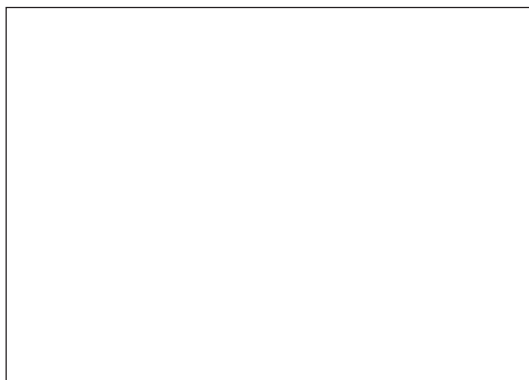




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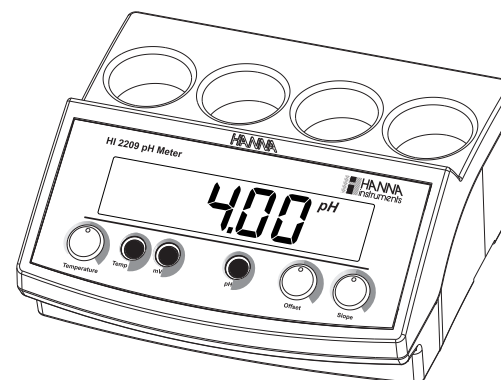
Local Sales and Customer Service Office



Instruction Manual

HI 2209 • HI 22091

Bench pH Meters



www.hannainst.com

Dear Customer,

Thank you for choosing a Hanna Instruments Product.

Please read this instruction manual carefully before using these instruments. This manual will provide you with the necessary information for the correct use of these instruments, as well as a precise idea of their 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.

WARRANTY

HI 2209 and HI 22091 are guaranteed for two years against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. Electrodes and probes are guaranteed for six months. This warranty is limited to repair or replacement free of charge.

Damage due to accident, misuse, tampering or lack of prescribed maintenance are not covered.

If service is required, contact the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number 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 instrument 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 instrument, make sure it is properly packed for complete protection.

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RECOMMENDATIONS FOR USERS

Before using these products, make sure that they are entirely suitable for the environment in which they are used.

Operation of these instruments in residential area could cause unacceptable interferences to radio and TV equipment, requiring the operator to follow all necessary steps to correct interferences.

The glass bulb at the end of the pH electrode is sensitive to electrostatic discharges. Avoid touching this glass bulb at all times. During calibration, ESD wrist straps should be worn to avoid possible damage to the electrode by electrostatic discharge.

To maintain the EMC performance of this equipment, the recommended cables noted in the user's manual must be used. Any variation introduced by the user to the supplied equipment may degrade the instrument's EMC performance.

To avoid electrical shock, do not use these instruments when voltages at the measurement surface exceed 24 Vac or 60 Vdc.

To avoid damage or burns, do not perform any measurement in microwave ovens.

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

| Application | Electrodes |
|--|------------------------------|
| 21. Lemon juice | FC 100B |
| 22. Meat | FC 200B, HI 2031B |
| 23. Micro plate sampling of less than 100 mL | HI 1083B |
| 24. Milk and Yogurt | FC 210B |
| 25. Paints | HI 1053B |
| 26. Paper | HI 1413B |
| 27. Photographic chemicals | HI 1230B |
| 28. Quality control | HI 1332B |
| 29. Sausages | FC 200B, HI 2031B |
| 30. Semisolid products | HI 2031B |
| 31. Skin | HI 1413B |
| 32. Soil samples | HI 1230B |
| 33. Solvents | HI 1043B |
| 34. Strong acid | HI 1043B |
| 35. Submersion application | HI 1130B |
| 36. Surface measurements | HI 1413B |
| 37. Swimming pool | HI 1130B, HI 2114B, HI 2910B |
| 38. Titrations with constant temperature range | HI 1131B |
| 39. Titrations with wide temperature range | HI 1131B |
| 40. Very high humidity | FC 911B, HI 1912B, HI 1911B |
| 41. Vials and test tube | HI 1330B |
| 42. Wine processing | FC 220B |

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any damage, notify your dealer.

Each meter is supplied complete with:

- **HI 1332B** plastic-body combination double-junction refillable pH electrode with BNC connector and 1 m (3.3') cable
- 12 Vdc adapter
- Instruction manual.

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

GENERAL DESCRIPTION

HI 2209 bench pH meter is designed for simplicity of use. It features a large easy-to-read liquid crystal display (LCD) and user friendly keyboard.

The pH calibration is made simple through the easy-to-operate front panel knobs for offset and slope adjustment.

A front knob is provided for easy manual set for temperature compensation of the pH reading.

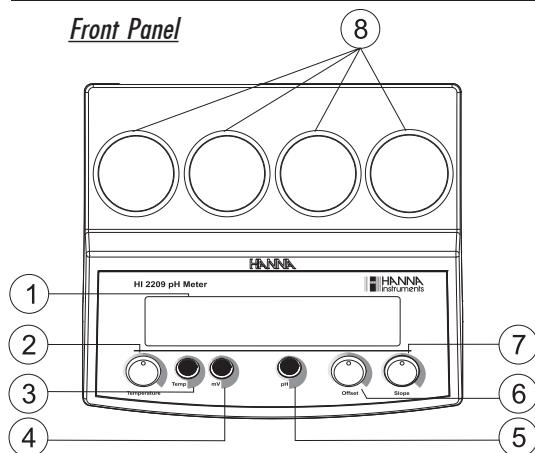
HI 2209 can also measure ORP (Oxidation Reduction Potential) in the mV range.

The range selection (pH, mV or °C for temperature compensation) is made simple through the front membrane keyboard.

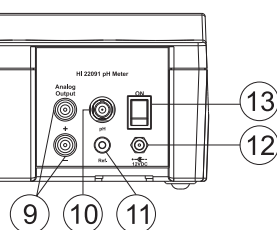
It is also available the model **HI 22091** with recorder output feature.

FUNCTIONAL DESCRIPTION

Front Panel



Rear Panel



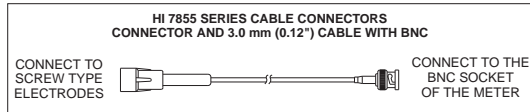
- 1) Liquid Crystal Display (LCD)
- 2) Temperature setting knob
- 3) °C range selection key
- 4) mV range selection key
- 5) pH range selection key
- 6) pH offset adjustment knob
- 7) pH slope adjustment knob
- 8) Sample holders
- 9) Analog output connectors (HI 22091 only)
- 10) BNC electrode connector
- 11) Reference electrode socket
- 12) Power adapter socket
- 13) ON/OFF switch

ELECTRODE APPLICATION REFERENCE GUIDE

| Application | Electrodes |
|--------------------------------|--|
| 1. Aquarium | HI 1332B, HI 1911B |
| 2. Bath-water | HI 1910B, HI 1130B |
| 3. Beer | HI 1131B |
| 4. Bread | HI 2031B, FC 200B |
| 5. Cheese | FC 200B |
| 6. Dairy products | FC 911B, FC 100B |
| 7. Dirty water | HI 1910B, HI 1912B |
| 8. Emulsions | HI 1053B |
| 9. Environment | HI 1230B |
| 10. Flasks | HI 1331B |
| 11. Food industry general use | FC 911B, FC 100B |
| 12. Fruit | FC 200B, FC 220B |
| 13. Fruit juices, organic | FC 210B |
| 14. Galvanizing waste solution | HI 1130B, HI 1912B |
| 15. Heavy-duty applications | HI 1135B |
| 16. High purity water | HI 1053B |
| 17. Horticulture | HI 1053B, FC 200B |
| 18. In-line applications | HI 1134B, HI 1135B, HI 2114B, HI 2910B |
| 19. Laboratory general use | HI 1131B, HI 1230B, HI 1332B, HI 1330B |
| 20. Leather | HI 1413B |

**EXTENSION CABLES FOR SCREW-TYPE ELECTRODES
(SCREW TO BNC ADAPTER)**

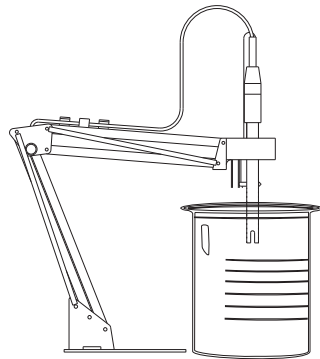
- HI 7855/1 Extension cable 1m (3.3') long
- HI 7855/3 Extension cable 3m (9.9') long
- HI 7855/5 Extension cable 5m (16.5') long
- HI 7855/10 Extension cable 10m (33') long



- HI 7855/15 Extension cable 15m (49.5') long

OTHER ACCESSORIES

- HI 710005 Voltage adapter from 115 Vac to 12 Vdc
- HI 710006 Voltage adapter from 230 Vac to 12 Vdc
- ChecktempC Pocket-size thermometer (range -50.0 to 150.0°C)
- HI 76405 Electrode holder



- HI 8427 pH and ORP electrode simulator with 1 m (3.3') coaxial cable ending in female BNC connectors
- HI 931001 pH and ORP electrode simulator with LCD and 1 m (3.3') coaxial cable ending in female BNC connectors

SPECIFICATIONS

| | |
|-------------------------------|---|
| RANGE | 0.00 to 14.00 pH |
| | ±1999 mV |
| RESOLUTION | 0.01 pH |
| | 1 mV |
| ACCURACY @ 25°C | ±0.01 pH |
| | ±1 mV |
| pH Calibration | Manual, 2 point, through knobs |
| Temperature Compensation | Manual from 0 to 100 °C (32 to 212 °F) |
| pH Electrode (included) | HI 1332B plastic body, double junction, refillable, with BNC and 1 m (3.3') cable |
| Analog Output (HI 22091 only) | 0 to 5 V 0 to 14 pH / -1999 to + 1999 mV Temperature: always 0 |
| Input Impedance | 10 ¹² ohms |
| Power Supply | 12 Vdc adapter (included) |
| Environment | 0 to 50 °C (32 to 122 °F) max. 95% RH non-condensing |
| Dimensions | 235 x 222 x 109 mm (9.2 x 8.7 x 4.3') |
| Weight | 1.3 Kg (2.9 lbs) |

OPERATIONAL GUIDE

POWER CONNECTION

Plug the supplied 12 Vdc adapter into the power supply socket (#12 on page 4).

Note: Make sure the mains line is protected by a fuse.

ELECTRODE CONNECTION

For combination pH or ORP electrodes (with internal reference) connect the electrode's BNC to the socket provided (#10 on page 4).

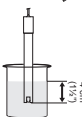
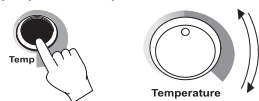
For an electrode with a separate reference, connect the measuring electrode's BNC to the BNC socket (#10 on page 4) and the reference electrode's jack to the socket provided (#11 on page 4).

Note: To prevent damage to the electrode, remove the pH electrode from the solution before turning the meter off. If the meter is OFF, detach the electrode from the meter before immersing the electrode in the storage solution.

TAKING pH MEASUREMENTS

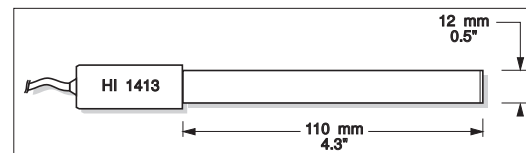
Make sure that the instrument has been calibrated for pH before taking pH measurements.

- Put the beakers (bottles 50 or 100 mL) with the solutions under test on the sample holders.
- Switch the instrument on by pressing the **ON/OFF** switch.
- Press the **pH** key to display the pH measurement.
- Immerse the electrode tip (4 cm / 1½") into the sample and shake briefly.
- Take the temperature of the solution with a **ChecktempC** or a glass thermometer (e.g. 25°C).
- Press and hold the **Temp** key to display temperature setting on the LCD and adjust the temperature knob to display the temperature of the sample.



HI 1413B

Glass-body, single junction, flat tip, Viscolene, non-refillable, combination pH electrode. Use: surface measurement.

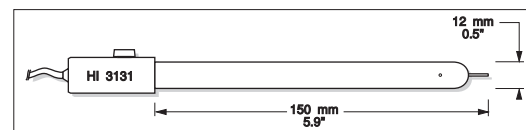


ORP ELECTRODES

HI 3131B

Glass-body, refillable, combination platinum ORP electrode.

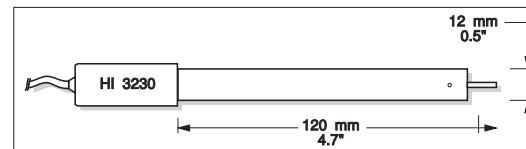
Use: titration.



HI 3230B

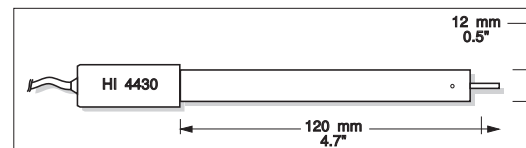
Plastic-body (PES), gel-filled, combination platinum ORP electrode.

Use: general purpose.



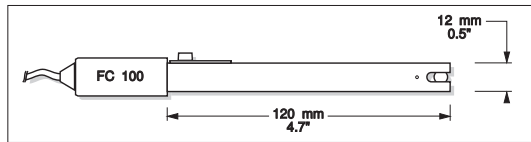
HI 4430B

Plastic-body (PES), gel-filled, combination gold ORP electrode. Use: general purpose.



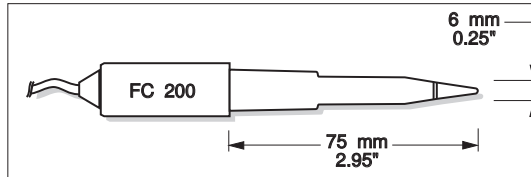
FC 100B

Plastic-body (PVDF), double junction, refillable, combination pH electrode.
Use: general purpose for food industry.



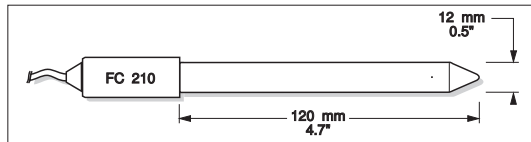
FC 200B

Plastic-body (PVDF), open junction, conic, Viscolene, non-refillable, combination pH electrode. Use: meat & cheese.



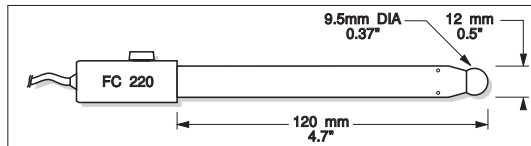
FC 210B

Glass-body, double junction, conic, Viscolene, non-refillable, combination pH electrode. Use: milk, yogurt.



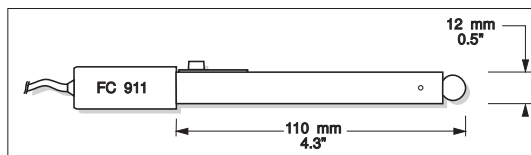
FC 220B

Glass-body, triple-ceramic, single junction, refillable, combination pH electrode. Use: food processing.



FC 911B

Plastic-body (PVDF), double junction, refillable with built-in amplifier, combination pH electrode. Use: very high humidity.



- Release **Temp** key. The meter returns to pH range.
- The display shows the pH value of the test solution compensated for temperature.



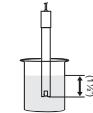
If measurements are taken in different samples successively, it is recommended that the electrode be rinsed thoroughly for better conditioning and to eliminate cross-contamination of the sample.

For the rinsing process, it is recommended to use a liberal amount of the next solution to be measured.

TAKING ORP MEASUREMENTS

HI 2209 and HI 22091 have the capability to take ORP measurements, using an ORP electrode. Hanna Instruments offers a variety of ORP electrodes for this purpose (see accessories). Contact your Dealer for more information.

- Connect the ORP electrode to the meter and submerge the tip (4 cm / 1½") into the sample to be tested.



Note: ORP measurements are taken without temperature compensation.

- Press the **mV** key to enter the mV mode. Allow a few minutes for the reading to stabilize.
- The display will indicate the mV value (positive or negative).



AFTER MEASUREMENTS

- Press the **ON/OFF** switch to switch the instrument off.

pH CALIBRATION

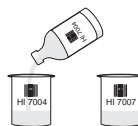
IMPORTANT

The instrument's pH range should be re-calibrated:

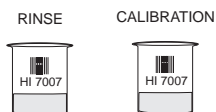
- When the meter is new.
- Whenever the pH electrode is replaced.
- At least once a month.
- After use in aggressive chemicals.
- After cleaning procedure and changing the reference electrolyte.
- For greatest accuracy.

PREPARATION

Pour small quantities (up to 4 cm / 1½" level) of pH 7.01 (HI 7007) and pH 4.01 (HI 7004) or pH 10.01 (HI 7010) solution into clean beakers (or 100 mL bottles). If possible use plastic beakers to minimize any EMC interferences.



If you are measuring in the acid range, use pH 4.01 as second buffer; if you are measuring in the alkaline range, use pH 10.01 as second buffer.



For accurate calibration, use two beakers for each buffer solution; the first for rinsing the electrode, the second for calibration. In this way, contamination of the buffer is minimized.

Note: The electrode should be submerged approximately 4 cm (1½") into the solution.

Note: If you need to calibrate to NBS standards, use pH 6.86 (HI 7006) and pH 9.18 (HI 7009) instead of pH 7.01 and 10.01 respectively.

Use a *ChecktempC* or a glass thermometer as reference.

Put the beakers with the calibrations solutions on the beaker holders on the top of the instrument.

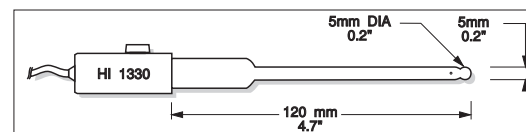
PROCEDURE

- Switch the instrument on by pressing the ON/OFF switch.



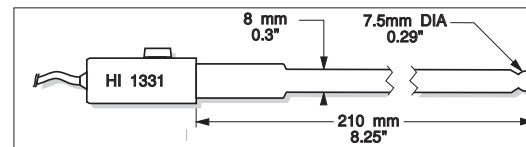
HI 1330B

Glass-body, semimicro, single junction, refillable, combination pH electrode. Use: laboratory, vials.



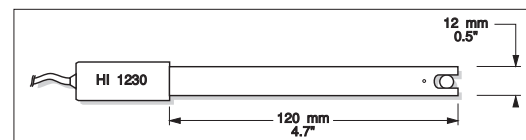
HI 1331B

Glass-body, semimicro, single junction, refillable, combination pH electrode. Use: flasks.



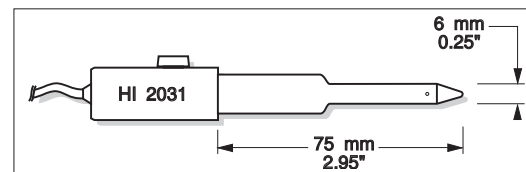
HI 1230B

Plastic-body (Ultem®), double junction, gel-filled, combination pH electrode. Use: general, field.



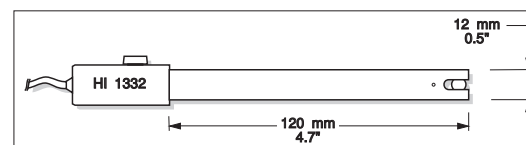
HI 2031B

Glass-body, semimicro, conic, refillable, combination pH electrode. Use: semisolid products.



HI 1332B

Plastic-body (Ultem®), double junction, refillable, combination pH electrode. Use: general purpose.



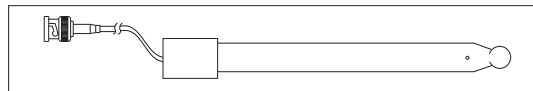
ORP PRETREATMENT SOLUTIONS

HI 7091L Reducing pretreatment solution, 500 mL

HI 7092L Oxidizing pretreatment solution, 500 mL

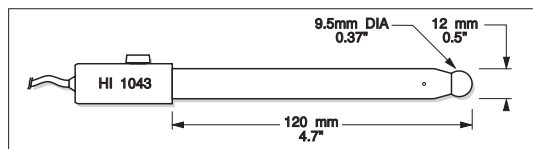
pH ELECTRODES

All electrodes part numbers ending in B are supplied with a BNC connector and 1 m (3.3') cable.



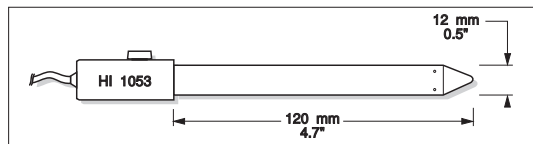
HI 1043B

Glass-body, double junction, refillable, combination pH electrode. Use: strong acid/alkali.



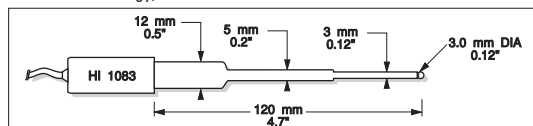
HI 1053B

Glass-body, triple ceramic, conic shape, refillable, combination pH electrode. Use: emulsions.



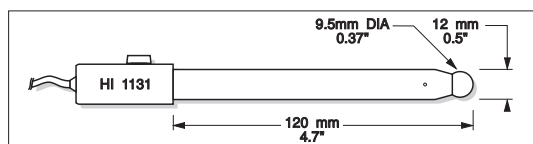
HI 1083B

Glass-body, micro, Viscolene, non-refillable, combination pH electrode. Use: biotechnology, micro titration.

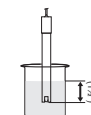


HI 1131B

Glass-body, double junction, refillable, combination pH electrode. Use: general purpose.



- Rinse and immerse the pH electrode into pH 7.01 buffer and shake briefly. Wait for the reading to stabilize.



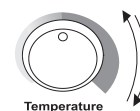
- Note the temperature of the buffer solution using a *ChecktempC* or a glass thermometer (e.g. 20°C).



- Press and hold the **Temp** key to select temperature setting.

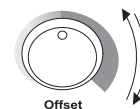


- Adjust the **Temperature** knob until the LCD shows the noted temperature.



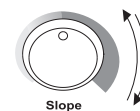
- Release the **Temp** key. The instrument returns to pH range.

- Wait a couple of minutes and adjust the **Offset** knob until the display shows the pH value at the noted temperature (see the pH versus temperature chart).



- Rinse and immerse the pH electrode in pH 4.01 / pH 10.01 buffer and shake briefly.

- Wait a couple of minutes and adjust the **Slope** knob until the display shows the pH value at the noted temperature (see the pH versus temperature chart).



- The pH calibration is now complete.

pH BUFFER TEMPERATURE DEPENDENCE

Temperature has an effect on pH. The calibration buffer solutions are affected by temperature changes to a lesser degree than normal solutions.

For manual temperature calibration please refer to the following chart.

| TEMP | | pH BUFFERS | | | | |
|------|-----|------------|------|------|------|-------|
| °C | °F | 4.01 | 6.86 | 7.01 | 9.18 | 10.01 |
| 0 | 32 | 4.01 | 6.98 | 7.13 | 9.46 | 10.32 |
| 5 | 41 | 4.00 | 6.95 | 7.10 | 9.39 | 10.24 |
| 10 | 50 | 4.00 | 6.92 | 7.07 | 9.33 | 10.18 |
| 15 | 59 | 4.00 | 6.90 | 7.05 | 9.27 | 10.12 |
| 20 | 68 | 4.00 | 6.88 | 7.03 | 9.22 | 10.06 |
| 25 | 77 | 4.01 | 6.86 | 7.01 | 9.18 | 10.01 |
| 30 | 86 | 4.02 | 6.85 | 7.00 | 9.14 | 9.96 |
| 35 | 95 | 4.03 | 6.84 | 6.99 | 9.11 | 9.92 |
| 40 | 104 | 4.04 | 6.84 | 6.98 | 9.07 | 9.88 |
| 45 | 113 | 4.05 | 6.83 | 6.98 | 9.04 | 9.85 |
| 50 | 122 | 4.06 | 6.83 | 6.98 | 9.01 | 9.82 |
| 55 | 131 | 4.08 | 6.84 | 6.98 | 8.99 | 9.79 |
| 60 | 140 | 4.09 | 6.84 | 6.98 | 8.97 | 9.77 |
| 65 | 149 | 4.11 | 6.84 | 6.99 | 8.95 | 9.76 |
| 70 | 158 | 4.12 | 6.85 | 6.99 | 8.93 | 9.75 |
| 75 | 167 | 4.14 | 6.86 | 7.00 | 8.91 | 9.74 |
| 80 | 176 | 4.16 | 6.87 | 7.01 | 8.89 | 9.74 |
| 85 | 185 | 4.17 | 6.87 | 7.02 | 8.87 | 9.74 |
| 90 | 194 | 4.19 | 6.88 | 7.03 | 8.85 | 9.75 |
| 95 | 203 | 4.20 | 6.89 | 7.04 | 8.83 | 9.76 |

For instance, if the buffer temperature is 25°C, the display should show pH 4.01, 7.01 or 10.01 at pH 4, 7 or 10 buffers, respectively.

At 20°C, the display should show pH 4.00, 7.03 or 10.06. The meter reading at 50°C will then be 4.06, 6.98 or 9.82.

ACCESSORIES

pH CALIBRATION SOLUTIONS

- HI 70004P pH 4.01 buffer solution, 20 mL sachet, 25 pcs
- HI 70007P pH 7.01 buffer solution, 20 mL sachet, 25 pcs
- HI 70010P pH 10.01 buffer solution, 20 mL sachet, 25 pcs
- HI 7004L pH 4.01 buffer solution, 500 mL
- HI 7006L pH 6.86 buffer solution, 500 mL
- HI 7007L pH 7.01 buffer solution, 500 mL
- HI 7009L pH 9.18 buffer solution, 500 mL
- HI 7010L pH 10.01 buffer solution, 500 mL
- HI 8004L pH 4.01 buffer solution in FDA bottle, 500 mL
- HI 8006L pH 6.86 buffer solution in FDA bottle, 500 mL
- HI 8007L pH 7.01 buffer solution in FDA bottle, 500 mL
- HI 8009L pH 9.18 buffer solution in FDA bottle, 500 mL
- HI 8010L pH 10.01 buffer solution in FDA bottle, 500 mL

ELECTRODE STORAGE SOLUTION

- HI 70300L Storage solution, 500 mL
- HI 80300L Storage solution in FDA bottle, 500 mL

ELECTRODE CLEANING SOLUTIONS

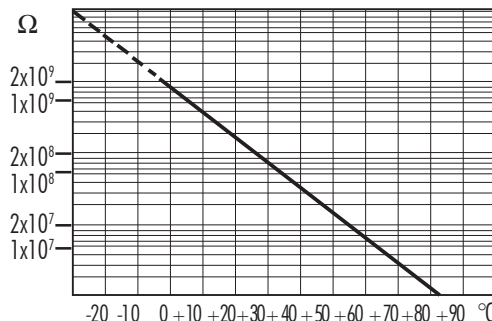
- HI 70000P Electrode rinsing solution, 20 mL sachet, 25 pcs
- HI 7061L General cleaning solution, 500 mL
- HI 7073L Protein cleaning solution, 500 mL
- HI 7074L Inorganic cleaning solution, 500 mL
- HI 7077L Oil & Fat cleaning solution, 500 mL
- HI 8061L General cleaning solution in FDA bottle, 500 mL
- HI 8073L Protein cleaning solution in FDA bottle, 500 mL
- HI 8077L Oil & Fat Cleaning solution in FDA bottle, 500 mL

ELECTROLYTE SOLUTIONS

- HI 7071 3.5M KCl + AgCl electrolyte solution, 4 x 30 mL, for single junction electrodes
- HI 7072 1M KNO₃ electrolyte solution, 4 x 30 mL
- HI 7082 3.5M KCl electrolyte solution, 4 x 30 mL, for double junction electrodes
- HI 8071 3.5M KCl + AgCl electrolyte solution in FDA bottle, 4 x 30 mL, for single junction electrodes
- HI 8072 1M KNO₃ electrolyte solution in FDA bottle, 4 x 30 mL
- HI 8082 3.5M KCl electrolyte solution in FDA bottle, 4 x 30 mL, for double junction electrodes

TEMPERATURE CORRELATION FOR pH SENSITIVE GLASS

The resistance of glass electrodes partially depends on the temperature. The lower the temperature, the higher the resistance. It takes longer time for the reading to stabilize if the resistance is higher. In addition, the response time will suffer to a greater degree at temperatures below 10°C.



Since the resistance of the pH electrode is in the range of 200 Mohm, the current across the membrane is in the pico Ampere range. Large currents can disturb the calibration of the electrode for many hours.

For these reasons **high humidity environments, short circuits and static discharges** are detrimental to a stable pH reading.

The pH electrode's life also depends on the temperature. If constantly used at high temperatures, the electrode life is drastically reduced.

| Typical Electrode Life | |
|------------------------|--------------------|
| Ambient Temperature | 1- 3 years |
| 90 °C | Less than 4 months |
| 120°C | Less than 1 month |

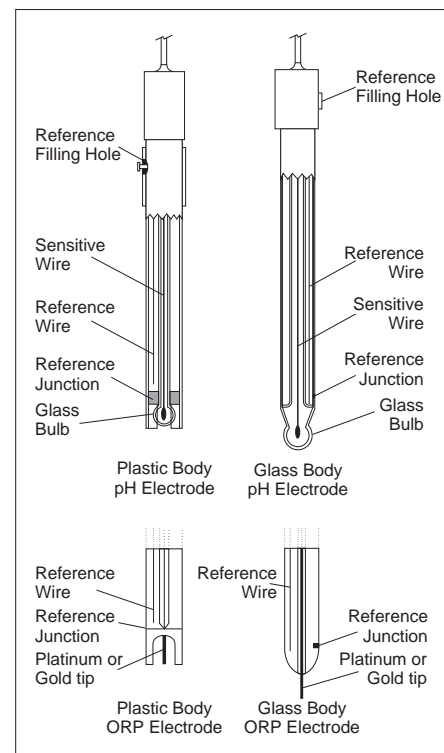
High concentrations of sodium ions interfere with readings in alkaline solutions; the pH at which the interference starts to be significant depends upon the composition of the glass. This interference is the alkaline error and causes the pH to be underestimated. Hanna's glass formulations have the indicated characteristics.

Alkaline Error

| Sodium Ion Correction for the Glass at 20-25°C | | |
|--|-------|-------|
| Concentration | pH | Error |
| 0.1 Mol L ⁻¹ Na ⁺ | 13.00 | 0.10 |
| | 13.50 | 0.14 |
| | 14.00 | 0.20 |
| 1.0 Mol L ⁻¹ Na ⁺ | 12.50 | 0.10 |
| | 13.00 | 0.18 |
| | 13.50 | 0.29 |
| | 14.00 | 0.40 |

ELECTRODE CONDITIONING AND MAINTENANCE

Note: To prevent damage to the electrode, remove the pH electrode from the solution before turning the meter off. If the meter is OFF, detach the electrode from the meter before immersing the electrode in the storage solution.



PREPARATION PROCEDURE

Remove the protective cap.

DO NOT BE ALARMED IF SALT DEPOSITS ARE PRESENT. This is normal with electrodes and they will disappear when rinsed with water.

During transport tiny bubbles of air may form inside the glass bulb affecting proper functioning of the electrode. These bubbles can be removed by "shaking down" the electrode as you would do with a glass thermometer.

If the bulb and/or junction is dry, soak the electrode in HI 70300 storage solution for at least one hour.

For refillable electrodes:

If the fill solution (electrolyte) is more than 2½ cm (1") below the fill hole, add **HI 7082** 3.5M KCl electrolyte solution for double junction or **HI 7071** 3.5M KCl+AgCl electrolyte solution for single junction electrodes.

For a faster response, unscrew the fill hole screw during measurements.



For AmpHel® electrodes:

If the electrode does not respond to pH changes, the battery is run down and the electrode should be replaced.

MEASUREMENT

Rinse the electrode tip with distilled water. Immerse the tip (bottom 4 cm /1½") in the sample and stir gently for a few seconds.

For a faster response and to avoid cross contamination of the samples, rinse the electrode tip with a few drops of the solution to be tested, before taking measurements.

STORAGE

To minimize clogging and assure a quick response time, the glass bulb and the junction should be kept moist and not allowed to dry out.

Replace the protective cap with a few drops of **HI 70300** storage solution or, in its absence, electrolyte solution (**HI 7071** for single junction, or **HI 7082** for double junction electrodes). Follow the Preparation Procedure above before taking measurements.

NEVER STORE THE ELECTRODE IN DISTILLED OR DEIONIZED WATER.

PERIODIC MAINTENANCE

Inspect electrode and cable. The cable used for connection to the meter must be intact and there must be no points of broken insulation on the cable or cracks on the electrode stem or bulb. Connectors must be perfectly clean and dry. If any scratches or cracks are present, replace the electrode. Rinse off any salt deposits.

For refillable electrodes:

Refill the reference chamber with fresh electrolyte (**HI 7071** for single junction or **HI 7082** for double junction electrodes). Allow the electrode to stand upright for 1 hour.

Follow the Storage Procedure above.

CLEANING PROCEDURE

General Soak in **HI 7061** general cleaning solution for approximately 30 minutes.

Removal of films, dirt or deposits on the membrane/junction:

- *Protein* Soak in **HI 7073** protein cleaning solution for 15 min.

- *Inorganic* Soak in **HI 7074** inorganic cleaning solution for 15 minutes.

- *Oil/grease* Rinse with **HI 7077** Oil & Fat cleaning solution.

IMPORTANT: After performing any of the cleaning procedures rinse the electrode thoroughly with distilled water, refill the reference chamber with fresh electrolyte (not necessary for gel-filled electrodes) and soak the electrode in **HI 70300** storage solution for at least 1 hour before taking measurements.

TROUBLESHOOTING

Evaluate your electrode performance based on the following.

- **Noise** (Readings fluctuate up and down) could be due to:
 - **Clogged/Dirty Junction:** Refer to the Cleaning Procedure above.
 - **Loss of shielding** due to low electrolyte level (in refillable electrodes only): refill with fresh **HI 7071** for single junction or **HI 7082** for double junction electrodes.
- **Dry Membrane/Junction:** soak in **HI 70300** storage solution for at least 1 hour.
- **Drifting:** soak the electrode tip in warm (approx. 50-60°C) Hanna **HI 7082** solution for one hour and rinse the tip with distilled water. Refill with fresh **HI 7071** for single junction electrodes and **HI 7082** for double junction electrodes (refillable electrodes only).
- **Low Slope:** refer to the cleaning procedure above.
- **No Slope:** check the electrode for cracks in glass stem or bulb and replace the electrode.
- **Slow Response/Excessive Drift:** soak the tip in **HI 7061** solution for 30 minutes, rinse thoroughly in distilled water and then follow the Cleaning Procedure above.