KWS-500 Online ORP Sensor

Introduction

KWS-500 online ORP sensor uses long-life industrial online electrodes and built-in temperature sensor for automatic temperature compensation, suitable for long-term online monitoring. The sensor uses RS485 communication interface and standard Modbus protocol, which can be easily networked and integrated without a controller. It is widely used in water quality treatment, hydrological monitoring, wastewater treatment, swimming pools, industrial control, biology and other fields.

Feature

- Digital sensor, RS-485 output, standard MODBUS protocol;
- No electrolyte required, strong anti-interference, no need for frequent calibration;
- Built-in temperature sensor, automatic temperature compensation;
- Adopt high-performance industrial online electrode, can work stably for a long time;
- Built-in calibration parameters, accurately calibrated at the factory, can be directly installed and used.

Technical Specifications

Measuring principle	Platinum electrode method
Range	-1999mV~1999mV
Accuracy	±20mV
Resolution	1mV
Ip Grade	IP68
Operating Temperature	0~50℃
Output	RS485, Modbus
Power Consumption	0.3W (recommend power: DC 12-24V, ≥1A)
Max. pressure	3 bar
Casing Dimension	φ28mm*194mm
Installation	NPT3/4, immersion installation
Cable Length	Standard 10m, customizable
Calibration	One-point calibration
Casing Material	POM + Titanium

Note: 1. The above technical parameters are all data under laboratory standard solution environment;
2. The sensor life and maintenance calibration frequency are related to the actual field conditions.

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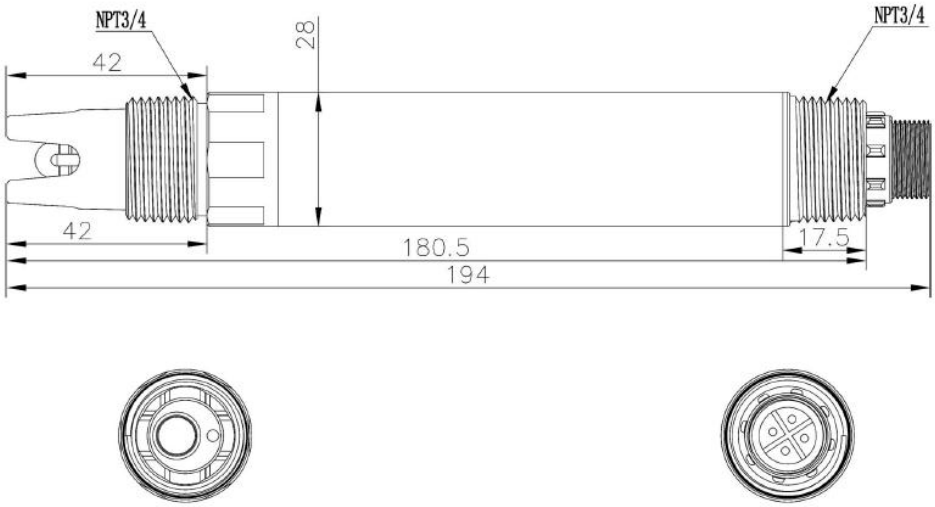
Dimensions



Wiring

Cable Information

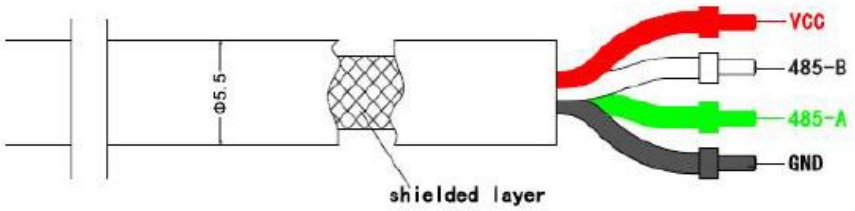
4 wire AWG-24 or AWG-26 shielding wire. OD=5mm

red - power supply (VCC)

white - 485 data _B (485_B)

green - 485 data _A (485_A)

black - ground (GND)

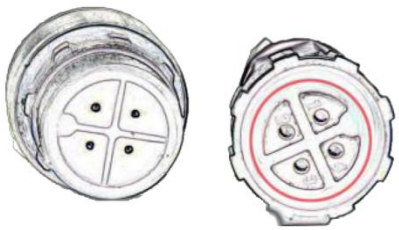


Installation

1. Wiring and Power supply

① Do not use the sensor cable to hoist the sensor! It is recommended to install a cable protective cover to ensure that the cable is powered and watertight.

② Make sure the connector between the sensor and the cable (or mother body) is correctly connected and tightened. Be careful not to damage the sealing ring (as shown in the red circle in the figure below) to ensure good watertightness.



③ Make sure the line sequence and power supply voltage are correct before powering on.

2. Sensor installation

① It is recommended that the sensor be installed vertically with the electrode facing downward (or at least 45° inclination), and not horizontally or even with the electrode facing upward;

② Considering the influence of water level, it is recommended that the sensor be installed 30cm below the lowest water level. If it is installed under pressure in a pipeline, please pay attention to the water pressure resistance range of the electrode;

③ The sensor needs to be fixedly installed to avoid the probe being bumped by factors such as water flow;

④ Be careful with the electrode bulb to avoid breaking it.

Calibration

Please refer to the Modbus protocol for calibration

1.Standard solution and precautions

The ORP standard concentration is: 222mv (25℃).

Notes:

(1) When the electrode is not in use, it needs to be stored in 3.3mol/L KCL solution or saturated KCl solution;

(2) The electrode should not be exposed to air for too long time;

(3) The electrode should be handled gently to avoid electrode bulb rupture;

(4) After calibrating a standard solution, it is necessary to rinse the electrode with deionized water, and gently wipe it with dust-free paper or cloth,then put it into the next standard solution;

(5) When the correct operation but the calibration software prompts that the calibration is abnormal or the original MV value of the sensor loses the gradient in the three concentration standard solutions, the electrode may fail.

Maintenance Schedule and Method

1. Maintenance Schedule

Cleanliness of the measurement window is very important to maintain accurate readings. It is recommended to clean the sensor optical window before testing.

Maintenance Task	Recommended Maintenance Frequency
	KWS-500 Online ORP Sensor
Sensor Cleaning	Every 2 to 3 weeks
Sensor Calibration	3~4 weeks is recommended (depending on the working conditions)

2. Maintenance Methods

（1）Clean the sensor surface：Wash the outer surface of sensor with tap water, if there is still residue, using soft brush, for some stubborn dirt, household detergent can be added in tap water to clean.

（2）Check the cable：The cable should not be taut during normal operation，The wires inside the cable may break if it is under long term stressed condition.

（3）Sensor Preservation：Regular electrode maintenance requires that a electrode be stored in the recommended storage solution between measurements, and that the electrolyte solution be refilled as necessary. 3.3mol/L potassium chloride solution is recommended as the proper storage solution.

3. Attention

Probe contains sensitive optical components and electronic components. Ensure that the probe far away from severe mechanical impact.

FAQ

Error	Possible Reason	Solution
Unable to connect or no measurement results displayed	Power supply or wiring failure	Check whether the power supply and wiring are correct according to the instruction
	Interface or protocol issues	1. Use the host computer software provided by our company to check whether the communication is normal; 2. Check according to the product supporting communication protocol.
The measured value is too high, too low or the value continues to be unstable	Sensor's window is dirty and worn	Clean sensor body, special light window table
	Electrode Aging	Specimen validation evaluation
	Calibration is required	Perform user calibration
Other questions	Please contact KACISE after-sales department	

Warranty Description

(1) The warranty period of KWS-500 ORP sensor is 1 year, and the warranty period of KWS-500 ORP sensor (multi-parameter) is 1 year.

(2) This warranty does not include the following situations:

① Damage caused by force majeure, natural disasters, social unrest, war (published or unpublished), terrorism, or any government mandate;

② Damage caused by improper use, negligence, accident or improper application and installation;

③ Freight for returning the goods to KACISE IoT;

④ Freight for expedited or express delivery of parts or products within the warranty scope;

⑤ Travel expenses for local warranty repairs.

(3) This warranty includes all the contents of the warranty provided by KACISE IoT for its products.

① This warranty constitutes the final, complete and exclusive statement of the terms of the warranty, and no person or agent is authorized to formulate other warranties on behalf of KACISE IoT.

② The above-mentioned repair, replacement or refund of the money and other remedies are special cases that do not violate this quality guarantee. The replacement or refund of the money and other remedies are for the company's products themselves. Based on strict liability obligations or other legal theories, KACISE IoT is not responsible for any other damage caused by product defects or negligent operation, including subsequent damages that are causally related to these situations.

Modbus Protocol

The RS485 communication protocol uses MODBUS communication protocol, and the sensors are used as slaves.

Baud rate	9600
Starting position	1
Data bits	8
Stop bit	1
Check digit	N

Read and write data (standard MODBUS protocol).

The default address is 0x01, the address can be modified by register

Reading data

Host call (hexadecimal)

01 03 00 00 00 01 84 0A

Code	Function Definition	Remarks
01	Device Address	
03	Function Code	

00 00	Start Address	See register table for details
00 01	Number of registers	Length of registers (2 bytes for 1 register)
84 0A	CRC checksum, front low and back high	

Slave answer (hexadecimal)

01 03 02 00 xx xx xx xx

Code	Function Definition	Remarks
01	Device Address	
03	Function Code	
02	Number of bytes read	
XX XX	Data (front low and back high DCBA)	See register table for details
XX XX	CRC checksum, front low and back high	

Writing data

Host call (hexadecimal)

01 10 1B 00 00 01 02 01 00 0C C1

Code	Function Definition	Remarks
01	Device Address	
10	Function Code	
1B 00	Register Address	See register table for details
00 01	Number of registers	Number of read registers
02	Number of bytes	Number of read registersx2
01 00	Data (front low and back high DCBA)	
0C C1	CRC checksum, front low and back high	

Slave answer (hexadecimal)

01 10 1B 00 00 01 07 2D

Code	Function Definition	Remarks
01	Device Address	
10	Function Code	
1B 00	Register Address	See register table for details
00 01	Returns the number of registers written	
7D 2D	CRC checksum (front low and back high)	

Calculating CRC Checksum

(1) Preset one 16-bit register as hexadecimal FFFF (i.e., all 1s) and call this register the CRC register.

(2) Iso-oring the first 8-bit binary data (both the first byte of the communication information frame) with the lower 8 bits of the 16-bit CRC register and placing the result in the CRC register, leaving the upper 8 bits of data unchanged.

(3) Shift the contents of the CRC register one bit to the right (toward the low side) to fill the highest bit with a 0, and check the shifted-out bit after the right shift.

(4) If the shifted out bit is 0: repeat step 3 (shift right one bit again); if the shifted out bit is 1, CRC register and polynomial A001 (1010 0000 0000 0001) for the iso-or.

(5) Repeat steps 3 and 4 until the right shift is made 8 times so that the entire 8-bit data is processed in its entirety.

(6) Repeat steps 2 through 5 for the next byte of the communication information frame.

(7) Exchange the high and low bytes of the 16-bit CRC register obtained after all bytes of this communication information frame have been calculated according to the above steps.

(8) The final CRC register content is obtained as follows: CRC code.

Register Table

Start address	Command Description	Number of registers	Data format (hexadecimal)
0x3000H	Device address (read and write)	1	2 bytes in total 00~01: Device address The range can be set from 1~254 For example, the data obtained is 02 00 (If the low position is in the front, it means that the address is 2) Take address 15 as an example, then 0F 00 Write the corresponding address (low in front) When the current device address is unknown, you can use FF as a common device address to ask for the current
0x0700H	Get Software and Hardware Rev	2	4 bytes in total 00 ~ 01: hardware version 02 ~ 03: software version For example, reading 0101 represents 1.1
0x0900H	Get SN	7	14 bytes in total 00: reserved 01 ~ 12: serial number 13: Reserved The 12 bytes of the serial number are translated

			according to ASCII code, i.e. the factory serial number
0x2600H	mV value	2	4 bytes in total 00~03: mV value 4 bytes of data. (The low position is in the front, DCBA format, and this data needs to be converted to a change floating point number)
0x2400	Temperature value acquisition	2	4 bytes in total 00~03：Temperature value
0x1200	ORP value acquisition	2	4 bytes in total 00~03：Potential value，Unit is mV
0x3400H	ORP user calibration K/B (read and write)	4	8 bytes in total 00~03：K 04~07：B To read K for example, read out as 4 bytes of data (low bit in front, DCBA format, need to convert this data to floating point, see below for conversion method) To write k, for example, we need to convert k to 32-bit floating point and write it in (DCBA format) **Note: K and b should be read and written together**