

MANUAL

Online COD BOD TSS TOC Analyzer

MS CBT 9110

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Chapter 1 Overview

This product is a digital COD BOS TSS TOC controller, connected to a digital COD BOD TSS TOC sensor for measurement. The controller supports two current outputs, one digital communication output and two control relays with configurable functions.

1.1 Technical Parameters

Detection Channel	Single Channel Digital COD Sensor
Measurement Parameters	COD (chemical oxygen demand), temperature, TOC (total organic carbon), TU (turbidity)
Estimated Parameters	BOD (biochemical oxygen demand)
Relay Control	2 SPST relays, Contact rating 3A
	Control Type: COD control/ Temp. control / TOC control / BOD control / TU control / Wash control
Current Output	Two active 4~20mA or 0~20mA, Max. Load: 1000Ω
	Corresponding Channel: COD / Temp. / TOC / BOD / TU
Comm. Interface	A RS485, support MODBUS-RTU protocol and JSON text format
Display Screen	3.2 inch graphic LCD display
Electronic Clock	Year-Month-Day, Hour-Minute-Second
History Recording	10,000 historical data can be recorded, support historical data download ⁽¹⁾
	100 calibration logs, 100 alarm logs
Operating Environment	0~+60℃, relative humidity 0~95%, no condensation
Storage Environment	-20~+70℃, relative humidity 0~55%, no condensation
Power Supply	100~240VAC or 18~36VDC, 24 W Max
Installation Method	Panel / wall / pipe mounting
Instrument Dimension	144*144*120 (unit: mm)
Protection Grade	IP66
Instrument Weight	About 800g

Note: (1) The download needs to be realized through the RS485 interface external data downloader.

Chapter 2 Mechanical Installation

2.1 Dimension

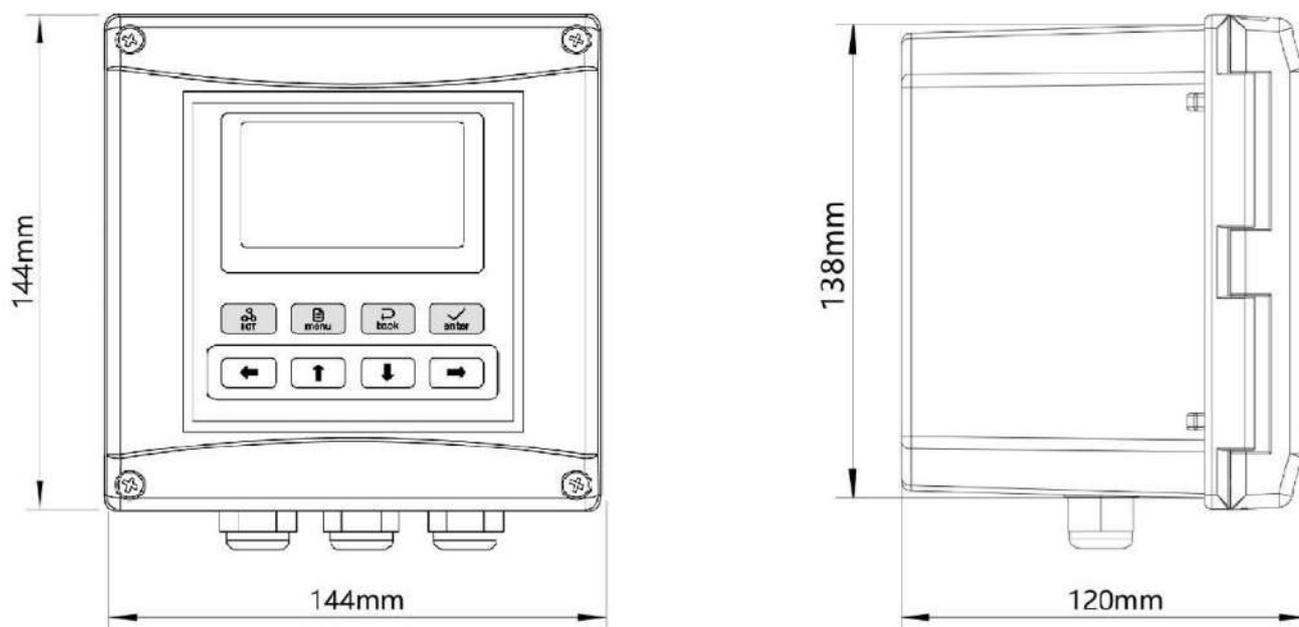


Figure 2-1 Instrument dimension

2.2 Installation

- Panel installation

When selecting a rack mount for the meter, use 2 mounting brackets to secure the meter, and the installation diagram is shown below:

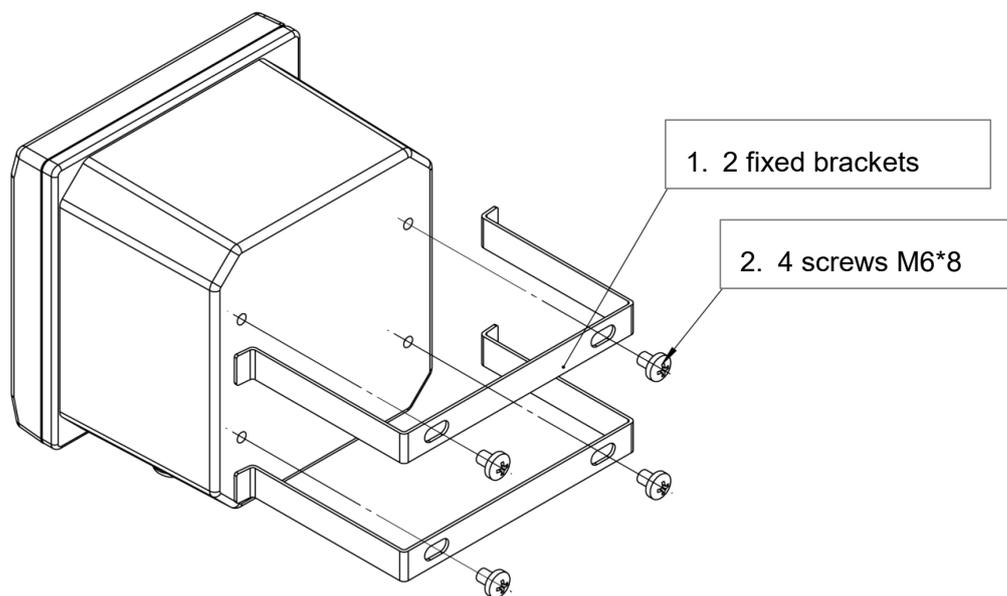


Figure 2-2 Panel mounting

- Wall installation

Connect the gray backplate to the meter, and then install it on the box or wall sidewall, the installation dimensions and schematic diagram are as follows:

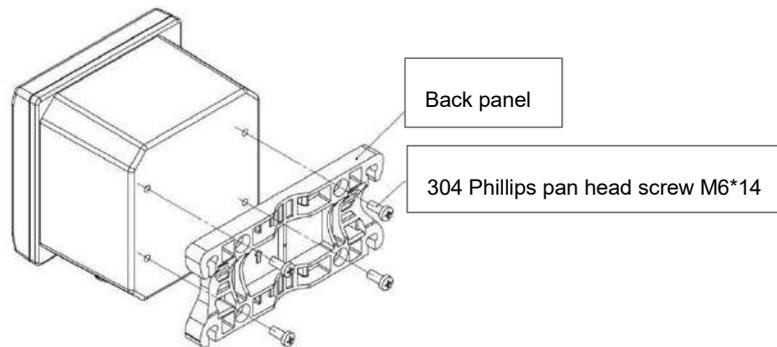


Figure 2-3 Wall mounting

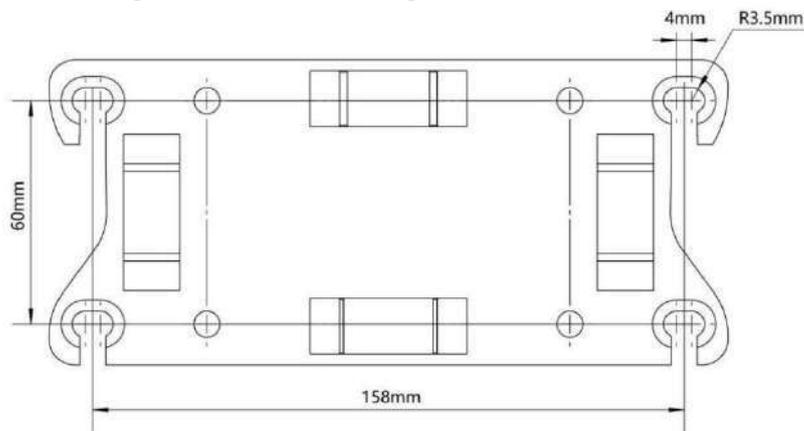


Figure 2-4 Wall mounting hole size dimensional drawing

- Pipe installation

Connect the gray backplate to the meter, and then fix the backplate to the horizontal or vertical pipe with a clamp, the installation diagram is shown below:

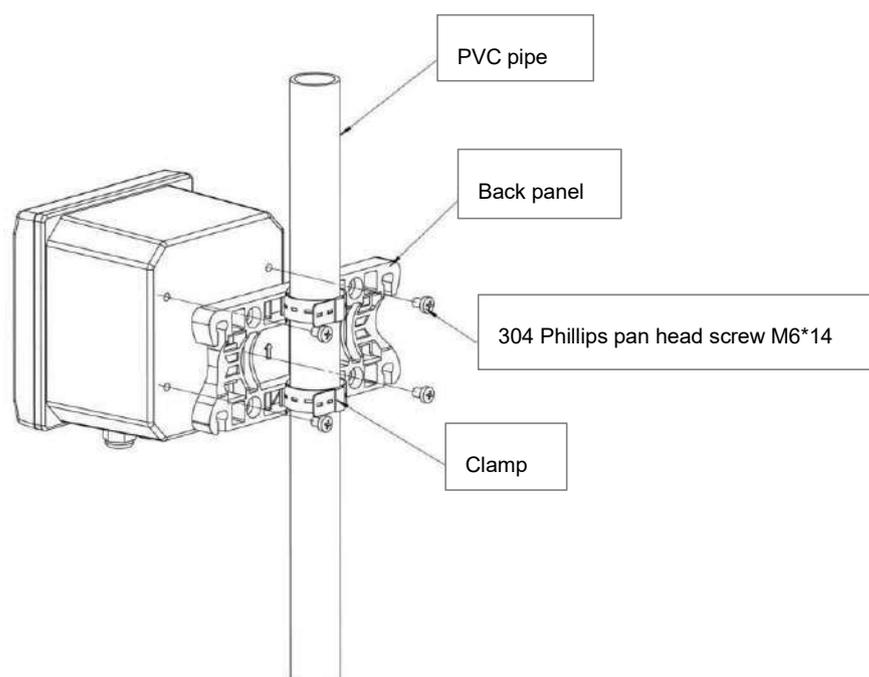


Figure 2-5 Pipe installation

Chapter 3 Electrical Installation

3.1 Power Connection

After unscrewing the screws on the back of the meter, remove the cover and see the terminal blocks. According to the power supply type of the instrument, access 100~240VAC or 18~36VDC.

Note: Before connecting AC power, be sure to cut off the power supply!

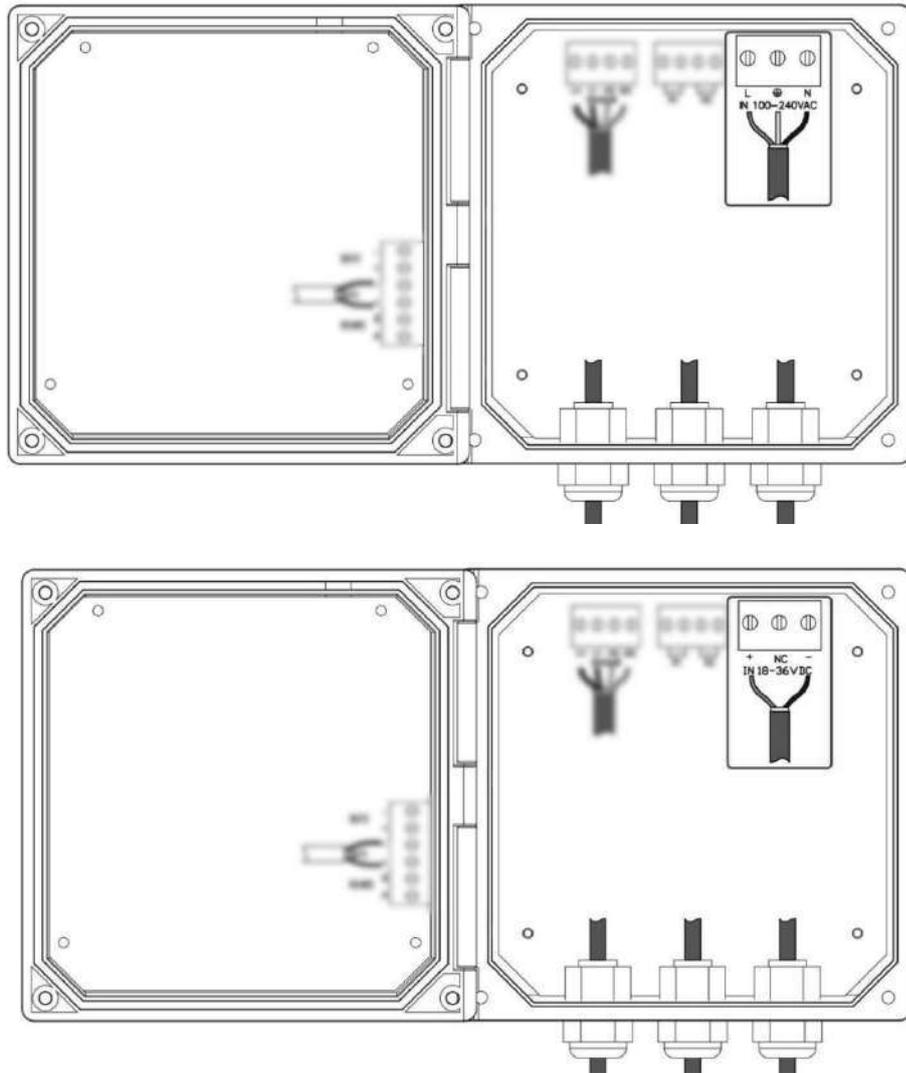


Figure 3-1 Two types of power terminals

Two kinds of power terminals are defined in the Table:

POWER	L	AC power LIVE wire	POWER	+	DC power positive
AC IN	\oplus	AC power ground wire	DC IN	NC	Floating terminal
100-240V	N	AC power NEUTRAL wire	18-36V	-	DC power negative

3.2 Terminal Definition

The electrode cable is connected to the V+ V- AS BS terminals, and the rest are connected according to actual needs.

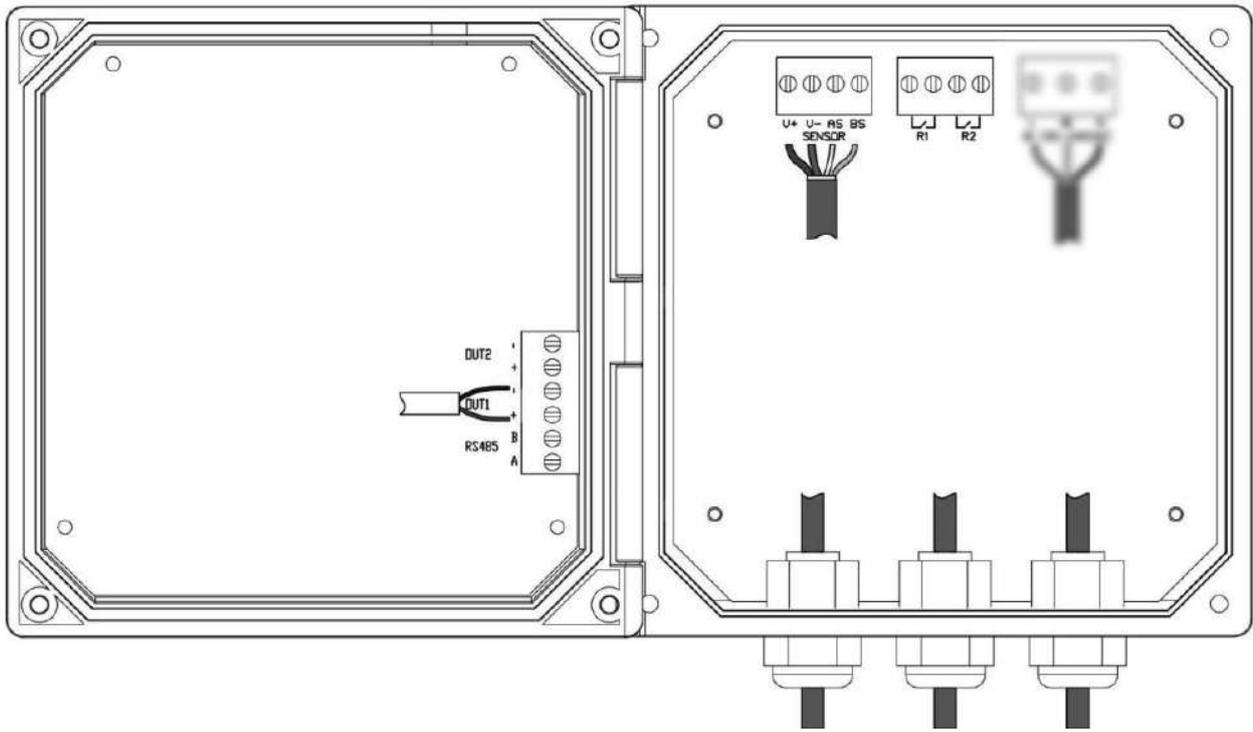


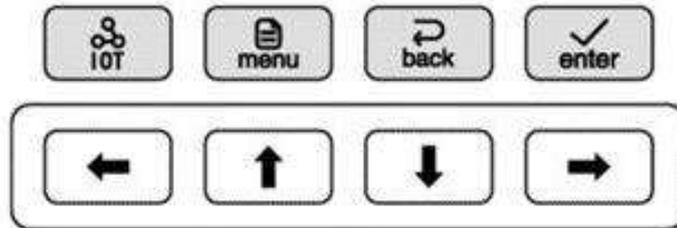
Figure 3-2 terminal blocks

The terminal locations and names are shown in the table below:

OUT2	+	Current 2 Output positive	V-	Sensor power - terminal
	-	Current 2 Output negative	AS	Sensor communication A terminal
OUT1	+	Current 1 Output positive	BS	Sensor communication B terminal
	-	Current 1 Output negative	R1	Relay 1 contact
RS485	A	RS485 signal D+(A) terminal		
	B	RS485 signal D-(B) terminal	R2	Relay 2 contact
V+		Sensor power + terminal		

Chapter 4 User Interface

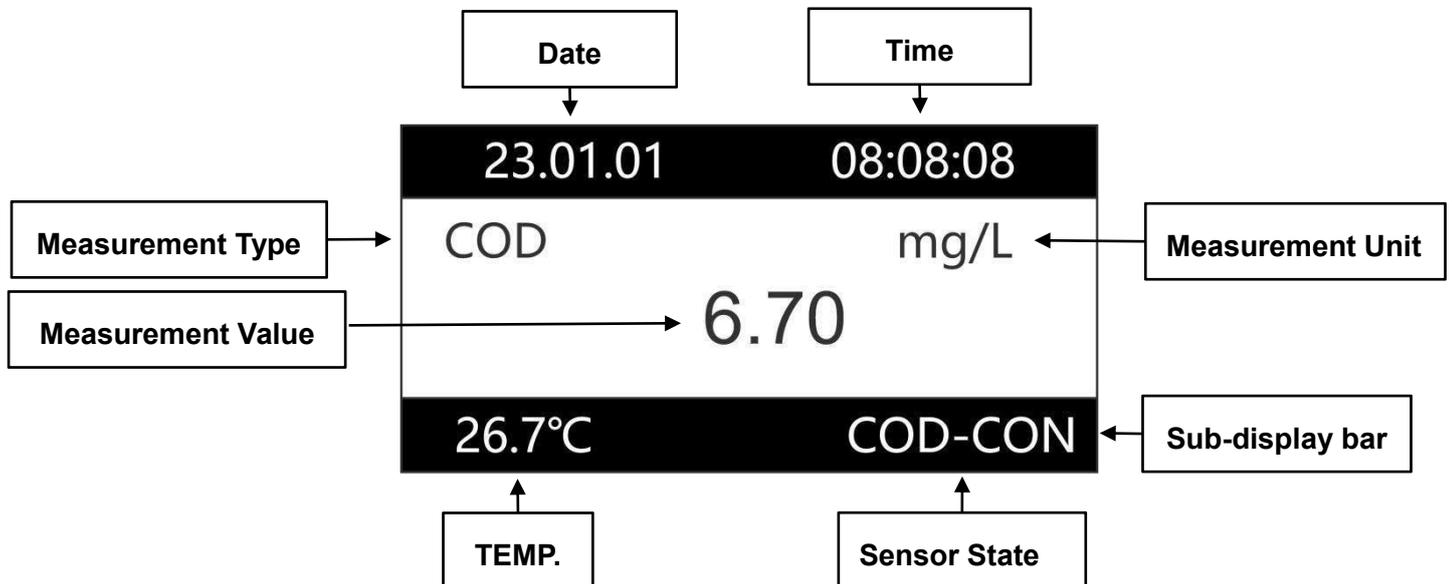
4.1 Panel Button



- **Up key:** In the menu option interface, to move the cursor up;
In the parameter setting interface to increase the data by 1 (change in the order of 0, 1, 2.... 9, 0);
- **Down key:** In the menu option interface to move the cursor down;
In the parameter setting interface to reduce the data by 1 (change in the order of 9, 8, 7... 0, 9);
In the measurement interface, can switch secondary displays.
- **Left key:** In the parameter setting interface, to move the cursor left;
In the menu interface, to return to the previous menu;
In the measurement mode, to switch the type of measured value displayed.
- **Right key:** In the parameter setting interface, to move the cursor right;
In the measurement mode, to switch the type of measured value displayed.
- **Internet of Things key:** has no function
- **Menu key:** In the measurement interface, long press to enter the menu interface; In the menu option interface to directly return to the measurement state; In the parameter setting interface to return to the previous menu.
- **Back key:** Return to the previous menu, such as in the parameter setting interface, abandon the modification and return to the previous menu.
- **Enter key:** In the menu option interface, press this key to select the option; in the parameter setting interface, press this key to confirm and return to the previous menu.

4.2 Display Screen

The meter normally displays the measurement interface after power-on. The specific information is as follows:



- **Date and Time:** Display the current date and time
- **Measurement Value/Type/Unit:** Display the current measurement type, value and unit. In the measurement interface, press the left/right key to switch to display COD, TOC, BOD and TU.
- **Sub-display Bar:** Press ↓ key under the measurement interface to switch the sub-display bar information: "Temp. Values&sensor state", "Two relay status", "Two current values",
- **Temperature Value:** Displays the current temperature measurement.
- **Sensor State:** "COD-CON" is displayed when the sensor is normally connected, and "COD-NC" is displayed when it is not connected.

Chapter 5 Menu Description

In the measurement interface, long press the  button to enter the menu. This chapter describes the main features.

5.1 Probe Setting

● Sensor communication

After the meter is connected to the sensor, if the measured value is not displayed, you need to enter the menu and select "Auto. Scan", or manually enter the current address of the sensor in "Sensor Address".

● COD/TU calibration

- The first point calibration: Put the sensor into the water sample 1 with known measurement value, make sure that the optical path is submerged below 2cm from the water surface, and there are no air bubbles. After the value is stable, enter the calibration value, and then press the  button to start calibration. If only one point of calibration is to be done, it can be done after the first point is calibrated.
- Second-point calibration: If you want to do two-point calibration, you need to perform the second point calibration after the first point calibration is completed. Put the sensor into the water sample 2 with a known measured value (the measured value of water sample 2 must be greater than the value of water sample 1), after the value is stable, enter the calibration value, and then press the  button to start calibration.
- Offset/factor correction: By setting the deviation and factor correction measurement value, it will be automatically updated after calibration. After setting,

*The measurement value = original measurement value * factor value + offset value.*

● BOD calculation

Correct the BOD estimation value by setting the BOD slope and deviation. After setting,
*BOD value=COD value*BOD slope value+BOD offset value.*

5.2 Alarm Setting

- **Control function**

When “ Sensor Control ” is selected in the menu, the relay is a control output relay.

When “ On Value ” > “ Off Value ” are set in the menu, the relay is a high alarm control.

When “ On Value ” < “ Off Value ” are set in the menu, the relay is low alarm control.

- **Wash relay**

When “ Wash Relay ” is selected in the menu, the relay is in the wash output state, and the relay will on and off in the set cycle for wash control.

When “ Hold ” is selected for “ Wash State ”, when cleaning, the measurement display value remains unchanged before the relay is operated.

When “ constant ” is selected for “ Wash State ”, the measurement value is the real-time value of continuous measurement.

5.3 Current Setting

Use a current signal to output the measured value.

Set the measured value for the current in “ Channel Select ”.

The measured values corresponding to the current output “ 20mA ” and “ 0mA/4mA ” are set in “ Max. Value ” and “ Min. value ”, respectively.

5.4 Comm. Setting

Use RS485 interface to output the measured value.

When [ModBus] is selected for [Comm. Protocol], Modbus standard comm. is used. Refer to the appendix for the description of relevant registers.

When [Json] is selected for [Comm. Protocol], the instrument will send the measured value every one minute in text format.

Appendix

ModBus Register Introduction

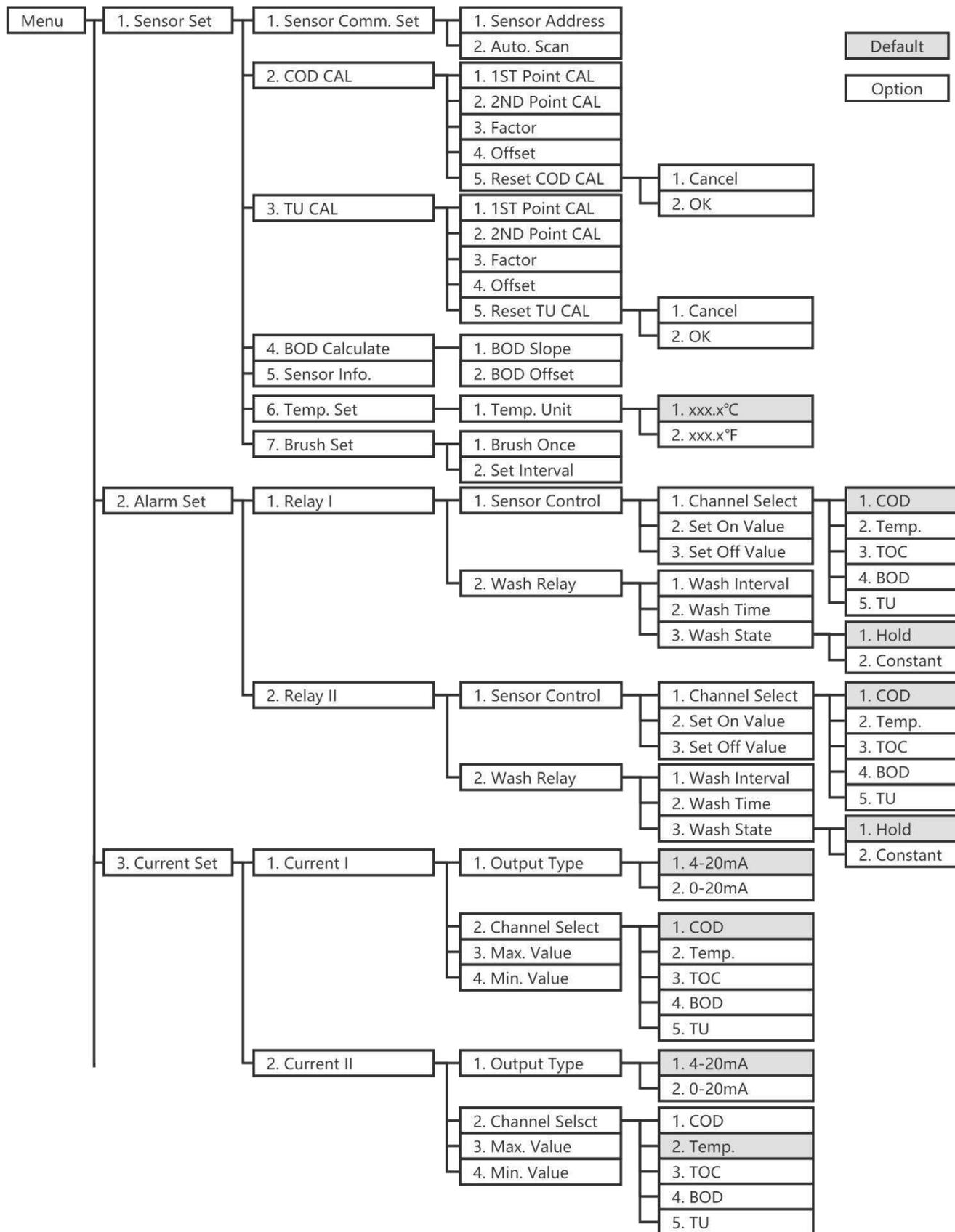
The instrument acts as a slave on the network and supports the Modbus RTU communication protocol.

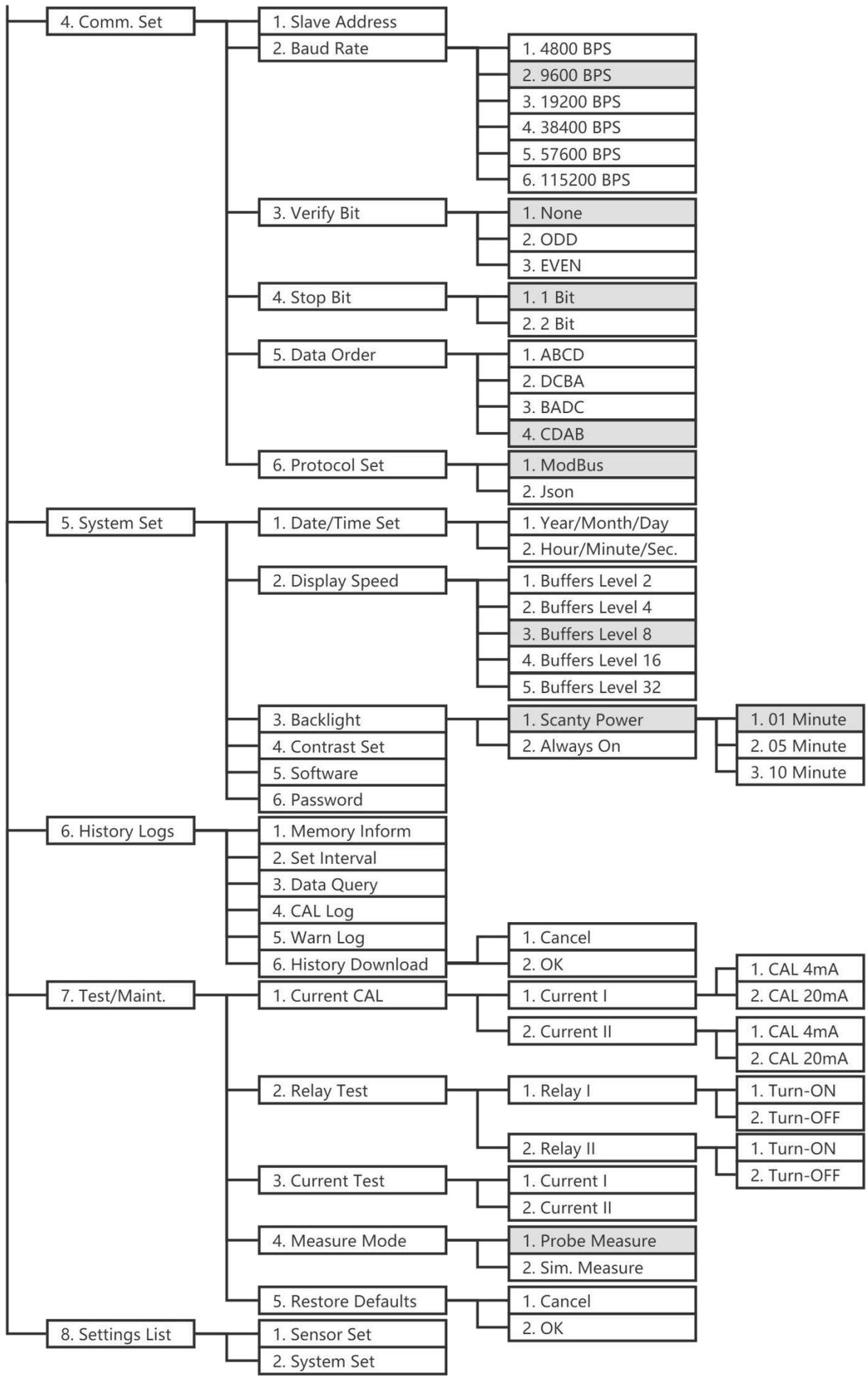
The main unit can use function code 04 to read the measurement results.

The parameters corresponding to the register address are defined as follows:

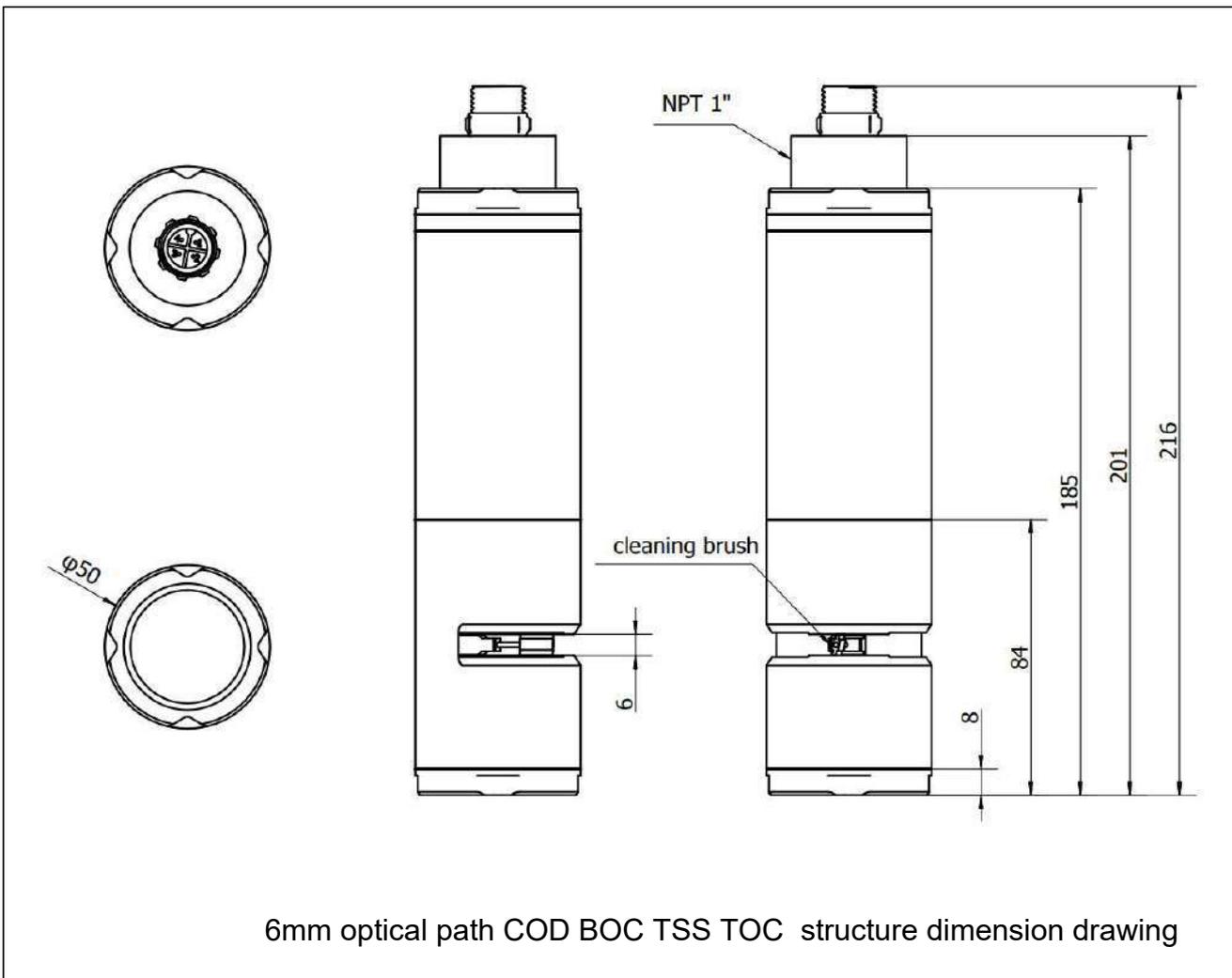
Register Start Address	Function Code	Parameters	Number of Registers	Data Format
0	04	COD value(mg/L)	2	32 bit floating point default CDAB(3412)
2	04	Temp. Value(°C)	2	32 bit floating point default CDAB(3412)
4	04	TU value(%)	2	32 bit floating point default CDAB(3412)
6	04	BOD value(mg/L)	2	32 bit floating point default CDAB(3412)
8	04	TOC value(mg/L)	2	32 bit floating point default CDAB(3412)

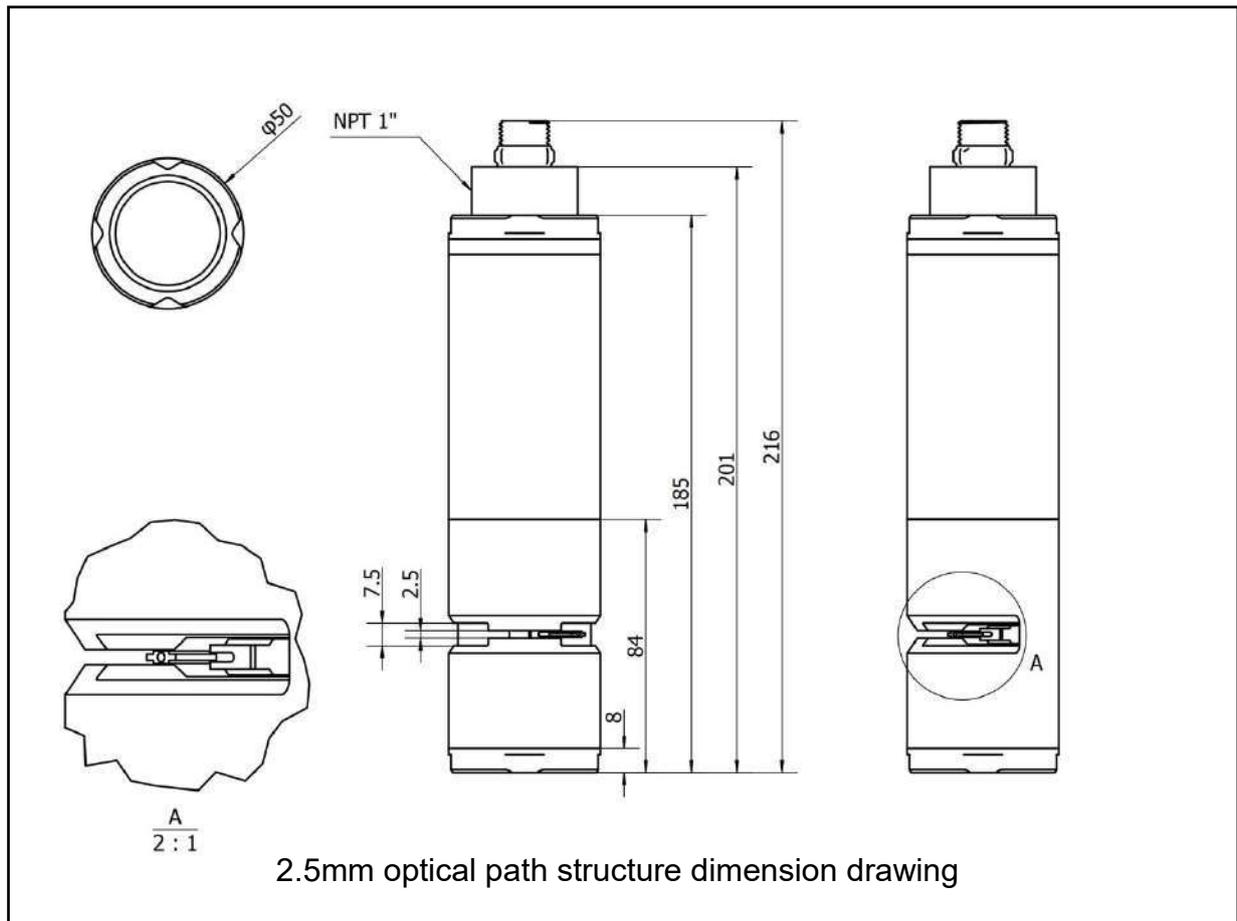
Menu Structure Diagram





Sensor Dimensions, Installation & Maintenance





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_A (485_A)
3. Green—485 data line_B(485_B)
4. Black—Ground (GND)

Installation

Note

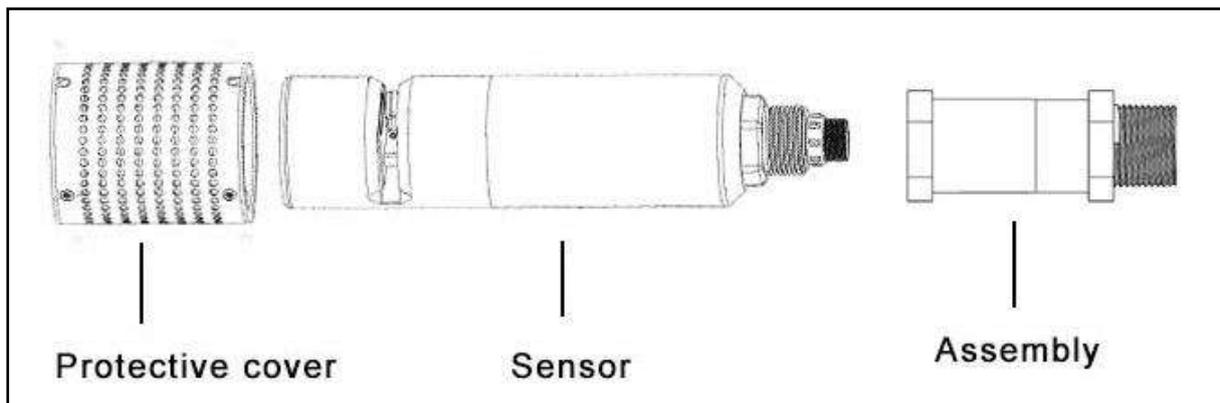
Disperse the cables before proceeding.

2.1 Configuration

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.



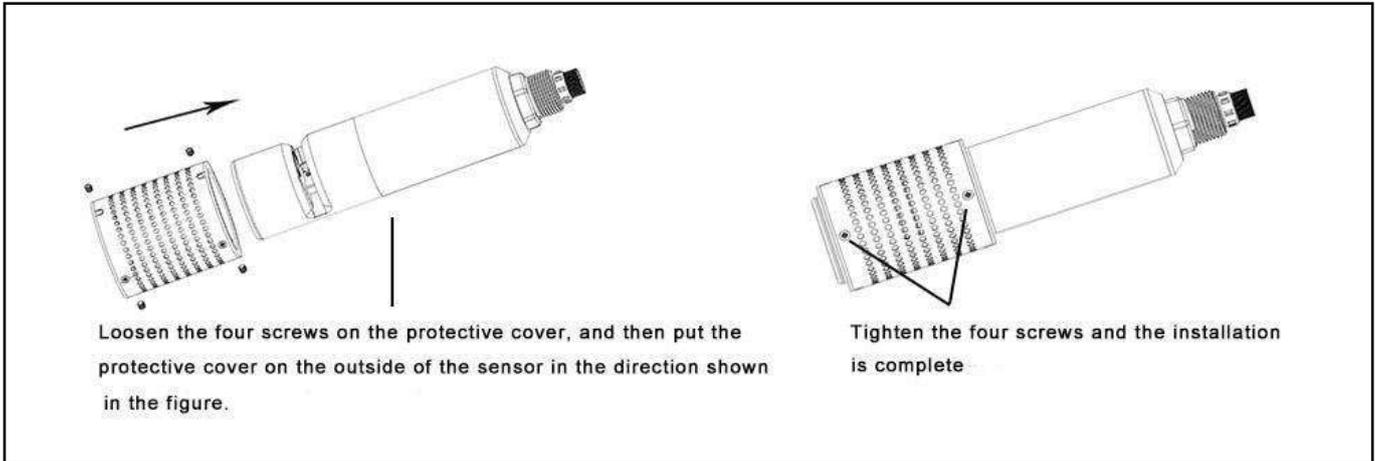
2.2 Installation Precautions

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.

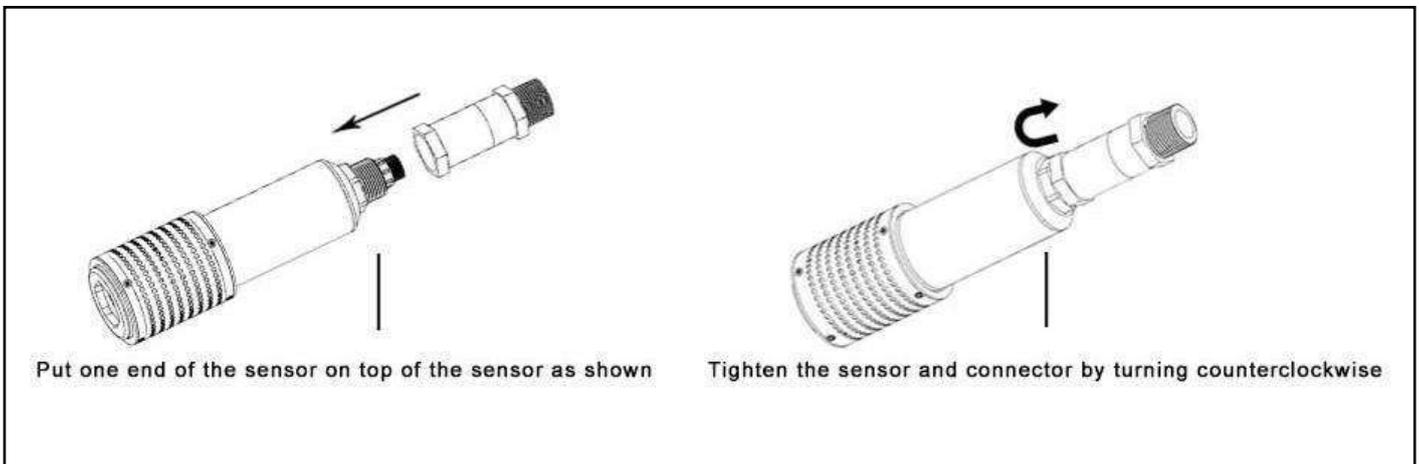
Installation Steps

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).



2. After the protective cover is installed, please install the assembly adapter as shown in the figure.



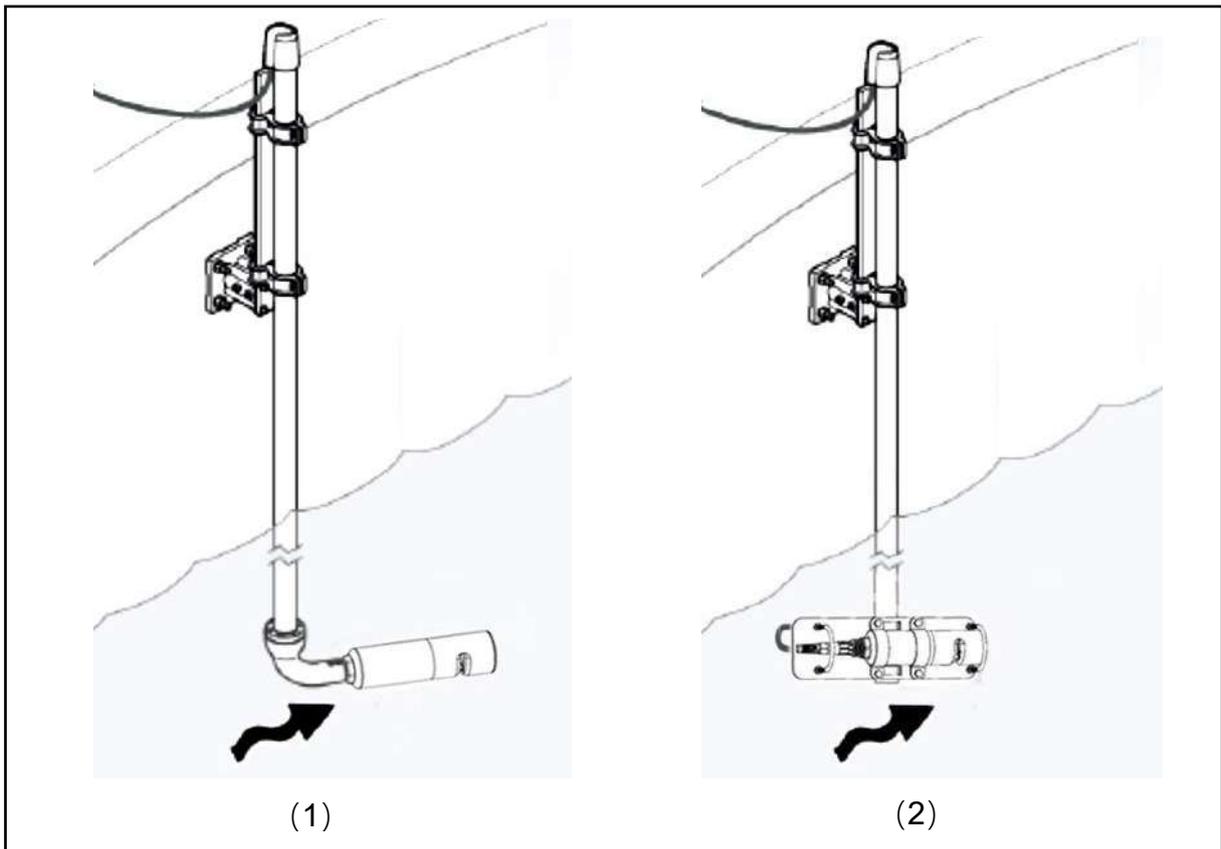
Warning

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.

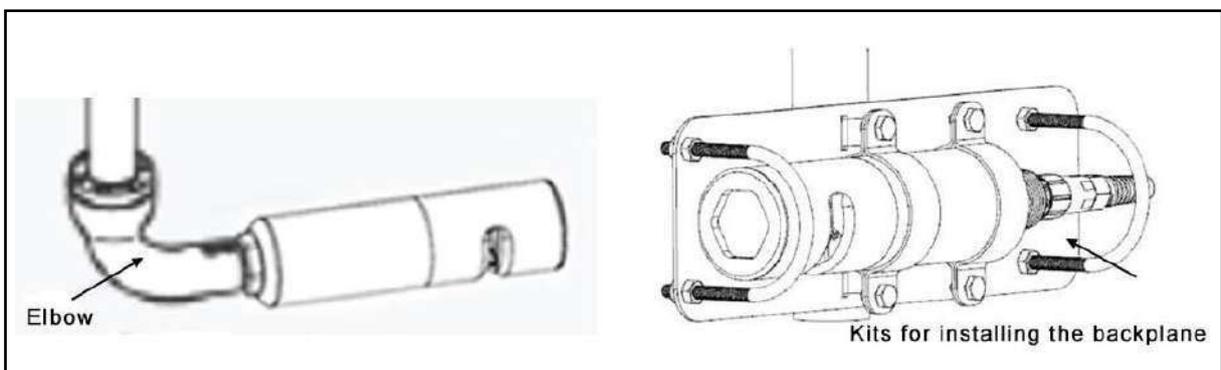
On-site fixed installation

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.



2. Optional parts view



Maintenance Schedule and Method

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
Calibrate the sensor	According to the working conditions and user needs, but not later than once every 3 months
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

Maintenance Method

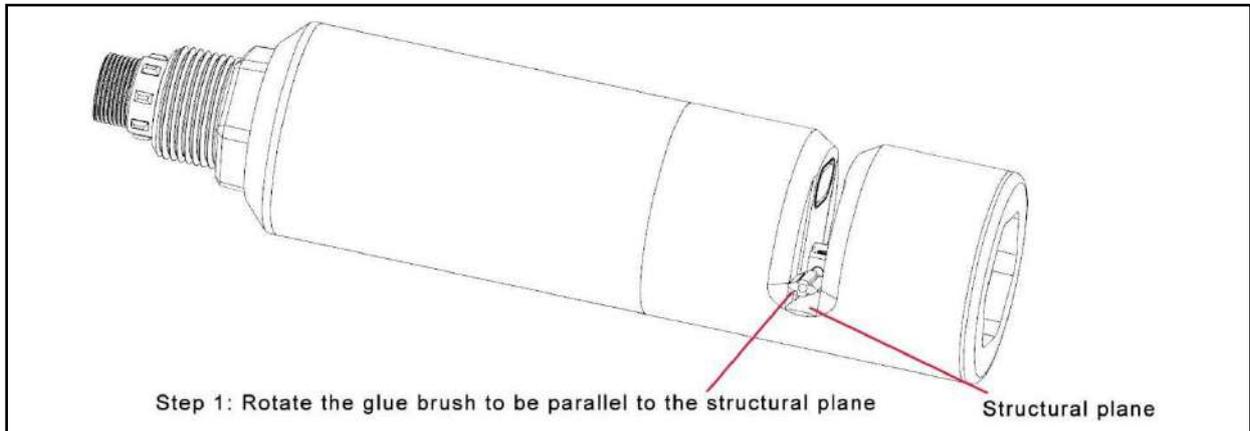
- 1. Cleaning the outer surface of sensor:** Clean the outer surface of the sensor with tap water. If there is still debris, wipe it with a damp soft cloth. For some stubborn dirt, you can add some household detergent to the tap water to clean;
- 2. Sensor measurement window surface cleaning:** use a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

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

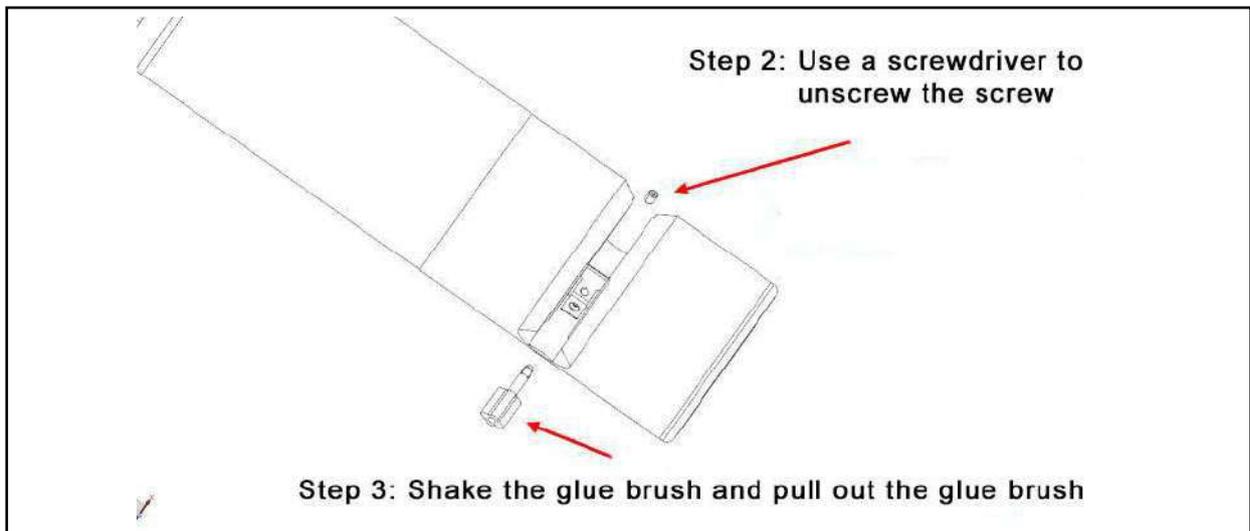
Cleaning Brush Replacement

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



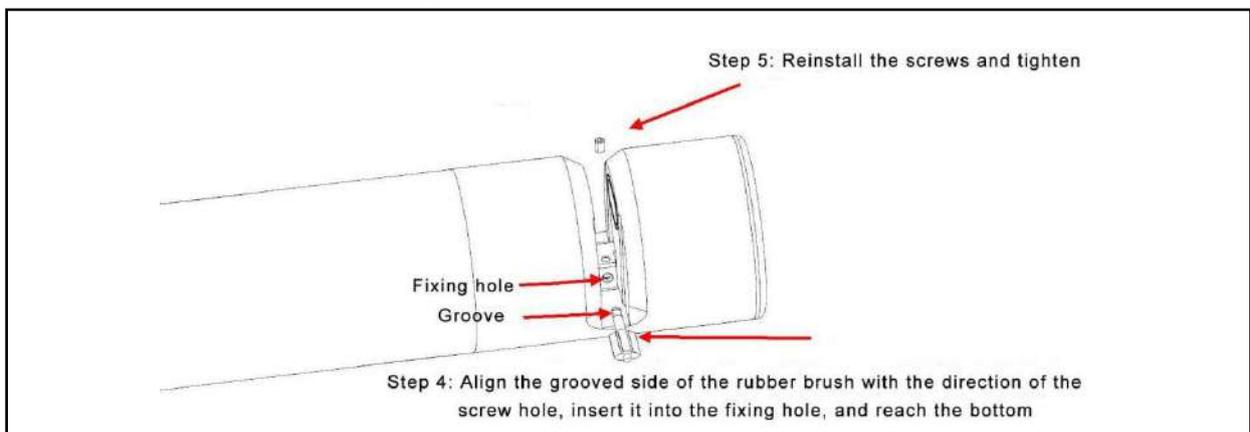
2. Using a screwdriver, unscrew the screw.

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.



Frequently Asked Questions

Table **given below** lists possible problems and solutions for 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
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	

TEST / CALIBRATION CERTIFICATE

Calibration Date :

ITEM DETAILS

Name : Online COD BOD TSS Analyzer

Make : MicroSet

Model : MS CBT 9110

Serial No :

Readings

COD

Standard COD Solution ppm	Reading Before Calibration ppm	Reading After Calibration ppm
Zero		

TSS

Standard TSS Solution ppm	Reading Before Calibration ppm	Reading After Calibration ppm
Zero		

RS 485 MODBUS Working OK

Calibrated By,

Sign

Seal

Initials



WARRANTY CERTIFICATE

MicroSet warrants each instrument to be free from defects in material & workmanship. This obligation to servicing or part returned to the company for that purpose & making good any parts thereof which shall be within warranty period, returned to the company under a written intimation & which to the company's satisfaction to be found defective. The company reserves the right to decide the workplace for the repair work. The freight for defective material will have to be borne by the buyer, & the transit risk for such material will rest with the buyer. The warranty is applicable only if the instrument is used within its specification.

THIS WARRANTY IS VALID UP TO 12 months from date of Tax Invoice (Sensors Carry No Warranty since Consumables)

ITEM DETAILS

Name	:	Online COD BOD TSS Analyzer
Make	:	MicroSet
Model	:	MS CBT 9110
Serial No	:	_____