

Suspended Solids Sensor (Sludge Concentration)

User Manual



Model: MLSS3

Version 1.0

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Chapter 1 Specifications

| Specification | Details |
|-----------------------|--|
| Principle | Infrared Scattering Principle |
| Measuring range | 0.01-20000mg/L, 0.01-45000mg/L, 0.01-120000mg/L |
| Accuracy | Less than $\pm 5\%$ of measured value (depending on sludge homogeneity) |
| Resolution | 0.01g/L |
| Working pressure | ≤ 4 bar |
| Calibration method | Multi-point calibration, factor calibration |
| Sensor main material | Body: SUS316L/titanium alloy/PVC; upper and lower covers: POM/PVC, cable: PURPUR |
| Installation | Horizontal installation, special 90° installation |
| Power supply | 12VDC |
| Protocol | MODBUS RS485 |
| Operating temperature | 0 to 50°C (no freezing) |
| Weight | 1.5KG |
| Degree of protection | IP68 |
| Cable length | Standard 5 m cable, extendable to 100m |

Table 1 Suspended solids (sludge concentration) sensor technical specifications

Note: Product specifications are subject to change without notice.

Chapter 2 Product Introduction

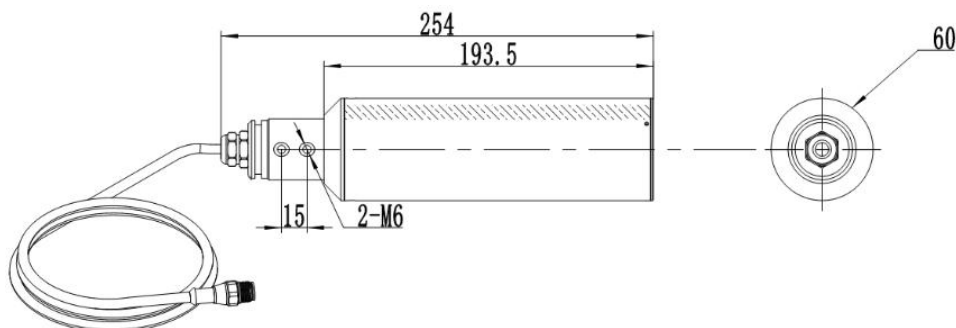
2.1 Product information

The suspended solids/sludge concentration sensor is based on the combined infrared absorption and scattering light method. The infrared light emitted by the light source is scattered by the suspended particles in the sample, and finally converted into an electrical signal by the photodetector, and the suspension of the sample is obtained after analog and digital signal processing. Matter/sludge concentration value.

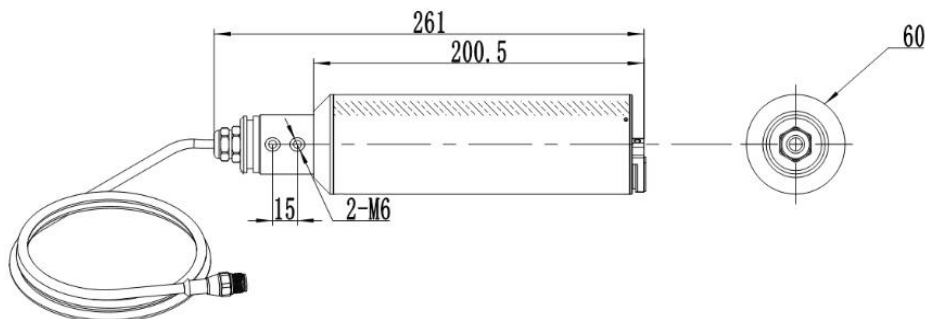
This product is widely used in the online monitoring of suspended solids/sludge concentration in various processes of sewage treatment plants; the online monitoring of suspended solids/sludge concentration in various industrial production process water and wastewater treatment processes. The sensor dimensions are shown in Figure 1.

SUS316L/Titanium Alloy Material Dimensions:

Without automatic cleaning device:



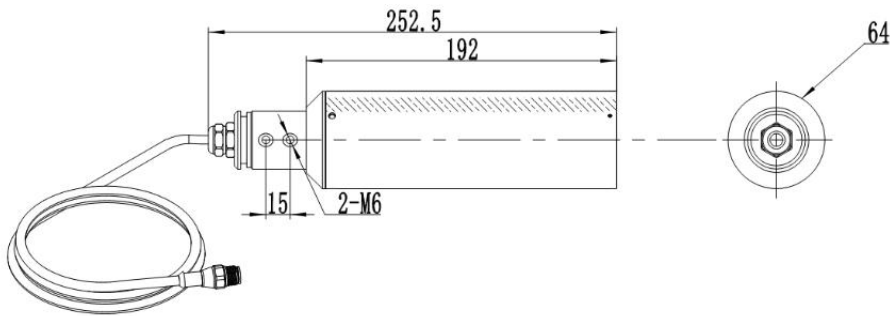
With automatic cleaning device:



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PVC material appearance size:

Without automatic cleaning device:



With automatic cleaning device:

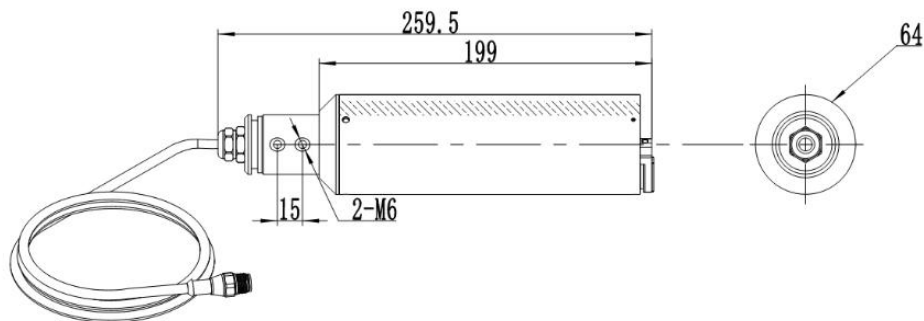


Figure 1 Dimensions of suspended matter (sludge concentration) sensor



2.2 Safety information

Please read this manual completely before unpacking, installing or using this equipment.

Otherwise, personal injury to the operator or damage to the equipment may result.

Warning label

Please read all labels and imprints attached to the instrument, and follow the instructions of these safety labels, otherwise personal injury or instrument damage may result.

When this symbol appears on the instrument, it indicates operating or safety information in the reference manual.



This symbol indicates that there is a risk of electric shock or death from electrocution.

Please read this manual in its entirety. In particular, pay attention to some precautions, warnings, etc. Make sure that the protection provided by this equipment is not compromised.

Chapter 3 Installation

3.1 Sensor installation

3.1.1 Quick Release pool side fixed installation

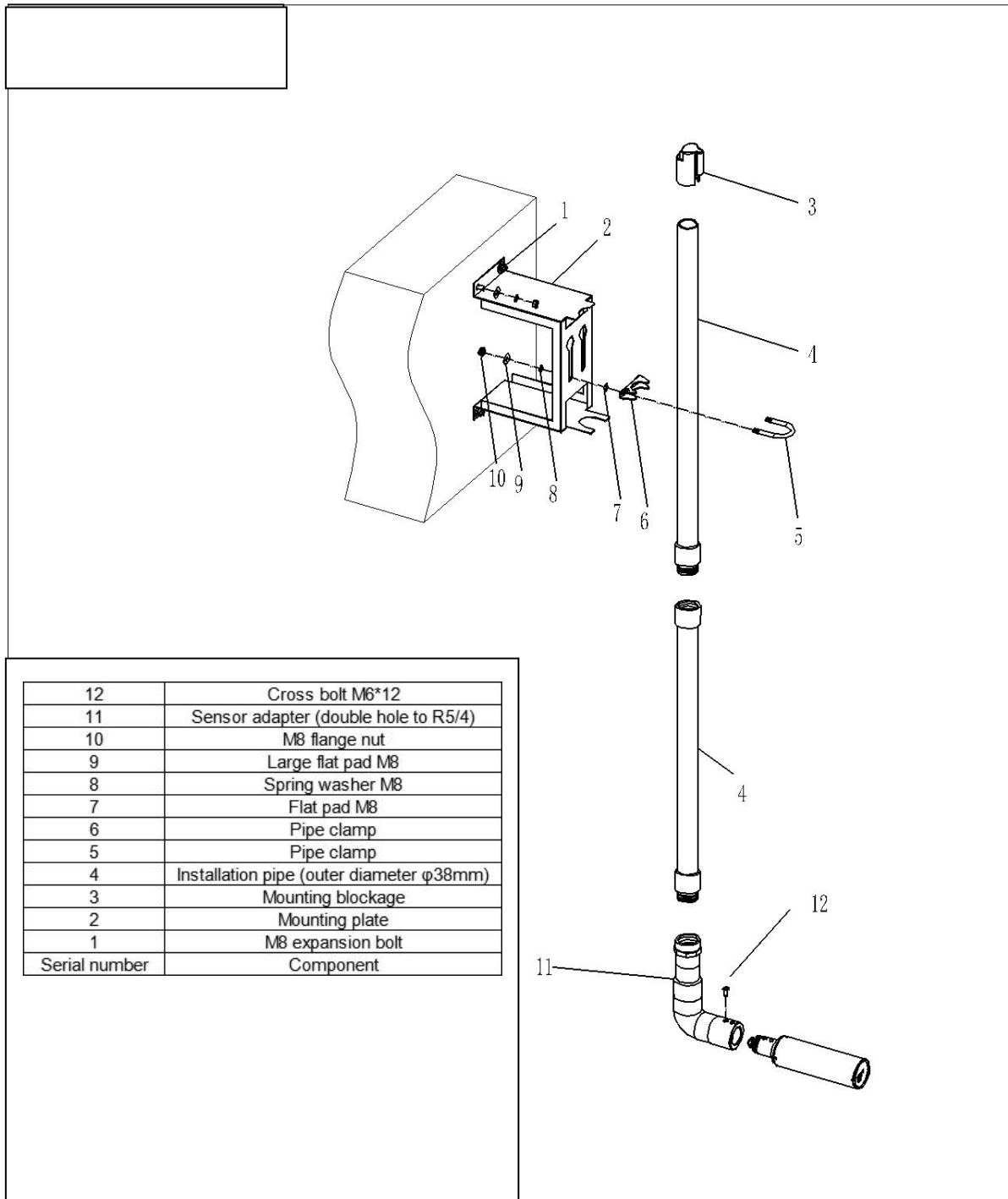


Figure 2 Schematic diagram of quick-release poolside installation

3.1.2 Classic poolside Fixed installation

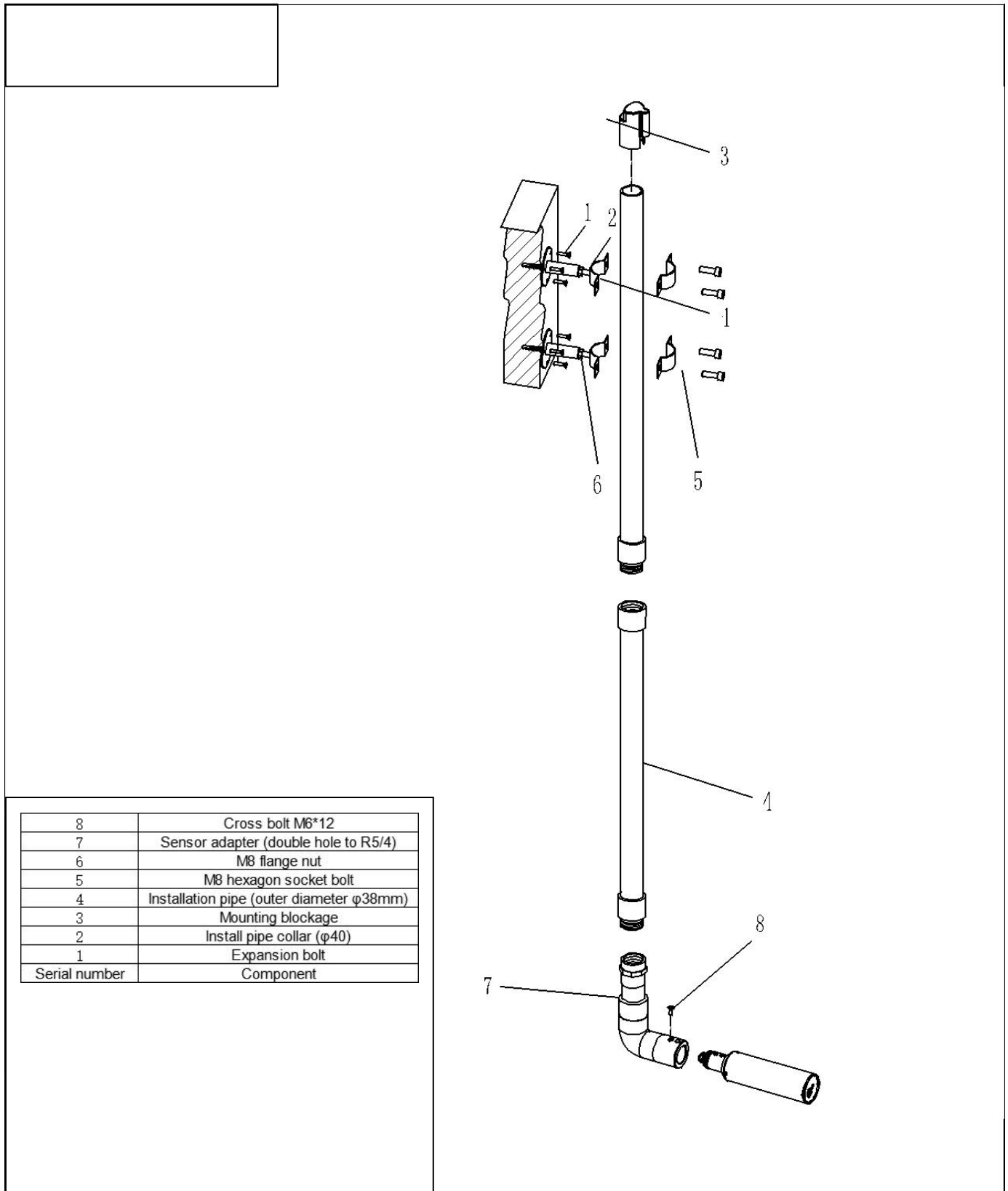


Figure 3 Schematic diagram of classic poolside installation

3.1.3 Railing fixed installation

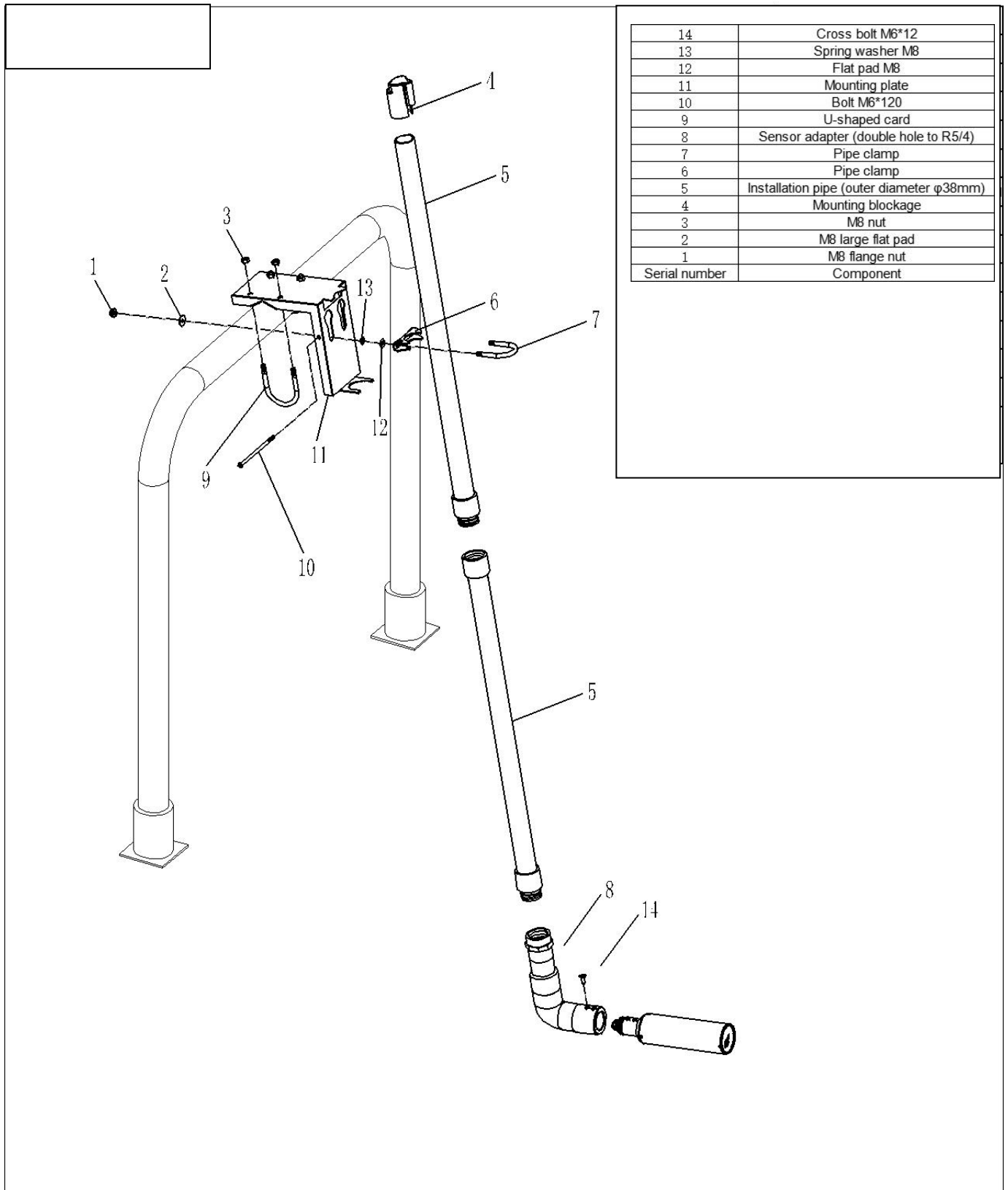


Figure 4 Schematic diagram of railing installation

3.2 Sensor connection

The sensor is properly connected with the following core definitions:

| Core No. | 1 | 2 | 3 | 4 | 5 |
|-------------|--------|-------|---------|---------|--------------|
| Sensor wire | Brown | Black | Blue | White | Yellow+Green |
| Signal | +12VDC | AGND | RS485 A | RS485 B | Ground wire |

Chapter 4 Interface and Operation

4.1 User Interface

The sensor is connected to the computer using RS485 to USB, and then used Modbus Poll for connection operation.

Note: Modbus Poll software is general software and can be downloaded online. .

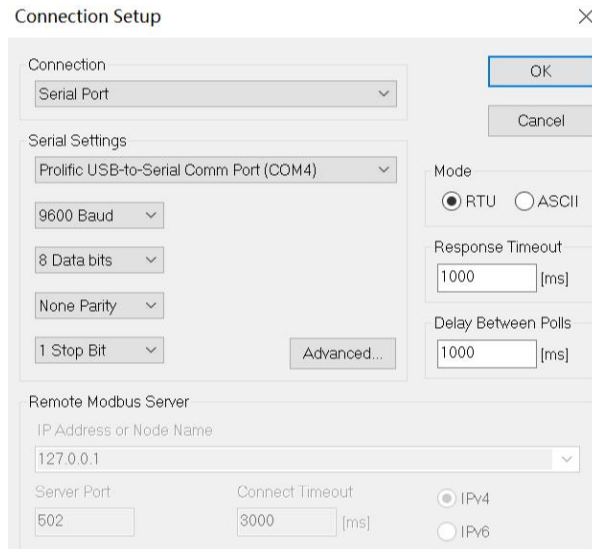
4.2 Parameter setting

1、 Click Setup on the menu bar, select Read/Write Definition, and then set the parameters (the slave address used for the first time is based on the slave label), enter "30" in the Quantity of the pop-up dialog box, and click OK.

Note: When the address of the slave is changed, it will communicate with the new address, and the address of the slave to be connected again next time is also the address changed recently.

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2、Click Connection on the menu bar, select the first line of Connection setup in the drop-down menu to set (the baud rate for the first time is based on the slave label), and click OK.



Note: Port is set according to the port number of the connection.

Tip: If the sensor has been connected according to the instructions, but Timeout Error appears in the software Display status, indicating that it has not been connected, remove and replace the USB connection port or check the USB to RS485 converter, etc., and repeat the above operations until the sensor is connected successfully.

Chapter 5 Sensor Calibration

There are two calibration methods for the sensor, but only one is effective. Which calibration mode to use is selected according to the actual needs of the site. For the selection method, see the communication protocol section.

The specific calibration can be carried out according to the following method steps.

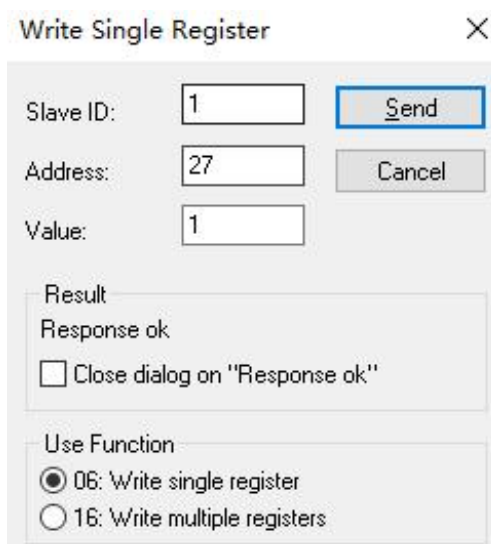
Note: Curve calibration is used as basic calibration and coexists with the other two calibration modes.

5.1 Factor Calibration

Suspended solids (sludge concentration) calibration requires the use of suspended solids standard solution. **When calibrating, ensure that the probe lens is 15cm away from the bottom of the calibration cup. When calibrating, ensure that there are no air bubbles at the front of the lens. It is recommended that the calibration cup be protected from light during calibration. Specific steps are as follows:**

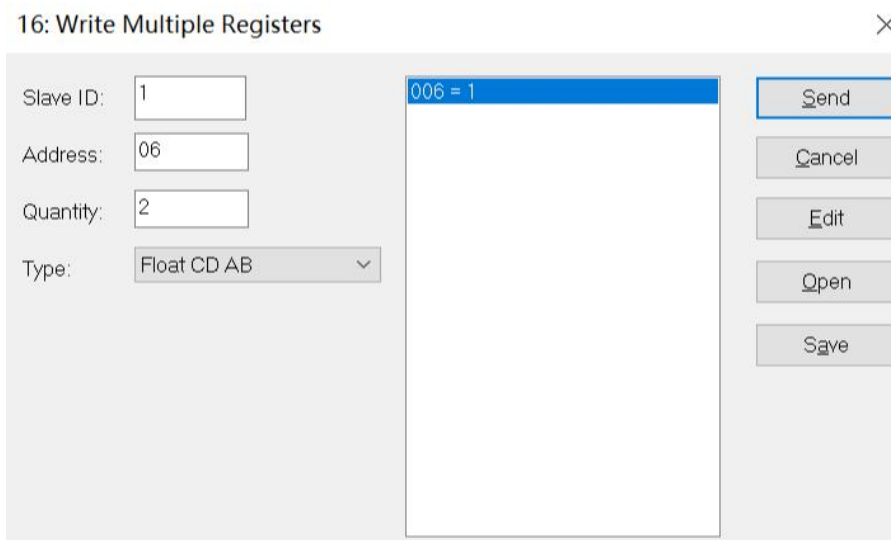
If there is a large deviation between the measured value and the standard solution value, the slope of the calibration curve needs to be corrected by a factor

1. Connect the sensor to the Modbus software;
2. Set the relevant parameters and clean the sensor;
3. Select "06" in the menu bar, and in the dialog box that appears, enter "27" for Address and "1" for Value, and then click "Send", as shown in the figure below;



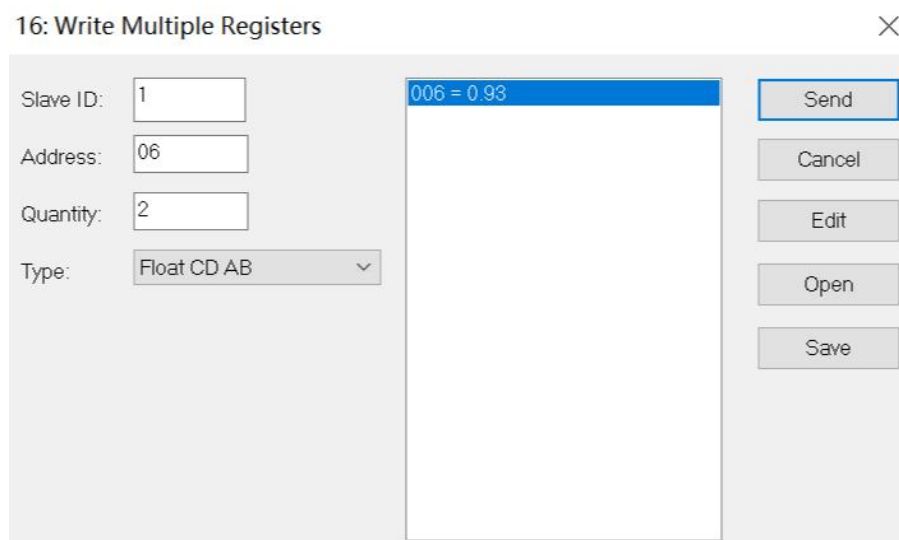
4. Select "16" in the menu bar, enter "06" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter "1" for Value, Click "OK", and then click "Send", as shown in the figure below;

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5. Slowly immerse the sensor into the suspended matter standard solution;
6. Wait for the value to stabilize, and record the measured value;
7. Calculate the correction factor; the correction factor is equal to the value of the standard solution divided by the value measured in step 6. (factor = standard solution value/measured value);
8. Select "16" in the menu bar, enter "06" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "factor value" (The factor value is calculated in step 7), click "OK", and then click "Send".

Assume that the calculated factor value calculated in step 7 is 0.93, as shown in the figure below:



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Tx = 6469: Err = 2204: ID = 1: F = 03: SR = 1000ms

| | Alias | 00000 | Alias | 00010 | Alias | 00020 |
|---|------------|---------|----------|-------|--------|-------|
| 0 | | 0 | | 0 | 手动刮刷指令 | 0 |
| 1 | | -- | 刮刷时间 | 1 | 自动刮刷指令 | 0 |
| 2 | 悬浮物/污泥浓度值 | 5667.26 | 响应时间 | 1 | | 0 |
| 3 | | -- | 悬浮物/污泥浓度 | 2 | | 0 |
| 4 | | 0 | 探头湿度 | 0 | | 0 |
| 5 | | -- | | 1 | | 0 |
| 6 | 悬浮物/污泥浓度因子 | 0.93 | 探头波特率 | 9600 | | 0 |
| 7 | | -- | 探头从机地址 | 1 | | 0 |
| 8 | | 0 | 序列号1 | 221 | | 0 |
| 9 | | -- | 序列号2 | 8329 | | 0 |

5.2 Four-point calibration

Suspended solids (sludge concentration) four-point calibration requires the use of suspended solids standard solution, **the specific steps are as follows:**

1. Connect the sensor to the Modbus software;
2. Prepare the four suspended substance standard liquids required for four-point calibration, generally recommended as zero point, 0.25 times the range point, 0.5 times the range point and full scale point, and wipe the sensor;
3. Refer to step 3-4 of 5.1, set the calibration method to factor, and the value of the factor is 1; in this way, the values of each standard solution are measured by the actual value of each standard solution.
4. Slowly immerse the sensor into the first suspended matter standard solution, record the value of the first standard solution (the target value of the standard solution) and the measured value of the first standard solution (the measured value is the actual value), clean and wipe clean;

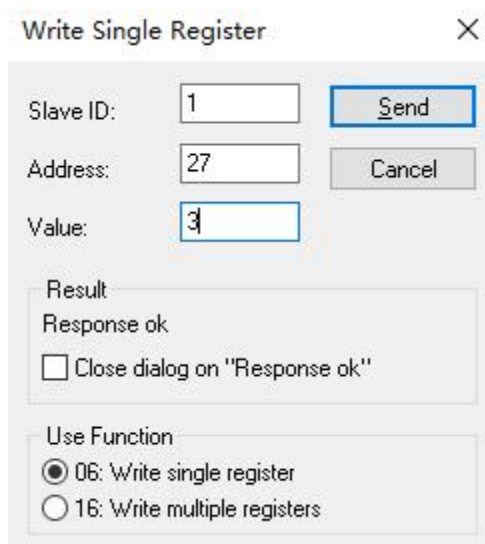
Slowly immerse the sensor into the second standard solution of suspended matter, record the value of the second standard solution and the measured value of the second standard solution, clean and wipe it clean;

Slowly immerse the sensor into the third standard solution of suspended matter, record the value of the third standard solution and the measured value of the third standard solution, clean and wipe it clean;

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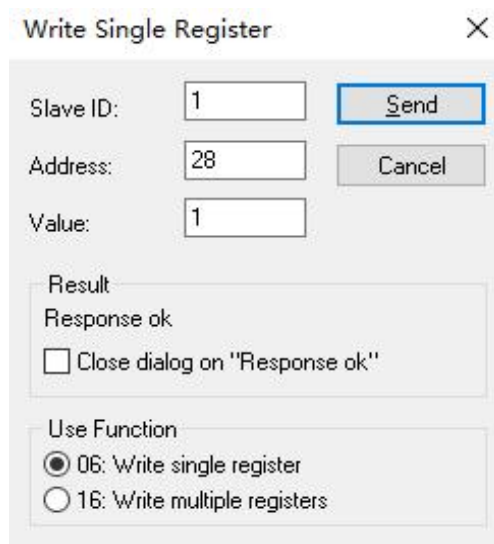
Slowly immerse the sensor into the fourth standard solution of suspended matter, record the value of the fourth standard solution and the measured value of the fourth standard solution, clean and wipe it clean; **(divide the target value by the measured value <2 during this process)**

5. Select "06" in the menu bar and enter "27" for Address and "3" for Value in the dialog box that appears, and then click "Send", as shown in the figure below;



The screenshot shows a dialog box titled "Write Single Register" with a close button (X) in the top right corner. It contains three input fields: "Slave ID" with the value "1", "Address" with the value "27", and "Value" with the value "3". To the right of the "Slave ID" field is a "Send" button, and to the right of the "Address" field is a "Cancel" button. Below the input fields is a "Result" section with the text "Response ok" and a checkbox labeled "Close dialog on 'Response ok'". At the bottom is a "Use Function" section with two radio buttons: "06: Write single register" (which is selected) and "16: Write multiple registers".

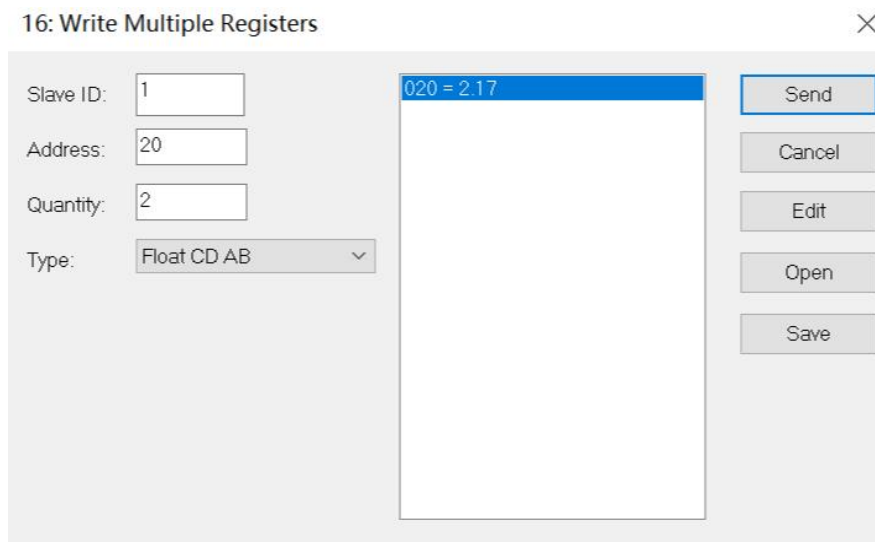
6. Select "06" in the menu bar, and enter "28" for Address and "1" for Value in the dialog box that appears, and then click "Send", as shown in the figure below;



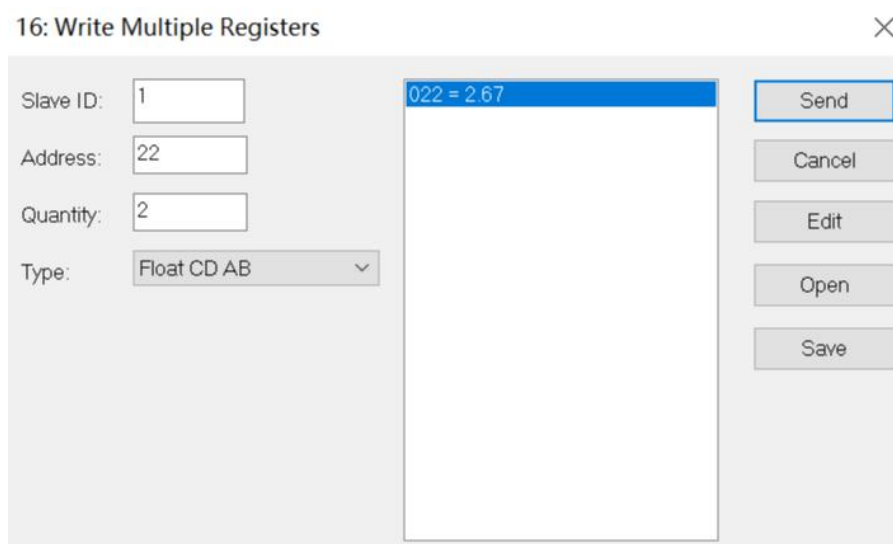
The screenshot shows a dialog box titled "Write Single Register" with a close button (X) in the top right corner. It contains three input fields: "Slave ID" with the value "1", "Address" with the value "28", and "Value" with the value "1". To the right of the "Slave ID" field is a "Send" button, and to the right of the "Address" field is a "Cancel" button. Below the input fields is a "Result" section with the text "Response ok" and a checkbox labeled "Close dialog on 'Response ok'". At the bottom is a "Use Function" section with two radio buttons: "06: Write single register" (which is selected) and "16: Write multiple registers".

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7. Select "16" in the menu bar, enter "20" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "1st Standard solution value", click "OK", and then click "Send", as shown in the figure below;

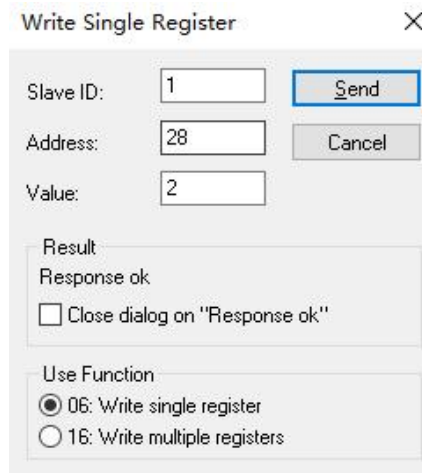


8. Select "16" in the menu bar, enter "22" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "1st Measured value of standard solution", click "OK", and then click "Send", as shown in the figure below;



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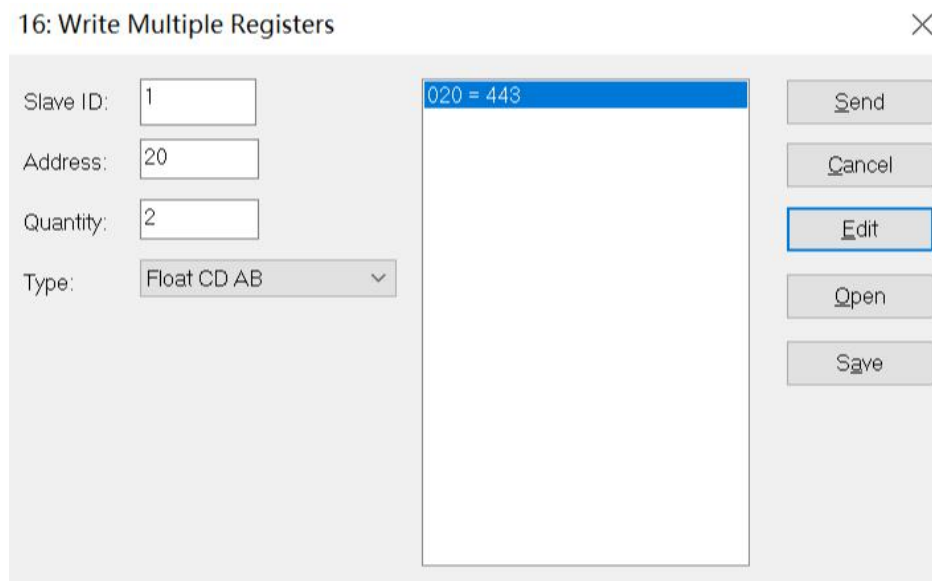
9. Select "06" in the menu bar, and enter "28" for Address and "2" for Value in the dialog box that appears, and then click "Send", as shown in the figure below;



The screenshot shows a dialog box titled "Write Single Register" with a close button (X) in the top right corner. It contains the following fields and controls:

- Slave ID: 1
- Address: 28
- Value: 2
- Buttons: "Send" (highlighted in blue) and "Cancel".
- Result section: "Response ok" and a checkbox labeled "Close dialog on 'Response ok'".
- Use Function section: Two radio buttons. The first is selected and labeled "06: Write single register". The second is labeled "16: Write multiple registers".

10. Select "16" in the menu bar, enter "20" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "2nd Standard solution value", click "OK", and then click "Send", as shown in the figure below;

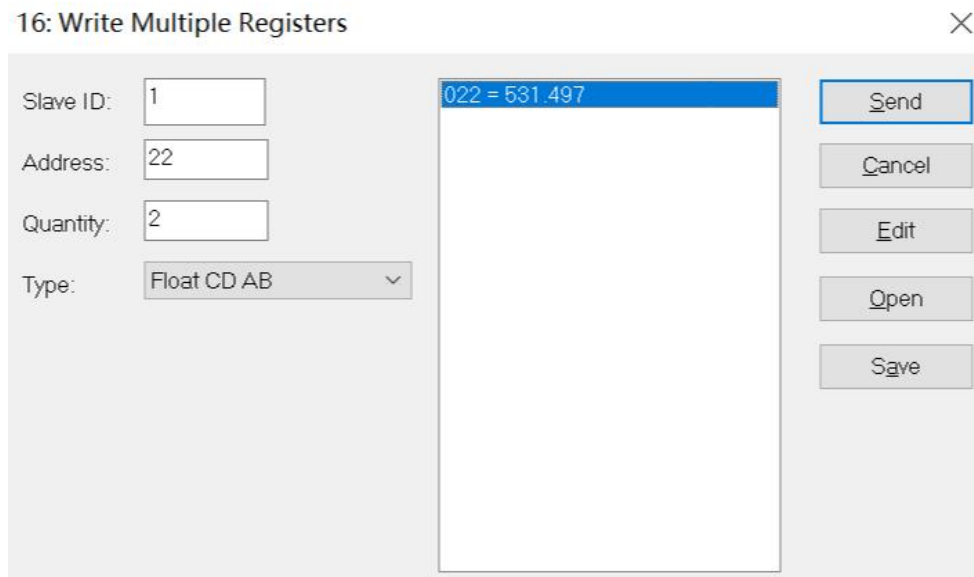


The screenshot shows a dialog box titled "16: Write Multiple Registers" with a close button (X) in the top right corner. It contains the following fields and controls:

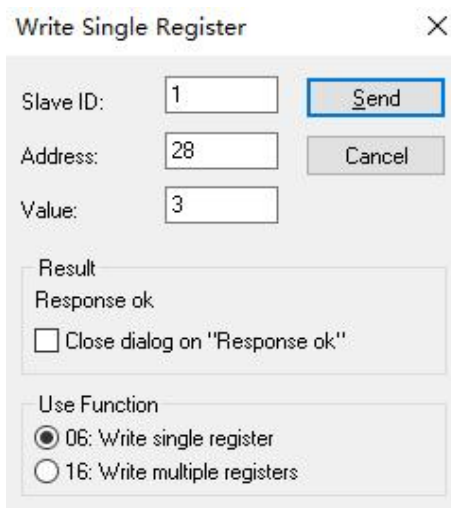
- Slave ID: 1
- Address: 20
- Quantity: 2
- Type: Float CD AB (dropdown menu)
- Buttons: "Send", "Cancel", "Edit" (highlighted in blue), "Open", and "Save".
- Value list: A list box containing "020 = 443", which is highlighted in blue.

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11. Select "16" in the menu bar, enter "22" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "2nd Measured value of standard solution", click "OK", and then click "Send", as shown in the figure below;

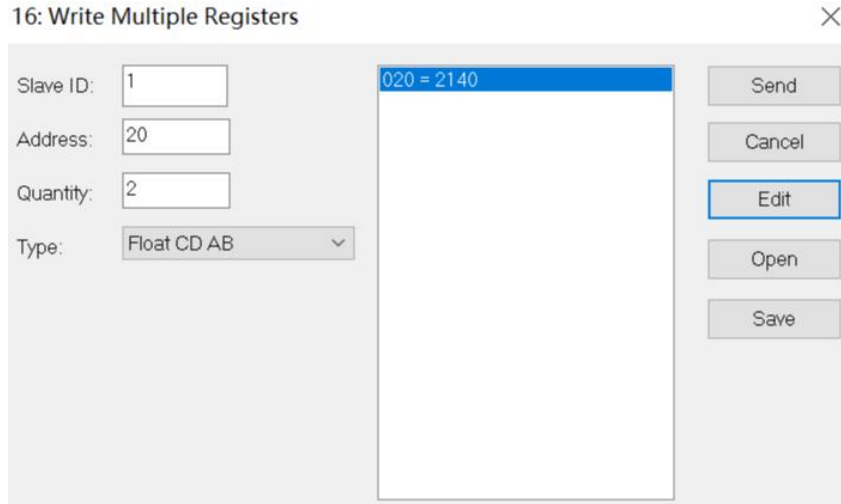


12. Select "06" in the menu bar, and enter "28" for Address and "3" for Value in the dialog box that appears, and then click "Send", as shown in the figure below;

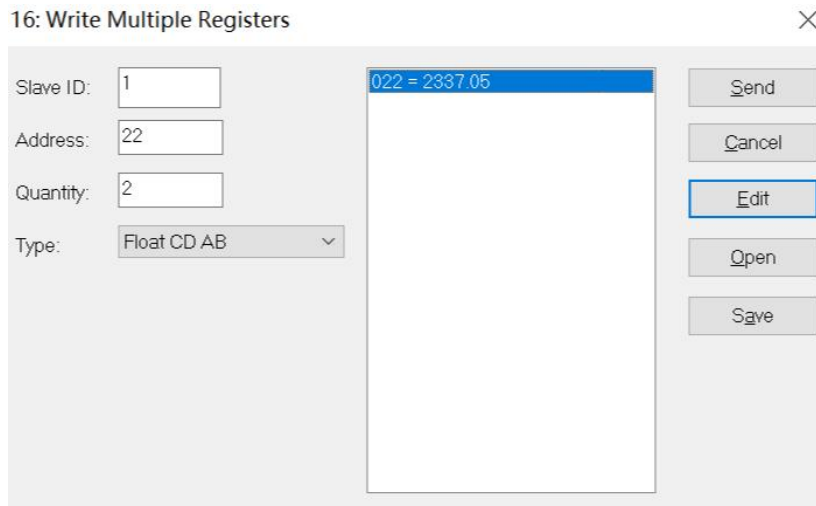


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13. Select "16" in the menu bar, enter "20" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "3rd Standard solution value", click "OK", and then click "Send", as shown in the figure below;



14. Select "16" in the menu bar, enter "22" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "3rd Measured value of standard solution", click "OK", and then click "Send", as shown in the figure below;



Suspended solids (sludge concentration) sensor manual

15. Select "06" in the menu bar and enter "28" for Address and "4" for Value in the dialog box that appears, and then click "Send", as shown in the figure below;



Write Single Register

Slave ID: 1

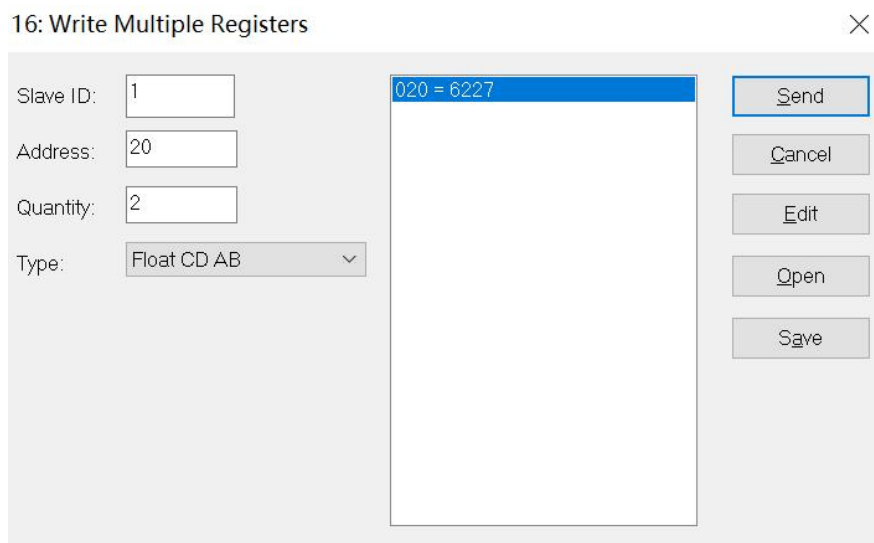
Address: 28

Value: 4

Result
Response ok
 Close dialog on "Response ok"

Use Function
 06: Write single register
 16: Write multiple registers

16. Select "16" in the menu bar, enter "20" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "4th Standard solution value", click "OK", and then click "Send", as shown in the figure below;



16: Write Multiple Registers

Slave ID: 1

Address: 20

Quantity: 2

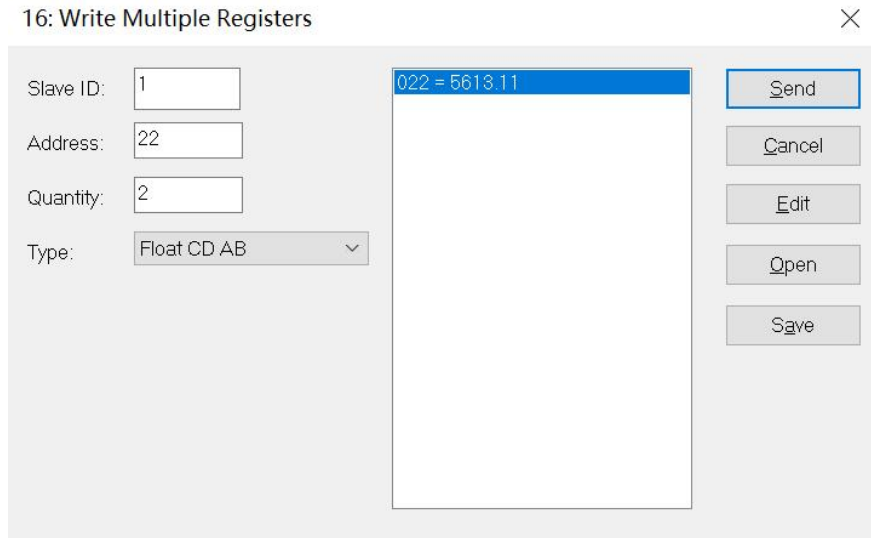
Type: Float CD AB

020 = 6227

Send
Cancel
Edit
Open
Save

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17. Select "16" in the menu bar, enter "22" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "4th Measured value of standard solution", click "OK", and then click "Send", as shown in the figure below;



18. Calibration is complete, remove the sensor to clean and wipe clean.

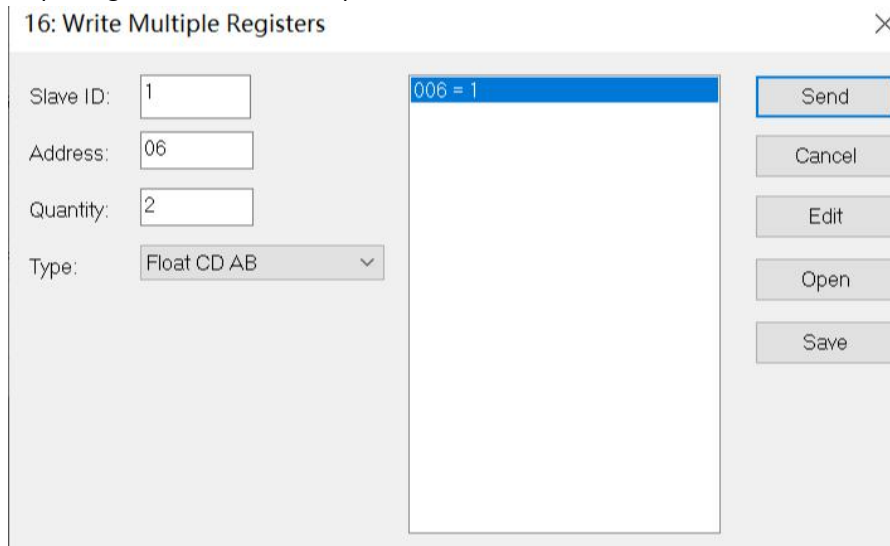
5.3 Curve Calibration

The calibration of suspended solids (sludge concentration) requires the use of turbidity standard solution to correct the calibration curve. **The specific steps are as follows:**

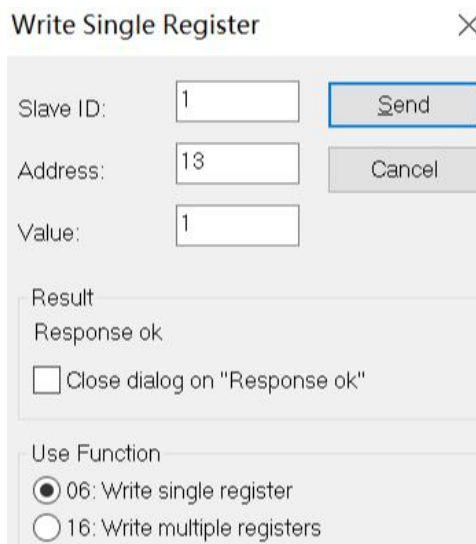
(If you enter the curve calibration, you must calibrate and perform the calibration action to step 11, otherwise the sensor will always be in the calibration mode, and choose to power off and restart or perform step 12 when the normal measurement cannot be performed.)

1. Connect the sensor to the Modbus software;
2. After setting the parameters according to chapter 4.2, select the second column, right click and select "Format", click "Float CD AB", and wipe the sensor;
3. Select "16" in the menu bar, enter "06" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter "1" for Value, Click "OK", and then click "Send", as shown in the figure below;

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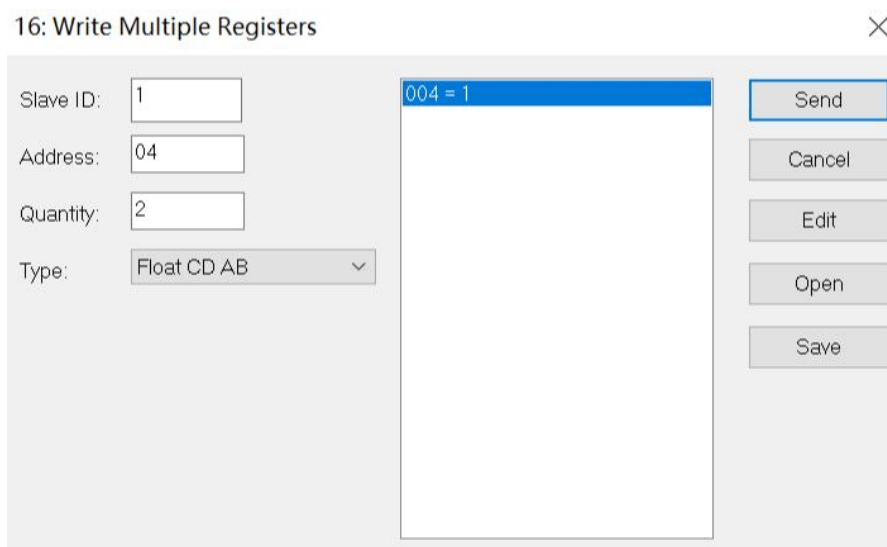
4、 Select "06" in the menu bar, and enter "13" for Address and "1" for Value in the dialog box that appears, and click "Send" to change the probe type to turbidity, as shown in the figure below;



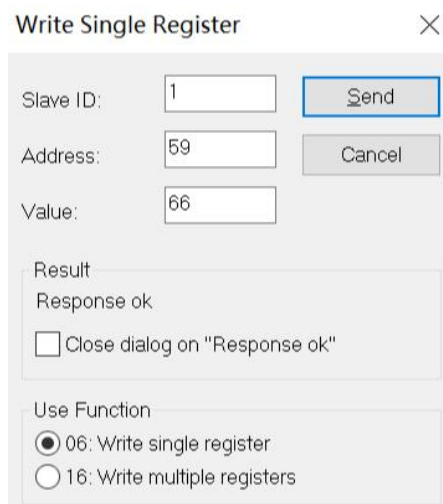
| | Alias | 00000 | Alias | 00010 | Alias | 00020 |
|---|-------|---------|--------|-------|--------|-------|
| 0 | 浊度值 | 0.26847 | | 0 | 手动刮刷指令 | 0 |
| 1 | | -- | 刮刷时间 | 1 | | -- |
| 2 | | 0 | 响应时间 | 1 | | 0 |
| 3 | | -- | 浊度 | 1 | | -- |
| 4 | 浊度因子 | 1 | 探头湿度 | 0 | | 0 |
| 5 | | -- | | 1 | | -- |
| 6 | | 0 | 探头波特率 | 9600 | | 0 |
| 7 | | -- | 探头从机地址 | 1 | | -- |
| 8 | 浊度偏差值 | 0 | 序列号1 | 221 | | 0 |
| 9 | | -- | 序列号2 | 8329 | | -- |

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- 5、 Select "16" in the menu bar, enter "04" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, enter "1" for Value, and click " OK", and then click "Send" to start the calibration.



- 6、 Enter the calibration mode, select "06" in the menu bar, and enter "59" for Address and "66" for Value in the dialog box that appears, and click "Send";



- 7、 Put the sensor in distilled water. After a while, select "06" in the menu bar, and input "59" for Address and "1" for Value in the dialog box;
- 8、 Wait for the value of address 22 to be less than 17 and stabilize for a period of time, as shown in the box in the figure below, select "06" in the menu bar, enter "59" for Address and "2" for Value in the dialog box, and click " Send", close the dialog box;

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Write Single Register ✕

Slave ID:

Address:

Value:

Result
N/A

Close dialog on "Response ok"

Use Function

06: Write single register

16: Write multiple registers

| | Alias | 00000 | Alias | 00010 | Alias | 00020 |
|---|-------|-------|--------|-------|--------|---------|
| 0 | 浊度值 | 0 | | 0 | 手动刮刷指令 | 343.043 |
| 1 | | -- | 刮刷时间 | 1 | | -- |
| 2 | | 0 | 响应时间 | 1 | | 8.48925 |
| 3 | | -- | 浊度 | 1 | | -- |
| 4 | 浊度因子 | 1 | 探头湿度 | 0 | | 0 |
| 5 | | -- | | 1 | | -- |
| 6 | | 0 | 探头波特率 | 9600 | | 0 |
| 7 | | -- | 探头从机地址 | 1 | | -- |
| 8 | 浊度偏差值 | 0 | 序列号1 | 221 | | 0 |
| 9 | | -- | 序列号2 | 8329 | | -- |

- 9、 Select "16" in the menu bar, enter "30" for Address and "2" for Quantity in the dialog box that appears, change Type to "Float CD AB", double-click the pop-up value on the right, and enter Value as "known standard solution value (500-1000NTU)", click "OK", and then click "Send";

16: Write Multiple Registers ✕

Slave ID:

Address:

Quantity:

Type:

030 = 631

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- 10、Put the sensor into the standard solution, select "06" in the menu bar, enter "59" for Address and "3" for Value in the dialog box that appears, and click "Send". After a period of time, wait until the turbidity in the figure below The value is close to and stable with the input value. In the "06" dialog box of the menu bar, enter "59" for Address, change the Value to "4", and click "Send" to complete the calibration;

Write Single Register
✕

Slave ID: Send

Address: Cancel

Value:

Result
N/A

Close dialog on "Response ok"

Use Function

06: Write single register

16: Write multiple registers

| | Alias | 00000 | Alias | 00010 | Alias | 00020 |
|---|-------|---------|--------|-------|--------|-------|
| 0 | 浊度值 | 631.394 | | 0 | 手动刮刷指令 | 0 |
| 1 | | -- | 刮刷时间 | 1 | | -- |
| 2 | | 0 | 响应时间 | 1 | | 0 |
| 3 | | -- | 浊度 | 1 | | -- |
| 4 | 浊度因子 | 1 | 探头温度 | 0 | | 0 |
| 5 | | -- | | 1 | | -- |
| 6 | | 0 | 探头波特率 | 9600 | | 0 |
| 7 | | -- | 探头从机地址 | 1 | | -- |
| 8 | 浊度偏差值 | 0 | 序列号1 | 221 | | 0 |
| 9 | | -- | 序列号2 | 8329 | | -- |

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- After the calibration is completed, select "06" in the menu bar, enter "13" for Address and "2" for Value in the dialog box that appears, click "Send", and the probe type changes to suspended solids/sludge concentration.

Write Single Register

Slave ID: 1

Address: 13

Value: 2

Result
Response ok
 Close dialog on "Response ok"

Use Function
 06: Write single register
 16: Write multiple registers

- If the customer wants to quit the calibration in the middle of the calibration or for other reasons, select "06" in the menu bar and enter "59" for Address and "33" for Value in the dialog box that appears.

Write Single Register

Slave ID: 1

Address: 59

Value: 33

Result
Response ok
 Close dialog on "Response ok"

Use Function
 06: Write single register
 16: Write multiple registers

Note: If the measured value of curve calibration is inaccurate, it is recommended to use factor calibration to calibrate again.

Chapter 6 Communication Protocol

The sensor is equipped with MODBUS RS485 communication function, please refer to 3.2 of this manual for communication wiring. The specific MODBUS-RTU table is as follows.

| MODBUS-RTU | |
|------------|-----------------------|
| Baud rate | 4800/9600/19200/38400 |
| Data bit | 8 bits |
| Parity | None |
| Stop bit | 1 bit |

| Register name | Address location | Read/write | Data type | Registers Number | Illustrate |
|--|------------------|------------|-----------|------------------|--|
| Suspended solids/sludge concentration value | 2 | OR | Float | 2 | 0-Range |
| Suspended solids/sludge concentration factor | 6 | RW | Float | 2 | 0.1-10 |
| Wiping time | 11 | OR | Int | 1 | Send interval time ((1-10080 unit: min) |
| Response time | 12 | RW | Int | 1 | 1-60s |
| Suspended solids/sludge concentration | 13 | RW | Int | 1 | This place is 2, if it is not 2, it should be changed to 2 |
| Probe humidity | 14 | OR | Int | 1 | It is recommended to be less than 10 (if it is greater than 10, it indicates that the sensor may have entered water) |

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| | | | | | | | | | | | | | | | |
|--|-------|-----|-------|---|--|---|---|-------------------|------|-------------------|------|--------------------|-------|--------------------|-------|
| Probe baud rate | 16 | R/W | Int | 1 | <table border="0"> <tr> <td>W</td> <td>R</td> </tr> <tr> <td>0 represents 4800</td> <td>4800</td> </tr> <tr> <td>1 represents 9600</td> <td>9600</td> </tr> <tr> <td>2 represents 19200</td> <td>19200</td> </tr> <tr> <td>3 represents 38400</td> <td>38400</td> </tr> </table> | W | R | 0 represents 4800 | 4800 | 1 represents 9600 | 9600 | 2 represents 19200 | 19200 | 3 represents 38400 | 38400 |
| W | R | | | | | | | | | | | | | | |
| 0 represents 4800 | 4800 | | | | | | | | | | | | | | |
| 1 represents 9600 | 9600 | | | | | | | | | | | | | | |
| 2 represents 19200 | 19200 | | | | | | | | | | | | | | |
| 3 represents 38400 | 38400 | | | | | | | | | | | | | | |
| Probe slave address | 17 | RW | Int | 1 | 1-254 | | | | | | | | | | |
| Serial number 1 | 18 | OR | Int | 1 | The first 4 digits of the serial number | | | | | | | | | | |
| Serial number 2 | 19 | OR | Int | 1 | The last 4 digits of the serial number | | | | | | | | | | |
| Manual scraping command | 20 | W | Int | 1 | Send 66 | | | | | | | | | | |
| Auto Wipe Command | 21 | W | Int | 1 | Send interval time ((1-10080 unit: min) | | | | | | | | | | |
| Calibration method | | | | | | | | | | | | | | | |
| Factor correction (using suspension standard) | | | | | | | | | | | | | | | |
| First step | 27 | W | Int | 1 | Send 1 (1 means sensor enable factor correction mode) | | | | | | | | | | |
| Four-point calibration (using suspended matter standard solution) | | | | | | | | | | | | | | | |
| First step | 27 | W | Int | 1 | Send 3 (3 means the sensor enables the four-point calibration mode) | | | | | | | | | | |
| First point correction | | | | | | | | | | | | | | | |
| First step | 28 | W | Int | 1 | Send 1 (1 represents point 1) | | | | | | | | | | |
| The second step is to set the target value | 20 | W | Float | 2 | Send target value | | | | | | | | | | |
| The third step is to set the actual value | 22 | W | Float | 2 | send actual value | | | | | | | | | | |
| Second point correction | | | | | | | | | | | | | | | |

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| | | | | | |
|--|----|---|-------|---|---|
| First step | 28 | W | Int | 1 | Send 2 (2 stands for point 2) |
| The second step is to set the target value | 20 | W | Float | 2 | Send target value |
| The third step is to set the actual value | 22 | W | Float | 2 | send actual value |
| Third point correction | | | | | |
| First step | 28 | W | Int | 1 | Send 3 (3 stands for point 3) |
| The second step is to set the target value | 20 | W | Float | 2 | Send target value |
| The third step is to set the actual value | 22 | W | Float | 2 | send actual value |
| Fourth point correction | | | | | |
| First step | 28 | W | Int | 1 | Send 4 (4 for point 4) |
| The second step is to set the target value | 20 | W | Float | 2 | Send target value |
| The third step is to set the actual value | 22 | W | Float | 2 | send actual value |
| Curve Calibration (Using Turbidity Standards) | | | | | |
| First step | 13 | W | Int | 1 | Send 1 (1 means switch to turbidity sensor state, ready to calibrate) |
| Second step | 59 | W | Int | 1 | Send 66 (66 means enter the curve calibration mode) |
| Third step | 59 | W | Int | 1 | Send 1 (1 means ready to calibrate 0 point) |
| The fourth step | 59 | W | Int | 1 | Send 2 (2 means calibration 0 point) |

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| | | | | | |
|-------------------|----|---|-------|---|--|
| The fifth step | 30 | W | Float | 2 | Write the standard solution value of the second point (500-1000NTU) |
| Step six | 59 | W | Int | 1 | Send 3 (3 stands for ready to calibrate point 2) |
| Step seven | 59 | W | Int | 1 | Send 4 (4 stands for calibration point 2) |
| Eighth step | 13 | W | Int | 2 | Send 2 (2 means switch to suspended solids/sludge concentration sensor state and enter normal measurement) |
| Cancel in process | 59 | W | Int | 1 | Send 33 33 to exit the calibration mode |

485 analysis

1、Read the suspended solids/sludge concentration value

| Register name | Address location | Read/write | Data type | Registers Number | Illustrate |
|---|------------------|------------|-----------|------------------|------------|
| Suspended solids/sludge concentration value | 2 | OR | Float | 2 | 0-Range |

Send command: 01 03 00 02 00 02 65 CB

Device returns: 01 03 04 00 00 40 E0 CA 7B

Send command analysis:

01: device address 01

03: Function code 03 for reading register content

00 02: The starting register address for reading is 02

00 02: read 2 registers

65 CB: CRC16 check code

Device returns parsing:

01: device address 01

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03: Function code 03 for reading register content

04: The length of the returned data is 4 bytes

00 00 40 E0: The read suspended solids/sludge concentration value is 7.00 (use IEEE 754 to analyze 40 E0 00 00)

CA 7B: CRC16 check code

2、Read the wipe time

| Register name | Address location | Read /write | Data type | Registers Number | Illustrate |
|---------------|------------------|-------------|-----------|------------------|--|
| Wiping time | 11 | OR | Int | 1 | Send interval time ((1-10080 unit: min) |

Send command: 01 03 00 0B 00 01 F5 C8

Device returns: 01 03 02 00 0A B8 44

Send command analysis:

01: device address 01

03: Function code 03 for reading register content

00 0B: The starting register address for reading is 11

00 01: read 1 register

F5 C8: CRC16 check code

Device returns parsing:

01: device address 01

03: Function code 03 for reading register content

02: The returned data length is 2 bytes

00 0A: The scraping time to read is 10 (minutes)

B8 44: CRC16 check code

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3、 Set up manual wipe commands

| Register name | Address location | Read /write | Data type | Registers Number | Illustrate |
|---------------------|------------------|-------------|-----------|------------------|------------|
| Manual wipe command | 20 | W | Int | 1 | Send 66 |

Send command: 01 06 00 14 00 42 49 FF

Device returns: 01 06 00 14 00 42 49 FF

Send command analysis:

01: device address 01

06: Function code 06 for writing register contents

00 14: The register address for writing data is 20

00 42: write data content is 66

49 FF: CRC16 check code

Device returns parsing:

01: device address 01

06: Function code 06 for writing register contents

00 14: The register address of the return write data is 20

00 42: Return and modify the data content to 66

49 FF: CRC16 check code

4、 Set Suspended Solids/Sludge Concentration Factor

| Register name | Address location | Read /write | Data type | Registers Number | Illustrate |
|--|------------------|-------------|-----------|------------------|------------|
| Suspended solids/sludge concentration factor | 6 | RW | Float | 2 | 0.1-10 |

Send command: 01 10 00 06 00 02 04 00 00 3F 80 63 D5

Device returns: 01 10 00 06 00 02 A1 C9

Send command analysis:

01: device address 01

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10: Function code 16 for writing register contents

00 06: The starting register address of writing data is 06

00 02: Write the data of 2 registers

04: data length 4 bytes

00 00 3F 80: The written suspended solids/sludge concentration factor is: 1.00 (use IEEE 754 to analyze 3F 80 00 00)

63 D5: CRC16 check code

Device returns parsing:

01: device address 01

10: Function code 16 for writing register contents

00 06: Return the start register address of write data as 06

00 02: return 2 registers

A1 C9: CRC16 check code

Chapter 7 Maintenance

In order to obtain the best measurement results, regular maintenance and maintenance are required. Maintenance and maintenance mainly include sensor cleaning, checking whether the sensor is damaged, etc. In maintenance and testing, you can also view the relevant status of the sensor.

7.1 Sensor cleaning

The two lenses on the sensor need to be cleaned, please perform cleaning and maintenance regularly according to the actual usage to ensure the accuracy of the measurement. When cleaning, rinse with water first, then wipe with detergent and a rag to remove stubborn stains.

7.2 Sensor damage inspection

Check the appearance of the sensor to see if it is damaged. If there is any damage, please contact the after-sales service center for replacement in time to prevent the sensor from being damaged due to water ingress. Note: It is recommended to replace the seal ring once a year.

7.3 Sensor wiper replacement

For sensors with scrapers, it is recommended to replace the rubber scrapers once a quarter. The specific steps are as follows:

SUS316L/Titanium alloy material



PVC material:



1. The position of the scraper is shown in the left figure;
2. Remove the rubber sheet on the scraper;
3. Then apply lubricating oil on the bracket;
4. Insert a new rubber sheet.

Chapter 8 Special Instructions

The optional self-cleaning wiper is driven by a motor. Do not turn it manually to avoid damage to the internal motor gear. Failure/damage caused by manually turning the wiper is not covered by the warranty!