Product Name	**Water Quality Monitoring Sensor**
Product SKU	**GAOTek-IOTS-137**
Product URL	**https://gaotek.com/product/gaotek-iot-water-quality-monitoring-sensor-2/**

Contact us: sales@gaotek.com

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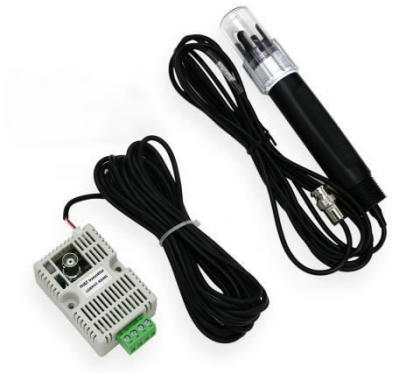
1. Product Introduction



1.1 Description

The product is convenient to connect with all kinds of control devices and display instruments to achieve on-line monitoring of pH and temperature status. This product is widely applied to all kinds of occasions that need to measure and control pH and temperature.

1.2 Features

- Small in size, Light in weight
- Easy to install and maintain
- The standard industrial signal output (0-5V, 0-10V, 4-20MA, ModbusRTU485)
- Can satisfy all kinds of real-time monitoring equipment on the spot.

1.3 Applications

Electroplating, fermentation, food processing, sewage treatment, metallurgy, environmental protection.

1.4 Technical Parameters

Technical parameter	parameter values	
measuring range	PH	0.0~14.0PH
	Temperature	-20℃ ~ +80℃
measurement accuracy	PH	±0.1PH
	Temperature	±0.5℃
working voltage	DC:12V ~ 24V (ripple< 50mV)	
Signal output	DC0-5V DC0-10V 4-20mA ModbusRTU485	
Power waste	< 1W	
Storage environment	Temperature	10℃-50℃ (-20℃ ~ +80℃ peak)
	Humidity	20-60%RH
work environment	Transmitter	-20℃ ~ +80℃
	pH electrode	-0℃ ~ +50℃
Shape size	65mm*46mm*28.5mm	

Note: The pH electrode cannot be placed in a solution with a negative temperature, otherwise it will cause the bulb at the front end to burst.

2. Product Installation

2.1. Electrical Diagram

	0-5V/0-10V	4-20mA	RS485
T/B	Temperature voltage signal	Temperature current signal	485-/B
GND	Power ground	Power ground	Power ground
PH/A	PH voltage signal	PH current signal	485+/A
VCC	Power positive 12-24v	Power positive 12-24v	Power positive 12-24v

2.2. Mounting Diagrams

Through the two holes on the left and right sides or the upper holes on the top of the red latch, the transmitter is fixed with M5 screws.

Rail installation;

3. Type summary

Product number	Range	pH electrode	Output Signal
LD144AA	0.0~14.0pH, -20℃~+80℃	without	0-5V
LD144AB	0.0~14.0pH, -20℃~+80℃	without	0-10V
LD144AC	0.0~14.0pH, -20℃~+80℃	without	4-20mA
LD144AD	0.0~14.0pH, -20℃~	without	RS485

	+80℃		
LD144BA	0.0~14.0pH, -20℃ ~ +80℃	ABS electrode	0-5V
LD144BB	0.0~14.0pH, -20℃ ~ +80℃	ABS electrode	0-10V
LD144BC	0.0~14.0pH, -20℃ ~ +80℃	ABS electrode	4-20mA
LD144BD	0.0~14.0pH, -20℃ ~ +80℃	ABS electrode	RS485
LD144CA	0.0~14.0pH, -20℃ ~ +80℃	PTFE electrode	0-5V
LD144CB	0.0~14.0pH, -20℃ ~ +80℃	PTFE electrode	0-10V
LD144CC	0.0~14.0pH, -20℃ ~ +80℃	PTFE electrode	4-20mA
LD144CD	0.0~14.0pH, -20℃ ~ +80℃	PTFE electrode	RS485
LD144DA	0.0~14.0pH, -20℃ ~ +80℃	Stainless steel electrode	0-5V
LD144DB	0.0~14.0pH, -20℃ ~ +80℃	Stainless steel electrode	0-10V
LD144DC	0.0~14.0pH, -20℃ ~ +80℃	Stainless steel electrode	4-20mA
LD144DD	0.0~14.0pH, -20℃ ~ +80℃	Stainless steel electrode	RS485

4. Output signal

4.1. Analog output

“Iout” means the current output value.“Vout” means the voltage output value.

4.1.1 4-20mA calculation formula

PH value = 0.875*Iout-3.5

Temperature value = 6.25*Iout-45

4.1.2 0-5V calculation formula

PH value = 2.8*Vout

Temperature value = 20*Vout-20

4.1.3 0-10V calculation formula

PH value =1.4*Vout

Temperature value = 10*Vout-20

4.2. RS485 output

4.2.1 Communication Basic Parameters

Date interface	Data bits	Stop bit	Parity check	Baud rate
RS485	8	1	No	9600bps

Checking method: A001 or 8005 reverse order

4.2.2 Register Description

Register name	Register number	Characteristic
Temperature	0X00	Read-only
PH	0X01	Read-only
ID	0X64	Read-Write
Baud rate	0X65	Read-Write

4.2.3 Communication Protocol Format and Examples

4.2.3.1 Read Address (Only used in stand-alone mode)

Send

ID	Function code	Register start address	Register	CRC_L	CRC_H

				number			
FA (common address)	03	00	64	00	01	D0	5E

Return

ID	Function code	Data length	Data (high order first)		CRC_L	CRC_H
FA (common address)	03	02	00	01	9C	50

Indicates that the module ID is: 0x01.

4.2.3.2 Modify Address

Send

ID	Function code	Register start address		ID		CRC check	
FA (common address)	06	00	64	00	(1-247)	CRC_L	CRC_H

When the data returned by the module is consistent with the sent data, it indicates that the ID modification is successful.

4.2.3.3 Modify baud rate

ID	Function code	Register start address		ID		CRC check	
FA (common address)	06	00	65	00	01: 2400 02: 4800	CRC_L	CRC_H

					03: 9600 04: 19200 05: 38400		

When the data returned by the module is consistent with the sent data, it indicates that the baud rate has been modified successfully. The module needs to be restarted to use the new baud rate.

4.2.3.4 Read Data

Send

ID	Function code	Register start address		Register number		CRC check	
(1-247)	03	00	00	00	02	CRC_L	CRC_H

Example: send "01 03 00 00 00 02 C4 0B" when the ID is 01

Return

ID	Function code	Data length	Temp Data_Low	Temp Data_High	PH Data_Low	PH Data_Low	CRC_L	CRC_H
01	03	02	01	2A	00	47	92	37

4.2.3.5 Calculation Method

Example: module returns data "01 03 02 01 2A 00 47 92 37"

Temperature calculation: (temperature data_high * 256 + temperature data_low) / 10.0

0x012A converted to decimal is 298: 298/10.0=29.8℃

PH calculation: (PH data_high * 256 + PH data_low) / 10.0

0x0047 converted to decimal is 71: 71/10.0=7.1pH

5. Transmitter calibration

5.1. Preparation of Calibration Solution

A. Use 25°C deionized water to prepare pH4.00 and pH9.18 calibration solution

B. Wash the two 250ml measuring cups with deionized water, and mark PH4.00 and PH9.18 on the outside of the two measuring cups respectively.

C. Put the PH4.00 buffer powder into the measuring cup marked as PH4.00 in step A.

D. Rinse the inner wall of the plastic bag with deionized water, pour it into the corresponding measuring cup, then dilute to the 250ml mark with deionized water, shake well and set aside.

E. Put the PH9.18 buffer powder into the measuring cup marked as PH9.18 in step B.

F. Rinse the inner wall of the plastic bag with deionized water, pour it into the corresponding measuring cup, then dilute to the 250ml mark with deionized water, shake well and set aside.

G. If the prepared calibration solution needs to be reused, please keep it sealed, and it can only be reused under the premise that the calibration solution is not polluted.

5.2. Calibrate the transmitter

A. Before calibration, it is necessary to observe whether there are air bubbles in the electrode glass bulb. If there are air bubbles, it will cause errors in the calibration. It is necessary to shake the electrode to make the air bubbles disappear.

B. The electrodes need to be kept active before calibrating. If the bulb has not been in the solution of the front cover, it is necessary to unscrew the front cover and soak the electrode in the 3Mkcl solution for several hours. Reactivate the electrodes.

C. Clean the electrodes and temperature sensor with deionized water and dry them with soft paper towels.

D. Correctly connect the transmitter power supply, pH electrode and temperature sensor.

E. Immerse the electrode and temperature sensor in the prepared pH4.00 calibration solution at the same time.

F. Click the calibration button to switch the calibration indicator light to green, and enter the PH4.0 calibration preparation state.

G. After putting the pH electrode and the temperature electrode into the pH4.0 standard solution at the same time, press and hold the calibration button. When the calibration indicator enters the green light flashing, the module enters the pH4.0 calibration (this process lasts for 20 seconds). At this time, you can Release the button. After calibration, the calibration indicator light is solid yellow.

H. Click the calibration button again to switch the indicator light to steady red, and enter the PH9.18 calibration preparation state.

I. Take the electrode and temperature sensor out of the PH4.00 calibration solution, then clean the electrode and temperature sensor with deionized water and dry them with a soft tissue (this process does not need to remove the electrode and temperature sensor from the transmitter).

J. Immerse the electrode and temperature sensor into the prepared pH9.18 calibration solution at the same time. Long press the calibration button, when the calibration indicator enters the red light flashing, it means that the module enters the pH9.18 calibration (this process lasts for 20 seconds), and then release the button. After calibration, the calibration indicator light is solid yellow.

Note:

A. When calibrating, you need to put the temperature electrode into the solution together.

B. If the temperature probe or electrode is damaged, loose, or mismatched during the calibration process, the calibration indicator will flash red and green alternately, and the calibration data will not be saved.

C. During the calibration process, if the electrode and the temperature probe detect no faults, the transmitter will automatically store the data of the current round of calibration, and the calibration indicator will always light yellow, indicating that the current round of calibration is over.

D. During normal use, if the electrode or temperature probe is loose, the calibration indicator light will flash red and green alternately to give an alarm.

6. Repair and Maintenance

A. Generally, the electrodes are cleaned every two weeks. This time varies depending on the condition of the water sample.

B. Calibrate the transmitter with calibration fluid once a month. This time varies depending on the condition of the water sample.

C. When the sensor output stabilization time is too long (usually less than 10 seconds) or the sensor response is slow, clean the electrode with 0.1mHCL regeneration solution.

D. When the transmitter cannot be calibrated, if the calibration is still not successful after replacing the new electrode, please contact our company.

7. Notes

A. Turn off the power when installing and replacing, and check whether the lead wires are correct before turning on the power.

B. When the module is not used for a long time, it needs to be stored in a dry environment.

C. When the electrode is not used for a long time, it is necessary to reactivate the electrode before use.

D. Some functional indicators of the product may be modified, and the indicators on the product logo shall prevail.

E. After the electrode service life reaches 12 months, aging will occur. It will ensure the accuracy of the data, and it is necessary to replace the new electrode and recalibrate in time.