Turbidity Sensor

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.

Preface

- Thank you for purchasing our company's products.
- This manual is an instruction manual about the various functions, wiring methods, setup methods, operation methods, fault handling methods, etc. of the product.
- Please read this manual carefully before operation, use this product correctly, and avoid unnecessary losses caused by incorrect operation.
- After you finish reading, please keep it in a convenient place for easy access at any time for reference during operation.

Note

- If there are any modifications to the content of this manual due to functional upgrades or other reasons, we will not notify you.
- We strive to ensure the accuracy of the content in this manual. If you find any errors, please contact us.
- The content of this manual is strictly prohibited from being reproduced or copied.
- This product is prohibited from use in explosion-proof environments.

Version

U-SUP-PTU-8011-EN1

Confirm Packaging Content

After opening the packaging box, please confirm the contents of the packaging before starting the operation. If you find any errors in the model and quantity or physical damage to the appearance, please contact our company.

Product List

Product Packaging Content

Number	Product Name	Quantity	Remarks
1	Turbidity Sensor	1	
2	Manual	1	
3	Certificate	1	

Contents

1. Product Overview

The turbidity sensor is based on the combined infrared absorption scattering method. The infrared light emitted by the light source is scattered by the turbidity in the sample, and finally converted into an electrical signal by the photodetector. After analog and digital signal processing, the turbidity value of the sample is obtained.

It can be widely used for turbidity monitoring in sewage treatment plants, water treatment plants, water stations, surface water, industrial and other fields. The size of the turbidity sensor is shown in the following figure.

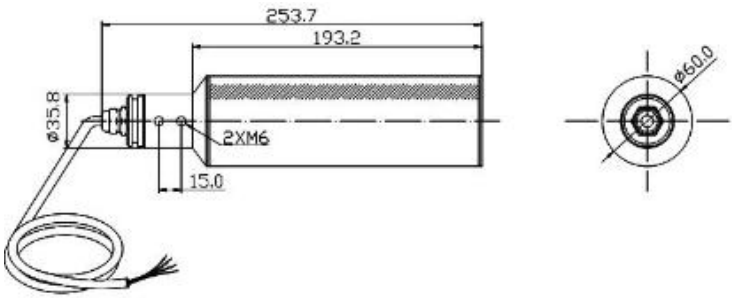


Fig. 1 Dimensional Drawing without Scraper Sensor

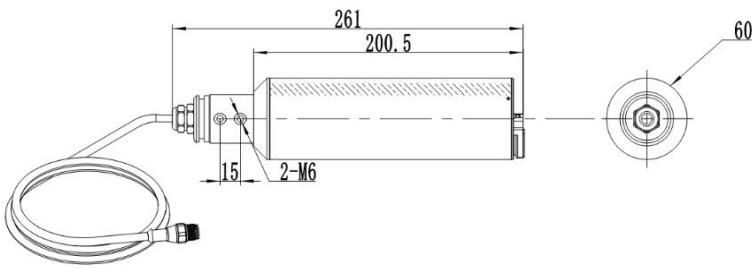


Fig. 2 Dimensional Drawing of Scraper Sensor

2. Technical Parameter

Table 1

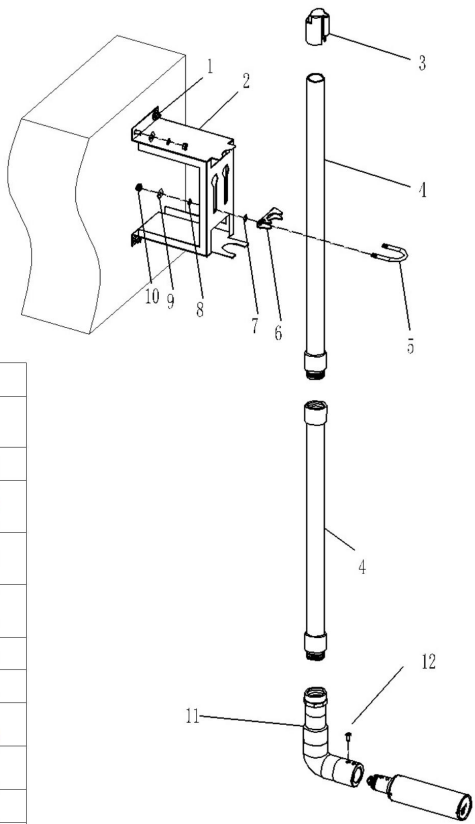
Specifications	Description
Measurement Range	(0.01~4000)NTU
Accuracy	Less than ± 2% of the measured value, or ± 0.1NTU, whichever is greater
Repeatability	±2%
Resolution	(0.01~0.1)NTU, Depending on different ranges
Pressure Range	≤0.4Mpa
Velocity of Flow	≤2.5m/s、8.2ft/s
Main Materials of Sensors	Fuselage: SUS316L/Titanium Alloy/PVC; Upper and Lower Covers: POM, Cable: PUR
Power Supply	DC power: 12VDC
Communication Output	RS485 Output, MODBUS-RTU Communication Protocol
Working Environment	(0~45)℃ (No condensation)
Weight	1.65kg
Level of Protection	IP68/NEMA6P
Cable Length	Standard 10 meter cable, extendable up to 100 meters

3. Installation

3.1. Installation of Sensors

3.1.1. Quick Detachable Pool Edge Fixed Installation

CBZJ-03

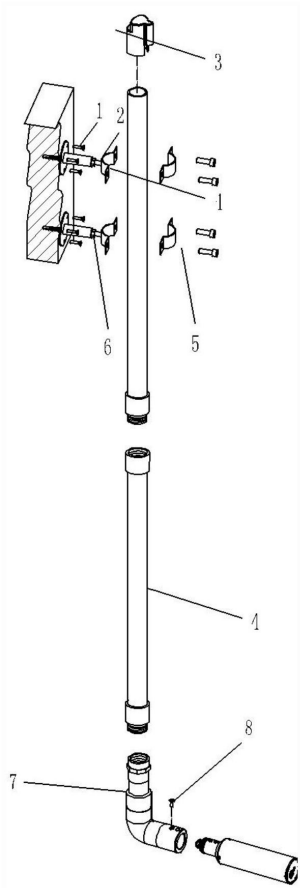


Number	Accessory
12	Cross Bolt M6*12
11	Sensor Adapter (dual hole to R5/4)
10	H8 Flange Nut
9	Large Flat Cushion M8
8	Spring Washer M8
7	Flat Cushion M8
6	Pipe Clamp
5	Pipe Clamp
4	Installation Pipe (outer diameter φ 38MM)
3	Install components to block the cold
2	Installation Board
1	N8 Expansion Bolt

Fig. 3 Quick Dismantling Pool Edge Installation Diagram

3.1.2. Classic Fixed Installation by the Pool Edge

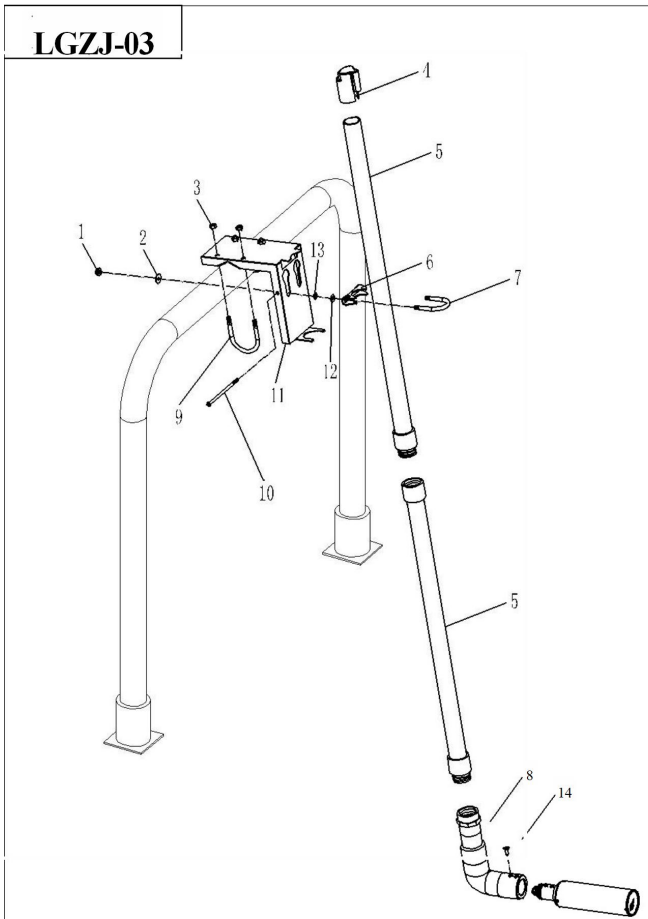
CBJD-03



Number	Accessory
8	Cross Bolt M6 * 12
7	Sensor Adapter (dual hole to R5/4)
6	M8 Flange Nut
5	H8 Hexagon Socket Screw
4	Installation Pipe (outer diameter φ 38MM)
3	Install components to block the cold
2	Install Pipe Clamp (φ 40)
1	Expansion Screws

Fig. 4 Classic Pool Side Installation Diagram

3.1.3. Fixed Installation with Railing



Number	Name
14	Cross Bolt M6*12
13	Spring Washer 8
12	Flat Cushion H8
11	Installation Board
10	Bolt：6*120
9	U-shaped Card
8	Sensor Adapter (dual hole to R5/4)
7	Pipe Clamp
6	Pipe Clamp
5	Installation Tube (outer diameter 38HH)
4	Installation Component Blockage
3	8 Nuts
2	H8 Large flat cushion
1	H8 Flange Nut

Fig. 5 Schematic Diagram of Railing Installation

3.2. Connection of Sensors

Sensors are correctly connected according to the following wire core definitions:

Table 2

Core Number	1	2	3	4	5
Sensor Wires	Brown	Black	Blue	White	Yellow&Green
Signal	+12VDC	AGND	RS485 A	RS485 B	Ground Wire

4. Interface and Operation

4.1. User Interface

The sensor is connected to the computer via RS485 to USB and then connected using Modbus Poll.

Note: Modbus Poll software is a universal software that can be downloaded online by oneself.

4.2. Parameter Settings

（1） Click on "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 pop-up dialog box Quantity and click OK.

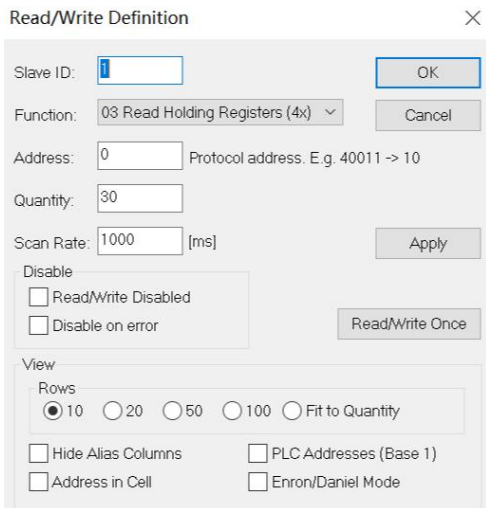


Fig. 6

Note: When the slave address is changed, communication will be carried out with the new address, and the next connected slave address will also be the most recently changed address.

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

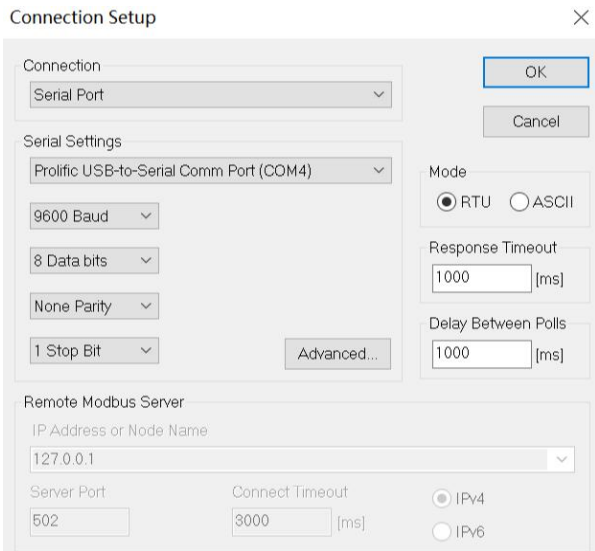


Fig. 7

Note: The port is set according to the connected port number.

Tip: If the sensor has been connected according to the instructions and a Timeout Error appears at the software Display status, it indicates that it has not been connected properly. 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.

5. Sensor Calibration

The turbidity sensor has been calibrated before leaving the factory. If self calibration is required, the following steps can be followed.

5.1. Factor Calibration

Turbidity calibration requires the use of turbidity standard solution. During calibration, ensure that the probe lens is 15cm away from the bottom of the calibration cup and that there are no bubbles at the front end of the lens. It is recommended that the calibration cup be treated with light avoidance during calibration. The specific steps are as follows:

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

（1） Connect the sensor to Modbus software;

（2） Set the relevant parameters and wipe the sensor clean;

（3） Select "16" from the menu bar and enter "04" for Address and "2" for Quantity in the dialog box that appears. Change the 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 following figure:

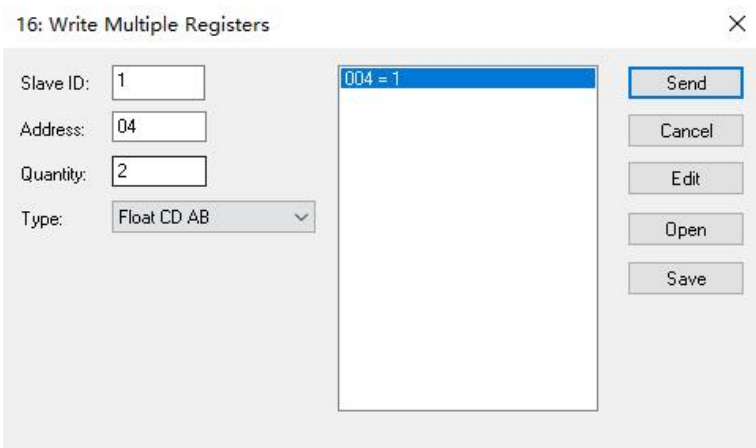


Fig. 8

（4） Slowly immerse the sensor into the turbidity standard solution;

（5） Wait for the numerical stability and record the measured value;

（6） Calculate the correction factor; The correction factor is equal to the standard solution value divided by the value measured in step 5. (Factor=standard solution value/measured value);

（7） Select "16" from the menu bar and enter "04" for Address and "2" for 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 "Factor Value" (the factor value is calculated in step 6), click "OK", and then click "Send".

Assuming the factor value calculated in step 6 is 1.02, as shown in the following figure:

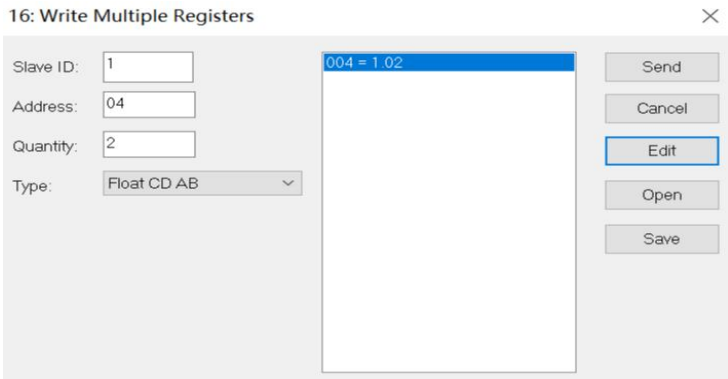
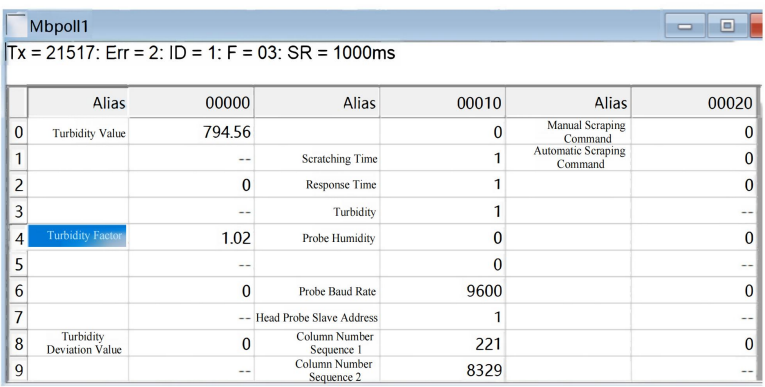


Fig. 9



	Alias	00000	Alias	00010	Alias	00020
0	Turbidity Value	794.56		0	Manual Scraping Command	0
1		--	Scratching Time	1	Automatic Scraping Command	0
2		0	Response Time	1		0
3		--	Turbidity	1		--
4	Turbidity Factor	1.02	Probe Humidity	0		0
5		--		0		--
6		0	Probe Baud Rate	9600		0
7		--	Head Probe Slave Address	1		--
8	Turbidity Deviation Value	0	Column Number Sequence 1	221		0
9		--	Column Number Sequence 2	8329		--

Fig. 10

5.2. Curve Calibration

Turbidity calibration requires the use of turbidity standard solution to calibrate the calibration curve. The specific steps are as follows:

If entering the curve calibration, it is necessary to calibrate and perform the calibration action until step 8, otherwise the sensor will remain in calibration mode. If it cannot measure normally, choose to power off and restart or perform step 9.

（1） Connect the sensor to Modbus software;

（2） After setting the parameters according to section 4.2, right-click on the second column and select "Format", then click on "Float CD AB" and wipe the sensor clean;

（3） Select "16" from the menu bar to enter "04" for Address and "2" for Quantity in the dialog box that appears. Change the Type to "Float CD AB", double-click the value that pops up on the right to enter "1" for Value, click "OK", and then click "Send" to start calibration.

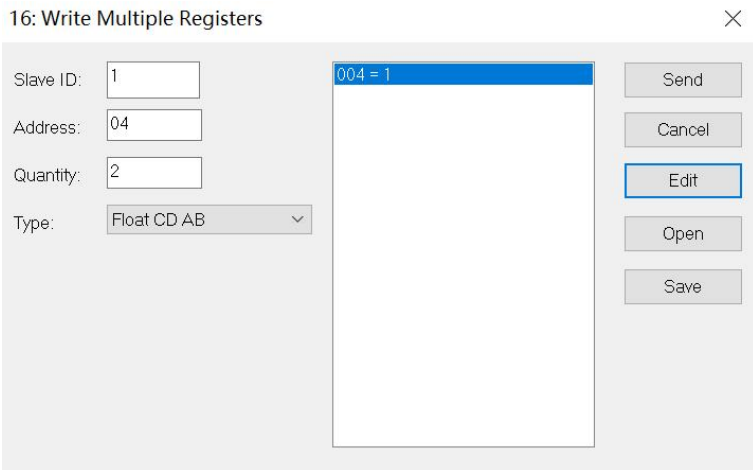


Fig. 11

（4） Enter calibration mode, select "06" from the menu bar, and enter "59" for Address and "66" for Value in the dialog box that appears. Click "Send";

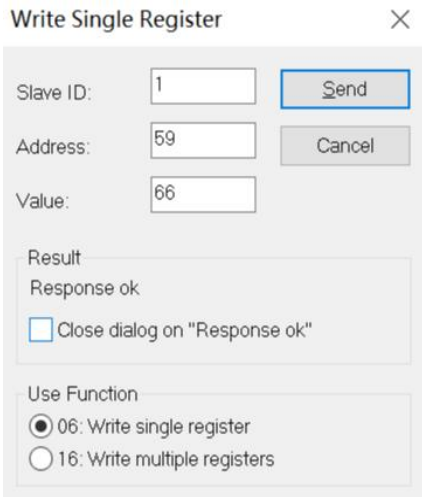


Fig. 12

（5） Place the sensor in distilled water, and after a period of time, select "06" from the menu bar. Enter "59" for Address and "1" for Value in the dialog box;

（6） After waiting for the value of address 22 to be less than 17 and stabilize for a period of time, as shown in the box below, select "06" from the menu bar, enter "59" for Address and "2" for Value in the dialog box, click "Send", and close the dialog box;

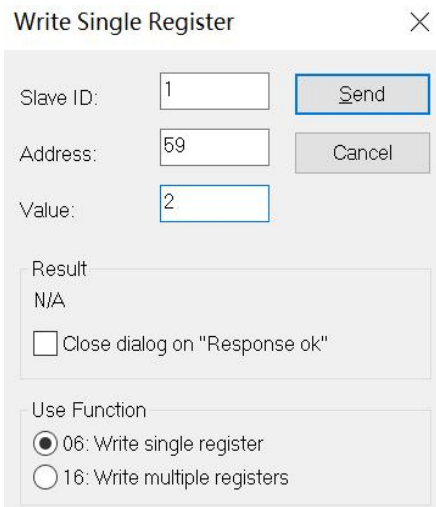
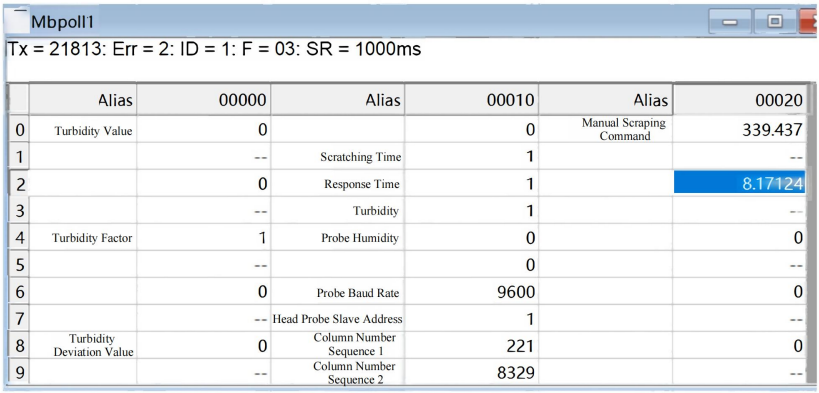


Fig. 13

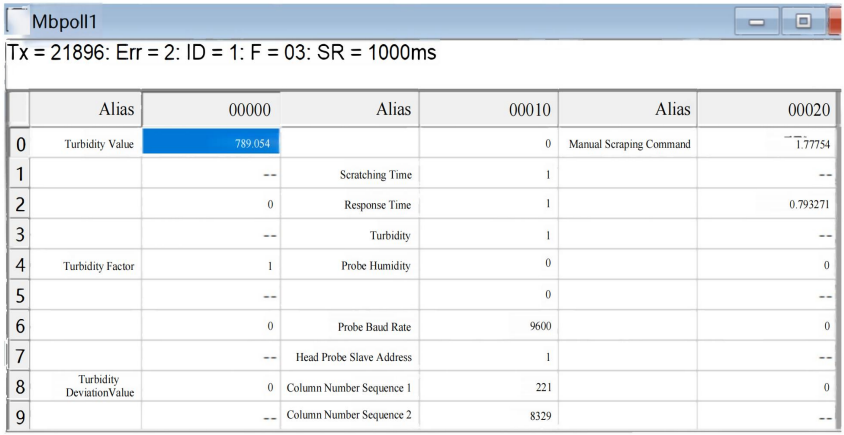


	Alias	00000	Alias	00010	Alias	00020
0	Turbidity Value	0		0	Manual Scraping Command	339.437
1		--	Scratching Time	1		--
2		0	Response Time	1		8.17124
3		--	Turbidity	1		--
4	Turbidity Factor	1	Probe Humidity	0		0
5		--		0		--
6		0	Probe Baud Rate	9600		0
7		--	Head Probe Slave Address	1		--
8	Turbidity Deviation Value	0	Column Number Sequence 1	221		0
9		--	Column Number Sequence 2	8329		--

Fig. 14

（7） Select "16" from the menu bar to enter "30" for Address and "2" for 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 "Known standard solution value (500-1000NTU)" for Value. Click "OK" and then click "Send";

（8） Place the sensor into the standard solution, select "06" in the menu bar to enter "59" for Address and "3" for Value in the dialog box that appears. Click "Send", and after a period of time, wait until the turbidity value in the figure is close to and stable with the input value. In the "06" dialog box of the original menu bar, enter "59" for Address and change "4" for Value. Click "Send" to complete the calibration;


Mbpoll1

Tx = 21896: Err = 2: ID = 1: F = 03: SR = 1000ms

	Alias	00000	Alias	00010	Alias	00020
0	Turbidity Value	789.054		0	Manual Scraping Command	1.77754
1		--	Scratching Time	1		--
2		0	Response Time	1		0.793271
3		--	Turbidity	1		--
4	Turbidity Factor	1	Probe Humidity	0		0
5		--		0		--
6		0	Probe Baud Rate	9600		0
7		--	Head Probe Slave Address	1		--
8	Turbidity DeviationValue	0	Column Number Sequence 1	221		0
9		--	Column Number Sequence 2	8329		--

Fig. 15

（9） If the customer wants to exit calibration midway or for other reasons, select "06" from the menu bar and send the following command to enter "59" in Address and "33" in Value.

6. Maintenance

In order to achieve the best measurement results, regular maintenance and upkeep are necessary. Maintenance and upkeep mainly include cleaning the sensors and checking if they are damaged. During maintenance and testing, the relevant status of sensors can also be viewed.

6.1. Cleaning of Sensors

The two lenses on the sensor need to be cleaned. Please regularly clean and maintain them according to actual usage to ensure measurement accuracy. When cleaning, rinse with clean water first, and then use a cleaning agent and cloth to wipe away stubborn stains.

6.2. Sensor Damage Inspection

Check the appearance of the sensor for any damage. If there is any damage, contact the after-sales maintenance center for replacement in a timely manner to prevent water ingress and malfunction of the sensor due to damage. Note: It is recommended to replace the sealing ring once a year.

6.3. Sensor Blade Replacement Sensor Blade Replacement

It is recommended to replace the rubber scraper blade once a quarter for sensors with a scraper blade. The specific steps are as follows:

SUS316L/Titanium Alloy: PVC:

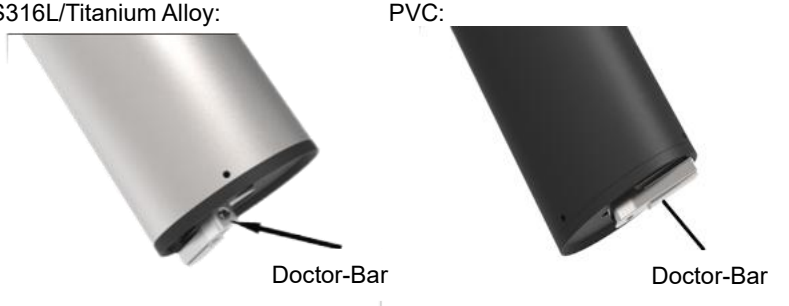


Fig. 16

1、The scraper position is shown in the left figure;

2、Remove the rubber sheet from the doctor-bar;

3、Then apply lubricating oil on the bracket;

4、Simply install a new rubber sheet.

7. Warranty and After-Sales Service

Our company promises to customers that the hardware accessories provided during the supply of this instrument have no defects in material and manufacturing process.

Starting from the date of purchase of the instrument, if we receive notification from the user regarding such defects during the warranty period, our company will provide unconditional free maintenance or replacement for products that are indeed defective. We guarantee that all non customized products can be returned or exchanged within 7 days.

Disclaimer

During the warranty period, product malfunctions caused by the following reasons are not within the scope of the three guarantee service:

(1) Product malfunction caused by improper use by customers.

(2) The customer's self disassembly, repair, and modification of the product resulted in product malfunction.

After sales service commitment:

(1) We promise to respond and handle customer technical questions within 2 hours after receiving them.

(2) We promise to provide test results within 3 working days and repair results within 7 working days after receiving the instruments for factory repair.

8. Communication Protocol

The sensor is equipped with MODBUS RS485 communication function. Please refer to section 3.2 of this manual for communication wiring. The specific MODBUS-RTU table is shown in the following table.

Table 3

MODBUS-RTU	
Baud Rate	4800/9600/19200/38400
Data Bits	8 Digits
Parity Check	Null
Stop Bit	1Digits

Table 4

Register Name	Address Location	Read/Write	Data Type	Number of Registers	Description
Turbidity Value	0	OR	Float	2	0-range
Turbidity Factor	4	RW	Float	2	0.1-10
Turbidity Deviation Value	8	RW	Float	2	±100NTU
Scratching Time	11	OR	Int	1	15/30/60/240/720/1440 /4320/10080min
Response Time	12	RW	Int	1	1-60s
Turbidity	13	RW	Int	1	This should be 1. If it is not 1, it should be changed to 1.

Register Name	Address Location	Read/Write	Data Type	Number of Registers	Description
Probe Humidity	14	OR	Int	1	Suggest less than 10 (if greater than 10, it indicates that the sensor may have been flooded.)
Probe Baud Rate	16	RW	Int	1	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
Automatic Scraping	21	W	Int	1	Time interval for sending:

Register Name	Address Location	Read/Write	Data Type	Number of Registers	Description
Command					15/30/60/ 240/720/1440/ 4320/10080min
Curve Correction					
Step 1	59	W	Int	1	Send 66 (66 represents entering calibration mode)
Step 2	59	W	Int	1	Send 1 (1 represents preparing to calibrate 0 points)
Step 3	59	W	Int	1	Send 2 (2 represents calibration point 0)
Step 4	30	W	Float	2	Write the value of point 2 standard solution (500-1000NTU)
Step 5	59	W	Int	1	Send 3 (3 represents preparing to calibrate point 2)
Step 6	59	W	Int	1	Send 4 (4 represents calibration point 2)
Exit During the Process	59	W	Int	1	Sending 33 represents exiting calibration mode

485 analysis:

（1）Read Turbidity Value

Table 5

Register Name	Address Location	Read/Write	Data Type	Number of Registers	Description
Turbidity Value	0	OR	Float	2	0-Range

Dispatch Orders: 01 03 00 00 00 02 C4 0B

Equipment Return: 01 03 04 00 00 40 E0 CA 7B

Send Command Parsing:

01: Equipment Address 01

03: Function code for reading register contents 03

00 00: The starting register address read is 0000

00 02: Read 2 registers

C4 0B: CRC16 verification code

Device Return Analysis:

01: Equipment Address 01

03: Function code for reading register contents 03

04: The length of the returned data is 4 bytes

00 00 40 E0: The turbidity value read is 7.00 (using IEEE 754 method to analyze 40 E0 00 00)

CA 7B: CRC16 checksum

(2) Read the scraping time

Table 6

Register Name	Address Location	Read/Write	Data Type	Number of Registers	Description
Scratching Time	11	OR	Int	1	15/30/60/240/720/1440/4320/10080min

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

Equipment Return: 01 03 02 00 0A B8 44

Send Command Parsing:

01: Equipment Address 01

03: Function code for reading register contents 03

00 0B: The starting register address read is 0011

00 01: Read 1 register

F5 C8: CRC16 checksum

Device Return Analysis:

01: Equipment Address 01

03: Function code for reading register contents 03

02: The length of the returned data is 2 bytes

00 0A: The read scraping time is 10

B8 44: CRC16 checksum

（3）Set Manual Scraping Brush

Table 7

Register Name	Address Location	Read/Write	Data Type	Number of Registers	Description
Manual Scraping Command	20	W	Int	1	Send 66

Send command: 01 06 00 14 00 42 49 FF

Equipment return: 01 06 00 14 00 42 49 FF

Send command parsing:

01: Equipment Address 01

06: Function code for writing register contents 06

00 14: The register address for writing data is 20

00 42: Write data content as 66

49 FF: CRC16 checksum

Device Return Analysis:

01: Equipment Address 01

06: Function code for writing register contents 06

00 14: Return the register address for writing data as 66

00 42: Return modified data content to 66

49 FF: CRC16 checksum

（4）Set Turbidity Factor

Table 8

Register Name	Address Location	Read/Write	Data Type	Number of Registers	Description
Turbidity Factor	4	RW	Float	2	0.1-10

Send command: 01 10 00 04 00 02 04 00 3F 80 E2 0C

Equipment return: 01 10 00 04 00 02 00 09

Send command parsing:

01: Equipment Address 01

10: Function code 16 for writing register contents

00 04: The starting register address for writing data is 0004

00 02: Write data from 2 registers

04: Data length of 4 bytes

00 00 3F 80: The turbidity factor written is 1.00 (using IEEE 754 method to analyze 3F 80 00 00)

E2 0C: CRC16 checksum

Device Return Analysis:

01: Equipment Address 01

10: Function code 16 for writing register contents

00 04: Return the starting register address for writing data as 0004

00 02: Return 2 registers

00 09:CRC16 verification code