Digital Conductivity Sensor

Introduction

Digital conductivity sensor is a new generation of intelligent water quality detection digital sensor independently developed by our company. Using high-performance CUP chip to complete conductivity measurement, data can be viewed, debugged and maintained by mobile phones and computers. It has the characteristics of easy maintenance, high stability, excellent repeatability and multi-function, and can accurately measure conductivity value in solution. It is widely used in continuous monitoring of conductivity value in solutions, such as thermal power, chemical fertilizer, metallurgy, environmental protection, pharmaceutical, biochemical, food and tap water.

Main features

- ✧ This product is conductivity digital sensor, which can directly output RS485/4-20mA signal.
- ✧ High precision, high stability and preferable ant jamming ability.
- ✧ No need instrument, can directly connect to computers, PLC and other devices with RS485 signal interface for data acquisition and maintenance. It's convenient for users to integrate data measured by sensors into the industrial control environment, such as host computer system and IOT.
- ✧ Using mobile phone APP, to collect, debug and maintain of the data through wired (OTG, and 485 transfer USB module) or wireless network (for example: WIFI, GPRS).
- ✧ The sensor can be set up by RE485 communication, such as slave address and Baud rate, online calibration, factory recovery, 4-20mA output corresponding range ,proportional coefficient, incremental compensation & so on

- ✧ Using three point correction methods.
- ✧ Power off protects > 10 years.

Technical indicators

- ✧ Measuring range: K=0.01，0-20uS/cm
  K=0.1, 0-200uS/cm
  K=1, 0-2000uS/cm
  K=10, 0~20.00 mS/cm
  K=30,0-300mS/cm
- ✧ Resolution: 0.01uS/cm, 0.1uS/cm, 1uS/cm, 0.01mS/cm,
- ✧ Accuracy: 2.0 %(FS)
- ✧ Automatic temperature compensation: 0~60℃. Tem compensation: NTC10K, PT1000 customizable.
- ✧ 485 interface: support for IOT, (partially compatible with MODBUS protocol).
- ✧ Working conditions: Ambient temperature is 0~60°C
- ✧ Input resistance: ≥1*1012Ω
- ✧ Output load: <750Ω 4-20mA (optional)
- ✧ Working voltage: DC5V, DC12V, or 24V
- ✧ Protection level: IP65
- ✧ Weight: 0.33kg

Wiring

Fig .1.0, Color Code of Wiring details

Digital Conductivity Sensor Communication Protocol

MODBUS-RTU	
Baud rate	9600（default）
Device No	1（default）
Data bit	8 digits
odd-even calibration	NO
Stop bit	1 digits

Register Setting

Register name	Address	type of data	length	Read / Write	Note
Display value	R0	unsigned	1	R	（1 decimal）
temperature	R1	unsigned	1	R	(2 decimal)
4mA output display value	R2	unsigned	1	R	（1 decimal）
20mA output display	R3	unsigned	1	R	（1 decimal）

value					
Rang lower limit	R4	unsigned	1	R	Default to 0
Rang upper limit	R5	unsigned	1	R	Default to 20000 (1 decimal)
Scale factor	R6	unsigned	1	R	（1 decimal）
Increment	R7	signed	1	R	（1 decimal）
Resolution	R8	signed	1	R	Default to 1
Product identification	R9	signed	1	R	Default to 3
Slave address	R10	unsigned	1	R	Range between 1-127
Baud rate	R11	unsigned	1	R	1200 2400 4800 9600 19200 38400 57600
Function calls	R12	unsigned	1	W	Find parameter settings for more details
parameter1	R13	unsigned	1	W	Find parameter settings for more details
parameter2	R14	unsigned	1	W	Find parameter setting formore details

MODBUS Instruction format

This sensor is compatible with 0x03, 0x06, 0x10 function codes of MODBUS protocol.

0x03 Command Format：

Definition	Address	Function Code	Initial Address	Number of Register	CRC calibration
Data	ADDR	0x03	Rstart	Rnum	CRC 16
Number of Bytes	1	1	2	2	2

Definition	Address	Function Code	Number of Data	Data	CRC calibration
Data	ADDR	0x03	Rnum*2	Data	CRC 16

Number of Bytes	1	1	1	Rnum*2	2

0x03 Return Format：

0x06 Command Format (same as command)：

Definition	Address	Function Code	Register Address	Data	CRC calibration
Data	ADDR	0x06	Raddr	Data	CRC 16
Number of Bytes	1	1	2	2	2

0x06 Return Format (same as command format) ：

Definition	Address	Function Code	Register Address	Data	CRC calibration
Data	ADDR	0x06	Raddr	Data	CRC 16
Number of Bytes	1	1	2	2	2

0x10 Command Format：

Definition	Add	Function Code	Initial Add	Number of Register	Number of Data	Data	CRC calibration
Data	ADDR	0x10	0x000C	0x0003	0x06	Data	CRC 16
Number of Bytes	1	1	2	2	1	6	2

0x10 Return Formats

Definition	Address	Function Code	Initial Address	Number of Register	CRC calibration
Data	ADDR	0x10	0x000C	0x0003	CRC 16
Number of Bytes	1	1	2	2	2

Data reading：

This sensor data is read using the 0x03 function code of the MODBUS protocol.

Example: Reading EC value and temperature value

Send command: 01 03 00 00 00 02 C4 0B

Return: 01 03 04 1A CC 09 C4 3A D7

The data part is**:** 1A CC 09 C4

EC Value: Data 0x1ACC, converted to decimal in 6860, EC value is 686.0uS/cm, reserved 1 decimal.

Temperature Value: Data 0x09C4, converted to decimal 2500, temperature value is 25.00, reserved 2 decimal.

Parameter adjustment：

1. Parameter adjustment of the sensor adopts 0x06 or 0x10 function code of MODBUS protocol.

2. It's divide into 3 steps in using using 0x06 function code to adjust parameters:

1) Write parameter 1 into register R13

2) Write parameter 2 into register R14

3) Write the function number into register R12

3. Use the 0x10 function code, and write the function number, parameter 1, and parameter 2 to the three registers starting from R12. It has same effect with write step by step.

4. When the function call is successful, the R12, R13, and R14 registers are all reset to 0. If the function call fails or the parameters are incorrect, the R14 register will display -1.

Function call parameter list

Function	Parameter 1	Parameter 2	Function number
Zero Calibration	Zero Cal*10	1	1
Slope Calibration	Slope Cal *10	2	1
Compensation Calibration	Compensate Cal*10	3	1
Manual temperature compensation	Temperature value*100	Any value	2

Change 4-20mA output range (customized）	4mA Output representative value	20mA representative value	3
Change Correction Factor	Scale factor	Display value increment	5
Change slave configuration	New slave number	New baud rate	6
Restore Factory Setting	Password 20034	Arbitrary value	7

Example: EC value calibration (using 0x10 function code)

Zero calibration: Standard liquid of conductivity is 73.0uS/cm, 73.0*10=730; convert to 16 bands is 0x02DA. Therefore, function number is 0x0001, parameter 1 is 0x02DA, and parameter 2 is 0x0001.

The data part is**:** 00 01 02 DA 00 01

Send command: 01 10 00 0C 00 03 06 00 01 02 DA 00 01 FA FC

Return**:** 01 10 00 0C 00 03 40 0B

Slope calibration: Standard liquid of conductivity is 1413.0uS/cm, 1413.0*10=14130, convert to 16 band is 0x3732. Therefore, function number is 0x0001, parameter 1 is 0x3732, and parameter 2 is 0x0002.

The data section is:00 01 37 32 00 02

Send command: 01 10 00 0C 00 03 06 00 01 37 32 00 02 35 05

Return: 01 10 00 0C 00 03 40 0B.

Attention and maintenance

1. If the electrode is not used, please store it in a dark, dry and ventilated environment.
2. The measuring electrode is a precision component, which is not decomposable. The shape and size of the electrode cannot be changed, and it is not possible to clean with a strong acid or alkali, so as not to change the electrode constant and affect the accuracy of the meter measurement. The measuring cable is a dedicated cable and cannot be replaced.
3. When measuring the electrode, it should be cleaned in distilled water (or deionized water) first and the filter paper should be used to absorb moisture to prevent impurities from being introduced into the liquid to be tested. Check if the terminal is dry. If there is dirt, please use absolute alcohol. Wipe, use after drying.
4. The electrode is used for a long time, and when a measurement error occurs, it must be calibrated with the meter. Make corrections.

When the calibration and measurement cannot be performed while maintaining and maintaining the electrode in the above manner, the electrode has failed. Please replace the electrode.