HI99121

Waterproof pH & Temperature Meter for Direct Measurement in Soil

INSTRUCTION MANUAL

HANNA® instruments

Dear Customer,

Thank you for choosing a Hanna Instruments product.
Please read this instruction manual carefully before using this meter.
This manual will provide you with the necessary information for correct use of this meter, as well as a precise idea of its versatility.
If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or view our worldwide contact list at www.hannainst.com.

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PRELIMINARY EXAMINATION

Remove the instrument and accessories from the packaging and examine it carefully to make sure that no damage has occurred during shipping. Notify your nearest Hanna Instruments Customer Service Center if damage is observed.

Each HI99121 is delivered in a rugged carrying case and is supplied with:

- HI12923 pH/temperature probe with conical tip, DIN connector and 1 m (3.3') cable
- HI70004 pH 4.01 buffer (1 sachet)
- HI70007 pH 7.01 buffer (1 sachet)
- HI700663 cleaning solution for soil deposits (1 sachet)
- HI700664 cleaning solution for humus deposits (1 sachet)
- HI7051M soil sample preparation solution
- HI721319 auger for ground penetration, packed separately in a carton box
- 100 mL beaker (1 pc.)
- 1.5V AAA alkaline batteries
- Instrument quality certificate
- Electrode quality certificate
- Instruction manual

Note: Save all packing material until you are sure that the instrument works correctly. Any damaged or defective item must be returned in its original packing material with the supplied accessories.

GENERAL DESCRIPTION AND INTENDED USE

The HI99121 portable pH meter together with HI12923 pH electrode is designed to measure pH in soil or soil slurries.

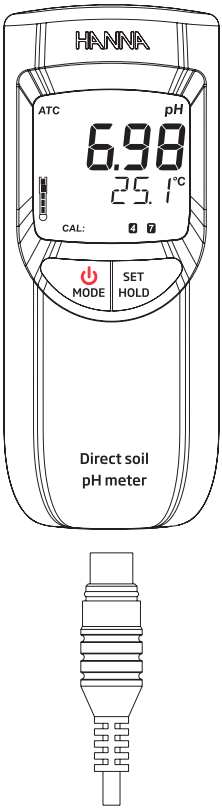
The HI99121 is a lightweight, portable pH and temperature meter. It features a two button operation system and is simple to use. It has a waterproof and compact casing, large dual-line display, and automatic pH calibration at one or two points.

The HI12923 has a conical rugged tip. It has a built-in temperature probe for temperature compensated pH readings and an integrated preamplifier to provide measurements impervious to noise and electrical interferences.

The HI721319 auger for ground penetration is supplied to loosen the soil prior to any measurements being taken. The use of the auger is recommended to prevent scratching to the pH glass.

MAIN FEATURES

- Simultaneous pH and temperature measurements on a large dual-line LCD display
- Automatic pH calibration at one or two points within two memorized buffer sets (standard or NIST)
- Selectable temperature unit (°C or °F)
- Electrode condition indicator
- mV of pH measurement for electrode check
- HI12923 dedicated pH probe with integrated temperature sensor
- Probe quick connect system
- Battery life indication and low battery detection
- Keystroke confirmation tone
- Auto-off function
- Waterproof casing IP67



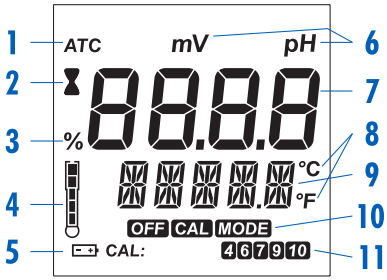
SPECIFICATIONS

Range*	-2.00 to 16.00 pH / -2.0 to 16.0 pH ±825 mV (pH-mV) -5.0 to 105.0 °C/23.0 to 221.0 °F
Resolution	0.01 pH / 0.1 pH 1 mV 0.1 °C/0.1 °F
Accuracy @ 25 °C / 68 °F	±0.02 pH / ±0.1 pH ±1 mV (pH-mV) ±0.5 °C up to 60 °C; ±1.0 °C outside ±1.0 °F up to 140 °F; ±2.0 °F outside
Temperature compensation	Automatic -5.0 to 105.0 °C/23.0 to 221.0 °F
pH calibration	Automatic, 1 or 2 point selectable buffer set Standard (4.01, 7.01 10.01) or NIST (4.01, 6.86, 9.18)
Probe (included)	HI12923 preamplified pH and temperature probe with conical tip, DIN connector and 1 m (3.3') cable
Battery type/life	1.5V AAA (3 pcs.) approx. 1400 hours of continuous use
Auto-off	user selectable: after 8 min, 60 min or disabled
Environment	0 to 50 °C (32 to 122 °F) RH max. 100%
Meter dimensions	154 x 63 x 30 mm (6.1 x 2.5 x 1.2")
Weight (with batteries)	196 g (6.91 oz.)
Case ingress protection rating	IP67

* the HI12923 is limited to be used from 0 to 12 pH and from -5 to 70 °C temperature (23 to 158 °F).

DISPLAY DESCRIPTION

1 Automatic Temperature Compensation indicator
2 Stability indicator
3 Battery percentage
4 Electrode condition indicator
5 Low battery indicator
6 Measurement unit
7 Primary LCD
8 Temperature unit
9 Secondary LCD
10 Meter modes indicator
11 pH calibration buffer(s) used



OPERATIONAL GUIDE

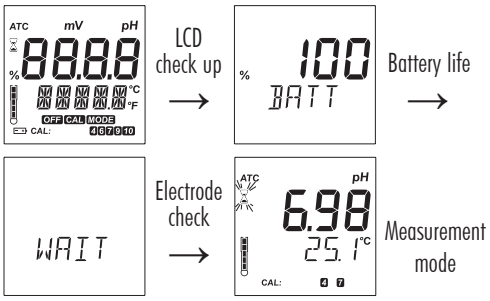
Each meter is supplied with batteries. Before using the meter for the first time, open the battery compartment and insert batteries, observing the polarity (see "Battery Replacement").

CONNECTING THE ELECTRODE

With the meter turned off, connect the HI12923 probe to the DIN socket on the bottom of the meter by aligning the pins and pushing in the plug firmly. Remove the protective cap from the probe before taking any measurements.

TURNING THE METER ON

To turn the meter ON, press the ⏻ button on the front of the meter. If it does not turn on, make sure that the batteries are properly installed in their place. The meter is provided with an active acoustic signal that confirms when a key is pressed. At start-up the meter displays all LCD segments for a few seconds, followed by the percentage indication of the remaining battery life, displaying "**WAIT**" until electrode check is in process then the meter enters the normal measurement mode.



Note: The meter detects the presence and the type of the probe at its input.

*- If the probe is not connected the message "**NO**" "**PROBE**" appears alternatively on the secondary LCD with "---" blinking on the first LCD line.*

*- If the probe is not compatible "**WRONG**" "**PROBE**" message appears alternatively on the secondary LCD with "---" blinking on the first LCD line.*

- If the readings are out of range, the nearest range limits are displayed blinking (e.g. -2.00 pH -5.0 °C).

SELECTING MEASUREMENT VALUES

While in measurement mode, press the **SET** button to select pH or pH-mV measurement on the first LCD line.

FREEZING MEASUREMENT VALUES

While in measurement mode, press and hold the **SET** button until "**HOLD**" appears on the secondary LCD. The "**HOLD**" remains for 1 second and reading of pH, mV and temperature will be frozen on the LCD with "**H**" blinking.

Press any button to resume active measurements.

ENTERING CALIBRATION MODE

Press and hold the ⏻ button until "**POWER**" and **OFF** tag is replaced by "**STD**" and **CAL** tag. Release the button.

ENTERING SETUP MODE

Press and hold ⏻ button until "**STD**" and **CAL** tag is replaced by "**SETUP**" and **MODE** tag. Release the button.

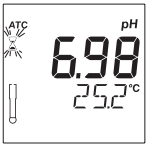
TURNING THE METER OFF

While in measurement mode, press the ⏻ button."**POWER**" and **OFF** tag will appear. Release the button.

pH MEASUREMENT & CALIBRATION

Make sure the meter has been calibrated before use. If the probe is dry, soak it in HI70300 storage solution for 30 minutes to reactivate it. If soiled, clean the electrode by soaking in cleaning solution for 20 minutes, then rinse the tip and soak in storage solution at least 30 minutes before use. Rinse the electrode off well and shake off excess droplets. Recalibrate before using. Submerge the probe in the sample to be tested while stirring it gently. Wait until the ⌛ tag on the LCD disappears.

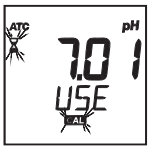
The LCD displays the pH value (automatically compensated for temperature) on the primary LCD, while the secondary LCD displays the sample temperature. If measurements are taken in different samples successively, rinse the probe tip thoroughly in distilled or deionized water to eliminate cross-contamination.



For better accuracy, frequent calibration of the pH sensor with the meter is recommended. In addition, the meter must be recalibrated:

a) whenever the pH electrode is replaced.
b) after testing aggressive chemicals.
c) when high accuracy is required.
d) at least once a month.
e) after cleaning the sensor.

pH calibration



Enter calibration mode while in pH measurement mode. Place the sensor into the first calibration buffer. If performing a two-point calibration, use pH 7.01 (pH 6.86 for NIST) buffer first. The meter will enter the calibration mode, displaying "**pH 7.01 USE**" CAL and ⌛ tag blinking (or "**pH 6.86 USE**" for NIST).
Follow directions for single and two-point calibration below:

Single-point calibration

1. Place the probe in any buffer from the selected buffer set. The meter will automatically recognize the buffer value.
2. If the buffer is not recognized or the calibration offset is out of the accepted range "**---- WRONG**" is displayed.
3. If the buffer is recognized "**REC**" is displayed then "**WAIT**" until the calibration is accepted.
   If using pH 7.01 (or pH 6.86 for NIST), after acceptance of the buffer press any key to exit. The "**SAVE**" message is displayed and the meter returns to pH measurement mode.

If using pH 4.01 or 10.01 (or pH 9.18 for NIST) buffer the "**SAVE**" message is displayed and meter returns to pH measurement mode.

Two-point calibration

Proceed with steps 1 through 3 under single-point calibration using 7.01 pH (pH 6.86 for NIST) buffer first. Then follow steps below:
The "**pH 4.01 USE**" message is then displayed.
Place the probe in the second calibration buffer (pH 4.01 or 10.01, or, if using NIST, pH 4.01 or 9.18). When the second buffer is accepted, the LCD will display "**SAVE**" for 1 second and the meter will return to the normal measurement mode.
If the buffer is not recognized or the slope is out of accepted range "**--- WRONG**" is displayed. Change the buffer, clean the electrode or press any key to exit calibration.
For better accuracy it is always recommended to carry out a two-point calibration.
After the calibration procedure has been completed, the CAL tag is turned on together with the calibrated points.

Exiting calibration and resetting default values

After entering the calibration mode and before the first point is accepted, it is possible to quit the procedure and return to the last calibration data by pressing the ⏻ button. The LCD displays "**ESC**" for 1 second and the meter returns to normal mode.
To reset the default values and clear a previous calibration, press the **SET** button after entering the calibration mode and before the first point is accepted.
The LCD displays "**CLEAR**" for 1 second, the meter resets to the default calibration and the CAL tag with the calibrated points on the LCD disappears.

ELECTRODE CONDITION

The display is provided with a probe icon (unless the feature is disabled from setup) which indicates the electrode status after calibration. The "condition" remains active for 12 hours (unless the batteries are removed).

The electrode condition is evaluated only if the current calibration has two points.

5 bars: excellent condition
4 bars: very good condition
3 bars: good condition
2 bars: fair condition
1 bar: poor condition
1 bar blinking: very poor condition

With 1 bar it is recommended to clean the electrode and recalibrate. If there is still only 1 bar or 1 bar blinking replace the probe.

Sensor check

Setting the meter to pH-mV range the user can check the sensor status at any time. The offset value is the reading in pH 7.01 buffer (@ 25 °C/77 °F). If this reading is outside the range ±30 mV, the electrode is considered "very poor". The slope value of the sensor is the difference between readings in pH 7.01 and in pH 4.01 buffers. When the slope reaches the value of about 150 mV, the electrode is considered "very poor". When "poor" or "very poor", it is recommended to replace it with a new one.

Note: To ensure reliable readings, the electrode must be cleaned with cleaning solution and then hydrated in storage solution for a minimum of 30 minutes before calibrating the probe.

METER SETUP

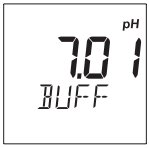
Setup mode allows the selection of the Temperature unit, Auto-off, Beep confirmation tone, the type of pH buffer set, the Resolution and Information. To enter Setup mode press and hold ⏻ button until "**STD**" and CAL tag is replaced by "**SETUP**" and MODE tag. Release the button.

- "**TEMP**" is displayed on the secondary LCD with the current temperature unit (e.g. "**TEMP °C**"), for °C/°F selection, use the **SET** button. After the temperature unit has been selected, press ⏻ to confirm and to enter the "**A-OFF**" selection.

- Use the **SET** button, to navigate through the auto-off choices: 8 minutes ("**8**", default value), 60 minutes ("**60**") or disabled ("**---**"). Press ⏻ to confirm and to enter the "**BEEP**" selection.

- To switch the beep tone ON or OFF, press the **SET** button; press ⏻ to confirm and to enter the calibration buffer selection "**pH 7.01 BUFF**".

- To change the buffer set, the meter will show the current buffer set: "**pH 7.01 BUFF**" (for standard buffer set: 4.01/7.01/10.01) or "**pH 6.86 BUFF**" (for NIST buffer set: 4.01/6.86/9.18). Change the set with the **SET** button. Press ⏻ to confirm and to enter pH resolution selection "**RESOL**".



- To change the pH measurement resolution between "**0.1**" and "**0.01**" use the **SET** button; then press ⏻ to confirm and to enter electrode calibration information "**INFO**" selection.

- To switch the electrode condition indicator on the LCD ON or OFF, press the **SET** button; press ⏻ to exit setup options. Change the set with the **SET** button, then press ⏻ to confirm and to return to normal mode.

SOIL pH

pH is the measure of the hydrogen ion concentration [H^+]. The pH scale goes from 0 (very acidic) to 14 (basic) with pH 7 being neutral. Soil can be acid, neutral or alkaline.

Figure 1 shows the relationship between the scale of pH and types of soil. Most plants prefer a pH range from 5.5 to 7.5; but some species prefer more acid or alkaline soils. Nevertheless, every plant has a target for optimum growth.

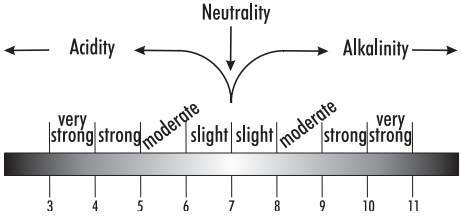


Fig. 1. Types of soil according to the pH value

pH strongly influences the availability of nutrients and the presence of microorganisms and plants in the soil.

For example, fungi prefer acidic conditions whereas most bacteria, especially those supplying nutrients to the plants, have a preference for moderately acidic or slightly alkaline soils. In fact, in strongly acidic conditions, nitrogen fixing and the mineralization of vegetable residual is reduced. Plants absorb the nutrients dissolved in the soil water and the nutrient solubility depends largely on the pH value. Hence, the availability of elements is different at different pH levels (see **Figure 2**).

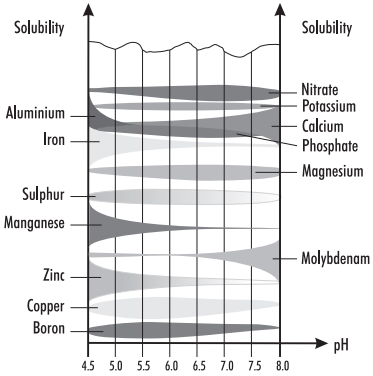


Fig. 2. Solubility of the elements according to varying pH

Each plant needs elements in different quantities and this is the reason why each plant requires a particular range of pH to optimize its growth.

For example, iron, copper and manganese are not soluble in an alkaline environment. This means that plants needing these elements should theoretically be in an acidic type of soil. Nitrogen, phosphorus, potassium and sulfur, on the other hand, are readily available in a pH range close to neutrality.

Abnormal pH values may increase the concentration of toxic elements for plants. For example, a plant may not tolerate an excess of aluminum ions that may increase under acidic conditions.

When pH values are too far from neutral conditions a less permeable and more compact soil may result.

Soil Management Strategy with regard to pH

- It is advisable to choose crops that are suitable for the soils pH range (e.g. rice, potato, strawberry crops have a preference for acid soil).
- Add fertilizers that do not increase acidity (urea, calcium nitrate, ammonium nitrate and superphosphate) or lower alkalinity (ammonium sulfate).
- A cost evaluation should be made prior to soil pH modification to determine cost of soil ameliorants versus value of plants grown.
- pH modification may produce critical improvement in plant performance but may take too long or be short lived.

For example, by adding lime, the effects in clay soil can last for as long as 10 years, but only 2-3 years in a sandy soil.

For an acid soil, we can use substances such as lime, dolomitic, limestone and marl, according to the nature of the soil. See **Table 1.**

Soil Ameliorants	Clay soil	Silty soil	Sandy soil
CaO	30-50	20-30	10-20
$Ca(OH)_2$	39-66	26-39	13-26
$CaMg(CO_3)_2$	49-82	33-49	16-33
$CaCO_3$	54-90	36-54	18-36

Table 1. Quantity (q/ha) of pure compound necessary to increase 1 unit of pH.

Different naturally occurring minerals may affect soil pH the same way, but the method for correction may differ. Take for example elevated soil pH:

- Soils rich with limestone:

Add organic matter (non-organic ameliorants such as sulfur and sulfuric acid might not make economic sense due to the large quantities needed).

- Alkaline-saline soils:

An appropriate use of irrigation can provide positive results (drop-irrigation) by flushing out salts.

If alkalinity is caused by sodium, it is recommended to add substances such as gypsum (calcium sulfate), sulfur or other sulfuric compounds. In this case, a cost evaluation is necessary. See **Table 2** and note what quantities provide the same result as 100 kg of gypsum.

Soil ameliorants (pure compounds)	Quantity (kg)
Calcium chloride: $CaCl_2 \cdot 2H_2O$	85
Sulfuric acid: H_2SO_4	57
Sulfur: S	19
Iron sulfate: $Fe_2(SO_4)_3 \cdot 7H_2O$	162
Aluminum sulfate: $Al_2(SO_4)_3$	129

Table 2. Soil ameliorants.

Procedure for direct ground measurement

Note: Do not use this procedure if the soil being measured is rocky the pH electrode can be damaged.

1) Ensure the meter is set up correctly and pH electrode is calibrated.
2) Dig and discard 5 cm (2") of topsoil.
3) Perforate the soil with the HI721319 auger for ground penetration to a depth of 20 cm (8").
4) If the soil is dry, moisten it with a small amount of distilled or deionized water.
5) Wash the electrode with tap water.
6) Insert the electrode pushing it slightly into the soil to ensure the pH bulb is in contact with the soil.
7) Allow the measurement to stabilize and record the value.
8) Wash the electrode with tap water and gently remove any soil remaining on the electrode with your finger, this will prevent the glass from scratching.

For the best results, prepare a soil slurry using the HI7051 soil sample preparation solution.

Procedure for the measurement of soil solution

1) Ensure meter is set up corectly and pH electrode is calibrated.
2) Sampling
   a) Extract soil sample for testing. For small sample area at least 2 samples are recommended. For larger areas take 1 sample per 1000 m^2 (0.25 acre). A higher number of samples will give you better results. Take the same size sample from each location (i.e. one bag). Avoid extracting samples with obvious anomalies and consider them separately.
      Depth and extraction guidelines:
      General: Dig and discard 5 cm (2″) of topsoil. Dig to a depth of 20 cm (8″).
      Herbaceous crops: Dig to a depth of 20 to 40 cm (8″ to 16″).
      Orchards: Dig to a depth of 20 to 60 cm (8″ to 24″).
   b) Spread each soil sample on newspaper and let them dry in a shady place or place them in a 40°C oven until dry. Discard any stones and plant residue.
   c) Mix all of the dried samples together to obtain a homogeneous mixture.
3) Prepare soil slurry
   a) Sift roughly 30 grams of the dried soil though a 2 mm sieve.
   b) Weigh 10 g of soil into a beaker and add 25 mL of HI7051 soil sample preparation solution. If necessary the sample size can be increased to 20 g and 50 mL of HI7051.
   c) Mix the sample vigorously for 30 seconds.
   d) Wait 5 minutes. This will allow the soil to release soluble nutrients.
4) Immerse the pH electrode into the prepared sample and swirl gently.
5) Allow the measurement to stabilize and record the value.
6) Wash the electrode with tap water and gently remove any soil remaining on the electrode with your finger, this will prevent the glass from scratching.

ORGANIC SUBSTRATE

The pH measurement of organic substrates is important in greenhouses and nursery growing pots. pH should be checked at the outset to make sure that the pH of bought substrate is that desired (pH can change if too much time elapses from the date of packaging to the moment of utilization).

1) Ensure pH meter is set up correctly and pH electrode is calibrated.

2) Direct pot measurements
   a) Add a little distilled or deionized water to the substrate if it is dry
   b) Use the HI721319 auger for ground penetration to puncture the soil.
   c) Insert the electrode pushing it slightly into the substrate to ensure the pH bulb is in contact with with it.
   d) Allow the measurement to stabilize and record the value.
   e) Wash the electrode with tap water and gently remove any substrate remaining on the electrode with your finger, this will prevent the glass from scratching.

3) Substrate solution
   a) Extract a sample of the substrate and allow it to dry. Remove any plant residues and rocks.
   b) Weigh 10 g of soil into a beaker and add 20 mL of HI7051 soil sample preparation solution. If necessary the sample size can be increased to 20 g and 40 mL of HI7051.
   c) Mix the sample vigorously for 30 seconds.
   d) Wait 5 minutes. This will allow the soil to release soluble nutrients.
   e) Immerse the pH electrode into the prepared sample and swirl gently.
   f) Allow the measurement to stabilize and record the value.
   g) Wash the electrode with tap water and gently remove any soil remaining on the electrode with your finger, this will prevent the glass from scratching.

IRRIGATION WATER

Irrigation water quality is a very important factor. If the pH value is well below pH 7, it is possible that contaminants are present.

Ranges for evaluation of water quality:

- 6 to 8.5 pH: good, can be utilized without problems
- 5 to 6 pH or 8.5 to 9 pH: sufficient, sensitive crops could have problems
- 4 to 5 pH or 9 to 10 pH: use carefully, avoid use if possible
- pH<4 or pH>10: Indicates presence of contaminants. Do not use for irrigation.

NUTRIENT SOLUTION

A rational fertilization program is required for optimum plant growth in greenhouses. pH value of nutrient solution (water + fertilizer) has to meet plant needs.

If a fertigation system with automatic pH control is used, ensure that it is functioning properly.

Check the pH of the irrigation solution as well as of any recycled solution.

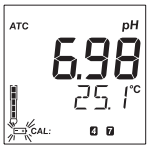
Table 3 tabulates optimum pH values for various plants.

ORCHARD PLANTS			
Preferred pH Range		Preferred pH Range	
Apple	5-6.5	Orange	5-7
Apricot	6-7	Peach	6-7.5
Cherry	6-7.5	Pear	6-7.5
Grapefruit	6-7.5	Plum	6-7.5
Grapevine	6-7	Pomegranate	5.5-6.5
Lemon	6-7	Walnut	6-8
Nectarine	6-7.5		
VEGETABLES AND HERBACEOUS CULTIVATIONS			
Preferred pH Range		Preferred pH Range	
Artichoke	6.5-7.5	Pepper	6-7
Asparagus	6-8	Early Potato	4.5-6
Barley	6-7	Late Potato	4.5-6
Bean	6-7.5	Sweet Potato	5.5-6
Brussels Sprout	6-7.5	Pumpkin	5.5-7.5
Early Carrot	5.5-7	Rice	5-6.5
Late Carrot	5.5-7	Soybean	5.5-6.5
Cucumber	5.5-7.5	Spinach	6-7.5
Eggplant	5.5-7	Strawberry	5-7.5
Lettuce	6-7	String	6-7.5
Maize	6-7.5	Sugar Beet	6-7
Melon	5.5-6.5	Sunflower	6-7.5
Oat	6-7	Tomato	5.5-6.5
Onion	6-7	Watermelon	5.5-6.5
Pea	6-7.5	Wheat	6-7

LAWN			
Preferred pH Range			
Lawn		6-7.5	
GARDEN PLANTS AND FLOWERS			
Preferred pH Range		Preferred pH Range	
Acacia	6-8	Ligustrum	5-7.5
Acanthus	6-7	Magnolia	5-6
Amaranth	6-6.5	Narcissus	6-8,5
Bougainvillea	5.5-7.5	Oleander	6-7.5
Dahlia	6-7.5	Paulownia	6-8
Erica	4.5-6	Portulaca	5.5-7.5
Euphorbia	6-7	Primula	6-7.5
Fuchsia	5.5-7.5	Rhododendron	4.5-6
Gentian	5-7.5	Roses	5.5-7
Gladiolus	6-7	Sedum	6-7.5
Hellebore	6-7.5	Sunflower	6-7.5
Hyacinth	6.5-7.5	Tulip	6-7
Iris	5-6.5	Viola	5.5-6.5
Juniper	5-6.5		
HOUSE PLANTS			
Preferred pH Range		Preferred pH Range	
Abutilon	5.5-6.5	Gardenia	5-6
African Violet	6-7	Geranium	6-8
Anthurium	5-6	Hibiscus	6-8
Araucaria	5-6	Jasmine	5.5-7
Azalea	4.5-6	Kalanchoe	6-7.5
Begonia	5.5-7.5	Mimosa	5-7
Camellia	4.5-5.5	Orchid	4.5-5.5
Croton	5-6	Palms	6-7.5
Cyclamen	6-7	Peperomia	5-6
Dieffenbachia	5-6	Philodendron	5-6
Dracaena	5-6	Yucca	6-7.5
Freesia	6-7.5		

Table 3. Preferred pH range for various crops and plants

BATTERY REPLACEMENT

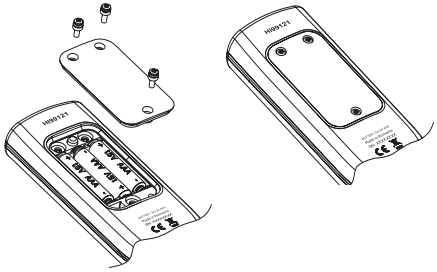


When the remaining battery life is less than 10% the battery tag blinks on the display to warn the user.

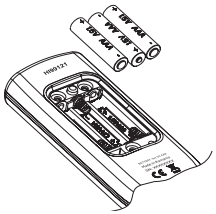
Battery Error Prevention System (BEPS)

If the battery is too weak (“**0%**”) the display shows “**bAtt**“, “**DEAD**“ for a few seconds then the meter powers off. Immediately replace the batteries with new ones.

The batteries are accessed by opening the battery cover on the back of the instrument. Remove protective boot if present.



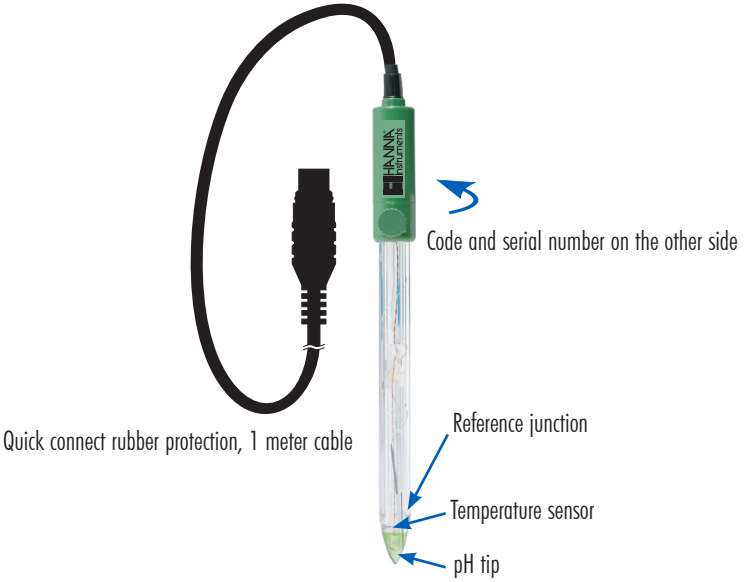
Replace the three 1.5V AAA alkaline batteries located in the battery compartment, observing the indicated polarity.



Replace the battery cover making sure that the gasket is in place.

ACCESSORIES

HI12923	Combination preamplified pH/temperature probe with conical tip, DIN connector and 1 m (3.3') cable
HI7004L	pH 4.01 buffer solution, 500 mL
HI7006L	pH 6.86 buffer solution, 500 mL
HI7007L	pH 7.01 buffer solution, 500 mL
HI7009L	pH 9.18 buffer solution, 500 mL
HI7010L	pH 10.01 buffer solution, 500 mL
HI70300L	Storage solution for pH and ORP electrodes, 500 mL
HI7061L	Electrode cleaning solution for general use, 500 mL
HI7071	3.5M KCl with AgCl reference electrolyte, 30 mL, 4 pcs.
HI700663P	Cleaning solution for soil deposits, 20 mL sachet, 25 pcs.
HI700664P	Cleaning solution for humus deposits, 20 mL sachet, 25 pcs.
HI7051L	Soil sample preparation solution, 500 mL
HI710028	Orange silicon rubber boot
HI710142	Black carrying case for HI991XX portable instruments
HI721319	Auger for ground penetration
HI76405	Electrode holder with steel base
HI77400P	Calibration kit (pH 4.01 and pH 7.01 buffer solution, 20 ml sachet, 5 pcs. each)



ELECTRODE MAINTENANCE

PREPARATION

- Remove the protective cap. Do not be alarmed if any salt deposits are present. Rinse with water.
- Shake the electrode down as you would do with a clinical thermometer to eliminate any air bubbles inside the glass tip.
- Remove the fill hole cover to ensure the reference junctions are flowing. Set aside for storage.
- Top up the electrolyte filling solution using HI7071 3.5M KCl with AgCl reference electrolyte.
- If the glass tip and/or junction are dry, soak the electrode in HI70300 storage solution for a minimum of 30 minutes.
- Rinse with water.
- Calibrate before using.

In case of loss of shielding due to low electrolyte level: empty electrolyte with a syringe and refill with fresh HI7071 3.5M KCl with AgCl reference electrolyte.

STORAGE

- To ensure a quick response, the glass tip and the junction should be kept moist and not allowed to dry.
- Replace protective cap with a few drops of HI70300 storage solution. Follow PREPARATION above before taking measurements.
- Replace the fill hole cover.

Note: Never store the electrode in distilled water.

PERIODIC MAINTENANCE

- Inspect the electrode for any scratches or cracks. If any present, replace the electrode.
- Rinse off any salt deposits with water.
- Follow the STORAGE procedure above.

CLEANING PROCEDURE

- Soak in Hanna HI7061 electrode cleaning solution for general use, HI700663 cleaning solution for soil deposits or HI700664 cleaning solution for humus deposits for 20 minutes. Rinse well and condition.
- Soak the electrode in HI70300 storage solution for a minimum of 30 minutes. Rinse with water. Calibrate before using.

TROUBLESHOOTING

- pH Meter: Follow the meter's operating and calibration procedures.
- Electrode: Evaluate your electrode performance based on the Sensor check procedure on page 10.

CERTIFICATION

All Hanna Instruments conform to the **CE European Directives**.

CE RoHS compliant

Disposal of Electrical & Electronic Equipment. The product should not be treated as household waste. Instead hand it over to the appropriate collection point for the recycling of electrical and electronic equipment which will conserve natural resources.

Disposal of waste batteries. This product contains batteries, do not dispose of them with other household waste. Hand them over to the appropriate collection point for recycling.

Ensuring proper product and battery disposal prevents potential negative consequences for the environment and human health. For more information, contact your city, your local household waste disposal service, the place of purchase or go to www.hannainst.com.

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Recommendations for users

Before using this product, make sure it is entirely suitable for your specific application and for the environment in which it is used. Any variation introduced by the user to the supplied equipment may degrade the meter's performance. For yours and the meter's safety do not use or store the meter in hazardous environments.

Warranty

HI99121 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. Electrodes and probes are warranted for a period of six months. This warranty is limited to repair or replacement free of charge. Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered.

If service is required, contact your local Hanna Instruments Office. If under warranty, report the model number, date of purchase, serial number (see engraved on the back of the meter) and the nature of the problem. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the meter is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Technical Service department and then send it with shipping costs prepaid. When shipping any meter, make sure it is properly packed for complete protection.

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