

KWS-250C Online Ammonium Nitrogen Sensor

Introduction

The KWS-250C integrated online ammonium nitrogen sensor is made of ammonium ion selective electrode based on PVC membrane, which is used to test the ammonium ion content in water. It has temperature compensation to ensure that the test is fast, simple, accurate and economical. This user manual details the technical parameters, use and maintenance, and communication protocol of the ammonium nitrogen sensor.



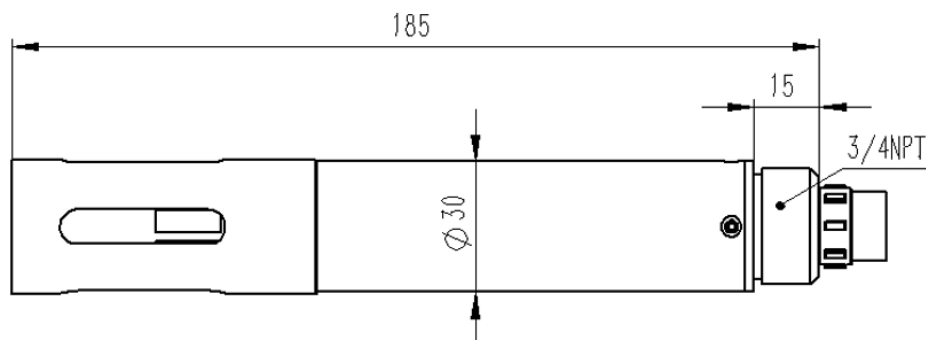
Feature

- Signal output: RS485, Modbus/RTU protocol, convenient for connection to third-party devices such as PLC, DCS, industrial control computers, controllers, paperless recorders or touch screens.
- Patented ammonium ion electrode, the internal reference solution seeps out of the microporous salt bridge extremely slowly under a pressure of at least 100KPa (1Bar). Such a reference system is very stable, and the electrode life is longer than that of ordinary industrial electrodes.
- Easy to install: 3/4NPT pipe thread, easy to install in submerged or in pipes and tanks.
- IP68 protection grade.

Technical Specifications

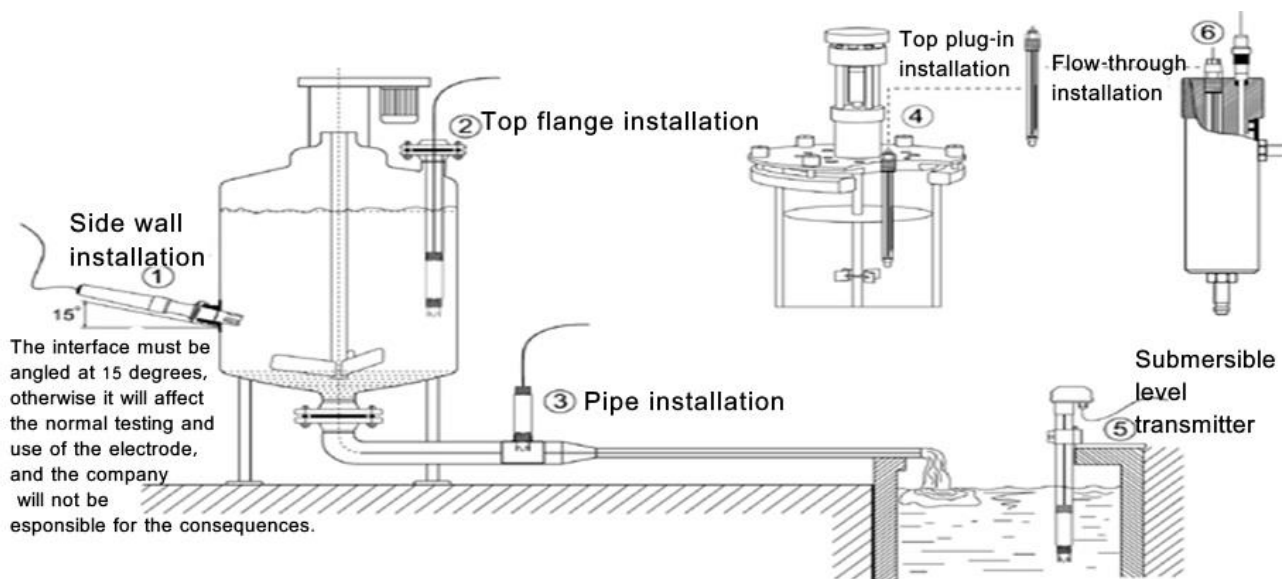
Model	KWS-250C	
Casing Material	POM	
Range and Resolution	0~10.00 mg/L	0.01 mg/L, 0.1℃
	0~100.00 mg/L	0.01 mg/L, 0.1℃
	0~1000.0 mg/L	0.1 mg/L, 0.1℃
Accuracy	0~10.00 mg/L	±10% or ±1 mg/L which is bigger, ±0.5℃
	0~100.00 mg/L	
	0~1000.0 mg/L	±10%, ±0.5℃
Response Time (T90)	<60s	
Minimum detection limit	0.09 (0-10mg/L and 0-100mg/L)	
	0.9 (0-1000mg/L)	
Calibration	Two-point calibration	
Work Condition	0~40℃, <0.1Mpa, 4~10pH	
Storage Temperature Range	-5 ~ 65℃	
Temperature Compensation	automatic temperature compensation (PT1000)	
Output	RS-485 (MODBUS RTU)	
Power Supply	12~24VDC	
Installation	Immersion mounting, 3/4NPT	
Cable Length	5 m, customizable	
Calibration Method	Two-point calibration	
Power Consumption	<0.2W@12V	
IP Grade	IP68	

Dimension



Installation and Electrical Connection

Installation



Note: The sensor cannot be installed upside down or horizontally, but must be installed at an angle of at least 15 degrees.

Wiring

- a) Red - power (12 ~ 24V)
- b) Black - ground (GND)
- c) Blue - 485A
- d) White - 485B

The wiring sequence should be carefully checked before powering on to avoid unnecessary losses due to wiring errors.

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

Maintenance

1. Use and maintenance

Before testing, remove the protective covers of the measuring electrode and the reference electrode. The electrodes should be soaked in clean water for 2 hours. After activation, clean them in deionized water and then test them. If the electrodes are not used for a long time (more than two weeks), they should be stored dry, and the sensing elements of the electrodes should be put into the protective caps.

Check whether the terminals are dry. If they are contaminated, wipe them with anhydrous alcohol and use them after drying. Avoid soaking in distilled water or protein solutions for a long time, and prevent contact with silicone grease. For electrodes that have been used for a long time, their PVC film may become translucent or have sediments. At this time, they can be rinsed with distilled water (or deionized water). If the electrodes have been used for a long time and measurement errors occur, they must be corrected.

If calibration and measurement cannot be performed after the above methods are used to maintain and service the electrodes, it means that the electrodes have failed. Please replace the electrodes.

The main interfering ions are shown in the table below:

The interfering ion concentrations that can produce a 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 ₂ H ₅ ⁺	> 0.1	> 0.1	> 0.1
Bu ₄ N ⁺	1*10 ⁻⁵	1*10 ⁻⁴	1*10 ⁻³

2. Calibration

Note: The sensor has been calibrated before leaving the factory. It is not advisable to calibrate it at will unless it exceeds the measurement error.

a) Zero-point calibration

Put the sensor in the zero-point standard solution, wait for 5 minutes, and wait for the value to stabilize to see if the displayed value is within the error range. If not, zero-point calibration is required. For calibration instructions, refer to the appendix.

b) Slope calibration

Put the sensor in the slope standard solution, wait for 5 minutes, and wait for the value to stabilize to see if the displayed value is within the error range. If not, slope calibration is required. For calibration instructions, refer to the appendix.

Quality and service

Quality assurance

- Quality inspection departments have standardized inspection procedures, with advanced detection equipment and instruments, and in strict accordance with the test procedures for products that do 72 hours aging test, stability test, not asubstandard products factory.
- The user directly returns the product batch with a failure rate of 2%, and all the costs incurred are borne by supplier. The reference standard refers to the product description provided by the supplier.
- Guarantee the quantity of goods and the speed of shipment.

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	No. of registers	CRC check code (low byte first)

b) Read data response frame

06	03	xx	xx..... xx	xx xx
Address	Function code	Number of 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)	Measured value +temperature	4 double-byte integers, namely the ammonium ion measurement value, the number of decimal places of the measurement value, the temperature value, and the number of decimal places of the temperature value.	4 (8 bytes)	read
44097 (0x1000)	Zero calibration	When calibrated in 1mg/L or 10mg/L standard solution, the data written in 0-100mg/L is the value of the standard solution concentration x100; the data written in 0-1000mg/L is the value of the standard solution concentration x10. The data read out is the mV value corresponding to the zero calibration value x100.	1 (2 bytes)	Write / read
44101 (0x1004)	Slope calibration	Calibrate in 10mg/L or 100mg/L standard solution. The data written in 0-100mg/L is the value of the standard solution concentration x100; the data written in 0-1000mg/L is the value of the standard solution concentration x10. The data read out is the mV value corresponding to the slope calibration value x100	1 (2 bytes)	Write / read

44113 (0x1010)	temperature calibration	When calibrated in solution, the written data is the actual temperature value x10; the read data is the temperature calibration offset x10.	1(2 bytes))	Write / read
48195 (0x2002)	Sensor address	The default is 6, and the data range is 1-127.	1 (2 bytes)	Write / read
48196 (0x2003)	Baud rate	The default is 9600. 0--9600, 1--19200.	1 (2 bytes)	Write / read
48225 (0x2020)	Reset sensor	The calibration value is restored to the default value, and the written data is 0. Note that the sensor needs to be calibrated again after being reset before it can be used.	1 (2 bytes)	write

4. Command Example

a) Read data command:

Function: Get the ammonium nitrogen and temperature measured by the sensor; the unit of ammonium 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 55 00 02 01 18 00 01 B3 5D

Examples of readings:

Ammonium nitrogen value	Temperature value
00 55 00 02	01 18 00 01

Ammonium nitrogen value: 00 55 indicates the hexadecimal reading of the ammonium nitrogen value, 00 02 indicates the ammonium nitrogen value with two decimal places, and the decimal value is 0.85.

Temperature value: 01 18 indicates the hexadecimal reading of the temperature value, 00 01 indicates the temperature value with one decimal place, and the decimal value is 28.0.

b) Calibration instruction:

Zero calibration

Function: Set the ammonium nitrogen zero calibration value of the sensor. Calibrate in 1mg/L standard solution, as follows:

Request frame: 06 06 10 00 00 64 8D 56

Response frame: 06 06 10 00 00 64 8D 56

Slope calibration

Function: Set the ammonium nitrogen slope calibration value of the sensor. Calibrate in 10mg/L standard solution, as follows:

Request frame: 06 06 10 04 03 E8 CD C2

Response frame: 06 06 10 04 03 E8 CD C2

c) Set the device ID address:

Function: Set the Modbus device address of the sensor.

Change the sensor address 06 to 01, as shown below

Request frame: 06 06 20 02 00 01 E3 BD

Response frame: 06 06 20 02 00 01 E3 BD

5. Error response

If the sensor does not execute the host command correctly, 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: Received function code