pH, mV, Auto Temp, Cal.

pH / ORP METER

Model : PH-224S

Your purchase of this pH / ORP METER marks a step forward for you into the field of precision measurement. Although this meter a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.

OPERATION MANUAL

TABLE OF CONTENTS

1. FEATURES

* pH : 0 to 14.00 pH, mV : ±1999 mV.
* mV function is used to accept the ORP electrode.
* BNC socket input, can accept most kind pH electrode.
* Separate pH electrode, easy for general purpose and remote measurement.
* pH measurement can select automatic temperature compensation (via. optional Temp. probe) or manual temperature adjustment.
* High input impedance for the pH function.
* Auto calibration for pH 7, pH 4 and pH 10.
* LCD with two display, easy readout.
* Can default auto power off or manual power off.
* Temperature unit can default to ℃ or ℉.
* Microcomputer circuit, intelligent function, high accuracy.
* Records Maximum and Minimum readings with recall.
* Data hold function for freezing the desired value.
* Heavy duty & compact housing case.
* Available for wide applications, such as aquarium, beverage, fish hatcheries, food processing, photography, laboratory, quality control, school & colleges, swimming pools, water conditions.

2. SPECIFICATIONS

2-1 General Specifications

pH Electrode	Optional, Any pH electrode with BNC connector.	
Measurement	pH	0 to 14 pH
	mV	-1999 mV to 1999 mV
Accurracy	pH	± 0.2 pH * After calibration, meter without PE-12 electrode.
Resolution	pH : 0.01 pH, mV : 1 mV	
Input Impedance	10^12 ohm	
Temperature Compensation for pH measurement	Manual	0 to 100 ℃, be adjusted by push button on front panel.
	Automatic (ATC)	With the optional temperature probe (TP-07) 0 to 65 ℃.
pH Calibration	pH 7, pH 4, and pH 10, 3 points calibration ensure the best linearity and accuracy.	
Circuit	Custom one-chip of microprocessor LSI circuit.	
Display	LCD size : 44 mm x 29 mm, dual function LCD display.	
Data Hold	Freeze the display reading.	
Memory Recall	Maximum & Minimum value.	
Sampling Time of display	Approx. 1 second.	
Power off	Auto power shut off to save battery life or manual power off.	
Operating Temperature	0 to 50 ℃.	

Operating Humidity	Less than 80% RH.
Power Supply	006P DC 9V battery (Alkaline or Heavy duty type). DC 9V adapter input. ** AC/DC power adapter is optional.*
Power Current	Approx. DC 6 mA.
Weight	200 g/0.44 LB. * Include probe and batterry.
Dimension	135 x 60 x 33 mm.
Accessories Included	Instruction manual..... 1 PCS
Optional probe and accessories	* pH electrode..... PE-03, PE-11, PE-01,PE-06HD PE-04HD, PE-05T, PE-03K7
	* Temp. probe for ATC..... TP-07
	* pH 7 buffer solution..... PH-07 * pH 4 buffer solution..... PH-04
	* ORP electrode..... ORP-14
	* Hard carrying case..... CA-06 * Soft Carrying case..... CA-05A

2-2 Electrical Specifications (23±5 ℃)

Measurement	Range	Resolution	Accuracy
pH	0 to 14 pH	0.01 pH	±(0.02 pH + 2 d)
mV	0 to ±1999 mV	1 mV	±(0.5% + 2 d)

* *pH accuracy is based on calibrated meter only.*

* *Above specification tests under the environment RF Field Strength less than 3 V/M & frequency less than 30 MHz only.*

3. FRONT PANEL DESCRIPTION

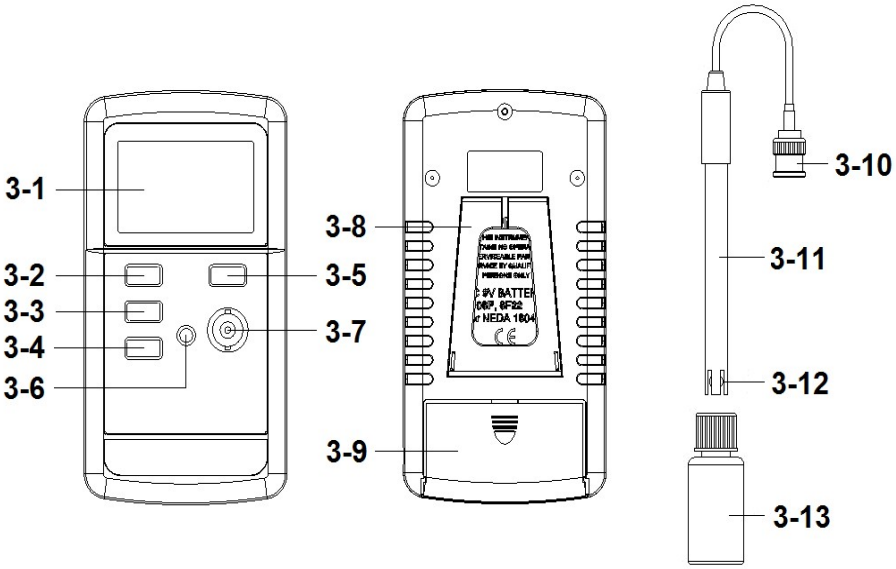


Fig. 1

3-1 Display
3-2 Power button
3-3 Hold button
3-4 REC button
3-5 pH / mV button , SET button ** FUNC = Function*
3-6 Temp. probe socket (ATC probe socket)
3-7 pH probe socket (BNC socket)
3-8 Stand
3-9 Battery compartment/Cover
3-10 pH electrode BNC plug (optional)
3-11 pH electrode sensing head (optional)
3-12 pH electrode handle (optional)
3-13 pH electrode protection bottle (optional)

4. MEASURING and CALIBRATION PROCEDURE

The meter default function are following :

* The display unit is set to pH.
* The temperature unit is set to ℃.
* Manual Temp. compensation setting (not ATC)
* Auto power off.
* The sampling time of data logger function is 1 seconds.

If the meter is first time to connect the pH electrode, it should make the calibration before operation, the calibration procedures refer to chapter 4-4, page 8.

4-1 pH measurement (manual Temp. compensation value adjustment)

1) Prepare the pH Electrode (optional), install the " Probe Plug " (3-10, Fig. 1) into the " pH Socket/BNC Socket " (3-7, Fig. 1).
2) Power on the meter by pressing " Power button " (3-2, Fig. 1) once.
   The up main display will show the pH value along with the " pH " indicator.
   The left down display will show the temperature value (manual Temp. value) with the " ℃ " (or ℉) indicator.

3) **Adjust the manual Temp. value same as the solution's temperature exactly, the procedures refer chapter 5-1, page 12.**

4) Hold the " Electrode Handle " (3-11, Fig. 1) by hand and let the " Sensing head " (3-12, Fig. 1) immersed wholly into the measured solution and little shake the probe.
5) The up main display will show the pH value of the measured solution, the left bottom display will show the setting Temp. compensation value.

4-2 pH measurement (ATC , automatic Temperature)

1) All the procedures are same as
   4-1 pH measurement (manual Temp. compensation value adjustment)
   but should prepare one temperature probe (optional, TP-07). Insert the TP-07's plug into the " Temp. probe socket " (3-6, Fig. 1), immerse the sensing head of temperature probe into the measurement solution.
2) The up main display will show the pH value, the left bottom display will show the sensing Temp. value of the measured solution.

When not use the Electrode, it should immerse the " Electrode sensing head " (3-12, Fig. 1) into the " Protection bottle " (3-15, Fig. 1).

4-3 mV Measurement

The instrument build in mV (millivolt) measurement function, which enable you to make ion-selective, ORP (oxidation-reduction potential), and other precise mV measurements.

1) Prepare the ORP Electrode (optional, ORP-14), install the " Probe Plug " of ORP electrode into the " BNC socket " (3-7, Fig. 1).

2) Power on the meter by pressing " Power button " (3-2, Fig. 1) once.
Pressing the " FUNC button " (3-5, Fig. 1) once , the display show " mV " indicator and the temperature value will be disappeared. Now the meter is ready for mV measurement (ORP measurement).

4) Insert the sensing head of ORP electrode into the measurement solution.
The main display will show the mV value (ORP value).

* *After the mV measurement, if pressing the " FUNC button " (3-5 , Fig. 1) once again will return to the pH measurement function.*

4-4 pH calibration

Calibrating Consideration

The pH meter already calibrated by mV signal that simulated from the ideal pH ELECTRODE mV output (base on 25 ℃ environment). However due to (a) An ideal electrode will produce 0 mV at pH 7.00, but most electrodes are slightly off. (b) The measuring environment temperature may not near 25 ℃ (15 to 35 ℃).

If intend to keep instrument combined electrode within high accuracy, it is necessary to make the following calibration procedures.

* *Basic calibration (single point calibration) : pH 7 calibration.*
* *Complete calibration (two points calibration) : pH 7 calibration and pH 4 calibration. pH 7 calibration and pH 10 calibration.*
* *During execute the calibration procedures, if the Display show " Err " error information, then please do the " Calibration clear " procedures, refer page 9 .*

Requiring Equipment for Calibration

1) pH electrode
2) Buffer solutions :
   pH 7.00 buffer solution (PH-07, optional).
   pH 4.00 buffer solution (PH-04, optional).

Calibration procedures

1) Prepare the pH Electrode (optional), install the " Probe Plug " (3-10, Fig. 1) into the " pH Socket/BNC Socket " (3-7, Fig. 1).
2) Power on the meter by pressing " Power Button " (3-2, Fig. 1) once.
3) Adjust the " Temperature Compensation Value " to make it same as the temperature value of the pH buffer solution.

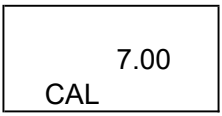
   * **Manual temperature compensation value adjustment procedure, refer to 5-1, page 11.**
   * **Automatic temperature compensation, it should plug in the ATC probe (optional, TP-07), please refer to 4-2, page 6.**

4) Hold the " Electrode Handle " (3-11, Fig. 1) by hand and let the " Sensing head " (3-12, Fig. 1) immersed wholly into the measured standard solution (pH 7.0, pH 4.0 or pH 10.0) and little shake the probe. Display will show the pH value of the solution.

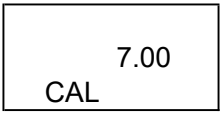
   * **If use the ATC probe, should immerse the ATC probe into the solution together.**

5) Use the two fingers to press the " REC button " (3-4, Fig 1) and " Hold button " (3-3, Fig. 1) at the same time, until Display will show the following screen

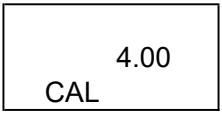
then release the both fingers.



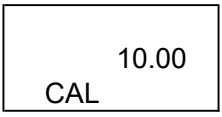
6) Press the " HOLD button " (3-3, Fig. 1) once in sequence to select the following screen.

a 

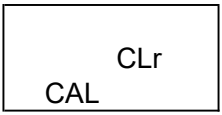
For pH 7.00 calibration

b 

For pH 4.00 calibration

c 

For pH 10.00 calibration

d 

Clear the existing calibration data

* After the above a, b, c screen is selected, then cooperate the relative standard solution, for example the

a screen should cooperate the pH 7.00 standard solution.
b screen should cooperate the pH 4.00 standard solution.
c screen should cooperate the pH 10.00 standard solution.

Press the " Enter Button " (3-4, Fig. 1), the upper Display will be flashing several seconds, then save the calibration data and finish the calibration procedures.

* **<u>If select the d screen, press the " Enter button " (3-4, Fig. 1) will clear existing calibration data.</u>**

  During execute the calibration procedures, if happen some thing wrong (Display show Err information), then execute the above " Calibration clear " procedures will clear all the existing calibration data and return to the Default value.

7) The complete procedures should execute the two calibration points :

   pH7 calibration
   pH4 calibration (or pH10 calibration)

* The calibration procedures should execute start from pH 7 calibration then follow pH 4 (or pH 10) calibration. It can not execute the calibration procedures start from the pH 4 (pH 10) then follow the pH 7.
* During execute the calibration procedures, press the " ESC button (3-3 Fig 1)" will exit the calibration procedures and return to normal measuring screen.
* Rinse the electrode with distilled water again when make each point calibration (pH7, pH4....).
* Repeat above two points procedures two times at least.

4-5 Data Hold

During the measurement, press the " Hold Button " (3-3, Fig. 1) once will hold the measured value & the LCD will display a " HOLD " symbol.

* Press the " Hold Button " once again will release the data hold function.

4-6 Data Record (Max., Min. reading)

* The data record function records the maximum and minimum readings. Press the " REC Button " (3-4, Fig. 1) once to start the Data Record function and there will be a " REC " symbol on the display.
* When the " REC " symbol on the display :
  a) Press the " REC Button " (3-4, Fig. 1) once, the " REC MAX " symbol along with the maximum value will appear on the display.
  b) Press the " REC button " (3-4, Fig. 1) again, the " REC MIN " symbol along with the minimum value will appear on the display.
  c) Press the " REC button " (3-4, Fig. 1) once, the Display will show the " REC " symbol only and execute the memory function continuously.
  d) To exit the memory record function, just press the " REC " button for 2 seconds at least. The display will revert to the current reading.

5. ADVANCED SETTING PROCEDURE

> Before executing advanced setting procedures, exit the " Hold function " and the Record " function.

a. Hold the " FUNC/SET button " (3-5, Fig. 1) at least five seconds will enter the Advanced Setting Procedures.

b. One by one to press the " FUNC/SET button " (3-5, Fig. 1) once to select the three main function and show the text on the lower display as :

AtC..... Change the manual Temp. compensation value of pH function
PoFF..... Auto power ON/OFF management
bEEP..... Change the beeper sound ON/OFF
t-CF..... Change the Temp ℃, ℉ unit

5-1 Change the manual temperature value of pH function

(Lower display show " Atc ")

This setting is available only when the plug of the temperature probe (optional, TP-07) is not inserted into the " Temp. probe socket " (3-6, Fig. 1).

a. After the low display show " noATC ", press the " Enter button " (3-4, Fig. 1) once. the " noAtc " symbol will flash. The up display will show the manual temperature compensation value, Use " ▲ button " (3-3, Fig. 1) and " ▼ button " (3-5, Fig. 1) to adjust the up display value until it same as the desiring temperature compensation value exactly.
b. After select the desiring value, press the " Enter button " (3-4, Fig. 1) to save the data with default.

5-2 Auto power ON/OFF

(Lower display show " PoFF ")

a. Use " HOLD button " (3-3, Fig. 1) to select " YES " or " no ".
   ** YES : Auto power off.*
   ** no : Auto power disable,*
b. After select the desiring function (YES or no), press the " REC button " (3-4, Fig. 1) to save the function with default.

5-3 Change the beeper sound ON/OFF

(Lower display show " bEEP ")

a. Use " HOLD button " (3-3, Fig. 1) to select " YES " or " no ".
   ** YES : Beeper sound ON*
   ** no : Beeper souund OFF (disable),*
b. After select the desiring function (YES or no), press the " REC button " (3-4, Fig. 1) to save the function with default.

5-4 Change the Temp ℃, ℉ unit

(Lower display show " t-CF ")

a. Use " HOLD button " (3-3, Fig. 1) to select " C " or " F ".
   ** C : ℃*
   ** F : ℉*
b. After select the desiring text (℃ or ℉), press the " REC button " (3-4, Fig. 1) to save the data with default.

6. BATTERY REPLACEMENT

1) When the left corner of LCD display show " ", it is necessary to replace the battery. However, in-spec. measurement may still be made for several hours after low battery indicator appears before the instrument become inaccurate.
2) Slide the " Battery Cover " (3-9, Fig. 1) away from the instrument and remove the battery.

3) Replace with 9V battery (Alkaline or Heavy duty type) and reinstate the cover.
4) Make sure the battery cover is secured after changing the battery.

7. OPTIONAL ACCESSORIES

Carrying case CA-03	Soft carrying case . (190 x 90 x 55 mm)
Carrying case CA-52A	Soft carrying case. (200 x 80 x 50 mm)