



YEX-S2-NHN-7C Ammonia Nitrogen Sensor with pH Compensation User Manual



Changsha Yex Technology Co., Ltd.

Mobile/WhatsApp: +8615111147890

Email: sales@yexsensor.com

Website: www.yexsensor.com

Add: 1303, Building A, Runjia Park Road, Yuelu District, Changsha City, Hunan
Province, China

User Notes

- Please read the instructions 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.



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I. Working Principle

The YEX-S2-NHN-7C integrated ammonia nitrogen sensor with compensation uses an ammonium ion-selective electrode based on a PVC membrane, together with a pH electrode for pH compensation of the water sample. It is used to measure ammonia nitrogen content in water and provides fast, simple, accurate, and economical measurement. This manual describes the technical parameters, use and maintenance, and communication protocol of the YEX-S2-NHN-7C sensor.

- Signal output: RS-485 bus with Modbus RTU protocol, convenient for connection to PLC, DCS, industrial control computers, general controllers, paperless recorders, touch screens, and other third-party devices.
- Patented ammonia nitrogen electrode: the internal reference solution seeps very slowly from the microporous salt bridge under a pressure of at least 100 kPa (1 bar). This reference system is very stable, and the electrode life is longer than that of ordinary industrial electrodes.
- Easy installation: 3/4 NPT thread, suitable for immersion installation or installation in pipes and tanks.
- IP68 protection grade.

II. Technical Performance and Specifications

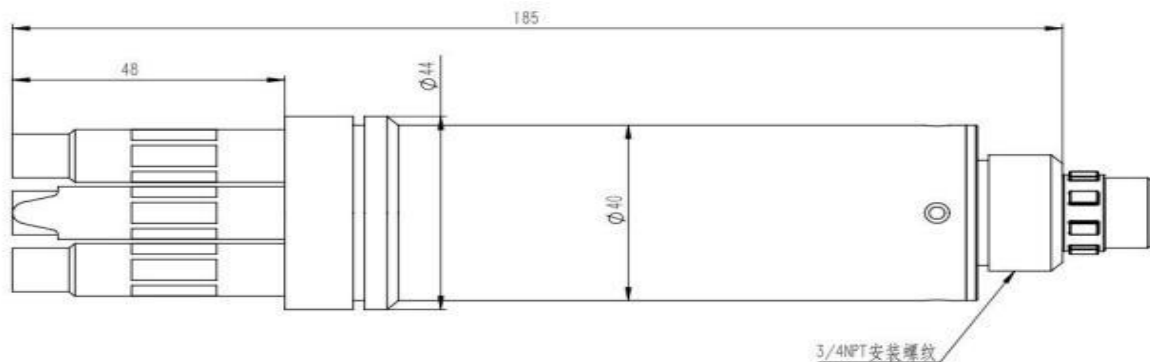
1. Technical Parameters

Item	Specification
Model	YEX-S2-NHN-7C
Measuring principle	Ion-selective electrode method
Range and resolution	NH ₄ ⁺ : 0-100.0 mg/L, 0.1 mg/L pH: 0-14.0, 0.01 Temperature: 0-45.0 °C, 0.1 °C
Response time (T90)	300 s
Minimum detection limit	0.09 mg/L (0-100 mg/L range)
Calibration	Two-point calibration
Temperature compensation	Automatic temperature compensation (Pt1000)
pH compensation	pH 4-10
Signal output	RS-485 (Modbus RTU)

Storage temperature	-5-65 °C
Working conditions	0-45 °C, <0.1 MPa, pH 4-9
Shell material	PVC, POM
Installation	Immersion installation, 3/4 NPT
Power	0.5 W @ 12 V
Power supply	12-24 V DC
Protection grade	IP68
Cable length	5 m; other lengths can be customized

Note: the sensor connector is an M16 5-core waterproof male connector.

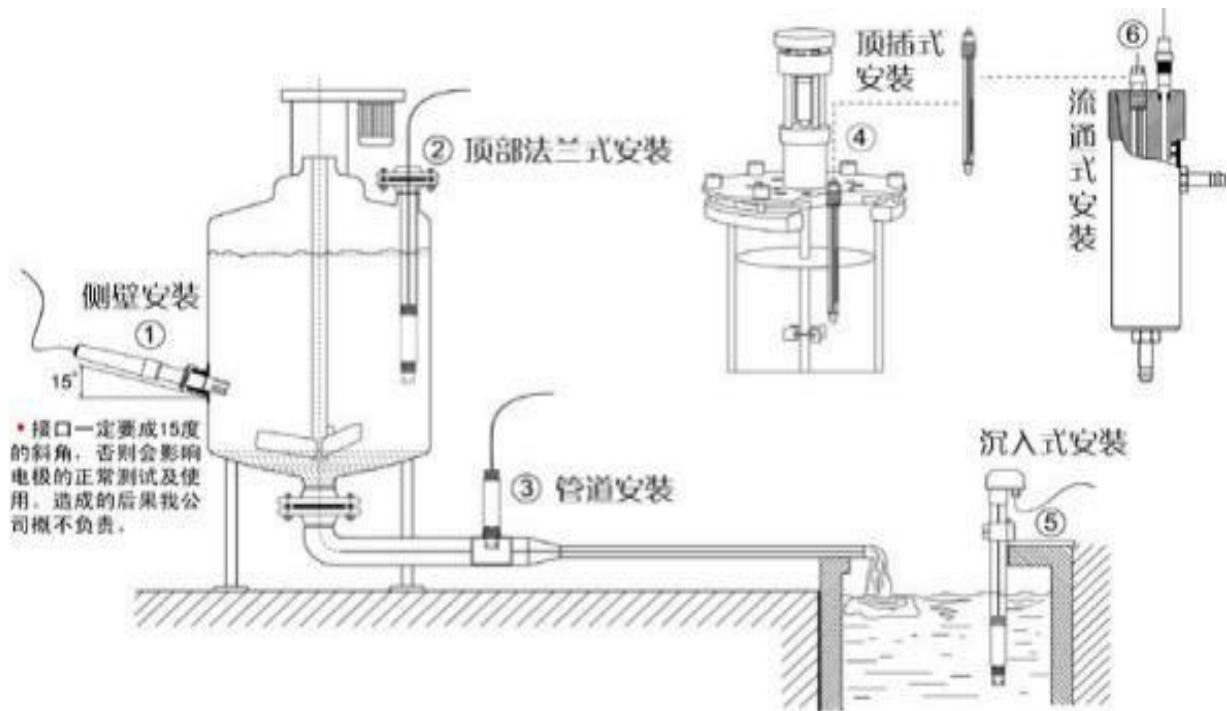
2. Dimension



III. Installation and Electrical Connection

1. Installation

Caution: the sensor must not be installed upside down or horizontally. It should be installed at an inclination of at least 15 degrees.



2. Electrical Connection

The cable is a 5-core twisted-pair shielded cable. The wire sequence is defined as follows:

Wire color	Definition
Red	Power positive (12-24 V DC)
Black	Ground negative (GND)
Blue	485A
White	485B
Yellow	Current output (if unused, leave suspended)

Carefully check the wiring sequence before power-on to avoid unnecessary loss caused by incorrect wiring.

Wiring instructions: since the cable may be immersed in water (including seawater) for a long time or exposed to air, all wiring points must be waterproofed. The user cable should have adequate corrosion resistance.

IV. Maintenance

1. Use and Maintenance

Before use, keep the electrode dry and keep the sensing element covered with the protective cap. Before testing, soak the electrode in clean water for 2 hours so that the sensitive membrane is fully activated. If stored overnight or longer, rinse the electrode head with deionized water, blot it dry, and place it back in the original package.

Check whether the wiring terminals are dry. If contaminated, wipe them with anhydrous alcohol and dry them before use. Avoid long-term immersion in distilled water or protein solutions, and prevent contact with silicone grease. After long use, the PVC membrane of the electrode may become translucent or covered with deposits. In this case, rinse it with distilled water or deionized water. If measurement error appears after long-term use,

recalibrate the electrode.

If the electrode still cannot be calibrated or used for measurement after the above maintenance, the electrode has failed and should be replaced.

The main interfering ions are shown below. The table gives the interfering ion concentration that may produce 10% error at different ammonium ion concentrations.

Interfering ion	10 ⁻⁴ M Ammonium	10 ⁻³ M Ammonium	10 ⁻² M Ammonium
K ⁺	0.005	0.08	
Na ⁺	7*10 ⁻⁵	6*10 ⁻⁴	6*10 ⁻³
Li ⁺	0.003	0.05	
Mg ²⁺	>0.5		
Ca ²⁺	>0.2		
Sr ²⁺			
Ba ²⁺	>0.1		
Zn ²⁺	0.001		
N ₂ H ₅ ⁺			
Bu ₄ N ⁺	1*10 ⁻⁵	1*10 ⁻⁴	1*10 ⁻³

2. Sensor Calibration

Caution: the sensor has been calibrated before leaving the factory. Do not recalibrate it unless the measurement error exceeds the allowable range. Calibrate pH first, and then calibrate NH₄⁺.

a) Zero calibration

Place the sensor in a small bottle containing the zero standard solution. Wait for 5 minutes. After the value is stable, check whether the displayed value is within the error range. If not, perform zero calibration. Refer to the appendix for the calibration command.

b) Slope calibration

Place the sensor in a small bottle containing the slope standard solution. Wait for 5 minutes. After the value is stable, check whether the displayed value is within the error range. If not, perform slope calibration. Refer to the appendix for the calibration command.

V. Quality and Service

1. Quality Assurance

The quality inspection department has standardized inspection procedures and advanced, complete testing equipment and methods. Products are inspected strictly according to the procedures, including a 72-hour aging test and stability test, and no unqualified product is allowed to leave the factory.

If the failure rate of a product batch received by the buyer reaches 2%, the batch may be returned directly, and all costs incurred shall be borne by the supplier. The inspection standard refers to the product description provided



by the supplier.

The supplier guarantees product quantity and shipment speed.

2. Accessories and Spare Parts

This product includes:

- 1 sensor
- 1 copy of the manual
- 1 certificate
- 1 cable (5 m)
- 100 mL ammonia nitrogen standard solution, 10 mg/L and 100 mg/L
- 3 pH buffer packs

3. After-sales Service Commitment

The company provides after-sales service for this instrument within one year from the date of sale, excluding damage caused by improper use. If repair or adjustment is required, please return the instrument at your own shipping cost and ensure that it is well packaged to avoid damage during transportation. The company will repair instrument damage free of charge within the warranty scope.

Appendix Data Communication

1. Data Format

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

2. Information Frame Format (xx represents one byte)

a) Read data command frame

16 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

16 03 xx xx ... xx xx xx

Address Function code Bytes Response data CRC check code (low byte first)

c) Write data command frame

16 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)

16 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	Registers	Access
40001 (0x0000)	Compensated	Four double-byte integers:	4 (8 bytes)	Read (0x03)

	ammonia nitrogen value + temperature	ammonia nitrogen measured value, decimal places of measured value, temperature value, and decimal places of temperature value.		
40005 (0x0004)	Ammonia nitrogen concentration value	Two double-byte integers: measured value and decimal places of measured value (default: 1 decimal place).	2 (4 bytes)	Read (0x03)
40009 (0x0008)	pH measured value	Two double-byte integers: measured value and decimal places of measured value (default: 2 decimal places).	2 (4 bytes)	Read (0x03)
44097 (0x1000)	Ammonia nitrogen zero calibration	Calibrate in 10 mg/L ammonia nitrogen standard solution. Write the concentration of the zero standard solution x10. The read data is the mV value corresponding to the zero calibration value x100.	1 (2 bytes)	Write (0x06) / Read (0x03)
44101 (0x1004)	Ammonia nitrogen slope calibration	Calibrate in 100 mg/L ammonia nitrogen standard solution. Write the concentration of the slope standard solution x10. The read data is the mV value corresponding to the slope calibration value x100.	1 (2 bytes)	Write (0x06) / Read (0x03)
44099 (0x1002)	pH zero calibration	Calibrate in pH 6.86 standard solution. Write 0. The read data is the pH zero offset x100.	1 (2 bytes)	Write (0x06) / Read (0x03)
44103 (0x1006)	pH slope calibration	Calibrate in pH 9.18 standard solution. Write 1. The read data is the slope value x100.	1 (2 bytes)	Write (0x06) / Read (0x03)
44113 (0x1010)	Temperature calibration	Calibrate in solution. Write the actual temperature value x10. The read data is the	1 (2 bytes)	Write (0x06) / Read (0x03)

		temperature calibration offset x10.		
48195 (0x2002)	Sensor address	Default address is 22. Writable data range: 1-254.	1 (2 bytes)	Write (0x06) / Read (0x03)
48196 (0x2003)	Baud rate	Default is 9600. 0--9600, 1--19200.	1 (2 bytes)	Write (0x06) / Read (0x03)

4. Command Examples

a) Read data command

Function: obtain the measured ammonia nitrogen and temperature values from the sensor. The ammonia nitrogen unit is mg/L, and the temperature unit is °C.

Request frame: 16 03 00 00 00 04 47 2E

Response frame: 16 03 08 00 55 00 01 01 18 00 01 A3 9D

Reading example:

ammonia nitrogen value	Temperature value
00 55 00 01	01 18 00 01

b) Calibration commands

Ammonia nitrogen zero calibration: set the zero calibration value in a 10 mg/L standard solution.

Request frame: 16 06 10 00 00 64 8F C6

Response frame: 16 06 10 00 00 64 8F C6

Ammonia nitrogen slope calibration: set the slope calibration value in a 100 mg/L standard solution.

Request frame: 16 06 10 04 03 E8 CF 52

Response frame: 16 06 10 04 03 E8 CF 52

pH zero calibration: set the pH zero calibration value in pH 6.86 standard solution.

Request frame: 16 06 10 02 00 00 2F ED

Response frame: 16 06 10 02 00 00 2F ED

pH slope calibration: set the pH slope calibration value in pH 9.18 standard solution.

Request frame: 16 06 10 06 00 01 AF EC

Response frame: 16 06 10 06 00 01 AF EC

c) Set device ID address

Function: set the Modbus device address of the sensor. The following example changes the sensor address from 22 to 01.

Request frame: 16 06 20 02 00 01 E1 2D

Response frame: 16 06 20 02 00 01 E1 2D

5. Error Response

If the sensor cannot correctly execute the host command, it returns information in the following format:



Definition	CODE	CRC check
ADDR	COM + 80H	CRC 16
CODE: 01	Function code error	
CODE: 03	Data error	
COM	Received function code	