# Nitrite Sensor User Manual

0-10 ppm

Nitrite is a basic conventional water quality monitoring digital sensor; using industrial online electrode, PVC membrane ion selection electrode production, selective test water ammonium ion content, fast response speed, accurate measurement. Built-in temperature sensor, can automatically temperature compensation, suitable for online long-term monitoring environment use.

characteristic:

1. Digital sensor, direct output Rs-485 digital signal, support MODBUS/RTU

2. Built-in temperature sensor, can automatically temperature compensation

3. Innovative ionic membrane head is replaceable, and low maintenance cost using replacement membrane head

4. 3/4" G top and bottom mounting thread design for easy installation

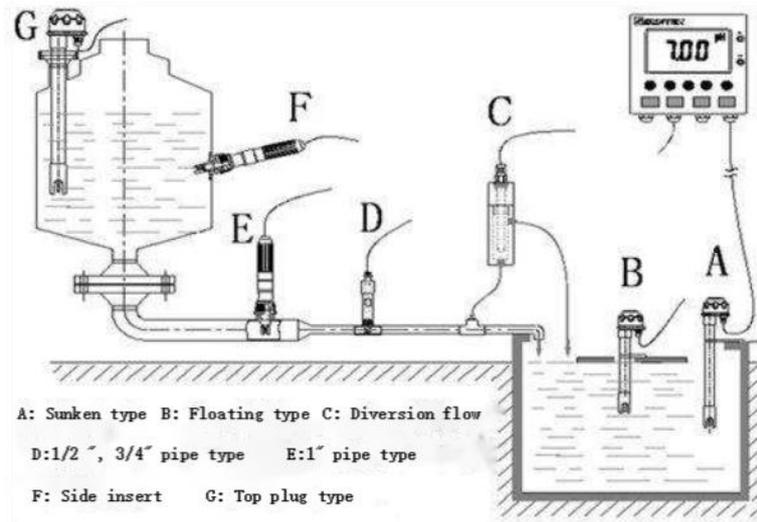5. Low sensor power consumption, internal circuit anti-interference design

3/4 ″G thread

Ø 30

189

3/4 ″G thread

3/4 ″G thread

Ø 30

114

129

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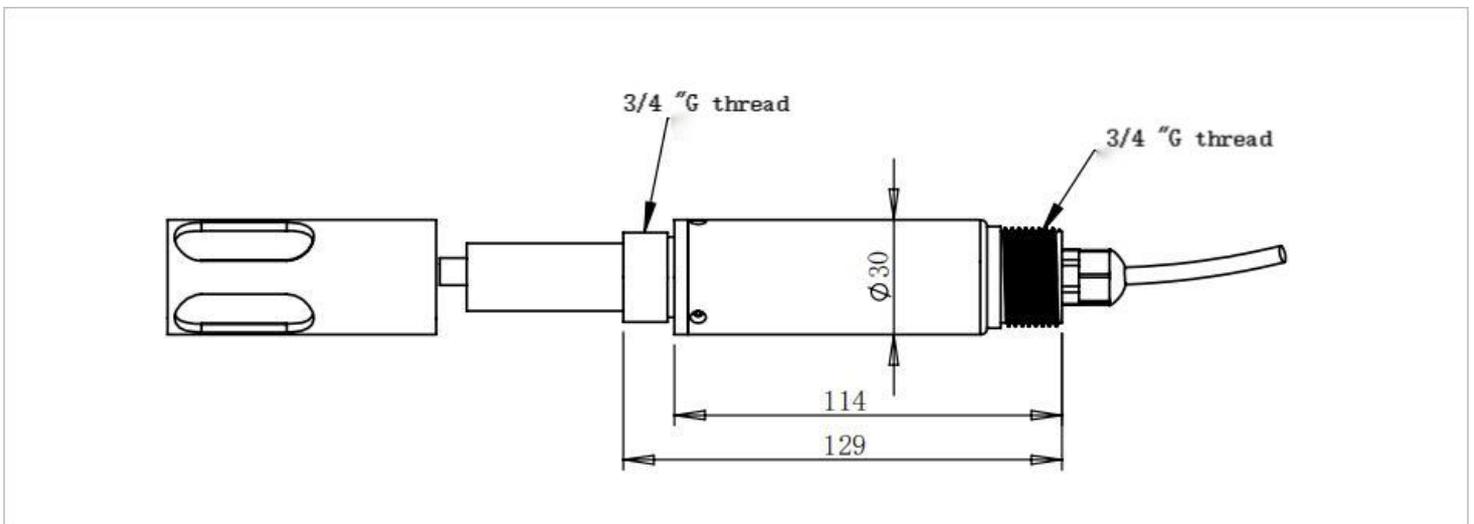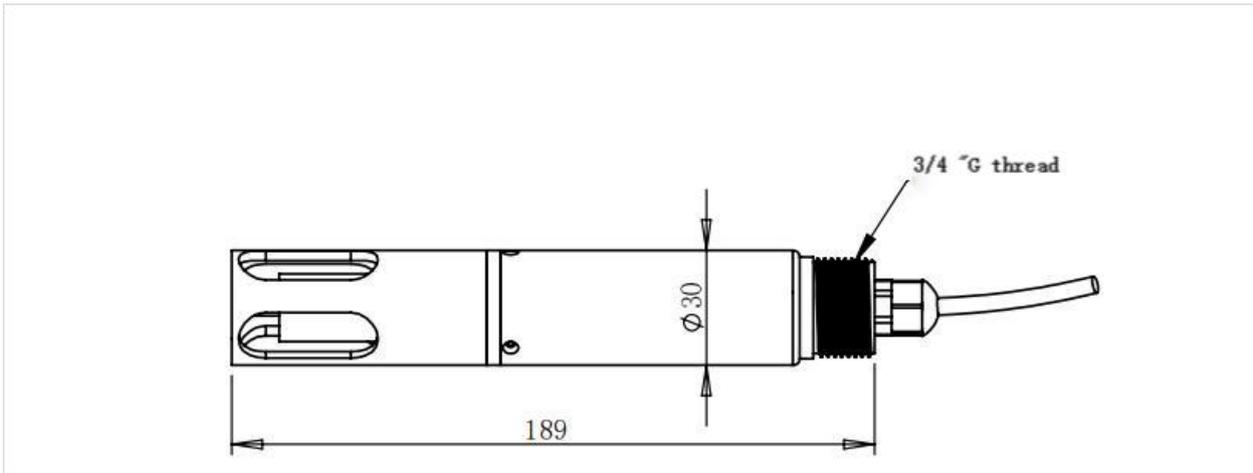
Name	Parameter
Output signal	Support for the RS-485, the Modbus/RTU protocol
Measuring method	Coadding ion selection method
Range	0~10.00mg/L (ppm) (pH range 4~10)
Accuracy	±5%F.S. or ±3 mg/L, whichever is large
Resolution ratio	0.01mg/L(0~10.00mg/L)
Going	0~40℃; <0.2 MPa
Calibration method	Two-point calibration
Response time	30 seconds for T90
Temperature compensation	Automatic Temperature Compensation (Pt100)
Source	12 or 24VDC±10%, 10 mA
Levels of protection	IP68; 20m of water depth
Life length	Sensor 1 year or more; membrane head for 6 months
Cable length	10m(default), customizable
Sensor housing material	POM; customizable

1. **Install**

A: Sunken type B: Floating type C: Diversion flow

D:1/2″, 3/4″ pipe type   E:1″ pipe type

F: Side insert   G: Top plug type

Note: Keep the sensor installation at least the tilt angle above 30°.

2. **Electrical connection**

- Brown wire -- Power (12 or 24VDC)

- Black line---- Ground (GND)

- Blue line ---- 485A

- White line--- 485B

- Bare copper - Shielding layer

Sensor cables: 4-wire AWG-24 or AWG-26 shielding wire.

Outer diameter: 6.0-6.2mm; flexible twisted pair shielding cable.

Calibration

If the range is 0-10 ppm, zero calibration in 1ppm, after data stabilization, zero calibration, data stability takes about 15-30 minutes; then slope calibration in 10ppm, after data stability, calibration slope, data stability takes about 15~30 minutes;

If the range is 0-100 ppm, zero calibration in 10ppm, after the data stabilization, the data stability takes about 15-30 minutes; then slope calibration in 100ppm, after the calibration slope, data stability takes about 15~30 minutes;

If numerical instability occurs during the above process, soak for 24 hours.

Check the MODBUS RTU Communication Protocol Operating Manual for the calibration instructions.

Note: The sensor has been calibrated before leaving the factory. If the measurement error is not exceeded, it does not need to be calibrated.

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1. Use and maintenance

New electrodes or long-used electrodes must be soaked in distilled water for half an hour before use, and then immersed in 1 ppm standard buffer for 24 hours to fully activate the membrane head.

Clean the electrode membrane head with distilled water, do not touch the membrane head with hard objects to avoid scratches; keep the membrane head at least 2cm from measurement.

The des should not be soaked in 1ppm nitrite ion solution.

The electrode need not be stored using the shell of built-in protective solution for several days, and should be soaked in 1ppm solution for 24 hours before the next use.

Avoid prolonged immersion in distilled water or protein solution and prevent contact with silicone grease. For longer electrodes, the membrane head becomes translucent or attached with sediment, which can be rinsed with distilled water (or deionized water).

Electrode use time is long, measure the data drift, please do the calibration.

The membrane head is dry and preserved when the electrode is not used for a long time.

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Quality and service

1.Quality assurance

Thank you for choosing our product!

Since its establishment, our company has been positioning product quality as the core of the company to participate in the market competition.

According to the product quality requirements, the company has established a strict quality inspection system. The company has strictly controlled and managed all the links related to product quality, established scientific inspection procedures, and quantified the inspection indicators, and assigned the responsibility to the people to ensure the company continuous and stable production of qualified products. The company strictly checks the raw materials, puts an end to the three no products, selects the products of domestic and foreign famous brand manufacturers, establishes strict product process indicators, and establishes a good supply and demand relationship with the supplier.

Our company has established a regular staff quality training system, learn new knowledge and information of quality management, establish the quality awareness of each employee, standardize their own behavior, from a solder joint, a wire, to a complete machine to be meticulous and excellence. The quality inspection department has established a standard inspection procedure, with advanced and perfect testing equipment and means, and strictly in accordance with the procedures of inspection, make every link of product quality testing, do not let a unqualified product leave the factory.

Our company provides the local after-sales service within one year from the sales date, but it does not include the damage caused by improper use. For maintenance or adjustment, please send it back, but the freight should be paid by yourself.

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2. Accessories and spare parts

Explain	Quantity (pcs)
Sensor	1
Titer	1
Instructions	1
Certificate	1

1. Introduction of the Modbus protocol

Modbus Protocol is a general communication protocol that has been widely used in the field of industrial control today. By this protocol, controllers can communicate with each other, or via a network (such as Ethernet). Modbus The protocol uses the master and slave communication technology, that is, the master device actively queries and operates the slave device

A) The master device sends requests to the slave device

B) Analyze and process the master device requests from the device, and then send the results to the master device

C) If any error occurs, the slave device will return an abnormal function code

Modbus RTU Communication mode frame format

device address	FC	data	CRC is eight places lower	CRC is eight places tall
8bit	8bit	n*8bit	8bit	8bit

● In RTU mode, message sending starts at a minimum of 3.5 characters. The first domain to transport is the device address. The network device constantly detects the network bus, including during the pause interval. When the first domain (address domain) receives it, each device decodes it to determine whether it is sent to it. After the last transfer character, a pause of at least 3.5 characters time calibrates the end of the message. A new message can start after this pause.

● The entire message frame must be transferred as a continuous stream. If there is a pause time of more than 1.5 characters before the frame completes, the receiving device will refresh the incomplete message and assume that the next byte is the address field for a new message.

2. Information frame format

The default data format for this sensor Modbus communication is:

MODBUS-RTU	
Baud rate	9600 (by default)
device address	1 (Default)
data bit	Eight
even-odd check	not have
stop bit	One

a) Function code 03H: Read the register value

Host sent

1	2	3	4	5	6	7	8
ADR	03H	Start register high byte	Start register is low bytes	Register number of high bytes	Register number is low bytes	CRC lower byte	CRC high byte

Byte 1 ADR: slave address code (=001~254)

Byte 203H: Read the register value function code

Bytes 3,4: register start address to read

To read the FCC,

5, Bytes 6: Number of registers to read

Bytes 7,8: CRC 16 checksum from bytes 1 to 6

Return from the machine:

1	2	3	4、5	6、7		M-1、M	M+1	M+2
ADR	03H	Total number of bytes	Register data 1	Register data 2	......	Register data M	CRC lower byte	CRC high byte

Byte 1 ADR: slave address code (=001~254)

Byte 203H: Return the read function code

3rd byte: Total number of bytes from 4 to M (including 4 and M)

4th to M bytes: register data

M + 1, M + 2 bytes: CRC 16 checksum from byte 1 to M

When the slave accepts an error, return it to:

1	2	3	4	5
ADR	83H	information code	CRC lower byte	CRC high byte

Byte 1 ADR: slave address code (=001~254)

Byte 283H: Read register value error

Byte 3 information code: 01 function code error

                          03 Data error

Bytes 4 and 5: CRC 16 checksum from byte 1 to 3

b) Function code 06H:, write a single register value

Host sent

1	2	3	4	5	6	7	8
ADR	06	Register the high-byte address	Register the low-byte address	Data high bytes	Data low bytes	CRC a sign or object indicating number lower byte	CRC a sign or object indicating number high byte

When the correct receipt is, the slave return is:

1	2	3	4	5	6	7	8
ADR	06	Register the high-byte address	Register the low-byte address	Data high bytes	Data low bytes	CRC a sign or object indicating number lower byte	CRC a sign or object indicating number high byte

When receiving receives error, return back:

1	2	3	4	5
ADR	86H	Error code information code	CRC a sign or object indicating number lower byte	CRC a sign or object indicating number high byte

Byte 1 ADR: slave address code (=001~254)

Byte 286H: Write register value error function code

Byte 3 error code information code: 01 function code error

03 Data error

Bytes 4 and 5: CRC checksum from byte 1 to 3

3. Data structure type

integer

Unsigned integer type (unsigned short)

The data consists of two integers.

XXXX XXXX	XXXX XXXX
Byte1	Byte0

Floating-point type (float)

Floating-point type, conform to IEEE 754 (single precision);

Data include 1 symbol bit, 8-bit index, and a 23-bit mantissa.

XXXX XXXX	XXXX XXXX	XXXX XXXX	XXXX XXXX
Byte3	Byte2	Byte1	Byte0
sign bit / Exp index position		f decimal place	

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4. Register address

Register address	Name	Read/write	Explanation	Register number (byte)	Data type
0x0100	Temperature value	R	Temperature value x 10 (e.g. 25.6℃ shows 256, default 1 decimal place)	1 (2 Bytes)	unsigned short
0x0101	Concentration value	R	For range 0-10 mg/L the readout data is the actual value x 100 (e.g. the value 1.62mg/L shows 162, default 2 decimal place) For range 0-100 mg/L the readout data is the actual value x 10 (e.g. the value 16.2mg/L shows 162, default 1 decimal place)	1 (2 Bytes)	unsigned short
0x0107	Moisture value	R	Moisture value x 10 (e.g. 11.3% relative humidity shows 113, default 1 decimal place)	1 (2 Bytes)	unsigned short
0x1000	Temperature calibration	R/W	Temperature calibration: the write data is the actual temperature value x 10; the readout data is temperature calibration offset value x 10	1 (2 Bytes)	unsigned short
0x1001	Zero calibration	R/W	For range 0-10 mg/L the written data is the actual value of standard solution x 100 (zero value 1ppm); For range 0-100 mg/L the written data is the actual value of standard solution x 10 (zero value 10ppm)	1 (2 Bytes)	unsigned short

0x1003	Slope calibration	R/W	For range 0-10 mg/L the written data is the actual value of standard solution x 100 (slope value 10ppm) For range 0-100 mg/L the written data is the actual value of standard solution x 10 (slope value 100ppm)	1 (2 Bytes)	unsigned short
0x2000	Sensor address	R/W	Default address is 1, the data range is 1-127	1 (2 Bytes)	unsigned short
0x2003	Baud rate	R/W	Default value is 1(9600bps), write 0 for 4800bps, 1 for 9600bps and 2 for 19200bps	1 (2 Bytes)	unsigned short
0x2020	Factory data reset	W	Write data 0 to the register addressed 0x2020 will restore the calibration value to default value. Note that the sensor must be calibrated again if it is reset, so please execute this instruction with caution.	1 (2 Bytes)	unsigned short

5. Example command

Default register:

a) **Change the slave address:**
   Address: 0x2000
   Number of registers: 1
   Function code: 0x06
   Default sensor address: 01

Change the Modbus device address of the sensor, change the device address 01 to 06, with the following example:

Send instruction: 01 06 20 00 00 06 02 08

Response: 01 06 20 00 00 06 02 08; Note: The address is

changed to 06 and the power is saved.

b) **Baud rate:**

Address: 0x2003

Number of registers: 1

Function code: 0x06

Default: 1 (9600bps)

Supported values: 0-2 (4800-19200bps)

The port rate can be changed on the computer setting, after the port rate change, power off and power on save setting. Porter rate supports 4800,9600,19200. The port rate assigned to the integer values is as follows:

integer	Baud rate
0	4800 bps
1	9600 bps
2	19200 bps

Send instruction: 01 06 20 03 00 02 F3 CB

Response: 01 06 20 03 00 02 F3 CB Note: Baud rate changed to 19200bps, the power was saved.

Functional register:

A) Measurement temperature command:

Address: 0x0100

Number of registers: 1

Function code: 0x03

Read the sample value: 19.2℃

Send instruction: 01 03 01 00 00 01 85 F6

Response: 01 03 02 00 C0 B8 14

Return hex unsigned integer data, temperature value =Integer / 10, keep 1 decimal place.

B) Survey Instruction:

Address: 0x0101

Number of registers: 1

Function code: 0x03

Range is 0-10 mg/L Read sample value: 2.56ppm

Send instruction: 01 03 01 01 00 01 D4 36

Response: 01 03 02 01 00 B9 D4

The register returns hexadecheal unsigned integer data with concentration value =Integer / 100 and 2 decimal places.

Range is 0 to 100 mg/L Read sample value: 30.0ppm

Send instruction: 01 03 01 01 00 01 D4 36

Response: 01 03 02 01 2C B8 09

The register returns hexad-unsigned integer data with concentration value =Integer / 10 and 1 decimal place.

C) Continuous read temperature and nitrite value instruction:

Address: 0x0100

Number of registers: 2

Function code: 0x03

Range 0-10 mg/L sample: temperature 19.2℃ and NH 2.56ppm

Send instruction: 01 03 01 00 00 02 C5 F7

Response: 01 03 04 00 C0 01 00 FB 9F

The register returns hex unsigned integer data with temperature value =Integer / 10 and retains 1 decimal place

The register returns hexadecheal unsigned integer data with concentration value =Integer / 100 and 2 decimal places.

Range 0-100 mg/L Read sample values: temperature 19.2℃ and NH 30.0ppm

Send instruction: 01 03 01 00 00 02 C5 F7

Response: 01 03 04 00 C0 01 2C FA 42

The register returns hex unsigned integer data with temperature value =Integer / 10 and retains 1 decimal place

The register returns hexad-unsigned integer data with concentration value =Integer / 10 and 1 decimal place.

D) Measurement of humidity instruction:

Address: 0x0107

Number of registers: 1

Function code: 0x03

Read sample value: 40%RH

Send instruction: 01 03 01 07 00 01 34 37

Response: 01 03 02 01 90 B9 B8

The register returns the hex unsigned integer data, with a humidity value =Integer / 10, with 1 decimal place retained.

E) Calibration instructions:

temperature correction

Address: 0x1000

Number of registers: 1

Function code: 0x06

Calibration example: Calibration at a temperature of 25.8℃

Send instruction: 01 06 10 00 01 02 0D 5B

Response: 01 06 10 00 01 02 0D 5B

The sensor needs to be calibrated at a constant temperature environment, when the temperature number no longer fluctuates.

Zero calibration

Address: 0x1001

Number of registers: 1

Function code: 0x06

Calibration example:

Range 0-10 is the value of the standard fluid concentration x100 used. The readout data is the mV value x100 corresponding to the zero-point calibration value.

Range 0-10 ppm for example: calibration zero in 1ppm / L standard liquid:

Send instruction: 01 06 10 01 00 64 D D21

Response: 01 06 10 01 00 64 D D21

0-100 scale writing data is the value of the standard liquid concentration x10. The readout data is the mV value x100 corresponding to the zero-point calibration value

Range 0-100 ppm for example: calibration zero in 10ppm / L standard liquid:

Send instruction: 01 06 10 01 00 64 D D21

Response: 01 06 10 01 00 64 D D21

Slope calibration

Address: 0x1003

Number of registers: 1

Function code: 0x06

Calibration example:

Range 0-10 is the value of the standard fluid concentration x100 used. The readout data is the mV value x100 corresponding to the slope calibration values.

Range 0-10ppm for example: calibration slope in 10 ppm / L standard solution:

Send instruction: 01 06 10 03 03 E8 7D B4

Response: 01 06 10 03 03 E8 7D B4

0-100 scale writing data is the value of the standard liquid concentration x10. The readout data is the mV value x100 corresponding to the slope calibration values.

Range 0-100ppm for example: calibration slope in 100 ppm / L standard solution:

Send instruction: 01 06 10 03 03 E8 7D B4

Response: 01 06 10 03 03 E8 7D B4