
Digital Conductivity Sensor Operation Manual



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Chapter 1 Specification

Specification	
Power supply	9-36VDC
Size	Diameter: 30mm* Length: 165mm
Weight	0.55KG
Material	Main: PP
	Cable: PVC
Waterproof Grade	IP68/NEMA6P
Scope of Measurement	0~30000 μ S/cm
	Temperature: 0-50°C
Display Accuracy	$\pm 1\%$ F.S
	Temperature: $\pm 0.5^{\circ}\text{C}$
Output	MODBUS RS485 /4-20mA (Optional)
Storage Temperature	0 to 45°C
Pressure Range	$\leq 0.3\text{Mpa}$
Calibration	Calibration of standard fluids and Alignment
Length of Cable	10m cable, can be extended to 100m
Warranty	Subject warranty is one year

Table 1: Conductivity Sensor technical specifications

Description: Product specifications are subject to change without prior notice.

Chapter 2 Product Introduction

It is used for continuous monitoring and control of conductivity / TDS and temperature values of aqueous solution. Widely used in power plant, petrochemical, metallurgy, paper, environmental protection water treatment, light industry electronics and other fields. Such as power plant cooling water, supply water, saturated water, condensate water and furnace water, ion exchange, reverse osmosis EDL, seawater distillation and other water production equipment raw water and water quality monitoring and control.

The sensor looks as shown in Figure 1. The sensor dimensions are shown in Figure 2.

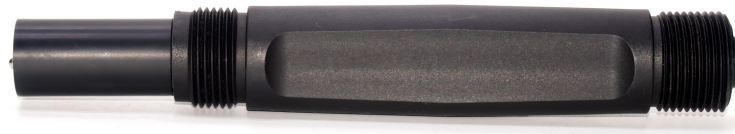


Figure 1: Conductivity Sensor appearance diagram

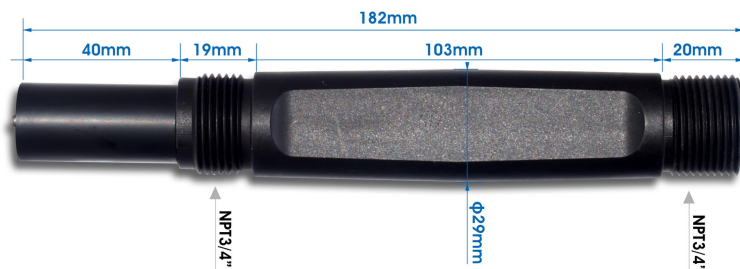


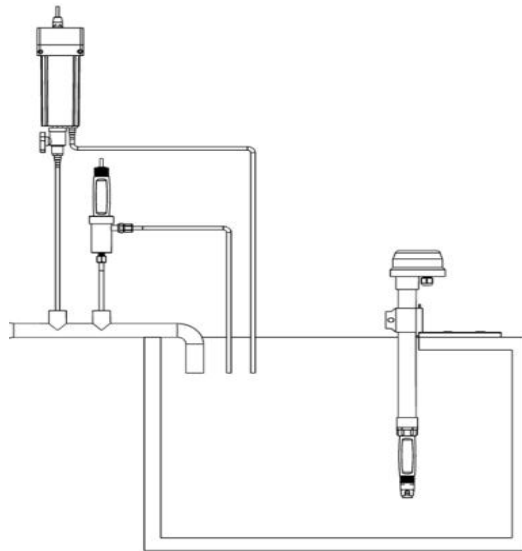
Figure 2: Conductivity Sensor dimensions

Chapter 3 Installation

3.1 Sensor installation

The specific installation steps are as follows:

Note: The plexiglass protection cap needs to be unscrewed before use to be able to measure.



Schematic diagram of the conductivity sensor installation

3.2 Connection of the sensor

The sensor is defined correctly connected according to the following wire core :

Core	1	2	3	4
Sensor color	Red	Black	Green	White
Signal	+9-36VDC	AGND	RS485 A	RS485 B

Chapter 4 Communication Protocol

The sensor is equipped with MODBUS RS485 communication function. Please refer to this manual 3.2 for communication wiring. The specific MODBUS-RTU table is shown below.

Communication configuration: 9600 N 8 1 Address: 2 can be modified through the broadcast address 254
communication protocol: MODBUS RTU

Salinity unit conversion: 1% = 10 PPT = 10000 PPM

Function code 03 read ; 06 modification

Add	Items	Default	Decimal	Range	Data type	Limitation
0-1	EC value	-	1	uS	Long int	Read-only
2-3	Temp. value	-	1	°C	Long int	Read-only
4-5	Electrode resistance	-	0	Ω	Long int	Read-only
6-7	Temp. resistance	-	0	Ω	Long int	Read-only
8-9	TDS		1	mg/L	Long int	Read-only
10-11	Salinity		2	PPT	Long int	Read-only
12	Calibration	1413	0		Signed int	Read-write
13	Buffer coefficient		0-5	0-5	Signed int	Read-write
14	Address	2		1-253	Signed int	Read-write
15	Temp. type	0	0	0: Auto 1: Manual	Signed int	Read-write
16	Manual temp.	250	1		Signed int	Read-write
17	Temp. fix	0	1		Signed int	Read-write
18	Linear comp.	1000	3		Signed int	Read-write
19	Dynamic fix	0	2		Signed int	Read-write
20	Electrode constant	100	2		Signed int	Read-write
21	Temp. coefficient	200	2		Signed int	Read-write
22	Baud rate	0	0	0:9600 1:19200 2:38400		Read-write
23	Parity bit	0	0	0: None 1: Odd 2: Even		Read-write

24	Solution 1 value	141			Concentration divided by ten	
25	Solution 2 value	1288			Concentration divided by ten	
26	Solution 1 measure value	141			Measured value divided by ten	
27	Solution 2 measure value	1288			Measured value divided by ten	

Chapter 5 Calibration of the sensors

The digital conductivity sensor has been calibrated before leaving the factory, and it can be operated according to the communication protocol if necessary.

Field calibration

To begin the calibration process, it is necessary to prepare a standard solution with a conductivity of "1413 μ S/cm" or other appropriate standard solution assumed to be 2000 μ S/cm. The digital conductivity sensor should then be immersed into the solution and allowed to stabilize until the value displayed at position "00-01" remains consistent. The "06" function code should be selected, followed by the entry of '12' on the 'Address' line. Enter the appropriate standard value, which should be "1413 μ S/cm" or the appropriate value assumed to be 2000 μ S/cm, in the "Value" input line. Click on the "Send" button, and wait for the display of the "Response OK" confirmation message in a pop-up window. This confirms that the digital conductivity sensor has been successfully calibrated on site.

It should be noted that as the data type of address 12 is a "Signed Int", the upper limit for the value to be entered is "32767". It is therefore essential that the standard liquid value be restricted to a maximum of "32767 μ S/cm".

The screenshot displays the software interface for sensor calibration. At the top, a menu bar includes File, Connection, Setup, Functions, Display, View, Window, and Help. Below the menu is a toolbar with various icons. A status bar at the bottom shows 'Tx = 71: Err = 0: ID = 2: F = 03: SR = 1000ms'. In the center, a list of registers is shown, with the following values highlighted in red boxes:

Register Address	Value
00000	0
00001	0
00002	0
00003	262
00004	595
00005	-30756
00006	0
00007	948
00008	0
00009	0
00010	0
00011	0
00012	1413
00013	0
00014	2
00015	0
00016	250
00017	0
00018	1000
00019	0
00020	45

Overlaid on the bottom right is a 'Write Single Register' dialog box. It contains the following fields and options:

- Slave: 2
- Address: 12
- Value: 1413
- Use Function:
 - ☒ 06: Write single regis
 - ☐ 16: Write multiple reg

The 'Send' button is highlighted in red.

Standard liquid calibration 1

Insert the digital conductivity sensor into the standard solution marked "84 $\mu\text{S}/\text{cm}$ " or another approved standard solution. Proceed to select the "06" function code, and input '24' on the 'Address' line. On the value line, designate '8' as the standard concentration divided by 10, with only integer bits accepted. Once completed, select "Send", and await the prompt of "Response OK" via pop-up display. Subsequently, allow the value displayed at position "00-01" to stabilize prior to selecting the "06" function code once more, and input '26' on the 'Address' line. On the "Value" line, input "the value displayed at 00-01 stable" as the approved solution concentration value divided by 10, only accepting integer bits. Upon completion, select "Send" once again and await the prompt of "Response OK" displayed via pop-up. Upon completion, the "00-01" will display the standard solution calibration value, signifying completion of the first point of calibration of the digital conductivity sensor!

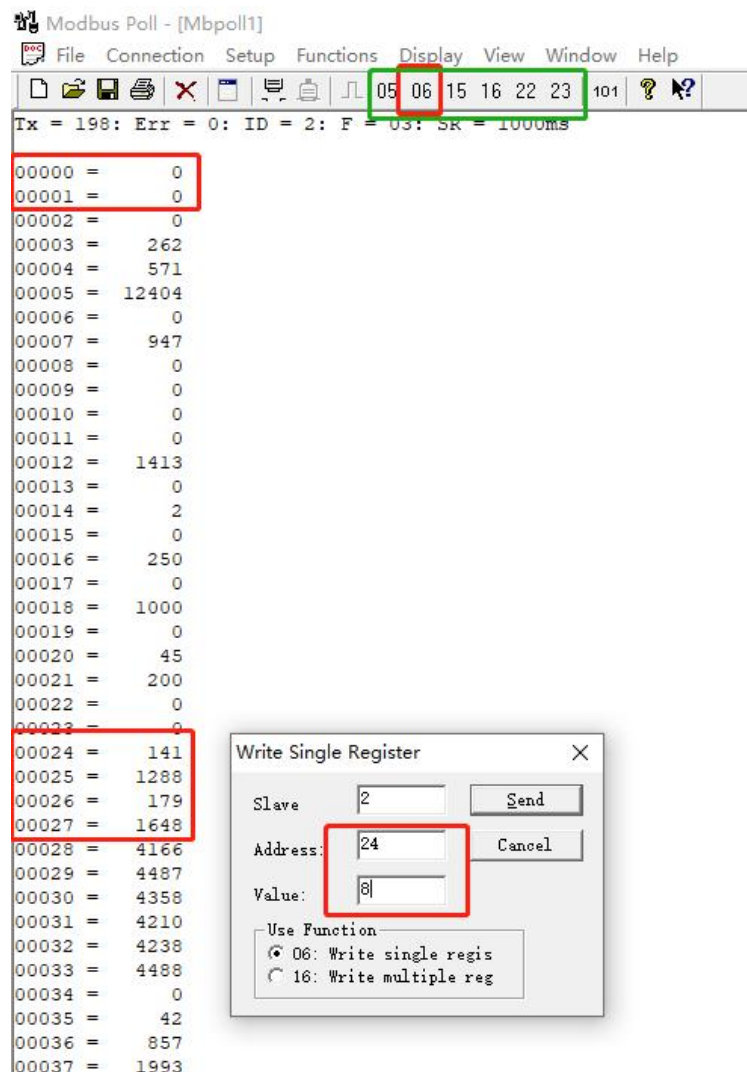
The screenshot shows the Modbus Poll software interface. The main window displays a list of registers (00000 to 00035) with their corresponding values. The registers 00000, 00001, 00024, 00025, 00026, and 00027 are highlighted with red boxes. The 'Write Single Register' dialog box is open, showing the following fields:

- Slave: 2
- Address: 24
- Value: 8
- Use Function: ☒ 06: Write single regis, ☐ 16: Write multiple reg

The 'Send' button is visible in the dialog box.

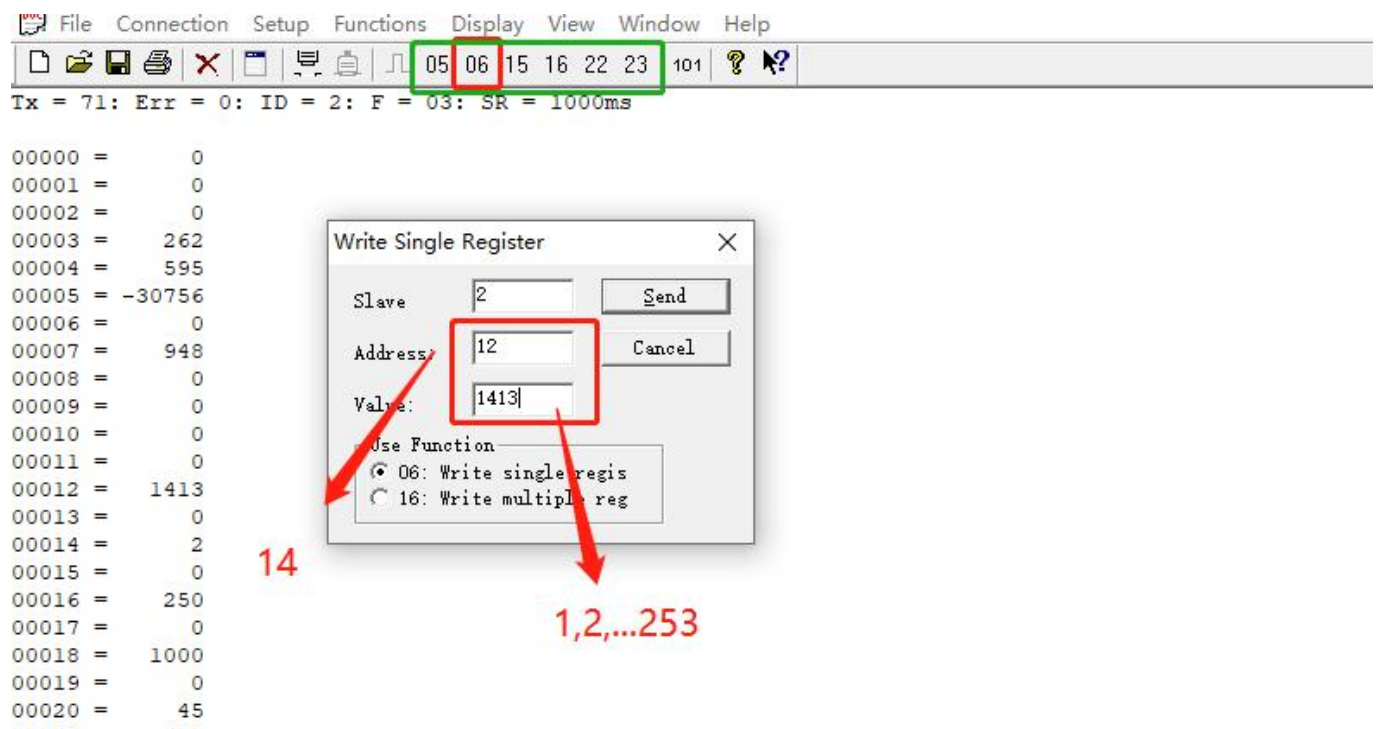
Standard liquid calibration 2

Insert the digital conductivity sensor into the designated "12.88ms/cm" standard solution or another suitable standard solution. Proceed to select function code "06" and enter the numerical value "25" on the designated "Address" line. Input "1288" as the standard solution concentration value on the "Value" line, ensuring only the integer component is taken into account. Click on the "Send" button, and observe the popup display indicating "Response OK". Wait until the value displayed in the "00-01" position stabilizes. Select function code "06" again, and input the numerical value "27" on the designated "Address" line. On the "Value" line, input the value previously displayed in the "00-01" position, ensuring only the integer component is considered. Click on the "Send" button, and observe the popup display indicating "Response OK". The "00-01" position will display the standard solution calibration value, signifying the successful completion of the second calibration point for the digital conductivity sensor!



Modify the sensor address

Upon successful connection of the digital conductivity sensor and MODBUS software, proceed to select the "06" function code. Enter "14" in the designated "Address" line and input either "1" or the specific address to be modified in the "Value" field. Upon completion, pressing "Send" will trigger a pop-up display indicating "Response OK", signifying a successful modification of the digital conductivity sensor address!



Conductivity Communication Explanation

The communication protocol adopts MODBUS (RTU) protocol, and the communication content and address can be changed according to the customer's needs.

The default configuration is network address 01, port rate 9600, no check, a stop bit, users can set the change;

Function code 03 instruction for example:

EC value =1892.0, Temperature value =27.6

Host sent: 02 03 00 00 00 0F 05 FD

Slave reply: 02 03 20 00 00 49 E8 00 00 01 14 00 00 14 F6 00 00 03 79 00 00 24 F4 00 00 00 60 05 85 00 00 00 02 00 00 45 3F

Explanation: 【02】 Represents the sensor address address;

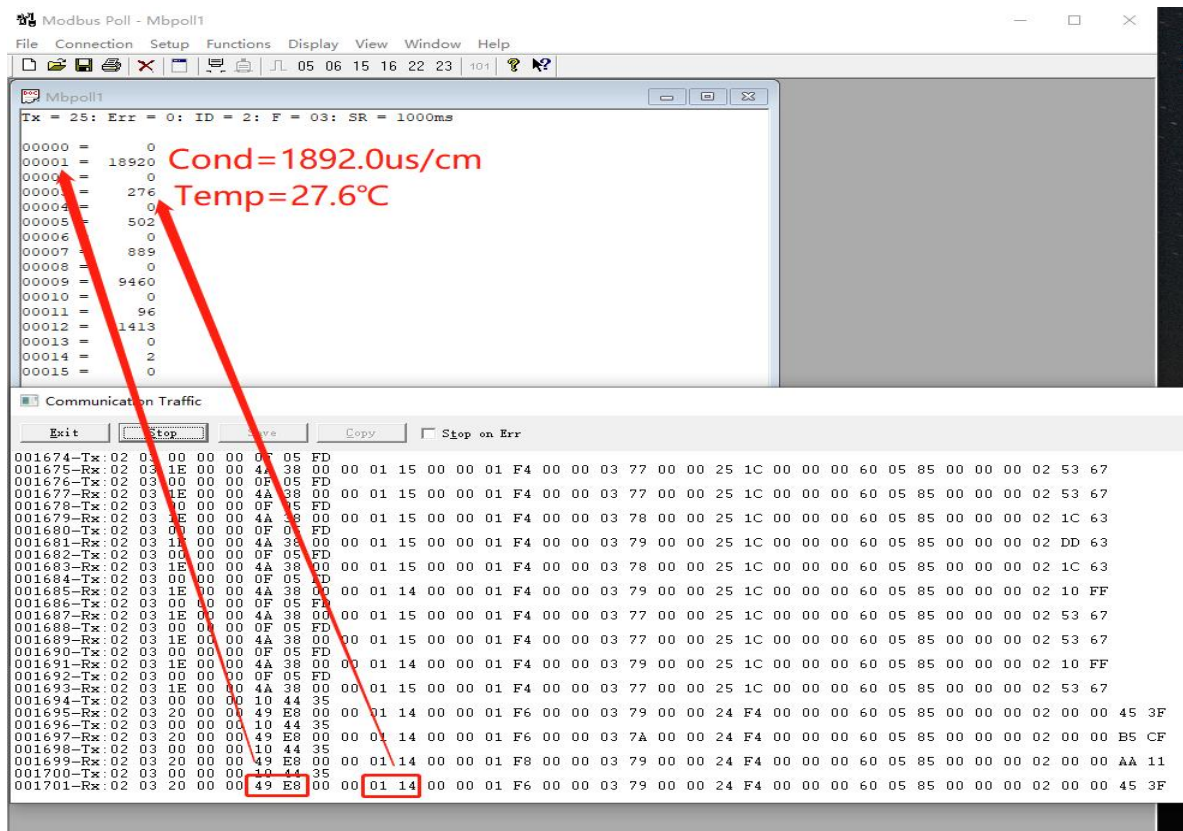
【03】 Representative function code 03;

【20】 Representative with 32 bytes of data;

【49 E8】 =18920; //EC value=1892.0μS/cm(1 decimal)

【01 14】 =276; //Temp. value=27.6°C(1 decimal)

【45 3F】 Represents the CRC 16 check code



Chapter 6 Maintenance

It is recommended that users check the conductive sensor once a year and send it to our company for assistance with the process as needed. The maintenance cycle of the cleaning sensor should be determined based on the cleaning degree of the water sample, and it is crucial to ensure that there is no dirty deposition on the internal or external surface of the sensor. For stainless steel and platinum conductivity sensors, it is important to clean them promptly with 50% warm detergent (or household soap powder) and a nylon wool brush, followed by a thorough washing with distilled water to prevent oil deposition on the sensor's surface. It is recommended that the conductance sensor not be touched with fingers; any adhesive sediment can be cleaned with a 2% dilute hydrochloric acid solution, followed by rinsing with water. In the case of the platinum black conductive sensor, it is recommended to clean the sensor head without using a brush or other items and only rinsing it with water. Finally, it is essential to keep the cable and plug dry to ensure reliable contact.

