Digital PH Sensor

User Manual

GEC-PH485

Product configuration

Digital PH sensor is a new generation of intelligent water quality monitoring digital sensor developed by our company.The data can be viewed, debugged and maintained through mobile APP or computer. It has several advantages, such as simple maintenance, high stability, excellent repeatability and multi-function. It can accurately measure PH value and temperature value in solution. It is widely used in the system of waste water treatment, purified water, circulating water and boiler water,as well as the PH test in the fields of electronics, aquaculture, food, printing and dyeing, electroplating, pharmacy, fermentation, chemical industry, etc, and it has a strong function in the environmental monitoring of surface water and pollution discharge and the remote system application.

Main features

- This product is digital PH sensor, which can directly output RS485 signal and 4~20mA signal.
- The product has high accuracy, high stability and strong anti-interference ability.
- Automatic temperature compensation function.
- Without controller, it can directly connect computer, PLC and other equipment with RS485/4-20ma signal interface for data acquisition and maintenance.It is convenient for users to integrate sensors into the industrial control environment such as upper computer system and IoT.

- ✧ Use mobile APP to collect, debug and maintain the sensor data through wired (OTG line and 485 to USB module) or wireless network (such as WIFI and GPRS).
- ✧ The sensor can be set with RS485 communication for its slave address, baud rate, online calibration, factory reset, 4-20mA output corresponding range, proportional coefficient, incremental compensation and other settings.
- ✧ Two point correction is used.

Technical indicators

- ✧ Measuring Range:0.00-14.00PH, 1-100.0℃
- ✧ Accuracy: ±0.02 PH, ±0.3℃
- ✧ Stability: ≤0.01PH/24h
- ✧ Temperature compensation: 0-99.9℃(PH) PT1000
- ✧ 485 Interface: support for Internet of things (partial compatibility of MODBUS protocol)
- ✧ Working conditions: temperature of 0 ~ 60 ℃
- ✧ Input impedance: ≥1×1012Ω
- ✧ Output load: 4-20mA load<750Ω (optional)
- ✧ Working voltage: DC24V
- ✧ Protection grade: IP68
- ✧ Weight: 0.4kg

Wiring Instructions (DC24V):

RS-485A

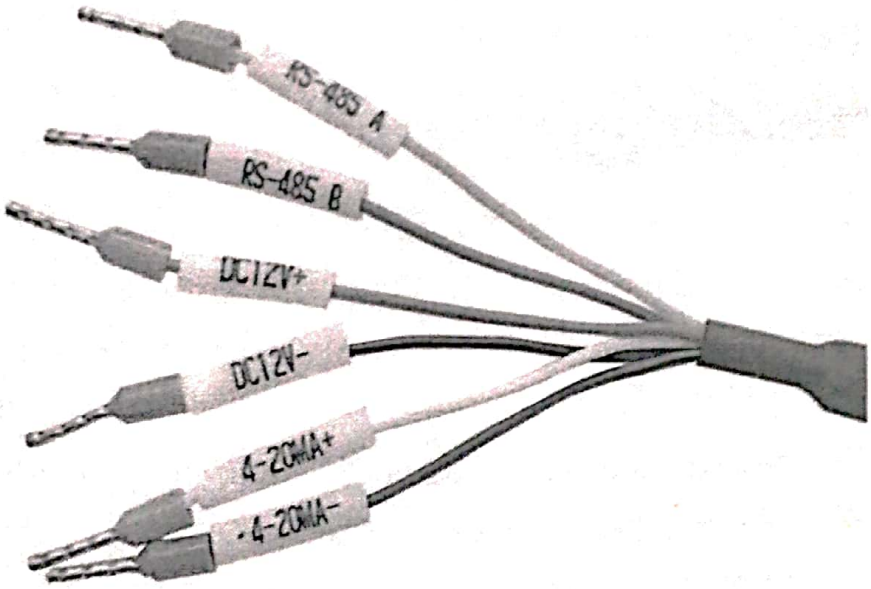
RS-485B

DC 12V/24V+

DC 12V/24V-

4-20mA+

4-20mA-



Digital PH 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	（3 decimal）
temperature	R1	unsigned	1	R	(2 decimal)
4mA output display value	R2	unsigned	1	R	（3 decimal）
20mA output display value	R3	unsigned	1	R	（3 decimal）
Rang lower limit	R4	unsigned	1	R	Default to 0
Rang upper limit	R5	unsigned	1	R	Default to 14000 (3 decimal)
Scale factor	R6	unsigned	1	R	（1 decimal）
Increment	R7	signed	1	R	（3 decimal）

Resolution	R8	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 settings for more details

MODBUS instruction format:

This sensor is compatible with MODBUS protocol 0x03, 0x06,

0x10 function code

Command format of 0x03

Definition	Address	Function code	Initial address	Number of registers	CRC verify
Data	ADDR	0x03	Rstart	Rnum	CRC 16
Number of bytes	1	1	2	2	2

Return format of 0x03

Definition	Address	Function code	Number of data	Data	CRC verify
Data	ADDR	0x03	Rnum*2	Data	CRC 16
Numb-er of bytes	1	1	1	Rnum* 2	2

Command format of 0x06

Definition	Address	Function code	Initial address	Data	CRC verify
Data	ADDR	0x06	Raddr	Data	CRC 16
Number of bytes	1	1	2	2	2

Return format (as in the command) of 0x06

Definition	Address	Function code	Register address	Data	CRC verify
Data	ADDR	0x06	Raddr	Data	CRC 16

Number of bytes	1	1	2	2	2

Command format of 0x01

Definition	Address	Function code	Initial address	Number of register	Number of data	Data	CRC verify
Data	ADDR	0x10	0x000C	0x0003	0x06	Data	CRC 16
Number of bytes	1	1	2	2	1	6	2

Return format of 0x01

Definition	Address	Function code	Initial address	Number of register	CRC verify
Data	ADDR	0x10	0x000C	0x0003	CRC 16
Number of bytes	1	1	2	2	2

Data reading

The sensor data is using MODBUS protocol 0x03 function code

Example: PH value and temperature value are read

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

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

The data section is: 1A CC 09 C4

PH value: data 0x1ACC, convert to decimal is 6860, PH is 6.860, with 2 decimal places reserved

Temperature value: 0x09C4 convert to decimal is 2500, temperature value is 25.00, and 2 decimal places are reserved.

Parameter adjustment:

1. The sensor parameter adjustment use the MODBUS protocol 0x06 or 0x10 function code.
2. Use 0x06 function code to adjust parameters into 3 steps
   1) write parameter 1 to register R13
   2) write parameter 2 to register R14
   3) write the function number to register R12
3. Using 0x10 function code, write function number, parameter 1 and parameter 2 to the three registers starting from R12 at one time.Equivalent to the step write effect.
4. When the function call is successful, all registers R12, R13 and R14 are reset to 0. If the function call fails or the parameters are not correct, register R14 will display -1

Function call parameter list

Function	Parameter 1	Parameter 2	Function Code
Zero calibration	zero PH value*1000	1	1

Slope calibration	Slope PH value*1000	2	1
Manual temperature compensation	Temperature value * 100	Any value	2
Change the 4-20ma output range (customized)	4mA output representative value	4mA output representative value	3
Modified coefficient	proportionality coefficient	Incremental value for indicating	5
Change configuration of slave	The new slave number	New baud rate	6
Restore factory setting	Password: 20034	Any value	7

Example: PH calibration (using 0x10 function code)

Zero calibration: PH value of standard solution is 6.86, 6.86*1000=6860, converted into hexadecimal 0x1ACC.Therefore, the function number is 0x0001, the parameter 1 is 0x1ACC, and the parameter 2 is 0x0001The data part is: 00 01 1A CC 00 01

Send order: 01 10 00 0C 00 03 06 00 01 1A CC 00 01 1D 98

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

Slope calibration: PH value of standard solution is 4.00, 4.00*1000=4000, converted into hexadecimal 0x0FA0.Therefore, the function number is 0x0001, the parameter 1 is 0x0FA0, and the parameter 2 is 0x0002

The data part is: 0001 0F A0 00 02

Send command: 01 10 00 c 00 03 06 00 01 of A0 00 02 99 88

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

Attention and Maintenance

1. The electrode has been calibrated by factory before send out, user can used it directly.If there are any doubt about the measured value, the PH standard buffer solution can be compared and the deviation can be re-calibrated. In order to improve the measurement accuracy, the PH value of the buffer should be stable, and it more closer to the measured value, the better. In generally, error range no more than 3 PH.
2. The sensitive glass bulb at the front of the electrode can not contact with the hard object.
3. Please keep the electrode socket clean and dry, and make sure the positive and negative electrode and voltage value correspond to the label before power supply.
4. Before the measurement, the bubble inside the glass bubble should be shaken out, otherwise the measurement error will be caused. During the measurement, the electrode should be placed at rest after being stirred in the test solution to accelerate the response.
5. Clean the electrode with deionized water before and after measurement.To ensure the measurement accuracy, the electrode should be used to remove the solvent by ion washing after the measurement in the viscous sample.
6. After long-term use, the electrode will be passivated, the sensitivity gradient decreases, the response is slow, and the numerical value is not accuracy. At this point, the bulb at the lower end of the electrode can be soaked for several hours with 0.1mol/L diluted hydrochloric acid (0.1mol/L diluted hydrochloric acid: 9mL hydrochloric acid was diluted with distilled water to 1000mL), and then soaked for several hours with 3mol/L KCL solution to restore its performance.
7. The electrode should be used for about one year, and new electrodes should be replaced after aging.

8. Glass bulb pollution or blockage of liquid interface will also cause passivation of the electrode. At this time, the electrode should be cleaned with appropriate solution according to the nature of pollutants, as shown in the following table.(for information)

Pollutant	Abluent:
Inorganic metal oxides	Less than 1 molar of hydrochloric acid
Organic oils	Dilute detergent (weak alkaline)
Resin polymer	Dilute alcohol, acetone, ether
Protein blood cell deposits	Acidic enzyme solution (such as pepsin)
pigments	Dilute bleach solution, hydrogen peroxide