



## **Sper Scientific Instruments**

### **Inductive Conductivity Sensor**

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## **Inductive Conductivity Sensor**

Digital conductivity sensor has all the functions of measuring and digitizing conductivity and various salinity, acid and alkali concentrations. It overcomes many difficulties of the previous sensors and integrates the signal processing circuit into an embedded MCU ASIC, which enables the sensor to be calibrated before leaving the factory, and the calibration value is permanently stored in the probe. With temperature compensation function, the temperature is also directly digital output.

1. Conductivity (absolute conductivity, conductivity after temperature compensation), temperature compensation coefficient can be set online

2. Salinity (main component NaCL etc., unit: ppt): 0-72ppt (0-100mS/CM)

3. Various acid concentrations (unit: %)

Hydrochloric acid(HCL): 0-20%

Hydrochloric acid(HCL): 25-40%

Nitric acid(HNO<sub>3</sub>): 0-25%

Sulfuric acid(H<sub>2</sub>SO<sub>4</sub>): 0-25%

Sulfuric acid(H<sub>2</sub>SO<sub>4</sub>): 35-85%

Sulfuric acid(H<sub>2</sub>SO<sub>4</sub>): 92-100%

4. Various alkali concentrations (unit: %)

Sodium hydroxide NaOH :0-18%

Sodium hydroxide NaOH :20-40%

The low-voltage and low-power design allows the probe to be directly applied to a single 5V power supply. The typical power consumption is only 0.125W, and the minimum can be as low as 0.075W. If intermittent work or sleep mode is used, the power consumption is lower. Conducive to applications in portable or battery devices.

1. Three communication serial ports are available: □RS485; □RS232; □TTL;

2. Optional working power supply:

□ +3.45V (Min)~+5.25V (Max )dc (Low power consumption)

□ +5.25V(Min) ~ +8.5V(Max)dc

□ +8.5V(Min) ~ +12V(Max)dc (12V standard type)

□ +8.5V(Min) ~ +35V(Max)dc (Wide voltage type)

@15mA typ.~ @25mA typ. Pmin=75mW

If you have special needs, it can be customized for customers

3. Digital wiring table:

Red: Power +

Black: serial port (Txd, A)

White: serial port (Rxd, B)

Blue wire: GND (cable shielding layer)

4. Probe temperature:

(0~50/100/150 optional) °C;

Transmitter working environment temperature: (-5~50)°C

5. Resolution:Temperature: 0.1°C; Conductivity, acid-base concentration: (full range)

±0.1%; range: specify when ordering, Salinity: accuracy (full scale) ±0.1ppt; resolution: ±0.01ppt

6. Pressure/temperature limit: 6.5bar/100°C, 8.0bar/60°C, 12.5bar/25°C
7. Maximum flow rate: 3 m/s
8. Digital filtering function: the duration of digital filtering can be set: 0~32 minutes
9. Temperature compensation range: 0-100°C, the compensation coefficient can be set online
10. Communication protocol: standard MODBUS RTU RTU protocol

. After receiving the host (host computer) request to send the command, the sensor sends a data packet, the data refresh cycle is 100ms, and the baud rate is 9600.

.Initial default address: 255; reference temperature: 25°C, temperature compensation coefficient: 2%/°C or specify when ordering.

Serial port setting: 9600-8-N-1

Input register: read-only, base address 0, function code 0x04

Offset address 0x00: temperature

Offset address 0x08: Conductivity value without temperature compensation

Offset address 0x0a: salinity

Offset address 0x0c: Conductivity value after temperature compensation

Offset 0x0e: HCL (25<N<40, otherwise N=0)

Offset 0x10: NAOH (20<N<40, otherwise N=0)

Offset 0x12: KOH (0<N<30, otherwise N=0)

Offset 0x14: H2SO4 (0-25%)

Offset 0x16: H2SO4 (35-85%)

Offset 0x18: H2SO4 (92-100%)

Offset 0x1a: HCL (0-20%)

Offset 0x1c: NAOH (0-18%)

Offset 0x1e: HNO3 (0-25%)

Offset 0x20: st\_unline (reserved and not open temporarily)

Offset 0x22: st\_man (solution) (reserved and not open temporarily)

Holding register: read and write/write only, base address 2000, function code 0x03, 0x06

Offset address 0x00: working mode (read and write, user mode (0x01), factory mode (0x00)), input 0x1234, 0x5678 or input decimal 4660, 22136 to switch)

Offset address 0x01: temperature compensation coefficient (read and write,

temperature compensation coefficient X100, for example 2%, enter 200 or 0xC8)

Offset address 0x02: reference temperature (read and write, input temperature, for example 25°C input 25 or 0x19)

Offset address 0x03: temperature calibration (write only, enter temperature X10, for example, 25.0°C enter 250 or 0xFA)

Offset 0x04: probe calibration 0 (write only, enter 0000, other values are invalid)

Offset 0x05: probe calibration gain (write only, enter the standard value)

Offset 0x06: configure modbus address (read and write, enter address code)

Offset 0x07: Reset the probe (write only, enter 0000, other values are invalid)

Offset 0x08: range (read only in user mode, read and write in factory mode)

Offset 0x0c: Set the amount of smoothing (read and write, from 0 to 32 minutes)

Examples of MODBUS data reading and writing are as follows:

Example 1: Probe address is 0xff, read mode, temperature compensation, need to read two consecutive registers, start reading from the register whose register address is 2000

Host computer sends: 0xff,

0x03, 0x07, 0xD0, 0x00, 0x02, 0xD1, 0x58

Data meaning: address | function code | register address high byte | register address low byte | high byte of the number of registers read | low byte of the number of registers read | check 1 | check 2

## **Calibration and debugging of potentiometer mode:**

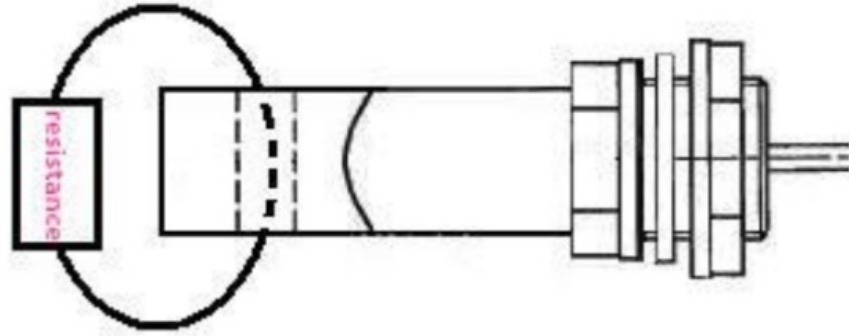
Each electrodeless sensor has a unique zero point and measurement range. Therefore, after the on-site installation, the first time the sensor is calibrated, zero point calibration is required. Zero point calibration provides the best measurement accuracy. Calibrate the measurement range of the sensor through different methods, so as to maintain the best measurement accuracy periodically. Over time, certain processes such as viscous suspensions may clog the sensor ring holes, which can cause slight measurement errors. The length of calibration time and the rate of measurement drift can change accordingly with each use and its special conditions.

When calibrating, the probe should be placed in the air at  $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ , and make sure that the sensor is dry and clean:

1. Zero adjustment: After connecting the wires according to the wiring table, power on,

and adjust the potentiometer in the middle to make the output value:  $0 \pm 0.1 \text{ mV}$ . (See the offset 0x02 in the debugging window)

2. Adjust the gain: Pass a  $100\Omega$  (for example, when the range is 200mS) precision resistor in the ring hole of the sensor, then close the head and tail (see the detection diagram), turn the potentiometer on the side to make the output The value is:  $427.0 \pm 1.0 \text{ mV}$  (seen at offset 0x02 in the debug window)



**Schematic Diagram**

3. Repeat steps 1 and 2 again, and it is complete (note: when performing step 1, the resistance of the threading should be opened).

### **Precautions for use**

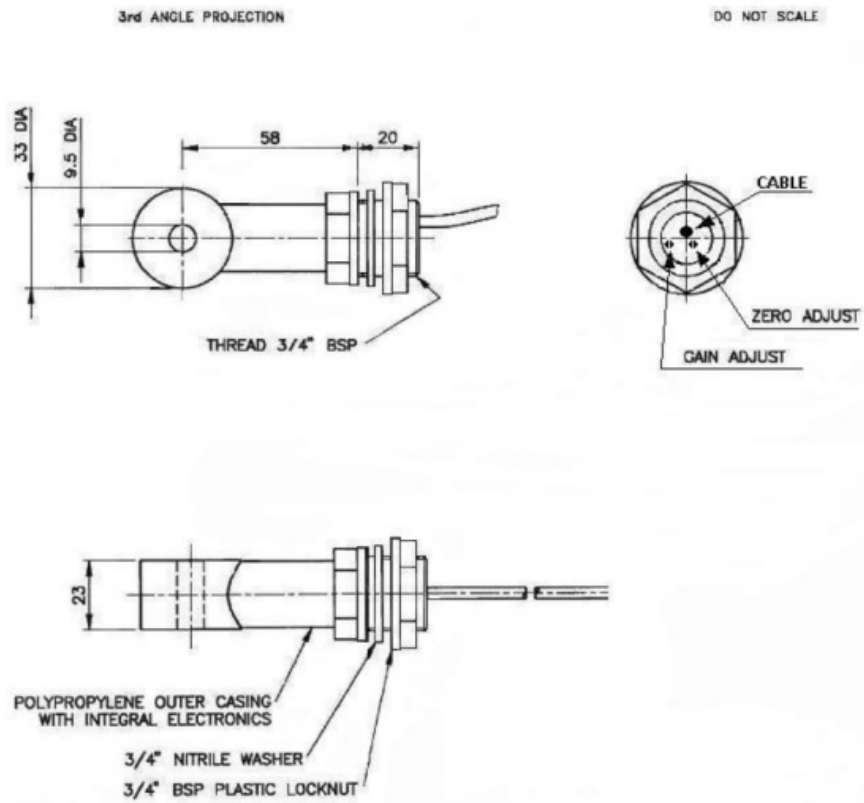
1. Wrong wiring, especially the wrong power connection, will cause the sensor to be completely destroyed!
2. The threaded port and above (including cables) must be completely isolated from the measured solution (although there is glue!). After long-term immersion (dripping) in the liquid, the sensor will be destroyed!
3. There is a filter capacitor in the heat shrink tube at the end of the cable (to prevent power fluctuation and interference), please do not cut it!
4. In order to ensure the accuracy of the sensor measurement, it is recommended to reserve a 20mm space around the sensor to avoid other materials close to the sensing area. Different spatial distances, the proportional coefficient will change, and the parameters should be balanced and compensated.
5. When installing, the sensing area is facing upwards or tilted upwards, which can avoid occasional air bubbles (or filter out by software filtering); suspend the sensor in the solution to prevent contact with the container (such as simply placing it randomly) Into the container will cause measurement error), and the probe should be kept still during the measurement;

6. The working temperature of the built-in signal processing sensor is 0~50°C, and the working temperature of the external signal processing sensor is 0~100°C.
7. If the power is turned off after a long time, the conductance value will drift slightly within 5~15 minutes.
8. When installing, do not try to tighten the connection by twisting the “ring” end of the sensor, which will cause the sensor housing to break.
9. When wiring, do not pass the probe cable through any pipe with AC or DC power. Electrical signals may interfere with sensor signals.
10. Since there may be a considerable temperature difference between the inside of the probe and the liquid being detected, it is clearly recommended: in working conditions that require accurate measurement or fast frequency response, do not use the temperature sensor built into the probe as the temperature sensing element of the liquid being detected!

**The physical picture of the probe (PP material shell, built-in signal processor)**



**Dimensions (PP material shell, built-in signal processor)**



(Product does not include lock nut)

Relevant data subject to change without notice, take the object as the criterion

The signal processor is externally placed on the electrode, which is suitable for liquid contact temperature over 50 °C:



Physical picture of conductivity sensor with anti-fouling cover: (suitable for environments containing various impurities, small particles, and small animals, such as sea water, sewage, rivers, etc., which can be free from frequent cleaning and maintenance)



PP-78/32 package physical picture: Mud conductivity sensor for mud logging unit

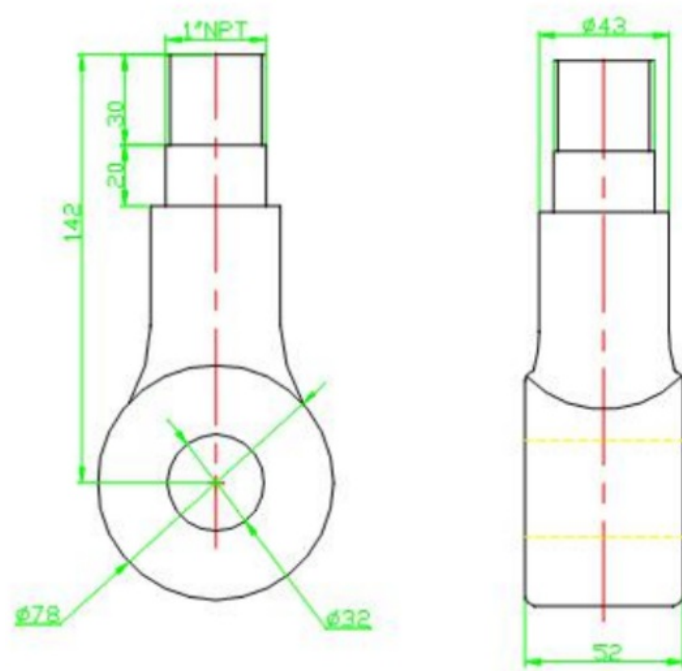


(The product does not include a lock nut)

Relevant data are subject to change without notice, the actual product shall prevail

## Dimensions

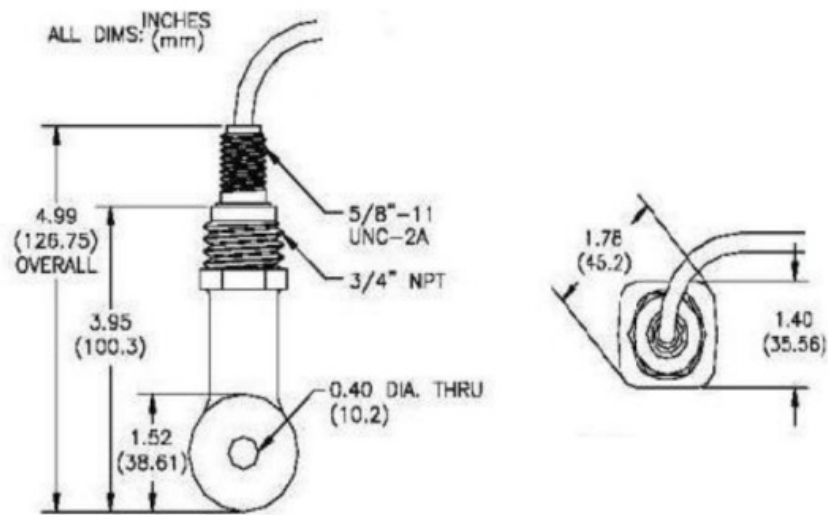




The physical picture of the probe (PFA material shell)



Dimensions of the probe (PFA material shell)



**Attachment with lower thread G3/2" for easy pipe installation:**



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## Documents / Resources

<p><small>Document Title: Spers Scientific Instruments Inductive Conductivity Sensor [pdf] User Manual</small></p> <p><small>Document Description: This document provides detailed information about the Spers Scientific Instruments Inductive Conductivity Sensor, including its features, specifications, and installation instructions.</small></p> <p><small>Document Type: User Manual</small></p> <p><small>Document Format: PDF</small></p> <p><small>Document Size: 1.2 MB</small></p> <p><small>Document Version: 1.0</small></p> <p><small>Document Date: 2023-10-27</small></p> <p><small>Document Author: Spers Scientific Instruments</small></p> <p><small>Document Keywords: Inductive Conductivity Sensor, Conductivity Sensor, Sensor</small></p>	<p><a href="#">Spers Scientific Instruments Inductive Conductivity Sensor [pdf] User Manual</a></p> <p>Inductive Conductivity Sensor, Conductivity Sensor, Sensor</p>
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## References

- [User Manual](#)

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