NBL-BOD-406-S Online BOD Sensor User Manual

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User Notes

- Please read this manual carefully before use and save it for reference.
- Please follow the operating procedures and precautions in this manual.
- When receiving the instrument, please carefully open the package and check whether the instrument and accessories are damaged due to shipping. If any damage is found, please inform the manufacturer and distributor immediately, and keep the package for return.
- When the instrument fails, do not repair it yourself. Please contact the maintenance department of the manufacturer directly.

Content

I. Working principle

Many organic substances dissolved in water absorb 275nm ultraviolet light and stimulate fluorescence. Therefore, by measuring the intensity of the excited fluorescence of these organic substances, the content of dissolved organic pollutants in water can be accurately measured.

Features:

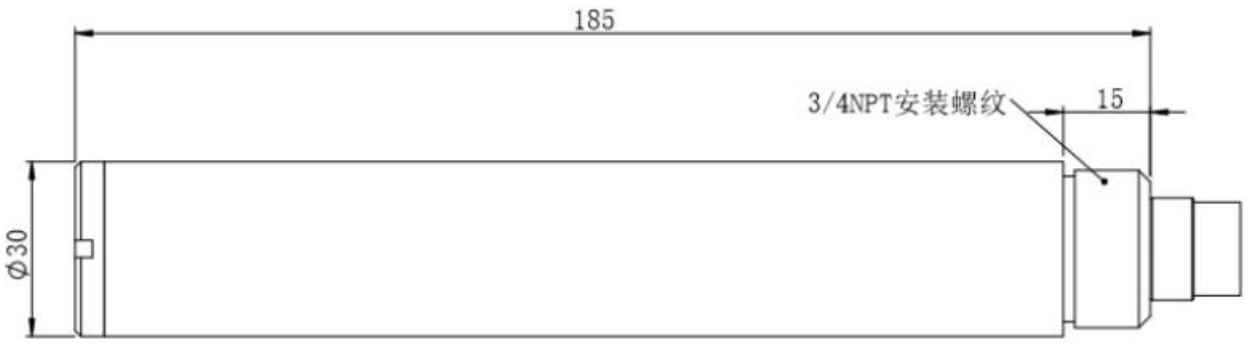
- No reagents required, no pollution, economical and environmentally friendly
- Small size, more convenient to install, and can conduct continuous online water quality monitoring
- Can measure BOD, temperature and other parameters
- Small drift, fast response, and more accurate measurement
- Excellent stability even for long-term monitoring
- Maintenance-free, long service life, low cost of use
- Digital sensor, RS-485 interface, Modbus/RTU protocol
- Optional 4-20mA
- Low power consumption design, anti-interference design

II. Technical performance and specifications

1. .Technical parameters

Model	NBL-BOD-406-S
Measurement principle	Fluorescence method
Measuring range	BOD
	0～300mg/L
BOD accuracy	±5%F.S. of reading
Response time (T90)	<30s
Lowest detection limit	1mg/L
BOD resolution	0.1mg/L
Calibration method	Two point calibration
Output method	RS-485 (Modbus/RTU), 4-20mA (optional)
Power supply	12～24VDC
Power consumption	0.2W@12V
Working conditions	0～45℃、<0.1MPa
Storage temperature	-5～65℃
Protection level	IP68
Installation method	Immersion installation
Cable length	5 meters, other lengths can be customized
Sensor housing material	316L stainless steel

2. Dimensional drawing



Note: The sensor connector is M16-5 core waterproof connector male

III. Installation and electrical connection

1. Installation

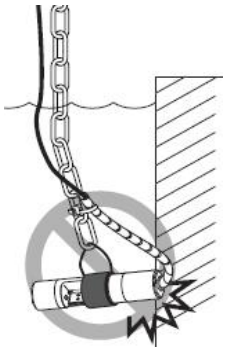
1) When hanging the sensor, avoid the sensor from hitting the wall or other water conservancy facilities due to water flow. If the water flow is strong, secure the sensor.

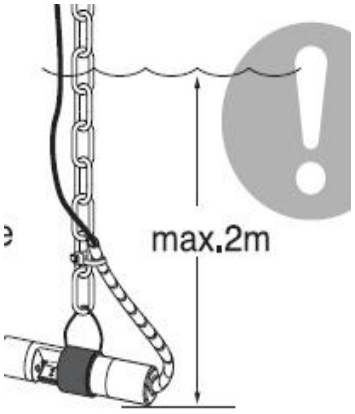
2) Install the sensor so that the depth from the water surface is no more than 2 meters.

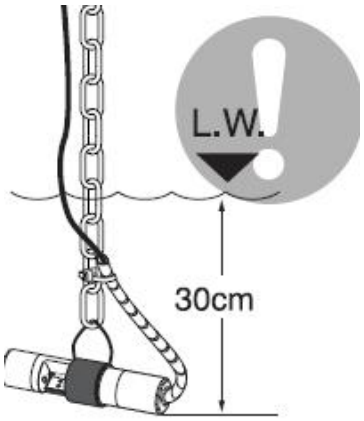
3) Considering the fluctuation of water level, submerge the sensor below the lowest possible water level of 30cm.

4) The sensor is placed in the water where there are no bubbles.

5) It is recommended to install a cable protective sleeve outside the sensor cable. The sensor is placed horizontally and firmly fixed, with the measurement area facing the direction of the water flow.







2. Electrical connection

The cable is a 5-core twisted pair shielded wire, and the line sequence is defined as follows:

- Red wire—power cord (12~24VDC)
- Black wire—ground wire (GND)
- Blue wire—485A
- White wire—485B

The wiring sequence should be carefully checked before powering on to avoid unnecessary losses caused by wiring errors.

Wiring instructions: Considering that cables are immersed in water (including seawater) or exposed to the air for a long time, all wiring locations are required to be waterproofed, and user cables should have certain anti-corrosion capabilities.

IV. Maintenance and maintenance

1. Maintenance schedule and methods

1.1 Maintenance schedule

To ensure accurate measurement, cleaning is very important. Regular cleaning of the sensor will contribute to the stability of the data.

Maintenance tasks	Recommended maintenance frequency
Calibrate the sensor (if required by the competent authority)	Carry out according to the maintenance schedule required by the competent authority

Maintain and inspect self-cleaning brushes	Return to the factory for inspection and maintenance every 18 months Self-cleaning brush

Note: The maintenance frequency in the above table is only a recommendation. Maintenance personnel are required to clean the sensor according to the actual usage of the sensor.

1.2 Maintenance methods

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

2) Check the sensor cable: The cable should not be tightened during normal operation, otherwise it is easy to break the internal wires of the cable, causing the sensor to not work properly.

3) Check whether the measurement window of the sensor is dirty and whether the cleaning brush is normal.

4) Check whether the sensor cleaning brush is damaged.

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

1.3 Things to note

The sensor contains sensitive optical and electronic components. Make sure the sensor is not subject to severe mechanical impact. There are no user-serviceable parts inside the sensor.

2. Calibration of sensors

BOD calibration

Calibration (2-point calibration)

①Put the sensor into the 500ppb tryptophan solution and confirm that all light paths are immersed >2cm underwater and there are no bubbles. Follow the appendix command to perform zero point calibration.

②Put the sensor into the 5000ppb tryptophan solution and perform slope calibration according to the appendix command.

Note: 1. When calibrating, calibrate the temperature first and then calibrate the BOD.

2. If the sensor value does not change within 3 minutes after calibrating the slope, just power off and then on again.

3. Precautions

- Prevent the sensor from being exposed to sunlight
- Please do not touch the sensor with your hands
- Avoid bubbles adhering to the sensor surface during measurement and calibration
- Avoid any direct mechanical stress (pressure, scratches, etc.) on the sensor during use.

4. Frequently asked questions and solutions

Question	Possible reason	Solution
The operation interface cannot connect or does not display the measurement results	Controller and cable connection error	Reconnect the controller and cables
	Cable failure	Please contact us
The measured value is too high, too low or the value continues to be unstable	The sensor window is attached to a foreign object	Clean the sensor window surface
	Sensor self-cleaning damaged	Replace cleaning brush

V. Quality and service

1. Quality assurance

- The quality inspection department has standardized inspection procedures, advanced and complete testing equipment and means, and strictly follows the inspection procedures. It conducts 72-hour aging tests and stability tests on the products, and does not allow any unqualified products to leave the factory.
- The consignee will directly return batches of products with a defective rate of 2%, and all costs incurred will be borne by the supplier. For consideration criteria, refer to the product description provided by the supplier.
- Ensure supply quantity and shipping speed.

2. Accessories and spare parts

This product includes:

- 1 sensor

- 1 copy of instruction manual
- 1 certificate of conformity

3. After-sales service commitment

Our company provides after-sales service for this machine within one year from the date of sale, but does not include damage caused by improper use. If repair or adjustment is needed, please send it back, but the freight will be borne by you. When sending it back, make sure it is well packaged to avoid shipping. If the instrument is damaged during the journey, our company will repair the damage to the instrument free of charge.

Appendix Data Communications

1. Data format

The default data format of Modbus communication is: 9600, n, 8, 1 (baud rate 9600bps, 1 start bit, 8 data bits, no parity, 1 stop bit).

Parameters such as baud rate can be customized.

2. Information frame format

a) Read data instruction frame

4B	03	xx xx	xx xx	xx xx
Address	Function code	Register Address	Number of registers	CRC check code(low byte first)

b) Read data response frame

4B	03	xx	xx……xx	xx xx
Address	Function code	Bytes	Answer data	CRC check code(low byte first)

c) Write data command frame

4B	06	xx xx	xx xx	xx xx
Address	Function code	Register Address	Write data	CRC check code(low byte first)

d) Write data response frame (same as write data command frame)

4B	06	xx xx	xx xx	xx xx
Address	Function code	Register Address	Write data	CRC check code(low byte first)

3. Register address

Register address	Name	Illustrate	Number of registers	interview method
0x0000	BOD measurement value	2 double-byte integers, respectively the measured value and the number of decimal places of the measured value (default is 1 decimal place).	2 (4 bytes)	Read (0x03)
0x0002	Temperature measurement	2 double-byte integers, respectively the temperature value and the number of decimal places of the temperature value (default is 1	2 (4 bytes)	Read (0x03)

		decimal place).		
0x1000	BOD zero point calibration	Calibration was performed in deionized water. The calibration value data written during calibration is 0; the data read out is the BOD zero offset. (Calibration can also be performed in a tryptophan standard solution of 0 to 500 ppb. The calibration value data written during calibration is the value of the concentration of the standard solution used)	1 (2 bytes)	Write(0x06)/Read(0x03)
0x1004	BOD slope calibration	Calibrate in standard solution of 500~5000ppb. The calibration value data written during calibration is the value of the concentration of the standard solution used; the data read out is the BOD slope x1000.	1 (2 bytes)	Write(0x06)/Read(0x03)
0x1010	temperature calibration	Temperature calibration: The written data is the actual temperature value x10; the read data is the temperature calibration offset x10.	1 (2 bytes)	Write(0x06)/Read(0x03)
0x1100	sensor switch	Turns the sensor measurement function on or off. When the written data is 0, the measurement is turned off; when the written data is 1, the measurement is turned on. The sensor is turned on by default when powered on.	1 (2 bytes)	write(0x06)

0x2002	sensor address	The default is 75, and the data range is 1~255.	1 (2 bytes)	Write(0x06)/Read(0x03)
0x2020	Reset sensor	The calibration value returns to the default value, and the written data is 0. Note that the sensor needs to be calibrated again after resetting before it can be used.	1 (2 bytes)	write(0x06)

1. Command example

a) Measurement instructions:

Function: Read the BOD value and temperature value of the sensor; the unit of BOD value is mg/L, and the unit of temperature is ℃.

Request frame: 4B 03 00 00 00 04 4A 63

Response frame: 4B 03 08 03 62 00 01 00 B9 00 01 CF F8

Reading example:

BOD value	temperature value
03 62 00 01	00 B9 00 01

For example: BOD value 03 62 represents the hexadecimal reading BOD value, 00 01 represents BOD with 1 decimal point, and the converted decimal value is 86.6.

The temperature value 00 B9 represents the hexadecimal reading temperature value, 00 01 represents the temperature value with 1 decimal point, and the converted decimal value is 18.5°C.

b) Calibration instructions:

temperature calibration

Function: Calibrate the sensor temperature to 25.8°C; temperature calibration should be performed after the temperature has stabilized for a period of time.

Request frame: 4B 06 10 10 01 02 02 F4

Response frame: 4B 06 10 10 01 02 02 F4

BOD zero point calibration

Function: Set the BOD zero point calibration value of the sensor; the command when calibrating the zero point in a 500ppb solution:

Request frame: 4B 06 10 00 01 F4 83 77

Response frame: 4B 06 10 00 01 F4 83 77

BOD slope calibration

Function: Set the BOD slope calibration value of the sensor; command when calibrating the slope in 5000ppb solution:

Request frame: 4B 06 10 04 13 88 CF F7

Response frame: 4B 06 10 04 13 88 CF F7

c) Boot command:

Function: Turn on or off the sensor measurement function. Note that it defaults to the

power-on state when powered on.

Request frame: 4B 06 11 00 00 01 43 5C

Response frame: 4B 06 11 00 00 01 43 5C

d) Change device ID address:

Function: Change the Modbus device address of the sensor.

Change the sensor address 06 to 01. The example is as follows:

Request frame: 4B 06 20 02 00 01 EC 60

Response frame: 4B 06 20 02 00 01 EC 60

2. Error response

If the sensor cannot correctly execute the host computer command, it will return information in the following format:

Definition	Address	Function code	Code	CRC check
Data	ADDR	COM+80H	xx	CRC 16
Number of bytes	1	1	1	2

a) CODE: 01 –Function code error

03 – Data is wrong

b) COM: The received function code