NBL-WQ-MLSS-4A Online sludge concentration 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

NBL-WQ-MLSS-4A integrated online sludge concentration sensor is designed and manufactured using the principle of scattered light measurement method. When a beam of light is emitted into a water sample, the suspended particles in the water sample scatter the light. By measuring the intensity of the backscattered light and comparing it with the internal calibration value, the sludge concentration in the water sample is calculated. The final value is output after linearization.

- Scattered light principle, built-in temperature sensor
- Supports RS-485 Modbus/RTU protocol, 4-20mA current output
- Fiber optic structure, strong resistance to external light interference
- Infrared LED light source, high stability
- IP68 protection, within 20 meters of water depth
- Convenient, fast, stable and easy to maintain

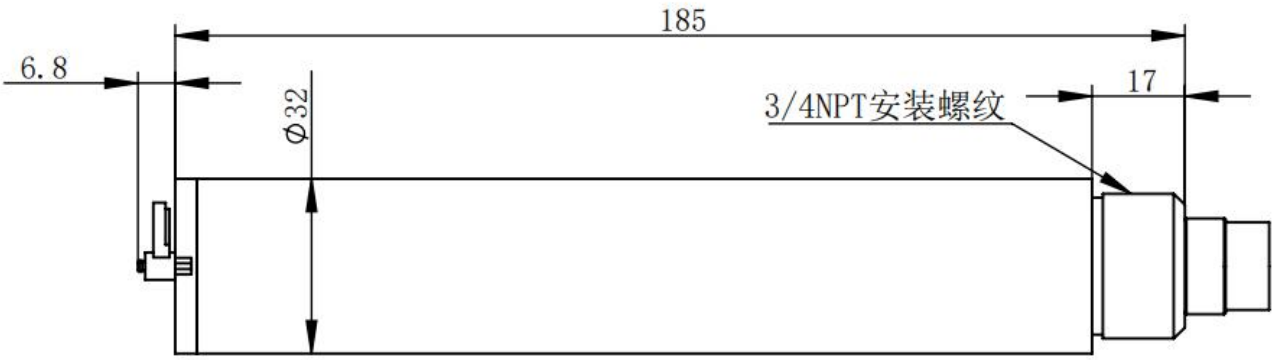
II. Technical performance and specifications

1. Technical parameters

Model	NBL-WQ-MLSS-4A
Measurement principle	scattered light method
Measuring range	0～20.000g/L
resolution	0.001g/L，0.1℃
Accuracy	±5% of reading (depending on sludge homogeneity)
Response time (T90)	±0.3℃
lowest detection limit	<30s
Calibration method	1mg/L
Temperature compensation	Two point calibration
output method	Automatic temperature compensation (Pt1000)
storage temperature	RS-485(Modbus/RTU), 4-20mA (optional)
working conditions	-5～65℃

shell material	0～50℃,＜0.2MPa
Installation method	POM and 316L stainless steel
Cable length	Submersible installation, 3/4NPT pipe thread
Power consumption	0.2W@12V
powered by	12～24VDC
Protection level	IP68

2. Dimensional drawing



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

III. Installation and electrical connection

1. Installation

Installation distance requirements: keep more than 5cm from the side wall and more than 10cm from the bottom.

2. Electrical connection

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

- Red wire—power cord (12~24VDC)
- Black wire—ground wire (GND)
- Blue wire—485A
- White wire—485B
- Yellow wire—current output (if not used, it can be left floating)

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 procedures and methods

1.1maintenance schedule

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

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

1.2Maintenance method

- 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.
- 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 and prevent the sensor from working properly.
- Check whether the measurement window of the sensor is dirty and whether the cleaning brush is normal.

1.3Precautions

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

a) Zero point calibration: Use a larger beaker to measure an appropriate amount of 0~2.000g/L sludge concentration standard solution, place the sensor vertically in the solution, with the measuring end of the sensor at least 10cm from the bottom of the beaker, wait for 3 to 5 minutes until the value stabilizes Perform zero point calibration. See the appendix for instructions.

b) Slope calibration: Place the sensor measurement end face in a 2.000-20.000g/L sludge concentration standard solution. The sensor measurement end face should be at least 10cm away from the bottom of the beaker. Wait for 3 to 5 minutes for the value to stabilize before performing slope calibration. See the appendix for instructions.

3. FAQ

Question	Possible Reason	Solution
The operation interface cannot connect or does not display the measurement results.	The measured value is too high, too low or the value continues to be unstable	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

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 testing standards, 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
- 1 cable (5 meters)

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).

2. Information frame format (xx represents one byte)

a) Read data instruction frame

40	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

40	03	xx	xx……xx	xx xx
Address	Function code	Bytes	Answer data	CRC check code(low byte first)

c) Write data command frame

40	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)

40	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
40001 (0x0000)	Measured value + temperature	4 double-byte integers, which are the measured value, the number of decimal places of the measured value, the temperature value, and the number of decimal places of the temperature value.	4 (8 bytes)	read
44097 (0x1000)	Zero point calibration	Calibrated in 0~2.000g/L sludge concentration standard solution, the written data is the actual value of the standard solution × 1000; the	1 (2 bytes)	write/read

		read data is the zero offset.		
44101 (0x1004)	slope calibration	Calibrate in 2.000~20.000g/L sludge concentration standard solution. The written data is the actual value of the standard solution × 1000; the read data is the slope value × 1000.	1 (2 bytes)	write/read
44113 (0x1010)	temperature calibration	Calibrated in solution, the written data is the actual temperature value × 10; the read data is the temperature calibration offset × 10.	1 (2 bytes)	write/read
48195 (0x2002)	sensor address	The default is 64, and the write data range is 1~255.	1 (2 bytes)	write/read
44865 （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)
44866 （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)
48225 (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

4. Command examples

a) Measurement instructions

Function: Get the sludge concentration and temperature measured by the sensor; the unit of sludge concentration is g/L, and the unit of temperature is ℃.

Request frame: 40 03 00 00 00 04 4B 18

Response frame: 40 03 08 27 FB 00 03 00 B0 00 01 49 FC

Reading example:

Sludge concentration value	temperature value
27 FB 00 03	00 B0 00 01

For example: the sludge concentration value 27 FB represents the hexadecimal reading of the

sludge concentration value, 00 03 represents the sludge concentration value with 3 decimal points, and the converted decimal value is 10.235.

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 the sensor;

An example of zero point calibration is as follows (assuming calibration in 2g/L standard solution, the written value is 2x1000, which is 0x07D0):

Request frame: 40 06 10 00 07 D0 81 B7

Response frame: 40 06 10 00 07 D0 81 B7

slope calibration

Function: Set the slope calibration value of the sensor;

An example of slope calibration is as follows (assuming calibration in 20g/L standard solution, the written value is 20x1000, which is 0x4E20):

Request frame: 40 06 10 04 4E 20 F7 A2

Response frame: 40 06 10 04 4E 20 F7 A2

c) Set device ID address:

Function: Set the MODBUS device address of the sensor;

Change the sensor address 40 to 01, the example is as follows

Request frame: 40 06 20 02 00 01 ED 1B

Response frame: 40 06 20 02 00 01 ED 1B

5. 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