

# STALWART



## Operation Manual

Please read and adhere to all recommendations in this manual to ensure the best experience and to maintain your Meter in good working order. The manual is for the model **SPH-71**.

## 1. Features

- 6.5-inch LCD screen with concise and friendly-use interface.
- Built-in microprocessor chip has Intelligent functions such as automatic calibration, ATC, data storage, clock display, USB output, function settings, wireless printing, and self-diagnosis information, etc.
- Auto recognition of 25 buffers with three kinds of options: Europe & USA, NIST and China. Support 1, 2, 3 point calibration.
- Wireless bluetooth printing and real-time data transfer to mobile phone are optional.
- Smart electrode status display to ensure accurate use.
- Omron long lasting and light touch key can be used more than 100,000 times.
- Can store 1000 sets of test data, which can be saved and transferred to USB memory stick and opened with Excel.

## 2. Technical Parameters

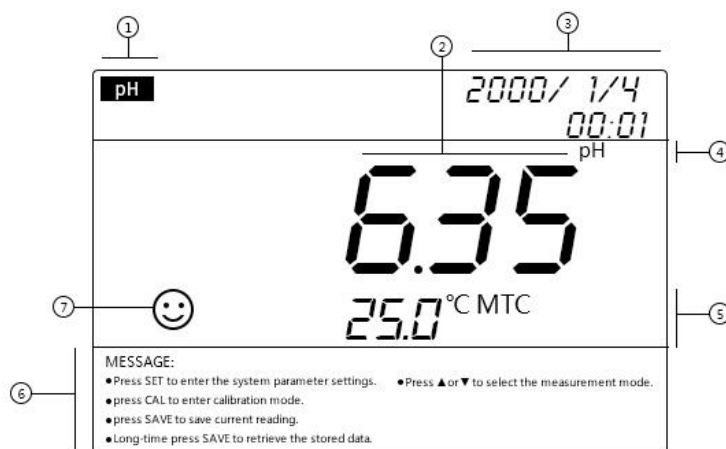
pH	Measuring range	(-2.00 ~ 20.00)pH
	Resolution	0.1/0.01 pH
	Accuracy	±0.02pH
	Auto calibration	1, 2, 3 point
	Buffer	Europe & USA, NIST, China standards
	Input current	≤2×10 <sup>-12</sup> A
	Input impedance	≥1×10 <sup>12</sup> Ω
	Stability	±0.01 pH/3h
	Temp. compensation	(0 ~ 100)°C, auto or manual
mV	Measuring range	-1999.9mV ~ 0 ~ 1999.9mV
	Resolution	1 mV
	Accuracy	±0.1% FS
Temp.	Range	(0 ~ 100)°C
	Resolution	0.1°C
	Accuracy	5 ~ 60°C: ±0.4°C, Others: ±0.8°C

Other	Display	6.5-inch LCD screen
	Data storage	1000 sets
	Power	DC 12V/1A
	Output	USB
	Ambient Temp.	5 ~ 40 °C
	Ambient Humidity	≤85%
	IP grade	IP54

### 3. Instrument Structure

#### 3.1. LCD display

- ①---Parameter mode
- ②---Measuring value
- ③---Time
- ④---Measurement unit
- ⑤---Temp. measuring value
- ⑥---Tips
- ⑦---Stability icon



#### 3.2. Operation Keys

**【ON/OFF】** Switch key

**【CAL】** Calibration key, Left direction key

- a) Under measuring mode, press the key to enter into calibration mode.
- b) Under setting mode, the key is a Left direction key.

**【SAVE】** Records saving, Records query, Right direction key

- a) Under measuring mode, short press the key to store measuring data, long press the key to check stored data.
- b) Under setting mode, the key is a Right direction key.

**【ESC/PRN】** Print, Return key

- a) Under measuring mode, it is used as a print key.
- b) Under non-measuring mode, it is used as a return key.

**【SET】** System setting

# STALWART

Under measuring mode, system setting interface can be entered through the key.

## 【UP】 Upward key

Under setting mode, it is used as a upward direction key.

## 【DOWN】 Switching key, Downward key

a) Under measuring mode, it is used as a switching key: pH-mV-pH.

b) Under setting mode, it is used as a downward direction key.

## 【OK】 Confirm key

### 3.3. Interface diagram



① Temperature probe

② pH electrode

③ Conductivity electrode, not available for pH meter

④ USB

⑤ Data cable

⑥ Power

## 4. pH measurement

### 4.1. Preparation work

4.1.1. Press 【ON/OFF】 key to turn on, then warm up for 10 minutes.

4.1.2. Check pH electrode glass bulb is kept wet or not, if the glass bulb is damaged, then the electrode will not work properly. if glass bulb's surface is dry, it needs to be immersed into a potassium chloride solution for 24 hours.

4.1.3. Insert the pH electrode and the temperature electrode into the corresponding interface.

### 4.2. Instrument Calibration

4.2.1. Press 【CAL】 to enter calibration mode, C1 is displayed to indicate the 1st point calibration.

4.2.2. Wash pH electrode and temperature probe in purified water, make them dry, immerse them into pH6.86 buffer solution, shake the electrodes and place them static, press **【OK】** after stability icon is appeared. when 6.86 is displayed, press **【OK】** to confirm the 1st point calibration, then C2 is displayed to enter the 2nd point calibration. or press **【ESC/PRN】** to exit calibration mode.

4.2.3. Wash the pH electrode and temperature probe in purified water and dry them, immerse them into pH4.00 buffer solution, shake the the electrodes and place them static, press **【OK】** after stability icon is appeared. when 4.00 is displayed, press **【OK】** to confirm the 2nd point calibration, then C3 is displayed to enter the 3rd point calibration. or press **【ESC/PRN】** to exit calibration mode.

4.2.4. Wash the pH electrode & temperature probe in purified water and dry them, immerse them into the pH9.18 buffer solution, shake the the electrodes and place them static, press **【OK】** after stability icon is appeared. when 9.18 is displayed, press **【OK】** to confirm the 3rd point, meanwhile exit calibration mode to enter measuring mode, the display screen will show “ L M H ” at the same time, which means the three point calibration is completed.

#### 4.2.5. Attentions

a) The Meter have one-point, two-point or three-point calibration. after the 1st point calibration, press **【ESC/PRN】** to exit calibration mode and enter measuring mode. The calibration icon “L” for one-point calibration will appear. When measuring accuracy is  $\leq \pm 0.1$  pH, just need to make one-point calibration.

b) After the 2nd point calibration, press **【ESC/PRN】** to exit calibration mode and enter measuring mode. The calibration icon “L M” for two-point calibration will appear. If only acidic solution is measured, choose pH 4.00 and 6.86 buffers for calibration. If only alkaline solution is measured, then choose pH6.86 & 9.18 buffers for calibration.

c) If the measuring range is relatively wide or the pH electrode is aged after being used for a long time, three point calibration is required, which will lead to higher accuracy. for the first time use of a new pH electrode, it must be calibrated at three points to adjust the slope of the Meter same as the pH electrode.

#### 4.3. pH solution measurement

Immerse pH electrode and temperature probe into the measured solution after wash and dry them, shake the electrodes and place them static. when the stability icon is displayed, then read the pH value.

**Note:** According to the principle of pH isothermal measurement, the closer the temperature of the measured solution is to the temperature of the buffer solution, the higher the measurement accuracy will be.

#### 4.4. Parameter Setting

Press **【SET】** to enter into setting mode, press **【UP】** or **【DOWN】** to choose P1-P12, press **【OK】** to enter the selected setting mode. Press **【ESC/PRN】** to return to measuring mode.

Prompt	Parameter setting	Remark
P1	Export data to excel	Insert USB drive, press <b>【OK】</b> to export data. If not, an error will be prompted.
P2	Set system time	
P3	Clear records	
P4	Temp. unit	°C, °F
P5	Check machine code	The code displayed on the screen is the machine code.
P6	APP authorization code	
P7	Restore to factory setting	When 8888 displayed on screen, press <b>【OK】</b> to restore to factory setting.
P8	Manual temp. compensation	
P9	Bluetooth mode	Bluetooth, APP
P10	pH resolution	0.1, 0.01
P11	pH standard buffer solution	CH (China series) : 1.68, 4.00, 6.86, 9.18, 12.46 pH USA (Europe & U.S.A series) : 1.68, 4.00, 7.00, 10.01, 12.45 pH NIS (NIST series) : 1.68, 4.01, 6.86, 9.18, 12.45 pH
P12	Ammonia pure water compensation	“OFF” No compensation. “H2O” Purified water pH compensation. “nH3”Ammonia pure water compensation.

## 4.5. Attentions

4.5.1. Calibration times depends on the sample, electrode performance and required accuracy. For higher accurate measurement ( $\leq \pm 0.02\text{pH}$ ), it should be calibrated immediately with high accurate standard buffer solution. for general accuracy measuring ( $\geq \pm 0.1\text{pH}$ ), it can be used almost one week or longer time after being calibrated.

4.5.2. The Meter must be recalibrated in the following situations

- a) New changed or unused electrode for a long time.
- b) After measuring acid ( $\text{pH} < 3$ ) or alkaline ( $\text{pH} > 10$ ) solution.
- c) After measuring solution which contains fluoride and concentrated organic solution.
- d) The solution's temperature is much different with calibration temperature.

# STALWART

4.5.3. There is an electrode soaking solution in the protective bottle at the front of the pH electrode, which can protect the glass bulb, when measuring, open the bottle cap, pull out the electrode and wash it with pure water, insert the electrode into the bottle and tighten the cap to prevent the exudation of the solution. If the soaking liquid in the protection bottle is found to be turbid or mildewed, clean it in time and replace the new soaking liquid.

4.5.4. It is not allowed to soak in pure water, protein solution and acid fluoride solution for a long time, and prevent getting touch with organic grease.

4.5.5. When the Meter is calibrated with a standard buffer solution of known PH value, the buffer solution pH value should be reliable in order to improve the measurement accuracy. The buffer solution should be changed in time after repeated use.

4.5.6. Always keep the meter clean and dry. especially for the socket of meter and electrode, otherwise it may lead to measurement error or failure.

4.5.7. The sensitive glass bulb at the front of combination electrode should not touch with hard things, and any broken and friction will make the electrode invalid. Before and after measuring, the electrode should be washed with purified water, and dry electrode after washing, Do not wipe glass bulb with paper towel, it will effect stability of electrode potential and enlarge response time. After the measurement in the viscous sample, the electrode shall be repeatedly washed with pure water for several times to remove the sample stuck on the glass film, or first cleaned with appropriate solvent.

4.5.8. If the electrode is used for a long time, or the solution under test contains substances that are likely to contaminate sensitive glass bulb or block the liquid interface, the electrode will be passivated. The phenomenon is that the sensitivity gradient is reduced, the response is slow, and the reading is inaccurate. The following measures can be taken according to different situations:

a) The glass bulb is contaminated and aging: soak the electrode in 0.1mol/L diluted hydrochloric acid for 24h, clean it with pure water, and then soak it with electrode soaking solution for 24h. If the passivation is serious, soak the electrode bulb in 4%HF (hydrofluoric acid) solution for (3~5) s, clean it with pure water, and then soak it in electrode soaking solution for 24h to make it new.

b) Cleaning of glass bulb and liquid interface contamination: (for reference)

<b>Contamination</b>	<b>Abluent</b>
Inorganic metal oxide	Diluted acid less than 1mol/L
Organic lipidic matter	Dilute detergent (weakly alkaline)
Resin macromolecule matter	Dilute alcohol, acetone, ether
Protein blood deposit	Acidic enzyme solution (such as dried yeast)
pigments substance	Dilute bleach solution, peroxide

4.5.9. The service life of pH electrode is about one year, but if the service condition is bad or the maintenance is improper, the service time will be shortened, and the electrode should be replaced in time

# STALWART

after aging or failure.

4.5.10. When the Meter is abnormal, please restore it to factory settings, then calibrate and measure again.

## 5. mV Measurement

5.1. Under pH measuring mode, press **【DOWN】** to choose mV measurement mode.

5.2. Connect ORP combination electrode or ion combination electrode, wash the electrode in pure water, keep it dry, and immerse it in the measured solution. shake the electrode and place them static. when the stability icon is displayed, then read the mV value.

## 6. Packing List

pH Meter

Electrode Holder

pH electrode

Temperature probe

Standard buffer solution (3 bottles)

Power Adapter

Manual