Preface

●Thank you for purchasing our products.

●This manual is an instruction manual about the functions, wiring methods, setting methods, operation methods, troubleshooting methods, etc. of the product.

●Please read this manual carefully before operation and use this product correctly to avoid unnecessary losses due to incorrect operation.

●After you have finished reading, please keep it in a safe place where you can access it at any time for reference during operation.

Notice

●The contents of this manual are subject to modification without notice due to function upgrades, etc.

●We strive to ensure that the contents of this manual are correct. If you find any errors, please contact us.

●The contents of this manual may not be reproduced or copied.

●This product is prohibited from being used in explosion-proof places.

Version

U- SUP-PSS-9010-CN1 First edition November 2021

Confirm the package contents

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

Product List

Product packaging content

Serial number	Item Name	quantity	Remark
1	Sludge concentration electrode	1	
2	manual	1	
3	Certificate	1	

Table of contents

Chapter 1 Product Overview

The suspended solids (sludge concentration) sensor is based on infrared scattered light technology, that is, the infrared light emitted by the light source will be scattered when passing through the sample being measured during the transmission process, and the intensity of the scattered light is proportional to the suspended solids concentration. The suspended solids (sludge concentration) sensor sets a scattered light receiver at 140°, and the suspended solids concentration value is obtained by analyzing the intensity of this group of scattered light.

This product is widely used in online monitoring of sludge concentration in various process of sewage treatment plants; online monitoring of suspended solids (sludge concentration) in various industrial production process water and wastewater treatment processes. The sensor size is shown in the figure.

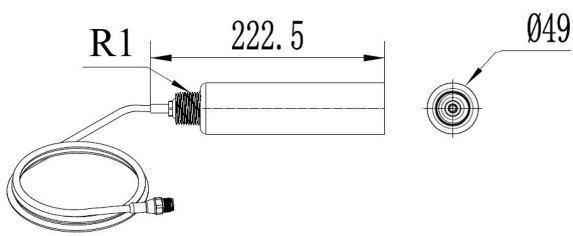


Figure 1 Dimensions of the sensor without scraper

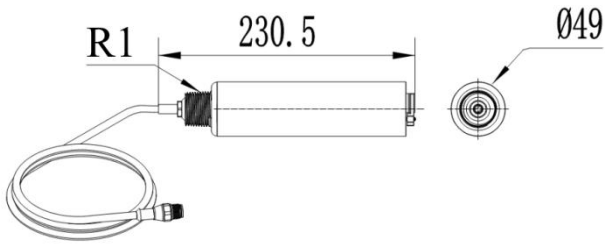


Figure 2 Dimensions of sensor with scraper

Chapter 2 Technical Parameters

Table 1

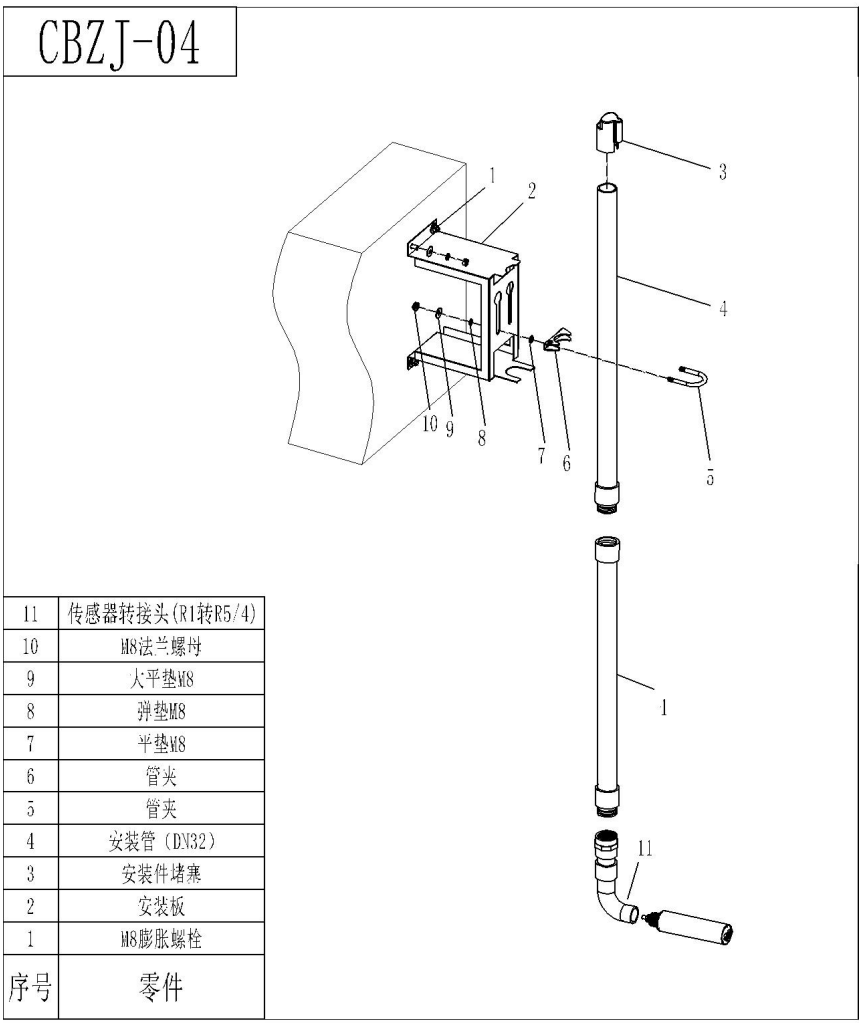
project	Information
Measuring range	(20 ~ 30000) mg/L
Measurement accuracy	Less than ±10% of the measured value (depending on the homogeneity of the sludge) or 10 mg/L, whichever is greater
Repeatability	±3%
Resolution	0.1mg/L, 1mg/L, depending on the range
Pressure Range	≤0.2M Pa
Main material of sensor	Body: SUS316L; Upper and lower covers: PPS+glass fiber Cable: PUR

Power supply	(9~36) VDC
Communication output	RS485 output, MODBUS-RTU communication protocol
Storage temperature	(-15~60) ℃
Operating temperature	(0 ~ 45) ℃ (no freezing)
weight	0.8kg
Protection level	IP68/NEMA6P
Cable length	Standard 10m cable, can be extended to 100m

Chapter 3 Install

3.1 Sensor Installation

3.1.1 Quick-release poolside fixed installation



11	传感器转接头(R1转R5/4)
10	M8法兰螺母
9	大平垫M8
8	弹垫M8
7	平垫M8
6	管夹
5	管夹
4	安装管（DN32）
3	安装件堵塞
2	安装板
1	M8膨胀螺栓
序号	零件

Figure 3 Schematic diagram of quick-release poolside installation

Note: The installation pipe DN32 with number 4 in the figure means the

inner diameter of the pipe is 32mm.

3.1.2 Classic poolside fixed installation

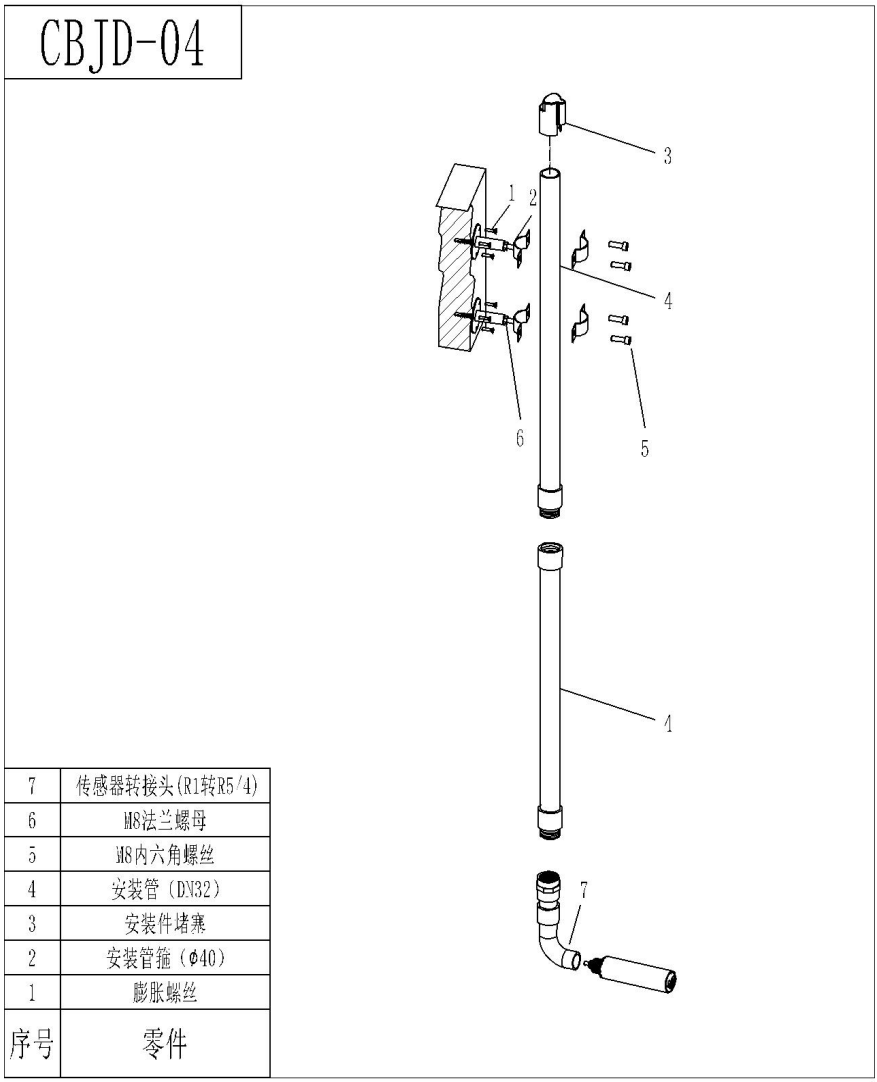


Figure 4 Schematic diagram of classic poolside installation

Note: The installation pipe DN32 with number 4 in the figure means the inner diameter of the pipe is 32mm.

3.1.3 Railing fixed installation

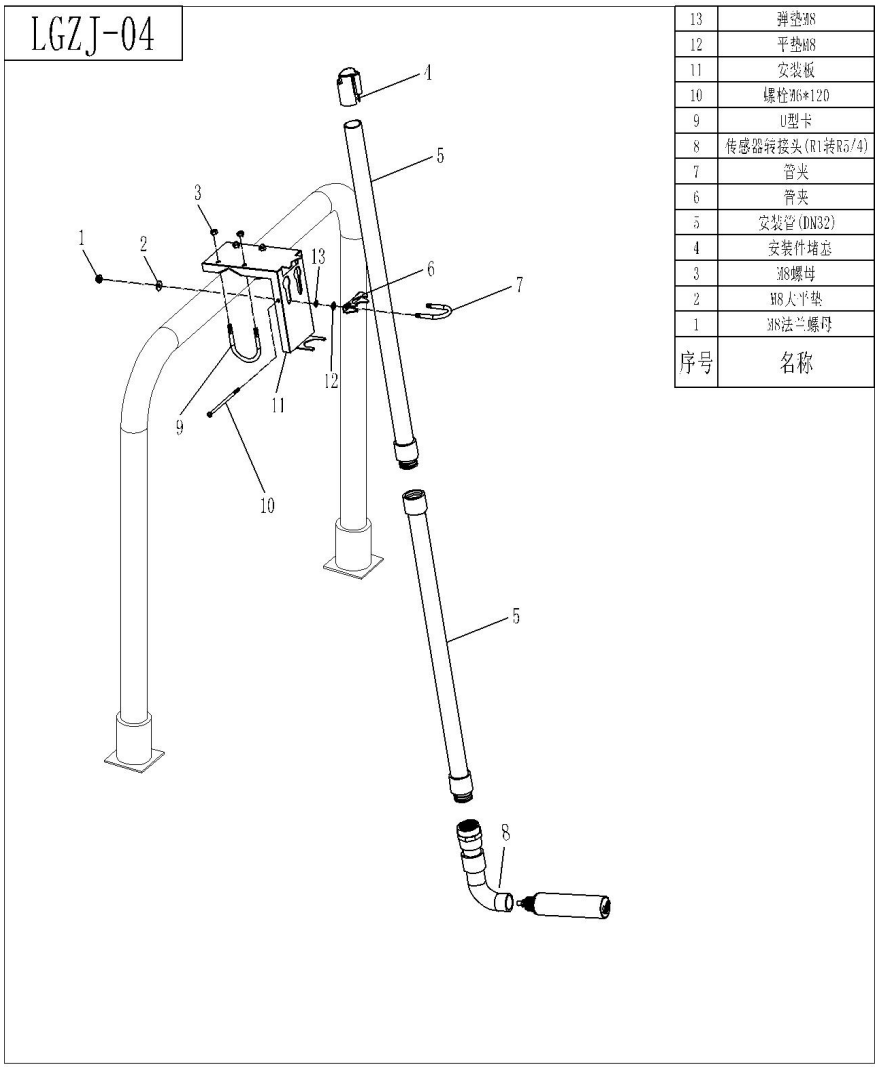


Figure 5 Schematic diagram of railing installation

Note: The number 5 installation pipe DN32 in the figure means the inner diameter of the pipe is 32mm.

3.2 Sensor connection

The sensor is correctly connected according to the following wire core definitions:

Wire core number	1	2	3	4	5
Sensor wire	brown	black	blue	White	Yellow+Green
letter Number	+ (9~36) VDC	AGND	RS485 A	RS485 B	Ground wire

Chapter 4 Interface and Operation

4.1 User Interface

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

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

4.2 Parameter settings

(1) Click Setup on the menu bar, select Read/Write Definition, set the parameters (the slave address used for the first time is based on the slave label), and click OK.

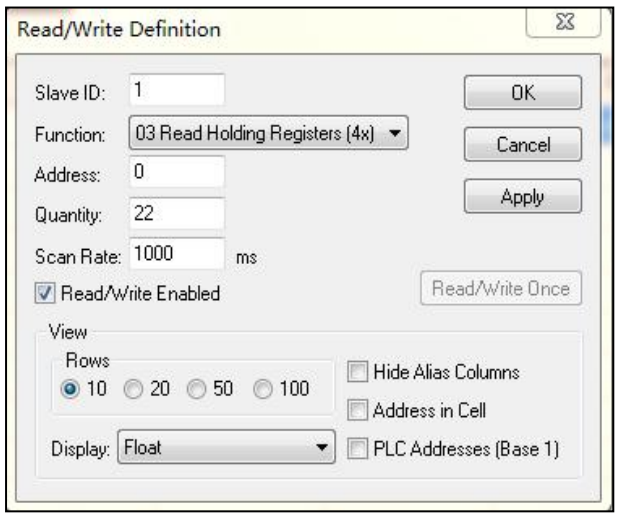


Figure 6

Note: When the slave address is changed, it will communicate with the new address, and the slave address for the next connection will also be the most recently changed address.

(2) Click Connection on the menu bar, select the first line of

Connection setup in the drop-down menu to set the baud rate (the baud rate for the first use shall be based on the slave label), and click OK.

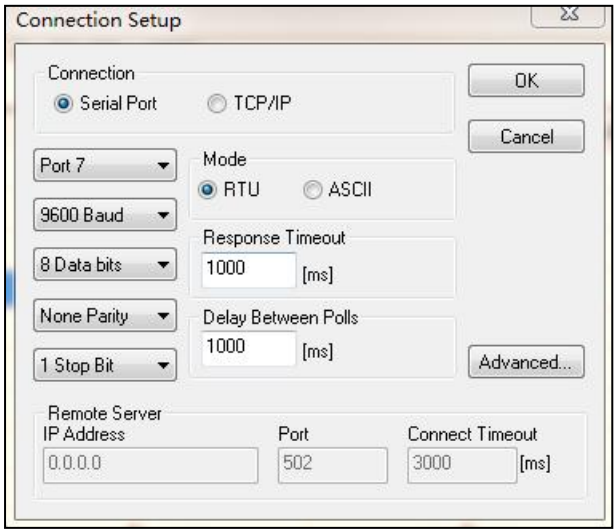


Figure 7

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

Tip: If the sensor has been connected as described, but a Timeout Error appears in the Display status area of the software , indicating that the connection is not yet complete, remove and replace the USB connection port or check the USB to RS485 converter, etc. Repeat the above steps until the sensor is successfully connected.

Chapter 5 Sensor Calibration

The suspended solids (sludge concentration) sensor has been calibrated before leaving the factory. If you need to calibrate yourself, you can do it in the factor calibration method or multi-point calibration method. The suspended solids (sludge concentration) calibration requires the use of suspended solids standard solution.

5.1 Factor calibration

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 relevant parameters and clean the sensor;

(3) Select "06" in the menu bar, enter "27" in the Address and "1" in the Value in the dialog box that appears, and then click "Send", as shown in the figure below:

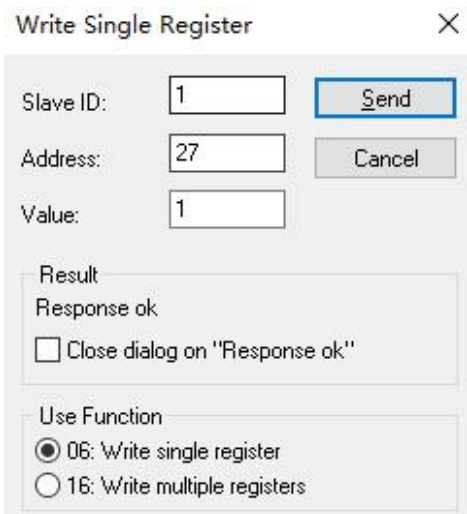


Figure 8

（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 value that pops up on the right, enter "1" for Value, click "OK", and then click "Send", as shown in the figure below;

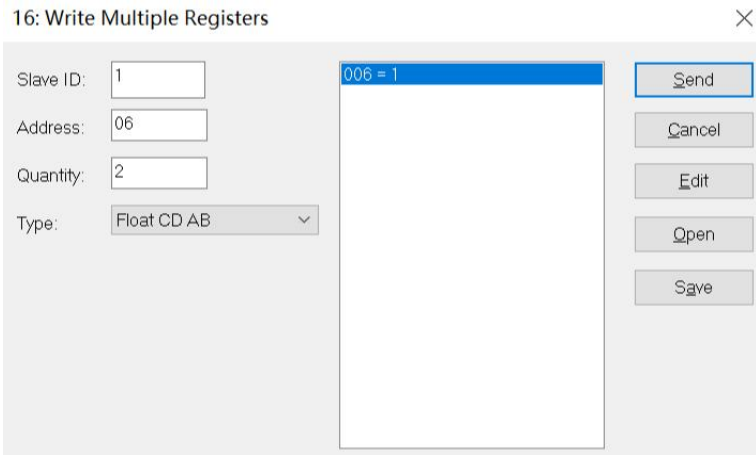


Figure 9

(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 standard solution value divided by the value measured in step 6. (Factor = standard solution value / measured value);

(8) Select "16" from the menu bar and enter "06" for Address and "2" for Quantity in the dialog box that appears. Change Type to "Float CD AB". Double-click the value that pops up on the right and enter the "Factor Value" (the Factor Value is the value calculated in step 7). Click "OK" and then click "Send".

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

following figure:

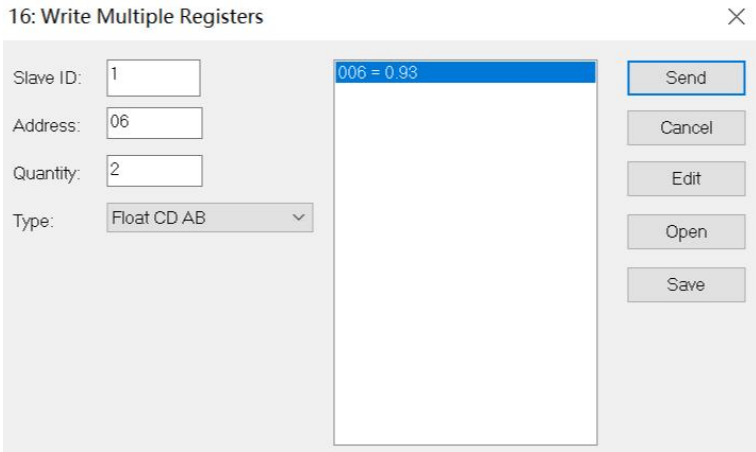


Figure 10

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

Figure 11

Note:

(1) During calibration, ensure that the probe lens is 15 cm away from the bottom of the calibration cup.

(2) Make sure there are no bubbles in the front of the lens during calibration.

(3) It is recommended that the calibration cup be protected from light during calibration.

5.2 Two -point calibration

The two-point calibration of suspended solids (sludge concentration) 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 two suspended solid standard solutions required for two-point calibration. Generally, the recommended ones are the zero point, 0.25 times the range, 0.5 times the range and the full range point, and clean the sensor.

(3) Refer to steps 3-4 of 5.1 and set the calibration mode to factor with the factor value of 1. In this mode, the values of each standard solution tested are the actual measured values of each standard solution.

(4) Slowly immerse the sensor into the first suspended solid standard solution, record the first standard solution value (the standard solution value is the target value) and the first standard solution measured value (the measured value is the actual value), clean and wipe it clean; slowly immerse the sensor into the second suspended solid standard solution, record the second standard solution value and the second standard solution measured value, clean and wipe it clean; (In this process, the target value divided by the measured value is < 2)

(5) Select "06" in the menu bar, enter "27" for Address and "2" for Value in the dialog box that appears, and then click "Send", as shown in the figure below;

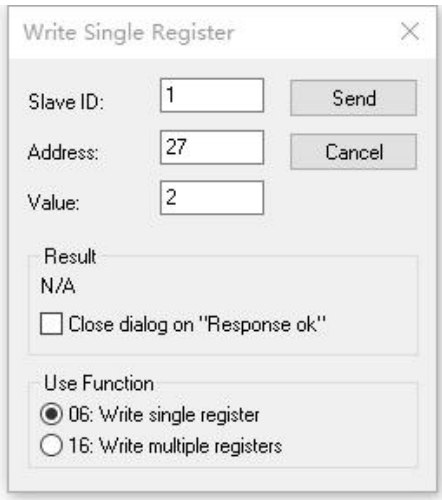


Figure 12

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

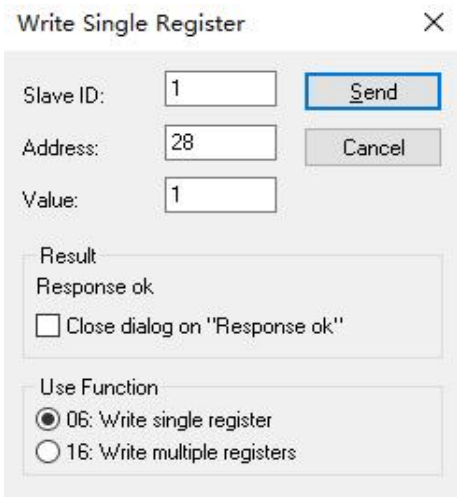


Figure 13

(7) Select "16" in the menu bar and enter "20" for Address and "2" for Quantity in the dialog box that appears. Change Type to "Float CD AB". Double-click the value that pops up on the right and enter the Value as "the first standard solution value". Click "OK" and then click "Send", as shown in the figure below.

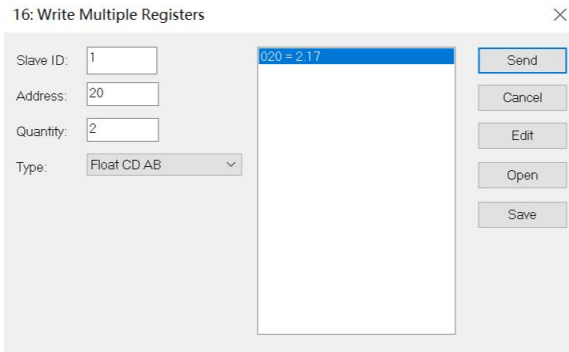


Figure 14

(8) Select "16" in the menu bar and enter "22" for Address and "2" for Quantity in the dialog box that appears. Change Type to "Float CD AB". Double-click the value that pops up on the right and enter the Value into "the measured value of the first standard solution". Click "OK" and then click "Send", as shown in the figure below.

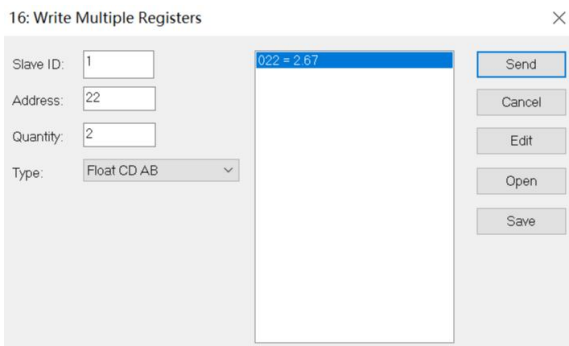


Figure 15

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

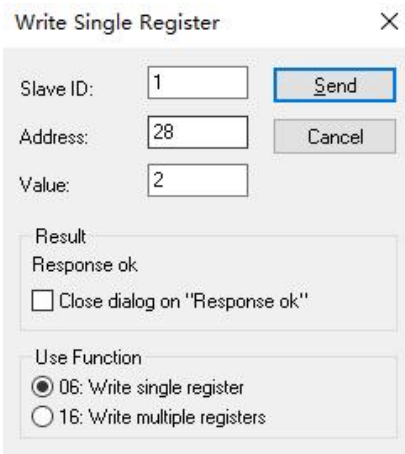


Figure 16

（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 value that pops up on the right, enter the Value as "the second standard solution value", click "OK", and then click "Send", as shown in the figure below;

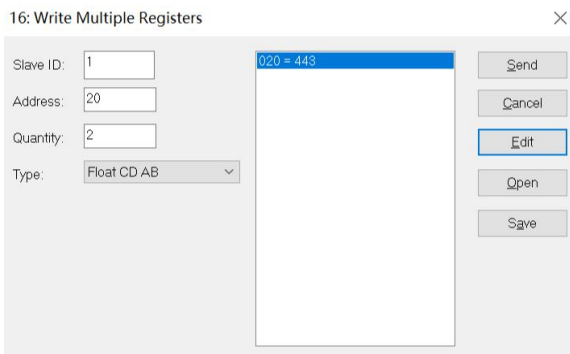


Figure 17

（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 value that pops up on the right, enter the Value into "the measured value of the second standard solution", click "OK", and then click "Send", as shown in the figure below;

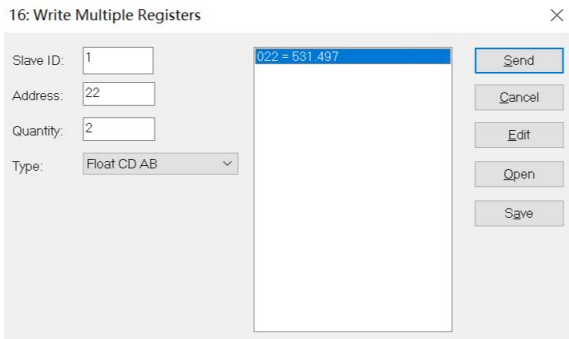


Figure 18

（12）After calibration is complete, remove the sensor, clean it and wipe it clean.

5.3 Four-point calibration

The four-point calibration of suspended solids (sludge concentration) 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 solid standard solutions required for the four-point calibration. Generally, the recommended ones are the zero point, 0.25 times the range point, 0.5 times the range point and the full range point, and clean the sensor;

(3) Refer to steps 3-4 of 5.1 and set the calibration mode to factor with the factor value of 1. In this mode, the values of each standard solution tested

are the actual measured values of each standard solution.

(4) Slowly immerse the sensor into the first suspended solid standard solution, record the first standard solution value (the standard solution value is the target value) and the first standard solution measured value (the measured value is the actual value), clean and wipe it clean; slowly immerse the sensor into the second suspended solid standard solution, record the second standard solution value and the second standard solution measured value, clean and wipe it clean; slowly immerse the sensor into the third suspended solid standard solution, record the third standard solution value and the third standard solution measured value, clean and wipe it clean; slowly immerse the sensor into the fourth suspended solid standard solution, record the fourth standard solution value and the fourth standard solution measured value, clean and wipe it clean; (In this process, the target value divided by the measured value < 2)

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

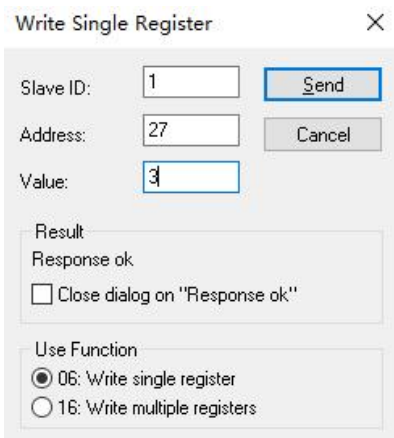


Figure 18

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

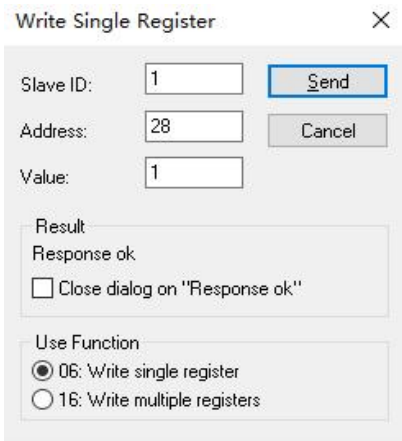


Figure 19

(7) Select "16" in the menu bar and enter "20" for Address and "2" for Quantity in the dialog box that appears. Change Type to "Float CD AB". Double-click the value that pops up on the right and enter the Value as "the first standard solution value". Click "OK" and then click "Send", as shown in the figure below.

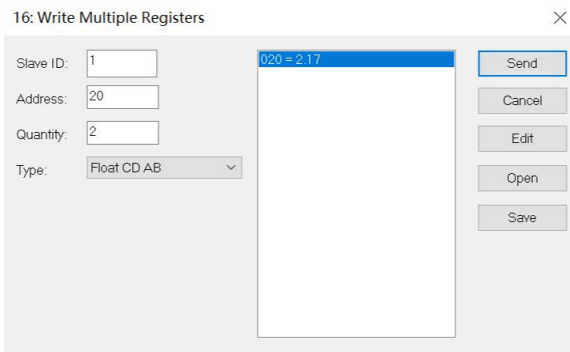


Figure 20

(8) Select "16" in the menu bar and enter "22" for Address and "2" for Quantity in the dialog box that appears. Change Type to "Float CD AB". Double-click the value that pops up on the right and enter the Value into "the measured value of the first standard solution". Click "OK" and then click "Send", as shown in the figure below.

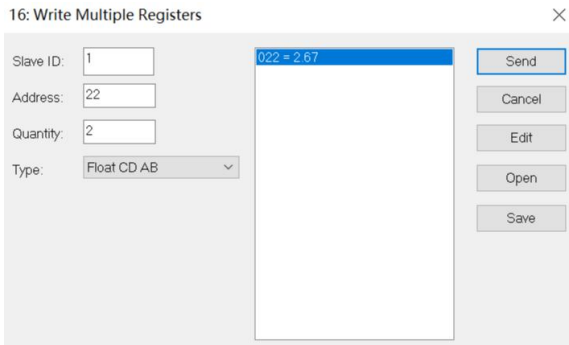


Figure 21

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

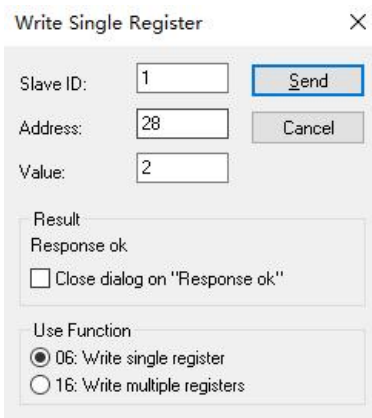


Figure 22

(10) Select "16" in the menu bar and enter "20" in the Address and "2" in the Quantity in the dialog box that appears. Change the Type to "Float CD AB". Double-click the value that pops up on the right and enter the Value as "the second standard solution value". Click "OK" and then click "Send", as shown in the figure below.

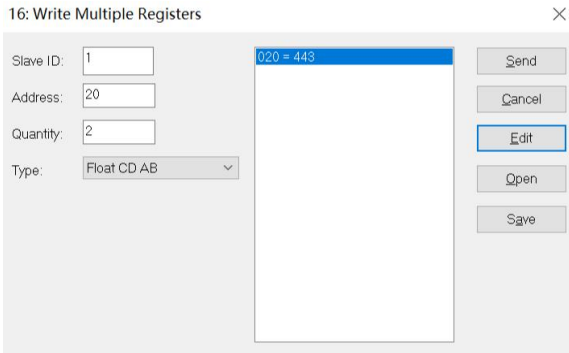


Figure 23

（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 value that pops up on the right, enter the Value into "the measured value of the second standard solution", click "OK", and then click "Send", as shown in the figure below;

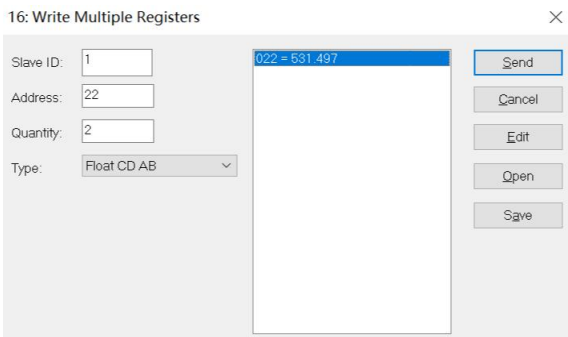


Figure 24

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

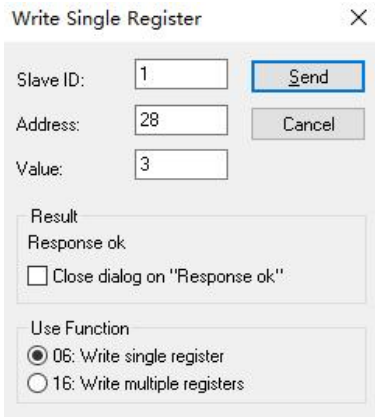


Figure 25

（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 value that pops up on the right, enter the Value as "the third standard solution value", click "OK", and then click "Send", as shown in the figure below;

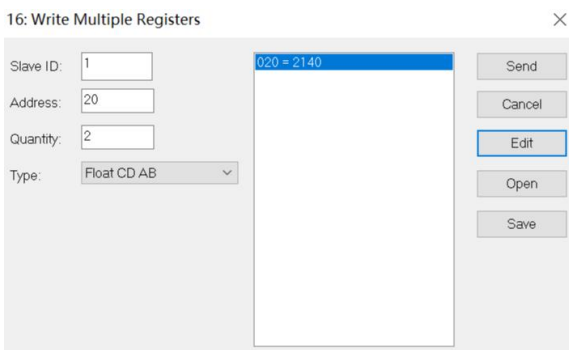


Figure 26

（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 value that pops up on the right, enter the Value into "the third standard solution measured value", click "OK", and then click "Send", as shown in the figure below;

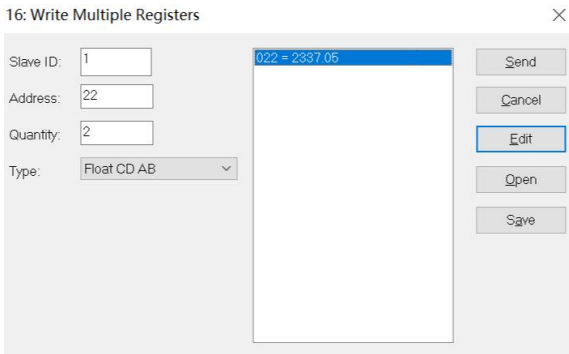


Figure 27

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

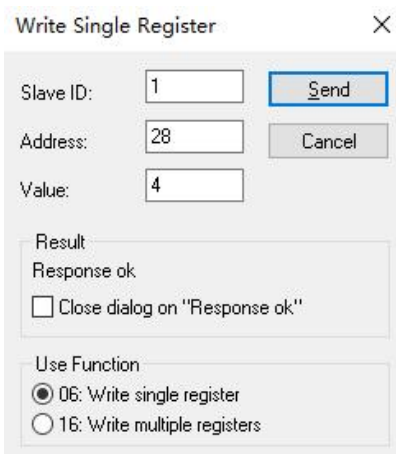


Figure 28

（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 value that pops up on the right, enter the Value into "the 4th standard solution value", click "OK", and then click "Send", as shown in the figure below;

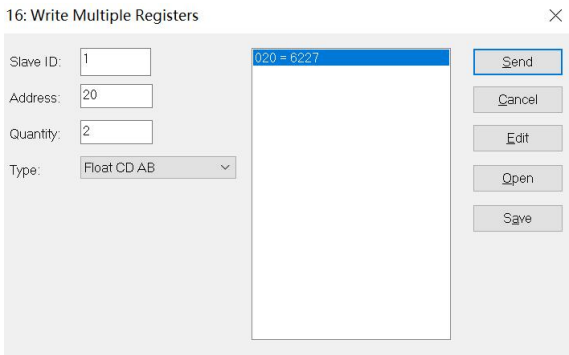


Figure 29

（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 value that pops up on the right, enter the Value into "the measured value of the 4th standard solution", click "OK", and then click "Send", as shown in the figure below;

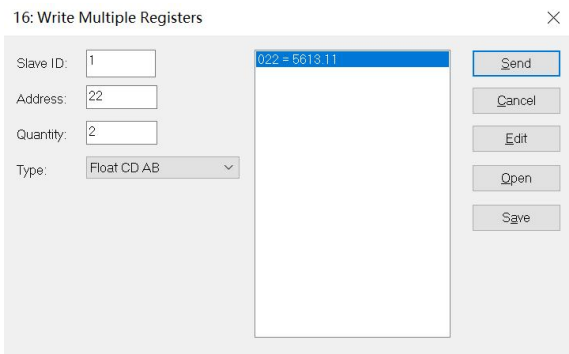


Figure 30

（18）After calibration is complete, remove the sensor, clean it and wipe it clean.

Chapter 6 Maintenance and Care

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

6.1 Sensor cleaning

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

6.2 Sensor damage inspection

Check the appearance of the sensor to see if it is damaged. If it is damaged, contact the after-sales service center to replace it in time to prevent the sensor from getting wet and causing malfunctions. Note: It is recommended to replace the seal ring once a year.

6.3 Sensor scraper replacement

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

Figure 31

(1) The scraper position is shown in the figure above;

(2) Remove the rubber sheet from the scraper;

(3) Then apply lubricating oil on the bracket;

(4) Install the new rubber sheet.

Chapter 7 Warranty and After-Sales Service

Our company promises to customers that the hardware accessories provided with this instrument are free of defects in material and manufacturing process.

The warranty period starts from the date of purchase of the instrument. If the company receives notification from the user about such defects during the warranty period, it will provide unconditional free maintenance or replacement for the defective products. All non-customized products will be guaranteed to be returned within 7 days.

Disclaimer

During the warranty period, product failures caused by the following reasons are not covered by the three guarantees service:

(1) Product failure caused by improper use by the customer.

(2) Product failure caused by the customer’s own disassembly, repair or modification of the product.

After-sales service commitment:

(1) For technical questions from customers, we promise to respond and resolve them within 2 hours of receiving the user's question.

to issue test results within 3 working days after receiving the goods and repair results within 7 working days.

Chapter 8 Communication Protocol

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

Table 2

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

Table 3

Register Name	address Location	Read/ Write	data type	Number of registers	illustrate
Suspended solids/sludge concentration value	2	OR	Float	2	20-30000
Suspended solids/sludge concentration factor	6	R W	Float	2	0.1 1 - 9.99
Scrape time	11	OR	Signed	1	Written at address 21
parameter	13	OR	Signed	1	1 is turbidity 2 is suspended matter
Manual scraping instructions	20	W	Signed	1	66

Automatic scraping command	twenty one	W	Signed	1	The sending interval in minutes
Response time	12	R W	Signed	1	3 -60s
Probe humidity	14	OR	Signed	1	Recommended less than 10
Probe baud rate	16	R/W	Signed	1	0 represents 4800 1 represents 9600 2 represents 19200 3 represents 38400
Probe slave address	17	R W	Signed	1	1-2 00
Sequence Number 1	614 4 0	OR	Signed	1	First 4 digits of the serial number
Sequence number 2	614 4 1	OR	Signed	1	4 digits in the serial number
Sequence number 3	614 4 2	OR	Signed	1	Last 4 digits of the serial number
Calibration method					
Factor Correction					
first step	27	R W	Signed	1	Send 1
Two-point calibration					
first step	27	R W	Signed	1	Send 2 (2 represents 2-point calibration)
First point correction					

first step	28	R W	Signed	1	Send 1 (1 represents the first point)
Step 2: Set the target value	20	R W	Float	2	Send target value
Step 3: Set the actual value	twenty two	R W	Float	2	Send actual value
Second point correction					
first step	28	R W	Signed	1	Send 2 (2 represents the second point)
Step 2: Set the target value	20	R W	Float	2	Send target value
Step 3: Set the actual value	twenty two	R W	Float	2	Send actual value
Four-point calibration					
first step	27	R W	Signed	1	Send 3 (3 represents four-point calibration)
First point correction					
first step	28	R W	Signed	1	Send 1 (1 represents the first point)
Step 2: Set the target value	20	R W	Float	2	Send target value
Step 3: Set the actual value	twenty two	R W	Float	2	Send actual value
Second point correction					

first step	28	R W	Signed	1	Send 2 (2 represents the second point)
Step 2: Set the target value	20	R W	Float	2	Send target value
Step 3: Set the actual value	twenty two	R W	Float	2	Send actual value
Third point correction					
first step	28	R W	Signed	1	Send 3 (3 represents the 3rd point)
Step 2: Set the target value	20	R W	Float	2	Send target value
Step 3: Set the actual value	twenty two	R W	Float	2	Send actual value
Fourth point correction					
first step	28	R W	Signed	1	Send 4 (4 represents the 4th point)
Step 2: Set the target value	20	R W	Float	2	Send target value
Step 3: Set the actual value	twenty two	R W	Float	2	Send actual value

8.1 485 Analysis

8.1.1 Reading suspended solids/sludge concentration values

Table 4

Register Name	address Location	Read/Write	data type	Storage Number of devices	illustrate
Suspended solids/sludge concentration value	2	OR	Float	2	20-30000

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 contents

00 02: The starting register address to be read is 02

00 02: Read 2 registers

65 CB: CRC16 checksum

Device return analysis:

01: Device address 01

03: Function code 03 for reading register contents

04: The returned data length is 4 bytes

00 00 40 E0: The suspended solids/sludge concentration value read is 7.00 (40 E0 00 00 is parsed using IEEE 754)

CA 7B: CRC16 checksum

8.1.2 Reading the Scraping Time

Table 5

Register Name	address Location	Read/Write	data type	Storage Number of devices	illustrate
Scrape time	11	OR	Signed	1	Written at address 21

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 contents

00 B: The starting register address to be read is 11

00 01: Read 1 register

F5 C8: CRC16 checksum

Device return analysis:

01: Device address 01

03: Function code 03 for reading register contents

02: The returned data length is 2 bytes

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

B8 44: CRC16 checksum

8.1.3 Setting manual scraping instructions

Table 6

Register Name	address Location	Read/ Write	data type	Storage Number of devices	illustrate

Manual scraping instructions	20	W	Signed	1	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 checksum

Device return analysis:

01: Device address 01

06: Function code 06 for writing register contents

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

00 42: Return the modified data content to 66

49 FF: CRC16 checksum

8.1.4 Setting the suspended solids/sludge concentration factor

Table 7

Register Name	address Location	Read/Write	data type	Storage Number of devices	illustrate
Suspended solids/sludge concentration factor	6	R W	Float	2	0.11-9.99

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

10: Function code 16 for writing register contents

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

00 02: Write data of 2 registers

04: Data length 4 bytes

00 00 3F 80: The suspended solids/sludge concentration factor written is: 1.00 (3F 80 00 00 is parsed using IEEE 754)

63 D5: CRC16 checksum

Device return analysis:

01: Device address 01

10: Function code 16 for writing register contents

00 06: The starting register address of the returned write data is 06

00 02: Return 2 registers

A1 C9: CRC16 checksum