I. **Overview**

This instrument our company independently developed a dedicated ultrasound system core processing technology, the use of advanced chips, electronic devices and other hardware, combined with high intelligence software echo analysis and processing technology to ensure the detection accuracy and authenticity, to achieve ultra high-speed digital signal processing functions, and includes a number of patented technology, simple operation, easy installation and maintenance, and has a stable and reliable, high precision, long life and other characteristics, suitable for water treatment and chemical industry, iron ore and other areas of monitoring, measurement level height, measuring distance. In today's era can completely replace similar imported instruments, such as convenient for users to use and maintain.
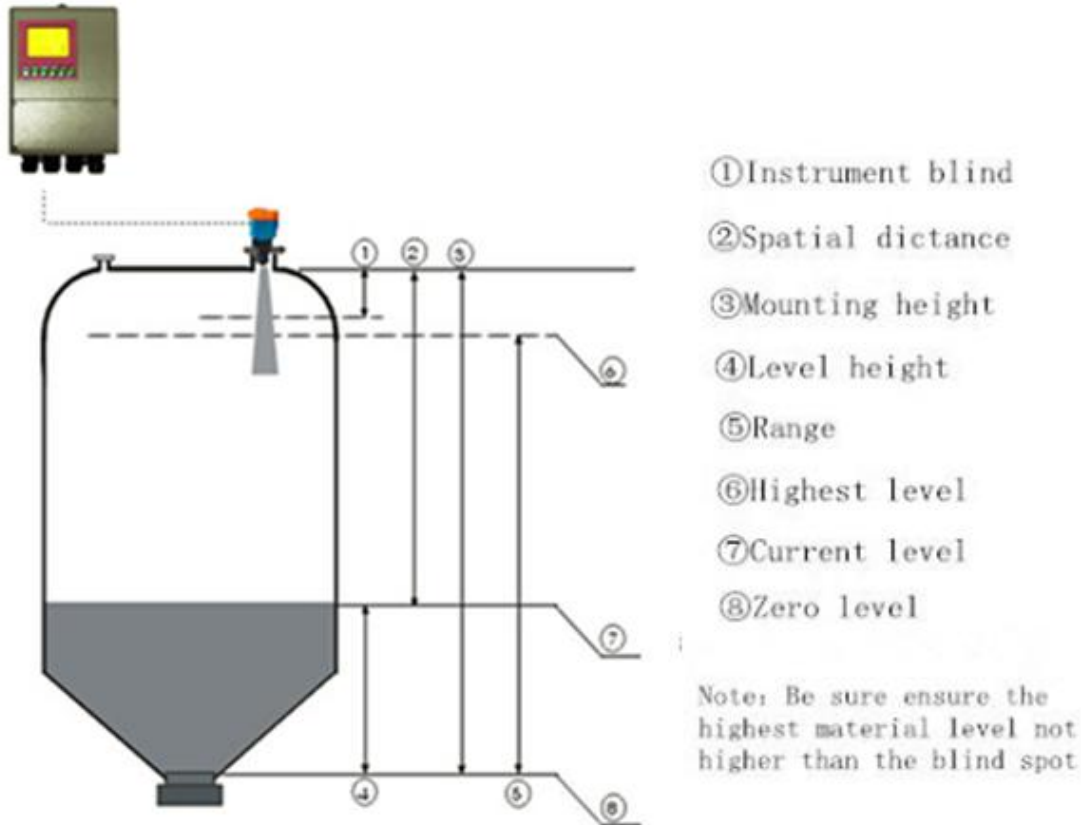
Instrument can be used to connect to a display table or a variety of DCS system via 4 ~ 20mA, switch control, RS485 (Modbus protocol, etc.), for automated operation industry, providing real-time monitoring data.

Feature：

- ♦ Intelligent processing patented sonic technology to a variety of anti-interference waves
- ♦ Non-contact instrument
- ♦ Lightning protection, transient short-circuit proof
- ♦ Data storage for up to 100 years
- ♦ Non-contact, wear-free, pollution-free, long life, low failure
- ♦ Automatic gain, energy concentration, the complex environment conducive

II. **Schematic diagram of the installation parameters and calculation principles**

Principle: The sensor sends an ultrasonic pulse beam is reflected back through the emitting surface detection surface, and was received by the sensor time t, combined with the speed of sound S (temperature variations, etc.) characteristics, this principle can be achieved through measurement and calculation.

① Instrument blind

② Spatial dictance

③ Mounting height

④ Level height

⑤ Range

⑥ Highest level

⑦ Current level

⑧ Zero level

Note: Be sure ensure the highest material level not higher than the blind spot

Demarcate： Installed by the user to enter height and range

Mounting height：(The height of the probe to the bottom of the tank）

Level height：(Water or material level height）

Air distance： (Probe to the test surface area）

Instrument blind： (Emitting surface area of the bottom of a short）

Formula：

1, distance: air Distance = S * T / 2, S = 331.45 + 0.61 * n ℃

2, Level: Level height = installation height - air distance

3,Output: Output current = level height / range * 16 + 4 = air or distance / range * 16 + 4

(Note: The output current value, in mA)

III. Inspection procedures

Before the instrument must be used to set or view the spatial distance is accurate. It is a test instrument for good or bad, and whether the use of environmental conditions unique reference value, regardless of the setting of parameters.

Instrument LXXXX display value and
the actual spatial distance must be quite
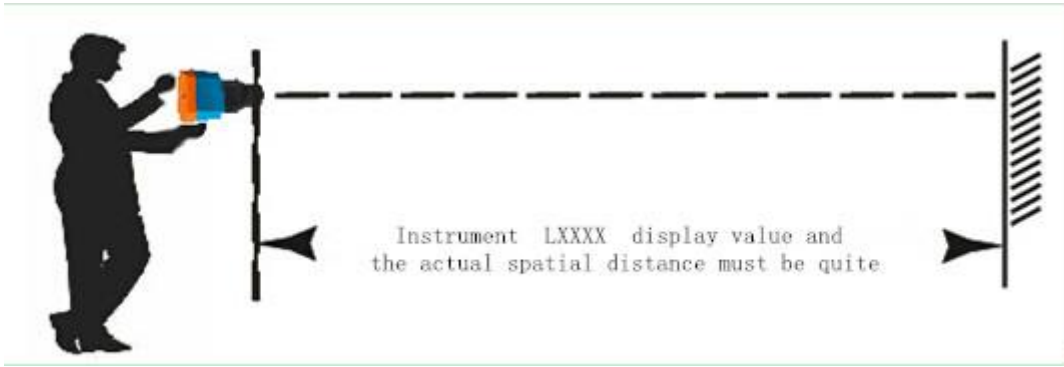
Specific operations： After launching the power meter vertical mouth is on the test surface,

press the left button ( ) to switch to the air distance display screen, to see whether
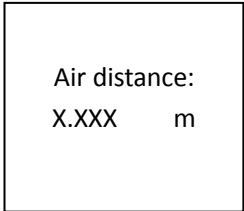
Air distance:
X.XXX   m

the value of the instrument air distance display approximately equal to the actual distance value; moving the

meter or test surface, viewing instrument display the amount of change is equal to the movement distance value;

if are about equal, indicating the instrument as well as a good working condition, you can enter the next step

debugging, use, or find out the reasons and so on. (Because there is a certain degree of emission of ultrasonic

propagation angle and blind, so try to open or low material level in the blind zone detection or outside, so as to

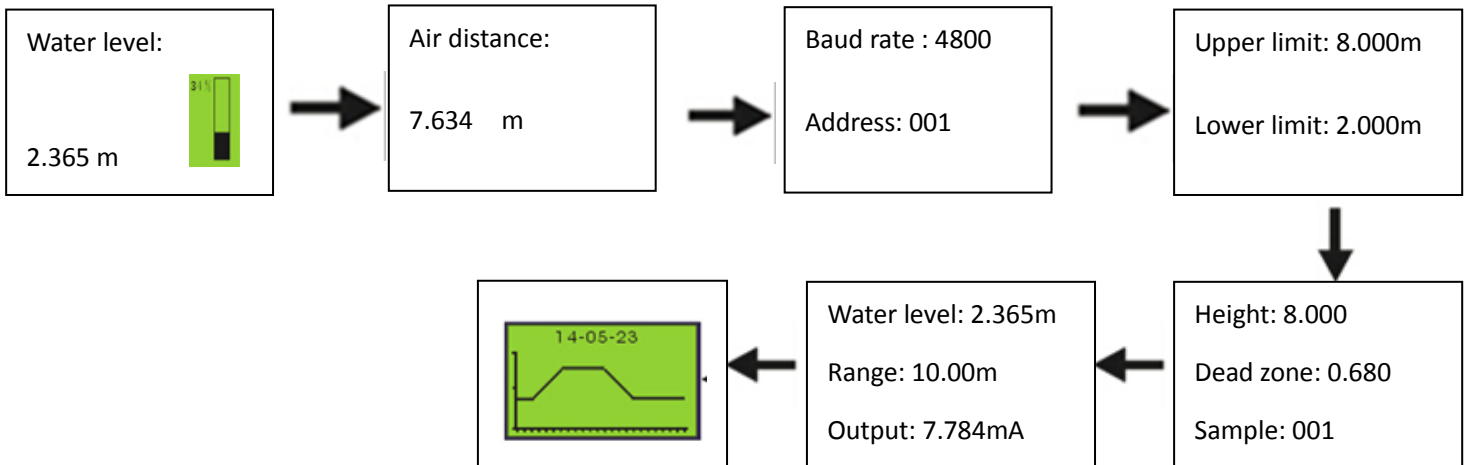ensure normal conditions throughout.)

IV. Instrumentation keyed surface parameter view, Set Description

Key Description：

Left		Right
Reduce		Add
Return		Confirm

Menu Instructions：

Work View mode:

| Water level:

2.365 m | → | Air distance:

7.634   m | → | Baud rate : 4800

Address: 001 | → | Upper limit: 8.000m

Lower limit: 2.000m |

↓

| | ← | Water level: 2.365m

Range: 10.00m

Output: 7.784mA | ← | Height: 8.000

Dead zone: 0.680

Sample: 001 |

After power is enabled by default in the operating mode the instrument. Working mode short press Left

(◄) button to cycle through the various operating parameters of the instrument, there is no key operation for

about 30 seconds, then the meter automatically returns to the display level height or distance air interface

(depending on the current measurement mode). Each parameter interface is as follows:

Menu Settings to enter：

Working mode, press and confirm (↵) around key 3s to enter the system

settings, enter the correct password (default password is 0000) and press the

Enter key to enter the parameter setting menu surface, using a shift, increase

or decrease button to enter the menu and set parameters. After setting the

> System settings:
>
> Please input the password:
>
> 0000

desired parameters after continuously press the return key (⌄) to save and exit to the operating mode.
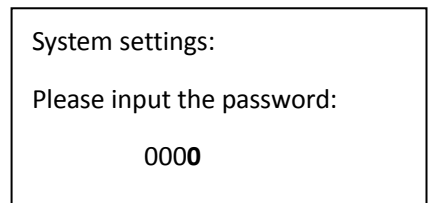
Use Instructions

Users simply set the benchmark instrument generally face value(mounting height) a parameter to meet the job

requirements.

Setting Menu

Setting menu items contain several sub-menus, menu display by shadow

confirm (↵) key to enter the menu, use changes in the shift key to

shadow shifted to the sub-menu position.

> Menu settings:
>
> **Pattern**   parameters   communication
>
> Display   system   others
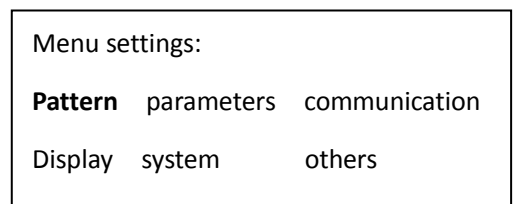
1-1.Mode setting

Mode setting for the meter mode (the default mode of operation of

the ultrasonic probe); another standard 4-20mA input mode (turned off).

Pattern settings:

Ultrasonic: 4-20mA

2-1.Parameter setting

Parameter setting item contains a number of sub-menus, menu display by

shadow confirm ( ) key to enter the menu. Changes in the use of the

shift key to the shadow position shifted to the sub-menu, press the Enter ( ) key to enter the option.

Parameter settings

Way   range   benchmark

Sample   control   time

2-2.Work setting

Work mode setting is used to measure the level of height or distance

measuring air mode (the default measurement level), the output

corresponding to the selected item. Shadows shifted to the rear

of the option press the Enter ( ) key to save settings.

Work ways settings

Water level

Air distance

2-3.Range setting

Range setting value corresponds to the output 20mA. When

the working interface displays the value of the analog output

range is equal to 20mA, working within the range of the display

screen, the analog output is calculated according to Equation 3.

Range settings

Range: 00**8**.000m

2-4.Benchmarking

Setting the benchmark for setting the reference plane (the

default height), or level (closed).

Benchmarking settings

Height

water level


2-4-1.Height setting

Mounting height is the most critical parameter setting instrument

is measuring the level of the reference value. Probe emitting

surface is generally set to zero (bottom, bottom of the tank, hopper bottom

etc., with the exception of special circumstances For output migration)

height. After setting all the other measurements are intact as a reference to make (Equation 2) conversion

---

Height settings

Installation height:

0**1**0.000m

calculations. (Of course, the production process due to the instrument probe discrete, so that the emission surface have a very slight deviation, the measurement reference plane setting request (mounting height) may have to modify the deviation at higher values.)

2-4-2.Sample set

Sample settings
Sample number:
00**3**

The number of samples collected ultrasonic echo is the number of values. Odd

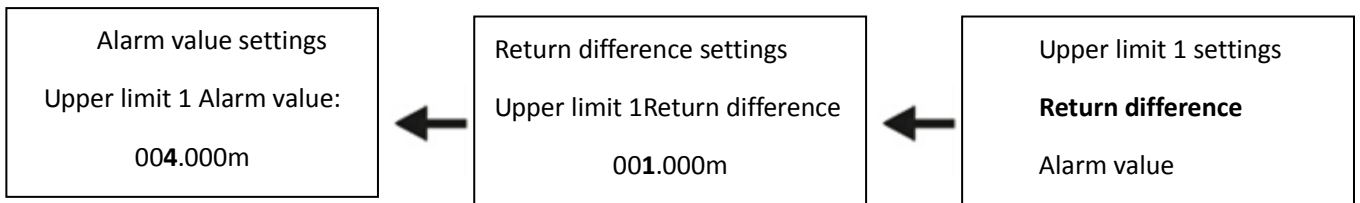bit values: the larger the sample value, the stronger the interference, the general value of 3 or 5.
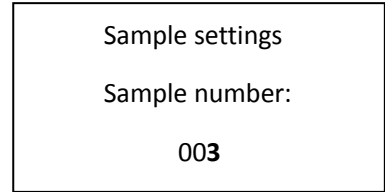
2-5.Control settings

Control settings
Upper limit1   Upper limit2
Lower limit1   Lower limit2

Control settings are programmable switch. 4-way switch with 2 groups

(ie 4 switch alarm points), each switching point is independent normally closed, normally open.
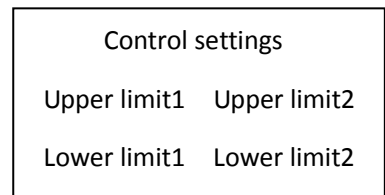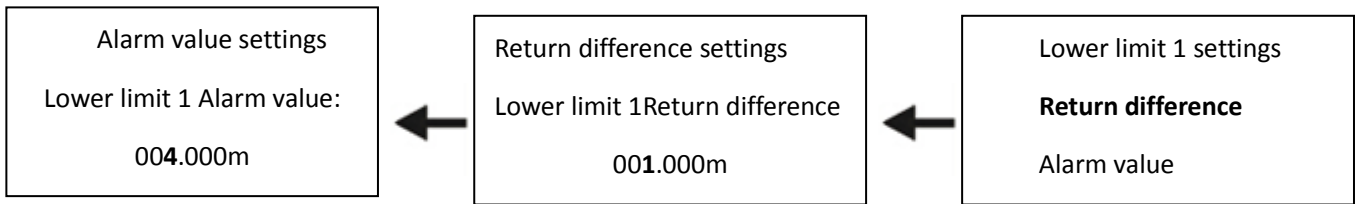
2-5-1.Setting an upper limit

The upper limit for a set containing the set hysteresis and alarm values. Alarm value is the value of the switch point, hysteresis is the point value of the segment values down control switch.

Alarm value settings		Return difference settings		Upper limit 1 settings
Upper limit 1 Alarm value:	←	Upper limit 1Return difference	←	**Return difference**
00**4**.000m		00**1**.000m		Alarm value

For example: if an alarm limit set at 004.00 points, the upper limit of a hysteresis is set to 001.00 then switch control actions are as follows: first instrument interface displays a value greater than or equal to 4.00, normally closed, normally open points are closed, return when the interface displays a value less than or equal to 3.00 (4.00-1.00 = 3.00), it closes the normally closed, normally open point is disconnected. So the cycle control. (The following other control identical)
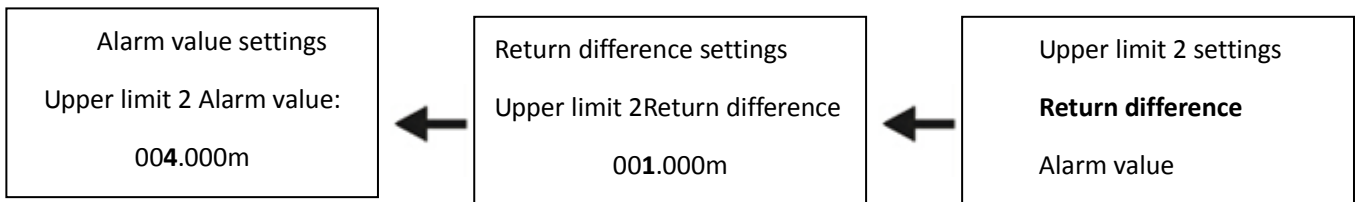
2-5-2.A set limit

Contains a set limit hysteresis and alarm settings. Alarm value is the value of the switch point, hysteresis is the point value of the segment values up control switch.

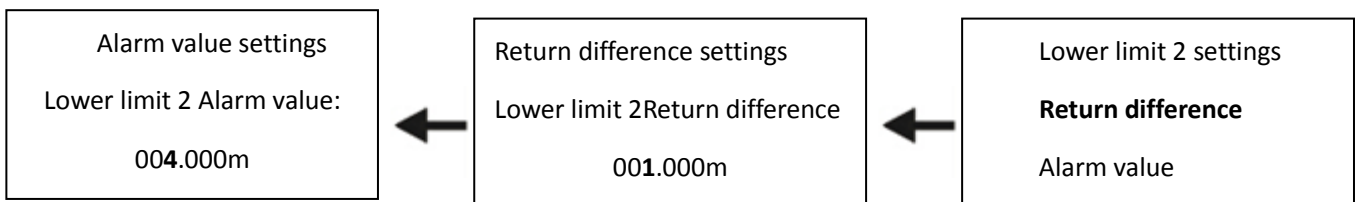| Alarm value settings		Return difference settings		Lower limit 1 settings
Lower limit 1 Alarm value: 00**4**.000m	←	Lower limit 1Return difference 00**1**.000m	←	**Return difference** Alarm value

2-5-3.Limit two set

Second, set the upper limit set contains hysteresis and alarm values. Alarm value is the value of the switch point,

hysteresis is the point value of the segment values down control switch.

| Alarm value settings		Return difference settings		Upper limit 2 settings
Upper limit 2 Alarm value: 00**4**.000m	←	Upper limit 2Return difference 00**1**.000m	←	**Return difference** Alarm value

2-5-4.Limit two set

The lower two set contains hysteresis and alarm set value. Alarm value is the value of the switch point, hysteresis

is the point value of the segment values up control switch.

| Alarm value settings		Return difference settings		Lower limit 2 settings
Lower limit 2 Alarm value: 00**4**.000m	←	Lower limit 2Return difference 00**1**.000m	←	**Return difference** Alarm value

2-6.Time Setting

Time setting is the instrument to work with the natural setting of the time synchronization, as well as recording and time synchronization profile.

| Time settings |
|---|
| Date: 14-06-08 |
| Time: 13:24:46 |
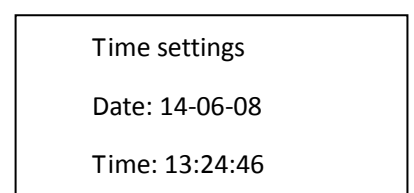
3-1.Communication settings

Instrument using standard Modbus RTU communication protocol format.

Instrumentation is the instrument promised numbered address,

baud rate is communication. Address the range of 001 to 255, baud rate 1200,2400,4800,9600 and so on.

Communication settings
Address
Baud rate
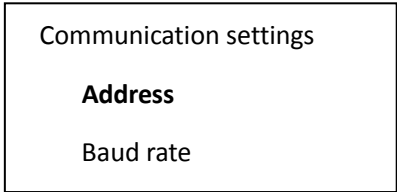
4-1.Display Settings

Bar chart and graph display set contains display. Display content can be turned off or turned on.

| Display settings |
| :---: |
| Bar charts |
| **Line charts** |
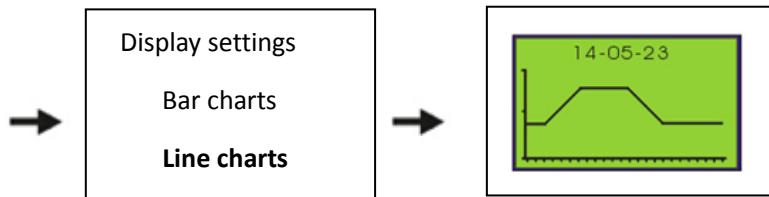
4-1-1.Setting the bar chart

Open bar chart display items that work interface displays a bar graph with the percentage   level of the pattern, no bar shows off the display.
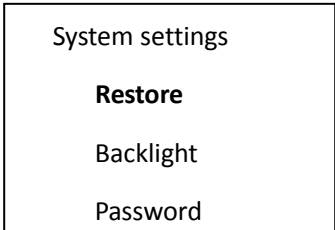
Bar charts settings
Open display
Close display
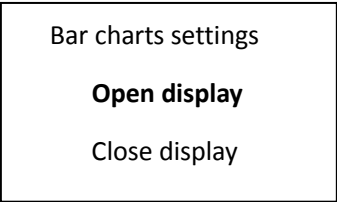
4−1−2.Display Settings

In the display settings interface with direct access to real-time view of the current graph.

Display settings
Bar charts
Line charts
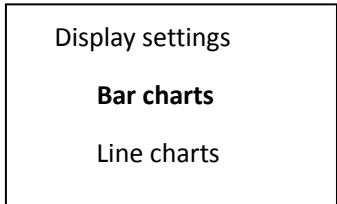
5-1.System Settings

System Restore factory is set, the backlight lit switches,

password change function.

| System settings |
| :---: |
| **Restore** |
| Backlight |
| Password |

5-1-1.Restore factory settings

If you think that some of the parameters to modify the wrong use of the instrument is not satisfactory, you can restore the factory settings, you want to re-edit parameters.
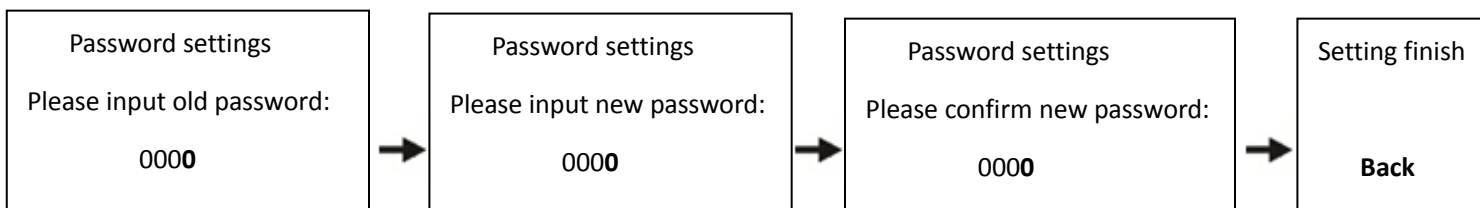
Restore factory settings		Confirm restore？
Please input the password:	➡	
0000		**Confirm** Cancel
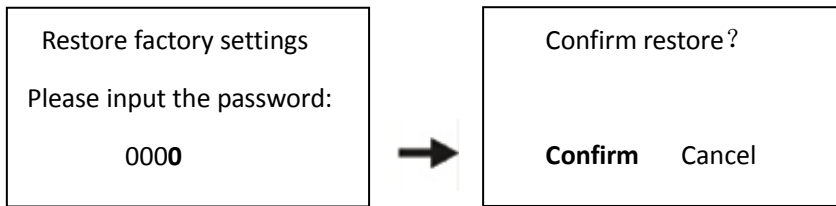
5-1-2.Always set the backlight

Always set the display backlight can be turned on or off, to facilitate inquiries at night. (When closed is no key operation for about a few minutes delay backlight off)

Backlight settings
Closed   Open
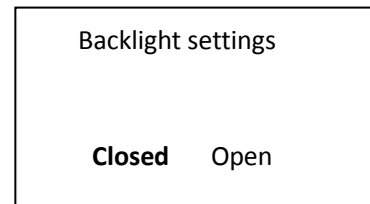
5-1-3.Password setting

Password setting can change an existing password, to prevent non-management staff error set other parameters. The new password is after instrument maintenance and modification of new key parameters, modify password changes after people must keep in mind.

Password settings		Password settings		Password settings		Setting finish
Please input old password:	➡	Please input new password:	➡	Please confirm new password:	➡	
0000		0000		0000		**Back**

V. Digital communication protocol format

Instrument using standard Modbus RTU communication protocol, baud rate 1200 to 4800 selectable, 8 data bits, no parity.

Under the MODBUS RTU mode, each frame includes Modbus address field, functional domains, data fields and check domain. Between every two transmitted characters or received time interval can not exceed 1.5 times the character transmission time interval if the two characters exceeds 3.5 times the character transmission time, protocol considered to have received a data frame, a new frame of data transmission begin.

Begin	Address code	Function code	Data	CRC checksum	Stop
3.5T	1 byte	1 byte	N * 1 byte	2 bytes	3.5T

Modbus protocol frame

Address code：Instrument number, ranging from 1 to 255.

Function code：Function code needs to be achieved, such as Read Holding Registers function code 03.

Data：Transmission of data content, such as the number to the read address register and the like.

Check：CRC16 checksum, the previous low.

The instrument is currently available only temporarily inquiry Read Holding Registers function code 03 support.

Data Description：

Address	Description	Data Types
0x0000	Liquid level	Float
0x0002	Air distance	Float
0x0004	Mounting height	Float
0x0006	Range of the instrument	Float
0x0008	Instrument blind	Float
0x000A	Output Current	Float
0x000C	Alarm limit 1	Float
0x000E	Limit 1 Backlash	Float
0x0010	Alarm limit 1	Float
0x0012	Limit 1 Backlash	Float
0x0014	Alarm limit 2	Float
0x0016	Limit 2 Backlash	Float
0x0018	Alarm limit 2	Float
0x001A	Limit 2 Backlash	Float

Instrument return variable for 32 single-precision floating-point type, accounting for 4 bytes, using the IEEE standard way to represent. Each standard Modbus holding register is two bytes, so each float variable occupies two holding registers, the address stored in the low 16 high, high address stored in the low 16. Such as air distance variable is stored in the table start address register is 0x0002, set the air distance is 100.54 (decimal), the corresponding hexadecimal representation for 0x42C9147B, the address is stored in register 0x0002 0x42C9, address 0x0003 register holds 0x147B.

Communication Command：

Function Code 03： Read Holding Registers

Send：

Address code	Function code	Register address high byte	Register address low byte	The number of high byte register	The number of low byte register	CRC checksum low byte	CRC checksum high byte

Response：

Address code	Function code	Returns the number of data bytes	A high byte data	A low byte data	……	Data N High Byte	N Low data byte	CRC checksum low byte	CRC checksum high byte

Explanation：

Address code： Instrument number, can be user-set, ranging from 1 to 255

Register address： Variable starting address, the data described with reference to

The number of register： To read the register number, the value is equal to the number of variables to be read bytes / 2

Returns the number of data bytes： Variable number of bytes to read

For example: Read the air distance, refer to the table, air distance variable is single-precision floating-point, four-byte, representing the holding register start address is 0x0002, set height is 100.54 air, instrument number is 1, then read follows：

send：

01	03	00	02	00	02	65	CB

Response：

01	03	04	42	C9	14	78	31	57

Simultaneously read multiple variables, simply send the starting address of the first variable, and the need to read the register number (variable number of bytes / 2), the instrument will return multiple variables simultaneously.

Error Handling： If the instrument receives the wrong communication request, it returns an error code corresponding to the contents of the error.

Error response：

Address code	Function code + 0x80	Error Codes	CRC checksum low byte	CRC checksum high byte

Description: Communication error function code when requesting a return to the highest position, such as 0x03 becomes 0x83 (0x03 + 0x80) returns.

**Error Codes：01：** Does not support the function code

02： Register address error

**03：** Data contents of the error

VI.Technical Specifications

Parameters	Performance	Parameters	Performance
Range	0.5～30m	Accuracy	0.25%, 0.5%
Supply voltage	220VAC or 24VDC	Resolution	1～5mm
Show	Chinese dotmatrix backlit	Launch angle	6°～12°
Blind	0.20～0.9m	Frequency	～40KHZ
Analog Output	4～20mA	Digital Output	RS485
Maximum load	750 Ohm	Switching output	<250;3A
Ambient temperature	−20～+55℃	Degreeof protection	IP65，IP67
Mounting thread	M66x3 or G2	Electrical Interface	M20x1.5
Housing material	PA6、 ABS		

Ⅶ. Wiring and other industrial use
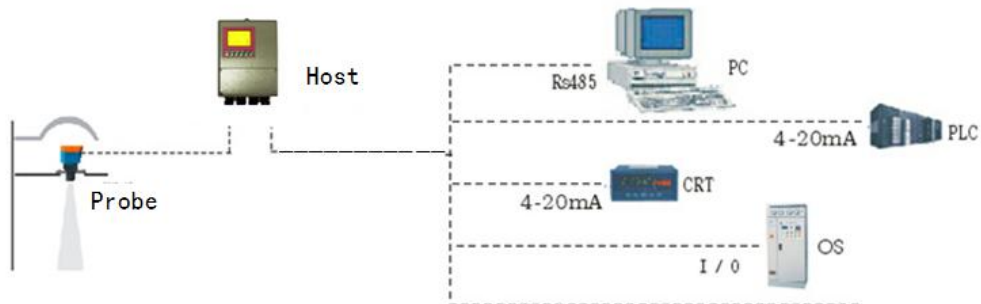
1、 **Terminal diagram below:**
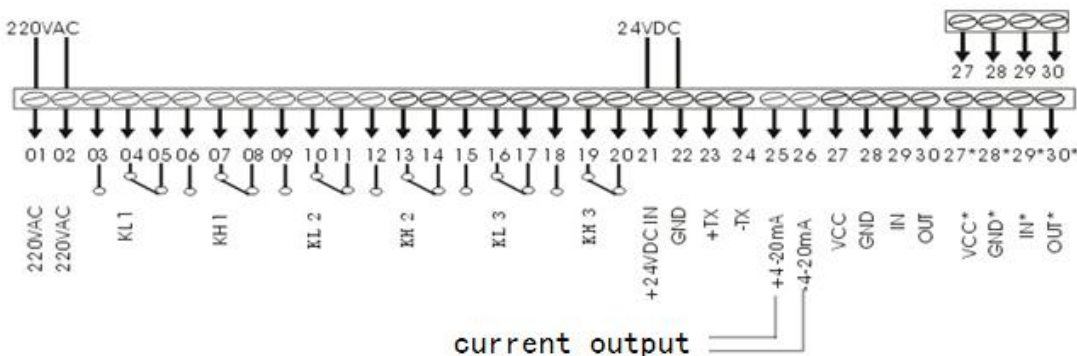
2、Part of the interface is as follows:
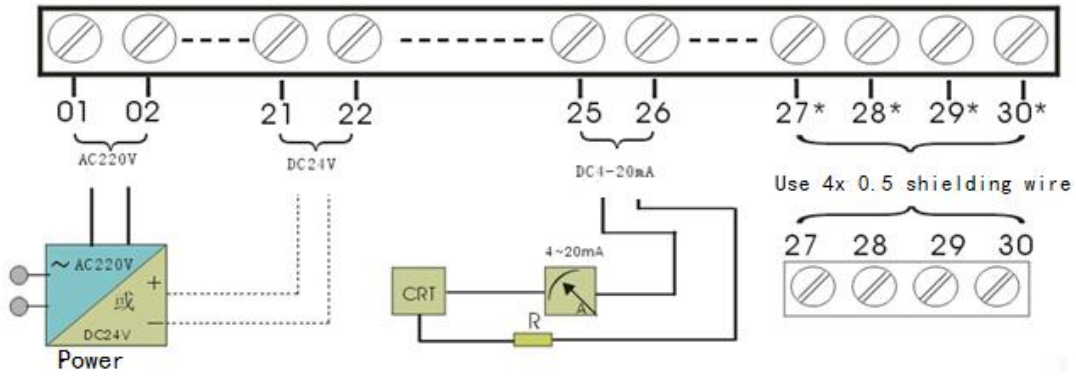
(Note: The host and probe connections generally need to use 4x0.5 shielded cord)

3、And other data exchange platform to connect:

Abnormal instrument analysis and processing

Anomalies	Analyze the reasons	Treatment options
Meter does not show, black, no backlight	(1) Wiring error (2) Power is not normal	Check the power supply wiring polarity, voltage, current, the circuit meets the requirements.
Current Level ------ Current ullage FFFFFFF Air distance FFFFFFF （Overflow Code: that there is no echo）	(1) Wiring is good (2) Vertical installation (3) Power is small (4) Instrument damp or flooded over (5) Is whether there is a bubble detection medium surface, floating debris, smoke, dust, etc;	Close analog field instrumentation whether echo (back test procedures) is digitally. If the normal installation vertical test surface, process or change the installation environment.
Instability instrument display, digital bounce, digital fixed, or inconsistent with the actual gap is too large	(1)Supply voltage inferior instability (2)Level height into the blind (3)Level top or side obstacles (4)Mounting aperture settings or location does not meet the requirements of (5)Electromagnetic, high-intensity pulsed interference (6)And mounting bracket resonance	Improve supply； Heightening install stagger blind use； Change the installation location, avoiding obstacles, riser installation； Grounding, shielding measures； Such as the installation Of anti-vibration rubber gasket installation.
Analog signals, digital signals, the digital output is not normal, etc	(1)Analog output is greater than 20mA (2)Only output 4mA (3)The analog output is too small (4)No analog output (5)No digital signal output (6)the digital signal output intermittent, unstable (7)No switching output	Display over range, change the range； Display overflow, check the wiring and installation； The load is too large, the supply voltage is too low； Use the loop connection is disconnected； Wiring and instrumentation address number, baud rate and protocol format is consistent； Whether this function, work overload, must be used within range.
Tip: When you repeatedly can't find the cause, if necessary, to communicate with the manufacturers analysis		

Conditions using the installation issues

In order to ensure the life of the instrument, the probe must be installed for outdoor installation shade from the storm cover, be sure to keep the instrument dry indoor use, ventilation. In a weak moisture, corrosive air environments use, be sure to pay attention to the seal (cap, waterproof connectors and other special circumstances, it is necessary to increase with the use of sealant or rubber cement seal).

Due to the presence of ultrasonic level meter launch angle and blind, so when we choose to stagger blind installation location and emission angle from the side, not too close to the highest media, side edge, so as not to affect the normal operation of the instrument. (Blind side and launch angle from the reference instrument generally in the range of about 10% to 5%).