User Manual

Supmea

Ultrasonic mud level meter

Supmea

Headquarters
5th floor,Building 4,Singapore Hangzhou Science Technology Park,No. 6 street,
Hangzhou Economic Development Area,Hangzhou 310018,China

Singapore
2 Venture Drive #11-30 Vision Exchange Singapore

info@supmea.com

www.supmea.com

Supmea Automation Co.,Ltd.

U-SUP-JFC-EN1

Preface

Thank you for purchasing our product. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by false operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- This product is forbidden to use in explosion-proof occasions.

Version

U-SUP-JFC-EN1

Safety Precautions

In order to use this product safely, be sure to follow the safety precautions described.

About this manual

- Please submit this manual to the operator for reading.
- Please read the operation manual carefully before applying the instrument. On the precondition of full understanding.
- This manual only describes the functions of the product. The company does not guarantee that the product will be suitable for a particular use by the user.

Precautions for protection, safety and modification of this product

- To ensure safety of this product and the systems it controls, Please read carefully the operation manual and understand the correct application methods before putting into operation, to avoid unnecessary losses due to operation mistakes. If the instrument is operated in other ways not described in the manual, the protections that the instrument give may be destroyed, and the failures and accidents incurred due to violation of precautions shall not be borne by our company.
- When installing lightning protection devices for this product and its control system, or designing and installing separate safety protection circuits for this product and its control system, it needs to be implemented by other devices.
- If you need to replace parts of the product, please use the model specifications specified by the company.
- This product is not intended for use in systems that are directly related to personal safety.Such as nuclear power equipment, equipment using radioactivity, railway systems, aviation equipment, marine equipment, aviation equipment and medical equipment.If applied, it is the responsibility of the user to use additional equipment or systems to ensure personal safety.

- Do not modify this product.
- The following safety signs are used in this manual:

Hazard, if not taken with appropriate precautions, will result in serious personal injury, product damage or major property damage.

Warning:Pay special attention to the important information linked to product or particular part in the operation manual.

- Confirm if the supply voltage is in consistent with the rated voltage before operation.
- Don’t use the instrument in a flammable and combustible or steam area.
- To prevent from electric shock, operation mistake, a good grounding protection must be made.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at is-electric level, shielded, wires shall be located rationally, SPD surge protector shall be applied properly.
- Some inner parts may carry high voltage. Do not open the square panel in the front except our company personnel or maintenance personnel acknowledged by our company, to avoid electric shock.
- Cut off electric powers before making any checks, to avoid electric shock.
- Check the condition of the terminal screws regularly. If it is loose, please tighten it before use.
- It is not allowed to disassemble, process, modify or repair the product without authorization, otherwise it may cause abnormal operation, electric shock or fire accident.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine or other organic solvents. Prevent all kinds of liquid from splashing on the

product. If the product falls into the water, please cut off the power immediately, otherwise there will be leakage, electric shock or even a fire accident.

- Please check the grounding protection status regularly. Do not operate if you think that the protection measures such as grounding protection and fuses are not perfect.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life and fire.
- Please strictly follow the instructions in this manual, otherwise the product's protective device may be damaged.

- Don’t use the instrument if it is found damaged or deformed at opening of package.
- Prevent dust, wire end, iron fines or other objects from entering the instrument during installation, otherwise, it will cause abnormal movement or failure.
- During operation, to modify configuration, signal output, start up, stop, operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and controlled equipment.
- Each part of the instrument has a certain lifetime, which must be maintained and repaired on a regular basis for long-time use.
- The product shall be scrapped as industrial wastes, to prevent environment pollution.
- When not using this product, be sure to turn off the power switch.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact us in time.

Disclaimer

- The company does not make any guarantees for the terms outside the scope of this product warranty.
- This company is not responsible for damage to the instrument or loss of parts or unpredictable damage caused directly or indirectly by improper operation of the user.

No.	Name	Quantity	Note
1	Ultrasonic mud level meter	1	
2	Manual	1	
3	Certificate	1	

After opening the box, please confirm the package contents before starting the operation.If you find that the model and quantity are incorrect or there is physical damage in appearance, please contact us.

Content

Chapter 1 Simple Setting Operation Instructions

The ultrasonic mud level m, featuring a full Chinese menu interface, allow for easy configuration to satisfy diverse requirements. Typically, by adhering to the installation guidelines provided in the manual, the device is ready for use upon setting a few specific param post-installation.

The panel includes three buttons used for instrument calibration. The liquid crystal display shows the measurement values after calibration.

Function: 1. Enter menu item, 2. Exit current menu item, 3. Confirm parameter modification.

Function: 1.Navigate the cursor, 2. Adjust param.

(1) To enter the main menu, press and hold the SET button for two seconds when the device powers on.

(2) Select the Measurement Type:

There are two modes: water depth and mud level measurement, with mud level as the default factory setting.

(3) Input the probe’s height into the “Reference Zero Point”.

The height of the probe is the distance from the probe's emission surface to the bottom of the pool.

In water depth measurement type, the reference zero point setting is not applicable and does not require configuration. The locations for the range high point and range low point are indicated in the following figure.

Water depth measurement type:Measure the water depth from the sensor emission surface to the mud moisture interface.

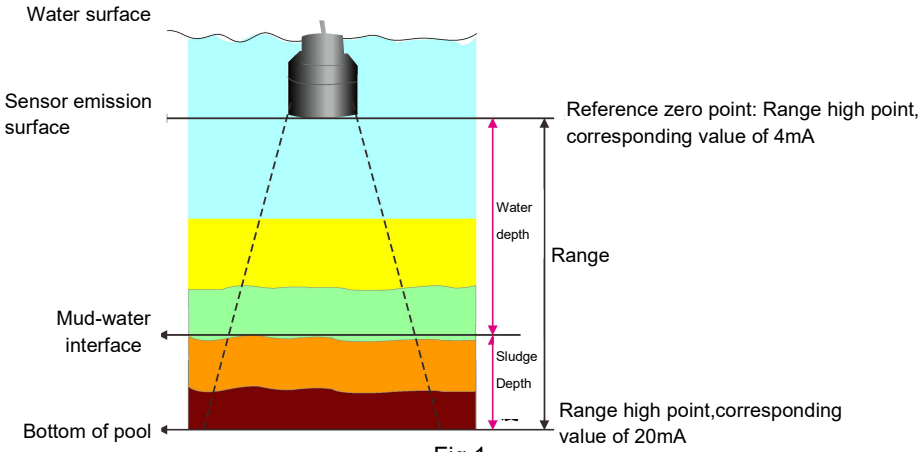

Fig.1

In the mud level measurement type, see the figure below for the positions of the reference zero point, range high point, and range low point.

Mud level measurement type: Measure the thickness of mud from the bottom of the water tank to the mud moisture interface

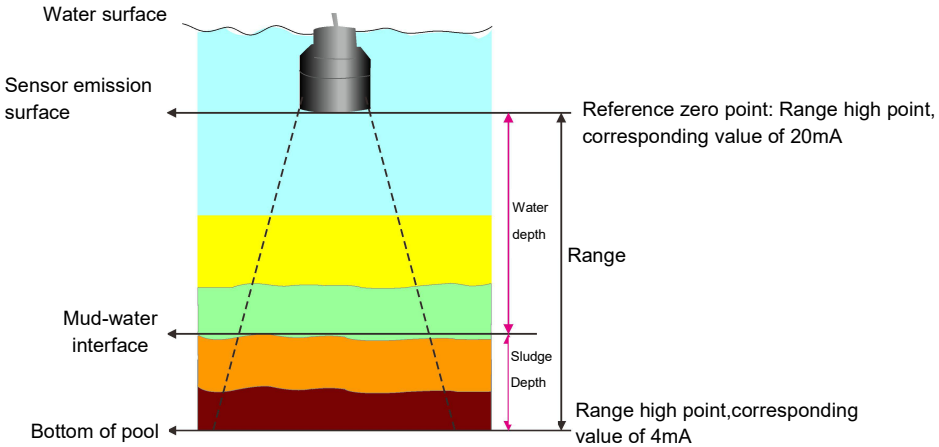

Fig.2

Range Low Point (corresponding to 4mA value):
In water depth Measurement Type: Typically, the probe's emission surface is considered the range low point, indicating a water depth of 0.00 m. This setting can be customized.
In mud level Measurement Type: Generally, the bottom of the pool is regarded as the range low point, indicating a mud level of 0.00 m. This setting can also be customized.

Range High Point (corresponding to 20mA value):
In water depth Measurement Type: The bottom of the pool is commonly set as the range high point, where the high point of the water depth range equals the vertical height from the probe's emission surface to the bottom of the pool. This can be defined by the user.
For instance: If the vertical height from the probe's emission surface to the bottom of the pool is 7.50 m after installation, the range high point is typically set to 7.50 m.
If necessary, the range high point can be adjusted to 7.00 m or 6.00 m. However, it should not exceed 7.50 m; it can only be equal to or less than 7.50 m.

In mud level Measurement Type: Typically, the height of the probe's emission surface is set as the range high point, where the high point of the mud level range equals the vertical height from the probe's emission surface to the bottom of the pool. This can be user-defined as well.
For example: If the vertical height from the installed probe's emission surface to the bottom of the pool is 5.30 m, then the range high point is usually set to 5.30 m.
If necessary, the range high point can be adjusted to 5.00 m or 4.00 m, but it must not exceed 5.30 m; it can only be equal to or less than 5.30 m.

Regarding relays: Options include 2-way relays or 4-way relays.
"Probe Selection "Parameter Calibration", and "Algorithm Selection" by default do

not require adjustment and should only be modified in the presence of electromagnetic interference or obstacle interference during measurement. It is advised to adjust these settings under the guidance of a professional technician.
Suggestion: When connecting the ultrasonic mud level meter to devices like electric motors, frequency converters, or PLCs that may cause interference, it is recommended to use an isolator in between and ensure reliable grounding. If a direct connection is not made, please maintain sufficient distance to minimize electromagnetic interference from these devices.
Caution: Especially for the wiring between the sensor and the main unit, do not run it in the same conduit as the 220VAC or 380VAC power cables. The sensor wires should be at least 50 centimetres away from 220VAC power lines and at least 100 centimetres away from 380VAC power lines.
If the sensor wires must be laid in the same cable tray as the AC power cables and the aforementioned distances cannot be maintained, then shield the wires using galvanized pipes to prevent interference from the AC power. The galvanized pipes must also be reliably grounded.

Chapter 2 Introduction

The ultrasonic mud level meter, also known as an ultrasonic sludge interface meter, is a non-contact, easy-to-install and maintain instrument for measuring sludge thickness in fixed containers. It operates by transmitting ultrasonic waves through liquid to detect mud levels underwater and is a new generation of ultrasonic sludge interface m developed by the company over many years, holding proprietary intellectual property rights.

Chapter 3 Debug

As the on-site installation environments for the instruments vary, it is essential for the ultrasonic sludge interface meter to be familiar with the basic param of the measurement required before operation, such as the reference zero point (the height from the probe to the bottom of the pool), range low point (the value corresponding to 4mA), and range high point (the value corresponding to 20mA). Hence, it is imperative to configure the instrument prior to measurement.
Other: Please do not independently modify the probe selection, parameter calibration, or algorithm selection settings.

Chapter 4 Technical Parameter

4.1.Technical Parameter

Table 1 Technical Parameter

Structure	Remote-type
Range	Standard ranges : 5m、10m、15m、20m Custom ranges: 30m、40m、50m、60m、70m etc.
Measurement Accuracy	1%～3%
Resolution	5mm or 0.5% (whichever is greater)
Display	English LCD
Analog Output	4～20mA / 750Ω load
Relays Output	Single channel with 2 routes AC 250V/8A or DC 30V/5A Programmable status, up to 4 relay routes possible
Power Supply	Standard 220V AC+15% 50Hz Optional 24VDC 120mA Custom options for 12VDC or battery power available
Environmental Temperature	Display instrument: -20°C~+60°C Probe: -20°C~+80°C
Communication	Optional RS485, RS232 communication
Protection Grade	Display instrument IP65, Probe IP68
Probe Cable	Up to 100 m, standard configuration 10 m
Probe Installation	According to the range and probe selection

4.2.Power Consumption

(1) When powered by a 24V source, the power consumption is 100mA without relays, 150mA with 2-way relays, and 200mA with 4-way relays.

The specific power ratings are as follows:

Without relays: 24V × 100mA = 2.4W;

With 2-way relays: 24V × 150mA = 3.6W;

With 4-way relays: 24V × 200mA = 4.8W.

(2) When powered by a 220V AC source, the power consumption is 100mA without relays, 150mA with 2-way relays, and 200mA with 4-way relays.

The specific power ratings are as follows:

Without relays: 220V × 100mA = 22W;

With 2-way relays: 220V × 150mA = 33W;
With 4-way relays: 220V × 200mA = 44W

Chapter 5 Installation

5.1. Installation Precautions

When choosing the installation location for the sensor, the following standards should be observed:

- The sensor should be kept perpendicular to the mud surface and the bottom of the pool.
- There must be no obstacles within the emission range directly below the probe to avoid ultrasonic signal blockage and reflection.
- The probe should be installed away from areas with rapid flow changes that cause gas bubbles and active floating solids to ensure accurate and stable measurements.
- The probe should be situated away from water inlets and outlets.
- The sensor probe must be fully submerged in water. If the pool walls are vertically aligned and the surface is flat, refer to the table below to determine the distance from the pool wall.
- If the pool walls are uneven or there are objects like brackets or pipes, the distance from the pool wall should be increased to avoid measurement interference caused by these objects.

For pools, bracket mounting can be used, ensuring the bracket's load capacity is sufficient and maintaining a certain distance between the sensor and the pool wall. If the pool walls are flat, the minimum obstacle-free radius distance from the sensor, taking the sensor as the centre, is detailed in the table below:

1.200kHz Ultrasonic Probes

Table 2

Maximum Range	Minimum Radius	Maximum Range	Minimum Radius	Maximum Range	Minimum Radius
5 m	＞0.7 m	10 m	＞1.4m	15 m	＞2.1 m
20 m	＞2.8 m	30 m	＞4.2m	40 m	＞5.6 m

2.300kHz Ultrasonic Probes

Table 3

Maximum Range	Minimum Radius	Maximum Range	Minimum Radius	Maximum Range	Minimum Radius
5 m	＞0.5 m	10 m	＞1.0 m	15 m	＞1.5 m
20 m	＞2.0 m	30 m	＞3.0 m	40 m	＞4.0 m

3.50kHz Ultrasonic Probes

Table 4

Maximum Range	Minimum Radius	Maximum Range	Minimum Radius	Maximum Range	Minimum Radius
5 m	＞1.2 m	10 m	＞2.4 m	15 m	＞3.6 m
20 m	＞4.8 m	30 m	＞6.0 m	40 m	＞7.2 m

5.2.Installation Dimensions

(1) Outline drawing of the display instrument for the split-type ultrasonic sludge interface meter:

(2) Dimensional drawing of the display instrument for the split-type ultrasonic sludge interface meter

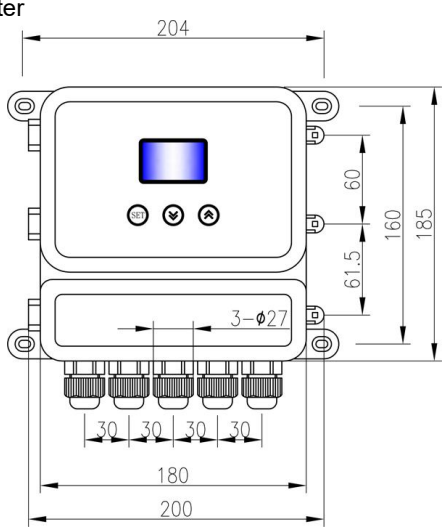

Fig.3

(3) Dimensional drawing of the probe for the split-type ultrasonic sludge interface meter series

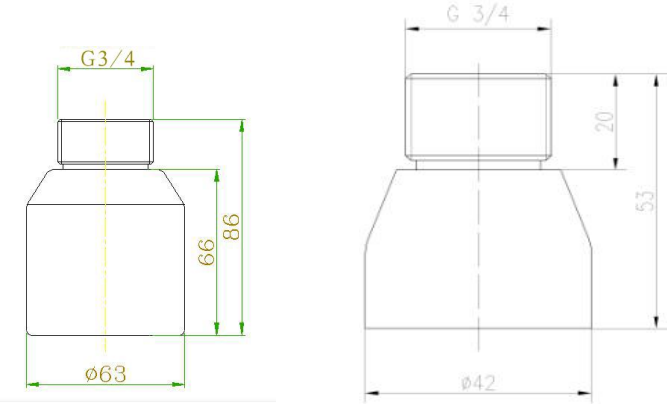

Fig.4

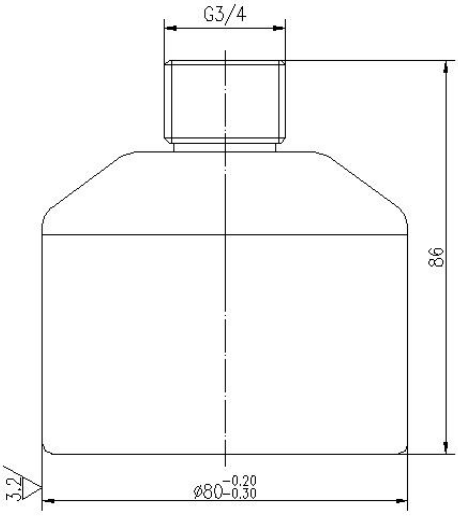

Fig.5

Chapter 6 Electrical connection

- Caution: For the split-type ultrasonic mud level meter, ensure the connection cable between the probe and the main unit is of adequate length beforehand. Do not use additional cables on-site to extend the connection. Connecting additional cables on-site can affect the signal transmission quality and strength.
- When connecting the power supply, do not connect the AC power to any terminals other than the AC power terminals. Doing so could damage the instrument's circuitry or components.
- The output terminals for 485, 232, and 4-20mA should not be short-circuited. A short circuit can cause internal circuit damage.
- The sensor's connection cable to the main unit must not be laid in the same conduit as any AC power cables. If it is unavoidable to run them in the same conduit, the sensor's cable should be encased in a metal pipe for protection, completely shielding it from electromagnetic interference from the AC power.

6.1.Connecting terminal

Electrical connection diagram for the split-type ultrasonic mud level meter:

220VAC Power Supply:

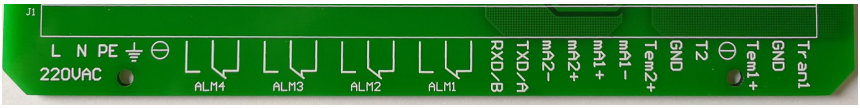

Fig.6

24VDC Power Supply:

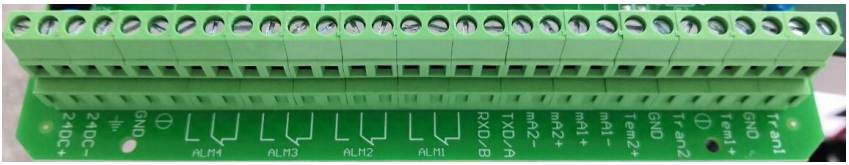

Fig.7

Electrical Connection Diagram :

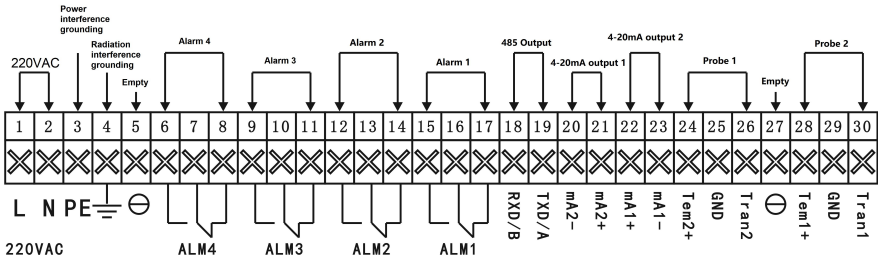

Fig.8

6.2.Wiring Method

Grounding requirements:

(1) The instrument's grounding terminal must be connected directly to the earth and not shared with other equipment's grounding terminals. This ground wire must be connected to a metal structure leading directly to the ground.

(2) Interference from the power supply is connected to terminal 3, while interference from the probe is connected to terminal 29.

(3) The grounding resistance must be less than 4 ohms.

Probe wiring: Connect the red wire to terminal 30 for Trans1, the black wire to terminal 29 for GND, and the blue wire to terminal 28 for Tem1+.

Current output wiring: Connect “Current +” to mA1 +; “Current -” to mA1-;

Relay wiring: Connect to ALM1, ALM2, ALM3, ALM4;

AC wiring: Connect to L, N.

DC wiring: Connect to 24V+, 24V-.

RS232 output wiring method:

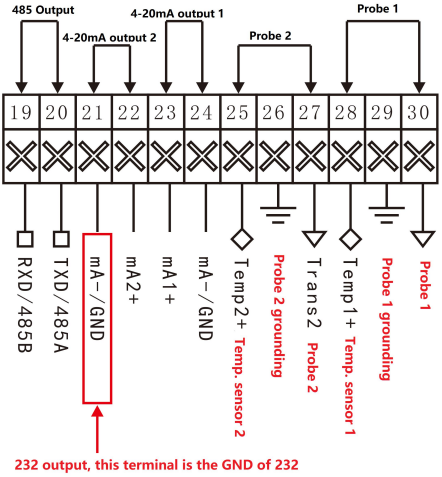

Fig.9

Relay output wiring method:

The wiring for "Relay 1" is standard; the wiring for the other relays is the same.

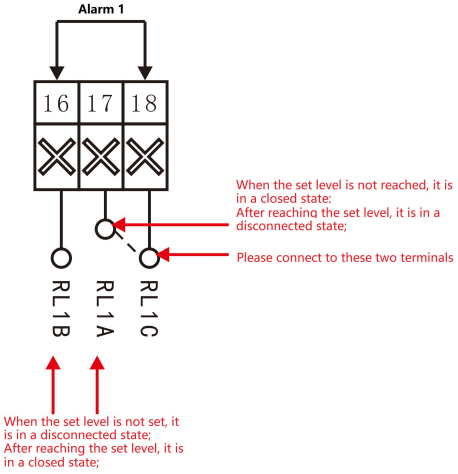

Fig.10

Chapter 7 Settings

7.1.Operating Mode Interface

This series of ultrasonic sludge interface meters and ultrasonic mud level meters have two working modes: operation and setting. After the device is powered on and the initialization process is completed, the sludge interface meter automatically enters the operating mode and begins to measure data. At this time, the measurement is in mud level Measurement Type and outputs a 4~20mA value proportionally to the mud level.

The operating mode interface of the ultrasonic sludge interface meter is as follows:

Fig.11

7.2.Menu Interface and Operation Instructions

(1) Press the Set key in the operating mode interface to enter the selection menu interface:

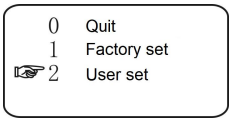

Fig.12

Press the SET key again to select "1 Factory set" to enter the primary menu.

7.2.1.Descriptions of the primary menu items

● Primary menu interface when parameters are not locked:

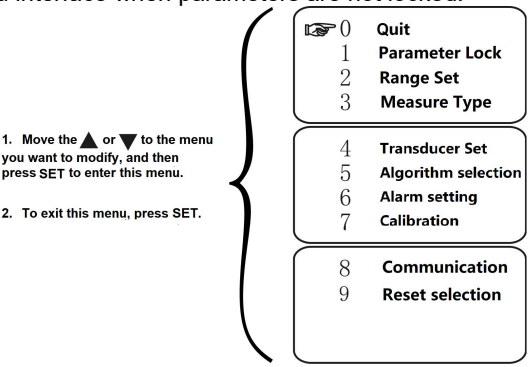

Fig.13

- Primary menu interface when parameters are locked:

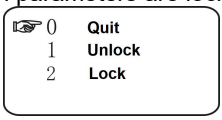

Fig.14

- “0 Quit”

When this option is selected, press the Set key to return to the operating mode interface.

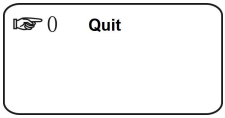

Fig.15

- "1 Unlock"
  - The menu is unlocked, allowing anyone to make changes.
- "2 Lock"

The menu is locked. When your parameters are set and you do not want others to change them randomly, lock the menu. To perform menu operations, you must enter the password. The initial password for this flow meter is 25, and users can change the initial password to set their own (special reminder: please remember the password you set; if forgotten, contact the manufacturer).

Unlock: If not locked, all menus can be modified at will.

Lock: Once globally locked, a password must be entered to make any modifications.

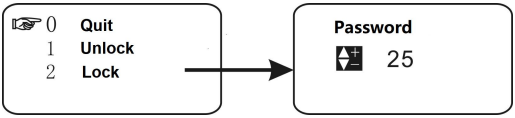

Fig.16

When the parameters are locked, press the Set key to enter the unlocking interface for locked parameters:

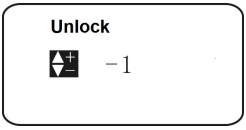

Fig.17

7.2.2.Range Setting

Set the bottom distance, range high point, range low point, and display units.

Bottom distance: Set the reference zero point of the sludge interface meter, which is mainly meaningful for level measurement; the factory default is set to the maximum range.

Range-L 4mA: Set the measurement value corresponding to the 4mA output of the sludge interface meter; the factory default is set to 0.

Range-H 20mA: Set the measurement value corresponding to the 20mA output of the sludge interface meter; the factory default is set to the maximum range.

Unit selection: There are three units to choose from - m, cm, mm. 'm' displays in meter, 'cm' in centimetre, and 'mm' in millimetre; the factory default is set to cm.

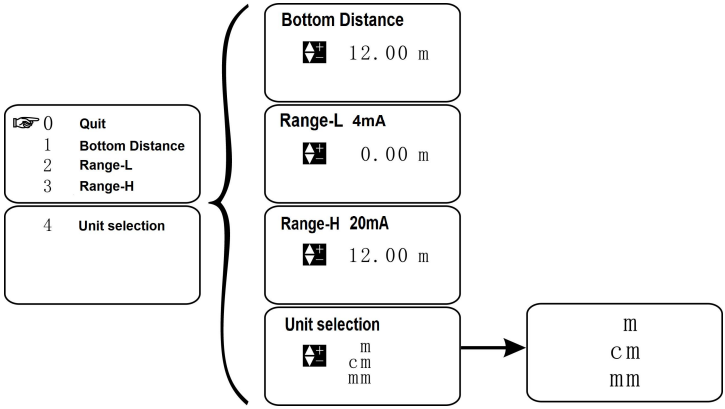

Fig.18

7.2.3. Measurement Type

Type Selection: There are two options available for selection - Level and Distance. Level measurement: the display shows the distance from the probe to the mud-water interface; Distance measurement: the display shows the distance from the reference zero point to the mud-water interface, i.e., the mud level height. The factory default is set to mud level measurement.

Damping Rate: There are three options to choose from - slow, middle, and fast. Slow: The response rate is slow, the measurement accuracy is high, and it is less likely to be interfered with; Middle: between slow and fast; Fast: The response rate is fast, the measurement accuracy is low, and it is more susceptible to

interference. The factory default is set to medium.

Safe Level: There are four options to choose from - hold, min, max value, and setting value. Hold: after the system loses the wave, the display value is the last measured value, and the current is the corresponding value; Min: after the system loses the wave, the display value is 4mA, and the current is 4mA; Max : after the system loses the wave, the display value is 20mA, and the current is 20mA; Setting Value: after the system loses the wave, the display value is the last measured value, and the current output is the set value of the set current. The factory default is set to hold.

Current Set : Set the specified output current after wave loss, greater than 3.6mA, less than 22mA. This setting is ineffective when selecting hold/maximum value/minimum value. The factory default is set to 3.6mA.

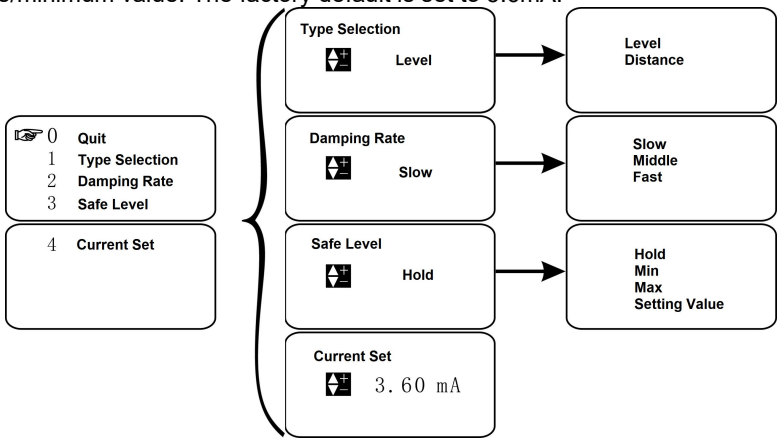

Fig.19

7.2.4.Transducer Setting (Please do not modify this parameter)

Select the transducer and set related parameters.

Transducer Type: There are nine options to choose from, 1-9. Select according to the label on the transducer; the factory default is set to 5.

Blanking: Set the near-end blind zone of the probe; the factory default is set between 0.30 to 0.60 meters.

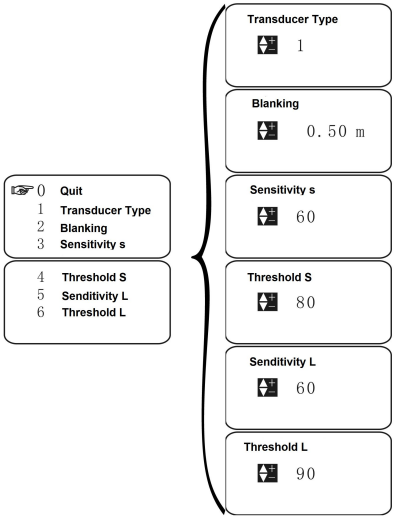

Fig.20

7.2.5.Algorithm Selection (Please do not modify this parameter)

Algorithm Selection: There are seven options to choose from for special environments: Environment 1,Environment 2,Environment 3,Environment 4,Environment 5,Environment 6,Environment 7.The factory default is set to Environment 7.

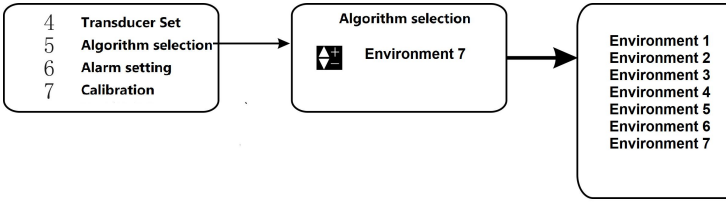

Fig.21

7.2.6.Alarm Setting

Configure the alarm relays.

Alarm1 Mode: There are three options to choose from - close, low alarm and high alarm.

Close: Relay 1 is inactive;

Low Alarm: Relay 1 triggers a low-level alarm;

High Alarm: Relay 1 triggers a high-level alarm.

The factory default is set to close .

Alarm 1 Value: Measured in meters, the factory default is set to 0.

Alarm 1 Diff: Measured in meters, the alarm is cleared only when the measurement value reaches the alarm value +/- the alarm differential. The factory default is set to 0.

The alarm differential can also enable a relay to control the entire operating process of a pump from a low water level to a high water level.

Example 1:for sludge discharge: it is required that when the mud level in the pool falls below 1 meter, the pump stops discharging mud; when the mud level rises to 5 meters, the pump starts to discharge mud. The specific settings are as follows:

Alarm1 Mode: High alarm ; Alarm1 Value: 5.00m; Alarm 1 Diff:4.00m.

Example 2: For mud entry: it is required that when the mud level in the pool falls below 1 meter, the pump starts to bring in mud; when the mud level rises to 5 meters, the pump stops bringing in mud. The specific settings are as follows:

Alarm 1 Mode: Low-level alarm. Alarm 1 Value: 1.00m; Alarm 1 Diff: 4.00m.

If the water depth reaches 5.00 meters, stop discharging mud.

Alarm 1 Mode: Low-level alarm. Alarm 1 Value: 5.00m; Alarm 1 Differential: 0.05m.

Explanation: In this case, the differential is set to avoid frequent relay activation and deactivation caused by water depth measurements fluctuating around 5.00 meters, leading to the pump turning on and off frequently. A differential value of 0.05 meters means that if the water depth fluctuates between 4.95 and 5.05 meters, the relay remains closed.

Alarm2 Mode, Alarm3 Mode, and Alarm4 Mode are set in the same manner.

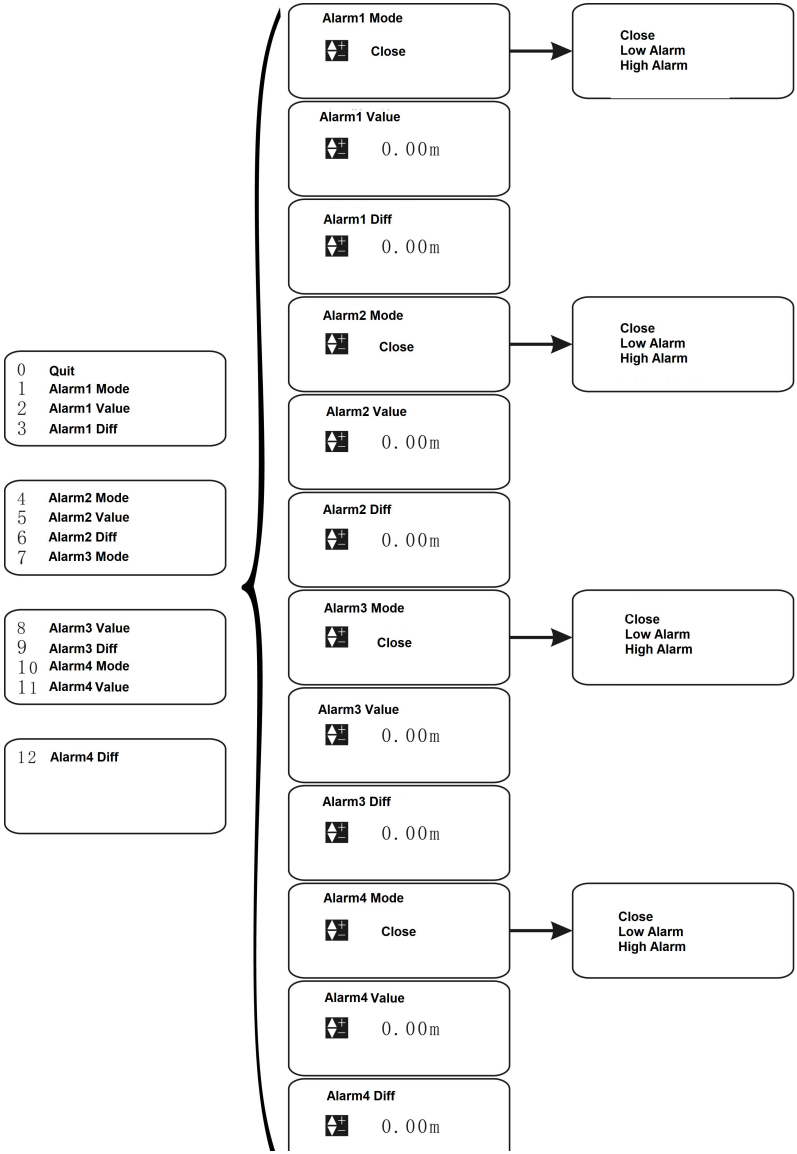
0 Quit
1 Alarm1 Mode
2 Alarm1 Value
3 Alarm1 Diff
4 Alarm2 Mode
5 Alarm2 Value
6 Alarm2 Diff
7 Alarm3 Mode
8 Alarm3 Value
9 Alarm3 Diff
10 Alarm4 Mode
11 Alarm4 Value
12 Alarm4 Diff
Alarm1 Mode
Close
Close
Low Alarm
High Alarm
Alarm1 Value
0.00m
Alarm1 Diff
0.00m
Alarm2 Mode
Close
Close
Low Alarm
High Alarm
Alarm2 Value
0.00m
Alarm2 Diff
0.00m
Alarm3 Mode
Close
Close
Low Alarm
High Alarm
Alarm3 Value
0.00m
Alarm3 Diff
0.00m
Alarm4 Mode
Close
Close
Low Alarm
High Alarm
Alarm4 Value
0.00m
Alarm4 Diff
0.00m

Fig.22

7.2.7.Calibration (Please do not modify this parameter)

Range Adjust: Input the actual value, and the system will automatically perform range calibration. The factory default is set to the measured value.

Sound Adjust : Input the actual value, and the system will automatically perform sound velocity calibration, which is used when the liquid is not water. For example: In cases with gasoline, acetone, alcohol, and other liquids, the speed of sound varies in these liquids, and calibration is needed.

4mA Adjust: Modify the value until the actual output current is 4mA. The factory default is set to 3100.

20mA Adjust: Modify the value until the actual output current is 20mA. The factory default is set to 7200.

Voltage: Enter the voltage value measured at the corresponding test point. The factory default is set to 5.00.

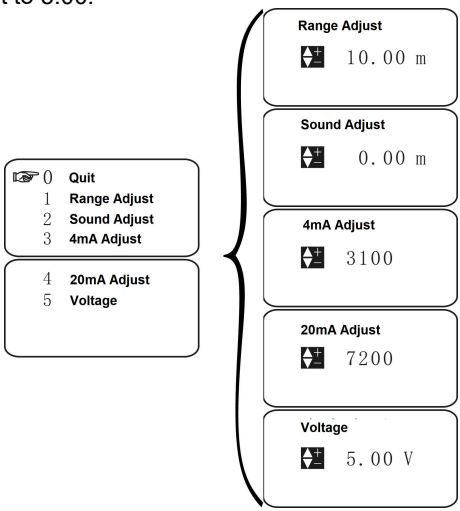

Fig.23

7.2.8.Communication Settings

Address: Select the communication address, with the default value set to 1. (When using RS485 communication, devices on the same RS485 bus must be set to different addresses. If there are devices with the same address, it will prevent the data from those devices with the same address from being uploaded.)

Baud Rate: Select the frequency of communication; options include 2400, 4800, 9600, 19200, with the default set to 9600.

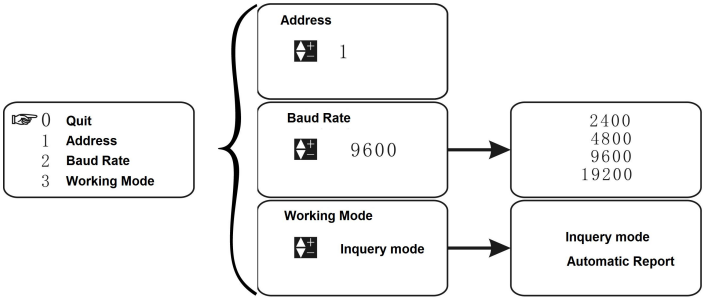

Fig.24

7.2.9.Reset Selection

Factory Reset: Yes: Restores to the state of the initial factory settings. No: Exit. The factory default is set to No.

System Reset: Yes: Restores system settings. No: Exit. The factory default is set to No.

Note: Before performing a system reset, record all previously set parameters, including the values for "Sound Adjust", "4mA Adjust", and "20mA Adjust" found in "7 Calibration". After the system reset, these values should be adjusted back to their pre-reset numbers.

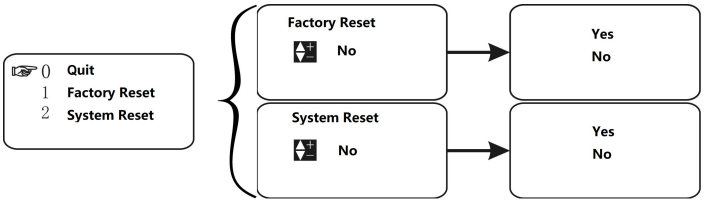

Fig.25

Chapter 8 Error Phenomena and Solutions

Table 5

Phenomenon	Cause	Solution
Sludge Interface Meter Not Displaying	Power is not connected properly	Check if the power cable is connected correctly. Ensure the supply voltage is between AC 180V~250V and is stable.
	LCD screen failure	Return to factory for repair.
	Circuit board is moist or has water ingress	Return to factory for repair.
	Circuit board is corroded	Return to factory for repair.
	Power section is burned out	Return to factory for repair.
Sludge Interface Meter Operates, Screen Displays a Speaker Symbol, the System is in Wave Loss Status.	Measurement distance exceeds the range of the sludge interface meter	Consider replacing with a sludge interface meter of a longer range.
	The medium being measured has strong disturbances or vibrations. There are many foams or bubbles in the medium.	Wait for the medium to stabilize; the device will automatically resume normal measurement. Once the foam or bubbles disappear, the measurement will normalize. Foam agents can also be added to eliminate foam.
	There are strong interference sources nearby, such as variable frequency drives or electric motors.	Check the surrounding environment and ensure electromagnetic shielding. Do not use the same power source as variable frequency drives or electric motors; also ensure reliable grounding. The instrument's power and output cables should not be placed in the same conduit as those for variable frequency drives or electric

Phenomenon	Cause	Solution
		motors. Use galvanized pipes for separate protection if necessary, and ensure the pipes are grounded reliably.
	The probe is not aimed correctly at the mud surface.	Reinstall the probe so it is perpendicular to the mud surface.
	There are extraneous objects in the measuring space, such as trash or floating objects in the water.	Choose a suitable installation position to avoid interference as much as possible.
	The mud level has entered the blind zone.	Raise the probe installation position or lower the sludge discharge position.
	The liquid being measured contains foam, turbulence, or sand content exceeding 10 grams per liter.	Eliminate the foam and consult the manufacturer.
	No echo	The probe is tilted and not aimed at the target, or the interference from the power supply/cables exceeds the strength of the return signal from the probe.
	No echo	The probe is incorrectly wired to the main unit terminals, or the probe cable was cut and incorrectly reconnected.
	The measurement distance does not exceed the range of the sludge interface meter, and there is no electromagnetic interference, but no echo signal is received.	Opt for a lower frequency probe for measurement. This situation is mostly caused by high impurity content in the water.

Chapter 9 Communication Protocol

Ultrasonic Mud Level Meter MODBUS Communication Protocol Version 1.4

MODBUS-RTU Communication Protocol

(1) Hardware uses RS-485 for master-slave half-duplex communication, where the master unit calls the slave unit's address, and the slave unit communicates by responding.

(2) Data frame is 10 bits: 1 start bit, 8 data bits, 1 stop bit, with no parity.

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

(3) Function Code 03H: Read Register Values

Master sends:

1	2	3	4	5	6	7	8
ADR	03H	Start Register High Byte	Start Register Low Byte	Number of Registers High Byte	Number of Registers Low Byte	CRC Low Byte	CRC High Byte

1st byte ADR: Slave unit address code (=001 to 254)

2nd byte 03H: Function code for reading register values.

3rd and 4th bytes: Start address of the registers to be read.

5th and 6th bytes: Number of registers to read.

7th and 8th bytes: CRC16 check from byte 1 to 6.

When the slave unit receives correctly, it responds with:

1	2	3	4、5	6、7		M-1、M	M+1	M+2
ADR	03H	Byte count	Register Data1	Register Data 2	...	Register Data M	CRC Low Byte	CRC High Byte

1st byte ADR: Slave unit address code (=001 to 254).

2nd byte 03H: Return read function code.

3rd byte: Total number of bytes from 4 to M (including 4 and M).

4th to Mth bytes: Register data.

M+1 and M+2 bytes: CRC16 check from byte 1 to M.

When the slave unit receives an error, it responds with:

1	2	3	4	5
ADR	83H	Information Code	CRC Low Byte	CRC High Byte

1st byte ADR: Slave unit address code (=001 to 254).

2nd byte 83H: Error in reading register values.

3rd byte Information Code: See information code table.

4th and 5th bytes: CRC16 check from bytes 1 to 3.

(4) Function Code 06H: Write Single Register Value

Master sends:

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

When the slave unit receives correctly, it responds with:

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

When the slave unit receives an error, it responds with:

1	2	3	4	5
ADR	86H	Error Information Code	CRC Low Byte	CRC High Byte

1st byte ADR: Slave unit address code (=001 to 254).

2nd byte 86H: Function code for a write register value error.

3rd byte Information Code: See information code table.

4th and 5th bytes: CRC16 check from bytes 1 to 3.

(5) Function Code 10H: Write Multiple Registers

Master sends:

1	2	3	4	5	6	7
ADR	10H	Start Register Address High Byte	Start Register Address Low Byte	Number of Registers High Byte	Number of Registers 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 Low Byte	CRC High Byte

When the slave unit receives correctly, it responds with:

1	2	3	4	5	6	7	8
ADR	10H	Start Register High Byte	Start Register Low Byte	Number of Registers High Byte	Number of Registers Low Byte	CRC Low Byte	CRC High Byte

When the slave unit receives an error, it responds with:

1st byte ADR: Slave unit address code (=001 to 254).

1	2	3	4	5
ADR	90H	Error Information Code	CRC Low Byte	CRC High Byte

2nd byte 90H: Function code for a write register value error.

3rd byte Information Code: See information code table.

4th and 5th bytes: CRC16 check from bytes 1 to 3.

(6) Register Definition Table: (Note: Register addresses are in hexadecimal)

Table 6

Address	Content Description	Read Only	Address	Content Description	Read Only
0000	Water depth/mud level instantaneous value (2 bytes, high byte first)	√	0001	Analog output instantaneous value (2 bytes, high byte first)	√
0002	Temperature instantaneous value (2 bytes, high 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 differential value (2 bytes, high byte first)	

Address	Content Description	Read Only	Address	Content Description	Read Only
0024	Alarm 2 value (2 bytes, high byte first)		0025	Alarm 2 differential value (2 bytes, high byte first)	
0026	Alarm 3 value (2 bytes, high byte first)		0027	Alarm 3 differential value (2 bytes, high byte first)	
0028	Alarm 4 value (2 bytes, high byte first)		0029	Alarm 4 differential value (2 bytes, high byte first)	
002A	Reference zero point (2 bytes, high byte first)		002B	Range high point (2 bytes, high byte first)	
002C	Range low point (2 bytes, high byte first)		002D	Set current (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	

Address	Content Description	Read Only	Address	Content Description	Read Only
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 √ Meter address	

(7) Notes:

Two-byte hexadecimal representation, high byte first:

(Note: Floating-point numbers are multiplied by 100, rounded, and then represented in hexadecimal)

The returned water depth or mud level values are in centimetres.

Example: Current instrument address is 1

Send: 01 03 00 00 00 01 84 0A

Return: 01 03 02 00 10 b9 88

The two red bytes indicate: The current measurement value is 0.16 meters (0x0010)

Note: Sign bit: When the measurement value and temperature are positive, the highest bit of the high byte is 0; when negative, the highest bit of the high byte is 1;

Example: When the current measurement is -0.16 meters, it returns: 01 03 02 80 10 E8 06

Measurement Mode: 0 — Water depth measurement; 1 — Mud level measurement

Safety Level: =0, hold; =55, minimum value; =AA, maximum value; =A5, set value

Alarm 1, 2, 3, 4 modes: 0 — Off; 1 — Low-level alarm; 2 — High-level alarm

Unit Selection: = 0, mm; =1, cm; =2, m

Algorithm Selection: 0—Special environment one; 1—Special environment two; 2—Special environment three; 3—Special environment four;

4—Special environment five; 5—Special environment six; 6—Special environment seven

Probe Type: 0—Select 1; 1—Select 2; 2—Select 3; 3—Select 4; 4—Select 5;

5—Select 6; 6—Select 7; 7—Select 8; 8—Select 9;

Response Speed: 0—Slow; 1—Medium; 2—Fast;

Factory Reset: 0—No; 1—Yes;

System Reset: 0—No; 1—Yes;

Baud Rate: 0—2400; 1—4800; 2—9600; 3—19200

Operating Mode: 0—Automatic reporting mode; 1—Polling mode

Registers are organized into areas for read/write operations

First area 0010 — 0021 Read only

Second area 0022 — 005B Read/Write

Third area 005C — 006B Read/Write

Within the same area, individual parameters can be read (or written) one at a time, or batch read (or written) for all parameters in the area. Cross-area read/write operations are not allowed.

All reserved registers are currently undefined, reserved for future upgrades for compatibility.

Table 7 Information Code Table

Information Code	Meaning
01H	Illegal function code
02H	Illegal data address
03H	Illegal data value
04H	CRC16 check error
05H	Received correctly
06H	Received error
07H	Parameter error