ATO

Industrial EC Sensor User Manual (485 Type)

SN-3002-EC -N01-*

Ver 2.0

Catalog

Chapter 1 Product Introduction

1.1 Product Overview

This product is a device for measuring the conductivity of solutions. It features automatic temperature compensation, adjusting the conductivity to the specified temperature. It can be widely used for continuous monitoring of the conductivity of aqueous solutions in cross-sectional water quality, aquaculture, wastewater treatment, environmental protection, pharmaceuticals, food, and tap water.

1.2 Functional Features

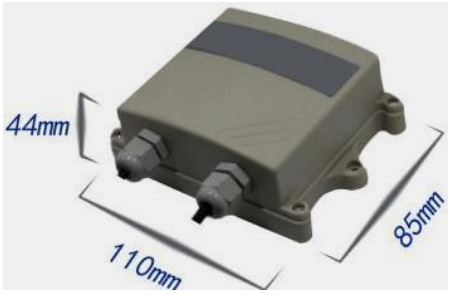
- Features salinity and TDS conversion function.
- RS485 communication interface: ModBus-RTU communication protocol allows for easy connection to a computer for monitoring and communication.
- ModBus communication address is configurable, and baud rate is modifiable.
- Wide voltage power supply: DC 10~30V.
- IP65 protection rating (non-display model only), suitable for outdoor rain and snow environments.

1.3 Main Parameters

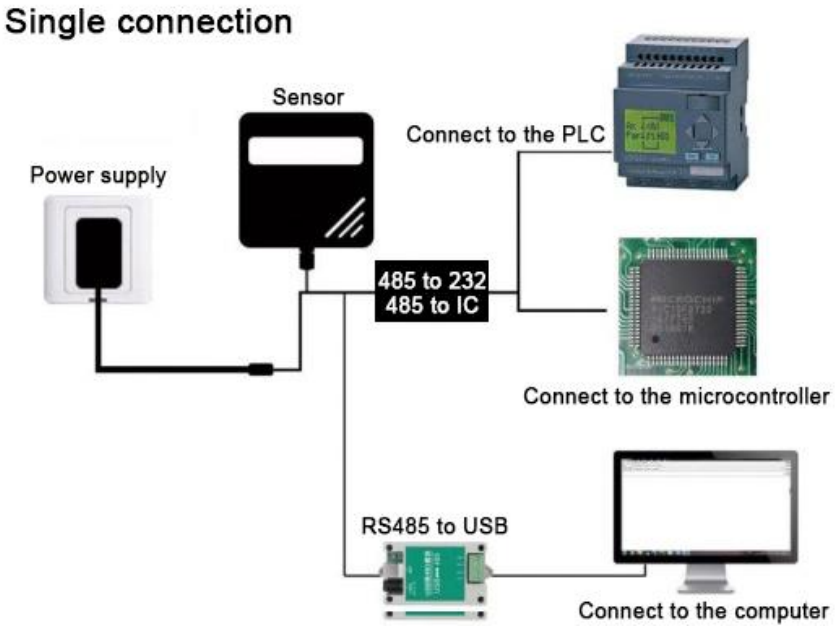
Power Supply	DC 10~30V
Power Consumption	0.4W
Communication Interface	RS485; Standard ModBus-RTU protocol; Communication baud rate: Default 4800 (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 adjustable)
Conductivity Measurement Range	K=0.01: 0.01~20μS/cm; Resolution: 0.001μS/cm
Conductivity Measurement Error	±1%FS
Temperature Measurement Range	-20~100℃; Resolution: 0.1℃
Temperature Measurement Error	±0.5℃
Temperature compensation range	-20~100℃ (Default compensation temperature 25℃)
Temperature compensation coefficient	Default 0.02
Salinity measurement range	K=0.01：0~10ppm
TDS Measurement Range	K=0.01: 0~10ppm

Transmitter Element Temperature and Humidity Resistance	-20℃~+80℃, 0%RH~95%RH (non-condensing)
Electrode Wire Length	Default 5m (customizable 10m, 15m, 20m)

Product dimensions:：

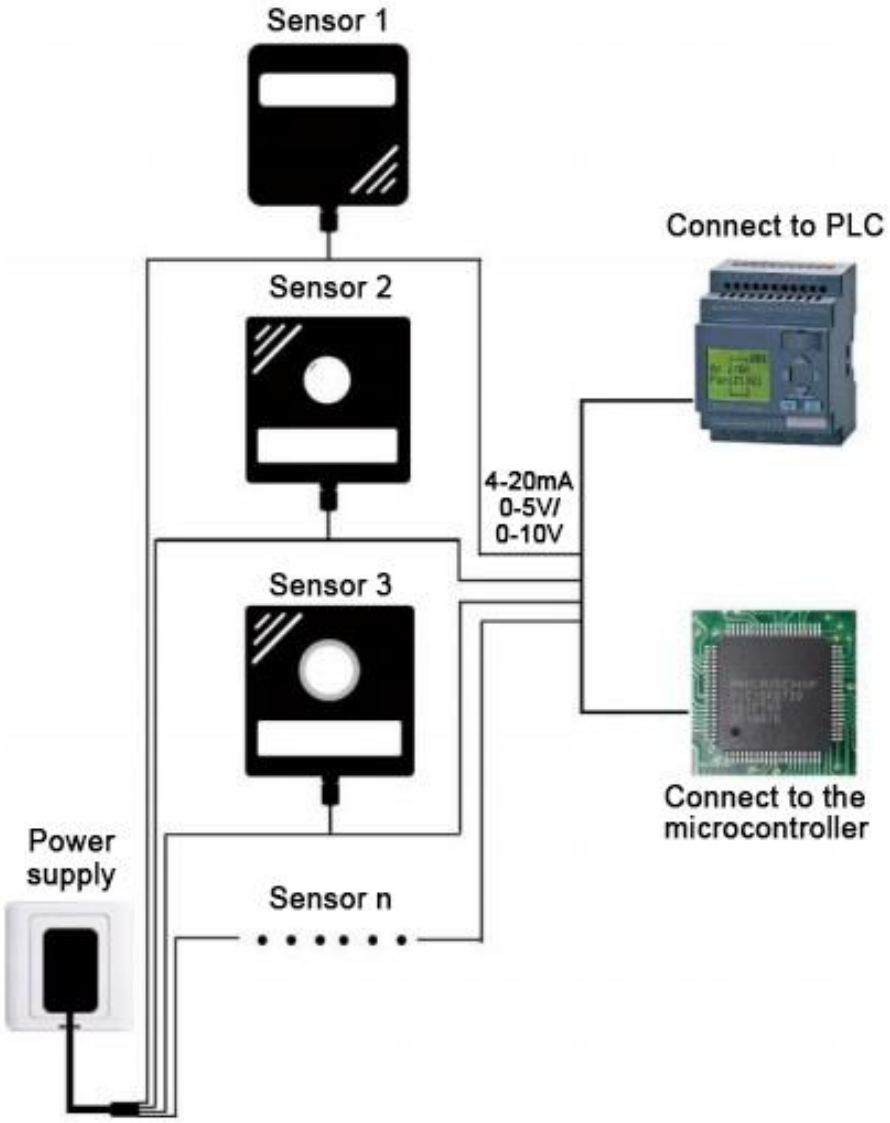


1.4 System Framework Diagram



This product can also be used with multiple sensors combined on a single 485 bus. Theoretically, one bus can support 254 485 sensors. The other end can be connected to a PLC with a 485 interface, a microcontroller via a 485 interface chip, or a computer via a USB to 485 adapter. Use the provided sensor configuration tool for configuration and testing (only one device can be connected when using this configuration software).

More connections



Chapter 2 Hardware Connection

2.1 Pre-Installation Inspection

Equipment List:

- ◆ 1 industrial EC sensor
- ◆ 1 conductivity electrode
- ◆ Certificate of conformity
- ◆ 2 expansion plugs, 2 self-tapping screws

2.2 Interface Description

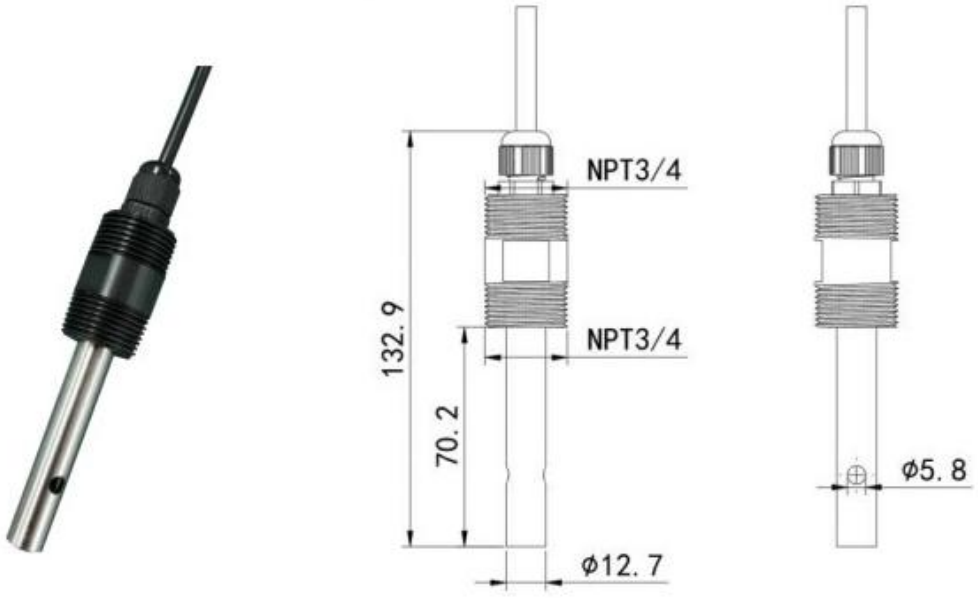
The power interface supports a wide voltage input of 7-30V. When wiring the 485 signal lines, ensure that the A and B lines are not reversed, and that there are no address conflicts between multiple devices on the bus.

2.2.1 Sensor Wiring

	Instructions	Instructions
Power Supply	Brown	Positive Power Supply (10~30V DC)
	Black	Negative Power Supply
Communication	Green	485-A
	Blue	485-B

2.3 Electrode Dimensions and Installation

2.3.1 Electrode Type and Dimensions

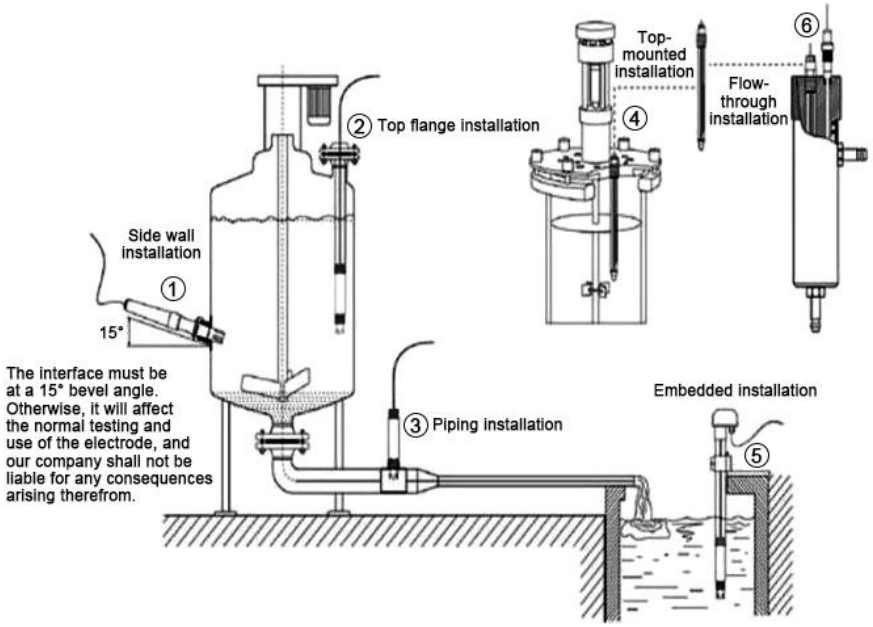


Stainless steel electrode with 3/4" threads on the top and bottom for easy installation.

2.3.2 Electrode Installation

1. Submerged Installation: The electrode lead passes through a stainless steel tube, and the 3/4 thread at the top of the electrode is connected to the 3/4 thread of the stainless steel tube using PTFE tape. Ensure that water does not enter the top of the electrode or the electrode lead.

2. Pipe Installation: Connect the electrode to the pipe via the 3/4 thread.



Chapter 3 Communication Protocol

3.1 Basic Communication Parameters

Encoding	8-bit binary
Data Bits	8 bits
Parity Bit	None
Stop Bit	1 bit
Error Check	CRC (Cyclic Redundancy Code)
Baud Rate	The speed can be set to 2400 bit/s, 4800 bit/s, or 9600 bit/s; the factory default is 4800 bit/s.

3.2 Data Frame Format Definition

Uses Modbus-RTU communication protocol, format as follows:

Initial Structure ≥4 bytes of time

Address Code = 1 byte

Function Code = 1 byte

Data Area = N bytes

Error Check = 16-bit CRC code

End Structure ≥4 bytes of time

Address Code: The transmitter's address, unique in the communication network (factory default 0x01).

Function Code: Indicates the function of the command sent by the host.

Data Area: The data area contains the actual communication data; note that the high byte of the 16-bit data comes first!

CRC code: A two-byte checksum.

3.3 Register Address

Register Address	Supported Function Codes	Description
0x0000	0x03/0x04	Conductivity value (16-bit unsigned integer, 1000 times the actual value for ranges 1-20; 100 times the actual value for ranges 1-200; 10 times the actual value for ranges 1-2000; actual value for ranges 10-20000)

0x0001	0x03/0x04	Temperature (16-bit signed integer, 10 times the actual value)
0x0002	0x03/0x04	Salinity (16-bit unsigned integer, ppm)
0x0003	0x03/0x04	TDS (16-bit unsigned integer, ppm)
0x0050	0x03/0x04/ 0x06/0x10	Temperature deviation value (16-bit signed integer, 10 times the actual value)
0x0051	0x03/0x04/ 0x06/0x10	Conductivity deviation value (16-bit signed integer, 1000 times the actual value for ranges 1-20; 100 times the actual value for ranges 1-200; 10 times the actual value for ranges 1-20000; actual value for ranges 10-20000)
0x0052,0x0053	0x03/0x04/ 0x16	Conductivity temperature compensation coefficient (floating-point big end)
0x0054,0x0055	0x03/0x04/ 0x16	Electrode Constant (Big Endian Floating-Point Number)
0x0110,0x0111	0x16	Calibration (Write 00 04 to register 0110H, write the calibration standard solution value to register 0111H; for ranges 1-20, the value is 1000 times the actual value; for ranges 1-200, the value is 10 times the actual value; for ranges 1-2000, the value is 10 times the actual value; for ranges 10-20000, the value is the actual value)
0x07D0	0x03/0x04/ 0x06/0x10	1~254 (16-bit unsigned integer, factory default 1)
0x07D1	0x03/0x04/ 0x06/0x10	0 represents 2400 1 represents 4800 2 represents 9600 3 represents 19200 4 represents 38400 5 represents 57600 6 represents 115200 7 represents 1200

3.4 Communication Protocol Example and Explanation

Example 1: Read the current conductivity and temperature of the device at address 01

Send frame:

Address code	Function code	Register addres	Register content	Low byte of checksum	High byte of checksum
0x01	0x03	0x00 0x00	0x00 0x02	0xc4	0x0b

Response Frame: (For example, a device with a measurement range of 0~2000μS/cm reads a conductivity value of 1000μS/cm and a temperature of 26.5℃)

Address code	Function code	Valid byte count	Register content	Low byte of checksum	High byte of checksum
0x01	0x03	0x04	0x27 0x10 0x01 0x09	0x30	0xd4

Conductivity calculation: 2710 (hexadecimal)=10000=> Conductivity=1000.0 μS/cm

Temperature calculation: 109H (hexadecimal) = 265 => Temperature = 26.5℃

Example 2: Setting a deviation value for the current conductivity value of the device at address 01 for numerical correction

Send frame: (If the current range of the device is 0~2000μS/cm, and the output conductivity value is 990, to correct the value to 1000, the difference is 1000-990=10, multiplied by 10 to 100 => 64H (hexadecimal), the register content is written as 00 64)

Address code	Function code	Register addres	Register content	Low byte of checksum	High byte of checksum
0x01	0x06	0x00 0x50	0x00 0x64	0x88	0x30

Response frame: (A mirror message that responds to the sent frame according to the MODBUS standard)

Address code	Function code	Register addres	Register content	Low byte of checksum	High byte of checksum
0x01	0x06	0x00 0x50	0x00 0x64	0x88	0x30

Example 3: Calibrate a device with a measurement range of 1~2000 at address 01 using a standard solution of 1413 μS/cm.

Frame Sending: Write 00 04 to addresses 0110H and 0111H respectively. 1413*10 is converted to hexadecimal as 37 32.

Address code	Function code	Register addres	Register length	Byte length	Register content	Low byte of checksum	High byte of checksum
0x01	0x10	0x01 0x10	0x00 0x02	0x04	0x00 0x04 0x37 0x32	0x29	0x17

Response frame: (A mirror message that responds to the downlink frame according to the ModBus standard)

Address code	Function code	Register addres	Register length	Low byte of checksum	High byte of checksum
0x01	0x10	0x01 0x20	0x00 0x02	0x41	0xfe

Chapter 4 Precautions and Maintenance

◆ WARNING: Risk of Personal Injury

This equipment is strictly prohibited from being used as a safety device, emergency stop device, or in any situation where personal injury may result from equipment malfunction.

◆ Usage Restrictions

This equipment is for use only as designed and within its authorized scope. Before installation, operation, or maintenance, the relevant instructions in the technical manual must be carefully read and understood. Failure to comply with the above warnings and guidelines may result in death or serious personal injury.

◆ The equipment itself generally does not require routine maintenance. In case of obvious malfunction, do not attempt to repair it yourself; contact us immediately!

◆ Before using the equipment, the conductivity electrode needs to be thoroughly shaken in the liquid being measured to remove any attached air bubbles. After that, the conductivity of the solution can be measured normally.

◆ Electrodes that are not used for a long period can generally be stored in a dry place. However, before use, they must be placed (stored) in distilled water for several hours to activate the electrodes. Electrodes that are used frequently can be placed (stored) in distilled water.

◆ Cleaning the Conductivity Electrodes:

Organic contaminants on the electrodes can be cleaned with warm water containing detergent, or with alcohol. Calcium and magnesium precipitates are best cleaned with 10% citric acid. Electrode plates or posts should only be cleaned chemically or by agitation in water. Wiping the electrode plates or posts will damage the plating (platinum black) on the electrode surface.

◆ The equipment should be calibrated before each use. For long-term use, it is recommended to calibrate every 3 months. The calibration frequency should be adjusted appropriately according to different application conditions (the degree of dirt in the application environment, the deposition of chemical substances, etc.)

Chapter 5 Warranty Information

This product is covered by a 12-month warranty from the date of purchase (based on valid proof of purchase). During the warranty period, under normal use and maintenance, if a malfunction is caused by defects in product materials or workmanship, we will provide free repair or parts replacement services after confirmation by our company. After the warranty period expires, we will still provide lifetime paid repair services.

1. The following situations are not covered by the warranty:
2. Damage caused by incorrect installation or operation.
3. Disassembly, repair, modification, alteration, or replacement of any parts by personnel other than our company's technicians, or replacement by the user.
4. Damage caused by negligent use or the introduction of water or other substances into the equipment.
5. Malfunctions or damage caused by unexpected events or natural disasters.
6. Malfunctions or damage caused by operating parameters exceeding the range listed in the product specifications.