KWS-350 Digital Conductivity Sensor

Introduction

Kacise KWS-350 digital conductivity sensor has wide range of measurement, automatic switching measurement range, built-in temperature sensor, Real-time temperature compensation.

Excellent resistance to pollution, even in harsh environments long-term online monitoring, there will be no polarization. RS485 output, can be networked without controller.

Feature

- Drinking water / surface water / industrial water treatment
- Signal output: RS-485 (Modbus/RTU protocol)
- Conveniently connect to third-party equipment such as PLC, DCS, industrial control computer, general controller, paperless recording instrument or touch screen.
- Immersion installation, with 3/4NPT pipe thread, convenient for immersion installation or installation in pipelines and tanks.
- IP68 protection.
- 0~20µS/cm,0~200µS/cm,0~5000µS/cm can output conductivity and TDS at the same time.

## Technical Specifications

| Model	KWS-350	
Principle	Electrode method	
Range and resolution	0~20 µS/cm(TDS 0-10 mg/L)	0.01
	0~200 µS/cm(TDS 0-100 mg/L)	0.1
	0~5000 µS/cm(TDS 0-3000 mg/L)	1
	0~200 mS/cm	0.1
Accuracy	±1.5%; ±0.3℃	
Response time (T90)	<10s	
Minimum detection limit	0.2mS/cm (0-200mS/cm)	
	0.1mS/cm (0-100mS/cm)	
	2uS/cm (0-5000uS/cm)	
Calibration method	Two-point calibration	
Cleaning method	/	
Temperature compensation	Automatic temperature compensation (Pt1000)	
Output method	RS-485 (Modbus RTU)	
Storage temperature	-5~65℃	
Working conditions	0~60℃, ≤0.6MPa	
Casing material	POM	
Installation method	Submersible installation, 3/4 NPT	
Power consumption	0.2W@12V	
Power supply	12~24V DC	
Protection level	IP68	

Dimensions

KWS-350 (Range: 0~20.00μS/cm)
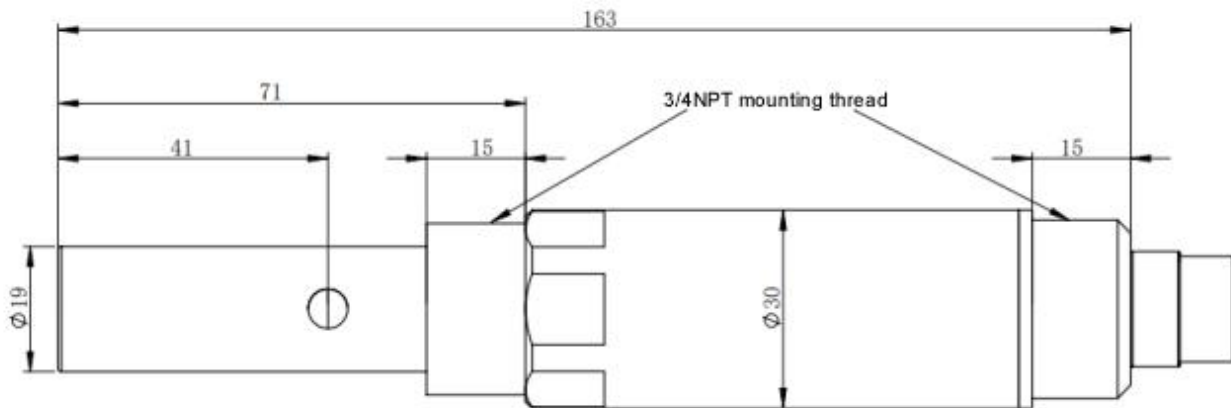
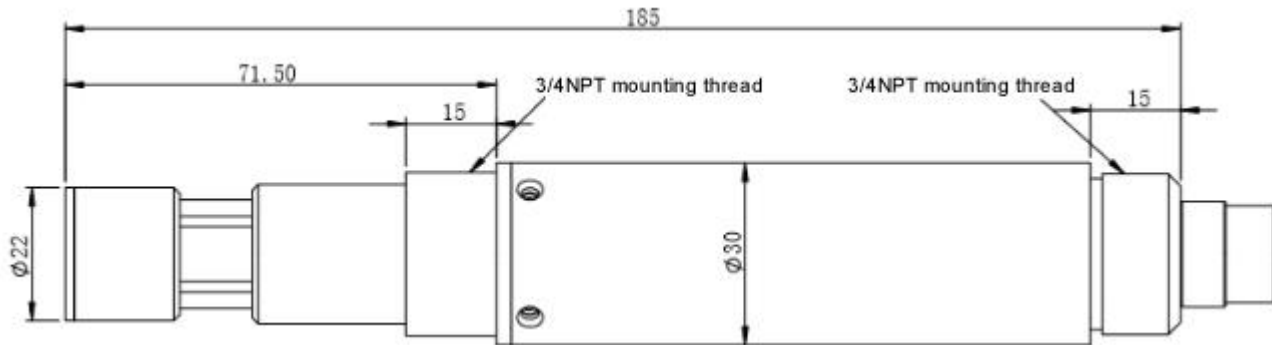**KWS-350 (Range: 0~200.0μS/cm)**
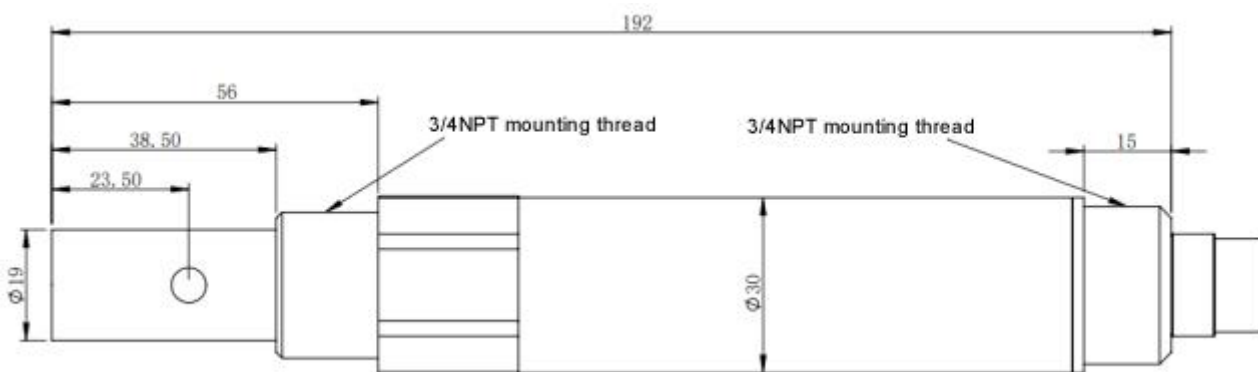
KWS-350 (Range: 0~5000μS/cm)
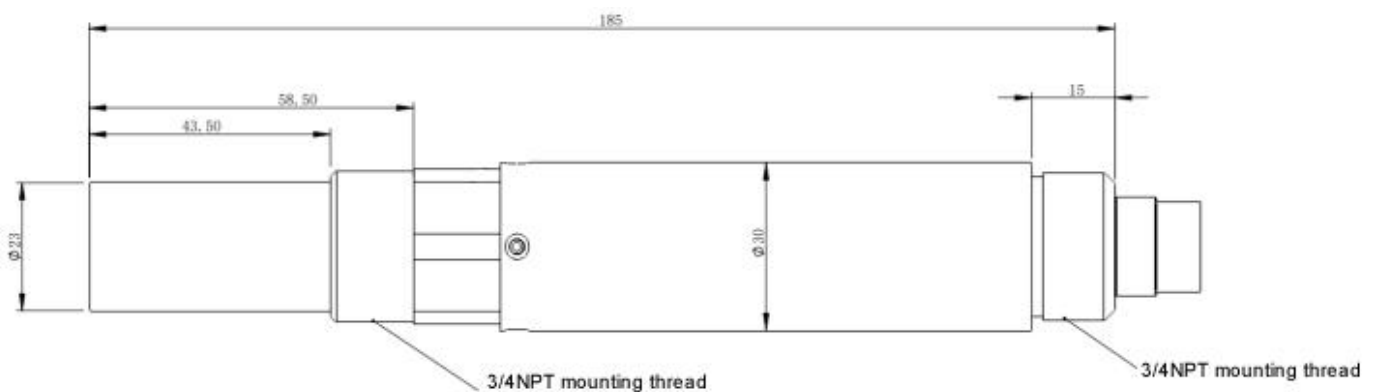
Note: The sensor connector is a male M16-5-core waterproof connector.

KWS-350 (Range: 0~200.0mS/cm)

Note: The sensor connector is a male M16-5-core waterproof connector.

Installation and Electrical Connection

Installation
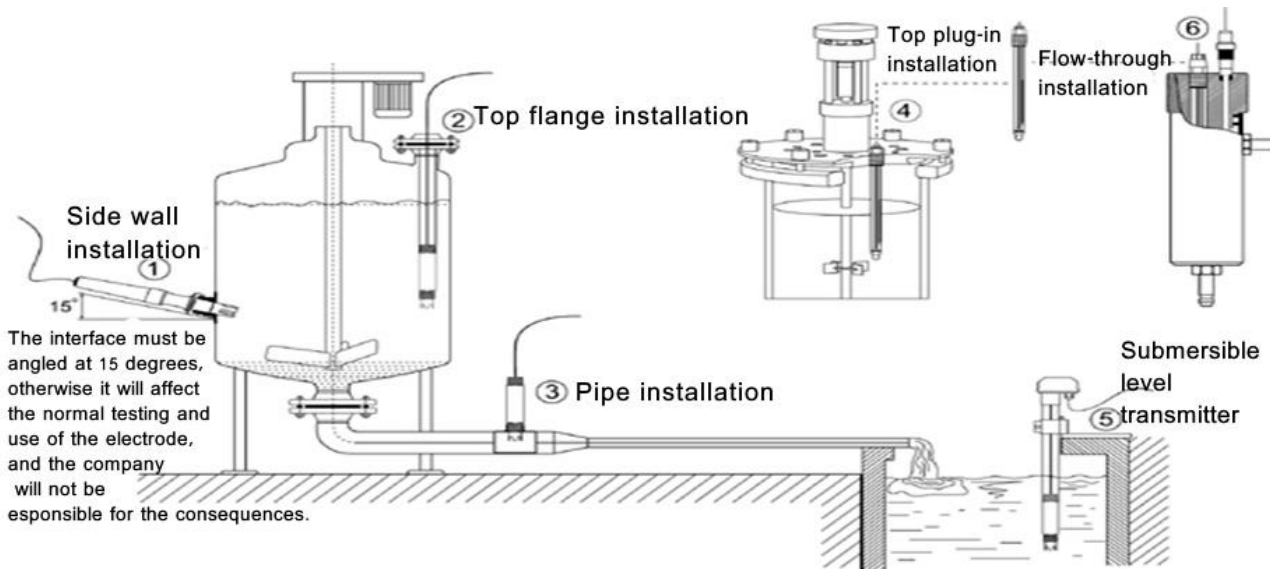
Note: When installing and testing, the sensor should be installed at least 2 cm away from the bottom and side walls of the container.

Wiring

The cable is a 4-core twisted pair shielded cable, and the line sequence definition is:
- Red-power cord(12～24VDC)
- Black-ground wire(GND)
- Blue-485A
- White-485B

Before powering on, carefully check the wiring sequence 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

Use and Maintenance

Conventional electrodes need to be cleaned and calibrated periodically, and the maintenance cycle is determined by the customer according to their working conditions. Conventional electrode cleaning method: Use a soft brush to remove attachments (be careful to avoid scratching the electrode surface), then clean with distilled water, and then perform calibration operations.

Cleaning method for inductive electrodes:

- Inductive electrodes are basically maintenance-free, and contamination or mild scaling of the shell does not affect its normal operation.
- If cleaning is required, use a soft brush or sandpaper to remove attachments, then clean with distilled water, and then perform calibration operations.
- Since inductive electrodes often work in an environment prone to scaling or dirt, the cleaning force can be appropriately increased. Slight scratches on the electrode surface do not affect the normal operation of the electrode, but avoid penetrating the electrode shell.

Calibration

a) Zero calibration:Rinse the sensor with distilled water and dry the liquid with filter paper. Connect the sensor to the power supply and place it vertically in the air for about 3 minutes. After the value stabilizes, perform zero calibration. See the appendix for calibration instructions.

b) Slope calibration:Place the sensor vertically in the standard solution (20% full scale - full scale), making sure the sensor is at least 2 cm away from the bottom and side walls of the container, and perform slope calibration. See the appendix for calibration instructions.

Quality and Service

Quality Assurance

- The quality inspection department has standardized inspection procedures, advanced and complete testing equipment and means, and strictly inspects according to the procedures, conducts 72-hour aging tests and stability tests on products, and does not allow unqualified products to leave the factory.
- The consignee directly returns the batch of products with an unqualified rate of 2%, and all the costs incurred are borne by the supplier. The inspection standards refer to the product description provided by the supplier.
- Guarantee the quantity of supply and delivery speed.

Service Commitment

The company provides after-sales service for this machine within one year from the date of sale, but does not include damage caused by improper use. If repair or adjustment is required, please send it back, but the freight is at your own expense. When sending it back, make sure that the packaging is good to avoid damage during transportation. The company will repair the damage of the instrument free of charge.

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(xx represents a byte)

a) Read data instruction frame

01	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

01	03	xx	xx......xx	xx xx
Address	Function code	Bytes	Answer data	CRC check code (low byte first)

c) Write data instruction frame

01	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)

01	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	Explain	Number of registers	Access Mode
40001 (0x0000)	Measurement value + temperature + TDS	6 double-byte integers, namely, measured value, measured value decimal places, temperature value, temperature value decimal places, TDS value, TDS value decimal places.	4(8byte)	Read
44097 (0x1000)	Zero calibration	When calibrated in air, the written data is 0. The read data is the zero offset.	1(2byte)	Write / read
44101 (0x1004)	Slope calibration	When calibrated in a known standard solution (20% full scale - full scale), the full scale is 0-20µS/cm, the written data is the actual value of the standard solution×100; the full scale is 0-200µS/cm, the written data is the actual value of the standard solution × 10; the full scale is 0-5000µS/cm, the written data is the actual value of the standard solution; the full scale is 0-200mS/cm, the written data is the actual value of the standard solution × 10; the read data is the slope value × 1000.	1(2byte)	Write / read
44113 (0x1010)	Temperature calibration	When calibrated in solution, the written data is the actual temperature value×10; the read data is the temperature calibration offset×10.	1(2byte)	Write / read
441155 (0x1012)	TDS coefficient	The default value is 0.64, which can be modified by the user according to the actual water conditions.	1(2byte)	Write / read
48195 (0x2002)	Sensor address	The default value is 1, and the write data range is 1-255. (200mS/cm address is 2)	1(2byte)	Write / read
48225 (0x2020)	Reset sensor	The calibration value is restored to the default value, and the write data is 0. Note: After the sensor is reset, it needs to be calibrated again before it can be used.	1(2byte)	Write

Note:

a. The register address is the register start address with register type defined according to the Modbus protocol (the actual register start address represented by hexadecimal in brackets).
b. When the sensor address is changed, the sensor address in the return instruction is the new address after the change.
c. Data definition of the measured value returned when reading data

XX XX	XX XX	XX XX	XX XX
2-byte measurement value	2-byte measurement value decimal places	2-byte temperature value	2-byte temperature decimal places

The default data type is: double-byte integer, high byte first; other types such as floating point numbers are optional.

4. Command Example

a. Measurement command

Function: Get the conductivity and temperature measured by the sensor; the unit of temperature is Celsius, and the unit of conductivity is mS/cm (or uS/cm);

Request frame: 01 03 00 00 00 04 44 09

Response frame: 01 03 0C 01 02 00 01 00 B0 00 01 00 A5 00 01 35 73

Reading example:

Conductivity value	Temperature value	TDS value
01 02 00 01	00 B0 00 01	00 A5 00 00

For example:

● Conductivity value 01 02 indicates the conductivity value in hexadecimal reading, 00 01 indicates the conductivity value with 1 decimal point (the decimal point is related to the range), and the decimal value is 25.8.

● Temperature value 00 B0 indicates the temperature value in hexadecimal reading, 00 01 indicates the temperature value with 1 decimal point, and the decimal value is 17.6.

● TDS value 00 A5 indicates the TDS value in hexadecimal reading, 00 00 indicates the temperature value without decimal point, and the decimal value is 165.

b. Calibration command

Zero calibration

Function: Set the conductivity zero calibration value of the sensor; Here the zero calibration is performed in the air;

Request frame: 01 06 10 00 00 00 8D 0A

Response frame: 01 06 10 00 00 00 8D 0A

Slope calibration

Function: Set the conductivity slope calibration value of the sensor; Here the slope value is based on the actual standard solution value, and 50mS/cm is used as an example for calibration;

Request frame: 01 06 10 04 01 F4 CC DC

Response frame: 01 06 10 04 01 F4 CC DC

c. Set device ID address

Function: Set the Modbus device address of the sensor;

Change the sensor address 01 to 06, as shown below

Request frame: 01 06 20 02 00 06 A3 C8

Response frame: 01 06 20 02 00 06 A3 C8

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 error

b) COM : Received function code