

PH60Z-MS Smart pH Meter for Small- Volume Measurement

User Manual



APERA INSTRUMENTS (Europe) GmbH

www.aperainst.de

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Thank you for choosing Apera Instruments. The PH60Z-MS pH Meter with LabSen® 246-5 pH/temp. electrode is made for measuring pH of general water solutions in small-volume (>60 micro liter) or in test tubes.

Please read this manual carefully before use in order to get the best result.

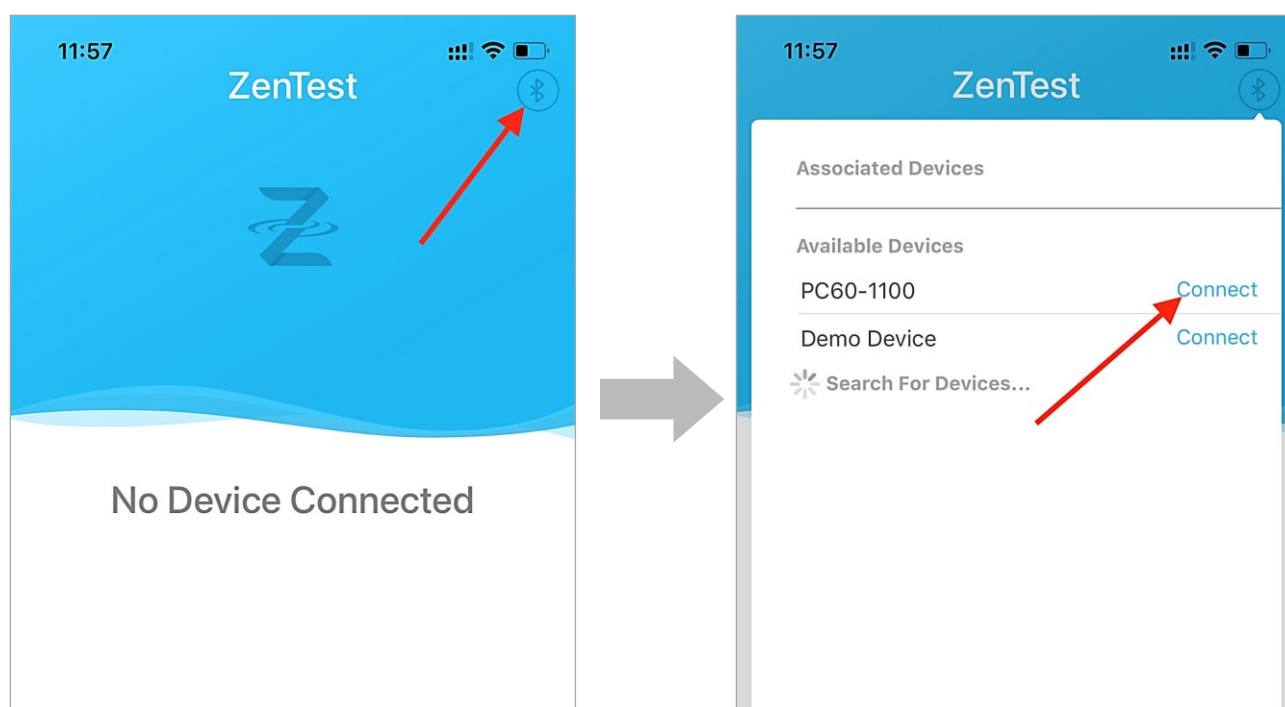
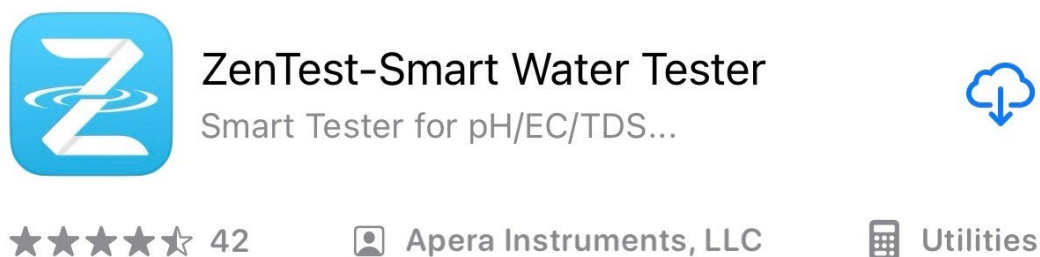
ATTENTION

- **NEVER** use the product when it's freezing cold. Let it warm to room temperature before using.
- **NEVER** use your finger to touch the pH glass membrane or use other materials to rub it. Doing so could generate static electricity and cause measurement errors. To remove extra water on electrode, just shake it off or blot dry with Kimwipe or lint- free cloth.

How to Connect with ZenTest[®] Mobile App

Search “**zentest**” in Apple App Store or Google Play App Store to download the latest App for your meter. Make sure the Bluetooth of your phone is turned on, then

go to ZenTest App, tap  on the upper right corner, then select your meter to connect (NOT the Demo device).



The content of this user manual focus on how to operate through the meter's keypad. For the guides on how to use the ZenTest App to achieve more functions, please refer to the video tutorials by scanning the QR code below.



1. What's in the kit



2. Keypad Functions

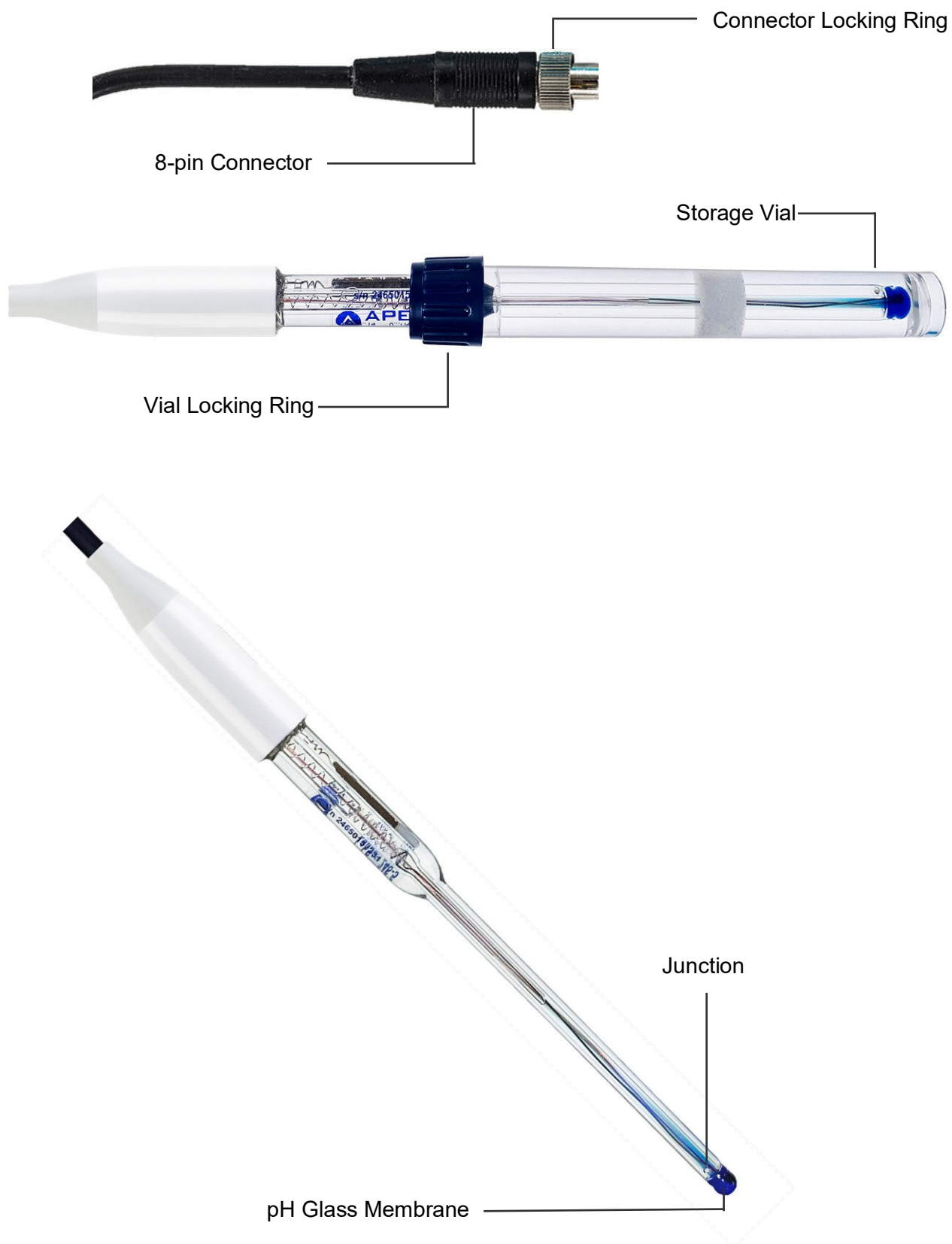
Short Press: < 2 seconds

Long Press: > 2 seconds

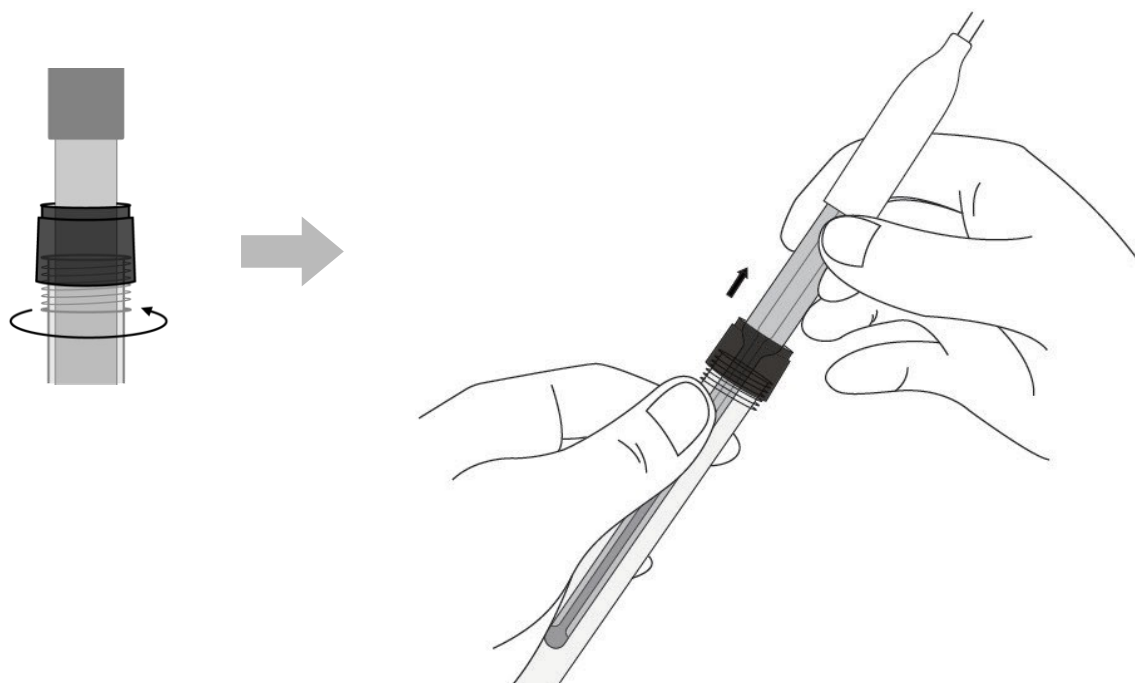
	1. Short press to turn on the tester and long press to turn off the tester. 2. When turned off, long press to enter parameter settings. 3. In measurement mode, short press to turn on backlight. 4. In calibration mode, short press to cancel calibration.
	1. In measurement mode, short press to switch between pH and mV measurement mode. (ORP Sensor is separately available) 2. In parameter settings, short press to change parameters (Unidirectional).
	1. Long press to enter calibration mode. 2. In calibration mode, short press to confirm calibration. 3. When reading is locked (auto. HOLD on), short press to unlock.

3. Preparation Before Use

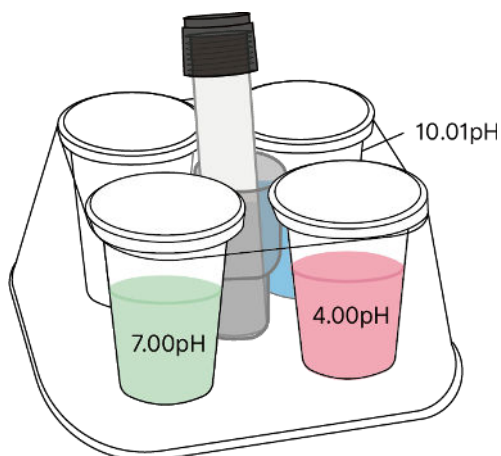
3.1 LabSen 246-5 Electrode Structure



- 3.2 Pull out the battery insulation paper.
- 3.3 Loosen the storage vial locking ring by twisting it counterclockwise. Then pull out the electrode slowly.



- 3.4 Let the storage vial (containing soaking solution) stand in the center of the CalBox solution organizer just in case it spills.



- 3.5 Rinse off the electrode with pure water (preferably distilled or deionized water. RO water is the alternative) , then blot dry the electrode with Kimwipe or clean tissues to remove excess water (Make sure NOT to rub the glass membrane).
- 3.6 Perform at least a 2-point calibration before first-time use. For calibration details, refer to Section 4.

4. pH Calibration

4.1 How to calibrate:

4.1.1 Short press  to power on the meter.

4.1.2 Pour pH buffer solutions into CalBox. Dip the electrode into pH 7.00 solution first, and make a quick stir in the solution, then let it stand.

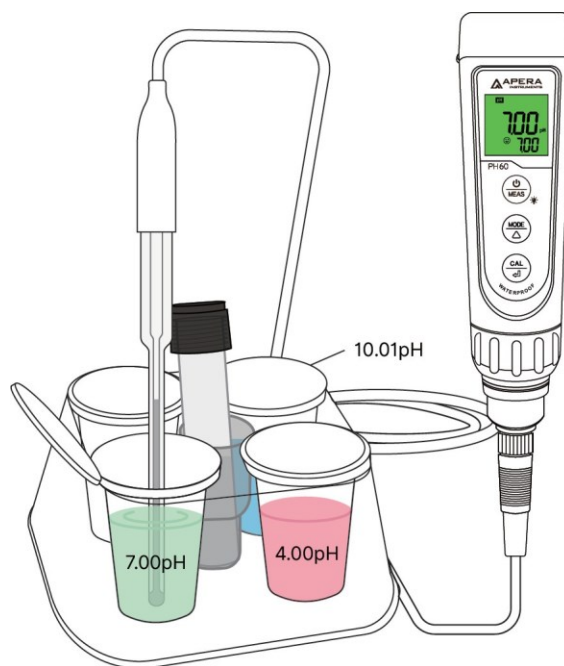
4.1.3 Long press  to enter calibration mode, the screen will turn green (Short press , if you decide to quit calibration and return to measurement mode).

4.1.4 Wait for the reading to stabilize (when  stays on the screen), then short press again  to finish the first point calibration. Once

calibration is complete, the meter switches to measuring mode and  will appear at the bottom left, indicating a successful 1-point calibration.

4.1.5 To calibrate the 2nd point, repeat steps 4.1.3 to 4.1.5 with the 4.00 pH calibration solution (DO NOT switch off the meter after you have completed the 7 pH calibration). If  is displayed next to  on the screen, a successful 2-point calibration has been completed.

4.1.6 If necessary (target pH value > 8.00), additionally calibrate the 3rd point with the 10.01 pH calibration solution and repeat steps 4.1.3 to 4.1.5. If  is then displayed next to  and , indicating a successful 3-point calibration.



4.2 Notes about calibration

4.2.1 Always start calibrating with pH 7.00 first. Perform the 2nd and 3rd point calibration immediately after the 1st point is finished. **Do NOT turn off the meter before you calibrate the second or third point.** Otherwise, after you restart the meter and perform calibration in pH 4.00 or pH 10.01, Er1 error will be generated and you will have to calibrate with pH 7.00 again. For more troubleshooting tips with calibration, refer to Section 14.

4.2.2 The pH 4.00 and pH 7.00 buffer solutions poured into the CalBox can be used for up to 10 times as long as they are not contaminated and the CalBox is capped when not in use. pH 10.01 can only be used for up to 5 times as it will lose its accuracy much faster. After that, replace the buffer solutions in the calibration vials with new ones to keep the accuracy. Keeping the freshness and cleanliness of calibration buffers is essential for accurate pH

measurement.

4.2.3 Isothermal Measurement Principle — The automatic temperature compensation of pH meters is not sufficient in compensating all pH measurement errors caused by temperature changes. To obtain the most accurate measurement, the meter should be calibrated in the buffer solution that is at the same temperature as the sample solution.

4.2.4 The tester can perform 1 to 3 points of automatic calibration and can recognize 5 types of pH standard solutions. For details, please refer to the following table:

Calibration	USA Standard Series		NIST Standard Series		Icon	Recommendation
1-point	7.00 pH		6.86 pH		(M)	Accuracy ≥ 0.1 pH
2- point	Option A	1st pt: 7.00 pH 2nd pt: 4.00 pH or 1.68 pH	Option A	1st pt: 6.86 pH 2nd pt: 4.01 pH or 1.68 pH	(L) (M)	Range < 7.00 pH
	Option B	1st pt: 7.00 pH 2nd pt: 10.01 pH or 12.45 pH	Option B	1st pt: 6.86 pH 2nd pt: 9.18 pH or 12.45 pH	(M) (H)	Range > 7.00 pH
3- point	1st pt: 7.00 pH 2nd pt: 4.00 or 1.68 pH 3rd pt: 10.01 or 12.45 pH		1st pt: 6.86 pH 2nd pt: 4.01 or 1.68 pH 3rd pt: 9.18 pH or 12.45 pH		(L) (M) (H)	Range: 0 to 14.00 pH

4.3 How often to calibrate the electrode?

The frequency that you need to calibrate your pH electrode depends on many factors such as the nature of test samples, condition of electrodes, and the requirement of the accuracy. For high-accuracy measurements ($\leq \pm 0.02\text{pH}$), the electrode should be calibrated before every test; For general-accuracy measurements ($\geq \pm 0.1\text{ pH}$), calibrate the electrode every 1-2 weeks.

In the following cases, the electrode must be re-calibrated:

- The electrode hasn't been used for a long time or a different electrode is connected.
- After measuring strong acid ($\text{pH} < 2$) or strong base ($\text{pH} > 12$) solutions.
- After measuring fluoride-containing solution and strong organic solution.
- There is a significant temperature difference between the test sample and the buffer solution.

5. pH Measurement

5.1 How to Take pH Measurement

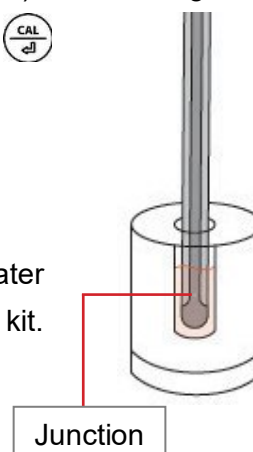
5.1.1 Short press  to power on. Remove the storage sleeve and rinse the electrode in distilled/deionized water, then shake off the excess water.

5.1.2 Submerge the electrode into your sample solution at least 1 inch deep, make a quick stir and hold still. Record the reading as the pH measurement when it is stabilized ( comes up and stays on screen).

5.1.3 If necessary, turn on the Auto-Hold function (refer to Section 8.3.3), the reading will be automatically locked when it's stable for more than 10 seconds. Short press  to cancel the Auto-Hold and keep measuring.

5.2 How to Take pH Measurement in Small-Volumes

5.2.1 The LabSen 246-5 pH electrode can measure as low as 60 μL of water sample with the use of the semi-micro container included in the test kit. Make sure to add in your sample solution to the level where the junction (the white spot) of the electrode can be submerged.



6. Electrode Cleaning

The meter is only as accurate as the electrode is clean. Always thoroughly rinse off the electrode before and after each measurement with distilled water or deionized water in a container or with a wash bottle.

To remove excessive water, just shake them off or blot dry with Kimwipe or lint-free cloth. Never rub the glass membrane of the electrode. Otherwise static electricity will be generated and cause measurement error.

For tough contaminants staying on the glass membrane or junction, refer to the following table for cleaning procedures:

Type of Contamination	Cleaning Agent	Soaking Time
Lipophilic substances, e.g. oil and fat deposits	Home dish soap water	5 – 10 minutes
Proteins	Apera Electrode Cleaning Solution (SKU: AI1166)	30 – 60 minutes

Inorganic coatings such as hydrocarbons	commercially available glass cleaning solutions	5 – 10 minutes
Hard, scale-type calcium deposits	Apera Electrode Cleaning Solution (SKU: AI1166)	5 – 10 minutes
Alkaline coatings	Apera Electrode Cleaning Solution (SKU: AI1166)	5 – 10 minutes
Acidic coatings	0.1M NaOH solution	5 – 10 minutes
Sulfide-containing substances	Thiourea	30– 60 minutes, leave until junction discoloration disappears.
Unknown substances	Apera Electrode Cleaning Solution (SKU: AI1166)	30 – 60 minutes

Use a soft brush to help thoroughly clean off the contaminants. After the cleaning procedure, the pH electrode should always be soaked in 3M KCl solution for 12-24 hours for rehydration. A re-calibration is also necessary before a new pH measurement.

7. Electrode Storage

- 7.1 Add 3M KCL soaking solution to the electrode storage vial and store the electrode in it. Twist on the vial locking ring tightly. If the 3M KCL soaking solution is contaminated, replace it with fresh solution. As a rule of thumb, replace the soaking solution on a monthly basis.
- 7.2 If you ever find white crystals outside the storage storage vial, it is perfectly normal. It is the 3M KCL soaking solution that crystalizes over time by its nature. Just rinse them off and add in new soaking solution. This chemical is not poisonous or dangerous, and the electrode's performance will not be affected.
- 7.3 NEVER store the electrode in pure water like tap, RO, distilled, or deionized water as they could damage the pH electrode. If this happens, immediately soak the pH electrode in 3M KCL soaking solution overnight, then re-calibrate it before use.

8. Parameter Settings

8.1 Settings Menu

Parameter	Parameter Setting Contents	Code	Factory Default
P1	Select pH buffer standard	USA – NIST	USA

P2	Low value measurement alarm setting	0 to 14.00pH	0 pH
P3	High value measurement alarm setting	0 to 14.00pH	14,00 pH
P4	Auto. Hold	Off – On	Off
P5	Select backlight	Off – 1 – On	1
P6	Select temperature unit	°C – °F	°F
P7	Restore to factory default	No – Yes	No

8.2 Parameter Settings

When the meter is turned off, long press  to enter parameter settings → Short press  to switch between P1-P2-P3...P7 → Short press  to select the parameter (starts flickering) → Short press  to change the parameter → Short press  to confirm the change → Long press  to return to measurement mode.

8.3 Parameter Setting Instruction

8.3.1 Standard pH Buffer Series (P1):

There are two options of standard buffer series: USA series and NIST series. Factory default is USA series, for details see section 4.2.

8.3.2 Alarm Function (P2&P3)

Examples:

■ Alarm triggered when reading ≤ 3.20 pH:

Set lowest value (P2) to 3.20 pH, highest value (P3) to 14.00 pH, when stable reading is less than 3.20 pH, the screen will turn red to send off the alarm.

■ Alarm triggered when reading ≥ 8.60 pH:

Set highest value (P3) to 8.60 pH, lowest value (P2) to 0.00 pH, when the stable reading is greater than 8.60 pH, the screen will turn red to send off the alarm.

■ Alarm triggered when reading ≤ 3.20 pH or ≥ 8.60 pH:

Set lowest value (P2) = 3.20 pH, highest value (P3) = 8.60 pH, when the stable reading is less than 3.20 pH or greater than 8.60 pH, the screen will turn red to send off the alarm.

8.3.3 Auto-Hold (P4)

Select "On" to activate the Auto-Hold function. When reading is stable for more than 10 seconds, the tester will lock the value automatically, and HOLD icon will show up

Short-press  to cancel the auto-hold (HOLD icon will go off).

8.3.4 Backlight (P5)

“Off”-turn off backlight, “On”-turn on backlight, 1- backlight will last for 1 minute.

8.3.5 Temperature Unit (P6)

Select between C° and F°.

8.3.6 Factory Default Setting (P7)

Select “Yes” to set the meter to its default status (erase all calibration records and return all parameter settings to the default value). This function can be used when the meter does not work well in calibration or measurement. Calibrate the meter again after setting the meter to factory default.

9. Technical Specifications (Instrument)

pH	Range	-2.00 – 16.00 pH
	Resolution	0,01 pH
	Accuracy	±0.01 pH (±1 digit)
	Calibration Points	1 – 3 points
	Automatic Temperature Compensation (ATC)	0 – 50 °C (32 – 122 °F)
Temp.	Measuring Range	0 – 50 °C (32 – 122 °F)
	Resolution	0.1 °C
	Accuracy	±0.5 °C
Screen	3-color LCD screen, Blue: Measurement; Green: Calibration; Red: Alarm	
Reading Lock	HOLD comes up on screen	
Low-Voltage Warning	 flashing, reminder of battery replacement needed	
Auto. Power-Off	In 8 minutes without operation	
Waterproof Rating	IP67	
Power	DC3V, AAA alkaline batteries×4	
Battery Life	Operation up to 2000 hours	
Dimension& Weight	Tester: 40×40×178mm/133g; Case: 255×210×50mm/700g	

10. Technical Specifications (Electrode)

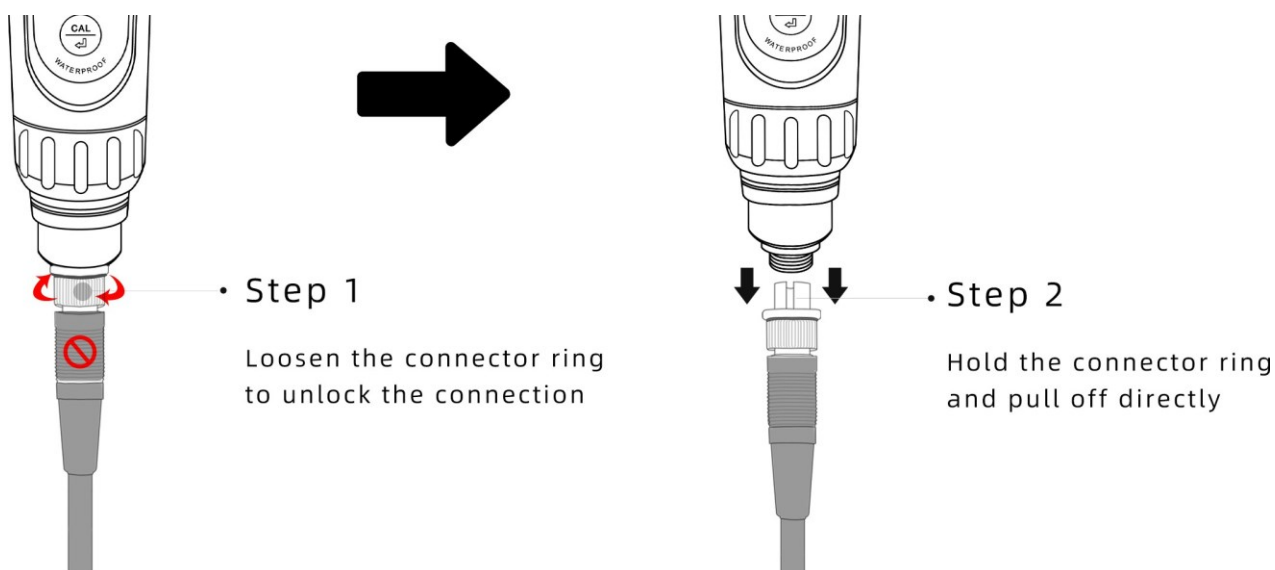
Measurement Range	0 – 14 pH
Temperature Range	0 to 100°C (32 to 212°F)

Reference System	Long-life Reference System
Junction	Ceramic
Reference Electrolyte	3M KCl
Shaft Dimension	12*120mm
Membrane Impedence	<350MΩ
Temperature Sensor	30KΩ NTC

11. Electrode Replacement

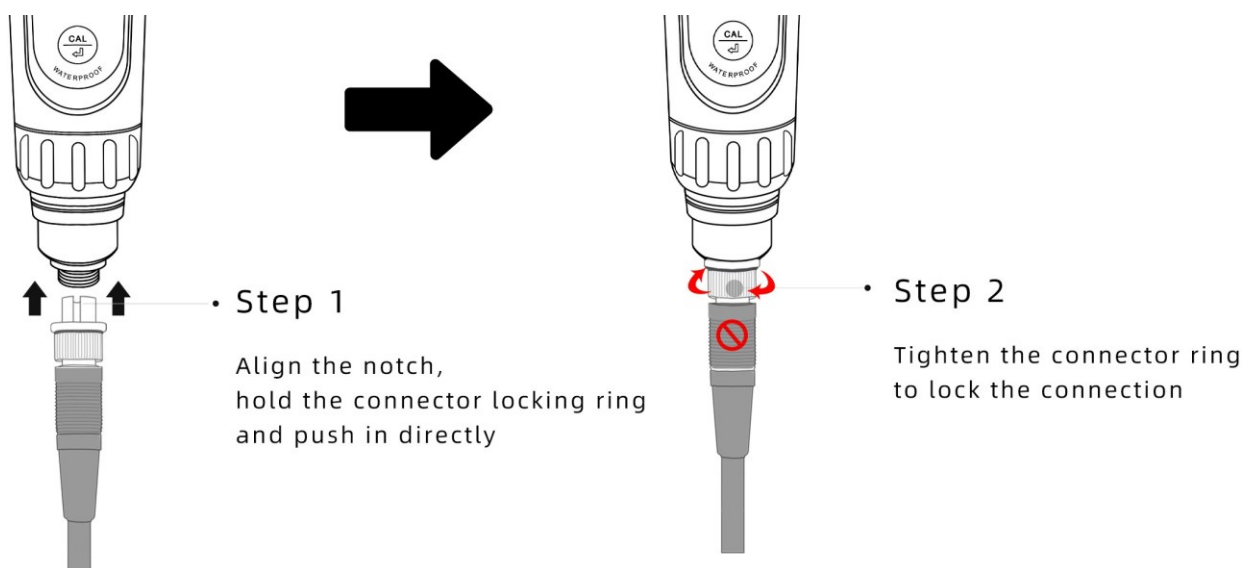
11.1 Every pH electrode gradually ages and will eventually fail. A typical service life of a pH electrode is 1-2 years depending on many factors such as frequency of use, nature of test samples, how well it is maintained, and etc. We recommend replacing your pH electrode every 1 to 2 years to guarantee the optimal performance.

11.2 Disconnect the old electrode



Never twist the black rubber part to prevent damage.

11.3 Install the new electrode



11.4 After installing the new electrode, please at least perform a 2-point calibration. Refer to Section 4.1 for how to calibrate.

11.5 pH Electrodes Compatible with the Meter for Other Applications

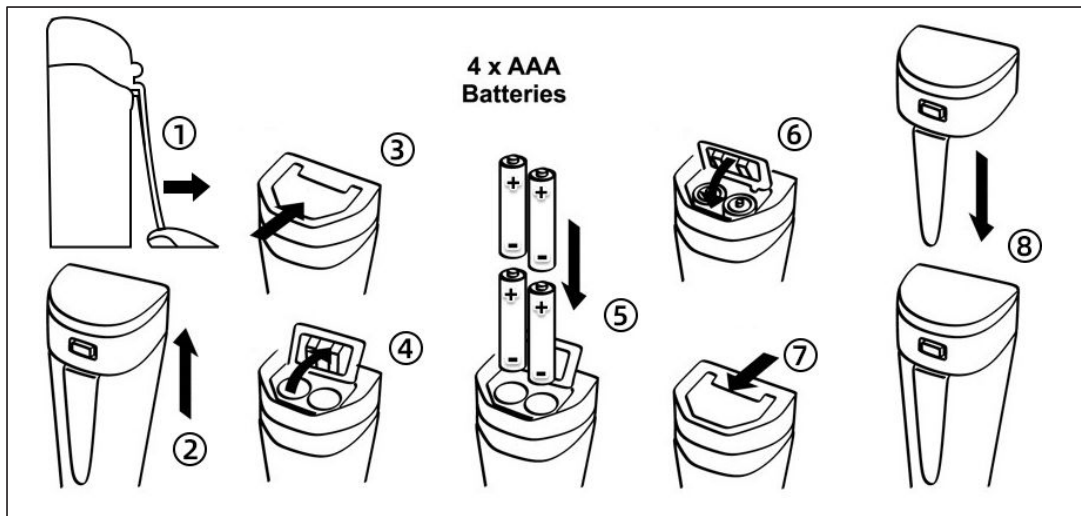
- LabSen 335 pH/Temp. Electrode for wastewater, suspensions, and emulsions
- LabSen 246-5 pH/Temp. Electrode for small-volume solutions and test tubes
- LabSen 845 pH/Temp. Electrode for strong alkaline and high-salinity solutions
- LabSen 835 pH/Temp. Electrode for HF-containing and strong acidic solutions
- LabSen 865 pH/Temp. Electrode for high temperature and caustic solutions
- LabSen 855 pH/Temp. Electrode for viscous samples
- LabSen 765 pH/Temp. Electrode for meats
- PH60S-E spear probe for foods e.g. cheese, sauce, milk, fruits, dough, etc.
- GS2-E spear probe for soil direct test
- PH60F-E flat probe for surface test

12. Battery Replacement

Please install batteries according to the following steps. *Please note the correct direction of battery installation: **The "+" OF EVERY SINGLE Battery MUST FACE UP.**

(WRONG INSTALLATION OF BATTERIES WILL CAUSE DAMAGE!)





- ① Loosen the pocket clip
- ② Pull off the battery cap
- ③ Slide and unlock battery compartment
- ④ Open the battery compartment
- ⑤ Insert the batteries (**all "+" FACE UP**)
- ⑥ Press down the battery compartment
- ⑦ Slide and lock the battery compartment
- ⑧ Close on the battery cap (make sure it's tightly closed with the O-ring. Otherwise the waterproof rating could be compromised.)

13. Self-Diagnosis Function

Error Symbol	Self-Diagnosis information
<i>Er 1</i>	The pH calibration solution cannot be recognized by the meter.
<i>Er 2</i>	 is pressed before measurement is fully stabilized.
<i>Er 3</i>	During calibration, readings being unstable for over 3 minutes.
<i>Er 4</i>	pH electrode offset out of range (<-60mV or >60mV)
<i>Er 5</i>	pH electrode slope out of range (<85% or >110%)
<i>Er 6</i>	The calibration reminder is triggered. It's time to perform a new pH calibration.

14. Troubleshooting Guide

Trouble	Reason	How to fix
	Incorrect calibration order (Er1)	Always calibrate pH 7 first, then pH 4 or pH 10. Refer to Section 4.2.1.

Calibration Error	Calibration solutions are in poor condition (Er1)	Make sure your calibration standard solutions are fresh and clean, and made by a legitimate manufacturer.
	Contaminated electrode (Er1)	Thoroughly clean off the electrode. Refer to Section 6.
	Aged electrode (Er1)	Replace the electrode.
	Dried-out electrode (Er1)	Soak in the soaking solution overnight to restore.
	Electrode is not in full contact with solutions (Er1)	Make sure the storage vial is taken off and the electrode is fully immersed in the solution (above the junction).
	Air bubbles around the sensor (Er1)	Make a quick stir in the solution to remove air bubbles.
	Pressing  too fast (Er2)	Wait for the reading to be fully stabilized before pressing  to finish the calibration
Reading is always slowly changing, won't stabilize.	Contaminated electrode	Thoroughly clean off the electrode. Refer to Section 6.
	Clogged junction	Refer to Section 6.2 to thoroughly clean off the junction.
	Aged electrode	Replace the electrode
	Testing low ionic strength solutions e.g. distilled water and deionized water	Refer to Section 5.2.
Display similar readings in any solutions or stuck at 7.00 pH	Broken electrode	- If you don't see any physical damage of the electrode and it's within the 6-month electrode warranty, contact us for warranty fulfillment; - If there is visible damage, replace the electrode.
	Instrument defect	Contact us for warranty fulfillment

Jumping Readings (generating random numbers)	Electrode is not in full contact with solutions	Make sure the storage vial is taken off and the electrode is fully immersed in the solution (above the junction).
	Air bubbles around the sensor	Make a quick stir in the solution to remove air bubbles.
	Electrode is not properly connected or the connector is broken.	• Check the electrode's connector, make sure it's not broken and is correctly connected. Refer to Section 11.3. • Screw on the connector cap to protect the connector when no electrode is connected.
Calibration is successful, but I think measurement is not accurate	Aged electrode	Replace the electrode
	Air bubbles around the sensor	Make a quick stir in the solution to remove air bubbles.
	Wrong buffer standard is selected	Match the buffer standard with the calibration buffers you use by changing the settings in P1.
	Verstopftes Diaphragma	Siehe Abschnitt 6.2 zur Reinigung des Diaphragmas
	Comparison with other meters, test strips, or drop tests	• To compare with other meters, make sure to perform a 2-point calibration for all meters in the same standards, then measure a 3rd standard solution. Whichever gives more accurate reading in the 3rd standard solution is the more accurate meter. • Test strips or drop tests' accuracy is not comparable to pH meters'.
	Calibration solutions are in poor condition	Make sure your calibration standard solutions are fresh and clean, and made by a legitimate manufacturer.
	The electrode is not suitable for your test sample or testing environment	Contact us to find the most appropriate electrode for your specific application.

15. Appendix

Function Comparision of PH60Z Meter and ZenTest® Mobile App

Functions	PH60Z Meter	ZenTest Mobile App
Display	Basic digital display	1.Basic Mode: digital display+calibration info (with manual data logger available)
		2.Dial Mode: see reading change with reading alarm range (with manual data logger available)
		3.Graph Mode: see the trend of reading changes (with auto. data logger available)
		4.Table Mode: see real time measurement data by every second (with auto. data logger available)
Calibration	Press buttons to operate	Operate on smartphone following graphic tutorial
Self-Diagnosis	Er1 – Er6 icons	Detailed problem analysis and solutions
Parameter Settings	Press buttons to set up (except for P7)	All parameters can be set up in Settings.
Reading Alarm	The screen turns red when alarm triggered; cannot be setup	Alarm display in all measurement modes, and alarm range can be set up.
Data Management	N/A	Manual or Auto. Datalogger; notes can be added to saved data
Data Output	N/A	Share data on your smart phone via email or other apps

16. Warranty

We warrant this instrument to be free from defects in material and workmanship and agree to repair or replace free of charge, at option of APERA INSTRUMENTS (Europe) GmbH, any malfunctioned or damaged product attributable to responsibility of APERA INSTRUMENTS (Europe) GmbH for a period of TWO YEARS (SIX MONTHS for the probe) from the delivery.

This limited warranty does NOT cover any damages due to:

Accidental damage, transportation, storage, improper use, failure to follow the product instructions or to perform any preventive maintenance, unauthorized repair or modifications, normal wear and tear, or other external causes or actions beyond our reasonable control.

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