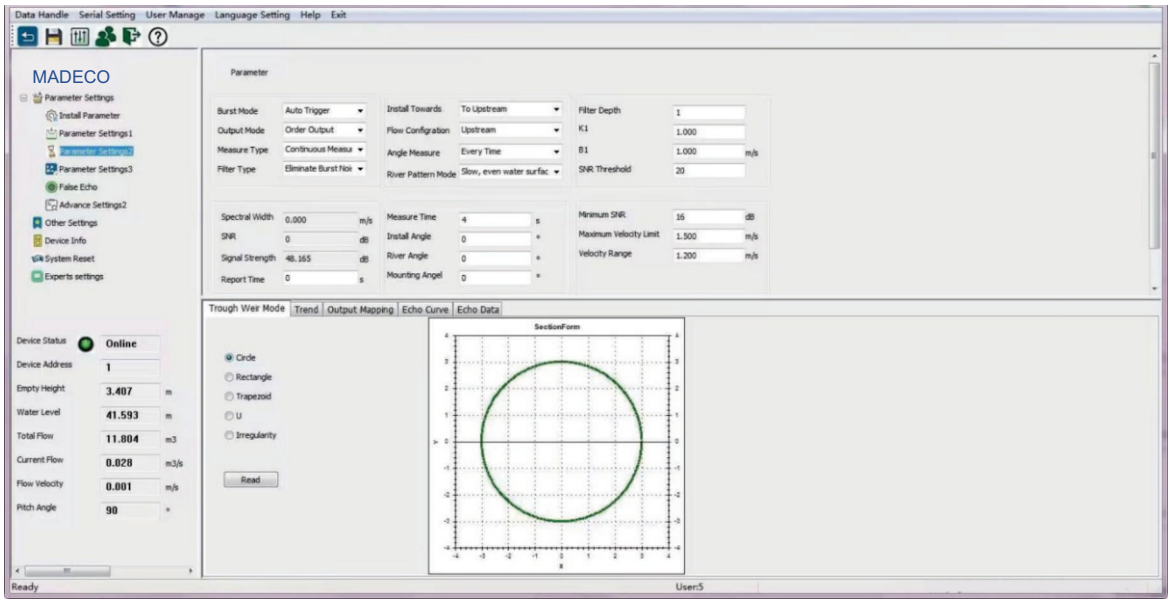


Figure13 Parameter setting 2

5.2.4 False echo storage function

Read the waveform curve of the instrument and establish the false wave storage. The interface is shown in the following figure:

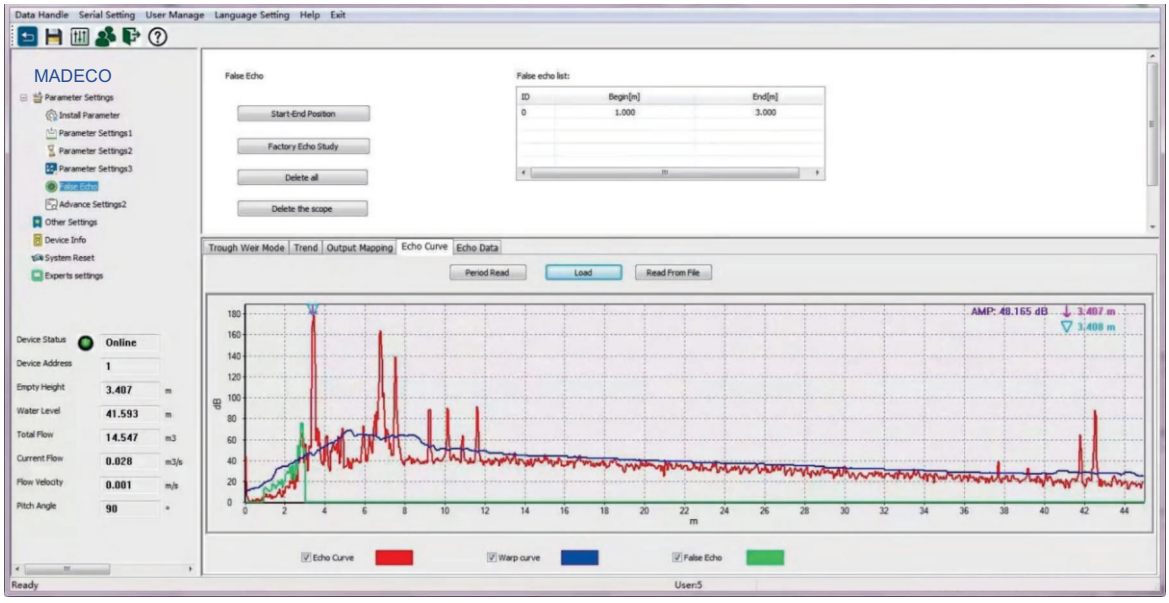


Figure14 False echo storage

5.2.5 Expert setting

The expert setting interface includes more specialized functions for trained personnel. It mainly includes original accumulation, primary filtering, secondary filtering, echo index, non extreme suppression, narrow wave filter, window setting, sampling, etc. The interface is as shown below:

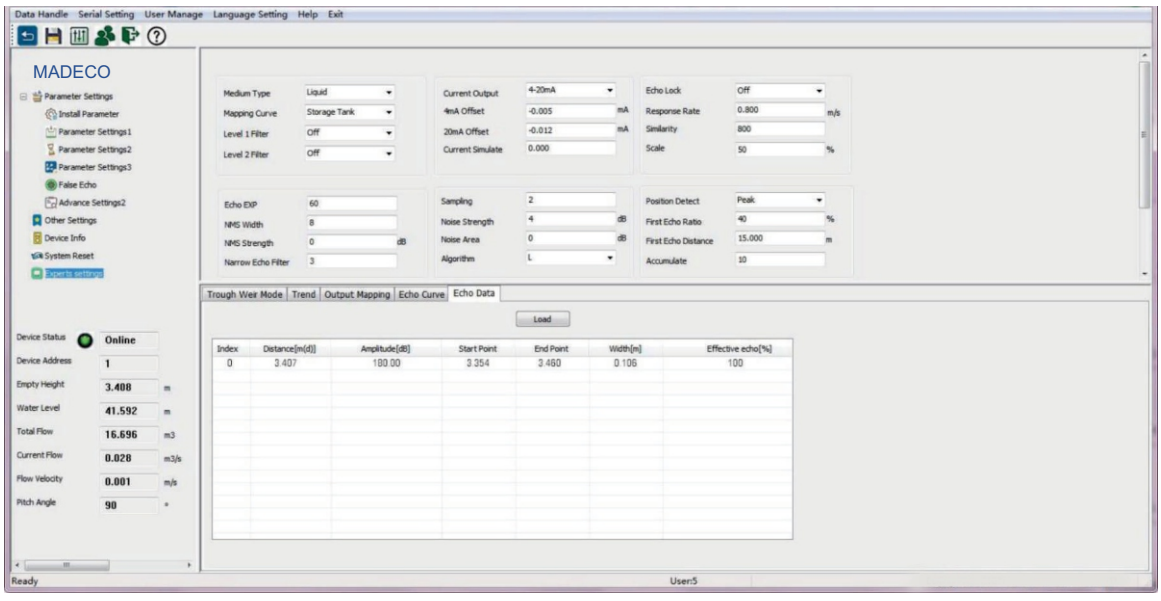
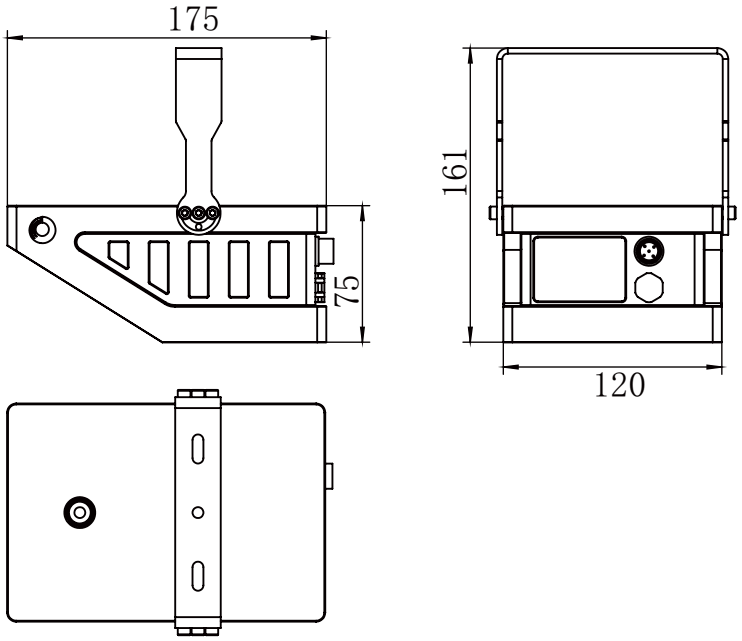


Figure15 Expert Setting

6. Product Dimensions (Unit: mm)

MDDF10 flowmeter size



7. Touch Screen Integrated Machine Product Description

7.1 Product appearance

Figure16

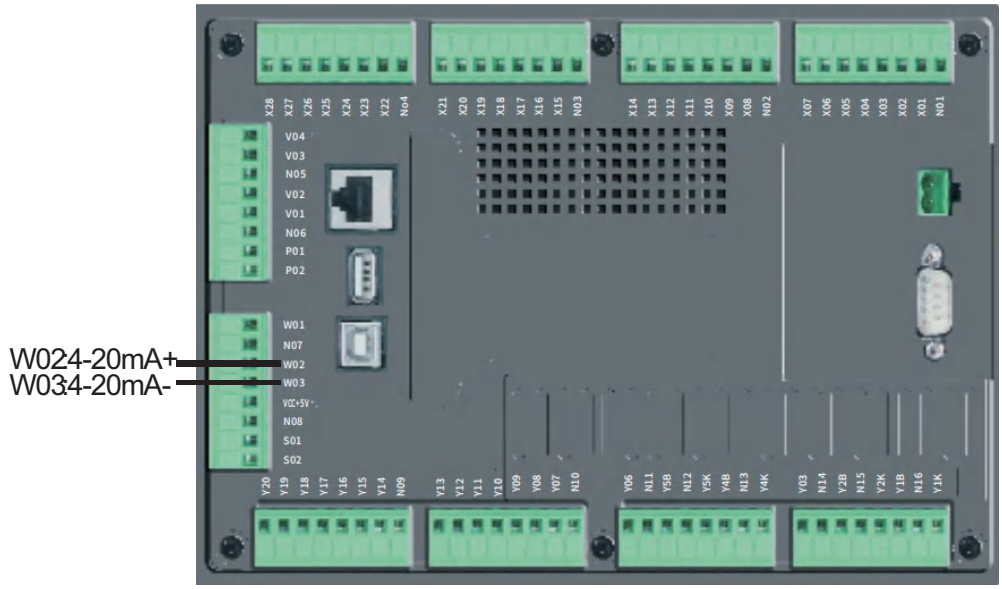


Figure17

7.2 Product Interface Description

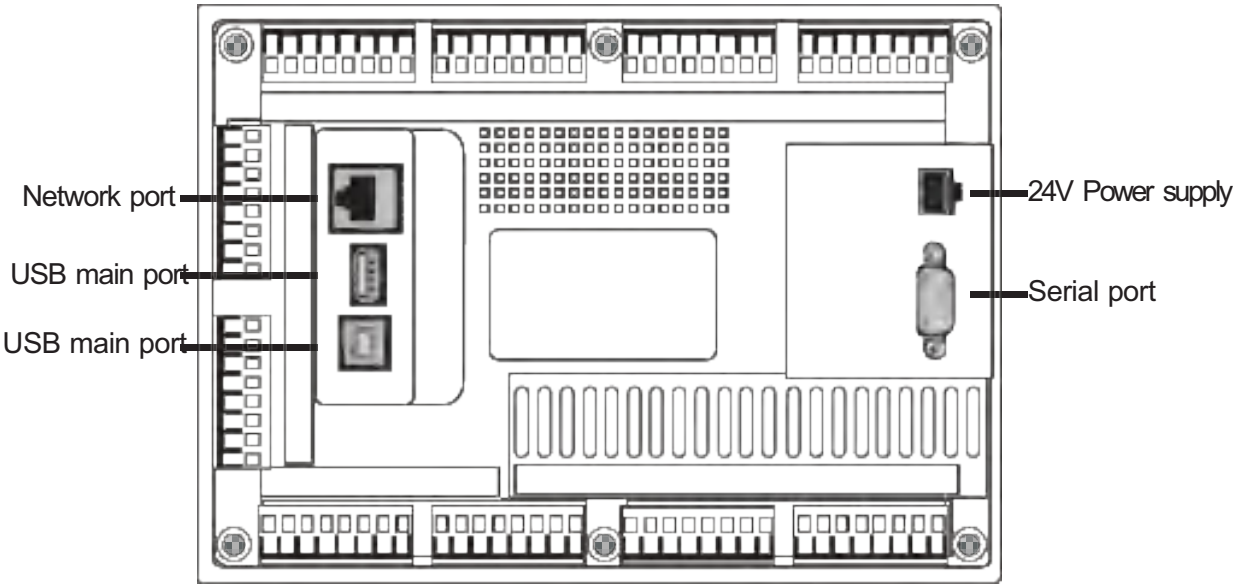


Figure18

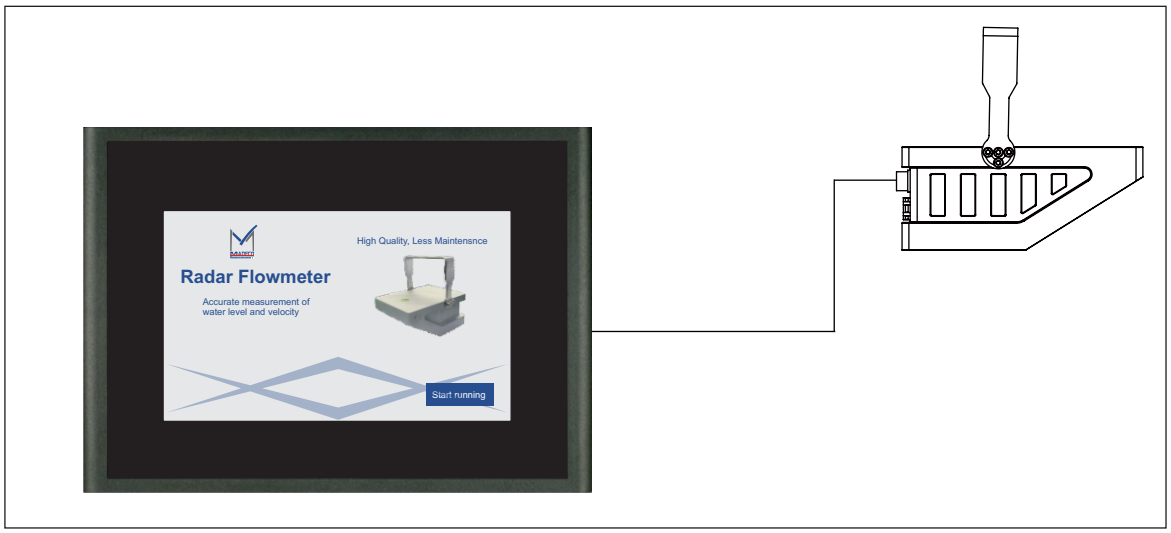


Figure19

7.3 Serial Port Pin Definition

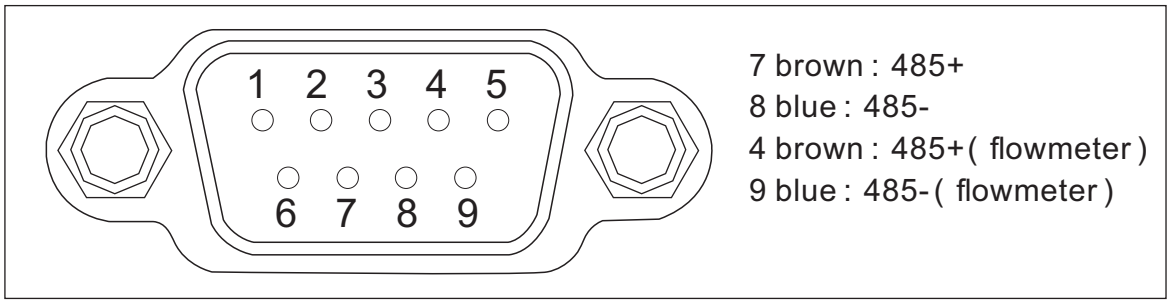


Figure20

7.4 Specific Operations

1. After the startup screen starts, the screen interface is as follows:
(1)Start running: Click the "Start running" button to enter the main screen interface.
start running

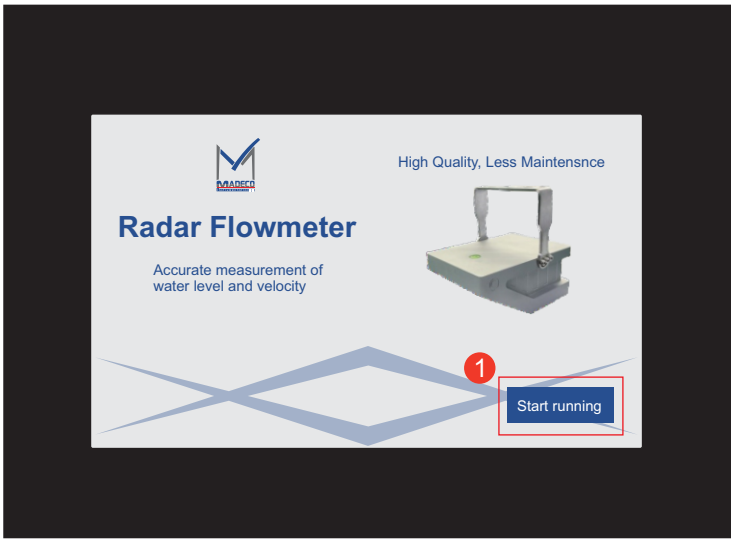


Figure21

2. The main screen interface is as follows:

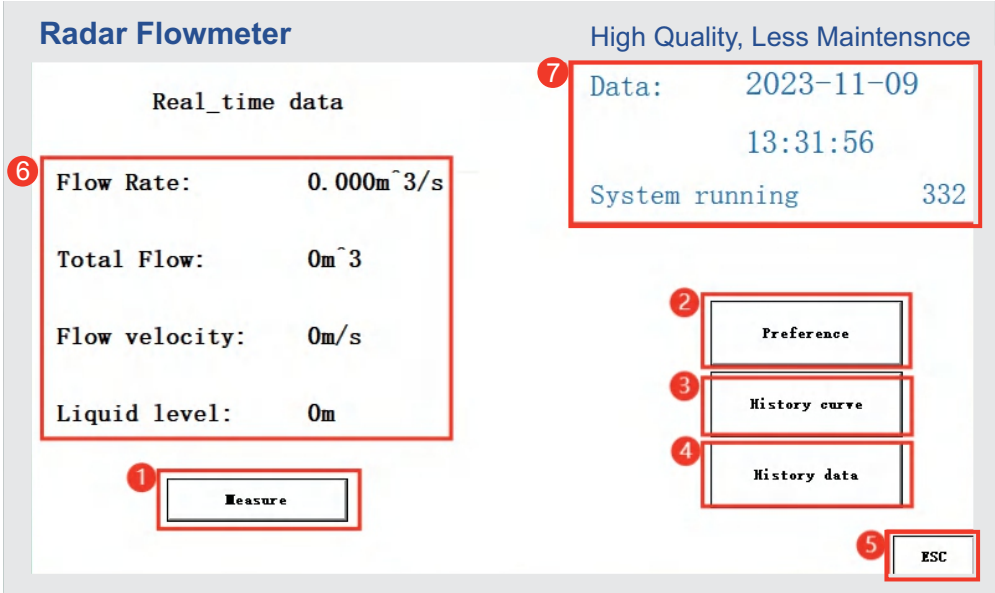


Figure22

Annotation:

- Click the "Measure" button to immediately read the above four parameters (the automatic collection period of the parameters is 10mins, and the automatic storage period is 5mins)
- Click the "Preference" button to enter the parameter setting interface.
- Click the "History curve" button to enter the historical curve interface.
- Click the "History data" button to enter the historical data interface.
- Click the"ESC" button to enter the start interface.
- Four parameters are displayed, namely "Flow Rate", "Total Flow ","Flow velocity" and "Liquid level".
- Display date and system running time.

3. The parameter setting interface is as follows:

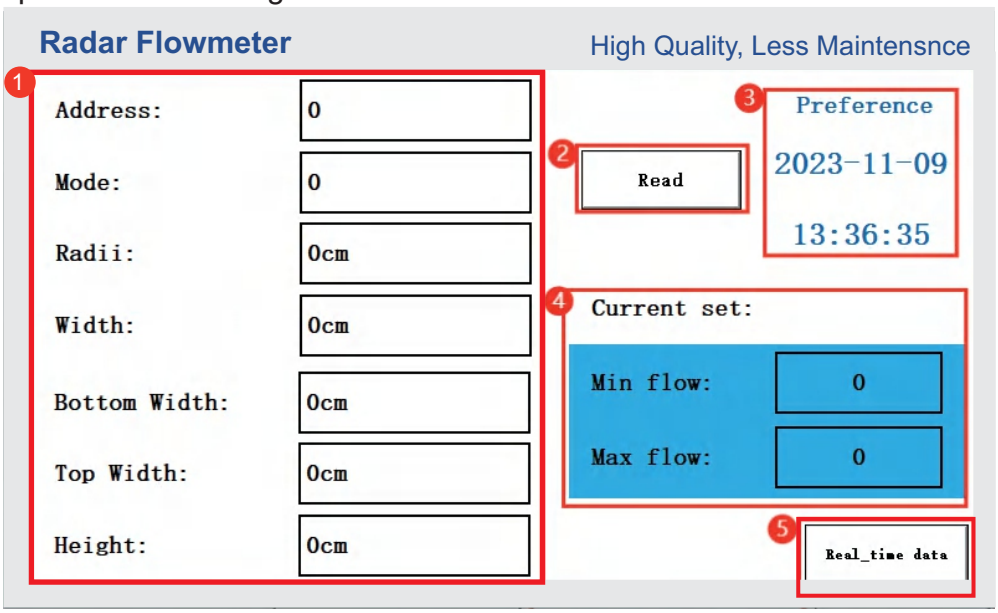


Figure23

Annotation:

- 7 parameters: address, mode, radius, slot width, lower bottom width, upper bottom width and slot height.
- Under normal circumstances, read it first and then set the parameters. Click the parameter to pop up the input box and enter it.(mode:1 cilcle ; 2 rectangle;3 trapezoid;4 u;5 irrgule)
- Read: Click the "Read" button to update the parameter data on the left. (Updated every ten minutes)
- Display the interface name and time.
- Current setting: You can set the "Min flow" and "Max flow" (used for W02 and W03 port output current calculation).
- Real-time data: Click the "Real-time Data" button to enter the real-time data interface.

4. The historical curve interface is as follows:

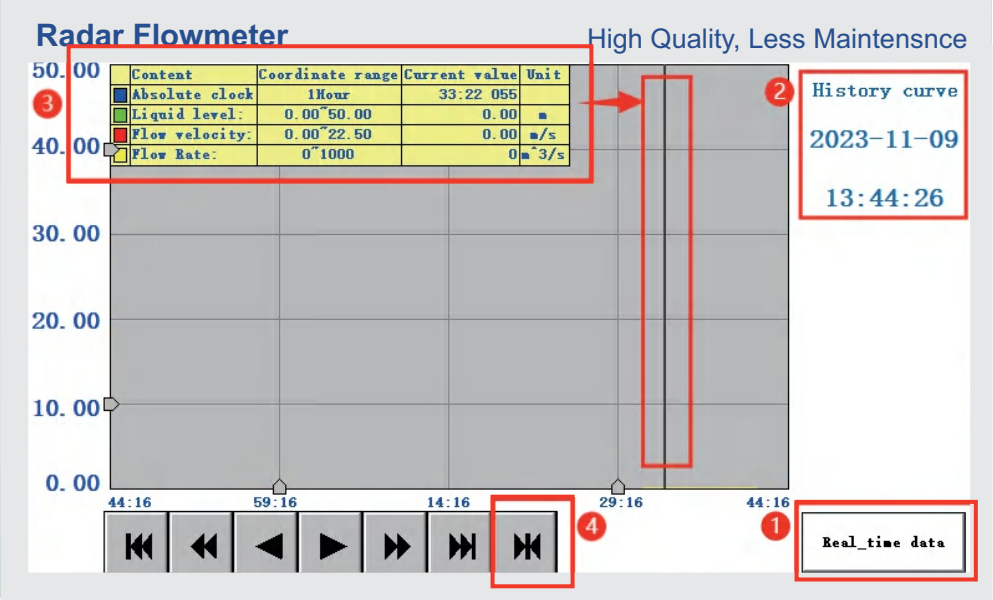


Figure24

Annotation:

- Click the "Real-time Data" button to enter the real-time data interface.
- Display the interface name and time.
- Display the time coordinates and data of the content where the baseline is located.
- Time setting button, set the time range of the curve display, there are three options, click to enter the following picture:

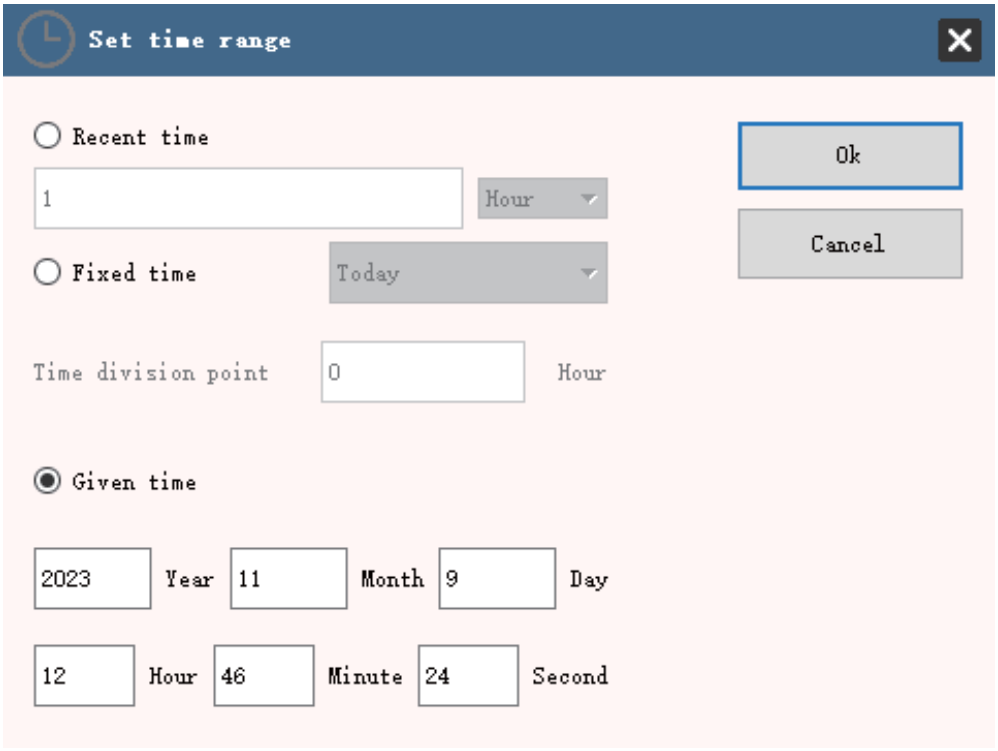


Figure25

5. The historical data interface is as follows:

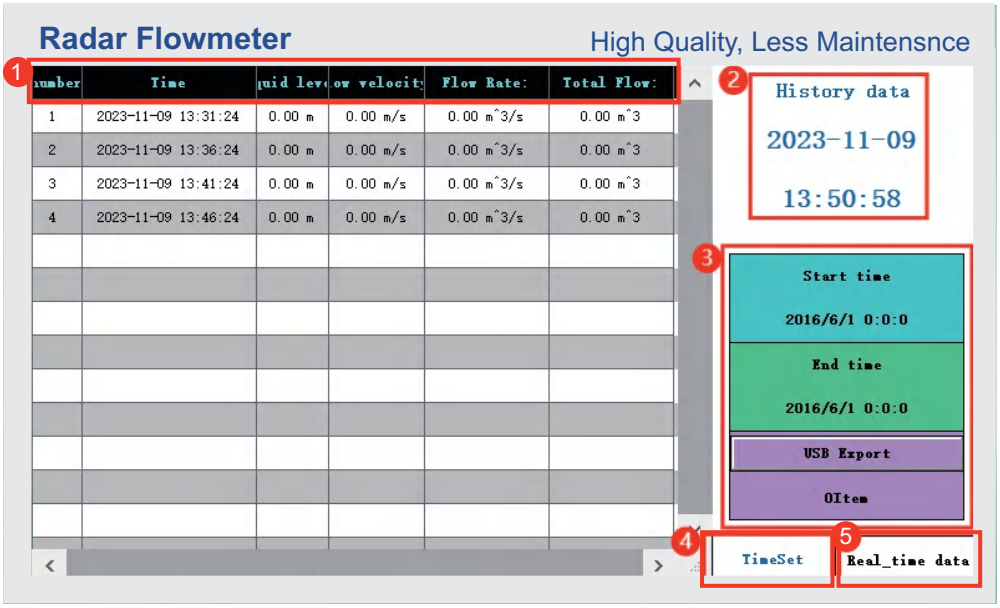


Figure26

Annotation:

- Historical data of time, liquid level, flow rate, instantaneous flow and cumulative flow.
- Display the interface name and time.
- Start time and end time of USB export. (Adjust time, only the number size can be modified, but the data format cannot be changed)

First enter the start time of the data you want to export, second enter the end time of the exported data, third click the "USB Export" button. The XXXX items that have been exported appear below.

If the number of exported items is negative, the following error occurs:

= -1001, incorrect progress or control data object type

= -1004, the group object name does not exist or the group object does not have the save attribute

= -1020, the export start time is greater than the end time

= -1021, the USB disk is not inserted

= -1022, only one export task is allowed at the same time

= -1023, the number of records read is 0

= -1024, file operation failed

= -1025, the export path is empty

= -1026, the export path is illegal

= -1027, the time format is incorrect

= -1028, unsupported export mode

- Time setting: The time range for historical data display can be changed. There are three options.
- Real-time data: Click to enter the real-time data interface.

8.Transportation and Storage

In addition to JB/T 9329, the transportation and storage conditions of the flowmeter shall also meet the following requirements:

1. The flowmeter shall be transported in strict accordance with the product characteristics and instructions during transportation.
2. The flowmeter shall be stored in a dry and ventilated room with a temperature of (-20~60)℃ and a relative humidity of no more than 80%. Do not mix with corrosive substances. Instruments that have been stored for a long time shall be sold and used after corresponding tests.

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