UV351-C/D COD sensor

Basic User Manual

Content

Introduction

Respected user:

Thank you very much for purchasing a sensor produced by DRFN. Before you use it, please read this manual carefully, it will be of great help to the use and maintenance of this instrument, and can avoid unnecessary troubles caused by improper operation and maintenance.

Please abide by the operating procedures and precautions in this manual.

To ensure that the after-sales protection provided by this instrument is effective, please do not use and maintain this instrument by methods other than those specified in this manual.

Any failures and losses caused by failure to comply with the precautions specified in this manual are not covered by the manufacturer's warranty, and the manufacturer does not assume any relevant responsibilities. Please keep all documents safe. If you have any questions, please contact our after-sales service department.

When you receive the instrument, please open the package carefully, and check whether the instrument and accessories are damaged due to transportation. If any damage is found, please contact the after-sales service department of our company, and keep the packaging for return processing.

When the instrument fails, please do not repair it by yourself, please contact the after-sales service department of our company.

1 Product Overview

The COD 351 series sensor is based on the principle of ultraviolet absorption method, combined with many application experiences, and has carried out a number of upgrades and innovations on the basis of the previous generation, not only smaller in size, but also integrated with the original split cleaning brush, making installation more convenient, and Has higher reliability.

The UV absorption method requires no reagents, no pollution, and is more economical and environmentally friendly. Long-term online water quality monitoring. Automatic compensation for turbidity disturbances, with automatic cleaning device, excellent stability even for long-term monitoring.

Test principle

Many organic compounds dissolved in water absorb UV light. Therefore, the total amount of organic pollutants in the water can be measured by measuring the degree of absorption of these organic substances to 254nm wavelength ultraviolet light. The COD 351 series sensor adopts two light sources, one 254nm ultraviolet light, and one turbidity compensation, which can automatically eliminate the interference of suspended substances in the water, so as to achieve more stable and reliable measurement.

Sensor Features

- Digital sensor, RS-485 output, support Modbus
- No reagents, no pollution, more economical and environmentally friendly
- Can measure parameters such as COD, TOC, turbidity and temperature
- Automatically compensate for turbidity interference, with excellent test performance
- With self-cleaning brush, it can prevent biological adhesion, and the maintenance cycle is longer
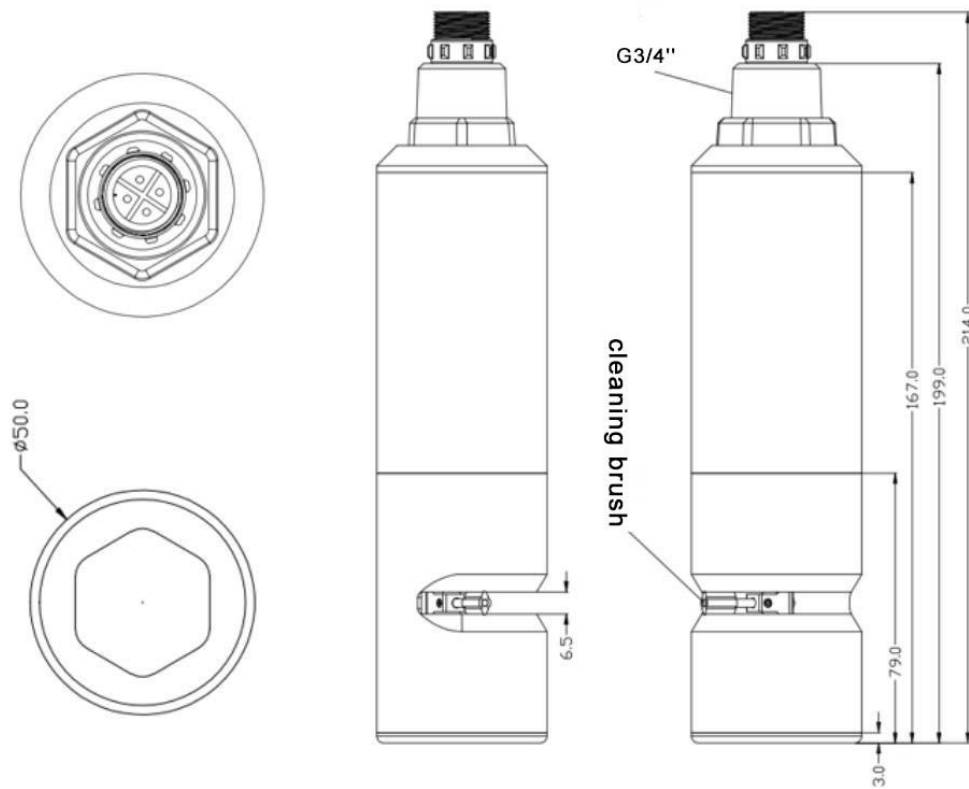
1.1 Product introduction

6.5mm optical path appearance diagram   **2.5mm optical path appearance diagram**

6.5mm optical path COD structure dimension drawing
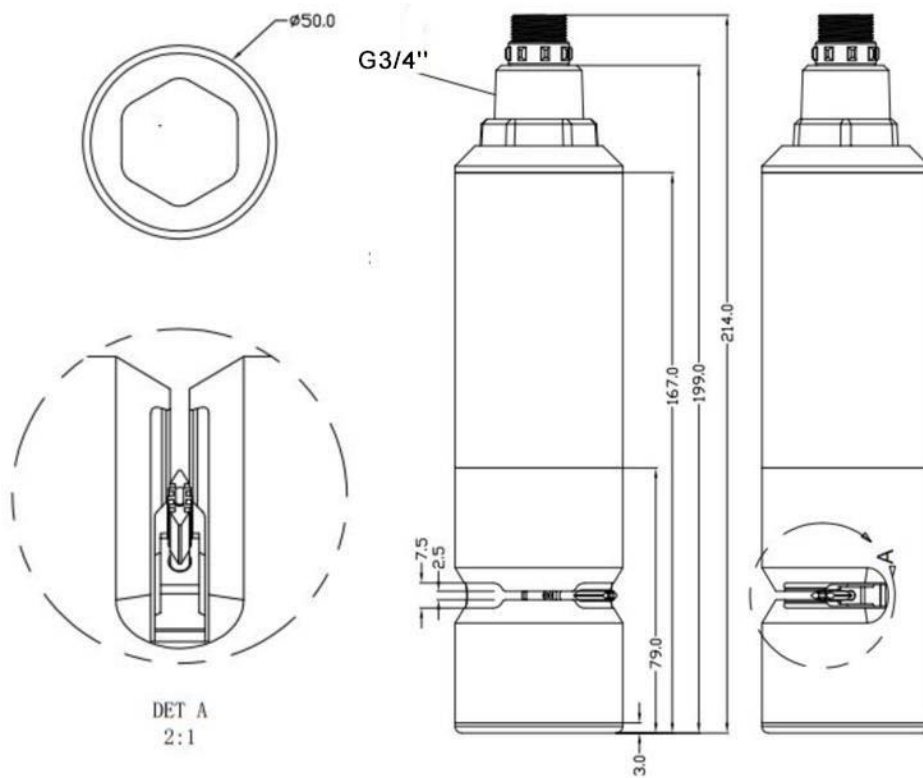
2.5mm optical path structure dimension drawing

1.2 Cable Definition

4-wire AWG-24 or AWG-26 shielded wire. OD=5~5.5mm
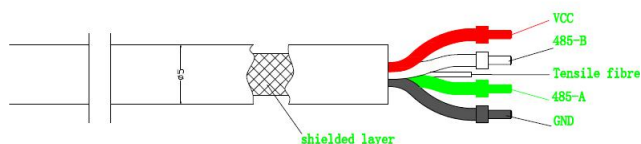
1. Red—Power (VCC)
2. White - 485 data line_B (485_B)
3. Green—485 data line_A (485_A)
4. Black—Ground (GND)
5. Bare wire - shield

1.3 Technical parameter

Interface	Support RS-485, Modbus protocol	
Items	COD_{uv} 351-B	COD_{uv} 351-C
Optical path	6.5mm	2.5mm
COD range	0.5 to 450mg/L equiv.KHP	1 to 1500mg/L equiv.KHP
COD accuracy	±5% equiv.KHP	±5% F.S. equiv.KHP
COD resolution	0.01mg/L	
TOC range	0.3 to 180mg/L equiv.KHP	0.4 to 600mg/L equiv.KHP
TOC accuracy	±5% equiv.KHP	±5% F.S. equiv.KHP
TOC resolution	0.01mg/L	
Turbidity range	0-300 NTU	0-500 NTU
Turbidity accuracy	±5% 或 0.5NTU	±5% F.S.
Turbidity Resolution	0.01NTU	
Temperature range	0~50℃ (no freezing)	
IP protection class	IP68	
Maximum pressure	3 bar	
User calibration	1-point or 2-point calibration	
Power information	DC 12V-24V, current <50mA (without cleaning brush)	
Sensor diameter	50mm	
Sensor length	214mm	
Cable length	10m (default)	
Shell material	POM and 316L (custom titanium alloy available)	

2 Installation

2.1 Configure

Standard configuration	Quantity	Unit	Remark
COD sensor	1	Branch	
Protective cover	1	PC	
Assembly adapter	1	PC	Optional mounting parts
Cable	1	PC	
Brush skin components	1	Unit	
The following installation parts are optional			
Elbow, Mounting Backplate Kit, etc.			

Protective cover   Sensor   Assembly
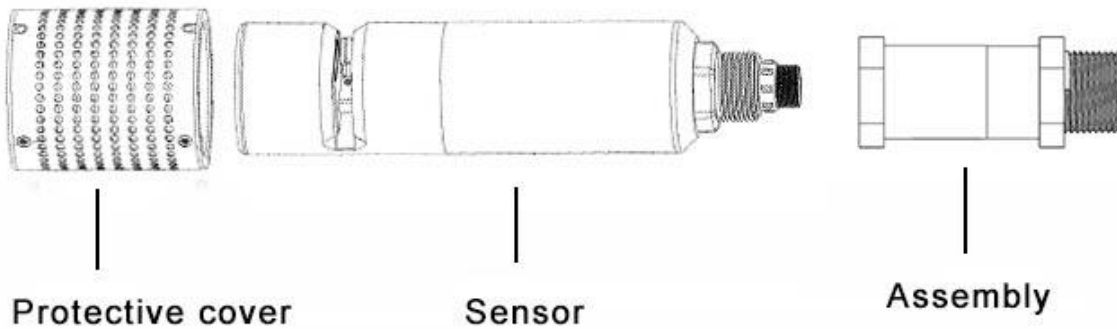
2.2   Installation Precautions

1. When suspending the sensor, avoid the sensor hitting the wall or other water conservancy facilities due to water flow. If the water flow is very fast, please fix the sensor;

2. Considering the fluctuation of water level, submerge the sensor below the possible minimum water level of 30CM;

3. The sensor is installed in a position where there are no air bubbles in the water, as far as possible from the aeration port;

4. Considering the specific environment such as the deposition of impurities in the water body, it is recommended to install the probe horizontally and keep the measurement window vertically downward.

2.3 Installation steps
Protective cover installation:
1. After taking out the sensor, you need to install a protective cover for the sensor, as shown in the figure below (4 screws on the mesh cover need to be tightened)
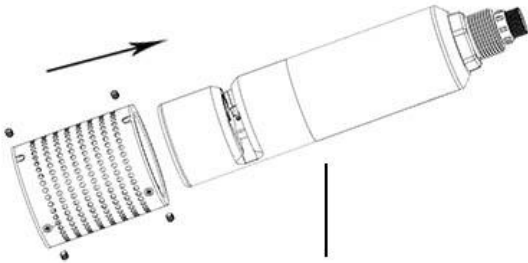
Loosen the four screws on the protective cover, and then put the protective cover on the outside of the sensor in the direction shown in the figure.
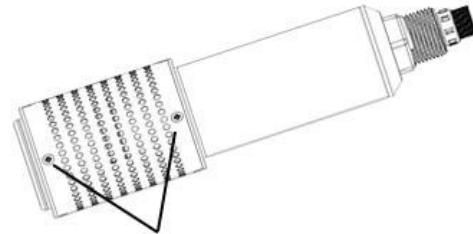
Tighten the four screws and the installation is complete

2. After the protective cover is installed, please install the assembly adapter as shown in the figure
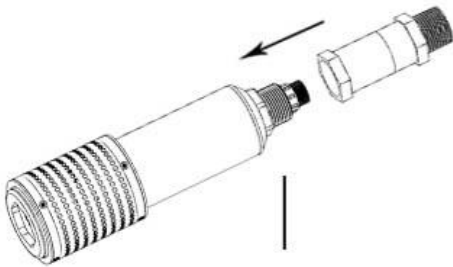
Put one end of the sensor on top of the sensor as shown
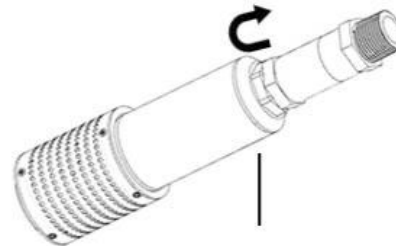
Tighten the sensor and connector by turning counterclockwise

⚠ Warning

1. **Please install the protective grille correctly.**
2. **Please do not use the sensor cable to hoist the sensor.**
3. **The hoisting accessories do not cover the measuring surface.**

On-site fixed installation:

1. It is recommended to perform fixed installation in the following two ways (1) and (2) in the schematic diagrams;
Among them, (1) the hoisting method is elbow type, which is suitable for the environment without rapid flow and water body with less debris; (2) the hoisting method is guard plate hoisting type, which is suitable for rapid flow environment and has high installation stability.

(1)   (2)

2. Optional parts view

Elbow

Kits for installing the backplane
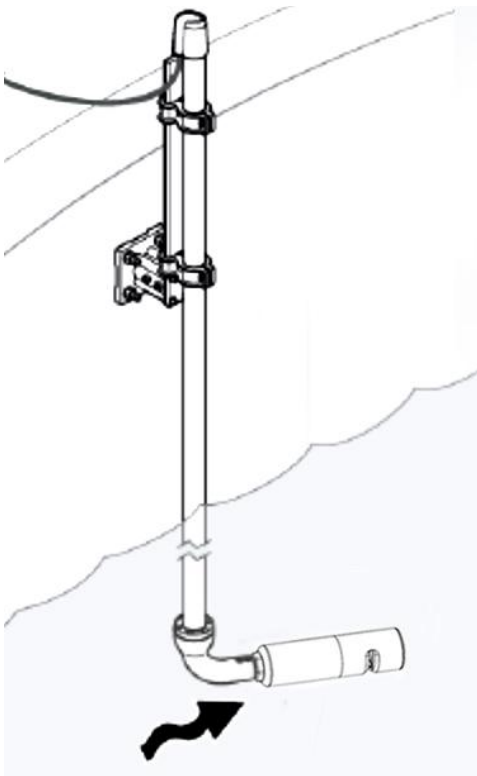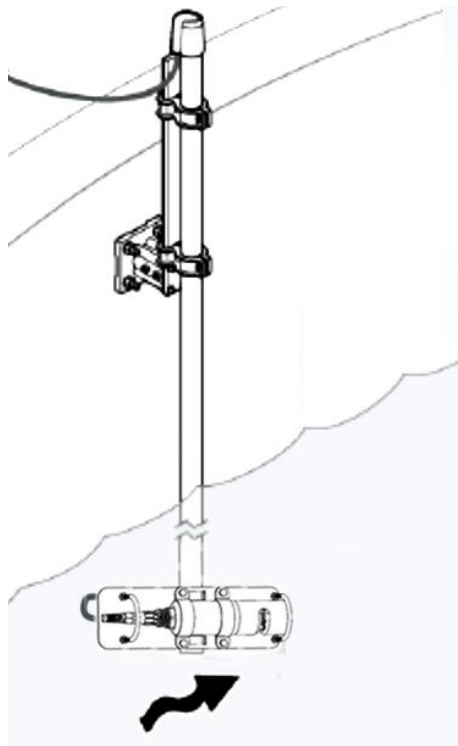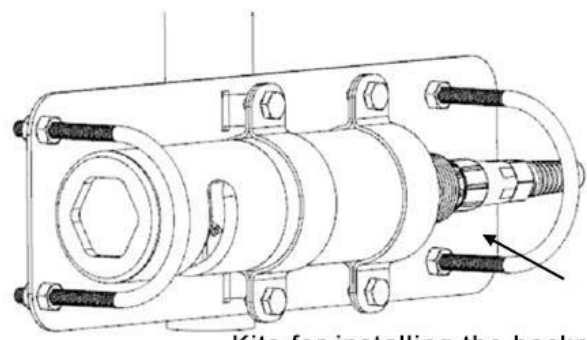
3 Maintenance schedule and method

3.1 Maintenance schedule

Although the sensor comes standard with a self-cleaning brush, harsh working conditions will still cause the sensor to be stained. In order to ensure accurate measurement, cleaning is very important. Regular cleaning of the sensor will help the stability of the data.

Maintenance tasks	Recommended maintenance frequency	
Clean the sensor	It is recommended to clean every 3-4 weeks	It is recommended to clean every 2-3 weeks
Calibrate the sensor	Depending on the working conditions and user needs, but not later than once in March	
Maintain and inspect the self-cleaning brush	Replace the new brush skin every 3~6 months (depending on the specific working conditions); return to the factory every 18 months to replace the dynamic seal	Replace the new brush skin every 2 months (depending on the specific working conditions); return to the factory every 18 months to replace the dynamic seal

3.2 Maintenance method

1. Cleaning the outer surface of the sensor: Clean the outer surface of the sensor with tap water. If there is still debris, wipe it with a damp soft cloth. For some stubborn dirt, you can add some household detergent to the tap water to clean;

2. Sensor measurement window surface cleaning: use a fine brush or a thin cotton swab to clean the light window, avoid scratching with a sharp object, so as not to damage the light window;

3. Check the cable of the sensor: the cable should not be taut during normal operation, otherwise the internal wire of the cable may be broken for a long time, resulting in abnormal operation of the sensor;

4. Check the cleaning brush: check whether the brush skin can effectively contact the light window, whether it rotates normally, and whether it is loose; **if the wear is serious and the window surface cannot be scraped, it needs to be replaced,** and if the rotating brush is loose, it needs to be re-tightened;

5. After 18 months of continuous use, the dynamic sealing device needs to be returned to the factory.

▲Notes

1. The probe contains sensitive optical components and electronic components. Make sure the probe is not subject to mechanical shock. There are no user-maintainable parts inside the probe.

2. The sensor self-cleaning brush has a gear motor inside. Under any circumstances, **the cleaning brush should not be rotated by external force (except for the operation of replacing the cleaning brush), or hindering the rotation of the cleaning brush.** Larger external force factors can cause damage to the geared motor.

3. If there are many debris in the water at the installation point, it is recommended to install a protective net or protective sleeve around the sensor to prevent the debris in the water from getting stuck on the cleaning brush.

4. The sensor installation should avoid facing the water flow and the position with more air bubbles.

3.3 Cleaning brush replacement

1. The sensor is placed horizontally, and the glue brush is rotated to be parallel to the structural surface

Step 1: Rotate the glue brush to be parallel to the structural plane   Structural plane
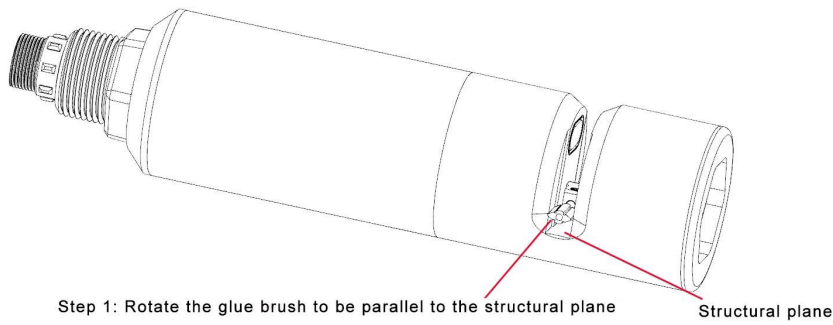
2. Using a screwdriver, unscrew the screw
3. Shake the glue brush and pull out the glue brush

Step 2: Use a screwdriver to unscrew the screw

Step 3: Shake the glue brush and pull out the glue brush
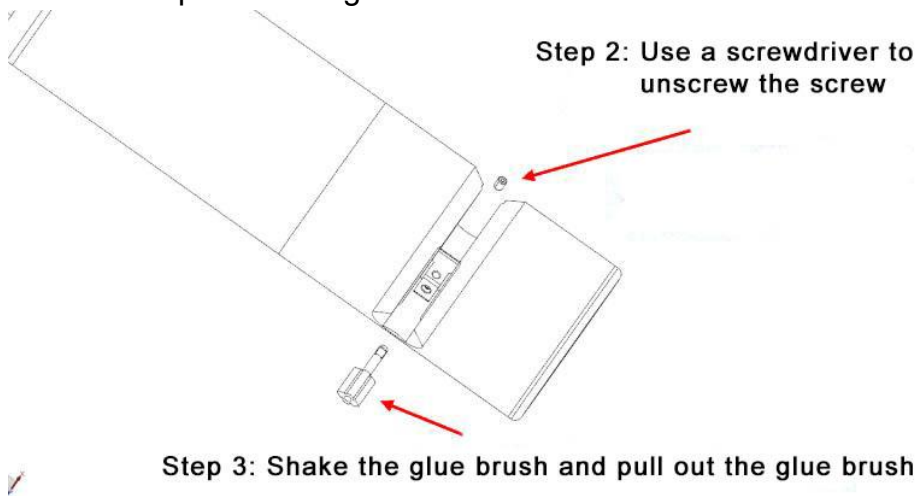
4. Align the grooved side of the rubber brush with the direction of the screw hole, and insert it into the fixing hole to the bottom
5. Reinstall the screws and tighten

Step 5: Reinstall the screws and tighten

Fixing hole

Groove

Step 4: Align the grooved side of the rubber brush with the direction of the screw hole, insert it into the fixing hole, and reach the bottom
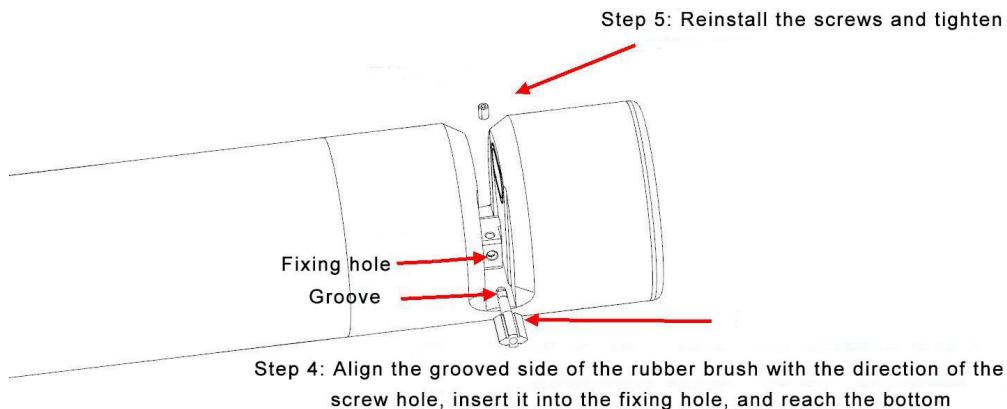
4.1 Brief description

COD 351 series sensors support one-point and two-point calibration.

4.2 Standard solution configuration

4.2.1 Required utensils and raw materials

4.2.1.1 Appliances

Analytical balance, medicine spoon, 50mL beaker, 100mL graduated cylinder, glass rod, pipette, 1L volumetric flask

4.2.1.2 Raw materials

KHP (potassium hydrogen phthalate, C8H5KO4), CAS# 877-24-7, as a commonly used dye in environmental research, can be used for COD calibration, deionized water

4.2.2 Configuration method

1. Accurately weigh 1.2754 g of KHP into a 1000 mL flask. Dilute to the highest volume with distilled water or deionized water, shake well, and obtain 1500mg/L concentration COD standard solution;

2. Take 100 mL (1) of the winning standard solution and inject it into a flask with a range of 1000 mL, then use distilled water or deionized water to dilute to the highest scale and shake well to obtain a COD standard solution with a concentration of 150 mg/L;

3. Other concentration standard solutions can be calculated and configured according to the dilution method;

Notice

1. The standard solution is best prepared and used immediately to ensure accuracy;

2. High-concentration mother liquor (such as 1500mg/L) can be sealed in a can and stored in the refrigerator for subsequent dilution; the storage period is recommended not to exceed one month;

5 Frequently Asked Questions

Table 5-1 lists possible problems and solutions for COD sensors, if your problem is not listed or the solution does not solve your problem, please contact us.

Abnormal	Possible reason	Solution
Communication abnormal	Abnormal power supply and wiring	Check whether the power supply and wiring are normal according to the manual
	Interface and protocol issues	Check according to product supporting communication protocol
No change in value	Abnormal cleaning brush	Check whether the brush is entangled/stuck by foreign objects, if so, please remove the foreign objects; re-power on, observe whether the brush rotates, if it cannot rotate or rotate abnormally, please contact our after-sales department
		Check whether the power supply of the power supply meets the requirements, and avoid moving due to low power supply
	Software and hardware exception	Please contact our after-sales department
The measured value is too high, too low, or the value is continuously unstable Certainly	The sensor is seriously polluted	Cleaning the sensor body, especially the light window surface
	Sensor cleaning brushes are heavily worn	Replace the cleaning brush
	need to be calibrated	Perform user calibration
Other	Please contact our after-sales department	

Table 5-1 List of frequently asked questions

6 Warranty Instructions

This warranty does not cover the following:

1. Damage caused by force majeure, natural disaster, social unrest, war (published or unpublished), terrorism, civil war or any government coercion

2. Damage caused by misuse, neglect, accident or improper application and installation

3. Shipping fee to ship the goods back to our company

4. Freight for expedited or express delivery of parts or products within the scope of the warranty

5. Travel expenses for local warranty management

This warranty covers the entire contents of our company's warranty on its products.

This warranty constitutes the final, complete and exclusive statement about the terms of the warranty, and no person or agent is authorized to make other warranties in the name of our company.

The above-mentioned remedies such as repair, replacement or refund of payment are all special cases that do not violate this warranty. Remedial measures such as replacement or refund of payment are all for the company's products themselves. Based on strict liability obligations or other legal theories, our company is not liable for any other damages caused by product defects or negligent operation, including subsequent damages that are causally related to these circumstances.

7.1 Overview

In order to carry out MODBUS RTU communication with the COD probe, the MODBUS master station terminal application software is required. MODBUS RTU is an open standard and provides multiple free commercial application toolkits.

In this manual, the address of the MODBUS register starts from 1. However, the MODBUS master station protocol starts to work from register address 0. Usually, the MODBUS master station software compiles the address. Therefore, the register address 2090 will be compiled to 2089 by the MODBUS master software.

7.2 Details of each command

7.2.1 Set slave ID

Function: Set the MODBUS slave device address of the sensor, the address range is 1~247.

The MODBUS slave device address of the sensor can be set through the MODBUS register with address 0x3000.

Start register	Register quantity	Register1	MODBUS Function Code
0x3000	0x01	New device address	0x10

Take the sensor's old device address = 0x01 and new device address = 0x14 as an example to illustrate the request frame and response frame for setting the slave ID command.

Definition	Address domain	Function code	Initial address		Register quantity		Byte count	Register value		CRC	
Byte	0	1	2	3	4	5	6	7	8	9	10
Content	0x01	0x10	0x30	0x00	0x00	0x01	0x02	0x14	0x00	0x99	0x53

Example of setting slave ID request frame

Remarks: byte8 is a reserved value, meaningless

Definition	Address Domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x10	0x30	0x00	0x00	0x01	0x0E	0xC9

Example of setting slave ID response frame

7.2.2 Get SN

Function: Get the identification number SN of the sensor, each sensor has a unique SN. The SN of the probe can be read from 7 consecutive MODBUS registers starting at 0x0900

Start register	Register quantity	Register1-7	MODBUS Function Code
0x0900	0x07	SN	0x03

The following takes the slave device address 0x01 and the returned SN "YL1014010022" as an example to illustrate the request frame and response frame for obtaining the SN command

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x09	0x00	0x00	0x07	0x07	0x94

Example of getting SN command request frame

Definition	Address domain	Function code	Byte count		Register value		CRC	
Byte	0	1	2	3	4~15	16	17	18
Content	0x01	0x03	0x0E	0x00	"YL1014010022"	0x00	0x4c	0x5f

Example of getting SN command response frame

Remarks: The probe SN is as follows, stored in ASCII format

Byte count	4	5	6	7	8	9	10	11	12	13	14	15
Content	0x59	0x4C	0x31	0x30	0x31	0x34	0x30	0x31	0x30	0x30	0x32	0x32

7.2.3 Start measuring

Function: Let the sensor start measuring. Use MODBUS register 0x2500. By default, the probe starts luminescence measurement when it is powered on.

Start register	Register quantity	MODBUS function code
0x2500	0x01	0x03

The following takes the slave device address 0x01 as an example to illustrate the request frame and response frame of the start measurement command

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x25	0x00	0x00	0x01	0x8F	0x06

Example of start measurement command request frame

Definition	Address domain	Function code	Byte count	Register Value	CRC	
Byte	0	1	2	3~4	5	6
Content	0x01	0x03	0x02	No meaning		

Example of start measurement command response frame

7.2.4 Get temperature and COD TOC value

Function: Get the temperature and COD TOC value of the probe: the unit of temperature is degrees Celsius, and the COD/TOC value is the value after user calibration, and the unit is mg/L.

Meaning	Address	Byte count
Temperature value	0x2600	4
COD value	0x2602	4
TOC value	0x2604	4

Temperature:

Get temperature request SEND:

Definition	Address domain	Function code	Byte count		Register Value		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x26	0x00	0x00	0x02	0x C7	0x43

Return temperatureRECEIVE:.

Definition	Address domain	Function code	Bytes	Temperature ①				CRC	
Byte	0	1	2	3-4		5-6		7	8
Content	0x01	0x03	0x04	0x00	0x00	0x00	0x00	0xFA	0x5F

COD：

Get COD request SEND:

Definition	Address domain	Function code	Byte count		Register Value		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x26	0x02	0x00	0x02	0x 6E	0x83

Return COD RECEIVE:

Definition	Address domain	Function code	Bytes	Temperature ①				CRC	
Byte	0	1	2	3-4		5-6		7	8
Content	0x01	0x03	0x04	0x00	0x00	0x00	0x00	0xFA	0x5F

TOC

Get TOC request SEND:

Definition	Address domain	Function code	Byte count		Register Value		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x26	0x26	0x00	0x02	0x C7	0xE8

Return TOC RECEIVE:

Definition	Address domain	Function code	Bytes	Temperature ①				CRC	
Byte	0	1	2	3-4		5-6		7	8
Content	0x01	0x03	0x04	0x00	0x00	0x00	0x00	0xFA	0x5F

①Floating point numbers are stored in little endian mode

7.2.5 Obtain software and hardware version numbers

Function:Get the currently used hardware version number and software version number. The software and hardware version numbers of the probe can be read from two consecutive MODBUS registers whose starting address is 0x0700.

Start register	Register quantity	Register1	Register2	MODBUS function code
0x0700	0x02	hardware version number	software version number	0x03

The following takes the slave device address 0x01, the returned hardware version 1.0, and the software version 1.0 as an example to illustrate the request frame and response frame of the command to obtain the software and hardware version numbers.

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x07	0x00	0x00	0x02	0xc5	0x7f

Example of getting hardware and software version command request frame

Definition	Address domain	Function code	Byte count	Register value				CRC	
Byte	0	1	2	3~4		5~6		7	8
Content	0x01	0x03	0x04	0x01	0x00	0x01	0x00	0xfa	0x5f

Example of getting hardware and software version command response frame

7.2.6 Stop measuring

Function: When the data is stable, you can stop the measurement, if you want to measure again, you need to send the start measurement command.

Use MODBUS register 0x2E00.

Initial address	Register quantity	MODBUS function code
0x2E00	0x01	0x03

The following takes slave address 0x01 as an example to illustrate the request frame and response frame of the stop measurement command.

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x2E	0x00	0x00	0x01	0x8D	0x22

Request frame for stop measurement command

Definition	Address domain	Function code	Byte count	Register value	CRC	
Byte	0	1	2	3~4	5	6
Content	0x01	0x03	0x02	No meaning		

Request frame for stop measurement command

7.2.7 Get COD user calibration parameters

Function: Obtain two calibration parameters K and B of COD.(In order to prevent the value deviation caused by factors such as probe aging, the calibration formula COD final=K*COD+B, the general default value is: K=1; B=0.)

User calibration parameters K, B can be read from 4 consecutive MODBUS registers starting at 0x1100

Start register	Register quantity	Register1, 2	Register3, 4	MODBUS function code
0x1100	0x04	K value	B value	0x03

The following takes the slave device address 0x01, the returned K=1.0, B=0.0 as an example to illustrate the request frame and response frame for obtaining the user calibration parameter command.

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x11	0x00	0x00	0x04	0x41	0x35

Request frame for obtain COD user calibration parameter command

Definition	Address domain	Function code	Byte count	Register value		CRC	
Byte	0	1	2	3~6	7~10	11	12
Content	0x01	0x03	0x08	1.0	0.0	0x9E	0x12

Response frame for obtain COD user calibration parameter command

Remarks: K, B: little-endian storage mode, floating-point number

K (3~6)				B (7~10)			
0x00	0x00	0x80	0x3F	0x00	0x00	0x00	0x00

Byte distribution of K and B values

7.2.8 Set user calibration parameter

Function: Set two calibration parameters K and B.

The user calibration parameters K and B can be set through four consecutive MODBUS registers starting at0x1100.

Start register	Register quantity	Register1, 2	Register3, 4	MODBUS function code
0x1100	0x04	K value	B value	0x10

The following takes the slave device address 0x01, K=1.0, B=0.0 as an example to illustrate the request frame and response frame of the user calibration parameter command.

Definition	Address domain	Function code	Initial address		Register quantity		Byte count	Register value		CRC	
Byte	0	1	2	3	4	5	6	7~10	11~14	15	16
Content	0x01	0x10	0x11	0x00	0x00	0x04	0x08	1.0	0.0	0x81	0xAE

Request frame for set COD user calibration parameter command

Remarks: K, B: little-endian storage mode, floating-point number

K (7~10)				B (11~14)			
0x00	0x00	0x80	0x3F	0x00	0x00	0x00	0x00

Byte distribution of K and B values

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x10	0x11	0x00	0x00	0x04	0xc 4	0xf6

Response frame for set COD user calibration parameter command

7.2.9 Get slave ID

Function: Get the MODBUS slave device address of the current electrode, this command uses 0xFF as the fixed address field

The MODBUS slave device address of the current electrode can be read from the MODBUS register whose starting address is 0x3000.

Initial address	Register quantity	Register1	MODBUS function code
0x3000	0x01	Current device address	0x03

Get the register definition of the slave ID

The following takes the returned address 0x03 as an example to illustrate the request frame and response frame for obtaining the slave ID command.

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	**0xFF**	0x03	0x30	0x00	0x00	0x01	0x9E	0xD4

Request frame for get slave ID command

Definition	Address domain	Function code	Byte count	Register value		CRC	
Byte	0	1	2	3	4	5	6
Content	0xFF	0x03	0x02	0x03	0x00(Reserve)	0x91	0x60

Response frame for get slave ID command

7.2.10 Get Turbidity value

Function: Obtain the turbidity value of the probe: the unit of temperature is NTU.

It can be read from the MODBUS register whose starting address is 0x1200.

Initial address	Register quantity	Register1,2	MODBUS function code
0x1200	0x02	Turbidity value	0x03

Get the register definition of the turbidity value

Take the slave address 0x01 as an example to illustrate the request frame and response frame of the turbidity=17.625 command.

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	**0x01**	0x03	0x12	0x00	0x00	0x02		

Request frame for get turbidity value command

Definition	Address domain	Function code	Byte count	Register value	CRC	
Byte	0	1	2	3~6	7	8
Content	0x01	0x03	0x04	17.625		

Response frame for get turbidity value command

7.2.11 Get Turbidity user calibration parameter

Function:Obtain the two calibration parameters K and B of turbidity, and proceed in deionized water.The turbidity user calibration parameters K and B can be read from 4 consecutive MODBUS registers starting at 0x3400.

Initial address	Register quantity	Register1,2	Register 3,4	MODBUS function code
0x3400	0x04	K value	B value	0x03

The following takes the slave device address 0x01, the returned K=1.0, B=0.0 as an example to illustrate the request frame and response frame of the command to obtain the turbidity user calibration parameter.

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x34	0x00	0x00	0x04		

Request frame for getting turbidity user calibration parameter command

Definition	Address domain	Function code	Byte count	Register value		CRC	
Byte	0	1	2	3~6	7~10	11	12
Content	0x01	0x03	0x08	1.0	0.0	0x9E	0x12

Response frame for getting turbidity user calibration parameter command

Remarks: K, B: little-endian storage mode, floating-point number

7.2.12 Set Turbidity User Calibration Parameters

Function: Set two calibration parameters K, B

Turbidity user calibration parameters K, B can be set through 4 consecutive MODBUS registers starting at 0X3400

Initial address	Register quantity	Register 1、2	Register 3、4	MODBUS function code
0x3400	0x04	K value	B value	0x10

Figure 52: Register Definitions for Set User Calibration Parameters Command

The following takes the slave device address 0x01, K=1.0, B=0.0 as an example to illustrate the request frame and response frame of the command to set the turbidity user calibration parameter. (Refer to 7.2.8)

Definition	Address domain	Function code	Initial address		Register quantity		Byte count	Register value		CRC	
Byte	0	1	2	3	4	5	6	7-10	11-14	15	16
Content	0x01	0x10	0x34	0x00	0x00	0x04	0x08	1.0	0.0		

Figure 53: Set Turbidity User Calibration Parameters Command Request Frame Remarks: K, B: little endian storage mode, floating point number

7.2.13 Turn on the brush

Function: Let the brush start to rotate. It is recommended to turn on the brush once when the power is turned on (default is off).

The starting address is 0x3100 to start the brush rotation.

Initial address	Register quantity	MODBUS function code
0x3100	0x00	0x10

The following takes the slave device address 0x01 as an example to illustrate the request frame and response frame for turning on the brush command.

Definition	Address domain	Function code	Initial address		Register quantity		Byte count	CRC	
Byte	0	1	2	3	4	5	6	7	8
Content	0x01	0x10	0x31	0x00	0x00	0x00	0x00	0x74	0x94

Request frame of turning on the brush

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x10	0x31	0x00	0x00	0x00	0xce	0xf5

Response frame of turning on the brush

7.2.14 Set the brush rotation interval

Function: set the interval of the brush rotation, the unit is min.

The brush rotation interval can be set through a MODBUS register whose starting address is 0x3200.

Initial address	Register quantity	Register 1	MODBUS function code
0x3200	0x01	Rotation interval value (min)	0x10

The following takes the slave device address 0x01 and the setting time of 10min as an example to illustrate the request frame and response frame of the brush command.

Definition	Address domain	Function Code	Initial address		Register quantity		Byte count	Register value		CRC	
Byte	0	1	2	3	4	5	6	7	8	9	10
Content	0x01	0x10	0x32	0x00	0x00	0x01	0x02	0x0A	0x00	0xB3	0x33

Request frame of setting the brush rotation interval command

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x10	0x32	0x00	0x00	0x01	0x0f	0x71

Response frame of setting the brush rotation interval command

7.2.15 Obtain the brush rotation interval

Function: obtain the interval of the brush rotation, the default is every 30 minutes.

The rotation interval of the brush can be read from 1 MODBUS register whose starting address is 0x3200

Initial address	Register quantity	Register 1	MODBUS function code
0x3200	0x01	Rotation interval value (min)	0x03

The following takes the slave device address 0x01 and the return time of 30min as an example to illustrate the request frame and response frame of the brush command.

Definition	Address domain	Function code	Initial address		Register quantity		CRC	
Byte	0	1	2	3	4	5	6	7
Content	0x01	0x03	0x32	0x00	0x00	0x01	0x8a	0Xb2

Request frame of obtaining the brush rotation interval command

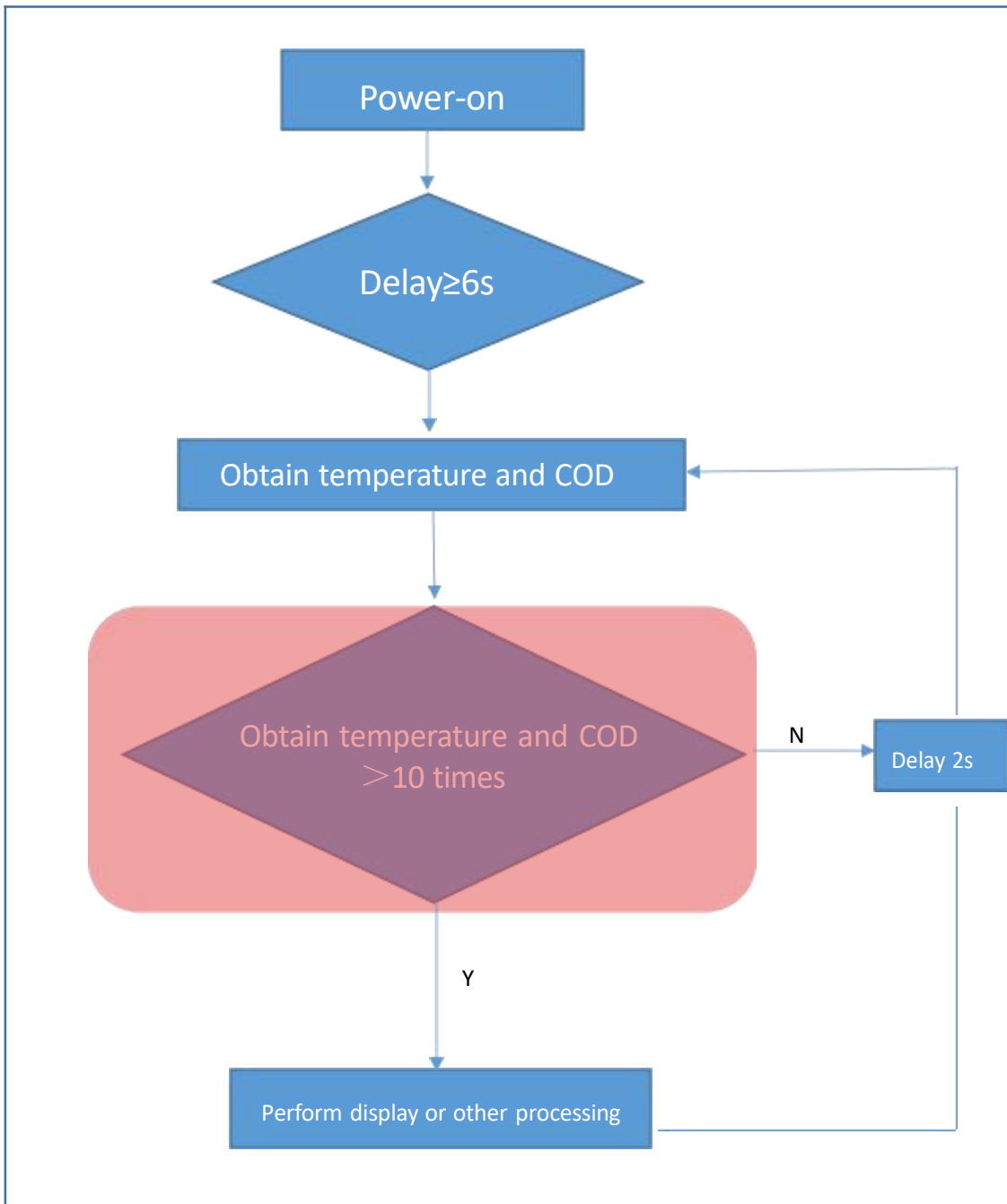| Definition	Address domain	Function code	Byte count	Register value		CRC	
Byte	0	1	2	3	4	5	6
Content	0x01	0x03	0x02	0x1E	0x00	0xb1	0xe4

Response frame of obtaining the brush rotation interval command

Remarks: Little-endian storage mode

The process of testing the COD value

Processing flow

Corresponding frame command

Get the temperature, COD, TOC, get the temperature of the probe (in degrees Celsius), and the COD value and TOC (in mg/L), execute this command with a delay of 2s after starting the measurement command, and then repeat this command every 2s.

Note: The meaning represented by the red part of the flow chart is that it is recommended that the user obtain the temperature and COD value 10 times, calculate the average value after the TOC value, and then perform other processing such as display.