NBL-WQ-TS-408-S Online Turbidity Sensor
User Manual

Changsha Zoko Link Technology Co., Ltd.

Tel:+8615367865107

E-mail：sales@niubol.com

Website：www.niubol.com

Address: Room 102, District D, Houhu Industrial Park, Yuelu District, Changsha City, Hunan Province, China

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 to 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, don't repair it yourself. Please contact the after-sales department of the manufacturer directly.

Content

I、Working principle

ZS-406S integrated online turbidity sensor is designed and manufactured using the principle of scattered light turbidity measurement. When a beam of light enters the water sample, the light is scattered by the turbidity material in the water sample. By measuring the scattered light intensity in the vertical direction to the incident light and comparing it with the internal calibration value, the turbidity in the water sample is calculated. degree, and output the final value after linearization.

- 90° angle scattered light principle, built-in temperature sensor
- Support RS-485, Modbus/RTU protocol, 4-20mA current output
- Optical fiber structure, strong resistance to external light interference
- Infrared LED light source, high stability
- IP68 protection, water depth within 20 meters
- Convenient, fast, stable and easy to maintain

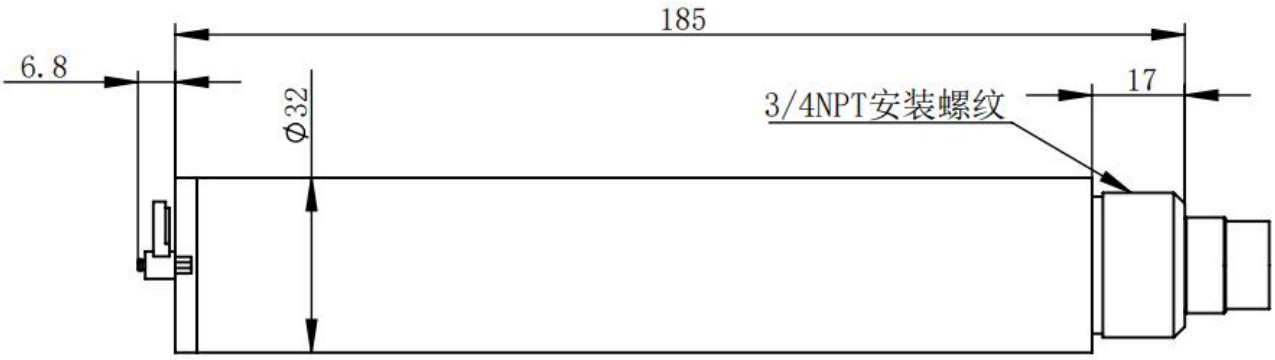
II、Technical performance and specifications

1. Technical parameters

model	NBL-WQ-TS-408-S	
Measurement principle	Scattering light method	
Measuring range & Resolution	0~20.00 NTU	0.01
	0~200.0 NTU	0.1
	0~1000.0 NTU	0.1
	0~4000.0 NTU	0.1
precision	0~20.00 NTU	±3% of reading or ±1.5 NTU, whichever is greater; ±0.3℃
	0~200.0 NTU	±3% of reading or ±2 NTU, whichever is greater; ±0.3℃
	0~1000.0 NTU	±5% or ±3 NTU, whichever is greater; ±0.3℃
	0~4000.0 NTU	0-200 NTU of reading: ±20 NTU 200-4000 NTU: ±5%; ±0.3℃
Calibration method	Two point calibration	

Cleaning method	With cleaning brush
Temperature compensation	Automatic temperature compensation (Pt1000)
output method	RS-485(Modbus/RTU),4-20mA(Optional)
working conditions	0～60℃，<0.2MPa
storage temperature	-5～65℃
shell material	ABS and 316L stainless steel
Installation method	Submersion Mount, 3/4NPT Pipe Thread
cable length	5 meters, other lengths can be customized
Power consumption	0.2W@12V
power supply	12～24VDC
防护等级	IP68

2. Dimensional drawing



Note:The sensor connector is m16-5 core waterproof connector male.

III、Installation and electrical connection

1. Install

Installation distance requirements: keep above 5cm with side wall and above 10cm with bottom.

2. Electrical connection

a) Red wire-power cord（12～24V）

b) Black wire-ground wire（GND）
c) Blue Line-485A
d) White Line-485B

After the wiring is completed, it should be carefully checked to avoid the wrong connection before the power is turned on.

Cable specification: Considering that the cable is immersed in water (including sea water) for a long time or exposed to the air, all the wiring points are required to do waterproof treatment, the user cable should has certain corrosion resistance.

Maintenance

1. Maintenance procedures and methods

1.1 Maintenance schedule

The cleanliness of the measuring window is very important for maintaining accurate readings.

Maintenance task	Recommended maintenance frequency
Calibrate sensors (If required by the competent authority)	According to the maintenance schedule required by the competent department

1.2 Maintenance method

- Sensor outer surface: clean the outer surface of the sensor with tap water, if there is still debris residue, wipe with wet soft cloth, for some stubborn dirt, you can add some household washing liquid to tap water to clean.
- Check the cable of the sensor: the cable should not be tightened when it is working properly, otherwise it is easy to break the wire inside the cable and make the sensor unable to work properly.
- Check the sensor measurement window if there is any dirt, cleaning brush is normal.

1.3 Note:

The probe contains sensitive optical and electronic components. Make sure the probe is not subjected to severe mechanical impact. There are no components inside the probe that need to be maintained by the user。

2. Calibration of sensors

a) Zero calibration: take proper amount of zero turbidity solution with large beaker, put the sensor vertically in the solution, the front end of the sensor is at least 10 cm from the bottom of the beaker, and the zero calibration will be carried out after the value is stabilized for 3-5

minutes. The instructions refer to the appendix.

Slope calibration: the sensor probe is placed in the standard solution, the front end of the sensor is at least 10 cm from the bottom of the beaker, and the slope calibration is carried out after 3 -5 minutes of numerical stability. The instructions refer to the appendix.

3. Frequently asked questions

Wrong	Probable cause	Resolvent
The operating interface cannot connect or does not display the measurement results	The measured value is too high, too low, or the numerical value remains unstable.	Reconnect the controller and cable.
	Cable failure	Please contact us.
The measured value is too high, too low, or the numerical value remains unstable.	The sensor window is attached to the external object.	Clean the window surface of the sensor.

V、Quality and service

1. Quality assurance

- The quality inspection department has a standard inspection procedure, with advanced and complete detection equipment and means, and according to the procedure inspection, the product is subjected to 72-hour aging experiment and stability experiment, so that a non-conforming product is not allowed to leave the factory.
- The consignee shall refund directly the product batches with a failure rate of 2%, and all expenses incurred shall be borne by the supplier. Consider the standard reference to the product description provided by the supplier.
- Ensure the quantity of goods and the speed of shipment.

2. Spare parts

This product includes:

- Transmitter *1
- One copy of explanation*1
- One certificate of quality*1

3. After-sales service commitment

The Company has provided the local after-sales service within one year from the date of sales, but does not include the damage caused by improper use. If it is necessary to repair or adjust it, please return it, but the freight is required to be self-contained. When it is returned, it shall be confirmed that the package is good to avoid damage during transportation. The Company will repair the damage of the instrument free of charge.

Appendix data communication

1. Data format

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

2. Information frame format (xx for one byte)

a) Read data instruction frame

07	03	xx xx	xx xx	xx xx
Address	FC	Register start address	Number of registers	CRC check code (low bytes in front)

b) Read data response frame

07	03	xx	xx……xx	xx xx
Address	FC	Bytes	Response data	CRC check code(low bytes in front)

c) Write data instruction frame

07	06	xx xx	xx xx	xx xx
Address	FC	Register address	read-in data	CRC check code(low bytes in front)

d) Write data response frame (co-write data instruction frame)

07	06	xx xx	xx xx	xx xx
Address	FC	Register address	read-in data	CRC check code(low bytes before）

3. Register address

Register address	Designation	Explain	Number of registers	Access mode
40001 (0x0000)	Measured temperature	4 double-byte integers, which are the measured values, the number of decimal places, the temperature value, and the number of decimal places of the temperature value, respectively.	4 (8 bytes)）	Read
44097 (0x1000)	Zero calibration	The 0-20NTU measurement range is calibrated in the 0-10NTU turbidity solution, and the written data is the actual value of the standard	1(2 bytes)	Write/ Read

		solution ×100;The 0-100NTU measurement range is calibrated in the 0-20NTU turbidity solution, and the written data is the actual value of the standard solution ×10;The measuring range of 0 ~ 1000NTU is calibrated in the turbidity solution of 0 ~ 200NTU, and the written data is the actual value of the standard solution ×10；Readout value is zero offset.		
44101 (0x1004)	Slope calibration	The 0-20NTU range is calibrated in a turbidity solution of 10-100NTU, and the written data is the actual value of the standard solution ×100;The measuring range of 0 ~ 100NTU is calibrated in the turbidity solution of 20 ~ 200NTU, and the written data is the actual value of the standard solution ×10;The measuring range of 0 ~ 1000NTU is calibrated in the turbidity solution of 200 ~ 1000NTU, and the written data is the actual value of the standard solution ×10; the readout value is slope value ×10.	1（2 bytes）	Write/ Read
44113 (0x1010)	temperature correction	Calibrate in the solution, the written data is the actual temperature value × 10, and the readout data is the temperature calibration offset	1（2 bytes）	Write/ Read

		× 10.		
48195 (0x2002)	Sensor address	The default is 6, and the write data range is 7-255.	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/ Read
44866 （0x1301）	Automatic cleaning lap setting	The default is 3 circles, and the data range is 0~6 circles.	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 re-calibrated after it has been reset before it can be used.	1（2 bytes）	Write

4. Command example

a) Measurement instructions

Function: Get the turbidity and temperature measured by the sensor; the unit of turbidity is NTU, and the unit of temperature is °C.

Request frame: 07 03 00 00 00 04 44 6F

Response frame: 07 03 08 01 02 00 01 00 B0 00 01 94 B4

Reading example:

Turbidity value	Temperature value
01 02 00 01	00 B0 00 01

For example: turbidity value 01 02 represents the hexadecimal reading turbidity value, 00 01 represents the turbidity 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 the sensor;

Zero point calibration example (calibrated in the 50NTU standard, the written value is

50×10=500, which is 0x01F4):

Request frame: 07 06 10 00 01 F4 8D 7B

Response frame: 07 06 10 00 01 F4 8D 7B

slope calibration

Function: Set the slope calibration value of the sensor;

Slope calibration example (calibrated in 2000NTU standard solution, write the value as 2000×10=20000, which is 0x4E20):

Request frame: 07 06 10 04 4E 20 F8 D5

Response frame: 07 06 10 04 4E 20 F8 D5

c) Set device ID address:

Function: Set the MODBUS device address of the sensor;

Change the sensor address 07 to 01, the example is as follows

Request frame: 07 06 20 02 00 01 E2 6C

Response frame: 07 06 20 02 00 01 E2 6C

5. Error response

If the sensor does not execute the upper computer command correctly, the following format information is returned:

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

a) CODE：01 – Functional code error
03 – Data error

b) COM：Received function code