

KWD120 Split-type Ultrasonic Sludge Level Meter



Table of contents

1.Introduction	1
2.Technical Parameters	1
3. Debugging	2
4.Installation Guide	2
4.1 Installation Precautions	2
4.1.1 Sensor installation requirements	2
4.1.2 Minimum obstacle-free radius	2
4.2 Dimensional and installation drawings of the mounting bracket	3
4.2.1 Overall drawing of the mounting bracket	3
4.2.2 Dimensions	5
4.3 Electrical wiring diagram	7
5.Operating Instructions	9
6.Settings	11
6.1 The introduction of running mode	11
6.2 Enter the menu	11
6.3 The first level menu instruction	11
7. Error Symptoms and Solutions	17
7.1 The meter is not working	17
7.2 The meter is working but has no display	17
7.3 The instrument is operating, but the screen displays "Loss of Waves"	17
7.4 The measured mud level differs significantly from the actual level or fluctuates... ..	18
8. Communication Protocol	20
8.1 Hardware Operating Mode	20
8.2 Data Frame Specifications	20
8.3 Function code 03H: Read register value	20
8.4 Function Code 06H: Write Single Register Value	21
8.5 Function Code 10H: Continuously Write Multiple Register Values	21
8.6 Register Definition Table	22

1.Introduction

Ultrasonic depth sounder is a contact-type, highly reliable, cost-effective, easy-to-install and maintain mu36d level measuring instrument. It detects underwater distance through liquid propagation. It is a new generation of ultrasonic depth sounding equipment developed by our company after years of hard work.

2.Technical Parameters

Function	Split type
Range	The conventional measuring range is 5 meters, 10 meters, 15 meters, 20 meters, and can be customized to 30 meters, 40 meters, 50 meters, 60 meters, 70 meters and further special measuring ranges
Measurement Accuracy	1%~3%
Resolution	5mm or 0.5% (the larger one)
Display	Chinese LCD display
Analog Output	4~20mA/510Ω load
Relay Output	2-way AC 250V/5A or DC 30V/5A, programmable status
Power Supply	Standard 220V AC+15% 50Hz Optional 24VDC 120mA Customized 12VDC or battery power supply
Ambient Temperature	Display instrument -20~+60℃, probe -20~+80℃
Communication	Optional 485, 232 communication (manufacturer protocol)
Protection Level	Display instrument IP65, probe IP68
Probe Cable	Standard 10 meters, can be customized up to 100 meters (without electromagnetic interference)
Probe Installation	Depending on the selection of measuring range and probe
Power consumption of 24V powered products	24V split instrument, the specific power is as follows: With only mA output is 1.5W (standard); With only 485 output is 0.9W (optional); With both 485 and mA output is 1.6W (optional); Add two relays, the power consumption increases by 0.8W on the original basis (optional);
Power consumption of 220V powered products	The power of 220VAC split instrument is 5W.

3. Debugging

Due to the different installation environments of the instrument, you must know the basic conditions of the required measurement before working, such as: measurement range, zero point, full range and on-site working conditions, etc. The instrument must be set before measurement.

Others: Please do not modify the three items of probe selection, parameter calibration and algorithm selection by yourself.

4. Installation Guide

4.1 Installation Precautions

4.1.1 Sensor installation requirements

- When selecting the sensor installation location, the sensor should be kept perpendicular to the mud surface and the pool bottom.
- There should be no obstacles in the transmitting surface directly below the probe to prevent the ultrasonic signal from being blocked and reflected by obstacles.
- The probe should be installed away from gas bubbles and active floating solids caused by sudden changes in flow rate to ensure accurate and stable measurement.
- The probe should be installed away from the water inlet and outlet.
- The sensor probe should be completely immersed in water. If the pool wall is vertical and the surface is flat, please determine the distance from the pool wall according to the table below.
- If the pool wall is uneven, or there are objects such as brackets and pipes, the distance from the pool wall needs to be increased to avoid interference with the measurement caused by the above objects.

4.1.2 Minimum obstacle-free radius

For the pool, you can use a bracket for installation. Pay attention to the load-bearing capacity of the bracket to keep a certain distance between the sensor and the pool wall. If the pool wall is flat from top to bottom, then with the sensor as the center, the minimum obstacle-free radius is detailed in the table below (all units are meters):

(1) Use 50KHz ultrasonic probe

Max range	Min radius	Max range	Min radius	Max range	Min radius
5m	≥6.75	10m	≥13.49	15m	≥20.24
20m	≥26.98	30m	≥40.47	40m	≥53.96

(2) Use 200KHz ultrasonic probe

Max range	Min radius	Max range	Min radius	Max range	Min radius
5m	≥1.72	10m	≥3.44	15m	≥5.15
20m	≥6.87	30m	≥10.31	40m	≥13.75

(3) Use 300KHz ultrasonic probe

Max range	Min radius	Max range	Min radius	Max range	Min radius
5m	≥0.83	10m	≥1.66	15m	≥2.49
20m	≥3.32	30m	≥4.99	40m	≥6.65

(4) Use 400KHz ultrasonic probe

Max range	Min radius	Max range	Min radius	Max range	Min radius
5m	≥0.70				

(5) Use 500KHz ultrasonic probe

Max range	Min radius	Max range	Min radius	Max range	Min radius
1m	≥0.35	2m	≥0.71	3m	≥1.06

(6) Use 650KHz ultrasonic probe

Max range	Min radius	Max range	Min radius	Max range	Min radius
1m	≥0.32	2m	≥0.63	3m	≥0.95

4.2 Dimensional and installation drawings of the mounting bracket

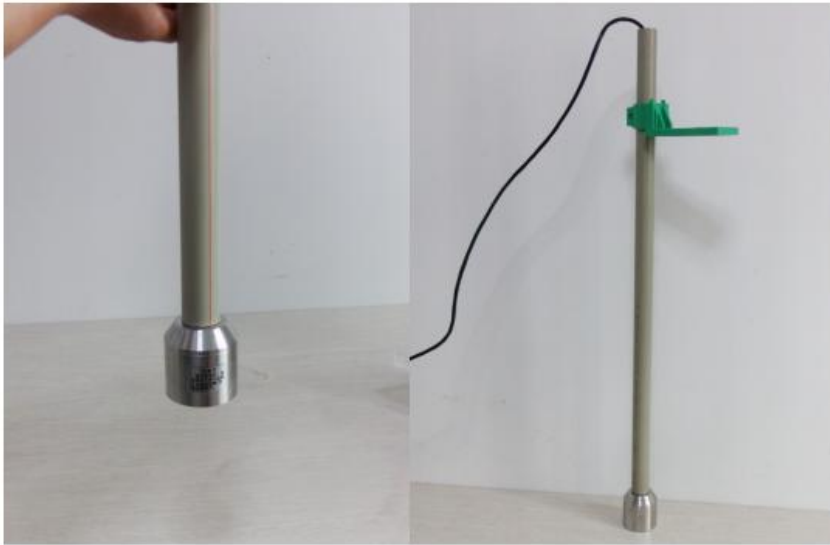
4.2.1 Overall drawing of the mounting bracket



① Pass the ultrasonic transducer cable through the casing.



- ② Screw the ultrasonic transducer and the inner thread of the pipe together and fix it.



- ③ Then pass it through the circular threading disc at the top.



- ④ The ultrasonic transducer is fixed.

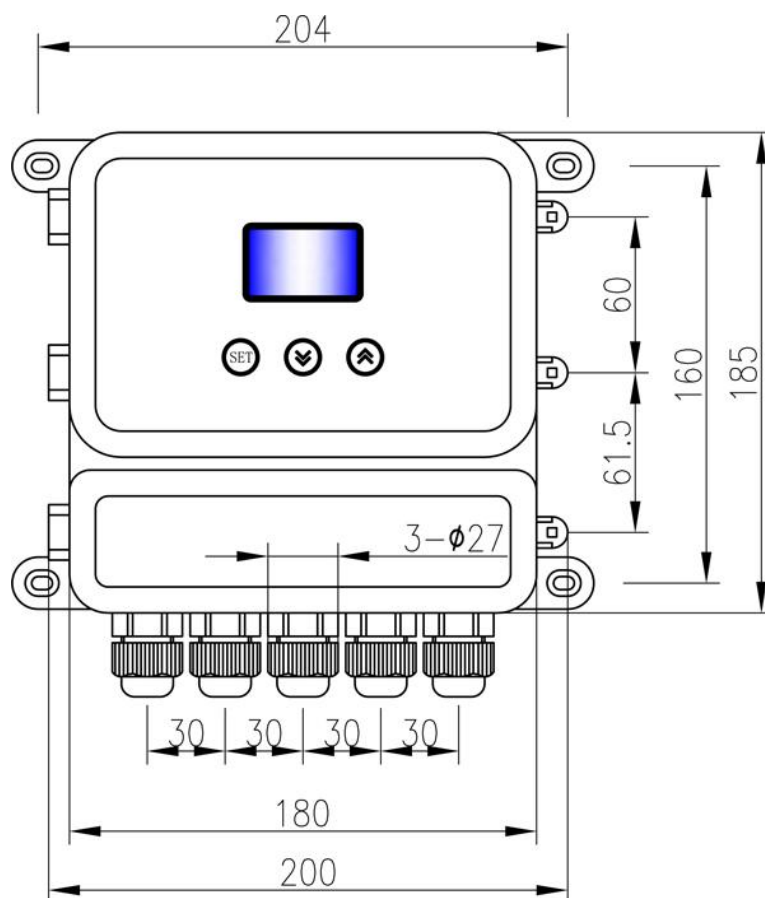


4.2.2 Dimensions

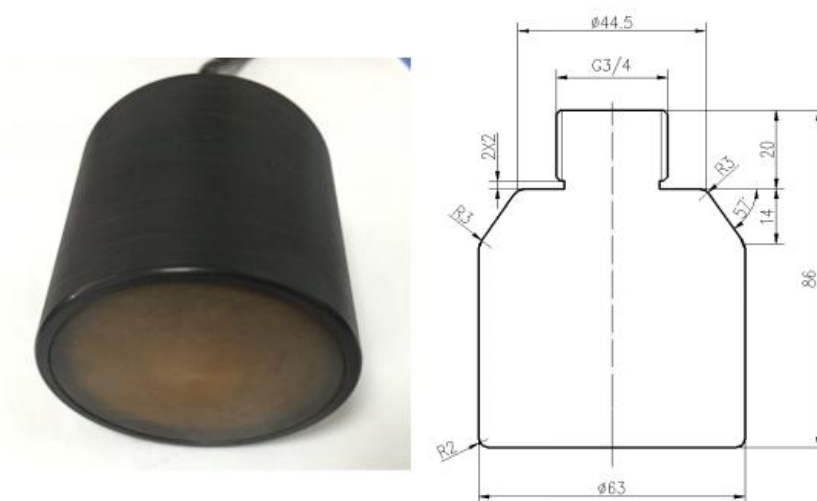
(1) Appearance



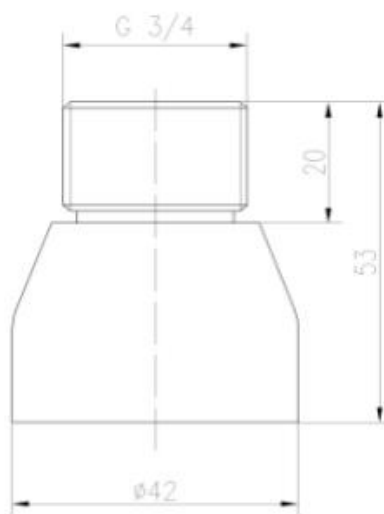
(2) Display instrument Dimension



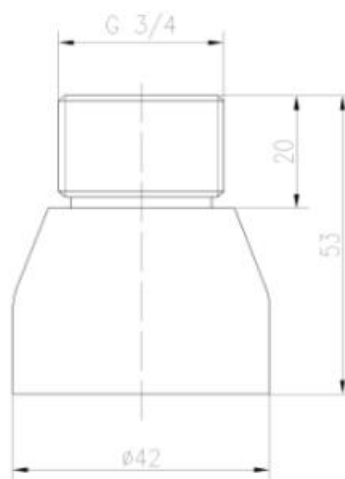
① 50Khz and 200Khz dual frequency



④ 500Khz

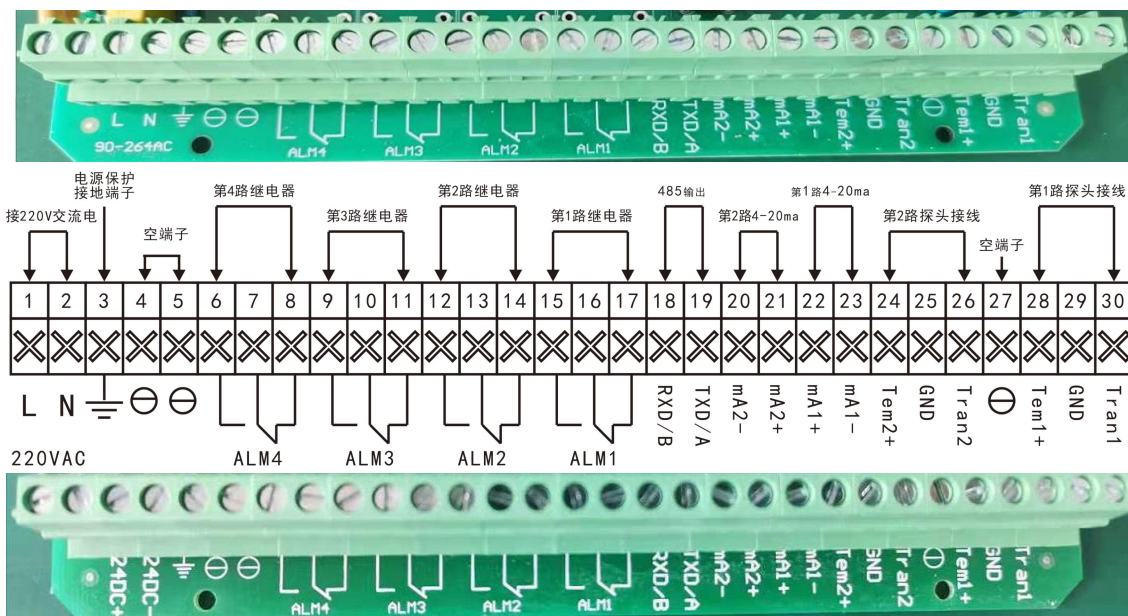


⑤ 650Khz



4.3 Electrical wiring diagram

(1) Electrical connection diagram of single-channel ultrasonic depth sounder:



Wiring method:

1. Transducer wiring method: red wire connects to Tran1 terminal; blue wire connects to Tem1+ terminal; black wire connects to GND terminal No. 29 (the black wire actually connects to the yellow wire/yellow-green wire, black wire and shield wire, which needs to be noted in some occasions where it is cut short).

2. 1st current output: "positive current" connects to mA1+; "negative current" connects to mA1-; 2nd current output: There is no 2nd 4-20mA output.

3. Power cord: If the power terminal of the instrument is marked with L and N, it is connected to 220VAC mains; if it is marked with 24DC+ and 24DC-, it is connected to 24V DC power supply.

4. The ground terminal of the instrument needs to be connected to the real earth (the ground resistance must be less than 4 ohms), and do not share the ground terminal with other strong electric equipment. Usually the ground terminal needs to be connected to terminal No. 3. If the interference is introduced after the external mA line (the instrument measurement is abnormal), the ground wire can be connected to the mA2- terminal (terminal No. 20). In some sites where the transducer wiring is not very reasonable, it is easy to introduce interference from the transducer wiring. In this case, the ground wire can be connected to the GND terminal (terminal 25).

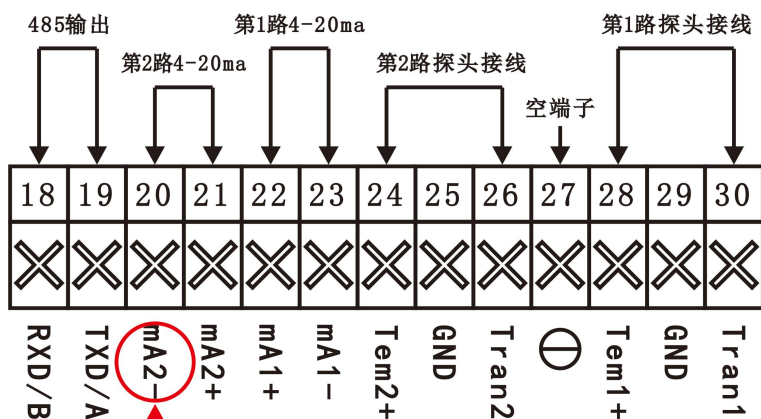
5. Communication line connection method:

485 wiring: 485A connects to the "TXD/A" terminal, 485B connects to the "RXD/B" terminal.

232 wiring: TXD connects to the "TXD/485A" terminal, RXD connects to the "RXD/485B" terminal.

The ground wire of 232 connects to the "mA2-" terminal.

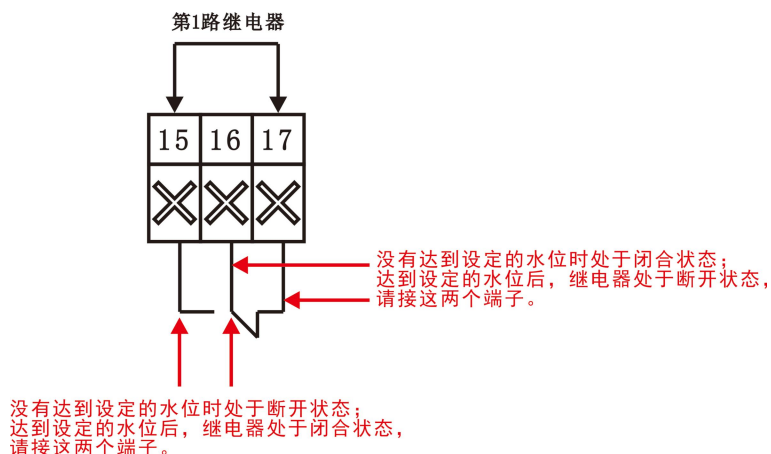
232 output wiring method:



在232输出的前提下，这个端子作为232的“GND”。

6. The relay is a single-pole double-throw relay. The first relay is connected to ALM1 (terminal 16 is the common terminal, 16 and 17 are normally closed, 16 and 15 are normally open), and the second relay is connected to ALM2 (terminal 13 is the common terminal, 13 and 14 are normally closed, 13 and 12 are normally open). The relay output wiring method is as follows:

Take the wiring of "Relay 1" as the standard, and all relay wiring is the same.



5. Operating Instructions

The Ultrasonic sludge blanket which have Chinese and English menu and simple setup, can meet different requirement from customer. Normally, After followed installation instruction, then setup several parameters, it will start to work.

Our products can be debugged through three keys on the panel. Then, the measured value is showed by LED.



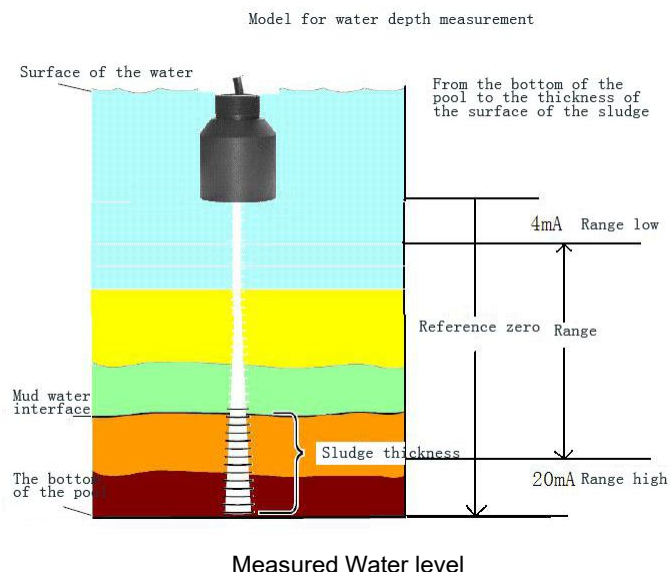
- ◇ Enter to menu
- ◇ Confirm menu
- ◇ Confirm parameter calibration
- ◇ Move the cursor
- ◇ Select the menu
- ◇ parameter calibration

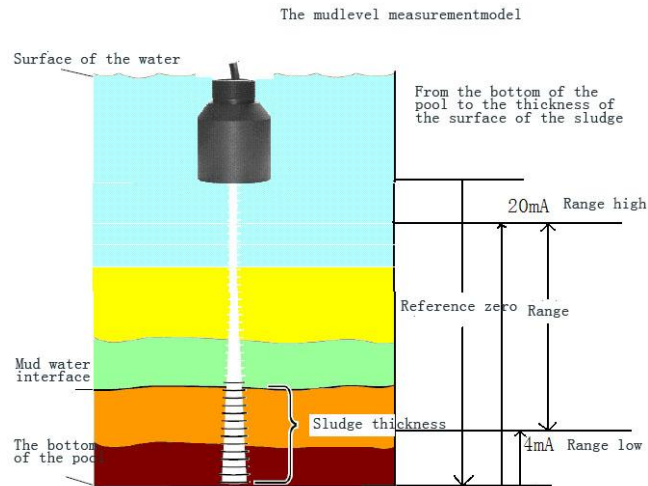
1. After switched on of the sludge blanket, press the SET key for two second and enter the first level menu.

2. Measured Mode:

Two types: Measured water level and Measured Sludge blanket, The factory default is Measured Sludge blanket.

3. The height value of probe input to the "reference zero". (the height of probe is the distance from the launch of probe to the bottom)





Measured Sludge blanket

Low point range sound velocity Calibration: the distance value from reference surface to it.

The value is positive (+), when it is higher than reference surface.

The value is negative(-), when it is lower than reference surface.

The output is 4mA under this set value.

High range point: the distance value from reference surface to it.

The value is positive (+), when it is higher than reference surface.

The value is negative (-), when it is lower than reference surface.

The output is 20mA under this set value.

4. Work with delay:

Enter alarm setting and setup the following three parameters.

①Alarm mode:

High level alarm, Low level alarm and Closed.

②Alarm value:

High level alarm: the sludge is higher than alarm value, it alarms

Low level alarm : the sludge is lower than alarm value, it alarms.

③Difference: It is used for preventing alarm switch beating repeatedly which caused by measurement errors near the alarm point.

High level alarm status: the sludge level is lower than (Alarm value -difference), then cancel the alarm.

Low level alarm status: the sludge level is higher than (Alarm value +difference), then cancel the alarm.

5. The probe and algorithm selection, parameter Correction should be setting under the guidance of professional and technical personnel.

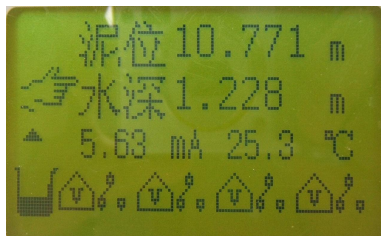
6. Suggestion: When this model connecting interference these devices such as motor, frequency converter, PLC, we'd better put the isolator in the middle of them with grounding. If there is no direct connection, please keep enough distance to reduce the above equipment electromagnetic interference.

6.Settings

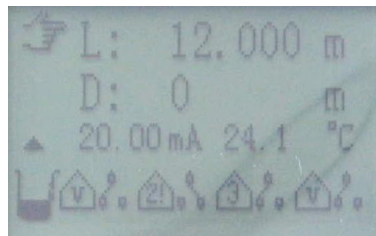
6.1 The introduction of running mode

This series of ultrasonic sludge blanket has two modes: running mode and setup mode.

After switched on and complete the initialization process, It will enter running mode automatically and start to measure data. Meanwhile measurement model is sludge blanket, output is 4 -20mA. Current output is proportional to the sludge level.



Chinese Mode



English Mode

Running Mode

6.2 Enter the menu

Menu interface and operating instructions :

please select "1 factory set" and enter to the first level menu.

```

0 Quit
1 Factory Set
2 User Set
    
```

6.3 The first level menu instruction

● No locked parameters

1. Move "▲" key and "▼" key , then modify the menu , press "SET" key enter and back this menu.

2. Back to menu, press "SET" key.

```

0 Quit
1 Parameter Lock
2 Range Set
3 Measure Type
    
```

```

4 Transducer Set
5 Algorithm Select
6 Alarm Setting
7 Calibration
    
```

```

8 Communication
9 Reset Selection
    
```

● 1 Parameter Lock

```

0 Quit
1 Unlock
2 Lock
    
```

◆0 "Quit"

Select this key, press the SET key and back the running mode.

```

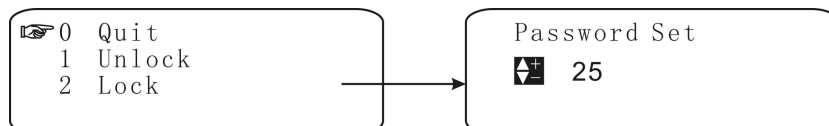
0 Quit
    
```

◆1 "Unlock"

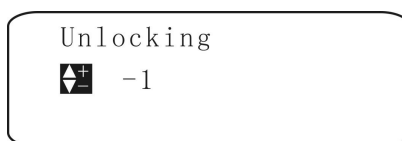
The menu have no lock, it can allow to change by others.

◆2 "Lock "

After set all the parameters, you can lock the menu, then it can' t be change by others. You can start to operate the menu When you input the password. The factory default password is 25, which can be modified by user. (Note: please remember the password by yourself, contact the factory after forgot the password.



★the parameters is locked, press SET key and enter the unlock interface :



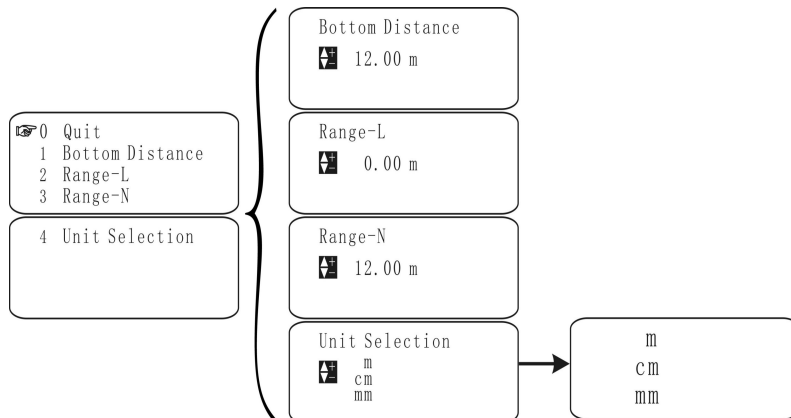
● 2 Range Set

Bottom Distance: Settings interface reference zero, this is meaningful only when material level measurements.The factory default is the biggest range.

Range-L: Set the measured value corresponding output 4mA.The factory default is 0.

Range-N: Set the measured value corresponding output 20mA .The factory default is maximum range.

Unit Selection: m、 cm、 mm , the factory default is cm.

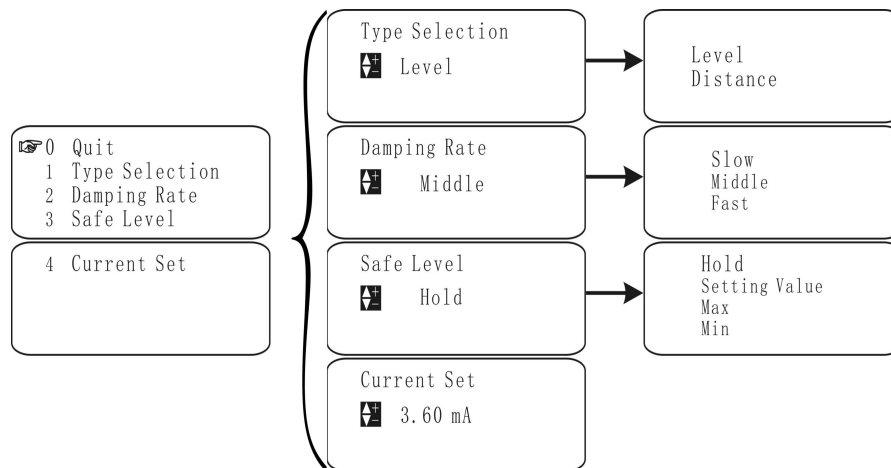


● 3 Measure Type

Mode : Water measured and Sludge measured..

- water measured: display value of the distance from probe to cut-off sludge.
- sludge measured: display value of the distance is the height of sludge from reference zero to cut-off sludge.
- The factory default is sludge measurement.Speed: Slow, Medium , Fast.
- Slow: Slow response rate, high measurement precision, No interference
- Medium : the middle of slow and fast.
- Fast: Slow response rate, high measurement precision, interference
- The factory default is Medium.Sludge level(Safa Level): Hold、 Min, Max, Setting Value.

- Hold: After lost wave, the display value is the final measured values, the current for the corresponding value.
- Min: After lost wave, the display value is 4mA, current is 4mA
- Max: After lost wave, the display value is 20mA, current is 20mA
- Setting Value: After lost wave, the display value is the final measured value, the output is setting value of current. The factory default is Maintain.
- Current : After lost wave, setup the output current, the parameter is more then 3.6mA, less than 22mA. Then select one of them: Maintain、 Minimum, Maximum and no effect. The default is 3.6mA.



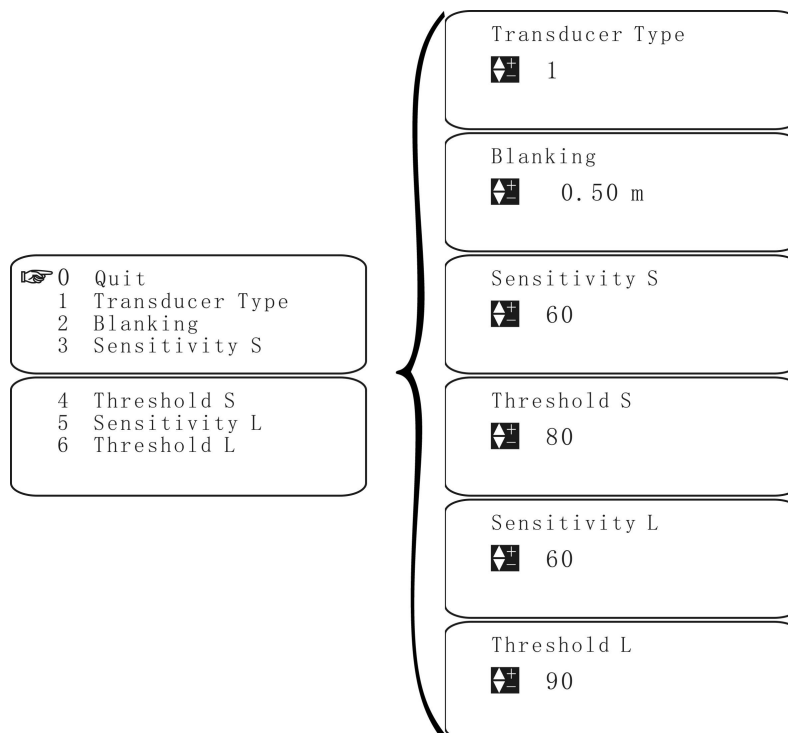
● 4 Transducer Set (DO NOT Modify them)

Probe selection and setup parameters.

Probe selection : options: from 1 to 9 and according to the label on the probe. The factory default is 5.

Blind Setting : set the proximal blind area of the probe.

The factory default is 0.30.



● 5 Algorithm Select (DO NOT Modify them)

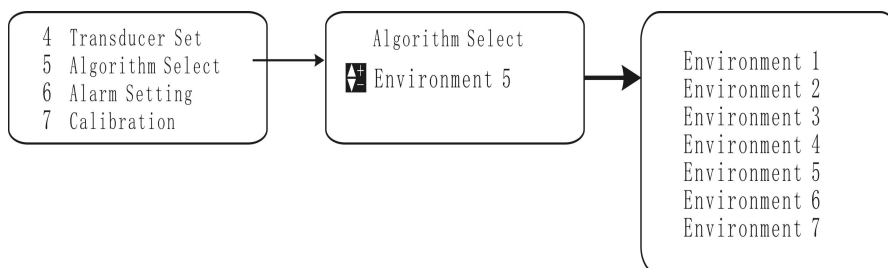
Options: special environment 1, special environment 2

special environment 3, special environment 4,

special environment 5, special environment 6,

special environment 7.

The factory default is special environment 7.



● 6 Alarm setting

◆ Setup the alarm of delay.

Alarm 1 mode: Closed, Low alarm, High alarm.

Closed: No function of Relay 1

Low alarm: Low alarm of Relay 1;

High alarm: High alarm of Relay 1.

The factory default is Closed.

The alarm 1 value: Units as M, the factory Default is 0.

The alarm 1 difference: Units as M, when alarm need to be cancel, the measured value (alarm value+/-difference value) is effective. The factory default is 0.

Alarm backlash can also make a relay to control the whole process of the water pump from low level to high level.

1.Eg: used for the Sludge discharge: the sludge level is less than 1M, the pump stop working; the water level rise to 5m, the pump start to work.

The specific setting is as bellow:

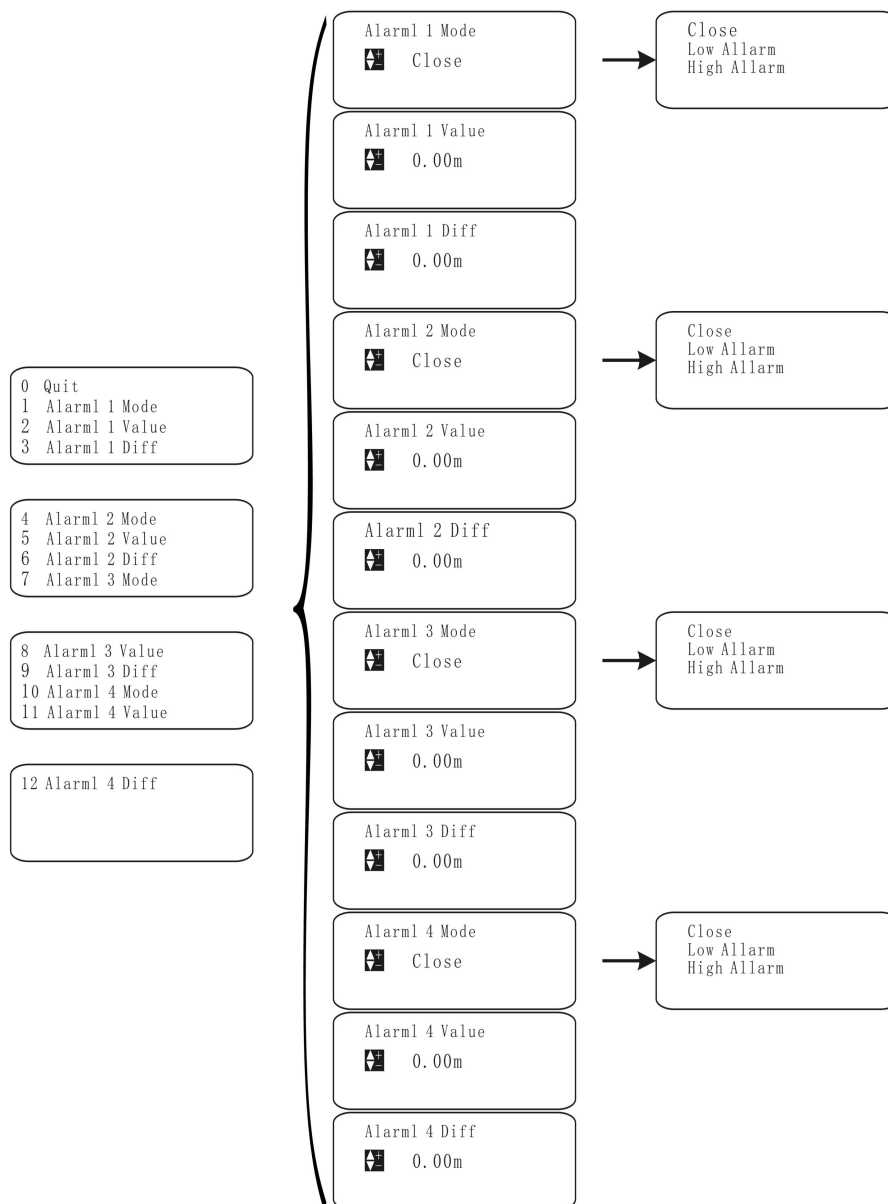
Alarm 1 mode : High Alarm. Value : 5.00m ; Difference : 4.00m.

2.Eg: used for the adding sludge: the sludge level is less than 1M, the pump start to add the sludge; the water level rise to 5m, the pump stop working..

The specific setting is as bellow:

Alarm 1 mode : Low Alarm. Value : 1.00m ; Difference : 4.00m.

Mode of alarm 2, alarm 3, 4 alarm setting is the same as above.



7 Calibration (Note: DO NOT Modify these Parameters)

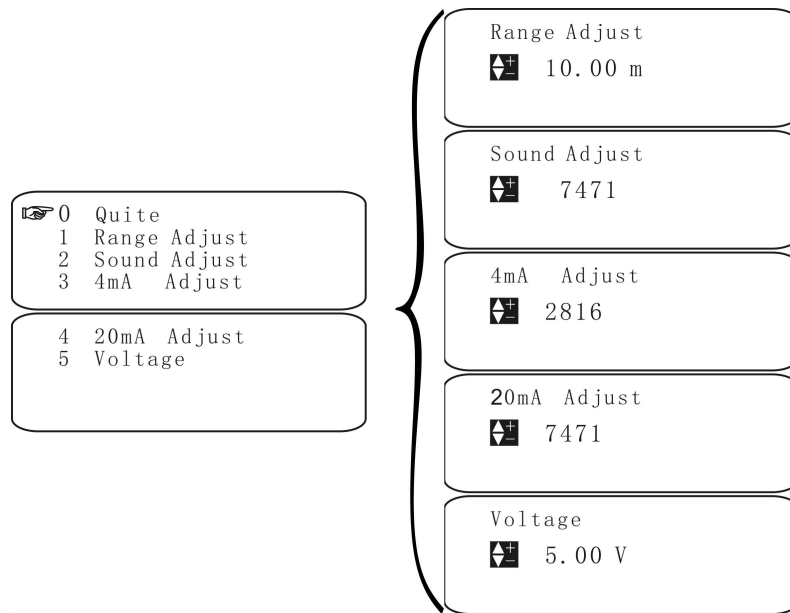
Range Calibration: Input the actual value, the system revise range automatically. The factory default is the measured value.

Sound Velocity Calibration: Input the actual value, the system calibrate sound velocity automatically. The application of liquid occasion are Gasoline, acetone, alcohol except water and the speed of sound propagation is different through these occasion.

4mA Calibration: Modify the value until the actual output current for 4mA. The factory default value is 3100.

20mA Calibration: Modify the value until the actual output current for 20mA. The factory default value is 7200.

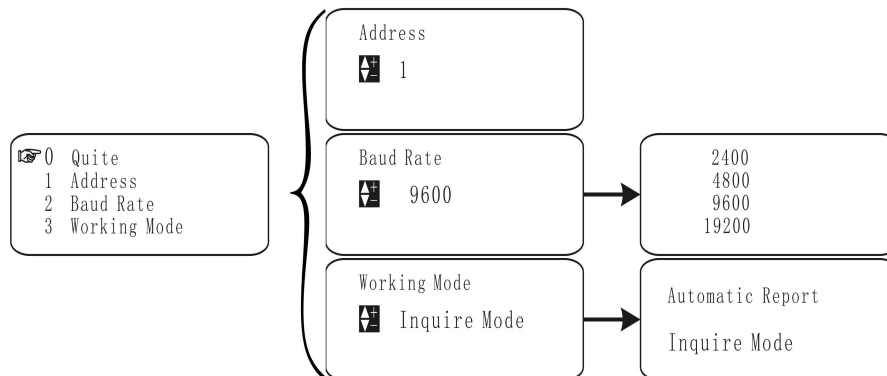
Reference Level: Enter the appropriate voltage values measured at test point. The factory default value is 5.00.



● 8 Communication

Address : Select the communication address, the factory default is 1. When 485 is selected, the device of same article 485 on the bus must be set different address, if the address is same, the data from the two devices of same address can't upload.

Baud rate : There are four types of baud rate include 2400, 4800, 9600 and 19200 to select, the factory default value is 9600.

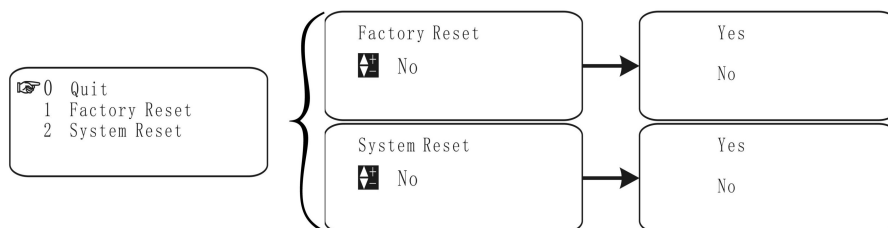


● 9 Reset Selection

Factory Reset : Yes: Restored to the state of factory setting. No: exit. The default setting is No.

System Reset : Yes : Restored to the state of factory setting. No: exit. The default setting is No.

Note: Before resetting the system, you need to record the following menu contents: reference zero, low range point, high range point, 4mA calibration value, 20mA calibration value, communication address, baud rate, and operating mode. After resetting the system, you need to change the values in these menus to the recorded values.



7. Error Symptoms and Solutions

7.1 The meter is not working

7.1.1 The power supply is not connected properly

Solution: Check that the power cord is properly connected and use a meter to test the voltage to ensure it is normal.

7.1.2 The power supply voltage is below a certain value

Solution: The power supply voltage needs to be adjusted to normal.

7.1.3 The power module or power circuit inside the meter is burned out

Solution: Return the meter to the factory for repair

7.1.4 Water vapor, water, or corrosion has entered the meter

Solution: Return the meter to the factory for repair or replace the entire circuit board. Check for high humidity and condensation, or for inadequate waterproofing.

7.2 The meter is working but has no display

7.2.1 The power supply is not connected properly

Solution: Check the power cord connection and measure the supply voltage to ensure it meets the minimum requirements of the meter.

7.2.2 The connection between the LCD and the mainboard is disconnected or loose

Solution: Check the connection and reconnect it.

7.2.3 LCD Screen Damaged

Solution: Return to factory for repair.

7.2.4 LCD Screen Non-Display Due to Low Temperature

Solution: This is usually caused by temperatures below -20°C . The LCD screen will display after the temperature rises.

7.2.5 LCD Screen Non-Display Due to High Temperature

Solution: This is caused by the ambient temperature exceeding 80°C . The ambient temperature does not meet the requirements. The instrument needs to be placed in an environment with an ambient temperature below 80°C .

7.3 The instrument is operating, but the screen displays "Loss of Waves"

7.3.1 The measured distance exceeds the range

Solution: Consider replacing an instrument with a larger measuring range than the current one.

7.3.2 The measured medium is being stirred, disturbed, vibrated, or subjected to water impact.

Solution: Wait until the measured medium calms down; the device will automatically resume normal measurement. Alternatively, find a more stable location for installation.

7.3.3 Strong interference sources such as inverters and motors are present in the surrounding area or power supply.

Solution:

- ① Check the equipment using the same power supply as the instrument and ensure proper electromagnetic shielding. Do not use the same power supply as an inverter or motor.
- ② If it's unavoidable to use the same power supply as a frequency converter or motor, use a 220VAC to 220VAC isolation transformer to filter electromagnetic interference from the power supply. An isolation transformer can only block some electromagnetic interference, not all. If, even after installing an isolation transformer, you still experience significant ripple and interference from pulse groups exceeding 2000V, using a linear power supply for secondary filtering can resolve the issue.

- ③ When connecting the instrument's 4-20mA or 485V output signal to interference-prone devices such as frequency converters and PLCs, it's best to use a signal isolator.
- ④ Ensure the instrument is reliably grounded. Ground it independently and don't share a common ground with other on-site equipment.
- ⑤ If there are nearby interference sources such as frequency converters, motors, and AC contactors, maintain a distance of at least 5 meters from these devices to reduce electromagnetic interference transmitted through the air from these devices.

7.3.4 Probe Misaligned with the Surface Under Test

Solution: Reinstall the probe perpendicular to the surface under test. A 2-3° deviation between the probe and the surface under test is not a problem.

7.3.5 The mud-water interface has entered the blind zone

Solution:

- ① Raise the probe installation position so that the distance between the probe and the highest mud-water interface is greater than the blind zone.
- ② Lower the high-level alarm value in the on-site system so that the mud-water interface does not enter the blind zone and the system begins to drain mud.

7.3.6 Excessive foam in the water

Solution:

- ① Filter the foam at the water inlet.
- ② Add defoaming agent.
- ③ Place the instrument where the foam is less likely to form.

7.3.7 Install near the water inlet or outlet

Solution: Keep away from the water inlet and outlet to avoid the impact of water flow.

7.3.8 High sediment content in the water

Solution:

- ① Wait for the sediment to settle before measuring.
- ② Add flocculant to allow suspended particles and flocs in the water to settle. Measure after sedimentation is complete.
- ③ If the height from the water surface to the bottom is greater than 5 meters, a 50kHz low-frequency probe can be used to measure the surface to see if it can penetrate the mud and sand and measure the true mud-water interface.

7.4 The measured mud level differs significantly from the actual level or fluctuates.

7.4.1 The probe's installation height from the pool bottom is set differently than the actual level.

Solution: Re-determine the probe's height from the pool bottom and enter the actual height into the "Reference Zero" setting.

7.4.2 The probe is not aligned with the measured surface.

Solution: Re-install the probe perpendicular to the measured surface. A 2-3° deviation between the probe and the measured surface is not a problem.

7.4.3 There are unnecessary obstructions within the measured area.

Solution: If there are unnecessary obstructions within the measured area, such as support rods, discharge ports, protrusions, or scrapers, re-select an appropriate installation location. Ensure that no obstructions are within the ultrasonic transmission range of the probe.

7.4.4 The power supply has strong electromagnetic interference.

Solution:

- ① Check the equipment using the same power supply as the instrument and ensure proper electromagnetic shielding. Do not use the same power supply as the inverter or motor.
- ② If using the same power supply as the inverter or motor is unavoidable, use a 220VAC to 220VAC isolation transformer to filter electromagnetic interference from the power supply. Isolation transformers can only block some electromagnetic interference, not all.

If significant ripple, group pulses above 2000V, or other interference is still detected on the power supply after installing the isolation transformer, using a linear power supply for secondary filtering can resolve the issue.

7.4.5 Electromagnetic Interference Transmitted from the 4-20mA Signal Output Line

Solution:

- ① Install a passive signal isolator between the instrument's 4-20mA output terminal and the PLC, DCS, or inverter.
- ② If the signal isolator provides normal measurements when installed close to the meter, but abnormal measurements when installed inside the PLC or DCS cabinet, this indicates that the 4-20mA output line and the 220VAC or 380VAC power line are not routed separately and are in the same cable tray, causing interference from the power supply of high-power equipment.

7.4.6 Electromagnetic Interference Transmitted from the 485 Signal Output Line.

Solution:

- ① Install a passive signal isolator between the meter's 485 output terminal and the PLC, DCS, or inverter.
- ② If the signal isolator provides normal measurements when installed close to the meter, but abnormal measurements when installed inside the PLC or DCS cabinet, this indicates that the 485 signal line and the 220VAC or 380VAC power line are not routed separately and are in the same cable tray, causing interference from the power supply of high-power equipment.

7.4.7 Electromagnetic Interference Transmitted from the Air.

Solution: Electromagnetic interference transmitted from the air, for example, can occur when the instrument is near an inverter, motor, or other high-power equipment.

- ① Avoid installing the instrument in the same electrical cabinet as other high-interference devices.
- ② Install the instrument separately in a metal instrument box that is grounded.
- ③ Keep the instrument box at least 5 meters away from these high-interference devices.

7.4.8 Normal operation, but data jumps when the pump starts

Solution:

- ① If the AC contactor is the cause, add an RC snubber circuit to the AC contactor wiring. R is 47R/1W, and C is 104/630V to reduce interference.
- ② If the AC contactor is the cause, install the instrument in a metal electrical box at least 5 meters away from the AC contactor.
- ③ If the instrument power cable and the 380VAC pump power cable are in the same cable tray or close together, add an isolation transformer to the instrument. The external power supply should enter the instrument power terminals through the isolation transformer.
- ④ If the instrument signal line and the water pump 380VAC power line are in the same wire trough or close to each other, a signal isolator should be added at the instrument end. The instrument output signal should pass through the signal isolator before entering the PLC or DCS.

8. Communication Protocol

MODBUS—RTU Communication Protocol

8.1 Hardware Operating Mode

The hardware uses RS-485, master-slave half-duplex communication, with the master calling the slave address and the slave responding.

8.2 Data Frame Specifications

The data frame is 10 bits: 1 start bit, 8 data bits, 1 stop bit, no parity.

Baud Rate: 2400, 4800, 9600, 19200 (default is 9600)

8.3 Function code 03H: Read register value

Host sends:

1	2	3	4	5	6	7	8
ADR	03H	Starting Register High Byte	Starting Register Low Byte	Register Count High Byte	Register Count Low Byte	CRC Low Byte	CRC High Byte

Byte 1 – ADR: Slave address code (range = 001 to 254)

Byte 2 – 03H: Function code for reading register values

Bytes 3–4: Starting address of the registers to be read

Bytes 5–6: Number of registers to read

Bytes 7–8: CRC16 checksum from byte 1 to byte 6

When the slave receives the request correctly, it responds with:

1	2	3	4、5	6、7		M-1、M	M+1	M+2
ADR	03H	Total bytes	Register data 1	Register data 2	...	Register data M	CRC Low Byte	CRC High Byte

Byte 1 – ADR: Slave address code (range = 001 to 254)

Byte 2 – 03H: Function code for reading register values

Bytes 3–4: Starting address of the registers to be read

Bytes 5–6: Number of registers to read

Bytes 7–8: CRC16 checksum from byte 1 to byte 6

When the slave receives the request correctly, it responds with:

1	2	3	4	5
ADR	83H	Exception Code	CRC low byte	CRC high byte

Byte 1 – ADR: Slave address code (range = 001 to 254)

Byte 2 – 83H: Error response code for read register failure

Byte 3 – Exception Code: Refer to the exception code table

Bytes 4–5: CRC16 checksum from Byte 1 to Byte 3

8.4 Function Code 06H: Write Single Register Value

Host sends:

1	2	3	4	5	6	7	8
ADR	06H	Register address high byte	Register address low byte	Data high byte	Data low byte	CRC Low Byte	CRC High Byte

When the slave receives the data correctly, it sends back:

1	2	3	4	5	6	7	8
ADR	06H	Register high byte	Register low byte	Data high byte	Data low byte	CRC Low Byte	CRC High Byte

When the slave receives an error, it sends back:

1	2	3	4	5
ADR	86H	Error Code	CRC low byte	CRC high byte

8.5 Function Code 10H: Continuously Write Multiple Register Values

Host Sends:

1	2	3	4	5	6	7
ADR	10H	Starting register address high byte	Starting register address low byte	Register count high byte	Register count low byte	Total number of data bytes

8、9	10、11	N、N+1	N+2	N+3
Register data 1	Register data 2	Register data M	CRC code low byte	CRC code high byte

When the slave receives the request correctly, it responds with:

1	2	3	4	5	6	7	8
ADR	10H	Starting Register High Byte	Starting Register Low Byte	Register Count High Byte	Register Count Low Byte	CRC Low Byte	CRC High Byte

When the slave receives an error, it sends back:

1	2	3	4	5
ADR	90H	Error Code	CRC low byte	CRC high byte

Byte 1 – ADR: Slave address code (range = 001 to 254)

Byte 2 – 90H: Error function code indicating a write register failure

Byte 3 – Exception Code: Refer to the exception code table

Bytes 4–5: CRC16 checksum from Byte 1 to Byte 3

8.6 Register Definition Table

(Note: Register addresses are encoded in hexadecimal)

ADR	Description	Read-Only	ADR	Description	Read-Only
0000	Instantaneous water depth/mud level (2 bytes, most significant byte first)	√	0001	Analog output instantaneous value (2 bytes, MSB first)	√
0002	Instantaneous temperature (2 bytes, most significant byte first)	√	0003	Reserved	
0004	Reserved		0005	Reserved	
0006	Reserved		0007	Reserved	
0008	Reserved		0009	Reserved	
000A	Reserved		000B	Reserved	
000C	Reserved		000D	Reserved	
000E	Reserved		000F	Reserved	
0010	Reserved	√	0011	Reserved	√
0012	Reserved	√	0013	Reserved	
0014	Reserved		0015	Reserved	
0016	Reserved		0017	Reserved	
0018	Reserved		0019	Reserved	
001A	Reserved		001B	Reserved	
001C	Reserved		001D	Reserved	
001E	Reserved		001F	Reserved	
0020	Reserved		0021	Reserved	
0022	Alarm 1 Value (2 bytes, high byte first)		0023	Alarm 1 Hysteresis Value (2 bytes, high byte first)	
0024	Alarm 2 Value (2 bytes, high byte first)		0025	Alarm 2 Hysteresis Value (2 bytes, high byte first)	
0026	Alarm 3 Value (2 bytes, high byte first)		0027	Alarm 3 Hysteresis Value (2 bytes, high byte first)	
0028	Alarm 4 Value (2 bytes, high byte first)		0029	Alarm 4 Hysteresis Value (2 bytes, high byte first)	
002A	Reference Zero Point (2 bytes, high byte first)		002B	Measuring Range High Limit (2 bytes, high byte first)	
002C	Measuring Range Low Limit (2 bytes, high byte first)		002D	Set Current Output (2 bytes, high byte first)	
002E	Blind Zone Setting (2 bytes, high byte first)		002F	Reserved	
0030	Reserved		0031	Reserved	
0032	Reserved		0033	Reserved	
0034	Reserved		0035	Reserved	
0036	Reserved		0037	Reserved	
0038	Reserved		0039	Reserved	
003A	Reserved		003B	Reserved	
003C	Reserved		003D	Reserved	

003E	Reserved		003F	Reserved	
0040	Reserved		0041	Reserved	
0042	Reserved		0043	Reserved	
0044	Reserved		0045	Reserved	
0046	Reserved		0047	Reserved	
0048	Reserved		0049	Reserved	
004A	Reserved		004B	Reserved	
004C	Reserved		004C	Reserved	
004E	Reserved		004F	Reserved	
0050	Reserved		0051	Reserved	
0052	Reserved		0053	Reserved	
0054	Reserved		0055	Reserved	
0056	Reserved		0057	Reserved	
0058	Reserved		0059	Reserved	
005A	Reserved		005B	Reserved	
005C	Alarm 1 Mode Alarm 2 Mode		005D	Alarm 3 Mode Alarm 4 Mode	
005E	Measurement Mode Unit Selection		005F	Algorithm Selection Safety Level	
0060	Probe Type Response Speed		0061	Factory Reset System Reset	
0062	Baud Rate Operating Mode		0063	Reserved	
0064	Reserved		0065	Reserved	
0066	Reserved		0067	Reserved	
0068	Reserved		0069	Reserved	
006A			006B	Meter type word √ Instrument address	