HI99121

Direct Soil pH Portable Meter

INSTRUCTION MANUAL

HANNA® instruments

Dear Customer,

Thank you for choosing a Hanna Instruments product.

Please read this instruction manual carefully before using the instrument.

This manual will provide you with the necessary information for correct use of the instrument, 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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Remove the meter from the packing material and examine it carefully to make sure that no damage has occurred during shipment. If noticeable damage is evident, contact your local Hanna Instruments Office.

Each meter is supplied complete with:

- HI12923 pH/temperature probe
- pH 4.01 & 7.01 Buffer sachet
- HI700663 electrode cleaning solution for soil deposits (1 sachet)
- HI700664 electrode cleaning solution for humus deposits (1 sachet)
- HI7051M soil preparation solution
- HI721319 ground auger
- 100 mL beaker (1 pc.)
- Alkaline batteries: 1.5V AAA (3 pcs.)
- Rugged carrying case
- Calibration certificate of meter
- Calibration certificate of probe
- Instruction manual

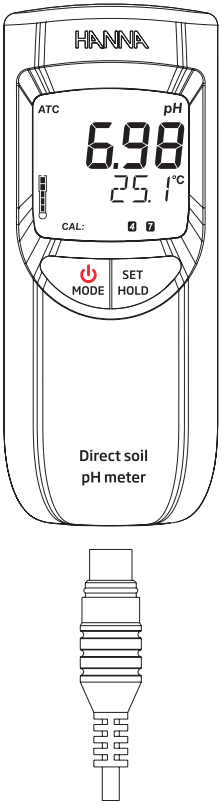
Note: Save all packing material until you are sure that the meter functions correctly. All defective items must be returned in the original packing together with the supplied accessories.

The HI99121 is the perfect portable pH meter for soil testing. With the HI99121 and HI12923 direct soil pre-amplified pH and temperature probe, users can test both the pH of soil directly or after preparation of a soil slurry with deionized water.

The HI12923 features a conical, rugged tip that can be directly used in soil. A plastic auger is supplied to perforate and loosen the soil prior to sensor measurement. Use this tool to prevent scratching the pH sensitive glass on nutrient crystals or small pebbles.

Main features:

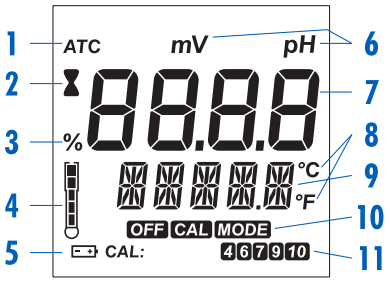
- Simultaneous pH and temperature measurements on a large dual-line LCD display
- Automatic pH calibration at one or two points within two memorized buffer sets (standard or NIST)
- Selectable temperature unit (°C or °F)
- Electrode condition indicator
- mV of pH measurement for electrode check
- HI12923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



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 @ 20 °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 glass body, pre-amplified pH electrode for soil measurement with internal temperature sensor, DIN connector and 1 m (3.3') cable (included)
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")
Meter Mass (with batteries)	196 g (6.91 oz.)
Case Ingress Protection Rating	IP67

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

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

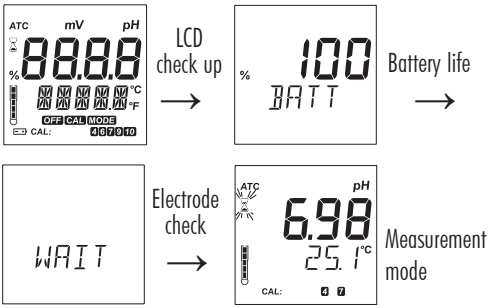
Each meter is supplied with batteries. Before using the meter for the first time, open the battery compartment and insert batteries, observing the polarity (see "Battery Replacement").

TO CONNECT 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.

TO TURN 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 tone 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, displays "**WAIT**" while doing an electrode check and then 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 on the secondary LCD with "---" blinking on the first LCD line.*
*- If the probe is not compatible "**WRONG**" "**PROBE**" message appears 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).

TO SELECT THE MEASUREMENT RANGE

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

TO FREEZE THE 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.

TO ENTER CALIBRATION MODE

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

TO ENTER SETUP MODE

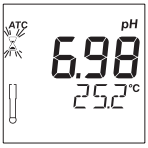
Press and hold ⏻ button until "**STD**" and **CAL** tag is replaced by "**SETUP**" and **MODE** tag. Release the button.

TO TURN 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 fouled, clean the electrode before use. Soak the electrode tip in cleaning solution for 20 minutes, then rinse in clean water and soak for 30 minutes in electrode storage solution to rehydrate it. Recalibrate before using. Submerge the probe in the sample to be tested while stirring it gently. Wait until the ⌛ tag on the LCD disappears.



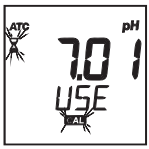
The LCD displays the pH value (automatically compensated for temperature) on the primary LCD, while the secondary LCD displays the sample temperature. If measurements are taken in different samples successively, rinse the probe tip thoroughly† to eliminate cross-contamination. After cleaning, rinse the probe tip with some deionized water and some of the sample to be measured.

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

a) The pH electrode is replaced.
b) After testing aggressive chemicals.
c) Where high accuracy is required.
d) At least once a month.
e) After cleaning the sensor.

† The probe tip should be rinsed with purified water (reverse osmosis, distilled, or deionized) before and after placing in any solution (buffer, storage, or sample).

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 6.86 for NIST) pH 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.

It is always recommended to carry out a two-point calibration for better accuracy.

When the calibration procedure is completed, the CAL tag is turned on together with the calibrated points.

To exit calibration and reset 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.

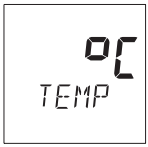
Sensor Check

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 before measuring the offset and the slope.

Setup mode allows the selection of the Temperature unit, Auto-off, Beep, 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.

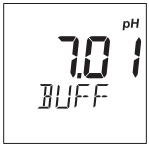
- "**TEMP**" is displayed on the secondary LCD with the current temperature unit (E.g. "**TEMP °C**"), for °C/°F selection, use the **SET** button. After the temperature unit has been selected, press ⏻ to confirm and to enter the "**A-OFF**" selection.



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

- To change the type of calibration 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**".



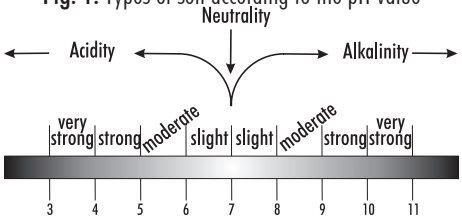
- To change the pH measurement resolution between "**0.1**" and "**0.01**" use the **SET** button; then press ⏻ to confirm and to enter electrode calibration information "**INFO**" selection.

- To switch ON or OFF the electrode condition indicator on the LCD, 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.

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.

Fig. 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 (**Fig. 2**).

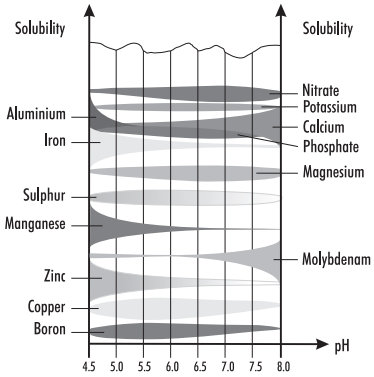


Fig. 2. Solubility of the elements according to varying pH

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.

A Soil Management Strategy with regard to pH

- It is advisable to choose crops that are suitable for the soils pH range (e.g. in an acid soil, cultivate rice, potato, strawberry).
- 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
$Ca\ CO_3$	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 effect 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**.

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. Quantities provide the same result as 100 kg of gypsum.

Procedure for direct ground measurement

1) Verify meter is set up correctly and pH electrode is calibrated.
2) Dig, discarding 5 cm of topsoil.
3) Perforate the soil (with HI721319 soil auger) to a depth of about 20 cm or more.
4) If the soil is dry, moisten it with a small amount of distilled water
5) Wash the electrode with tap water (not distilled).
6) Insert the electrode pushing it slightly into the soil to ensure proper contact.
7) Observe the measurement.
8) Wash the electrode with tap water (not distilled) and (using a finger) gently remove any soil remaining on the electrode (avoid using a rag or cloth).
9) Repeat the procedure in different locations in the field.
10) Consider the average of the measured data.

For best results, it is advisable to measure the pH of a soil solution, using a sample of soil and soil preparation solution HI7051. It is better to use this procedure if you have to test a stony field in which you risk damaging the electrode.

Procedure for the measurement of soil solution (1:2,5)

A) Verify meter is set up corectly and pH electrode is calibrated.

B) Sampling

1) Extracting Soil Sample.
   Take 1 sample per 1000 m^2 (0.25 acre) of homogeneous area. Even for small areas, 2 samples are recommended (the more the samples, the better the end-results, because the result is more representative).
2) Avoid extracting samples from soil presenting obvious anomalies and consider them separately.
3) Sample quantity:
   Take the same quantity of soil for each sample. For example, use bags with similar dimensions (1 bag per sample).
4) Depth of extraction:
   General: dig and discard 5 cm (2″) of topsoil.
   Herbaceous crops: from 20 to 40 cm of depth (8″ to 16″).
   Orchards: from 20 to 60 cm of depth (8″ to 24″).
5) Spread the soil samples on the pages of a newspaper and let the soil dry in a shady place or put it in an oven at 40 °C.
6) Crumble the dried soil and mix all the samples together to obtain a homogeneous mixture, discarding stones and vegetable residues.
7) From this mixture, take the soil sample for analysis.

C) Soil solution preparation and measurement

1) Sift the soil at 2 mm.
2) Weigh 10 g of soil and put it in 25 mL of soil preparation solution HI7051 (use the apposite beaker) or 20 g of soil per 50 mL of soil preparation solution HI7051.
3) Mix for 30 seconds. Homogenize the sample by vigorous mixing.
4) Wait for about 5 minutes to allow the soil to release soluble nutrients.
5) Mix again and immerse the pH electrode into the prepared sample and swirl to ensure maximum solution contact.
6) Wait for a stable reading before recording the measurement.

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 the substrate bought is that desired (pH can change if too much time elapses from the date of packaging to the moment of utilization).

A) Verify pH meter is set up correctly and pH electrode is calibrated.

B) Direct measurement in pot:

If the substrate is dry, add a little distilled water. Use the auger tool to puncture the soil. Insert the electrode into the soil hole and wait for a stable reading, before recording the measurement.

C) Measurement of the organic substrate solution (1:2):

Let the substrate dry and discard the coarse vegetable residues and pebbles.

Prepare a solution composed of 1 part of mould and 2 parts of HI7051 solution (for example: fill the beaker with the substrate up to 50 mL, press it gently, empty the content in another container and add 100 mL of HI7051 solution).

Homogenize the sample for 30 seconds and then wait for 5 minutes to allow the soil to release soluble nutrients into the solution. Mix again and immerse the pH electrode into the prepared sample and swirl to ensure maximum solution contact.

IRRIGATION WATER

The quality of irrigation water is a very important factor. If the pH value is very far from pH 7, it is possible that other anomalies are present.

Ranges for evaluation of water quality:

- 6 to 8.5 pH: good, it 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 wetting the vegetation/avoid use if possible.
- pH<4 or pH>10: Other anomalies that have to be identified via chemical analysis. Do not use for irrigation.

A rational fertilization program is required for optimum plant growth in greenhouses. The pH value of the nutrient solution (water + fertilizer) has to meet the plants need.
If a fertirrigation system with automatic pH control is used, ensure that it is functioning properly. Check the pH of the irrigation solution as well as any recycled solution.
Table 3. tabulates optimum pH values for various plants.

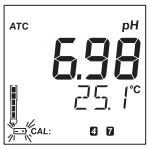
ORCHARD PLANTS			
Preferred pH Range		Preferred pH Range	
Apple	5-6.5	Orange	5-7
Apricot	6-7	Peach	6-7.5
Cherry	6-7.5	Pear	6-7.5
Grapefruit	6-7.5	Plum	6-7.5
Grapevine	6-7	Pomegranate	5.5-6.5
Lemon	6-7	Walnut	6-8
Nectarine	6-7.5		
VEGETABLES AND HERBACEOUS CULTIVATIONS			
Preferred pH Range		Preferred 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
Egg Plant	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	5-7
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. Optimum pH for various Plants.

BATTERY REPLACEMENT

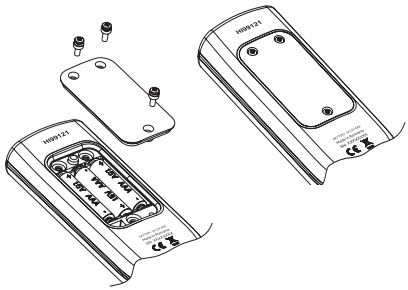


When the remaining battery life is less than 10% the battery tag blinks on the display to warn the user.

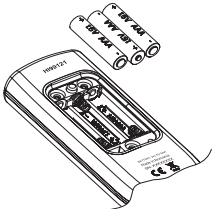
Battery Error Prevention System (BEPS)

If the battery is too weak (**"0%"**) the display shows **"bAtt"**, **"DEAD"** for few seconds then the meter power 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.

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 bulb.
- Remove the fill hole cover to ensure the reference junctions are flowing. Set aside for storage.
- Top off the electrolyte filling solution using HI7071 solution.
- If the bulb and/or junction are dry, soak the electrode in HI70300 Storage Solution for at least 30 minutes.
- Rinse with water.
- Calibrate before using.

Loss of shielding due to low electrolyte level: Empty electrolyte with a syringe and refill with fresh HI7071.

STORAGE

- To ensure a quick response, the glass bulb 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

A frequent cleaning of the pH electrode is strongly recommended to ensure correct calibration and reliable readings.

Hanna Instruments has developed a complete series of cleaning solutions dedicated to specific applications and kind of dirt that has to be removed from the electrode.

In soil measurements you can choose between two different solutions accordingly to the type of tested soil:

- HI700663 is indicated for inorganic soil deposits (as minerals, limestone, adsorbed clays)
- HI700664 is specific for organic soil deposits (humus)

If cleaning is performed frequently, soak the electrode in the specific solution for a few minutes.

If the electrode has not be cleaned for a while, for a complete removal of soil deposits, proceed as follows:

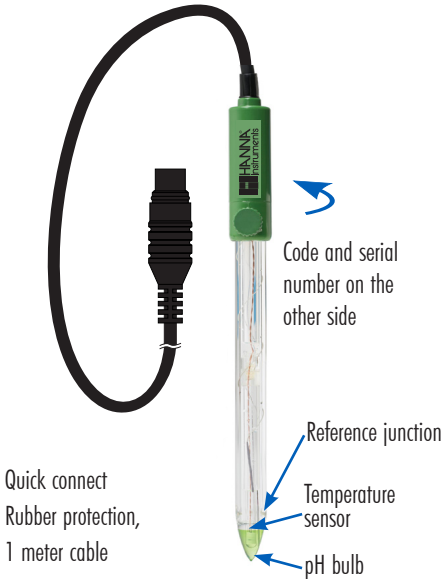
- wipe the electrode body (not bulb) with paper or soft tissue
- rub the reference with abrasive paper
- immerse into cleaning solution for at least 20 minutes
- rinse the sensor with water and place in storage solution for a minimum of 30 minutes recalibrate the probe before using.

IMPORTANT: After performing any of the cleaning procedures rinse the electrode thoroughly with distilled water. Soak the electrode in HI70300 storage solution for at least 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.

HI12923	Glass body, pre-amplified pH electrode for soil measurement with internal temperature sensor, 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	pH electrode storage solution, 500 mL
HI7061L	General purpose cleaning solution for pH electrode, 500 mL
HI700663P	Cleaning solution for inorganic soil deposits, 20 mL sachet, 25 pcs.
HI700664P	Cleaning solution for organic deposits, 20 mL sachet, 25 pcs.
HI7051	Soil preparation solution
HI710028	Silicon rubber boot orange color
HI721319	Ground plastic auger
HI76405	Electrode holder
HI77400P	Calibration kit (pH 4 & 7, 20 mL, 5 pcs. each)



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.

MAN99121N 05/18

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 meters' 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. 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 in 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.

Hanna Instruments reserves the right to modify the design, construction or appearance of its products without advance notice.

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