Manual for Aqueous Conductivity Transmitter

RK-3001-TDS

Ver1.0

Chapter 1 Product Introduction

1.1 Introduction

The conductivity/hardness online analyzer is one of the intelligent online chemical analysis instruments. It is widely used in the EC value or TDS value and water temperature in solutions such as thermal power, chemical fertilizers, metallurgy, environmental protection, pharmaceuticals, biochemistry, food and tap water. Continuous monitoring. This product is equipped with a waterproof housing to convert the signal of the aqueous solution into a standard 485/4-20mA/0-10V signal through digital setting and analysis. The product does not need to be calibrated in one molding process and can be used immediately.

Parameters:

Parameter	Parameter content
DC power supply	12-24V DC
Power consumption	≤0.15W（@12V DC , 25℃）
Measurement accuracy	3%F.s
Output signal	485/4-20mA/0-10V
Water temperature range	-10℃-80℃（Manual / Auto）
Water temperature accuracy	0.1℃
responding speed	≤15s

Probe parameters:

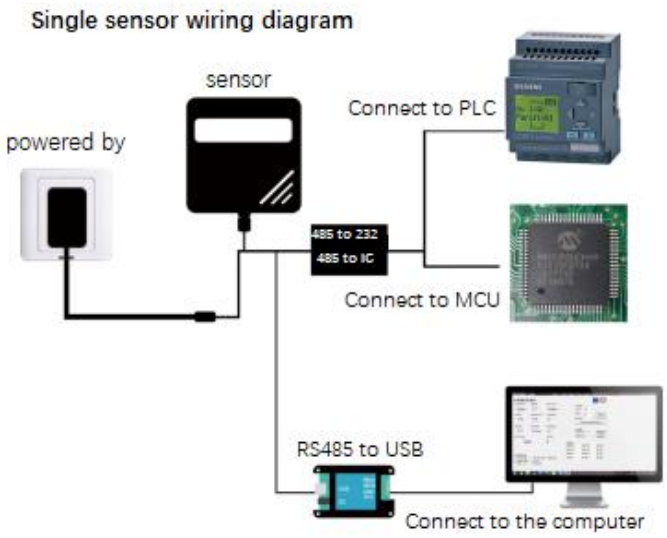
Electrode model	RK-K001	RK-K010	RK-K100	RK-K1000
K value	K=0.01	K=0.1	K=1	K=10
range	0-20us/cm	0-200us/cm	0-2000us/cm	0-20000us/cm
Resolution	0.001us/cm	0.001us/cm	0.01us/cm	0.1us/cm
Application occasions	Pure water detection	Drinking water testing	Tap water, river water	Sewage testing

Electrode material	stainless steel	stainless steel	stainless steel	Polysulfone
Installation thread	1/2 thread	1/2 thread	1/2 thread	3/4 thread
Probe cable length	5 meters (default)			

1.2 System framework diagram

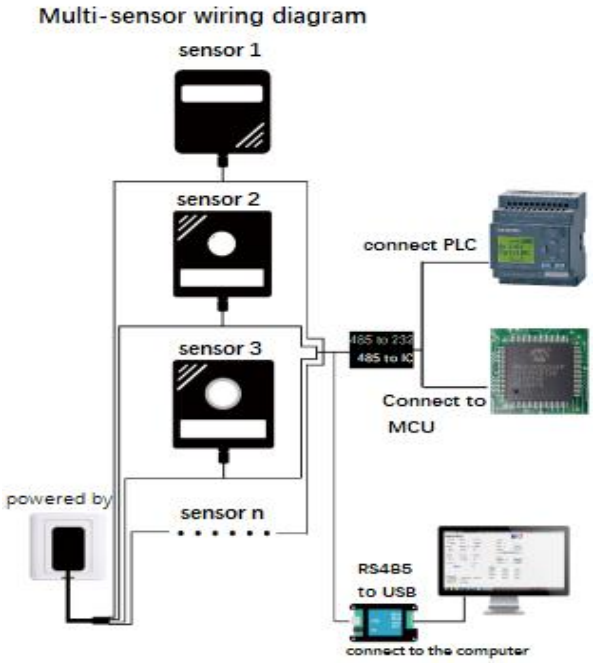
1.2.1 485 interface frame diagram

This sensor can be connected and used alone. First, use a 12V DC power supply. The device can be directly connected to a PLC with 485 interface, and it can be connected to a single-chip microcomputer through a 485 interface chip.The single-chip microcomputer and PLC can be programmed through the modbus protocol specified later to cooperate with the sensor.At the same time, use USB to 485 to connect to the computer, and use the sensor configuration tool provided by our company for configuration and testing.



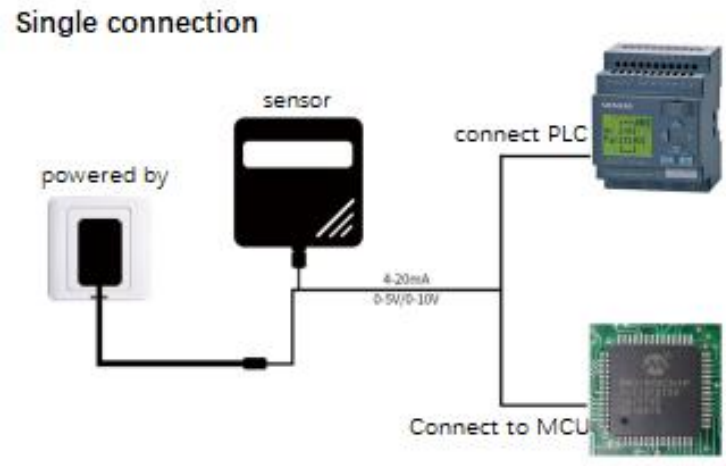
This product can also be used by combining multiple sensors on a single 485 bus. Please follow the "485 bus field wiring rules" (see appendix) when performing 485 bus combination.In theory, one bus can connect more than 16 485 sensors. If you need to connect more 485 sensors, you can use 485 repeaters to expand more 485 devices， The other end is connected to a PLC with a 485 interface, connected to a single-chip microcomputer through a 485 interface chip, or connected to a computer

using USB to 485, and configured and tested using the sensor configuration tool provided by our company.



1.2.2 Frame diagram of analog interface

The analog interface can be directly connected to the PLC data module, or the signal can be processed by the single-chip microcomputer, as shown in the figure below:



Chapter 2 Hardware Connection

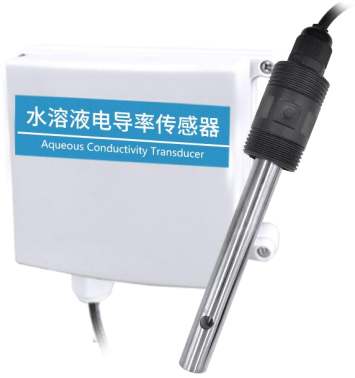
2.1 Inspection before equipment installation

Please check the equipment list before installing the equipment:

name	Quantity
High-precision sensor	1 set
12V waterproof power supply	1 set (optional)
Warranty card/certificate	1 serving

2.2 Interface description

The power interface can be a wide voltage power input of 12-24V. The product pays attention to the positive and negative of the signal line, and do not reverse the positive and negative of the signal line.



Wiring mode of 485 interface sensor:

	Thread color	Description
power supply	brown	Power supply positive (12-24VDC)
	black	Power negative
Communication	Yellow (gray) color	485-A
	blue	485-B

Analog interface sensor wiring mode:

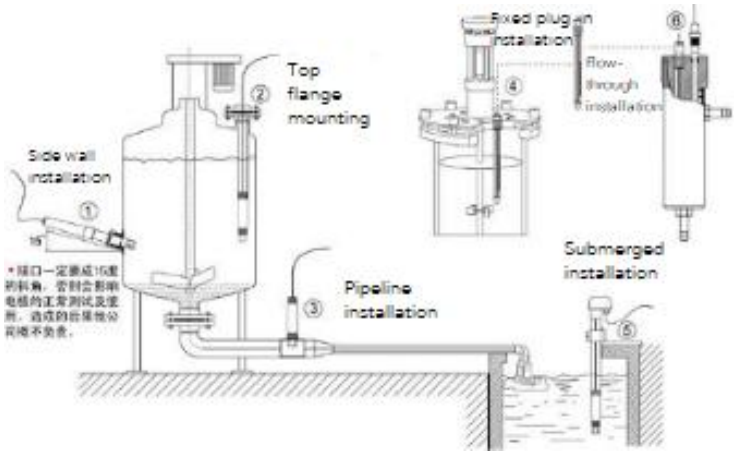
	Thread color	Description
power supply	brown	Power supply positive (12-24VDC)
	black	Power negative
Communication	Yellow (gray) color	Voltage/current output positive
	blue	Voltage/current output negative

The factory default provides 5 meters long wire, customers can extend the wire as needed or wire in order.

2.3 Installation instructions

This meter is wall-mounted. Please install it on the wall and try to avoid wind, rain and direct sunlight.In order to prevent the water temperature inside the instrument from rising, please install it in a well-ventilated place.When installing the instrument, please do not tilt it left or right, try to install it horizontally.

The electrode is a very precise component, and the correct installation method must be used. The wrong installation method will cause the electrode to be damaged or irreversibly damaged.Electrode adopts pipeline installation. Immersion type. Flange installation is all possible.



Please do not put the electrode directly into the water, you should choose the electrode mounting bracket or the flow cup to fix it.Before installation, be sure to use raw material tape (3/4 thread) to do a waterproof seal to prevent water from entering the electrode and causing short circuit of the electrode cable.

During the water cut, make sure that the electrode is immersed in the test liquid or wear a protective cap with a built-in protective liquid. In winter, if the water temperature is low for a long time, the antifreeze device should be added or the room should be returned to add water for storage.Otherwise, the service life will be shortened.

Chapter 3 485 interface communication protocol

3.1 Basic communication parameters

parameter	content
coding	8-bit binary
Data bit	8-bit
Parity bit	no
Stop bit	1 person
Wrong calibration	CRC lengthy cyclic code
Baud rate	2400bps/4800bps/9600 bps can be set, the factory default is 9600bps
coding	8-bit binary

3.2 Data frame format definition

Adopt Modbus-RTU communication protocol, the format is 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 time

Address code: the address of the transmitter, which is unique in the communication network (factory default 0x01).

Function code: The command function prompt sent by the host, this transmitter only uses the function code 0x03 (read memory data).

Data area: The data area is the specific query data area, pay attention to the 16bits data high byte first.

CRC code: two-byte check code.

Interrogation frame:

address code	function code	Register start address	Register length	Check code low bit	High bit of check code
1 byte	1 byte	2 byte	2 byte	1 byte	1 byte

Reply frame:

address code	function code	Number of valid bytes	Data area	Second data area	Nth data area
1 byte	1 byte	1 byte	2 byte	2 byte	2 byte

3.3 Register address

Register address	PLC configuration address	content	operating
0001H	40002	Water temperature (unit: 0.1℃)	Read only
0002H	40003	Conductivity (high byte) (unit refer to the probe selection table)	Read only
0003H	40004	Conductivity (low byte) (unit refer to the probe selection table)	Read only
0100H	40101	Device address (0-252)	Read and write
0101H	40102	Baud rate (2400/4800/9600)	Read and write

3.4 Communication protocol example and explanation

3.4.1 Read the conductivity value of device address 0x01

Interrogation frame:

address code	function code	initial address	Data length	Check code low bit	High bit of check code
0x01	0x03	0x00,0x02	0x00,0x02	0x65	0xCB

Response frame (e.g. read conductivity value of 1.89 conductivity)

address code	function code	Number of valid bytes	Conductivity value	Check code low bit	High bit of check code
0x01	0x03	0x04	0x00 0x00 0x00 0xBD	0x78	0x35

Conductivity (take the probe with K=1 as an example, the resolution is 0.01us/cm):

00BD H(Hexadecimal)=189=>Conductivity=1.89 us/cm

3.4.2 Read the water temperature value of the device address 0x01

Interrogation frame:

address code	function code	initial address	Data length	Check code low bit	High bit of check code
0x01	0x03	0x00,0x01	0x00,0x01	0xd5	0xca

Reply frame:

address code	function code	Number of valid bytes	Water temperature value	Check code low bit	High bit of check code
0x01	0x03	0x02	0x00 0xAF	0xDB	0xBF

Water temperature:

00AF H(hexadecimal)=175=>water temperature=17.5℃

3.4.3 Read device address 0x01 water temperature, conductivity concentration value

Interrogation frame:

address code	function code	initial address	Data length	Check code low bit	High bit of check code
0x01	0x03	0x00,0x01	0x00,0x03	0xA4	0x0B

Reply frame:

address code	function code	Number of valid bytes	Water temperature value	Conductivity value	Check code low bit	High bit of check code
0x01	0x03	0x06	0x01 0x1b	0x00 0x00 0x00 0x28	0xDB	0xBF

Water temperature:

011B H(hexadecimal)=283=>water temperature=28.3℃

Conductivity (take the probe with K=1 as an example, the resolution is 0.01us/cm):

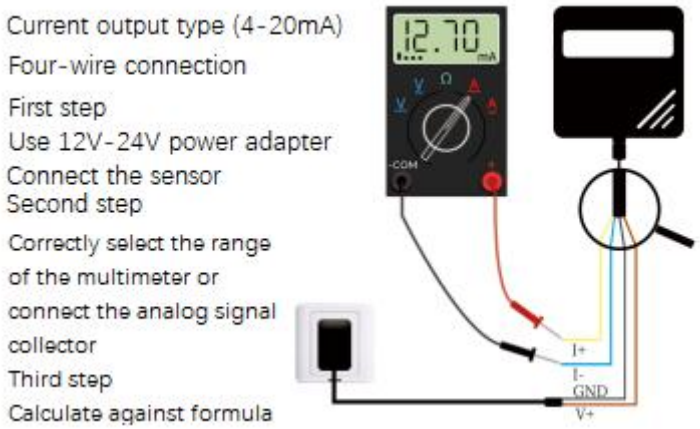
0028 H(Hexadecimal)=40=>Conductivity=0.4 us/cm

Chapter 4 Analog Wiring Instructions

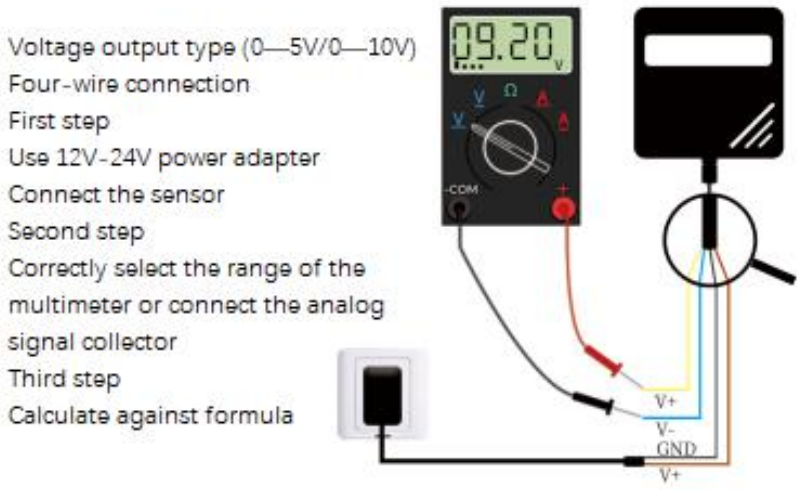
The analog sensor wiring is simple, just connect the wire to the designated port of the device. The device supports 3/4 wire connection.

4.1 Typical four-wire wiring method

The following figure shows the wiring method of current sensor. Connect the power cord (brown wire and black wire) of the sensor to the power source;The yellow (gray) color line of the sensor is the signal positive when the signal is connected to the acquisition device, and the current flow is from the sensor to the acquisition device;The blue line of the sensor is the negative signal when the signal is connected to the current acquisition device, and the current flow is from the acquisition device to the sensor.



The following figure shows the wiring method of voltage type sensor. Connect the power cord (brown wire and black wire) of the sensor to the power supply;The yellow (gray) wire of the sensor is the signal positive of the signal being connected to the acquisition device, and the voltage of the yellow (gray) wire is the output voltage;The blue line of the sensor is the negative signal when the signal is connected to the voltage acquisition device. The voltage of the blue line is the reference voltage, which is 0V consistent with the voltage of the black line.

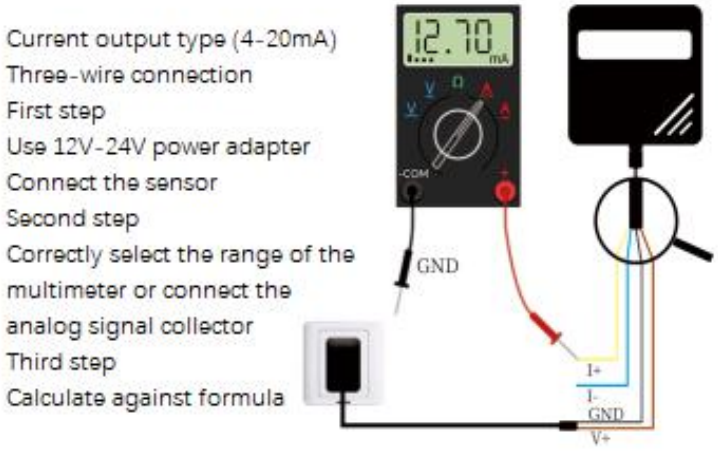


4.2 Typical three-wire wiring method

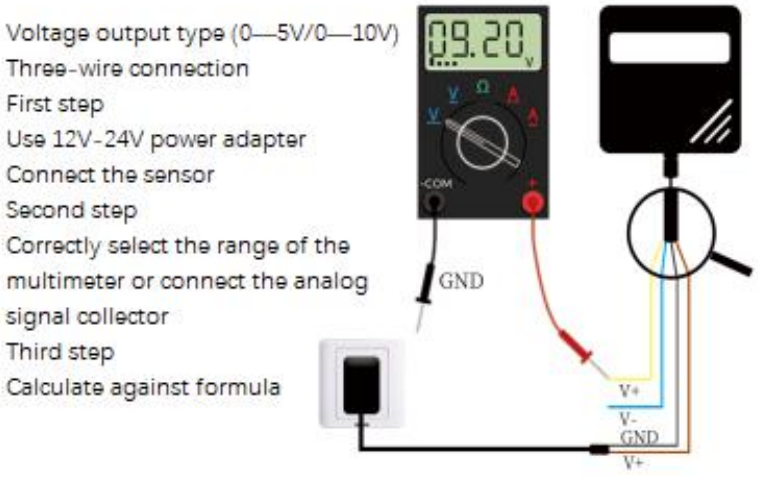
For typical three-wire wiring, compared to four-wire wiring, the blue wire can be

omitted. In the sensor, the blue wire and the black wire are short-circuited in the sensor, so the blue wire can be omitted.

For the three-wire current connection method, after connecting the power cord (brown wire and black wire) of the sensor to the power supply, only the yellow (gray) wire of the sensor is connected to the signal positive of the current acquisition device.



For the three-wire voltage connection mode, after connecting the sensor's power cord (brown wire and black wire) to the power supply, only the yellow (gray) wire of the sensor is connected to the signal positive of the voltage acquisition device.



Chapter 5 Meaning and Conversion of Analog Parameters

5.1 Analog 4-20mA current output

Current value	Conductivity
4mA	0
20mA	full range

The calculation formula is P(conductivity)=(I(current)-4mA)*full scale/16mA

The unit of I is mA. 4mA represents 0 point, and 20mA represents the maximum range linear conversion.

5.2 Analog 0-10V voltage output

Voltage value	Conductivity
0V	0
10V	full range

The calculation formula is P (conductivity) = V (voltage) * full scale/5000mV

The unit of V is mV. Please use 0V to represent 0 points and 10V to represent the maximum range linear conversion.

5.3 Analog 0-5V voltage output

Voltage value	Conductivity
0V	0
5V	full range

The calculation formula is P (conductivity) = V (voltage) * full scale/10000mV

The unit of V is mV. Please use 0V to represent 0 points and 10V to represent the maximum range linear conversion.