pH Water Quality Sensor Module

(Model：ZW-Ph103)

Manual

Version： 1.0

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Zhengzhou Winsen Electronic Technology Co., Ltd

Statement

Thanks for purchasing our product. In order to let customers use it better and reduce the faults caused by misuse, please read the manual carefully and operate it correctly in accordance with the instructions. If users disobey the terms or remove, disassemble, change the components inside of the sensor, we shall not be responsible for the loss.

The specific such as color, appearance, sizes &etc, please in kind prevail.

We are devoting ourselves to products development and technical innovation, so we reserve the right to improve the products without notice. Please confirm it is the valid version before using this manual. At the same time, users' comments on optimized using way are welcome.

Please keep the manual properly, in order to get help if you have questions during the usage in the future.

Zhengzhou Winsen Electronics Technology CO., LTD

ZW-pH103 pH water quality sensor module

Profile

The ZW-pH103 pH water quality sensor module is a universal module that uses electrochemical principles to detect the H + content in water, with good selectivity and stability. It adopts TTL output, which is easier to use. ZW-pH103 is designed and manufactured with mature electrochemical detection technology closely combined with sophisticated circuit design.

Sensor characteristics

Low power consumption, high accuracy, linear output, easy calibration and excellent stability.

Main application

It is widely used for water quality pH detection in laboratory research, water plant water supply, waste-water treatment, aquaculture, farmland irrigation and other fields.

Technical indicators

Chart 1

Model	ZW-pH103
Detect Parameter	pH
Range	1～14
Work Voltage	DC 9～36 V
Response time	＜3S
Repetitive	＜±3%
Linearity	＜±5%
Output Model	TTL output
Lifespan	3 yrs (in normal condition)
Work Temp.	0 ～ 50℃
Stock Temp.& Humidity	T：10～30℃
	H：15% ～ 90%RH non-condensing

Pin Definitions

Chart 2

Vin	Power
GND	Power ground
Rx	TTL Input
Tx	TTL Output

Communication Protocol

1.General settings

Chart 3

Baud rate	9600
Data byte	8
Stop byte	1
Check	Null

2.Communication description

The module is configured with an active upload communication mode by default when leaving the factory. In this mode, the module sends the current concentration value (in hexadecimal) externally every second.

If switching to the query-response mode is required, send the 0x78 command to change the communication mode to 0x41 (query-response). In this mode, the module will send the current concentration value only after receiving the 0x86 command (read module concentration). A recommended communication cycle is 1 second.

Frame Format Description: Each data frame has a fixed length of 9 bytes. The start byte is fixed at 0xFF, followed by a 1-byte command, 6 bytes of data, and a 1-byte checksum.

Chart 4

0	1	2	3	4	5	6	7	8
Initial	Command	Data1	Data 2	Data 3	Data 4	Data 5	Data 6	Calibration value
0xFF								

Note: Calibration value=0-(Command+Data1+…Data6)

3.Communication command

(1) Active sending mode

Chart 5

	Command:0x86	Active sending mode							
Receive	0	1	2	3	4	5	6	7	8
	Initial	Command	Sensor pH value		Gas code	Decimal	Sensor Temp value		Calibration value
	0xFF	0x86	High byte	Low byte	0x3A	0x02	High byte	Low byte	0x83
Example	FF 86 02 AE 3A 02 01 0A 83 （Assume PH value is 6.86, Temp. is 26.6℃）								

Note 1: pH value = (pH high byte * 256 + pH low byte) * pH resolution

Note 2: Temperature value = (Temperature high byte * 256 + Temperature low byte) * 0.1℃

Note 3: The decimal digit value of 0x00 indicates a resolution of 1.

The decimal digit value of 0x01 indicates a resolution of 0.1.

The decimal digit value of 0x02 indicates a resolution of 0.01.

Note 4: The default resolution for the temperature value is 0.1℃

(2) Sensor's communication mode changing

Chart 6

	Command: 0x78	Change communication mode（communication mode: 0x40 active upload 0x41 query-response）							
Send	0	1	2	3	4	5	6	7	8
	Initial	Address	Command	communication mode	--	--	--	--	Calibration value
	0xFF	0x01	0x78	0x40: active upload 0x41: query-response	0	0	0	0	0x46
Example	FF 01 78 41 00 00 00 00 46（switch to query-response mode）								
Receive	0	1	2	3	4	5	6	7	8
	Initial	Command	Back	--	--	--	--	--	Calibration value
	0xFF	0x78	Success: 1 Fail: 0	0	0	0	0	0	0x87 0x88
Example	FF 78 01 00 00 00 00 00 87								

Note: To switch to active upload mode, send FF 01 78 40 00 00 00 00 47 (hexadecimal).

(3) Sensor's pH value and temperature reading

Chart 7

1	0x86	Read the pH value and temperature							
Send	0	1	2	3	4	5	6	7	8
	Initial	Address	Command	--	--	--	--	--	Calibration value
	0xFF	0x01	0x86	0	0	0	0	0	0x79
Example	FF 01 86 00 00 00 00 00 79								
Receive	0	1	2	3	4	5	6	7	8
	Initial	Command	Sensor’s concentration		Gas code	Decimal	Sensor’s Temp.		Calibration value
	0xFF	0x86	High byte	Low byte	0x3A	0x02	High byte	Low byte	0x83
Example	FF 86 02 AE 3A 02 01 0A 83 （Assume PH value is 6.86,Temp. is 26.6℃）								

Note 1: pH value = (pH high byte * 256 + pH low byte) * pH resolution

Note 2: Temperature value = (Temperature high byte * 256 + Temperature low byte) * 0.1℃

Note 3: The decimal digit value of 0x00 indicates a resolution of 1.

The decimal digit value of 0x01 indicates a resolution of 0.1.

The decimal digit value of 0x02 indicates a resolution of 0.01.

Note 4: The default resolution for the temperature value is 0.1℃

(4) Sensor pH value calibrating

Chart 8

1	Command: 0x88	Sensor pH value calibration							
Send	0	1	2	3	4	5	6	7	8
	Initial	Address	Command	Calibrated pH		Calibrate point	--	--	Calibration value
	0xFF	0x01	0x88	High byte	Low byte	0～9	0	0	0xC6
Example	FF 01 88 02 AE 01 00 00 C6 (PH value 6.86, Calibrate point is 1)								
Receive	0	1	2	3	4	5	6	7	8
	Initial	Command	Back	--	--	--	--	--	Calibration value
	0xFF	0x88	Success: 1 Fail: 0	0	0	0	0	0	0x77
Example	FF 88 01 00 00 00 00 00 77(calibration success)								

Note 1: There must be at least 2 calibration points and no more than 10. The pH values should be

arranged in ascending order, corresponding to calibration points 0 to 9, and the sequence must not be altered.

Note 2: If there are fewer than 10 calibration points, the calibration should start from point 0 and proceed in ascending order without any gaps.

Note 3: After the calibration is successful, the sensor will restart and use the new calibration data for calculations.

(5) Sensor address changing

Chart 9

1	Command: 0x8B	传感器地址修改							
Send	0	1	2	3	4	5	6	7	8
	Initial	Origin address	Command	Command	Target address	--	--	--	Calibration value
	0xFF	0x01or0 xFF	0x8B	Read: 0 Write:1	0x02	0	0	0	0x73
Example	FF FF 8B 01 02 00 00 00 73 (Change the address to 0x02)								
Receive	0	1	2	3	4	5	6	7	8
	Initial	Command	Back	--	--	--	--	--	Calibration value
	0xFF	0x8B	Success:1 Fail: 0	0	0	0	0	0	0x74
Example	FF 8B 01 00 00 00 00 00 74(Success)								

Note 1: The original address in the data packet can either be the sensor's own address or the broadcast address 0xFF. If it is the sensor's own address, only the matching sensor will respond to the command. If it is the broadcast address 0xFF, all sensors will respond.

Note 2: After the address is successfully modified, the sensor will restart and use the new address for communication.

4. Calibration value calculation

```
/**************************************************************************
* Name: unsigned char FucCheckSum(unsigned char *i,unsigned char ln)
* Function Description: Checksum (sum the 1st to 7th bytes of the send and receive protocol, take the bitwise negation, and add 1).
* Function Description: Sum the elements from the 1st to the second-to-last element of the data packet, then take the bitwise negation and add 1 (the number of elements must be greater than 2).
```

```
**********************************************************************/
unsigned char FucCheckSum(unsigned char *i,unsigned char ln)
{
    unsigned char j,tempq=0;
    i+=1;
    for(j=0;j<(ln-2);j++)
    {
        tempq+=*i;
        i++;
    }
    tempq=(~tempq)+1;
    return(tempq);
}
```

Precautions

1. The module shall avoid contact with organic solvents, coatings, agents and oils.

2. Do not apply the module to systems involving personal safety.

3. Do not install the module in a strong air convection environment.

4. The module shall not withstand excessive impact or vibration, and can not shake during use, otherwise the value returned will be inaccurate.

5. Please supply the module in strict accordance with the power supply voltage of the module. The voltage exceeding 12V will lead to irreversible damage to the module.

6. Do not place the module in a strong air convection environment.

7. Do not place the module in a high concentration of organic gas for a long time.