

# **NBL-WQ-EC-4A Online Conductivity Sensor User Manual**



Changsha Zoko Link Technology Co., Ltd.

Tel:+8615367865107

E-mail: [sales@niubol.com](mailto:sales@niubol.com)

Website: [www.niubol.com](http://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 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.

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## I 、 Application Environment

- Drinking water/surface water/various water supply/industrial water treatment
- Signal output: RS-485 (Modbus/RTU protocol)、 4-20mA
- Easily connect to third-party devices such as PLCs, DCSs, industrial control computers, general-purpose controllers, paperless recording instruments, or touchscreens.
- Submerged installation with 3/4NPT pipe thread for easy submerged installation or installation in pipes and tanks.
- IP68 Protection grade

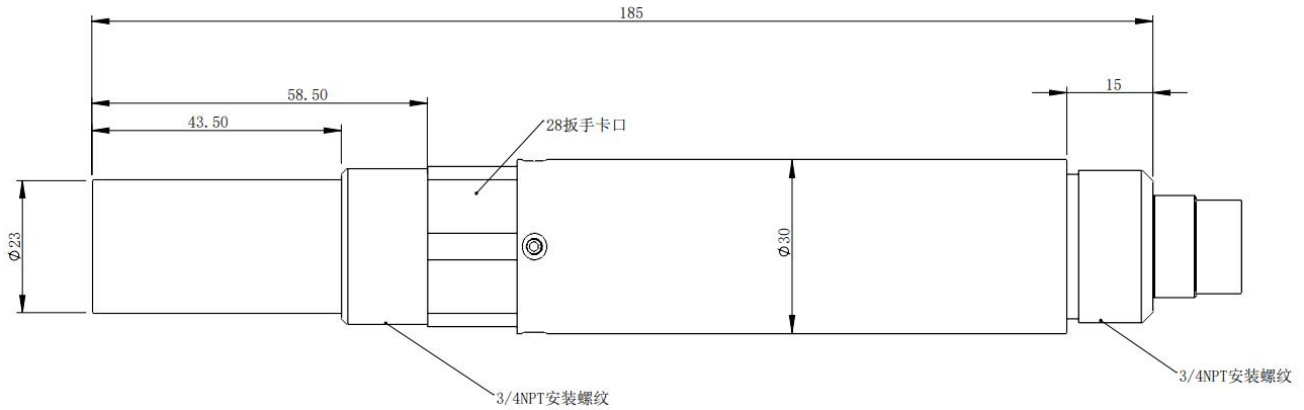
## II 、 Technical performance and specifications

### 1. Technical parameters

<b>Model</b>	NBL-WQ-EC-4A	
<b>Measuring range and resolution</b>	EC: 0~5000 $\mu$ S/cm	1 $\mu$ S/cm
<b>Precision</b>	$\pm$ 1.5%, $\pm$ 0.3 $^{\circ}$ C	
<b>Working temperature</b>	-5~65 $^{\circ}$ C	
<b>Working pressure</b>	0~50 $^{\circ}$ C, <0.6MPa	
<b>Power supply</b>	12~24VDC	
<b>Signal output</b>	RS-485(Modbus/RTU)、 4-20mA(Optional)	
<b>Wetted material</b>	ABS/SUS316L (default)	
<b>Mounting method</b>	Submersion Mount, 3/4NPT Pipe Thread	
<b>Cable length</b>	5 meters, other lengths can be customized	
<b>Temperature compensation</b>	Automatic temperature compensation (Pt1000)	
<b>Calibration</b>	Two point calibration	
<b>Power consumption</b>	0.2W@12V	
<b>Protection grade</b>	IP68	

## 2. Dimensional drawing

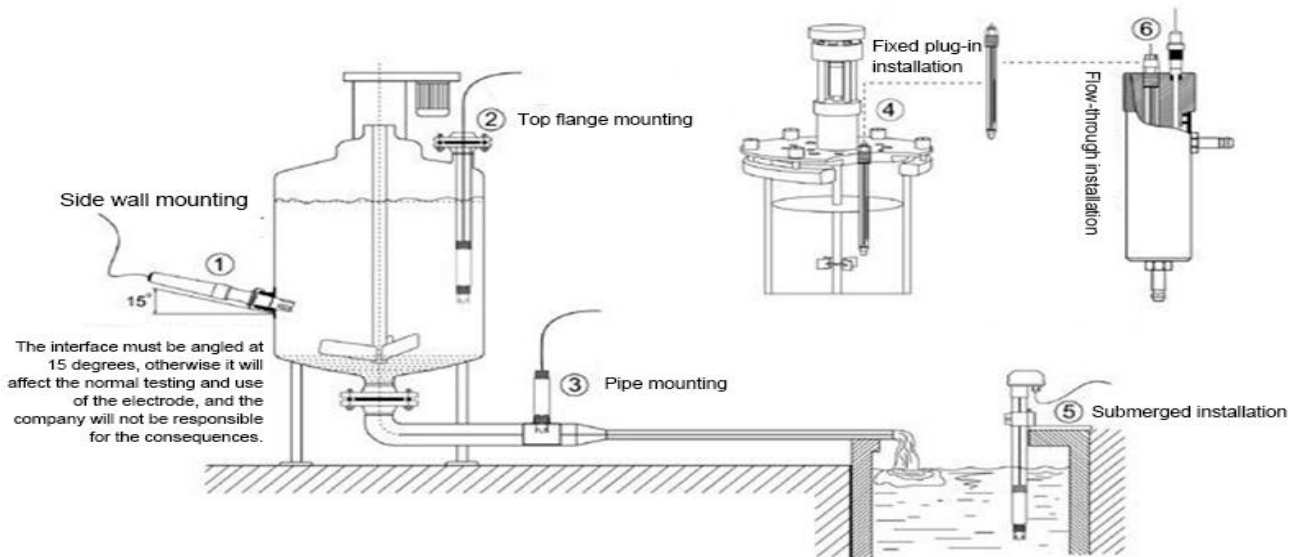
### NBL-WQ-EC-4A-1.0



Note : the connector of the sensor is M16-5 core waterproof connector

## III、 Installation and electrical connection

### 1. Installation



Note: DDM-406A-1.0 and DDM-406A/206S-SI are installed and tested at least 2 cm from the bottom and side walls of the container.

## 2. Electrical connection

The cable is a 5-core twisted pair shielded wire, and the wire sequence definition:

- Red wire—power wire (12~24VDC)
- Black wire - ground wire (GND)
- Blue wire - 485A
- White wire - 485B
- Yellow wire -- current output (suspended if not in use)

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

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

## IV、 Maintenance

### 1. Use and maintenance

Conventional electrodes need to be cleaned and calibrated periodically, and the maintenance cycle is determined by the customer according to their own working conditions. Conventional electrode cleaning method: use a soft brush to remove attachments (be careful to avoid scratching the surface of the electrode), then clean with distilled water, and then perform the calibration operation.

Cleaning method of inductive electrode:

- The inductive electrode is basically maintenance-free, and the pollution or mild scaling of the casing will not affect its normal operation.
- If cleaning is required, remove the deposits with a soft brush or sandpaper, rinse with distilled water, and then perform the calibration operation.
- Since the inductive electrode often works in an environment that is easy to scale or dirty, the cleaning force can be appropriately increased. Slightly scratching the surface of the electrode will not affect the normal operation of the electrode, but avoid penetrating the outer shell of the electrode.

### 2. Calibration

#### a) Zero calibration

Rinse the sensor with distilled water and blot dry with filter paper. Connect the sensor to the power supply and place it vertically in the air for about 3 minutes. After the value is stable, perform zero calibration. See the appendix for calibration instructions.

#### b) Slope calibration

Place the sensor vertically in the standard solution (20% full scale - full scale), pay attention to the sensor at least 2 cm from the bottom and side walls of the container, and perform slope calibration. See the appendix for calibration instructions.

## V 、 Quality and service

### 1. Quality assurance

- The quality inspection department has standardized inspection procedures, advanced and perfect testing equipment and means, and inspects products in strict accordance with the regulations, and conducts 72-hour aging experiments and stability experiments on products, and does not allow a substandard product to leave the factory.
- The consignee will directly return the product batches with a failure rate of 2%, and all the costs incurred shall be borne by the supplier. The testing standard refers to the product description provided by the supplier.
- Guaranteed supply quantity and delivery speed.

### 2. Accessories and spare parts

This product includes:

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

### 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 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 (xx represents a byte)

a) Read data command frame:

01	03	xxxx	xx xx	xx xx
Address	Function code	Register address	Number of registers	CRC check code (low byte first)

b) Read data response frame:

01	03	xx	xx.....xx	xx xx
Address	Function code	Number of bytes	Response data	CRC check code (low byte first)

c) Write data command frame:

01	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):

01	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	Description	Number of registers	Interview method
40001 (0x0000)	Measured value + temperature + TDS	6 double-byte integers, which are the measured value, the number of decimal places of the measured value, the temperature value, the number of decimal places of the temperature value, the TDS value, and the number of decimal places of the TDS value.	6 (12bytes)	read
44097 (0x1000)	Zero point calibration	Calibrated in air, write data as 0. The read data is the zero offset.	1 (2bytes)	write/read
44101 (0x1004)	slope calibration	Calibrate in a known standard solution (20% full scale - full scale).	1 (2bytes)	write/read

		The full scale range is 0~5000 $\mu$ S/cm. The written data is the actual value of the standard solution. The readout data is the slope value $\times$ 1000.		
44113 (0x1010)	temperature calibration	Calibrated in solution, the written data is the actual temperature value $\times$ 10; the read data is the temperature calibration offset $\times$ 10.	1 (2bytes)	write/read
48195 (0x2002)	sensor address	The default is 1, and the written data range is 1-255.	1 (2bytes)	write/read
48225 (0x2020)	Reset sensor	The calibration value returns to the default value, and the written data is 0. Note: After the sensor is reset, it needs to be calibrated again before it can be used.	1 (2bytes)	Write

Notice:

a) The register address is the register starting address with register type defined according to the Modbus protocol (the hexadecimal number in parentheses represents the actual register starting address).

b) When changing the sensor address, the sensor address in the return instruction is the new address after the change.

c) Data definition of the measured value returned when reading data:

xx xx                      xx xx                      xx xx                      xx xx  
 2bytes measured value              2bytes decimal places of measured value              2bytes

temperature value    2bytes temperature decimal places

**The default data type is: double bytes integer type, high bytes first; other types such as floating point numbers are optional.**

#### 4. Command examples

a) Measurement instructions

Function: Get the conductivity, temperature and TDS values measured by the sensor; the unit of temperature is degrees Celsius, the unit of conductivity is  $\mu$ S/cm, and the unit of TDS is mg/L;

Request frame: 01 03 00 00 00 06 C5 C8

Response frame: 01 03 0C 01 02 00 00 00 B0 00 01 00 A5 00 00 F9 23

Reading example:

Conductivity value	Temperature value	TDS value
01 02 00 00	00 B0 00 01	00 A5 00 00

For example: the conductivity value 01 02 represents the conductivity value in hexadecimal reading, 00 00 represents the conductivity value without a decimal point, and the converted decimal value is 258.

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

The TDS value 00 A5 represents the TDS value in hexadecimal reading, 00 00 represents the TDS value without a decimal point, and the converted decimal value is 165.

b) Calibration instructions

Zero point calibration

Function: Set the conductivity zero-point calibration value of the sensor; here the zero-point calibration is performed in the air;

Request frame: 01 06 10 00 00 00 8D 0A

Response frame: 01 06 10 00 00 00 8D 0A

slope calibration

Function: Set the conductivity slope calibration value of the sensor; the slope value here is based on the actual standard solution value. Take 50mS/cm as an example to refer to the calibration;

Request frame: 01 06 10 04 01 F4 CC DC

Response frame: 01 06 10 04 01 F4 CC DC

c) Set device ID address

Function: Set the Modbus device address of the sensor;

Change the sensor address 1 to 02, the example is as follows

Request frame: 01 06 20 02 00 02 A2 0B

Response frame: 01 06 20 02 00 02 A2 0B

## 5. Response Error

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

definition	Addresses	Function code	CODE	CRC check
data	ADDR	COM+80H	xx	CRC 16
Number of bytes	1	1	1	2

a) CODE: 01 – The function code is wrong  
03 – Data error

b) COM: received function code