NHN-302 Multi Parameters Online Ammonia Nitrogen Sensor User Manual

YANTAI CHEMINS INSTRUMENT CO., LTD.

Tel：0535-3463801 0571-89870583

E-mail：service@chemins-tech.com　service@chemins-env.com

Website：www.chemins-tech.com

Address: No. 15, Entrepreneurship Base, Development Zone, Zhaoyuan City,

Shandong Province

User Notes

- Please read the instruction carefully before using and save it for reference.

- Please follow the instructions and precautions.

- When receiving the instrument, please open the packaging carefully, inspect equipment's damage level in case of transportation, if you found spoiled equipment, please immediately notify the manufacturer and distributor, and retain the packaging, in order to send back to processing.

- When the instrument is in trouble, please don't repair it by yourself, please directly contact the maintenance department of the manufacturer.

# Content

Ⅰ、 Application environment

NHN-302 multi parameters online ammonia nitrogen sensor is fabricated using a PVC membrane-based ammonium ion selective electrode for testing ammonium ion content in water with temperature, ph and potassium ion compensation to ensure fast, simple, accurate and economical testing. The technical parameters, maintenance and communication protocols of the ammonia nitrogen sensor are described in detail in this user manual.

# Ⅱ、 Technical performance and specifications

1. Technical parameters

Model	NHN-302
Measuring range	NH_4^+： 0～1000mg/L or 0～100mg/L NH_3：0～150mg/L or 0～15mg/L K^+： 0～1000mg/L pH: 0～14pH Temperature：0～35℃
Resolution	NH_4^+： 0.1mg/L
Accuracy	NH_4^+： ±5%F.S. NH_3 or total ammonia nitrogen ： ±5%F.S. K^+： ±5%F.S. pH： 0.1pH Temperature：0.5℃
Working temperature	0～35℃
Working pressure	＜0.1MPa
Temperature compensation	Auto temperature compensation (Pt1000) pH compensate range：4～10pH K^+compensate range：0～1000mg/L
Power supply	12～24VDC
Signal output	RS-485 bus, Modbus/RTU protocol
Wetted material	PVC and POM
Installation	3/4NPT thread, immersion installation
Cable length	5 meters, other lengths can be customized
Calibration	Two-point calibration
Measuring method	Ion selection method
Protection grade	IP68

2. Dimensional drawing
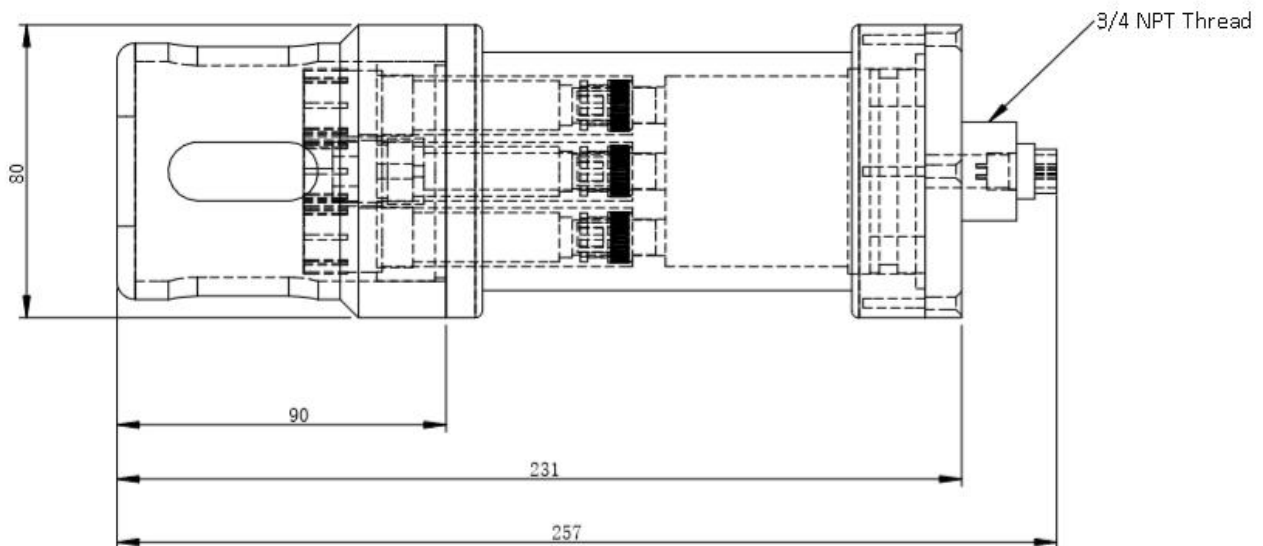
Ⅲ、Installation and electrical connection

1. Installation
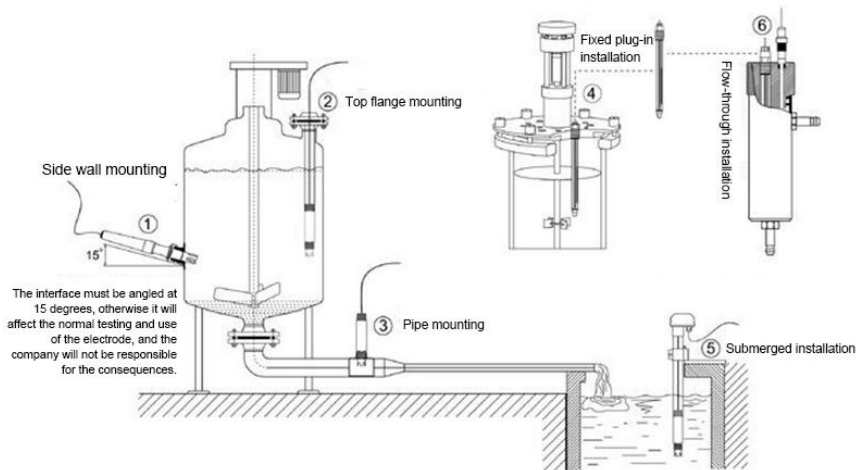
Note: The sensor should not be installed upside down or horizontally when installed, at least at an angle of 15 degrees or more.

A. Check if there are bubbles in the sensor membrane, if the answer is yes then hold the sensor vertically with your hand, strongly swing it to the direction of the protective cover of the sensor membrane head（down), or tap the outside of the protective cover of the sensor membrane head several times, make the air bubbles which attached to the electrode

membrane overflow.

B. The protective shell of the sensor is connect with the shell by M66*3 thread, users can also use M66×3 thread installation according to the use of the installation mode

2. Electrical connection

a) Red line - power cord (12 ~ 24V)

b) Black line - ground (GND)

c) Blue line - 485A

d) White line - 485B

After wiring is completed, it should be carefully checked to avoid incorrect connections before powering up.

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.

Ⅳ、Maintenance

1. Use and maintenance

The electrode should be kept dry before use. The sensing element of the electrode should be enclosed in a protective cap. Before testing, the electrode can be immersed in a mixture of 10 mg/L ammonium standard solution and 10 mg/L potassium standard solution for 2 hours, make the sensitive film of the electrode is fully activated. If stored overnight or longer, wash the electrode heads with deionized water, blot them dry, and then place them in their original packaging.

Check if the terminal is dry. If it is stained, wipe it with absolute alcohol and dry it. Avoid long-term immersion in distilled water or protein solution and prevent contact with silicone grease. With longer electrodes, its PVC film may become translucent or with deposits, which can be rinsed with distilled water (or deionized water). The electrode is used for a long time. When a measurement error occurs, it must be calibrated with the meter.

When the calibration and measurement cannot be performed while maintaining and maintaining the electrode in the above manner, the electrode has failed. Please replace the electrode.

The main interference ions are shown in the table below:

Interference ion concentration that produces 10% error at different ammonium ion concentrations

Interferences (moles/liter)	10^{-4} M Ammonium	10^{-3} M Ammonium	10^{-2} M Ammonium
H^+	< 2	< 1	< 1
Li^+	0.2	0.5	0.5
Na^+	0.005	0.08	0.8
K^+	$7*10^{-5}$	$6*10^{-4}$	$6*10^{-3}$
Cs^+	0.003	0.05	0.5
Mg^{3+}	> 0.5	> 1	> 1
Ca^{2+}	> 0.2	> 1	> 1
Sr^{2+}	> 0.2	> 1	> 1
Ba^{2+}	> 0.1	> 0.5	> 0.5
Zn^{2+}	0.001	0.01	0.1
$N_2H_5^+$	> 0.1	> 0.1	>0.1
Bu_4N^+	$1*10^{-5}$	$1*10^{-4}$	$1*10^{-3}$

2. Sensor calibration

Note: The sensor has been calibrated before leaving the factory. If it is not beyond the measurement error, it should not be arbitrarily calibrated. First calibrate K+ and pH ， last calibrate the NH4+。

a) Zero calibration

Place the sensor in a vial containing the zero standard solution and wait for 5 minutes. After the value is stable, see if the displayed value is within the error range. If not, perform a zero calibration. Refer to the appendix for calibration instructions.

b) Slope calibration

Place the sensor in a vial containing the standard solution of the slope and wait for 5 minutes. After the value is stable, see if the displayed value is within the error range. If not, the slope calibration is required. Refer to 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 strictly in accordance with the regulations, to do 72-hour aging test and stability test on the product, and not to allow one unqualified product to leave the factory.
- The receiving party directly returns the product batch with a failure rate of 2%, and all the costs incurred are borne by the supplier. The reference standard refers to the product description provided by the supplier.
- Guarantee the quantity of goods and the speed of shipment.

2. Accessories and spare parts

This product includes:
- Sensor*1
- User manual*1
- Certificate*1
- 100mg/L ammonium ion standard solution
- PH buffer agent *3
- 100mg/L potassium ion standard solution

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 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 parity, 1 stop bit).

Parameters such as baud rate can be customized.

2. Information frame format

a) Read data instruction frame

06	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

06	03	xx	xx......xx	xx xx
Address	Function code	Bytes	Answer data	CRC check code (low byte first)

c) Write data instruction frame

06	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 data command frame)

06	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	Instruction	Number of registers	Access method
40001 (0x0000)	NH_4^+ Concentration value and temperature	4 double-byte integers, which are , measured value decimal places, temperature values, and temperature value decimal places.	4（8 bytes）	Read(0x03)
40005 (0x0004)	K^+concentration value	2 double-byte integers, which are , measured value decimal places	2（4 bytes）	Read(0x03)
40007 (0x0006)	PH measuring value	2 double-byte integers, which are , measured value decimal places	2（4 bytes）	Read(0x03)
40009 (0x0008)	$NH3^+$ Concentration value	2 double-byte integers, which are , measured value decimal places	2（4 bytes）	Read(0x03)
40011 (0x000A)	NH_3 + NH_4^+concentration value	2 double-byte integers, which are , measured value decimal places	2（4 bytes）	Read(0x03)
48225 (0x2020)	NH_4^+ Zero calibration	When the measuring rarge is $0 \sim 100mg/L$, there need calibrate the zero point in 1 mg/L; when the measuring range is 0-1000mg/L,ther e need calibrate the zero point in 10 mg/L standard solutions.The written value when zero calibrate is the used zero point standard	1（2 bytes）	Write

		solution concentration x10。The readout value is the mV value corresponding with the zero calibration value x100		
44101 (0x1004)	NH_4^+slope calibration	When the measuring rarge is 0 ～ 100mg/L， there need calibrate the slope point in 1 mg/L; when the measuring range is 0-1000mg/L, ther e need calibrate the slope point in 10 mg/L standard solutions. The written value when slope calibrate is the used slope point standard solution concentration x10。The readout value is the mV value corresponding with the slope calibration value x100	1（2bytes）	write(0x06)/ read(0x03)
44098 (0x1001)	K^+zero calibration	When the measuring rarge is 0 ～ 100mg/L， there need calibrate the zero point in 1 mg/L; when the measuring range is 0-1000mg/L,ther e need calibrate the zero point in 10 mg/L standard solutions.The written value when zero calibrate is the used zero point standard solution concentration x10。The readout value is the mV value corresponding with the zero calibration value	1（2bytes）	write(0x06)/ read(0x03)

		x100		
44102 (0x1005)	K⁺slope calibration	When the measuring rarge is 0 ～ 100mg/L, there need calibrate the slope point in 1 mg/L; when the measuring range is 0-1000mg/L, ther e need calibrate the slope point in 10 mg/L standard solutions. The written value when slope calibrate is the used slope point standard solution concentration x10。The readout value is the mV value corresponding with the slope calibration value x100	1（2bytes）	write(0x06)/ read(0x03)
44099 (0x1002)	pH zero calibration	Calibrate in the standard solution with PH 6.86, the written value is 0, the readout value is PH zero offset x100	1（2bytes）	write(0x06)/ read(0x03)
44103 (0x1006)	pH slope calibration	When calibrate in the standard solution with 4.00 PH, the written value is 0; when calibrate in the standard solution with 9.18 PH, the written value is 1; The readout value is slope value x1000。	1（2bytes）	write(0x06)/ read(0x03)
44113 (0x1010)	Temperature calibration	The written value is actual temperature value x10；The readout value is temperature	1（2bytes）	write(0x06)/ read(0x03)

		calibration offset x10。		
48195 (0x2002)	Sensor address	Default is 6, the data range is 1～127	1（2bytes）	write(0x06)/ read(0x03)
48225 (0x2020)	Reset sensor	Calibration values are restored to default values，the written value is 0. Note, the sensor need to be calibrated again after reset.	1（2 字节）	写(0x06)

4. Command example

a) Read the data instruction:

Function: Obtain the ammonia nitrogen value and temperature of the measuring probe; the unit of ammonia nitrogen is mg/L; the unit of temperature is °C.

Request frame: 06 03 00 00 00 04 45 BE

Response frame: 06 03 08 00 62 00 01 01 01 00 01 60 59；

Example of reading:

Ammonia value	Temperature value
00 55 00 02	01 01 00 01

Such as: ammonia nitrogen value: 00 62 means hexadecimal reading ammonia nitrogen value, 00 01 means ammonia nitrogen value with one decimal places, converted to decimal value of 9.8.

Temperature value: 01 01 indicates the hexadecimal reading temperature value, 00 01 indicates that the temperature value has a decimal number and is converted to a decimal value of 25.7.

b) Potassium read command: 06 03 00 04 00 02 84 7D

c) Ph read command: 06 03 00 06 00 02 25 BD

d) Ph calibration:

Prepare three standard liquids within the validity period (pH=4.0, pH=6.86, pH=9.18), a cup of deionized water and a clean towel for the test period.

✓ Zero calibration: Rinse the sensor with deionized water and dry it with a towel, put into PH=6.86 standard solutions. Stir the standard solutions first, then adjust the sensor position, make sure the sensor is in the center of the standard solutions, send the zero calibration command after standing 3 minutes, the command is as below:

Request frame：06 06 10 02 00 00 2D 7D;

Response frame：06 06 10 02 00 00 2D 7D;

✓ Slope calibration: Remove the sensor and resin it with deionized water and wipe dry, according to the customer's requirement, if the customer's measuring medium is alkaline solution, then put it into the PH=9.18 standard solutions(if the medium is acid solutions, then put is into PH-4.0 standard solutions) to do slope calibration, stir the standard solution first, then adjust the sensor position, make sure the sensor is in the center of the standard solution, send the slope calibration command after standing 3 minutes, the command is as below:

High point standard solution 9.18PH calibration:
Request frame: 06 06 10 06 00 01 AD 7C
Response frame: 06 06 10 06 00 01 AD 7C
Low point standard solutiion 4.00PH calibration:
Request frame: 06 06 10 06 00 00 6C BC
Response frame: 06 06 10 06 00 00 6C BC

5. Error respond

If the sensor does not correctly execute the host command, it will return the following format information:

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