NBL-WQ-COL-408-S Online Colorimetric 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

By measuring the absorption degree of visible light of 470nm wavelength by the measured water body, the chromaticity of the water body can be accurately measured. The online chromaticity sensor uses two light sources, one visible light is used to measure chromaticity, and one reference light is used to measure water turbidity. In addition, a specific algorithm is used to compensate for the attenuation of the optical path and eliminate particulate suspended impurities to a certain extent. interference, thereby achieving more stable and reliable measurements.

Features:

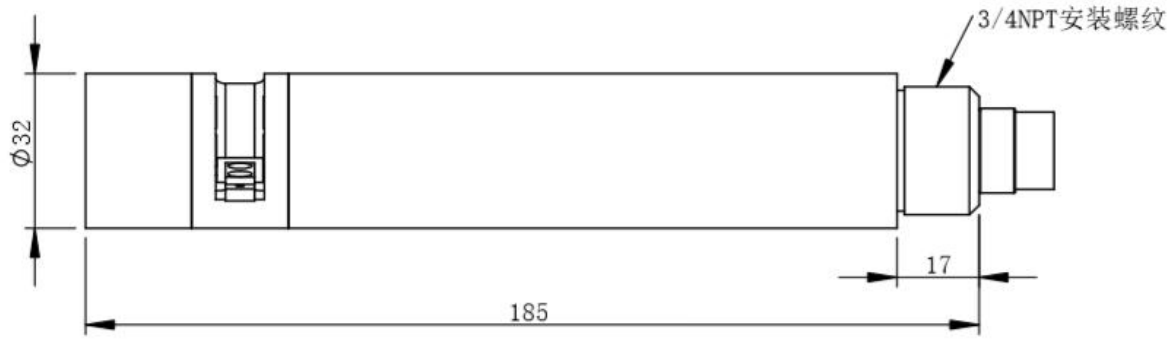
- No reagents required, no pollution, economical and environmentally friendly
- Small size, more convenient to install, and can conduct continuous online water quality monitoring
- Can measure parameters such as color, turbidity and temperature
- Automatically compensate for turbidity interference
- With cleaning brush to prevent biological adhesion
- 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 current output
- Low power consumption design, anti-interference design

II. Technical performance and specifications

1. Technical parameters

Model	NBL-WQ-COL-408-S	
Measurement principle	Dual-wavelength visible light absorption method	
Measuring range	Chroma	Turbidity
	0～500Hazen	0～200NTU
Colorimetric accuracy	±5% of reading	
Response time (T90)	＜30s	
lowest detection limit	2Hazen	
Chroma resolution	0.1Hazen	
Turbidity accuracy	±5%	
Turbidity resolution	0.1NTU	
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	

2. Dimensional drawing



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

III. Installation and electrical connection

1. Installation

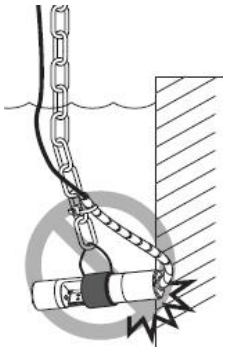
1) When hanging the sensor, avoid the sensor from hitting the wall or other water conservancy facilities due to water flow. If the water flow is strong, secure the sensor.

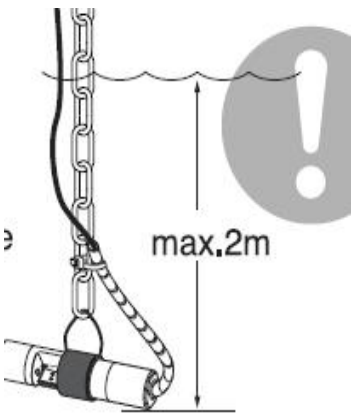
2) Install the sensor so that the depth from the water surface is no more than 2 meters.

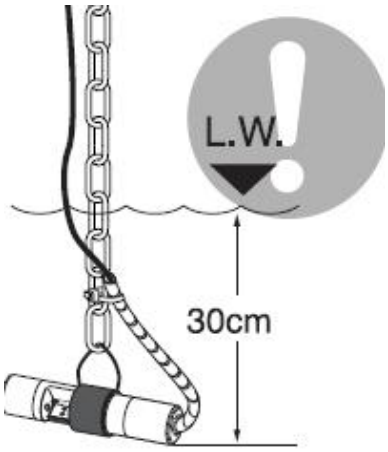
3) Considering the fluctuation of water level, submerge the sensor below the lowest possible water level of 30cm.

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. 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.

3. 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

10	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

10	03	xx	xx……xx	xx xx
Address	Function code	Bytes	Answer data	CRC check code(low byte first)

c) Write data command frame

10	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)

10	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	Colorimetry measurements	2 double-byte integers, respectively the measured value and the number of decimal places of the measured value (default 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 decimal place).	2 (4 bytes)	Read (0x03)
0x0004	Turbidity measurement	2 double-byte integers, respectively the measured value and the number	2 (4 bytes)	Read (0x03)

		of decimal places of the measured value (default is 1 decimal place).		
0x1000	Chroma Zero Point Calibration	Can be calibrated in 0-100 color standards. The calibration value data written during calibration is the concentration of the standard solution used x10; the data read out is the zero offset x10.	1 (2 bytes)	Write(0x06)/ Read(0x03)
0x1004	Chroma slope calibration	Calibration can be performed in a standard solution of 200 to 500 Hazen; the calibration value data written during calibration is the concentration of the standard solution used x10; the read data is the slope value 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)
0x1020	Turbidity zero point calibration	Calibration was performed in zero turbidity water. The calibration value data written during calibration is 0; the data read out is the zero offset.	1 (2 bytes)	Write(0x06)/ Read(0x03)
0x1024	Turbidity Slope Calibration	Can be calibrated in 100-200NTU standard solution. The calibration value data written during calibration is the concentration of the standard solution used x10; the data read out is the slope value x1000.	1 (2 bytes)	Write(0x06)/ Read(0x03)
0x1100	sensor switch	Turns the sensor measurement function on or off. When the written	1 (2 bytes)	write(0x06)

		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.		
0x2002	sensor address	The default is 16, and the data range is 1~255.	1 (2 bytes)	Write(0x06)/ Read(0x03)
0x1300	Automatic cleaning interval setting	The default is 30 minutes, and the data range is 6 to 6000 minutes.	1 (2 bytes)	Write(0x06)/ Read(0x03)
0x1301	Automatic cleaning lap setting	The default is 3 circles, and the data range is 0~6 circles.	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 chromaticity value and temperature value of the sensor; the unit of chromaticity value is degree, and the unit of temperature is ℃.

Request frame: 10 03 00 00 00 04 47 48

Response frame: 10 03 08 03 62 00 01 00 B9 00 01 EB DD

Reading example:

Chroma value	Temperature value
03 62 00 01	00 B9 00 01

For example: the chroma value 03 62 represents the hexadecimal reading chroma value, 00 01 represents the chroma 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: 10 06 10 10 01 02 0F DF

Response frame: 10 06 10 10 01 02 0F DF

Turbidity zero point calibration

Function: Set the turbidity zero point calibration value of the sensor; the zero point calibration is performed in zero turbidity water.

Request frame: 10 06 10 20 00 00 8F 81

Response frame: 10 06 10 20 00 00 8F 81

Turbidity Slope Calibration

Function: Set the turbidity slope calibration value of the sensor; command when calibrating the slope in 100NTU solution:

Request frame: 10 06 10 24 03 E8 CE FE

Response frame: 10 06 10 24 03 E8 CE FE

Chroma Zero Point Calibration

Function: Set the chromaticity zero-point calibration value of the sensor; the zero-point calibration is performed in 0 chromaticity standard solution.

Request frame: 10 06 10 00 00 00 8E 4B

Response frame: 10 06 10 00 00 00 8E 4B

Chroma slope calibration

Function: Set the chromaticity slope calibration value of the sensor; command when calibrating the slope in 1000 chromaticity standard solution:

Request frame: 10 06 10 04 27 10 D5 B6

Response frame: 10 06 10 04 27 10 D5 B6

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: 10 06 11 00 00 01 4E 77

Response frame: 10 06 11 00 00 01 4E 77

d) Change device ID address:

Function: Change the Modbus device address of the sensor.

Change the sensor address 16 to 01. The example is as follows:

Request frame: 10 06 20 02 00 01 E1 4B

Response frame: 10 06 20 02 00 01 E1 4B

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