pH SENSOR (WATER QUALITY ANALYSIS)
User Manual for SRWQ100-pH104-8701

135mm
75mm 30mm 30mm

Signal Line

25mm

M39*1.5
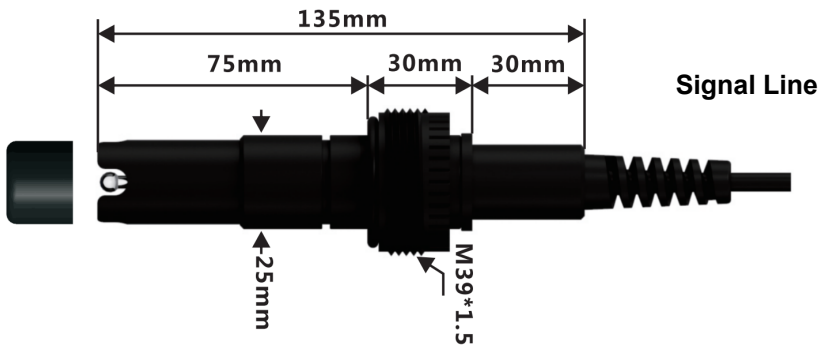
Thank you for choosing L-com product. To ensure safe, accurate performance and product longevity, please take a moment to familiarize yourself with this manual before powering the device. Please keep it handy for future reference. In case of any questions regarding the installation or use of product, please call us at 800.341.5266.

Reach out to us at customerservice@l-com.com and visit our website at www.l-com.com
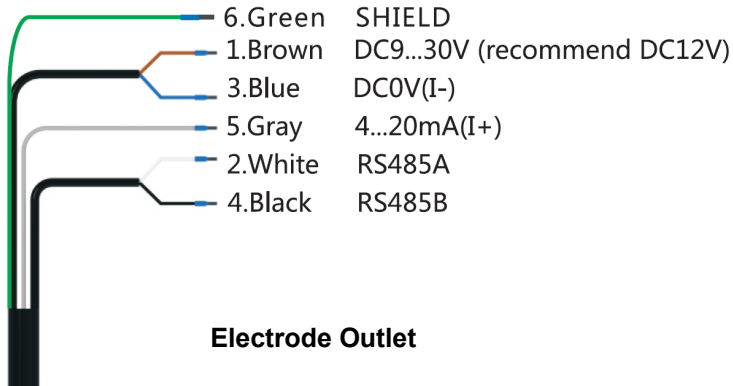
Technical Data ≫

pH Range	0 – 14 pH
Resolution	0.01 pH
Accuracy	±0.01 pH
pH Balance	7.00 ± 0.25
Temperature Range	0 – 60.0 ˚C
Resolution	0.1 ˚C
Accuracy	±0.3 ˚C
Temperature Compensation	Automatic
Slope	≥96%
Output	RS485, 4 – 20 mA
Power Supply	9 – 30 VDC (Recommend 12V)
Pressure Range	0 – 3 bar
Shell Material	PPS, ABS
Liquid Junction	PTFE
Pipe Thread	M 39*1.5
Cable Length	5m or customized
Protection Grade	IP68

Instructions Before Use ≫

- Electrode bulb is fragile and cannot be repaired after damage.

- During measurement process, if there is dirt, adhesive or scale on the electrode bulb, the measured value will be inaccurate or fluctuate. It should be cleaned and calibrated from time to time.

- If there is bubble in the bulb, the measured value will be inaccurate or fluctuate. User can gently shake the electrode bulb to remove the bubble.

Electrode Wiring ≫

- Please follow the instructions carefully, wrong wiring will damage the product completely.

- Examine all the wiring carefully in the system. Make sure wiring is complete before switching ON the power.

- It is strictly forbidden that RS485A line and RS485B line should not touch the power line. It will permanently damage the communication of the electrode.

6.Green   SHIELD
1.Brown   DC9...30V (recommend DC12V)
3.Blue   DC0V(I-)
5.Gray   4...20mA(I+)
2.White   RS485A
4.Black   RS485B

Electrode Outlet

Electrode Activation ≫

- The electrode should be activated in 3 M KCL solution.
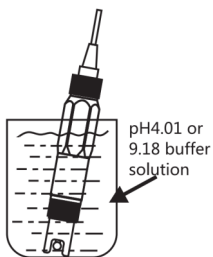
- Dry electrode must be activated before use.

Electrode Calibration ≫

- The electrode has been calibrated before shipment, user can directly use it.

- It is recommended to use the two-point method for calibration, usually with 6.86pH or 7.00 buffer solution to calibrate the zero point. Then the slope is determined with the buffer solution of 4.01pH or 9.18.

- The electrode should be calibrated in fresh buffer solution. If the solution to be tested is acidic, the pH of the buffer solution should be less than the solution to be tested. If the solution to be tested is alkaline, the pH of the buffer solution should be greater than the solution to be tested.

- Users are recommended to calibrate the electrode every 1 to 2 months.

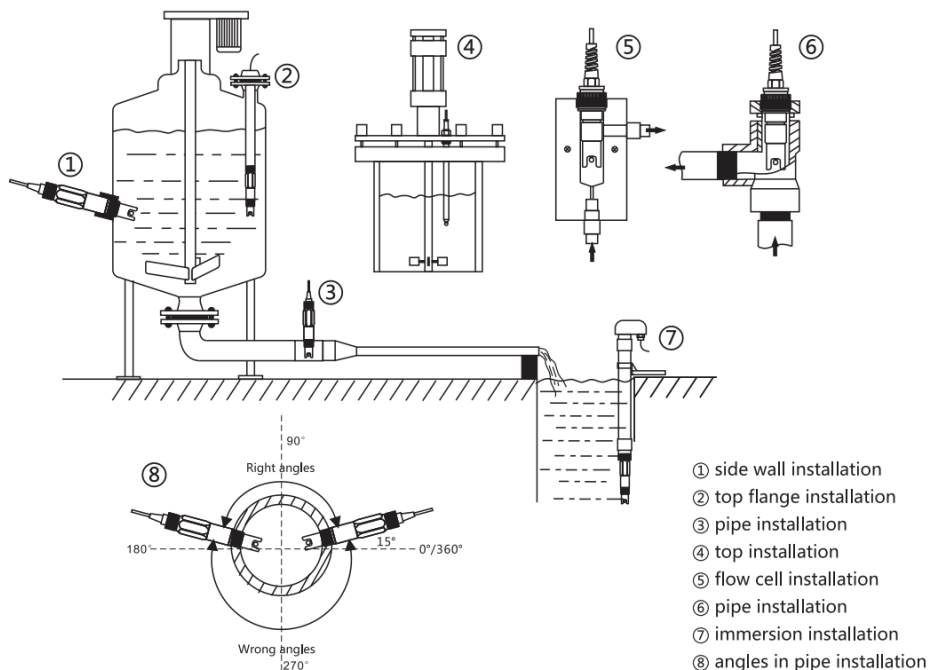|	
20min	Put the electrode into the buffer solution of pH4.01 and soak for 10 mins, and then soak in buffer solution of pH 6.86 for 10 mins.
Deionized water	Rinse the electrode with distilled water or deionized water and dry it with a paper towel.
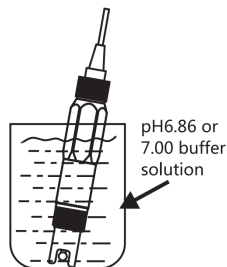
	Put the electrode in pH 6.86 or 7.00 buffer solution and wait until the value is stable, calibrate the first point . Then take the electrode out of the buffer solution, rinse and dry it with a paper towel.
	Put the electrode in pH 4.01 or 9.18 buffer solution and wait until the value is stable, calibrate the second point .Then take the electrode out of the buffer solution rinse and dry it with a paper towel.

Electrode Installation »

- It is recommended pH electrode to be installed in the flow cell for more stable and accurate measurement.
- If electrode is installed in the pipe, the right angle should be 15°~165°.
- Follow the procedure below:

① side wall installation
② top flange installation
③ pipe installation
④ top installation
⑤ flow cell installation
⑥ pipe installation
⑦ immersion installation
⑧ angles in pipe installation

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During Immersion Installation ≫

- During installation procedure, there will be frequent dirt on electrode, clean it regularly.
- Measuring value is not stable.
- Different insertion depths affects the measured value.
- The position of the electrode must be above the sediment.

Electrode Communication ≫

Default Communication Instructions:

- Data starting at 0x represents hexadecimal.
- The check code is 16CRC, the low byte is in the front and the high byte is in the back.
- Floating point number occupy four bytes.

Communication Description (Factory Default):

Baud Rate	9600 (Default)
Data Bit	8
Stop Bit	1
Check Bit	No
Address	1 (Default)

Host Computer Transmission Format:

	Data Type	Description	Remarks
Integer	16-Bit Integer	The high-low bytes of word component are not reversed	Ex: O x 0032 to decimal number is 50
Floating Point Number	(CDAB) 3412	The high-low word of the double-byte component is reversed, but the high-low byte of the word is not reversed.	Example: 72 37 41 DB transfer to floating point number. CDAB change order is ABCD. Eg: 41 DB 72 37 transfer to floating point is 27.4

Function Code Description:

- This product supports 03,06,16 and other common function codes.
- The output register uses 16 function codes when writing double word data or writing multiple data in batches.

03	Read single or multiple registers
06	Write single register
16	Write multiple registers

Read Floating Point Number >>

Host Computer Transmission Format:

	ID Address	Func-tion Code	Register Start Address		Qty. Of Registers		CRC16	
			High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte
Eg: Read Measured Value	0x01	0x03	0x00	0x01	0x00	0x02	0xCB	0x95
Eg: Read Temp. Value	0x01	0x03	0x00	0x03	0x00	0x02	0x0B	0x34

Slave Computer Response Format:

	ID Address	Func-tion Code	Qty of Registers	Read Register Data in Hexadecimal Floating Point Number				CRC16	
				C	D	A	B	High Byte	Low Byte
Eg: Measured Value Return	0x01	0x03	0x04	0x2C	0x81	0x40	0x91	0xE7	0x52
Eg: Temp. Value Return	0x01	0x03	0x04	0x72	0x37	0x41	0xDB	0x8E	0x20

Note: 72 37 41 DB transfer to floating point number, CDAB change order is ABCD, i.e. 41 DB 72 37 transfer to floating point is 27.4.

Read Integer >>

Host Computer Transmission Format:

	ID Address	Function Code	Register Start Address		Qty. Of Registers		CRC16	
			High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte
Eg: Read Warning Status	0x01	0x03	0x00	0x07	0x00	0x01	0xCB	0x35

Slave Computer Response Format:

	ID Address	Function Code	Qty of Registers	Read Register Data in Hexadecimal Floating Point Number		CRC16	
				A	B	High Byte	Low Byte
Eg: Measured Value Return	0x01	0x03	0x02	0x00	0x00	0x44	0xB8

Write Floating Point Number ≫

Host Computer Transmission Format:

	ID	Function Code	Register Start Address		Qty. Of Registers		Qty Of Byte	Register Data in Hexadecimal Floating Point Number				CRC16	
			High Byte	Low Byte	High Byte	Low Byte		C	D	A	B	High Byte	Low Byte
Eg: Write Value Offset	0x01	0x10	0x00	0x12	0x00	0x02	0x04	0x00	0x00	0x3F	0x80	0x2A	0x63

Slave Computer Response Format:

	ID Address	Function Code	Register Start Address		Qty. Of Registers		CRC16	
			High Byte	Low Byte	High Byte	Low Byte	High Byte	Low Byte
Eg: Return Value Offset	0x01	0x10	0x00	0x12	0x00	0x02	0xCD	0xE1

Note: The measured value if offset by 1.00, floating point number 1.00 coverts to hexadecimal 0X3F800000, transpose the high and low positions 0X00003F80 and write 0X0012.

Write Integer ≫

Host Computer Transmission Format:

	ID Address	Function Code	Register Start Address		Register Data in Hexadecimal Integer		CRC16	
			High Byte	Low Byte	A	B	High Byte	Low Byte
Eg: Write Device Address	0x01	0x06	0x00	0x19	0x00	0x02	0xCC	0xD9

Slave Computer Response Format:

	ID Address	Function Code	Register Start Address		Register Data in Hexadecimal Integer		CRC16	
			High Byte	Low Byte	A	B	High Byte	Low Byte
Eg: Device Return Address	0x01	0x06	0x00	0x19	0x00	0x02	0xCC	0xD9

Note: Change the local computer address 1 to address 2 and write the hexadecimal number 0X00 02 into register 0X00 19.

Calibration Instructions >>

Before Calibration:

- Write the value of zero calibration (i.e., the value of the first point) and the value of slope calibration (i.e., the value of the second point) to the electrode before calibration.

- If the zero calibration value is 6.86pH, write the data 0x01to register 0x36.

- Send command: 01 06 00 36 00 01 A8 04.

- If the slope calibration value is 4.01pH, write the data 0x01 to register 0x38.

- Send command: 01 06 00 38 00 01 C9 C7.

Start Calibration:

First Step:

- Clean and dry the electrode. Put the electrode in the solution 6.86 of zero point calibration. Send command: 01 03 00 66 00 01 64 15.

- After the measured ADC value is stable, read the ADC value in the 0x66 register. Write the instruction to confirm the calibration to the 0x3E register.

- Send command: 01 06 00 3E 00 FF A8 46.

Second Step:

- Clean and dry the electrode ,put the electrode in the solution 4.01 of slope calibration. Send command: 01 03 00 66 00 01 64 15.

- After the measured ADC value is stable, read the ADC value in the 0x66 register. Write the instruction to confirm the calibration to the 0x3F register.

- Send command: 01 06 00 3F 00 FF F9 86.

Address Description >>

Name	Hosting Number	Data Type	Length	Read/ Write	Description
Measurements	0x 00 01	Floating Point	2	Read	Storage location for measured value
Temperature measurement	0x 00 03	Floating Point	2	Read	Storage location for measured temperature
Current output value	0x 00 05	Floating Point	2	Read	Output current based on PH/ORP measurements
Warning	0x 00 07	Integer	1	Read	00: Normal 01: Measurement exceeds the upper limit 02: Measurement exceeds the lower limit 03: Temperature exceeds the upper limit 04: Temperature exceeds the lower limit
Measure mode	0x 00 08	Integer	1	Read/ Write	00: pH ; 01: ORP

Name	Hosting Number	Data Type	Length	Read/Write	Description
Upper limit of measurement	0X 00 0A	Floating Point	2	Read/Write	Upper limit of measured value (20mA corresponding value)
Lower limit of measurement	0X 00 DC	Floating Point	2	Read/Write	Lower limit of measurement value (4mA corresponding value)
Upper temperature limit	0X 00 OE	Floating Point	2	Read/Write	Upper temperature limit
Lower temperature limit	0x 00 10	Floating Point	2	Read/Write	Lower temperature limit
Measured value offset	0x 00 12	Floating Point	2	Read/Write	Adjust measurement
Temperature offset	0x 00 14	Floating Point	2	Read/Write	Adjust temperature value
Damping coefficient	0x 00 16	Integer	1	Read/Write	0-10
Device address	0x 00 19	Integer	1	Read/Write	1-255
Baud rate	0X 00 1A	Integer	1	Read/Write	0=2400 , 1=4800 , 2=9600 3=19200, 4=38400
Restore factory	0X 00 1B	Integer	1	Write	
ORP calibration value	0x 00 30	Floating Point	2	Read/Write	
Calibrating slope	0x 00 34	Integer	2	Read	-0.1984
Zero point calibration solution	0x 00 36	Integer	1	Read/Write	0=7.00, 1=6.86
Slope calibration solution	0x 00 38	Integer	1	Read/Write	0=1.68 , 1=4.01 , 2=9.18 3=10.1 , 4=12.45
Manual temperature	0X 00 3A	Floating Point	2	Read/Write	25°c
Zero confirmation	0X 00 3E	Integer	1	Write	
Slope confirmation	0X 00 3F	Integer	1	Write	
Measured ADC	0x 00 66	Integer	1	Read	

Common Instruction Examples >>

Sr. No.	Function	Send command	Return command	Remarks
1	Read measured value	01 03 00 01 00 02 95 CB	01 03 04 2C 81 40 91 52 E7	The 2C814091 change order is 40912C81 and its floating point is 4.53
2	Read temperature measurement	01 03 00 03 00 02 34 0B	01 03 04 72 37 41 DB 20 8E	The 723741DB change order is 41DB7237and its floating point is 27.4
3	Read current output value	01 03 00 05 00 02 D4 0A	01 03 04 00 00 41 40 CB 93	The 00004140 change order is 41400000 and its floating point is 12.00
4	Read warning	01 03 00 07 00 01 35 CB	01 03 02 00 00 B8 44	0000 is the current state
5	Write measurement mode	01 06 00 08 00 01 C9 C8	01 06 00 08 00 01 C9 C8	Set to ORP mode
6	Write upper limit of measurement	01 10 00 0A 00 02 04 00 00 41 20 42 58	01 10 00 0A 00 02 61 CA	The upper measurement limit is set to 10.00
7	Write lower limit of measurement	01 10 00 0C 00 02 04 00 00 3F 80 E3 AA	01 10 00 0C 00 02 81 CB	The lower measurement limit is set to 1.00
8	Write upper temperature limit	01 10 00 0E 00 02 04 00 00 42 C8 43 15	01 10 00 0E 00 02 20 0B	The upper temperature limit is set to 100.00
9	Write lower temperature limit	01 10 00 10 00 02 04 00 00 40 A0 C3 1B	01 10 00 10 00 02 40 0D	The lower temperature limit is set to 5.00
10	Write measured value offset	01 10 00 12 00 02 04 00 00 3F 80 63 2A	01 10 00 12 00 02 E1 CD	Set to 1.00
11	Write temperature offset	01 10 00 14 00 02 04 00 00 3F 80 E3 00	01 10 00 14 00 02 01 CC	Set to 1.00
12	Write damping coefficient	01 06 00 16 00 01 A9 CE	01 06 00 16 00 01 A9 CE	Set to 1
13	Write device address	01 06 00 19 00 02 D9 CC	01 06 00 19 00 02 D9 CC	Set to 2
14	Write baud rate	01 06 00 1A 00 00 A8 0D	01 06 00 1A 00 00 A8 0D	Set to 2400
15	Write restore default	01 06 00 1B 00 FF B9 8D	01 06 00 1B 00 FF B9 8D	Factory default values are restored after sent

Sr. No.	Function	Send command	Return command	Remarks
16	Write ORP calibration value	01 10 00 30 00 02 04 00 00 42 AC C0 66	01 10 00 30 00 02 41 C7	Write ORP standard liquid value 86mV
17	Read calibration slope	01 03 00 34 00 02 85 C5	01 03 04 CC CD 3E 4C 45 09	The CCCD3E4C change order to 3E4CCCD and its floating point is 0.2
18	Write zero point compensation solution	01 06 00 36 00 01 A8 04	01 06 00 36 00 01 A8 04	Set to 6.86
19	Write slope calibration solution	01 06 00 38 00 02 89 C6	01 06 00 38 00 02 89 C6	Set to 9.18
20	Write manual temperature	0110 00 3A 00 02 04 00 00 41 A0 40 EC	01 10 00 3A 00 02 61 C5	Set to 20.0
21	Write zero calibration	01 06 00 3E 00 FF A8 46	01 06 00 3E 00 FF A8 46	Confirm to calibration zero
22	Write slope calibration	01 06 00 3F 00 FF F9 86	01 06 00 3F 00 FF F9 86	Confirm to calibration slope
23	Read measuring AD	01 03 00 66 00 01 64 15	01 03 02 2E E0 A4 6C	2EE0 turns to integer 12000

Maintenance And Storage >>

- After washing the electrode, only use soft paper towel to absorb the water. Do not rub the sensitive membrane.

- While storing the electrode, the protective cover must be put on.

- The protective cover must contain the immersion fluid to keep the moisture of the electrode bulb.

- The white potassium chloride salty substance crystal on the electrode will affect the operation. To remove the crystal, rinse the electrode with distilled water and then dry it.

- Cable connector must be kept clean and free of moisture or water.

- The electrode should not be placed in the air for long periods of time. Put on the protective cover when it is not in use.

Troubleshooting >>

- If the measurement is not accurate, its mostly because the pH electrode has changed. So it is necessary to check whether the pH electrode is in good condition or not. If the bubble is damaged, replace the bubble.

- If the value of the instrument is too large, too small or no change, check whether the electrolyte is dry, missing or contaminated. If the above conditions occur, change / add the electrolyte.

MODBUS Troubleshooting >>

Problem	Possible reason	Solution
Modbus no response	The baud rate, or stop bit does not match the Modbus master settings	Verify that the settings match the Modbus master device settings, and verify that the Modbus master device parity check is set to None.
	Rs232 or RS485 cable is faulty	Replace / repair cables
	No network offsets and terminations, or network offsets and terminations are not suitable.	Check the termination or offset settings for all network devices. Only the endpoints of the network should be turned on and terminated, and there should be only a point on the network to provide an offset.
	The slave address is incorrect, or the slave address is the same as the address of another bus device	Verify that all addresses are unique and are between 1 and 247.
Modbus abnormal response	Register not supported	Verify that the register is supported.
	Incorrect data type	Verify that the requested register data type matches the Modbus master device request. For example, user cannot access a floating point data using 2-byte integer data. When a floating point data (2 registers / 4 bytes) is requested, two registers must be requested at the same time.