SZ551-B C

UV254 COD Sensor

User Manual

SIBO.X INDUSTRIAL CO.,LTD.
Add: No. Building 1, No. 1, Jingshi Road, Cicheng Town Industrial Park, Jiangbei District, Ningbo City, Zhejiang, China
https://www.sbxsun.com
Email: info@sbxsun.com
Tel: +86-15958288207

Catalogue

Preface 3

1 Overview 4

1.1 Introduction 5

1.2 Definition of cable 7

1.3 Technical parameters 7

2 Installation 8

2.1 Configuration 8

2.2 Installation precautions 8

2.3 Installation steps 8

3 Calibration 10

3.1 Brief description 10

3.2 Calibration Solution Preparation 10

4 Maintenance schedule and methods 10

4.1 Maintenance Schedule 10

4.2 Maintenance methods 11

4.3 Wiper replacement 12

5 Trouble Shooting 12

6 Warranty Description 13

7 Communication protocols 14

7.1 Reading data 14

7.2 Writing data 15

7.3 Calculating CRC Checksum 16

7.4 Register Table 16

7.5 Conversion algorithms for floating point numbers 18

Preface

Dear customer

Thank you for using our product . Reading the entire manual before use is highly recommended for operation and maintenance the instrument and out of unnecessary trouble.

Please observe the operating procedures and precautions in this manual.

To make sure the effective after-sales protection provided by the instrument, please do not use any operation or maintenance other than which mentioned in the manual.

Due to non-compliance with the precautions specified in this manual, any fault and loss caused shall not be covered by the warranty, and the manufacturer shall not bear any relevant responsibility. If you have any questions, please contact our after-sales service department or representative.

Carefully unpack the instrument and accessories from the shipping container, and inspect for possible damage during shipping. Check received parts with items on the packing list. If any parts or materials are damaged or missing, please contact our customer service or the authorized distributor immediately.

Save all packing materials until you are sure that the instrument functions properly. Any damaged or defective items must be returned in their original packaging materials.

1 Overview

UV254 COD sensor features highly reliable UVC LED for light absorption measurement. This proven technology provides reliable and accurate analysis of organic pollutants for water quality monitoring at low cost and low maintenance. With rugged design, and integrated turbidity compensation, it is an excellent solution for continuous monitoring of source water, surface water, municipal and industrial wastewaters.

Features

Digital sensors, digital RS-485 output, Modbus protocol;

No chemicals, direct UV254 spectral absorption measurement;

Proven UVC LED technology, long lifetime, stable and instant measurement;

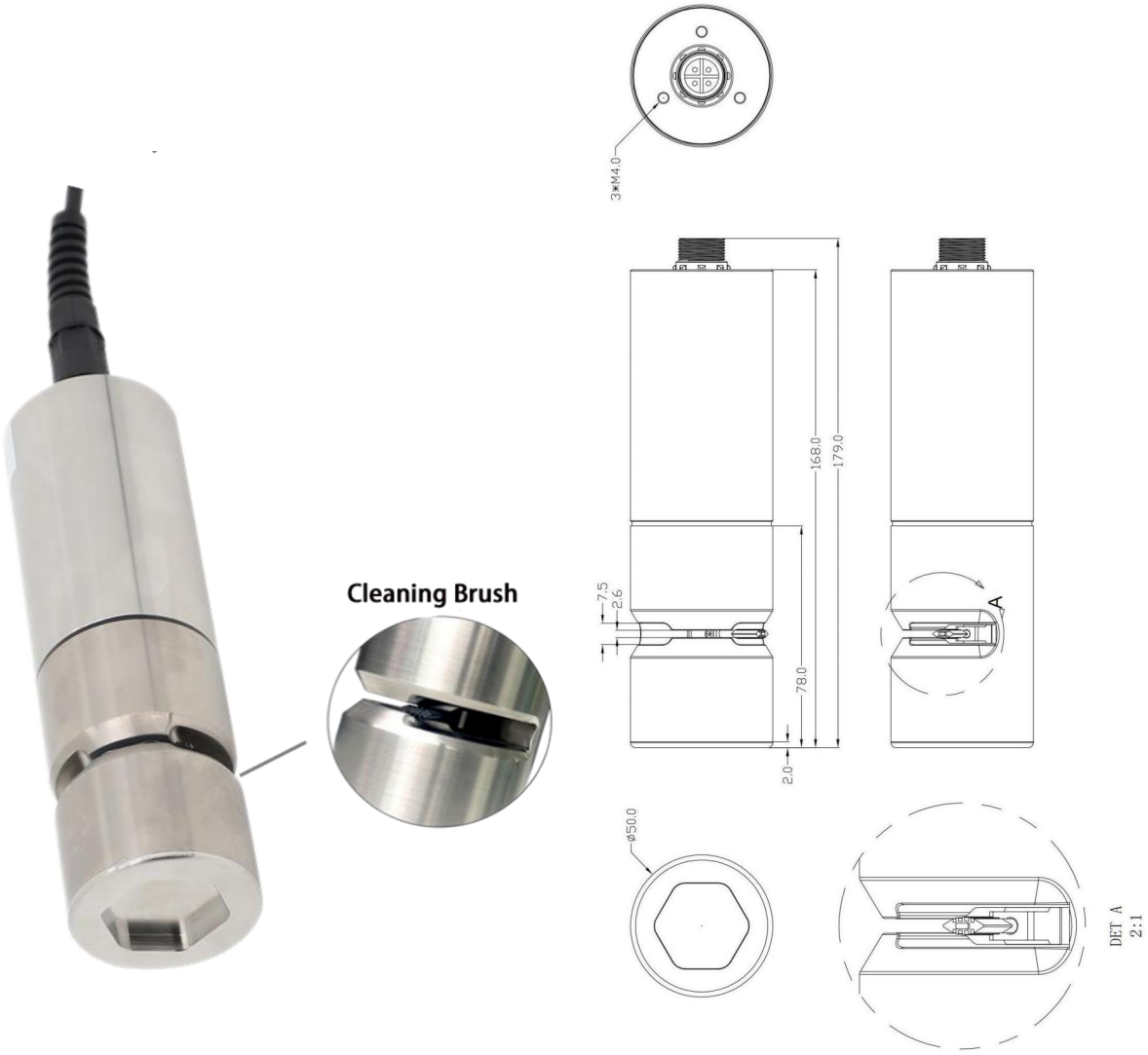
Measurement of parameters such as COD, TOC, turbidity and temperature;

With self-cleaning brushes to prevent biological adhesion and longer maintenance intervals.

1.1 Introduction



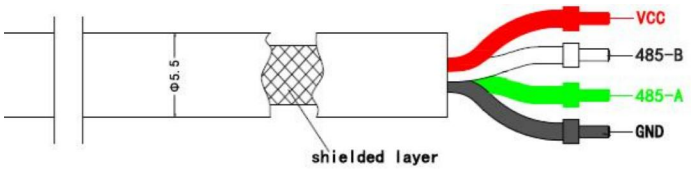
▲ UV254 COD sensor（standard range）



▲ **UV254 COD sensor（large range）**

1.2 Definition of cable

4 wire AWG-24 OR AWG-26 shielding wire. OD=5.5mm



1, Red—Power (VCC)
2, White—485 Date_B (485_B)
3, Green—485 Date_A (485_A)
4, Black—Ground (GND)

1.3 Technical parameters

Name	UV254 COD Sensor	
COD Range	0-500mg/L	0-1500mg/L
COD Accuracy	±5%	±5%
COD Resolution	0.01mg/L	0.01mg/L
TOC Range	0-180mg/L	0-600mg/L
TOC Accuracy	±5%	±5%
TOC Resolution	0.01mg/L	0.01mg/L
TUR Compensation	Yes	Yes
Temperature Range	0-50℃	0-50℃
IP Rating	IP68	IP68
Maximum Pressure	3bar	3bar
Calibration	One-point or Two-points	One-point or Two-points
Power	0.25W(Brushes don't rotate) 0.8W(Brushes rotate). Power supply：DC 12-24V, ⩾1A	0.25W(Brushes don't rotate) 2W(Brushes rotate). Power supply：DC 12-24V, ⩾1A
Output	RS-485, MODBUS protocol	RS-485, MODBUS protocol
Size	Φ50mm*179mm	Φ50mm*179mm
Cable Length	10m (default), customizable	10m (default), customizable
Body Materials	316L (custom titanium available)	316L (custom titanium available)

Note:

The above technical parameters are all data under laboratory standard liquid environment.

Sensor life and maintenance calibration frequency are related to actual field conditions.

2 Installation

Note
Spread the cables before operation.

2.1 Configuration

Item	Number	Unit	Note
COD Sensor	1	pcs	Including lifting sheet metal and holding hoop
Metal protective cover	1	pcs	
Cables	1	pcs	
Brush component	1	group	

2.2 Installation precautions

① The sensor shall be installed vertically with the sensor facing down, avoid horizontally installation or with sensor face upward.

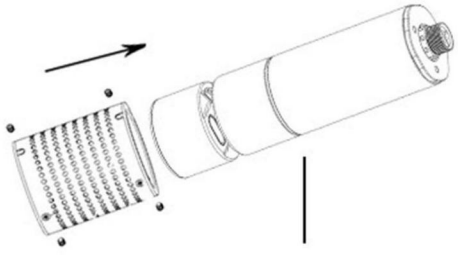
② Considering the influence of water level, the sensor is recommended to be installed under water surface level of 30cm. Probe shall be fully submerged into water.

③ The sensor must be securely mounted to avoid any damage caused by water flow and other unknown factors.

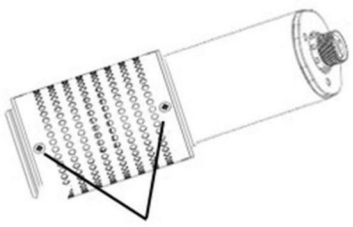
2.3 Installation steps

(1) Protective cover installation:

After unpacking of the sensor, install a protective probe cover onto the sensor, as shown in the figure below (4 screws on the cover shall be tightened).



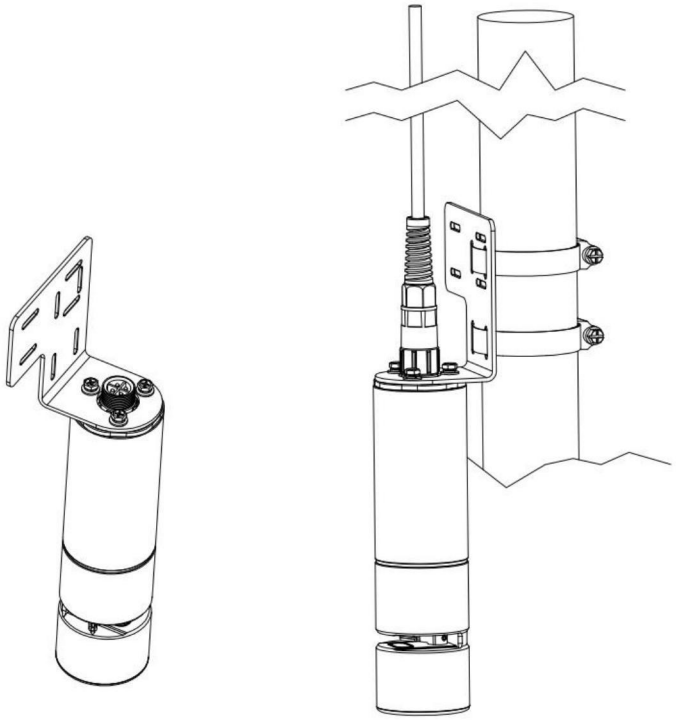
Loose 4 screws on the protection cover, and then slid the cover on the sensor gap.



Tighten the screws to complete installation

（2）Fixed installation on site：

It is suggested to carry out a fixed installation in the following two ways as shown in Figure (1) and Figure (2).



Elbow installation in Figure (1) is good for environment with no rapid water flow and less debris.

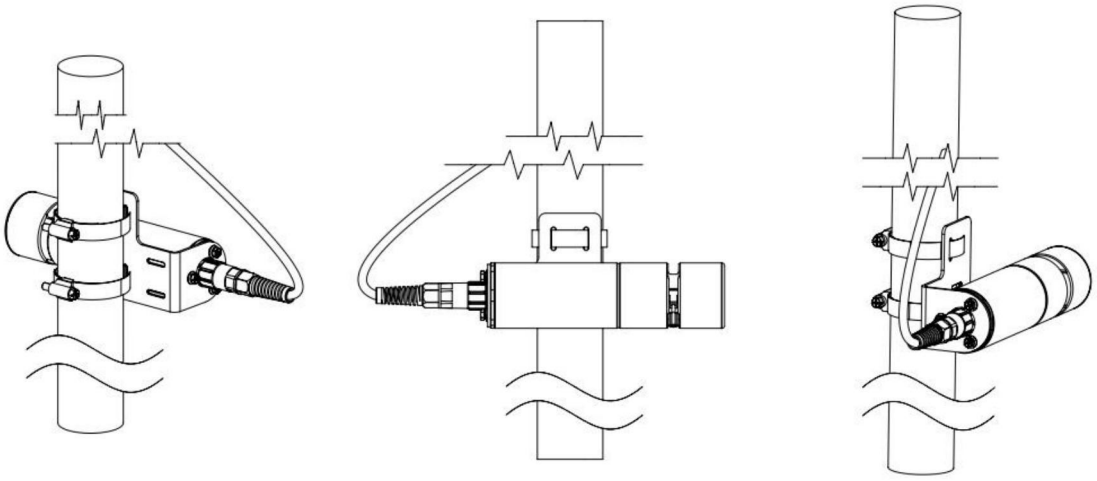


Fig. (2) an illustration for plate installation, which provide a stable installation in rapid water flow.

Warning

1. Please install the protective mesh cover correctly.
2. Do not use the sensor cable to lift the sensor.
3. Do not cover the measuring surface with lifting accessories.

3 Calibration

3.1 Brief description

COD sensor supports zero point, one point or two-points calibration with Smart PC App. You can scan the QR code on the right to get the details of the App, as well as "help" document in the compressed package. Ffor more detailed information, please contact Customer Service directly.

3.2 Calibration Solution Preparation

（1）Required appliances and raw materials

①Required appliances: analytical balance, medicine spoon, 50mL beaker, 100mL measuring cylinder, glass rod, pipette gun, 1L volumetric flask;

②Raw materials: KHP (potassium hydrogen phthalate, C8H5KO4), CAS:877-24-7, as a commonly used stain in environmental research, which can be used for COD calibration, deionized water.

（2）Configuration method

①Take 1.2754g of KHP and dissolve in deionized water, fixed capacity to 1L. At this time, the 1500mg/L COD mother solution is prepared;

②Dilute the solution in step 1 according to the required concentration. For example, take 100mL of 1500mg/L COD mother solution and dissolve in deionized water, fixed capacity to 1L. At this time, the 150mg/L COD standard solution is prepared.

Notes:

The standard solution should be configured at the time of use to ensure accuracy;

Highly concentrated mother solution (e.g:1500mg/L) can be sealed in cans and refrigerated for subsequent dilution;The retention period is recommended to be within one month.

4 Maintenance schedule and methods

4.1Maintenance Schedule

Although COD sensor comes with standard self-cleaning brush, water environments will still cause the sensor optical window to be stained and the wiper blade can be strained by derbies. To ensure accurate measurement, keep the probe clean is very critical to the performance of the probe. Regular maintenance of the sensor is strongly recommended.

Maintenance task	Recommended maintenance frequency
Sensor cleaning	Cleaning every 3 to 4 weeks
Calibration sensor	Depending on the working conditions and user needs, but not later than once 3 months.
Maintenance and inspection of self-cleaning brush	Replace a new brush every 2 to 6 months (depending on water condition)

4.2 Maintenance methods

（1）**Inspect probe body：** Wash the probe body with tap water, if there is still a clastic residues, using wet soft cloth to wipe, for some stubborn dirt, can add household detergents in tap water to clean.

（2）**Check the cable：** The cable should not be in any force, tension, or twist. It cause the internal wire broken.

（3）**Check the sensor measurement window:** carefully inspect probe optical window for potential stains, scratches, or dirty spots. Clean the window gently using cotton swabs. **DO NOT USE ANY SOLVENT.**

（4）**Check the sensor wiper:** replace the wiper as necessary if see any tear and wear of the blade.

Attention:

（1）The sensor has optical components and electronic components which have more than ten years expected lifetime. Ensure to keep that the sensor away from mechanical impact or vibration.

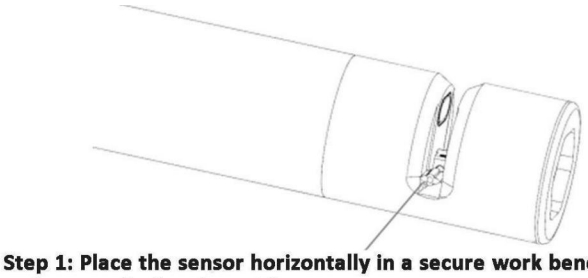
（2）Force to rotate or obstruct the cleaning brush. The large external force will lead to the damage of the motor gear.

（3）If there are many debris in the water body at the installation point, it is recommended to install a protective net around the sensor or a protective sleeve to prevent debris from enter into sensor optical gap.

（4）Sensors should not be installed directly opposite the water flow and where there are many bubbles.

4.3 Wiper replacement

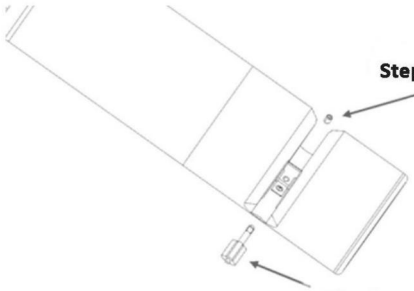
（1）Place the sensor horizontally in a secure work bench and rotate the brush to side (see the picture below).



Step 1: Place the sensor horizontally in a secure work bench and rotate the brush to side

（2） Use a screwdriver to unscrew the screw.

（3）Gently pull the wiper out, use tweezer if necessary.

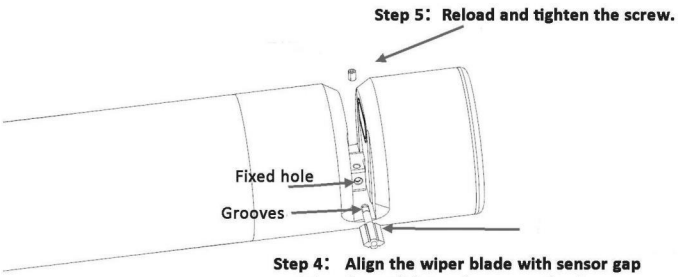


Step 2: Use a screwdriver to unscrew the screw

Step 3: Gently pull the wiper out, use tweezer if necessary

（4）Align the wiper blade with sensor gap and then insert it into wiper mounting base .

（5）Tighten the screw, DO NOT OVER TIGHTEN.



Step 4: Align the wiper blade with sensor gap and then insert it into wiper mounting base .

5 Trouble Shooting

Table 5-1 lists symptoms, possible causes, and recommended solutions for common problems encountered with COD sensor. If your symptom is not listed, or if none of the solutions solves your problem, please contact us.

ERROR	POSSIBLE CAUSE	SOLUTION
Communication anomalies	Controller and cable connection error	Check whether the power supply and wiring are correct according to the instruction.
	Interface or communication issues	Use our SmartPC upper computer software to check whether the communication is normal; Check according to the product supporting communication protocol.
No change in reading	Cleaning brush failure	Check whether the brush is entangled by debris, if so, please remove them gently; Turn on the power again and observe whether the brush rotates. If it cannot rotate or rotates abnormally, please contact customer service;
		Check whether the power supply power meets the requirements.
	Software and hardware anomalies	Please contact us
Reading is too high, too Low or unstable	Sensors are seriously contaminated	Wash the surface
	Sensor self - cleaning damage	Replace the cleaning brush
	Calibration is required	Perform user calibration
Other errors	Please contact us	

Table 5-1 List of frequently asked questions

6 Warranty Description

(1) The warranty period is 1 year（Except for consumables）.

(2) This quality assurance does not cover the following cases.

① Due to force majeure, natural disasters, social unrest, war (declared or undeclared), terrorism, the War or damage caused by any governmental compulsion.

② damage caused by misuse, negligence, accident or improper application and installation.

③ Freight charges for shipping the goods back to our company sensing technology.

④ Freight charges for expedited or express shipping of parts or products covered by the warranty.

⑤ Travel to perform warranty repairs locally.

(3) This warranty includes the entire contents of the warranty provided by Yosemite Sensing Technology with respect to its products.

① This warranty constitutes a final, complete and exclusive statement of the terms of the warranty, and no person or The agent is authorized to establish other warranties in the name of our company sensing technology.

② The remedies of repair, replacement, or return of payment as described above are exceptional cases that do not violate this warranty, and the remedies of replacement or return of payment are for our products themselves. Based on strict liability or other legal theory, our company sensing technology shall not be liable for any other damage caused by a defective product or by negligent operation, including any subsequent damage that is causally related to these conditions.

7 Communication protocols

The RS485 communication protocol uses MODBUS communication protocol, and the sensors are used as slaves.

Data byte format.

Baud rate	9600
Starting position	1
Data bits	8
Stop bit	1
Check digit	N

Read and write data (standard MODBUS protocol)

The default address is 0x01, the address can be modified by register

7.1 Reading data

Host call (hexadecimal)

01 03 00 00 00 01 84 0A

Code	Function Definition	Remarks
01	Device Address	
03	Function Code	
00 00	Start Address	See register table for details
00 01	Number of registers	Length of registers (2 bytes for 1 register)
84 0A	CRC checksum, front low and back high	

Slave answer (hexadecimal)

01 03 02 00 xx xx xx xx

Code	Function Definition	Remarks
01	Device Address	
03	Function Code	
02	Number of bytes read	
XX XX	Data (front low and back high DCBA)	See register table for details
XX XX	CRC checksum, front low and back high	

7.2 Writing data

Host call (hexadecimal)

01 10 1B 00 00 01 02 01 00 0C C1

Code	Function Definition	Remarks
01	Device Address	
10	Function Code	
1B 00	Register Address	See register table for details
00 01	Number of registers	Number of read registers
02	Number of bytes	Number of read registers x2
01 00	Data (front low and back high DCBA)	
0C C1	CRC checksum, front low and back high	

Slave answer (hexadecimal)

01 10 1B 00 00 01 07 2D

Code	Function Definition	Remarks
01	Device Address	
10	Function Code	
1B 00	Register Address	See register table for details
00 01	Returns the number of	

	registers written	
7D 2D	CRC checksum (front low and back high)	

7.3 Calculating CRC Checksum

(1) Preset one 16-bit register as hexadecimal FFFF (i.e., all 1s) and call this register the CRC register.

(2) Iso-oring the first 8-bit binary data (both the first byte of the communication information frame) with the lower 8 bits of the 16-bit CRC register and placing the result in the CRC register, leaving the upper 8 bits of data unchanged.

(3) Shift the contents of the CRC register one bit to the right (toward the low side) to fill the highest bit with a 0, and check the shifted-out bit after the right shift.

(4) If the shifted out bit is 0: repeat step 3 (shift right one bit again); if the shifted out bit is 1, CRC register and polynomial A001 (1010 0000 0000 0001) for the iso-or.

(5) Repeat steps 3 and 4 until the right shift is made 8 times so that the entire 8-bit data is processed in its entirety.

(6) Repeat steps 2 through 5 for the next byte of the communication information frame.

(7) Exchange the high and low bytes of the 16-bit CRC register obtained after all bytes of this communication information frame have been calculated according to the above steps.

(8) The final CRC register content is obtained as follows: CRC code.

7.4 Register Table

Start address	Command Description	Number of registers	Data format (hexadecimal)
0x0700H	Get Software and Hardware Rev	2	4 bytes in total 00 ~ 01: hardware version 02 ~ 03: software version For example, reading 0101 represents 1.1
0x0900H	Get SN	7	14 bytes in total 00: reserved 01 ~ 12: serial number 13: Reserved The 12 bytes of the serial number are translated according to ASCII code, i.e. the factory serial number

0x1100H	COD User calibration K/B (read/write)	4	Total 8 bytes 00~03: K 04~07: B To read K for example, read out as 4 bytes of data (low bit in front, DCBA format, need to convert this data to floating point, see below for conversion method) To write k, for example, we need to convert k to 32-bit floating point and write it in (DCBA format)
0x1B00H	Brush power-on startup settings	1	2 bytes in total 00~01: 0x0000 does not start on power 0x0100 Power on and self-start
0x2600H	COD value acquisition	8	16 bytes in total 00~03：Temperature value 04~07：COD value 08~11：SAC value 12~15：TOC value The reading temperature value/COD value is 4 bytes of data. (The low position is in the front, DCBA format, and this data needs to be converted to a change floating point number. The conversion method is shown below)
0x1200H	Turbidity value acquisition	2	4 bytes in total 00~03：Turbidity value
0x3400H	Turbidity User calibration K/B (read/write)	4	8 bytes in total 00~03：K 04~07：B Take reading K as an example, read out as 4 bytes of data（The low position is in the front, DCBA format, and this data needs to be converted to a change floating point number. The conversion method is shown below） To write k as an example, convert k to a 32-bit floating point number and write it in (DCBA format)
0x3000H	Device address (read and write)	1	2 bytes in total 00~01: Device address The range can be set from 1~254 For example, the data obtained is 02 00 (If the low position is in the front, it means that

			the address is 2) Take address 15 as an example, then 0F 00 Write the corresponding address (low in front) When the current device address is unknown, you can use FF as a common device address to ask for the current
0x3100H	Brush startup (write only)	0	Send a write command with a write length of 0
0x3200H	Brush repeated start time setting (read and write)	1	2 bytes in total 00~01: Time Take the reading value 1E 00 (default) as an example, the actual value is 0x001E, that is, 30 minutes. For example, if you need to write for 60 minutes, convert it to 3C 00 for writing.
0x2100	COD range limit acquisition/setting	1	2 bytes in total 00~01：COD range upper limit， default 2000mg/L e.g. get data as D0 07 （low in front ,This indicates a maximum value of 2000）

7.5 Conversion algorithms for floating point numbers

7.5.1 Converting floating point numbers to hexadecimal numbers

Step 1: Convert the floating point representation of 17.625 to binary floating point

First find the binary representation of the integer part

$17 = 16 + 1 = 1\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0$

So the binary representation of the integer part 17 is 10001B

Then find the binary representation of the fractional part

$0.625 = 0.5 + 0.125 = 1\times2^{-1} + 0\times2^{-2} + 1\times2^{-3}$

So the binary representation of the decimal part 0.625 is 0.101B

So the floating point number in binary form for 17.625 expressed in floating point form is 10001.101B

Step 2: Shift to find the exponent.

Shift 10001.101B to the left until there is only one place left before the decimal point to get 1.0001101B, and

10001.101B = 1.0001101 B x 2^4 . So the exponential part is 4, which, when added to 127, becomes 131, whose binary representation is 10000011B

Step 3: Calculate the end number

Removing the 1 before the decimal point of 1.0001101B gives the trailing number 0001101B (because the 1 before the decimal point must be 1, the IEEE specifies that only the one after the decimal point should be recorded). An important note for 23-bit trailing numbers: the first bit (i.e. the hidden bit) is not compiled. The hidden bit is the bit to the left of the separator, which is usually set to 1 and suppressed.

Step 4: Symbol bit definition

A positive number has a sign digit of 0 and a negative number has a sign digit of 1, so 17.625 has a sign digit of 0.

Step 5: Convert to floating point

1 digit sign + 8 digits exponent + 23 digits mantissa

0 10000011 00011010000000000000000B (corresponding to 0x418D0000 in hexadecimal)

7.5.2 Converting hexadecimal numbers to floating point numbers

Step 1: Convert hexadecimal number 0x427B6666 to binary floating point number 0100 0010 0111 1011 0110 0110 0110 0110B into sign, exponent and mantissa bits

0 10000100 11110110110110011001100110b

1 digit sign + 8 digits exponent + 23 digits mantissa

Sign bit S: 0表示正数

Index bit E: 10000100B = 1× 2^7 +0× 2^6 +0× 2^5 +0× $2^4+0\times2^3$ +1× 2^2 +0× 2^1 +0× 2^0

=128+0+0+0+0+0+4+0+0=132

Last digit M: 11110110110011001100110B = 8087142

Step 2: Calculating floating point numbers

D = $(-1)^S \times (1.0+M/2^{23}) \times 2^{E-127}$

= $(-1)^0 \times (1.0+8087142/2^{23}) \times 2^{132-127}$

= 1 x 1.964062452316284 x 32

= 62.85