NBL-WQ-CHLO-408-S Online Chlorophyll Sensor
User Manual

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User Notes

- Please read the instructions carefully before using and save it for reference.
- Please follow the instructions and precautions.
- When receiving the instrument, please open the packaging carefully, inspect equipment's damage level in case of transportation, if you found spoiled equipment, please immediately notify the manufacturer and distributor, and retain the packaging, in order to send back to processing.
- When the instrument is in trouble, please don't repair it by yourself, please directly contact the maintenance department of the manufacturer.

Content

I、Operational principle

The chlorophyll sensor uses leading optical technology, integrated design, high efficiency power management, rugged structure, stable sensor performance, maintenance-free and frequent calibration, and can be used online for a long time. It can be used for research, investigation and monitoring of rivers, lakes, ponds, marine surveys, aquaculture, drinking water sources, algae and phytoplankton conditions.

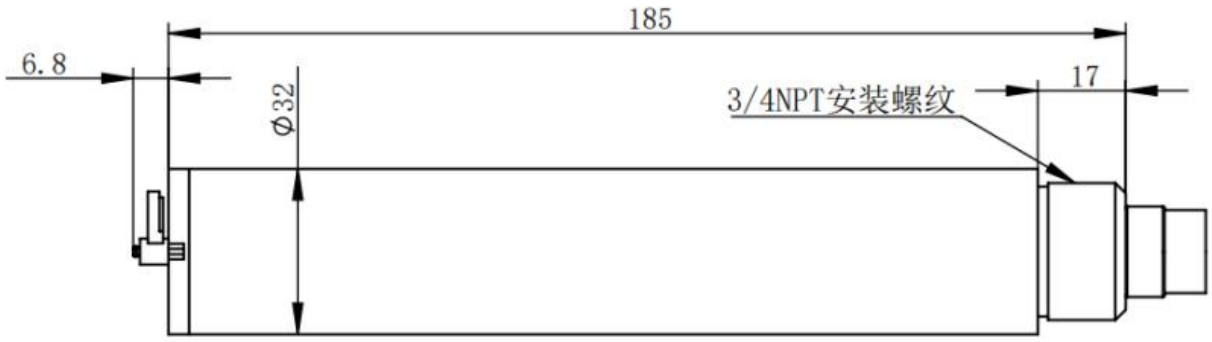
- 0～400ug/L
- Resolution: 0.1ug/L
- 0～50 °C; IP68 protection, water depth within 20 meters
- Built-in temperature sensor
- Support RS-485, Modbus/RTU protocol
- Convenient, fast, stable and easy to maintain

II、Technical performance and specifications

1. Technical parameters

Model	NBL-WQ-CHLO-408-S
Measuring range	0～400ug/L
Resolution	0.1 ug/L，0.1℃
Precision	±3%，±0.3℃
Calibration method	Two-point calibration
Protection level	IP68
Deepest depth	Underwater 20 meters
Temperature range	0～50℃
Sensor interface	RS-485(Modbus/RTU),4~20mA(Optional)
Power information	12～24VDC
Power consumption	0.2W@12V
Cable length	5 meters, other lengths can be customized
Shell material	316 Stainless stell

2、Dimensional drawing



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

III、Installation and electrical connection

1. Installation

Installation Distance Requirements: With the side wall to maintain more than 3cm, with the bottom to maintain more than 10cm.

2. Electrical connection

Cable for the 4-core twisted pair shielded wire, wire sequence definition:

- Red cord—power cord（12V～24VDC）
- Black cord —ground cord（GND）
- Blue cord—485A
- White cord—485B
- Yellow cord—Current output (if unused, suspended)

The wiring sequence should be carefully checked before power-on to avoid unnecessary losses caused by faulty wiring.

Wiring instructions: considering the cable long-term Immersion in water (including sea water) or exposure to air, all wiring are required to do waterproof treatment, the user cable should have a certain degree of corrosion resistance.

IV、Maintenance

1. Maintenance procedures and methods1.1 Maintenance schedule

The cleanliness of the measurement window is very important to maintain accurate readings.

Maintenance task	Recommended maintenance frequency
Calibrate the sensor (if required by the competent authority)	According to the maintenance schedule required by the competent authority

1.2 Maintenance methods

- Sensor outer surface: Clean the outer surface of the sensor with tap water. If there is still debris left, wipe it out with a soft, damp cloth. For some stubborn dirt, add some household washing liquid to the tap water to clean it.
- Check the cable of the sensor: the cable should not be tightened during normal operation, otherwise the cable inside the cable will be broken and the sensor will not work properly.
- Check the sensor's measurement window for dirt.

1.3 Notes

The sensors contains sensitive optical and electronic components. Make sure the probe is not subject to severe mechanical shock. There are no parts inside the probe that require user maintenance.

2. Sensor calibration

a) Zero calibration: Take an appropriate amount of distilled water in a brown beaker and place the sensor vertically in the solution. The front end of the sensor is at least 10 cm from the bottom of the beaker. After 3 to 5 minutes, the value is stabilized and zero calibration is performed. The instructions refer to the appendix.

b) Slope calibration: Place the sensor probe in the standard solution. The front end of the sensor is at least 10 cm away from the bottom of the beaker. After 3 to 5 minutes, the slope is calibrated after the value is stabilized. The instructions refer to the appendix.

3. Frequently Asked Questions

Error	Possible reason	Solution
The operation interface cannot be connected or the measurement result is not displayed.	The measured value is too high, too low or the value is continuously unstable.	Reconnect controller and cable
	Cable failure	Please contact us

The measured value is too high, too low or the value is continuously unstable.	The sensor window is attached by a foreign object	Cleaning the sensor window surface

V、Quality and service

1. Quality assurance

- The quality inspection department has standardized inspection procedures, advanced and perfect testing equipment and means, and strictly in accordance with the regulations, to do 啊 a 72-hour aging test and stability test on the product, and not to allow one unqualified product to leave the factory.
- The receiving party directly returns the product batch with a failure rate of 2%, and all the costs incurred are borne by the supplier. The reference standard refers to the product description provided by the supplier.
- Guarantee the quantity of goods and the speed of shipment.

2. Accessories and spare parts

This product includes:

- 1 Sensor
- 1 copy of the instruction manual
- 1 certificate
- 1 Cable (5 m)

3. After-sales service commitment

The company provides local after-sales service within one year from the date of sale, but does not include damage caused by improper use. If repair or adjustment is required, please return it, but the shipping cost must be conceited. Damaged on the way, the company will repair the damage of the instrument for free.

Appendix data communicationData format

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

2. Information frame format

a) Read data instruction frame

0B	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

0B	03	xx	xx.....xx	xx xx
Address	Function code	Bytes	Answer data	CRC check code (low byte first)

c) Write data instruction frame

0B	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 data command frame)

0B	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	Instruction	Number of registers	Access method
40001 (0x0000)	Measured value + temperature	Four double-byte integers are measured, measured decimal and temperature decimal places.	4 (8 bytes)	Read
44097 (0x1000)	Zero calibration	Calibrated in distillation, the write data is 0; the read data is zero offset. (It can also be calibrated in a standard solution of 0-100 ug/L. The calibration method is based on the slope calibration)	1 (2 bytes)	Write/Read

44101 (0x1004)	Slope calibration	It was calibrated in a known standard solution (100 ug/L - 400 ug/L), and the written data was the actual value of the standard solution × 10; the read data was the slope value × 1000.	1 (2 bytes)	Write/Read
44113 (0x1010)	Temperature correction	Calibrated in solution, the written data is the actual temperature value x 10; the read data is the temperature calibration offset x 10 .	1 (2 bytes)	Write/Read
48195 (0x2002)	Sensor address	The default is 11, writing data range 1-255.	1 (2 bytes)	Write/Read
48225 (0x2020)	Reset sensor	The calibration value is restored to the default value and the write data is 0. Note that the sensor needs to be calibrated again after resetting.	1 (2 bytes)	Write

4. Command example

a) Measurement instructions

Function: Get the chlorophyll value and temperature measured by the sensor; the unit of chlorophyll is ug/L, and the unit of temperature is ℃.

Request frame: 0B 03 00 00 00 04 44 A3

Response frame: 0B 03 08 01 02 00 01 00 B0 00 01 AB E4

Reading example:

Chlorophyll value	Temperature value
01 02 00 01	00 B0 00 01

For example: chlorophyll value 01 02 represents the hexadecimal reading chlorophyll value, 00 01 represents the chlorophyll value with 1 decimal point, and the converted decimal value is 25.8.

The temperature value 00 B0 represents the hexadecimal reading temperature value, and 00 01 represents the temperature value with 1 decimal point converted into a decimal value of 17.6.

b) Calibration instructions

Zero point calibration

Function: Set the zero-point calibration value of sensor chlorophyll; here the zero-point calibration is performed in distilled water;

Request frame: 0B 06 10 00 00 00 8D A0
Response frame: 0B 06 10 00 00 00 8D A0
slope calibration
Function: Set the slope calibration value of sensor chlorophyll; the slope value here is based on the actual standard solution value x10, take 400ug/L as an example to refer to the calibration;
Request frame: 0B 06 10 04 0F A0 C9 E9
Response frame: 0B 06 10 04 0F A0 C9 E9
c) Set device ID address:
Function: Set the MODBUS device address of the sensor;
Change the sensor address 11 to 01, the example is as follows
Request frame: 0B 06 20 02 00 01 E2 A0
Response frame: 0B 06 20 02 00 01 E2 A0

5. Error response

If the sensor does not correctly execute the host command, it will return the following format information:

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