

GroStar GS2 Soil pH Pen Tester Brief Manual

1. Features

- Specialized soil pH probe built with Swiss spear glass membrane and PTFE clog-free junction, the perfect companion for quick and reliable direct soil pH measurement.
- The probe is replaceable, saving money in the long run
- Intuitive operation, completing 2-point calibration within 30 seconds.
- Colored backlit LCD screen, white for measurement, green for calibration, red for error messages.
- Durable structure, IP67 waterproof rating, powered by AAA batteries, lasting up to 2000 hours.

2. Instrument Introduction

a. Keypad

	Short Press	Long Press
	1. Power on 2. In measurement mode, press to manually hold the measurement (HOLD displays on screen). Press again to cancel the hold.	Power off: hold the key until OFF displays.
	In measurement mode, press to turn on or off the backlight.	Start calibration: in measurement mode, hold the key until CAL displays
	/	Long press to switch between °F and °C

- b. Probe cap
 - The spear probe must be stored in cap filled with 3M KCL solution. We recommend replacing the solution at least once a month.

3. Preparation before first use

- a. Prepare a bucket of clean water (tap water is ok. Ideally use RO water). Rinse the probe in clean water and shake dry.
- b. Pull out the battery slip. Then power on the tester.
- c. Open the seal of the calibration solutions and submerge the probe in the calibration solution. Check the reading of the tester. If it reads 7.0 pH in the green pH 7 buffer and 4.0 pH in the red pH 4 buffer, then you are good to start the measurement. If there is a discrepancy (usually within 0.2 pH) between the reading and the value of the standard solution, please calibrate the tester before measurement begins (see Section 4).

4. Calibration

- a. Power on and remove the probe cap. Always calibrate 7.00 pH first. Rinse the probe with clean water and shake-dry, then submerge it in the 7.00 pH standard buffer; shake the probe in the solution for a few seconds and let it stand.
- b. Hold  key until **CAL** shows up on screen. The tester automatically starts the calibration process. When **Good** shows up, the calibration is successful, and the tester returns to measurement mode.
- c. The **M** icon will show up on the lower left corner indicating the tester is successfully calibrated. Repeat Step a to finish the 4.00 pH and/or 10.01 pH calibration, then **L** and/or **H** icon will show up next to **M**.
- d. **M/L/H** will disappear after 30 days, reminding you to re-calibrate the tester. We recommend calibrating the tester at least once a month to ensure the accuracy. If you feel like the accuracy is not as good, simply test the standard buffers (make sure the buffers are fresh and clean). If there is discrepancy, then it's time to calibrate again.
- e. If the calibration fails, the screen will turn red. For details, see Section 11.

5. Measure soil pH directly

- 1) Remove about 2 inches (5cm) of the top layer soil, making sure the soil is wet. If the soil is dry, pH measurement cannot be performed. You can add some distilled or RO water to moisten. Ideally, wait 24 hours before measuring.
- 2) Use the digging tool to create a pathway for the spear probe at about 4-6 inches (10-15cm) in depth. This will help minimize the wear and tear of the spear glass probe.
- 3) Power on the tester; Remove the probe cap; Rinse the probe in the water bucket, and shake dry.
- 4) Insert the probe in the hole you just created up until the bottom where you cannot stick in any further (do NOT use excessive force to stick in); Wait for the reading to fully stabilize (☺ stays on screen), then press  key to hold the reading; Take out the tester and record the measurement.
- 5) After each test, the probe must be thoroughly rinsed in the water bucket. Make sure to clean off the dirt on the white PTFE junction ring using the cleaning brush. Avoid brushing the spear glass tip as much as possible. After the cleaning, shake the probe dry.

The white PTFE ring junction will become brownish after the first soil pH test as some small soil particles are stuck on the ring, which can never be fully removed. This brownish junction will not affect the measurement accuracy as long as the bigger soil particles are eliminated by the cleaning brush in water.

- 6) Repeat Step 2) to Step 5) to record 3-5 measurements in different locations of your sample area, then calculate the average value. After measurement, put the probe back in the storage cap and soak in the 3M KCL solution.

The recommended pH range for soil crops is 6.2 to 7.2 pH. And the best pH range for each plant is different.

The factors that are affecting the soil pH include soil type, growth stage of the plant, use and types of fertilizers, use of pesticides, and the soil's temperature. In the practice of direct soil pH testing, because soil is not evenly distributed, the soil in different locations and different depth will have slightly different pH values. Even when the angle you stick in the probe is different, the measurement can also be affected. Therefore, selecting multiple locations while doing your best sticking in the probe at the same depth and angle, then calculating the average is the best way to offset such reading errors and maximize the measurement accuracy.

6. Measuring soil solution's pH

- 1) Remove about 2 inches (5cm) of the top layer soil and collect different locations' soil samples at approximately 6 inches (15cm) deep.
- 2) Thoroughly mix all collected soil.
- 3) Ideally, dry the soil in the air or bake in an oven at 104°F / 40°C.
- 4) Weigh out 20g of the mixed soil sample into a glass jar and add 100g of distilled or deionized water in it.
- 5) Shake well for 5 minutes or use a magnetic stirrer to automatically stir for 15 minutes. Leave overnight.
- 6) Shake or stir again next morning, then allow it to settle for 15-30 minutes.
- 7) Power on the tester; Remove the probe cap; Rinse the probe in the water bucket, and shake dry.
- 8) Submerge the probe into the soil solution, shake for a few seconds, and wait for the reading to fully stabilize. Then record the reading.
- 9) After measurement, put the probe back in the storage cap and soak in the 3M KCL solution.

7. Other Functions

- a. If necessary, you can hold the reading before recording the measurement by short pressing . Press it again to cancel the hold.
- b. Long press  to switch temperature unit between °F and °C.
- c. The tester will automatically power off if there is no operation within 10 minutes.

8. Probe Cleaning

- a. A clean probe is essential to measurement accuracy. Always thoroughly rinse off the probe before and after each measurement with clean water. Do not wipe the glass sensor tip. Shake-dry and dap off excess water with clean tissue.
- b. For tough contaminants, soak the probe in Apera's cleaning solution for at least 30 minutes. Then soak the probe in 3M KCL overnight. Rinse it off and recalibrate the tester before measuring again.

9. Storage

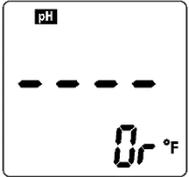
Always store the probe in the storage cap filled with 3M KCL solution.

Replace the KCL at least once a month.

10. Notes

- a. Never store the probe in pure water such as tap water, RO water, distilled water, deionized water, etc.
- b. Never use your finger to touch the glass membrane or use other material to wipe it.
- c. Avoid testing in high ($>45^{\circ}\text{C}$) or low temperature ($<5^{\circ}\text{C}$) solutions as it will cause greater measurement error and cause damage to the probe. Test your samples and perform calibration close to room temperature as much as possible.
- d. Do NOT test oily liquid or solutions containing proteins.
- e. Make sure the battery lid must be tightly closed on. O-rings must be properly installed. Otherwise, the waterproof rating will be compromised.

11. Error messages

	<p>Calibration Errors</p> <ol style="list-style-type: none">1. The first calibration point is not 7.00 pH or calibration buffer is wrong or problematic.2. Reading cannot stabilize within 1 minute3. Probe slope or offset is exceeding the standard range
	<p>Temperature or pH measurement is out of range</p>

12. Technical Specs

pH Range	0.0 to 14.0pH
pH Resolution	0.1 pH
pH Accuracy	±0.1 pH
Temperature compensation	Automatic
Temperature Range and Operating Temperature	32 to 122°F (0 to 50°C)
Temperature Resolution	0.1°F/°C
Temperature Accuracy	±0.5°C
Calibration	1 to 3 points (7/4/10)
Unit	pH, °F, °C
Power supply	4*AAA alkaline batteries, up to 2000 hours of operation
Backlight	White (measurement); Green (calibration); Red (errors)
Reading hold	Manual
Warranty	Two years for the instrument, one year for the probe
pH probe	Low resistance lithium glass membrane, double-junction, blue gel electrolyte
Successful calibration indicators	M (7.00 pH), L (4.00 pH), H (10.01 pH)
Low battery reminder	
Waterproof rating	IP67
Reading stabilization icon	
What's in the box	GS2 Soil pH Pen Tester, 7.00/4.00 pH (50mL each), 3M KCL storage solution (10ml), digging tool, cleaning brush, user manual, lanyard.