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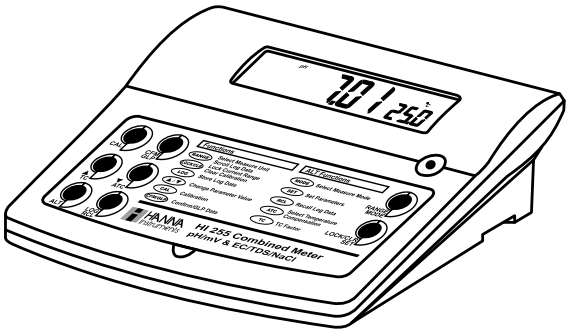
Instruction Manual

HI 255

Multiparameter pH/mV/°C EC/TDS/NaCl Bench Meter



HANNA instruments
www.hannainst.com

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 turn to the back cover for our worldwide contact list.

WARRANTY

HI 255 is guaranteed for two years against defects in workmanship and materials when used for its 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 accidents, misuse, tampering or lack of prescribed maintenance is 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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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 or the nearest Hanna Customer Service Center.

Each instrument is supplied with:

- **HI 1131B** Glass-body Combination pH Electrode with 1 m (3.3') Cable
- **HI 76310** Conductivity / TDS probe
- **HI 7662** Temperature Probe
- **HI 76404** Electrode Holder
- **pH 4.01 & 7.01** Buffer Solutions (20 mL each)
- **HI 7071S** Electrolyte Solution
- 12VDC Power 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

The HANNA **HI 255** is a logging microprocessor-based pH, ORP, Conductivity (EC), TDS, NaCl and Temperature bench meter. Relative mV feature is also provided.

The pH measurements are compensated for temperature effect manually or automatically with the **HI 7662** temperature probe.

pH Calibration is possible in up to three points, using five memorized buffers (4.01, 6.86, 7.01, 9.18 and 10.01).

The autoranging feature of the EC and TDS ranges automatically sets the instrument to the scale with the highest possible resolution.

The conductivity measurements are compensated for temperature effect manually or automatically with the temperature sensor inside the conductivity probe. It is also possible to disable the temperature compensation and measure the actual conductivity.

The temperature coefficient is user selectable.

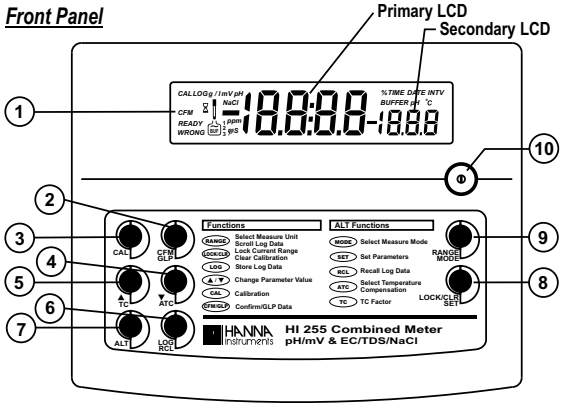
The **GLP** feature provides a guarantee of data consistency.

An alarm time-out is available to alert the user that too much time elapsed since last pH calibration.

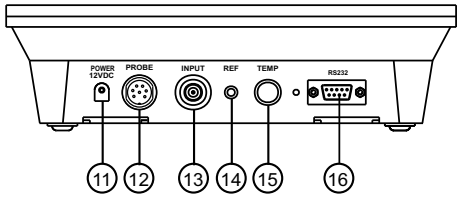
The instrument can store data in memory at the user's request for later retrieval.

FUNCTIONAL DESCRIPTION

Front Panel



Rear Panel



1) Liquid Crystal Display (LCD).
2) **CFM/GLP** key, to confirm different values or to display Good Laboratory Practice information.
3) **CAL** key, to enter and exit/escape calibration mode.
4) ▼ key, to manually decrease temperature value or other parameters.
   ATC key (alternate function), to select EC temperature compensation mode.
5) ▲ key, to manually increase temperature value or other parameters.
   TC key (alternate function), to view the temperature coefficient value.
6) **LOG** key, to store measured data.
   RCL key (alternate function), to enter/exit recall mode.
7) **ALT** key, to select alternate key function.
8) **LOCK/CLR** key, to freeze current EC range on the LCD or to clear pH calibration parameters.
   SET key (alternate function), to enter/exit setup mode.
9) **RANGE** key, to switch measurement unit pH/mV/EC or focused data.
   MODE key (alternate function), to select measurement mode/pH resolution.
10) **ON/OFF** switch.
11) Power supply socket.
12) Conductivity socket.
13) BNC electrode connector.
14) Electrode reference socket.
15) Temperature probe socket.
16) RS232 serial communication connector.

HI 255
SPECIFICATIONS

RANGE	−2.00 to 16.00 pH −2.000 to 16.000 pH
	±699.9 mV ±2000 mV
	0.00 to 29.99 µS/cm 30.0 to 299.9 µS/cm 300 to 2999 µS/cm 3.00 to 29.99 mS/cm 30.0 to 200.0 mS/cm up to 500.0 mS/cm actual(*) conductivity
	0.00 to 14.99 ppm 15.0 to 149.9 ppm 150 to 1499 ppm 1.50 to 14.99 g/l 15.0 to 100.0 g/l up to 400.0 g/l actual(*) TDS (with 0.80 factor)
	0.0 to 400.0% NaCl
	−10.0 to 120.0 °C (pH RANGE) 0.0 to 60.0 °C (EC RANGE)
RESOLUTION	0.01 pH 0.001 pH
	0.1 mV (±699.9 mV) 1 mV (±2000 mV)
	0.01 µS/cm 0.1 µS/cm 1 µS/cm 0.01 mS/cm 0.1 mS/cm
	0.01 ppm 0.1 ppm 1 ppm 0.01 g/l 0.1 g/l
	0.1% NaCl
	0.1 °C
ACCURACY @ 20 °C/68 °F	± 0.01 pH ± 0.002 pH
	±0.2 mV (±699.9 mV) ±1 mV (±2000 mV)
	±1% of reading ±(0.05 µS/cm or 1 digit, whichever greater)
	±1% of reading ±(0.03 ppm or 1 digit, whichever greater)
	±1% of reading
	±0.4 °C (excluding probe error)

(*) Actual conductivity (or TDS) is the conductivity (or TDS) value without temperature compensation.

HI 255
SPECIFICATIONS (cont.)

Rel mV offset range	±2000 mV
Computer interface	opto-isolated RS232
pH Calibration	1, 2 or 3 point calibration; 5 buffers available (4.01, 6.86, 7.01, 9.18, 10.01)
EC Calibration	1 point slope calibration; 6 buffers available: 84.0, 1413 µS/cm 5.00, 12.88, 80.0, 111.8 mS/cm 1 point offset: 0.00 µS/cm
NaCl Calibration	1 point with HI 7037L buffer (optional)
Temperature compensation	Manual or Automatic from: –10.0 to 120.0 °C (pH RANGE) 0.0 to 60.0 °C (EC RANGE) (can be disabled on conductivity range to measure actual conductivity)
Conductivity temperature coefficient	0.00 to 6.00 %/°C (for EC and TDS only) default value is 1.90 %/°C
TDS factor	0.40 to 0.80 (default value is 0.50)
pH Electrode	HI 1131B
EC Probe	HI 76310
Temperature probe	HI 7662
Input impedance	10^{12} ohm
Power supply	12 VDC adapter
Dimensions	240x182x74 mm (9.4x7.1x2.9")
Weight	1.1 Kg (2.5 lb); kit with holder 2.5 Kg (5.5 lb)
Environment	0 – 50 °C (32 – 122 °F) max RH 95% non condensing
Warranty	2 years

OPERATIONAL GUIDE

POWER CONNECTION

Plug the 12 VDC adapter into the power supply socket.

Note: This instrument uses non volatile memory to retain the calibration parameters and all other settings, even when unplugged.

Note: Make sure a fuse protects the main line.

ELECTRODE AND PROBE CONNECTIONS

For pH or ORP measurements connect an electrode with internal reference to the BNC connector on the back of the instrument.

For electrodes with a separate reference connect the electrode's BNC to the BNC connector and the reference electrode plug to the reference socket.

For temperature measurements and automatic temperature compensation connect the temperature probe to the appropriate socket.

For EC/TDS measurements connect the probe to the 7-pin connector. Make sure the probe sleeve is properly inserted.

INSTRUMENT START-UP

- Turn the instrument on by pressing the **ON/OFF** switch.
- All LCD tags are displayed and a beep is sounded while the instrument performs a self test.

Note:
- The instrument starts in the same range and mode as it was at power off.
- The **RANGE** key toggles between pH, mV and EC ranges.
- The **ALT&MODE** keys changes the displayed information for the selected range.

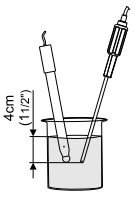
pH MEASUREMENTS

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

- Press **RANGE** to enter pH range.

Note: To select pH resolution press the **ALT&MODE** keys.

- Submerge the electrode tip and the temperature probe approximately 4 cm (1½″) into the sample to be tested and stir gently. Allow time for the electrode to stabilize.



- The pH is displayed on the primary LCD and the temperature on the secondary LCD.

- If the reading is out of range, the closest full-scale value will be displayed blinking on the primary LCD.

If measurements are taken successively in different samples, it is recommended to rinse the electrode thoroughly with deionized water or tap water and then with some of the next sample to prevent cross-contamination.

The pH reading is affected by temperature. In order to measure the pH accurately, the temperature effect must be compensated for. To use the Automatic Temperature Compensation feature, connect and submerge the **HI 7662** temperature probe into the sample as close as possible to the electrode and wait for a few seconds.

If the temperature of the sample is known, manual compensation can be performed by disconnecting the temperature probe.

The display will then show the default temperature of 25 °C or the last temperature reading with the "°C" tag blinking.

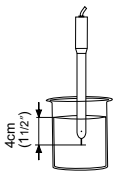
The temperature can now be adjusted with the **ARROW** keys (from –10.0 °C to 120.0 °C).

mV/ORP MEASUREMENTS

An optional ORP electrode must be used to perform ORP measurements (see Accessories).

Oxidation-Reduction Potential (REDOX) measurements provide the quantification of the oxidizing or reducing power of the tested sample.

To correctly perform a REDOX measurement, the surface of the ORP electrode must be clean and smooth.



- Press **RANGE** to enter mV range.
- Submerge the tip of the ORP electrode (4 cm/1½") into the sample to be tested and allow a few seconds for the reading to stabilize.

• The instrument displays the mV reading on the primary LCD and the temperature on the secondary LCD line.

• If the reading is out of range, the closest full-scale value will be displayed blinking on the primary LCD.

RELATIVE mV MEASUREMENTS

Press the **ALT&MODE** keys simultaneously while in mV range. The "rEL" message will be displayed on the secondary LCD line for about one second and the "mV" tag will blink. After one second the temperature will be displayed on the secondary LCD line.

The reading displayed by the instrument is equal to the difference between the current mV input value and relative mV offset established in the relative mV calibration.

CONDUCTIVITY MEASUREMENTS

Connect the conductivity probe to the instrument.

• Press **RANGE** to enter conductivity measurement range (EC).

• Immerse the probe into the solution to be tested. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.

The conductivity value will be displayed on the primary LCD and the temperature on the secondary LCD line.

• If the reading is out of range, the full-scale value (200.0 for Mtc/Atc mode or 500.0 for actual conductivity) will be displayed blinking.

- If **LOCK** was pressed to freeze the LCD range and the reading went out of range, the full-scale value of the frozen range will be displayed blinking.

The EC reading is affected by temperature.

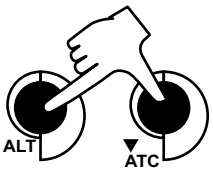
Three options of compensating temperature are available, on EC measurement mode.

Note: The compensation is referenced at the selected reference temperature (see SETUP for details, page 31).

Automatic (Atc): The EC probe has a built-in temperature sensor; the temperature value is used to automatically compensate the EC/TDS reading (from 0.0 – 60.0 ºC).

Manual (Mtc): The temperature value, shown on the secondary LCD, can be manually set with the **ARROW** keys. The "ºC" tag blinks when this option is active.

No Compensation (notc): The temperature value is displayed, but is not taken into account and "ºC" tag blinks with a higher frequency. The reading displayed on the primary LCD is the actual EC or TDS value. To select the desired option, press the **ALT&ATC** keys until the option is displayed on the LCD.



Note:
- The default compensation mode is **Atc**.
- If no temperature probe detected, **Atc** mode can not be selected and the instrument displays "----" on the secondary LCD.

If temperature compensation is active, measurements are compensated using the temperature coefficient (default value 1.90 %/ºC). To change the temperature coefficient, enter the setup mode and select the "tc" item (see SETUP for details, page 31). The current temperature coefficient can be quickly viewed by pressing the **ALT&TC** keys. The value is briefly displayed on the secondary LCD.

- If the temperature reading is out of 0.0 – 60.0 ºC interval and **Atc** option is selected, the "ºC" tag will blink and the closest interval limit will be displayed.
- Press the **ARROW** keys to change the displayed temperature value. This value is used to compensate the EC/TDS reading.

TDS MEASUREMENTS

Press the **ALT&MODE** keys while in EC range. The instrument will switch to TDS measuring range. A TDS reading will be displayed on the primary LCD and the temperature reading on the secondary LCD.

- If the reading is out of range, the full-scale value (100.0 for Mtc/Atc mode or 400.0 for actual TDS) will be displayed blinking.
- If **LOCK** was pressed to freeze the LCD range and the reading went out of range, the full-scale value of the frozen range will be displayed blinking.

NaCl MEASUREMENTS

Press the **ALT&MODE** keys while in EC range until NaCl is displayed on the LCD. The instrument will display the NaCl reading on the primary LCD and the temperature reading on the secondary LCD line.

- If the reading is out of range, the full-scale value (400.0%) will be displayed blinking.

TEMPERATURE MEASUREMENTS

To take temperature measurements while the instrument is in pH/ORP range, connect the **HI 7662** temperature probe to the appropriate socket.

Immerse the temperature probe into the sample and allow the reading on the secondary LCD to stabilize.

For EC/TDS/NaCl range, the **HI 76310** probe has a built-in temperature sensor.

Note: • If the instrument is in pH/ORP range and the **HI7662** temperature probe is not connected, the "°C" tag will blink (manual compensation) even if EC probe is connected.

AUTORANGING

The EC and TDS scales are autoranging. The meter automatically sets the scale with the highest possible resolution.

By pressing **LOCK**, the autoranging feature is disabled and the current range is frozen on the LCD. The "Auto" "Off" (autoranging disabled) tags will be displayed on the LCD for a few seconds. To restore the autoranging option, press **LOCK** again. The "Auto" "On" (autoranging enabled) tags will be displayed on the LCD for a few seconds.

Note: Autoranging is automatically restored if the range is changed, if the setup or calibration modes are entered and if the meter is turned off and back on again.

pH CALIBRATION

Calibrate the instrument frequently, especially if high accuracy is required.
The instrument should be recalibrated :

- Whenever the pH electrode is replaced.
- At least once a week.
- After testing aggressive chemicals.
- If "CAL" "INTV" tags are blinking during measurement.

Every time you calibrate the instrument use fresh buffers and perform an electrode Cleaning Procedure (see page 45).

PREPARATION

Pour small quantities of the buffer solutions into clean beakers. If possible, use plastic or glass beakers to minimize any EMC interferences.

For accurate calibration and to minimize cross-contamination, use two beakers for each buffer solution. One for rinsing the electrode and one for calibration.

If you are measuring in the acidic range, use pH 7.01or 6.86 as first buffer and pH 4.01 as second buffer. If you are measuring in the alkaline range, use pH 7.01 or 6.86 as first buffer and pH 10.01 or 9.18 as second buffer.

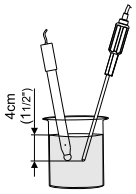
PROCEDURE

Calibration has a choice of 5 memorized buffers: pH 4.01, 6.86, 7.01, 9.18 and 10.01.

It is recommended to perform a two or three-point calibration. However, the instrument also allows a one-point calibration, as described on page 14.

Select pH range by pressing **RANGE**.

THREE-POINT CALIBRATION



- Immerse the pH electrode and the temperature probe approximately 4 cm (1½") into a buffer solution of your choice (pH 4.01, 6.86, 7.01, 9.18 or 10.01) and stir gently. The temperature probe should be close to the pH electrode.
- Press **CAL**. The "CAL" and "BUF" tags will appear and the "7.01" buffer will be displayed on the secondary LCD.

- If necessary, press the **ARROW** keys to select a different buffer value.

- The "⧖" tag will blink on the LCD until the reading is stable.
- When the reading is stable and close to the selected buffer, "READY" tag will be displayed and "CFM" tag will blink.
- Press **CFM** to confirm calibration.
- The calibrated value will be displayed on the primary LCD and the second expected buffer value on the secondary LCD line.

Note: The instrument will automatically skip the buffer used for the first point. It also skips 6.86 if 7.01 buffer was used and viceversa. Likewise, it will skip 9.18 if 10.01 buffer was used and viceversa.

- After the first calibration point is confirmed, immerse the pH electrode and the temperature probe approximately 4 cm (1½") into the second buffer solution and stir gently. The temperature probe should be close to the pH electrode.
- If necessary, press the **ARROW** keys to select a different buffer value.
- The "⧖" tag will blink on the LCD until the reading is stable.
- When the reading is stable and close to the selected buffer, "READY" tag will be displayed and "CFM" tag will blink.
- Press **CFM** to confirm calibration.
- The calibrated value will be displayed on the primary LCD and the third expected buffer value on the secondary LCD line.

Note: The instrument will automatically skip the buffer used for the first and second calibration point.

- After the second calibration point is confirmed, immerse the pH electrode and the temperature probe approximately 4 cm (1½") into the third buffer solution and stir gently. The temperature probe should be close to the pH electrode.
- If necessary, press the **ARROW** keys to select a different buffer value.
- The "⧖" tag will blink on the LCD until the reading is stable.
- When the reading is stable and close to the selected buffer, "READY" tag will be displayed and "CFM" tag will blink.
- Press **CFM** to confirm calibration.
- The instrument stores the calibration value and returns to normal measurement mode.

Note:

- If the value measured by the instrument is not close to the selected buffer, "WRONG" "BUF2" and "WRONG" " " tags will blink alternately. In this case, check if the correct buffer has been used or regenerate the electrode by following the Cleaning Procedure (see page 45). If necessary, change the buffer or the electrode.

- If "WRONG", "Buffer pH" tags and "Old" tag on secondary LCD are displayed blinking, an inconsistency between new and previous (old) calibration is detected. Clear calibration parameters by pressing **LOCK/CLR** and proceed with calibration from the current calibration point (the instrument will keep all confirmed values during current calibration).
- If **LOCK/CLR** is pressed at the first calibration point, the instrument clears all calibration parameters and returns to measurement mode.
- The "WRONG" tag and temperature value are displayed blinking if temperature reading is out of the defined temperature range of the buffer. Calibration cannot be confirmed in this situation.

- Press **RANGE** to display the temperature reading on the LCD during calibration.

TWO-POINT CALIBRATION

- Proceed as described in "Three-point calibration" section.
- Press **CAL** after the second calibration point was confirmed.

The instrument will return to measurement mode and will memorize the two-point calibration data.

ONE-POINT CALIBRATION

- Proceed as described in "Three-point calibration" section.
- Press **CAL** after the first calibration point was confirmed.

The instrument will return to measurement mode and will memorize the one-point calibration data.

Note: Calibration parameters are evaluated taking in consideration the new values for the confirmed buffers in current calibration and the old values, if existing, for the other buffers. To clear old calibration values, press **LOCK/CLR** before exiting calibration.

RELATIVE mV CALIBRATION

- Press **CAL** when the instrument is in RELATIVE mV measurement mode. The "mV" and "⧖" tags will blink. Absolute mV is displayed on the primary LCD and "AbS" message is displayed on the secondary LCD.
- When the reading is stable and inside the offset window (±2000 mV), the instrument asks for confirmation.
- If the reading is out of the offset window, "WRONG" tag will be displayed.
- Press **CFM** to confirm absolute value. The instrument will display 0.0 mV on the primary LCD and "rEL" message on the secondary LCD line. In this moment the relative mV offset is equal to absolute mV reading.
- Use the **ARROW** keys if you want to change the displayed value.
- Press **CFM** to confirm relative mV calibration. The instrument will return to measurement mode.

EC/TDS CALIBRATION

EC calibration is a one-point procedure. Selectable calibration points are 0.00 µS for offset and 84.0 µS, 1413 µS, 5.00 mS, 12.88 mS, 80.0 mS, 111.8 mS for slope.

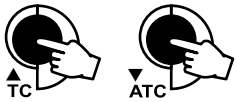
Rinse the probe with calibration solution or deionized water. Immerse the probe into the solution. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.
To enter EC calibration, select the EC range and press **CAL**.

Note: TDS reading is automatically derived from the EC reading and no specific calibration for TDS is needed. Pressing **CAL** when TDS range is selected has no effect.

For zero calibration, just leave the dry probe in the air. This calibration is performed in order to correct the reading around 0.00 µS point. The slope is evaluated when the calibration is performed in any other point.

The "BUF" and "CAL" tags are displayed. The primary LCD will display the EC reading. The secondary LCD will display the buffer value. The "⧖" and "∼" tags will blink.

Select the desired value with the **ARROW** keys, if necessary.



When the reading is stable, "READY" tag is displayed and "CFM" tag starts blinking on the LCD, asking for confirmation.

Press **CFM** to confirm calibration.
The instrument stores the calibration value and returns to measurement mode.

Note: • If the uncalibrated reading is too far from the expected value, the "WRONG" and "BUF" tags will blink. Calibration can not be confirmed. In this case check if the correct buffer has been used or clean the probe by following the Cleaning Procedure (see page 45).

- If the meter is in **Atc** mode and the buffer temperature is out of 0.0 – 60.0 ºC interval, "WRONG" "ºC" tags and the temperature will be displayed blinking.

- For best results choose an EC buffer value close to the sample to be measured.
- In order to minimize any EMC interference, use plastic or glass beakers.
- It is possible to set the cell constant value directly, without following the calibration procedure. To set the cell constant, enter SETUP mode and select "CEL" (see SETUP for details, page 31).

NaCl CALIBRATION

NaCl calibration is a one-point procedure at 100.0% NaCl. Use the **HI 7037L** calibration solution (sea water solution) as a 100% NaCl standard solution.

Rinse the probe with some of the calibration solution or deionized water. Immerse the probe into **HI 7037L** solution. The sleeve holes must be completely submerged. Tap the probe repeatedly to remove any air bubbles that may be trapped inside the sleeve.

To enter NaCl calibration select the NaCl range and press **CAL**.

The "BUF" and "CAL" tags are displayed. The primary LCD will display the NaCl reading in percentage. The secondary LCD will display "100". The "⧖" and "∼" tags will blink.

When the reading is stable, the "READY" tag will be displayed and "CFM" tag starts blinking on the LCD, asking for confirmation.

Press **CFM** to confirm calibration.

The instrument stores the calibration value and returns to measurement mode.

Note:
- If the reading is too far from the expected value, "WRONG" "BUF" tags will blink. Calibration cannot be confirmed.
- If the temperature of the buffer is out of 0.0 – 60.0 °C temperature interval, the "WRONG" and "°C" tags will be displayed blinking.
- If a new EC calibration is performed, NaCl calibration is automatically cleared. Thus, a new NaCl calibration is required.

GOOD LABORATORY PRACTICE (GLP)

GLP is a set of functions that allows storage and retrieval of data regarding the maintenance and status of the electrode.

All data regarding pH, Rel mV, EC and NaCl is stored for the user to review when necessary.

CALIBRATION ALARM TIME-OUT

For pH calibration, this instrument allows the user to set the number of days before the next required pH calibration. This value can be set from 1 to 7 days. The default setting is OFF (disabled).

The instrument checks if the time-out time has expired. If the time elapsed, the "CAL" "INTV" tags will blink as a reminder.

Note: If the instrument was not calibrated, the "CAL" "INTV" tags will be displayed even if the feature is disabled in SETUP menu.

LAST pH CALIBRATION DATA

The last pH calibration data is stored automatically after a successful calibration.

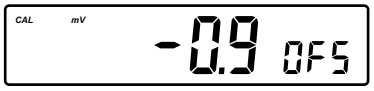
To view the pH calibration data, press **GLP** when the instrument is in pH (mV) measurement mode.

The instrument will display the time (hh:mm) of the last calibration.

Press the **ARROW** keys to view the next logged calibration parameter (pressing the ▲ key):

- The date (yy.mm.dd).

- The pH calibration offset.



- The pH calibration slope(the GLP slope is the average of the calibration slopes; the percentage is referred to the ideal value of 59.16 mV/pH).

- The calibration buffers in calibrating order.
  The first pH calibration buffer:

  The second pH calibration buffer:

  The third pH calibration buffer:

Note:
- The "OLd" message displayed beside the pH value means that this buffer was not used during last calibration. Press and hold down the **ALT&SET** keys if you want to see calibration date (or time if old calibration was made in the same day with current calibration).
- If "no bUF" message appears on the LCD, the instrument informs you that calibration was performed in less than three points.

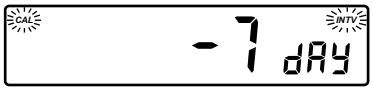
- Temperature compensation mode (**Atc** or **Mtc**; with or without temperature probe).

- pH resolution during calibration:

- Calibration Alarm Time-Out status:
  if disabled.

  or the number of days until the calibration alarm will be displayed.

  or if expired (7 days ago).



- The instrument ID.

LAST Relative mV CALIBRATION DATA

Last Relative mV calibration data is stored automatically after a successful calibration.

To view the Relative mV calibration data, press **GLP** when the instrument is in Relative mV measurement mode.

The instrument will display the time (hh:mm) of the last calibration.

Press the **ARROW** keys to view the next logged calibration parameter (pressing the ▲ key):

- The date (yy:mm:dd):

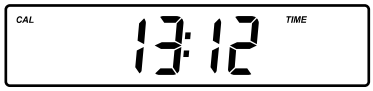
- The Relative mV calibration offset:

- The instrument ID.

LAST EC CALIBRATION DATA

Last EC calibration data is stored automatically after a successful calibration.
To view the EC calibration data, press **GLP** when the instrument is in EC measurement mode.
The instrument will display:

- The time.



Press the **ARROW** key to view the next logged calibration parameters (pressing the ▲ key).

- The date.

- The EC calibration buffer.

- The cell constant.

- The calibration offset factor.

- The reference temperature.

- The temperature coefficient.

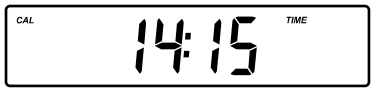
- The temperature compensation mode.

- The instrument ID.

LAST NaCl CALIBRATION DATA

Last NaCl calibration data is stored automatically after a successful calibration. To view the NaCl calibration data, press **GLP** when the instrument is in NaCl measurement mode. The instrument will display:

- The time.



Press the **ARROW** key to view the next logged calibration parameters (pressing the ▲key).

- The date.

- The salinity coefficient.

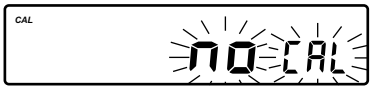
- The cell constant.

- The reference temperature.

- The temperature compensation mode.

- The instrument ID.

Note:
- If **notc** is selected as temperature compensation mode during calibration, the temperature coefficient is not displayed in GLP.
- Press **GLP** at any moment and the instrument will return to measurement mode.
- If calibration has not been performed on the selected range, the instrument displays "no CAL" message blinking.



LOGGING FUNCTION

Up to 200 LOG samples can be stored into memory.

LOGGING THE CURRENT DATA

To store the current reading into memory press **LOG** while the instrument is in measurement mode.

The instrument will display the current date (mm.dd) on the primary LCD, the record number on the secondary LCD and "LOG" tag will blink for a few seconds (see example below: record No. 5 dated September 14):

If there are less than 6 memory locations remaining, the record number and "Lo" message will blink to alert the user.

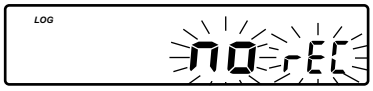
If the log space is full, "FULL LOC" message will be displayed and no more data will be saved.

When **LOG** is pressed, a complete set of information of the corresponding measurement range is stored.

VIEW LOGGED DATA

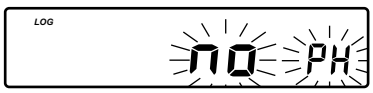
Press the **ALT&RCL** keys while in measurement mode to retrieve the stored information.

If no data were logged, the instrument displays:

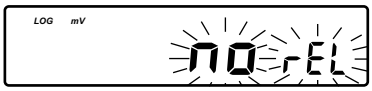


If no data were logged for the current selected measurement range, one of the next messages will be displayed:

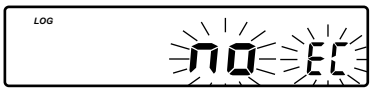
On pH measurements ranges:



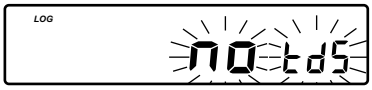
On Relative mV range:



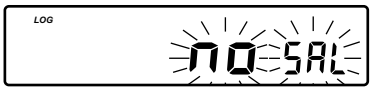
On EC range:



On TDS range:

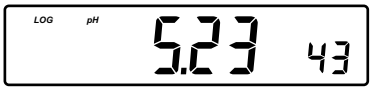


On NaCl range:



Otherwise, the instrument will display the memorized data:

- If **RCL** is invoked while the instrument is in pH or mV measurement range:



Or if **RCL** is invoked while the instrument is in Rel mV range:

Or if **RCL** is invoked while the instrument is in EC measurement range:

Or if **RCL** is invoked while the instrument is in TDS measurement range:

Or if **RCL** is invoked while the instrument is in NaCl measurement range:

Pressing the **ARROW** keys, the instrument will display the same parameter but for a different record:
(example on pH range)

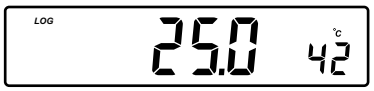
or

Note: The instrument will automatically skip log records from other measurement ranges.

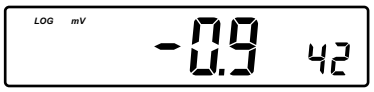
Press **RANGE** and the instrument will display the next logged parameter as follows:

For pH/mV Range

- The **temperature** value on the primary LCD and the record number on the secondary LCD.



- The **mV** value on the primary LCD and the record number on the secondary LCD.

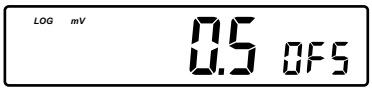


Note: When the pH, mV or temperature is displayed, if the **ALT&SET** keys are pressed and hold down, the secondary LCD will display the record date.

- The **time** on the primary LCD, along with "TIME" tag.

- The **date** on the primary LCD, along with "DATE" tag.

- The calibration **offset** on the primary LCD and "OFS" message on the secondary LCD.



- The calibration **slope** on the primary LCD and "SLP" message on the secondary LCD.

- The **temperature compensation mode** on the primary LCD and "tcP" message on the secondary LCD.

Note: When the time, date, year, offset or slope is displayed, if the **ALT&SET** keys are pressed and hold down, the secondary LCD will display the record number.

- The "dEL" message on the primary LCD and the selected record on the secondary LCD, with "LOG" tag displayed and "CFM" tag blinking.

Note:
- If one of the **ARROW** keys is pressed while "dEL" and record number is displayed, the next/previous record number is selected.
- If the **ALT&SET** keys are pressed, the secondary LCD will display "ALL" message.

- Pressing the **ALT&SET** keys again, the secondary LCD will display the record number.
- Press **CFM** to confirm deletion.
- If "dEL ALL" option was selected, all records (for all ranges) are deleted and the instrument returns to measurement mode.

For Relative mV Range

- The temperature value, the mV absolute value, the time and the date as described above.
- The Relative mV offset.

- The "dEL" message as described above.

For EC Range

- The temperature value, time and date as described on pH Range.
- The **offset factor** on the primary LCD and "OFS" message on the secondary LCD.

- The **reference temperature** on the primary LCD and "rEF" message on the secondary LCD.

- The **temperature coefficient** on the primary LCD and "tc" message on the secondary LCD.

- The temperature compensation mode as described on pH Range.
- The **cell constant** on the primary LCD and "CEL" message on the secondary LCD line.

Note: • When the EC or temperature is displayed, if the **ALT&SET** keys are pressed and hold down, the secondary LCD will display the record date.

- When the information that does not display the record number is selected, pressing and keeping hold down the **ALT&SET** keys will display the record number on the secondary LCD line.

- The "dEL" message as described in pH Range.

For TDS Range

- The temperature reading as described in pH range (page 27).
- The **conductivity** value on the primary LCD and the record number on the secondary LCD.

- The time and the date as described in pH Range.
- The **TDS factor** on the primary LCD and "cF" message on the secondary LCD.

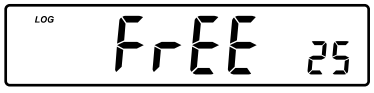
- The reference temperature, the temperature coefficient, the temperature compensation mode and the cell constant as described in EC Range.
- The "dEL" message as described in pH Range.

For NaCl Range

- The temperature reading as described in pH Range (page 27).
- The conductivity value as described in TDS Range.
- The time and date as described in pH Range.
- The **salinity factor** on the primary LCD and "cF" message on the secondary LCD, with "LOG" and "NaCl" tags displayed.

- The reference temperature, the temperature compensation mode, the cell constant and "dEL" message as described above.

Note: After **LOG** is pressed or "dEL" is confirmed, the instrument will display the amount of free log space for about one second (example 25 records free).



Press the **ALT&RCL** keys to leave RECALL mode at any time.

SETUP

Setup mode allows viewing and modifying the instrument parameters.
In according with the selected range, SETUP menu allows the possibility to view and/or change specific range parameters and common parameters (for all ranges).
The common parameters are:

- Instrument ID
- Time
- Date
- Beep Status
- Baud Rate (serial communication)
- Command Prefix (serial communication)

The range specific parameters are:

In pH Range

- Calibration Alarm Time-Out

In EC/TDS/NaCl Range

- Cell Constant
- TDS Factor
- Temperature Coefficient
- Reference Temperature

To enter SETUP mode press the **ALT&SET** keys while the instrument is in measurement mode. The instrument will display the first parameter of the specific range.

Select a parameter with the **ARROW** keys.

Press **CAL** if you want to change a parameter value. The selected parameter will start blinking.

Press **RANGE** to toggle between displayed parameters.

Press the **ARROW** keys to increase or decrease the displayed value.

Press **CFM** to save the modified value or **CAL** to escape.

Press the **ARROW** keys to select the next/previous parameter.

SET COMMON PARAMETERS

Instrument ID parameter

Press **CAL** when the instrument ID is displayed. The instrument ID (0000 to 9999) will start blinking.

Press the **ARROW** keys to change the instrument ID value.

Press **CFM** to save the modified instrument ID value.

Press **CAL** to escape without saving.

Note: The instrument ID is downloaded to a PC as part of a logged data, set to identify its origin.

Current Time Set

Press **CAL** when the current time is displayed. The hour will start blinking.

Press the **ARROW** keys to change the hour.

Press **RANGE**. The minutes will start blinking.

Press the **ARROW** keys to change the minutes.

Press **CFM** to save the modified value.

Press **CAL** to escape without saving.

Current Date Set

Press **CAL** when the current date is displayed. The year will start blinking.

Press the **ARROW** keys to change the year.

Press **RANGE**. The month will start blinking.

Press the **ARROW** keys to change the month.

Press **RANGE**. The day will start blinking.

Press the **ARROW** keys to change the day.

Press **CFM** to save the modified value.

Press **CAL** to escape without saving.

Beep Status Set

Press **CAL** when the beep status is displayed. Beep status (On or OFF) will start blinking.

Press the **ARROW** keys to change the beep status (On or OFF).

Press **CFM** to save the modified beep status.

Press **CAL** to escape without saving.

Note:
- If enabled, an audible signal will follow each key pressed. Inactive keys have a longer beep. A longer beep can be also heard when the range limits of a parameter are reached.
- During calibration an audible signal can be heard when the reading becomes stable.

Baud Rate Set

Press **CAL** when the baud rate is displayed. The baud rate (600, 1200, 2400, 4800 or 9600) will start blinking.

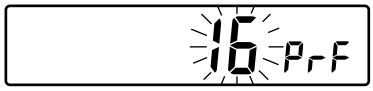
Press the **ARROW** keys to change the baud rate value.

Press **CFM** to save the modified baud rate value.

Press **CAL** to escape without saving.

Serial Communication Command Prefix Set

Press **CAL** when the command prefix is displayed. Command prefix (0 to 47) will start blinking.



Press the **ARROW** keys to change the command prefix.
Press **CFM** to save the modified command prefix value.
Press **CAL** to escape without saving.

Note: • See the PC interface section on page 39 for a complete explanation.
• The command prefix must be 16 if **HI 92000** PC software is used.

SPECIFIC RANGE PARAMETER

pH Range

Calibration Alarm Time-Out Set

Press **CAL** when the calibration time-out is displayed. Calibration time-out (OFF or 1 to 7 days) will start blinking.

Press the **ARROW** keys to change the calibration time-out value.
Press **CFM** to save the modified calibration time-out value.
Press **CAL** to escape without saving.

EC/TDS/NaCl Range

Cell Constant Parameter Set

Press **CAL** when the cell constant is displayed. The cell constant will start blinking.

Press the **ARROW** keys to change the cell constant (0.500 to 1.700).
Press **CFM** to save the modified cell constant.
Press **CAL** to escape without saving.

TDS Factor Set

Press **CAL** when the TDS factor is displayed. The TDS factor will start blinking.

Press the **ARROW** keys to change the TDS factor (0.40 to 0.80).
Press **CFM** to save the modified TDS factor.
Press **CAL** to escape without saving.

Temperature Compensation Coefficient Set

Press **CAL** when the temperature compensation coefficient is displayed. The temperature compensation coefficient will start blinking.

Press the **ARROW** keys to change the temperature compensation coefficient. (0.00 to 6.00 %/ºC).
Press **CFM** to save the modified temperature compensation coefficient.
Press **CAL** to escape without saving.

Reference Temperature Parameter Set

Press **CAL** when the reference temperature is displayed. The reference temperature will start blinking.

Press the **ARROW** keys to toggle between 20.0 ºC and 25.0 ºC reference temperature value.
Press **CFM** to save the modified reference temperature value.
Press **CAL** to escape without saving.

TEMPERATURE CALIBRATION (for technical personnel only)

The instrument has two temperature channels: one that measures the temperature from the **HI 7662** probe while the instrument is in pH/mV range and the other that measures temperature from the EC probe while the instrument is in EC/TDS/NaCl range.

All the instruments are factory calibrated for temperature on both channels.

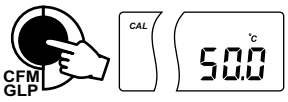
Hanna's temperature probes are interchangeable and no temperature calibration is needed when they are replaced.

If the temperature measurements are inaccurate, temperature recalibration should be performed.

For an accurate recalibration, contact your dealer or the nearest Hanna Customer Service Center, or follow the instructions bellow.

- Prepare a vessel containing ice and water and another one containing hot water (at a temperature of around 50 °C). Place insulation material around the vessels to minimize temperature changes.
- Use a calibrated thermometer with a resolution of 0.1 °C as a reference thermometer. Connect the **HI 7662** probe to the appropriate socket for the pH temperature channel or the **HI 76310** probe for the EC temperature channel.
- With the instrument off, press and hold down the **CAL&ALT** keys, then power on the instrument to calibrate the pH temperature channel or **CAL** and "▼" keys and then power on the instrument to calibrate the EC temperature channel. The "CAL" tag will appear and the secondary LCD will show 0.0 °C.

- Immerse the temperature probe (or EC probe) in the vessel with ice and water as near as possible to the calibrated thermometer. Allow a few seconds for the probe to stabilize.
- Use the **ARROW** keys to set the reading on the secondary LCD to that of ice and water, measured by the calibrated thermometer. When the reading is stable and close to the selected calibration point, "READY" tag will appear and "CFM" tag will blink.
- Press **CFM** to confirm. The secondary LCD will show 50.0 °C.



- Immerse the temperature probe (or EC probe) in the second vessel as near as possible to the calibrated thermometer. Allow a few seconds for the probe to stabilize.
- Use the **ARROW** keys to set the reading on the secondary LCD to that of the hot water.

- When the reading is stable and close to the selected calibration point, "READY" tag will appear and "CFM" tag will blink.
- Press **CFM** to confirm. The instrument returns to measurement mode.

Note: If the reading is not close to the selected calibration point, "WRONG" tag will blink. Change the temperature probe (or EC probe) and restart calibration.

mV CALIBRATION (for technical personnel only)

All the instruments are factory calibrated for mV.

Hanna's ORP electrodes are interchangeable and no mV calibration is needed when they are replaced.

If the mV measurements are inaccurate, mV recalibration should be performed.

For an accurate recalibration, contact your dealer or the nearest Hanna Customer Service Center or follow the instructions below.

A two or three-point calibration can be performed at 0.0 mV, 600.0 mV and 1800.0 mV.

- Attach to the BNC connector a mV simulator with an accuracy of ±0.1 mV.
- With the instrument off, press and hold down the **CFM&LOG** keys, then power on the instrument. The "CAL" tag will appear and the secondary LCD will show 0.0 mV.
- Set 0.0 mV on the simulator.
  When the reading is stable and close to the selected calibration point, "READY" tag will appear and "CFM" tag will blink.
- Press **CFM** to confirm. The secondary LCD will display 600 mV.
- Set 600.0 mV on the simulator.
  When the reading is stable and close to the selected calibration point, "READY" tag will appear and "CFM" tag will blink.
- Press **CFM** to confirm. The secondary LCD will display 1800 mV.
- Set 1800.0 mV on the simulator.
  When the reading is stable and close to the selected calibration point, "READY" tag will appear and "CFM" tag will blink.
- Press **CFM** to confirm. The instrument returns to measurement mode.

Note:
- If the reading is not close to the selected calibration point, "WRONG" tag will blink. Verify calibration condition or contact your vendor if you can not calibrate.
- Press **CAL** in any moment of the calibration process. The instrument will return to measurement mode. If calibration process is stopped after 600 mV is confirmed, the 600 mV range is calibrated and calibration parameters are memorized.

PC INTERFACE

Data transmission from the instrument to the PC can be done with the **HI 92000** Windows® compatible software (optional). **HI 92000** also offers graphing and on-line help feature.

Data can be exported to the most popular spreadsheet programs for further analysis.

To connect your instrument to a PC, use the optional Hanna **HI 920010** cable connector. Make sure that your instrument is switched off and plug one connector to the instrument RS232C socket and the other to the serial port of your PC.

Note:
- Other cables than **HI 920010** may use a different configuration. In this case communication between instrument and PC may not be possible.
- If you are not using Hanna Instruments **HI 92000** software, please see the following instructions.

SENDING COMMANDS FROM PC

It is also possible to remotely control the instrument with any terminal program. Use **HI 920010** cable to connect the instrument to a PC, start the terminal program and set the communication options as follows: 8, N, 1, no flow control.

COMMAND TYPES

To send a command to the instrument the scheme is:

<command prefix> <command > <CR>

where: <command prefix> is a selectable ASCII character between 0 and 47.

<command> is the command code (3 characters).

Note: Either small or capital letters can be used.

SIMPLE COMMANDS

RNG Is equivalent to pressing **RANGE**

CAL Is equivalent to pressing **CAL**

CFM Is equivalent to pressing **CFM/GLP**

UPC Is equivalent to pressing the **UP** arrow key

DWC Is equivalent to pressing the **DOWN** arrow key

SET Is equivalent to pressing **SET/CLR**

LOG Is equivalent to pressing **LOG**

MMD Is equivalent to pressing **MODE**

CHR n Change the instrument range according with the parameter value (n):
- n=0 pH range/0.01 resolution

- n=1 pH range/0.1 resolution
- n=2 mV range
- n=3 Relative mV range
- n=4 EC range
- n=5 TDS range
- n=6 NaCl range

The instrument sends the "ACK" (6) character every time a command is recognized and a "NAK" (21) character for invalid commands.

COMMANDS REQUIRING AN ANSWER

RAS Causes the instrument to send a complete set of readings in according with the current range:
- pH, mV and temperature reading on pH range.
- mV and temperature reading on mV range.
- Rel mV, absolute mV and temperature reading on Rel mV range.
- Conductivity and temperature reading on EC range.
- TDS and temperature reading on TDS range.
- NaCl and temperature reading on NaCl range.

MDR Requests the instrument model name and firmware code.

PAR Requests the setup parameters setting.

NSL Requests the number of logged samples.

GLP Requests the calibration data record.

LOD xxx Requests the xxxth record logged data ("Err3" sent when "xxx" is an invalid record number).

LOD ALL Requests all logged data.

Note:
- "Err8" is sent if instrument is not in measurement mode.
- "Err7" is sent if mV are asked during pH calibration mode.
- "NAK" (21) character is sent when the instrument receives an unknown or a corrupted command.

The characters sent by the instrument are always capital letters.

pH VALUES AT DIFFERENT TEMPERATURES

The temperature has an effect on pH. The calibration buffer solutions are affected by temperature changes to a lesser degree than normal solutions. During calibration the instrument will automatically calibrate to the pH value corresponding to the measured or set temperature.

TEMP		pH VALUES				
°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	7.04	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	9.10	9.92
40	104	4.04	6.84	6.98	9.07	9.98
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	4.07	6.84	6.98	8.99	9.79
60	140	4.09	6.84	6.98	8.97	9.77
65	149	4.11	6.85	6.99	8.95	9.76
70	158	4.12	6.85	6.99	8.93	9.75

During calibration the instrument will display the pH buffer value at 25 °C.

CONDUCTIVITY VERSUS TEMPERATURE CHART

The conductivity of an aqueous solution is a measure of its ability to carry an electrical current by means of ionic motion.

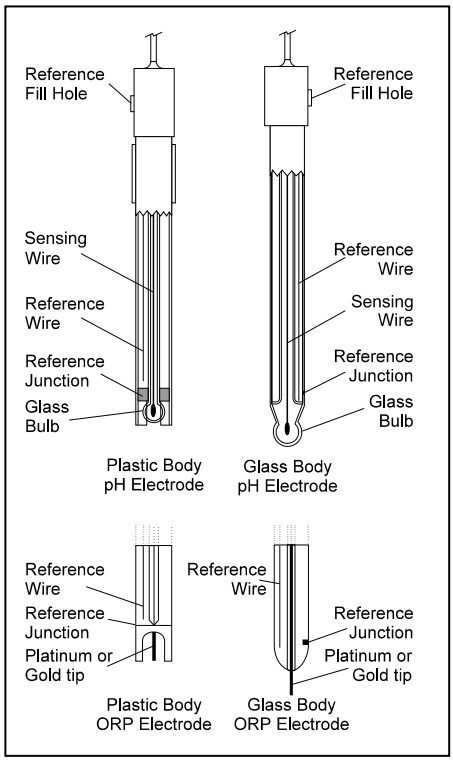
The conductivity invariably increases with increasing temperature.

It is affected by the type and number of ions in the solutions and by the viscosity of the solution itself. Both parameters are temperature dependent. The dependency of conductivity on temperature is expressed as a relative change per Celsius degrees at a particular temperature, commonly as %/ºC.

The following table lists the temperature dependence of HANNA EC calibration buffers.

ºC	ºF	HI7030 HI8030 (µS/cm)	HI7031 HI8031 (µS/cm)	HI7033 HI8033 (µS/cm)	HI7034 HI8034 (µS/cm)	HI7035 HI8035 (µS/cm)	HI7039 HI8039 (µS/cm)
0	32	7150	776	64	48300	65400	2760
5	41	8220	896	65	53500	74100	3180
10	50	9330	1020	67	59600	83200	3615
15	59	10480	1147	68	65400	92500	4063
16	60.8	10720	1173	70	67200	94400	4155
17	62.6	10950	1199	71	68500	96300	4245
18	64.4	11190	1225	73	69800	98200	4337
19	66.2	11430	1251	74	71300	100200	4429
20	68	11670	1278	76	72400	102100	4523
21	69.8	11910	1305	78	74000	104000	4617
22	71.6	12150	1332	79	75200	105900	4711
23	73.4	12390	1359	81	76500	107900	4805
24	75.2	12640	1386	82	78300	109800	4902
25	77	12880	1413	84	80000	111800	5000
26	78.8	13130	1440	86	81300	113800	5096
27	80.6	13370	1467	87	83000	115700	5190
28	82.4	13620	1494	89	84900	117700	5286
29	84.2	13870	1521	90	86300	119700	5383
30	86	14120	1548	92	88200	121800	5479
31	87.8	14370	1575	94	90000	123900	5575

ELECTRODE CONDITIONING & MAINTENANCE



PREPARATION PROCEDURE

Remove the protective cap of the pH electrode.

DO NOT BE ALARMED IF SALT DEPOSITS ARE PRESENT. This is normal with electrodes. 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** or **HI 80300** Storage Solution for at least one hour.

For refillable electrodes:

If the filling solution (electrolyte) is more than 2½ cm (1") below the fill hole, add **HI 7082** or **HI 8082** 3.5M KCl Electrolyte Solution for double junction or **HI 7071** or **HI 8071** 3.5M KCl + AgCl Electrolyte Solution for single junction electrodes.

For 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 pH 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.

Take care that the sleeve holes of the EC probe are completly submerged. Tap the probe repeatedly to remove air bubbles that may be trapped inside the sleeve.

STORAGE PROCEDURE

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

Replace the solution in the protective cap with a few drops of **HI 70300** or **HI 80300** Storage Solution or, in its absence, Filling Solution (**HI 7071** or **HI 8071** for single junction and **HI 7082** or **HI 8082** for double junction electrodes). Follow the Preparation Procedure on page 43 before taking measurements.

Note: NEVER STORE THE ELECTRODE IN DISTILLED OR DEIONIZED WATER.

PERIODIC MAINTENANCE

Inspect the electrode and the cable. The cable used for connection to the instrument 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 with water.

pH Electrode Maintenance

For refillable electrodes:

Refill the reference chamber with fresh electrolyte (**HI 7071** or **HI 8071** for single junction and **HI 7082** or **HI 8082** for double junction electrodes). Allow the electrode to stand upright for 1 hour.

Follow the Storage Procedure above.

pH ELECTRODE CLEANING PROCEDURE

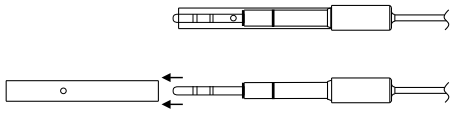
• General	Soak in Hanna **HI 7061** or **HI 8061** General Cleaning Solution for approximately ½ hour.
• Protein	Soak in Hanna **HI 7073** or **HI 8073** Protein Cleaning Solution for 15 minutes.
• Inorganic	Soak in Hanna **HI 7074** Inorganic Cleaning Solution for 15 minutes.
• Oil/grease	Rinse with Hanna **HI 7077** or **HI 8077** Oil and 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** or **HI 80300** Storage Solution for at least 1 hour before taking measurements.

EC Probe Maintenance

Rinse the probe with clean water after measurements. If a more thorough cleaning is required, remove the probe sleeve and clean the probe with a cloth or a nonabrasive detergent. Make sure to reinsert the sleeve onto the probe properly and in the right direction. After cleaning the probe, recalibrate the instrument.

The platinum rings support is made of glass. Take great care while handling the probe.

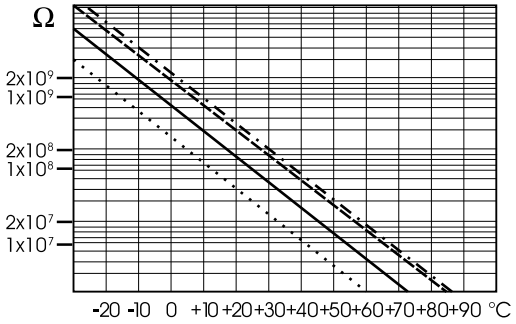


TROUBLESHOOTING GUIDE

SYMPTOMS	PROBLEM	SOLUTION
Slow reponse/excessive drift measuring pH.	Dirty pH electrode.	Soak the electrode tip in HI 7061 or HI 8061 solution for 30 minutes and then clean the electrode.
Readings fluctuate up and down (noise).	Clogged/dirty junction. Low electrolyte level (refillable pH electrodes only). EC probe sleeve not properly inserted; air bubbles inside sleeve.	Clean the electrode. Refill with fresh solution (for refillable pH electrodes only). Insert the sleeve. Tap the probe to remove air bubbles.
Out of range in the mV scale.	Dry membrane/junction.	Soak in HI 70300 or HI 80300 storage solution.
The meter does not accept the buffer solution for calibration.	Out of order pH electrode.	Follow the cleaning procedure. If still no results replace the electrode.
If the display shows: "pH" and "-2.00" or "16.00" blinking.	Out of range in the pH scale.	a) Recalibrate the meter. b) Make sure the pH sample is in the specified range. c) Check the electrolyte level and the general state of the electrode.
If the display shows: "mV" and "-2000" or "+2000" blinking.	Out of range in the mV scale.	Electrode not connected.
The display shows EC, TDS or NaCl reading blinking.	Out of range in EC, TDS or NaCl scale.	Recalibrate the meter. Make sure the solution is in specified range. Make sure the LOCK key was not pressed.
The meter does not work with the temperature probe.	Broken temperature probe.	Replace the temperature probe.
The meter fails to calibrate or gives faulty readings.	Broken electrode.	Replace the electrode.
The meter fails to calibrate NaCl.	Incorrect EC calibration.	Recalibrate the meter in EC range. Set cell constant to 1.
At startup the meter displays all LCD tags permanently.	One of the keys is blocked.	Check the keyboard or contact the vendor.
"Err xx" error message displayed.	Internal error.	Power off the meter and then power it on. If the error persists, contact the vendor.

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 more 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 25 °C.



Since the resistance of the pH electrode is in the range of 50 – 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

Alkaline Error

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 called alkaline error and causes the pH to be underestimated. Hanna's glass formulations have the indicated characteristics.

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

ACCESSORIES

pH BUFFER SOLUTIONS

HI 70004P pH 4.01 Buffer Sachets, 20 mL, 25 pcs
HI 70007P pH 7.01 Buffer Sachets, 20 mL, 25 pcs
HI 70010P pH 10.01 Buffer Sachets, 20 mL, 25 pcs
HI 7001L pH 1.68 Buffer Solution, 500 mL
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 approved bottle, 500 mL
HI 8006L pH 6.86 Buffer Solution in FDA approved bottle, 500 mL
HI 8007L pH 7.01 Buffer Solution in FDA approved bottle, 500 mL
HI 8009L pH 9.18 Buffer Solution in FDA approved bottle, 500 mL
HI 8010L pH 10.01 Buffer Solution in FDA approved bottle, 500 mL

pH ELECTRODE STORAGE SOLUTIONS

HI 70300L Storage Solution, 460 mL
HI 80300L Storage Solution in FDA approved bottle, 460 mL

CLEANING SOLUTIONS

HI 7061M General Cleaning Solution, 230 mL bottle
HI 7061L General Cleaning Solution, 460 mL bottle
HI 8061M General Cleaning Solution, 230 mL bottle FDA approved bottle
HI 8061L General Cleaning Solution, 460 mL bottle FDA approved bottle
HI 70000P Electrode Rinse Sachets, 20 mL, 25 pcs
HI 7073L Protein Cleaning Solution, 460 mL
HI 7074L Inorganic Cleaning Solution, 460 mL
HI 7077L Oil & Fat Cleaning Solution,460 mL
HI 8073L Protein Cleaning Solution in FDA approved bottle, 460 mL
HI 8077L Oil & Fat Cleaning Solution in FDA approved bottle, 460 mL

pH ELECTRODE REFILL ELECTROLYTE SOLUTIONS

HI 7071 3.5M KCl + AgCl Electrolyte, 4x30 mL, for single junction electrodes
HI 7072 1M KNO_3 Electrolyte, 4x30 mL
HI 7082 3.5M KCl Electrolyte, 4x30 mL, for double junction electrodes
HI 8071 3.5M KCl + AgCl Electrolyte in FDA approved bottle, 4x30 mL, for single junction electrodes
HI 8072 1M KNO_3 Electrolyte in FDA approved bottle, 4x30 mL
HI 8082 3.5M KCl Electrolyte in FDA approved bottle, 4x30 mL, for double junction electrodes

ORP PRETREATMENT SOLUTIONS

HI 7091L	Reducing Pretreatment Solution, 460 mL
HI 7092L	Oxidizing Pretreatment Solution, 460 mL

CONDUCTIVITY SOLUTIONS

HI 70030C	12880	µS/cm (µmho/cm), 20 mL sachets (25 pcs.)
HI 70031P	1413	µS/cm (µmho/cm), 20 mL sachets (25 pcs.)
HI 70033P	84	µS/cm (µmho/cm), 20 mL sachets (25 pcs.)
HI 70039P	5000	µS/cm (µmho/cm), 20 mL sachets (25 pcs.)
HI 7030M	12880	µS/cm (µmho/cm), 230 mL bottle
HI 7031M	1413	µS/cm (µmho/cm), 230 mL bottle
HI 7033M	84	µS/cm (µmho/cm), 230 mL bottle
HI 7030M	12880	µS/cm (µmho/cm), 230 mL bottle
HI 7034M	80000	µS/cm (µmho/cm), 230 mL bottle
HI 7035M	111800	µS/cm (µmho/cm), 230 mL bottle
HI 7039M	5000	µS/cm (µmho/cm), 230 mL bottle
HI 7030L	12880	µS/cm (µmho/cm), 460 mL bottle
HI 7031L	1413	µS/cm (µmho/cm), 460 mL bottle
HI 7033L	84	µS/cm (µmho/cm), 460 mL bottle
HI 7034L	80000	µS/cm (µmho/cm), 460 mL bottle
HI 7035L	111800	µS/cm (µmho/cm), 460 mL bottle
HI 7039L	5000	µS/cm (µmho/cm), 460 mL bottle
HI 7037L	100% NaCl sea water standard solution, 460 mL bottle	
HI 8030L	12880	µS/cm (µmho/cm), 460 mL FDA approved bottle
HI 8031L	1413	µS/cm (µmho/cm), 460 mL FDA approved bottle
HI 8033L	84	µS/cm (µmho/cm), 460 mL FDA approved bottle
HI 8034L	80000	µS/cm (µmho/cm), 460 mL FDA approved bottle
HI 8035L	111800	µS/cm (µmho/cm), 460 mL FDA approved bottle
HI 8039L	5000	µS/cm (µmho/cm), 460 mL FDA approved bottle

TDS SOLUTIONS

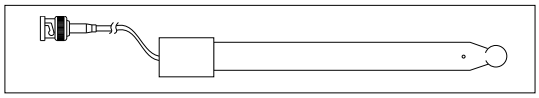
HI 70080C	800	ppm (mg/L), 20 mL (25 pcs.)
HI 70080P	800	ppm (mg/L), 20 mL (25 pcs.)
HI 70032C	1382	ppm (mg/L), 20 mL (25 pcs.)
HI 70032P	1382	ppm (mg/L), 20 mL (25 pcs.)
HI 77300C	1382	ppm (mg/L) & pH 7.01, 20 mL
HI 77300P	1382	ppm (mg/L) & pH 7.01 20 mL
HI 70442C*	1500	ppm (mg/L), 20 mL (25 pcs.)
HI 70442P*	1500	ppm (mg/L), 20 mL (25 pcs.)
HI 77200C*	1500	ppm (mg/L) & pH 7.01, 20 mL
HI 77200P*	1500	ppm (mg/L) & pH 7.01, 20 mL
HI 7032M	1382	ppm (mg/L), 230 mL
HI 7032L	1382	ppm (mg/L), 460 mL

HI 70442M*	1500	ppm (mg/L), 230 mL
HI 70442L*	1500	ppm (mg/L), 460 mL

* 4-4-2 solution with approx. 0.65 ppm = 1 μS/cm conversion rate.

pH ELECTRODES

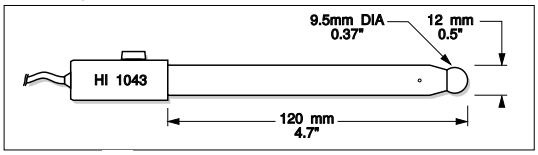
All electrodes part numbers ending in B are supplied with a BNC connector and 1 m (3.3') cable, as shown below :



HI 1043B

Glass-body, double junction, refillable, combination **pH** electrode.

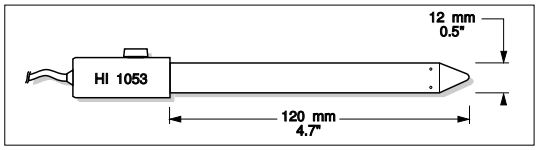
Use: strong acid/alkali.



HI 1053B

Glass-body, triple ceramic, conic shape, refillable, combination **pH** electrode.

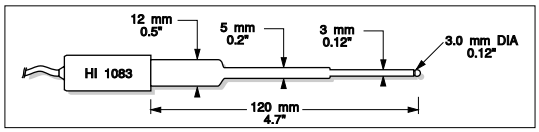
Use: emulsions.



HI 1083B

Glass-body, micro, Viscolene, non-refillable, combination **pH** electrode.

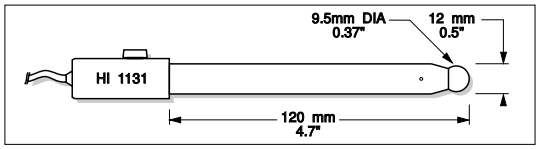
Use: biotechnology, micro titration.



HI 1131B

Glass-body, single junction, refillable, combination **pH** electrode.

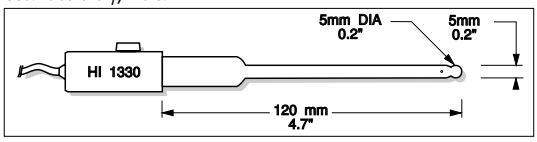
Use: general purpose.



HI 1330B

Glass-body, semimicro, single junction, refillable, combination **pH** electrode.

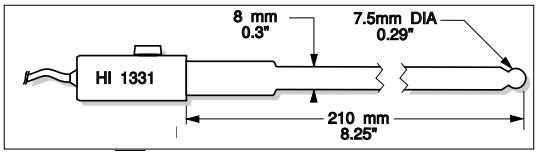
Use: laboratory, vials.



HI 1331B

Glass-body, semimicro, single junction, refillable, combination **pH** electrode.

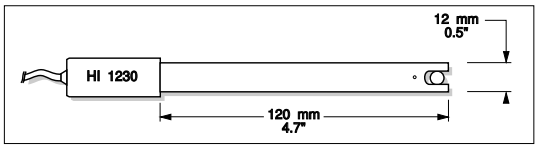
Use: flasks.



HI 1230B

Plastic-body (Ultem®), double junction, gel-filled, combination **pH** electrode.

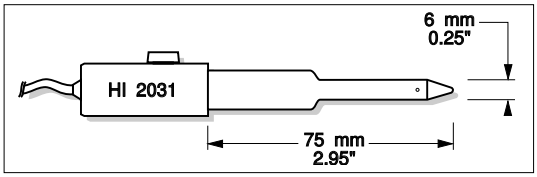
Use: general, field.



HI 2031B

Glass-body, semimicro, conic, refillable, combination **pH** electrode.

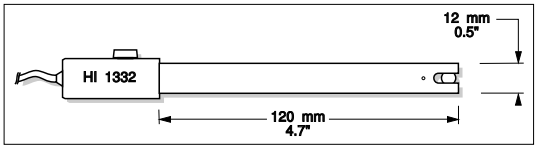
Use: semisolid products.



HI 1332B

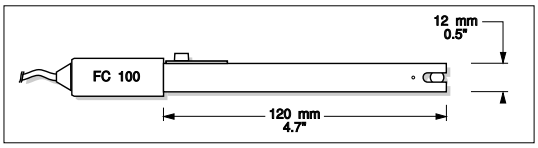
Plastic-body (Ultem®), double junction, refillable, combination **pH** electrode.

Use: general purpose.



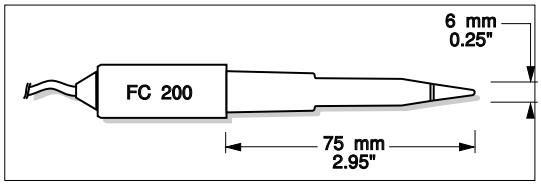
FC 100B

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



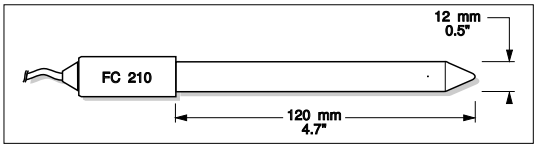
FC 200B

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



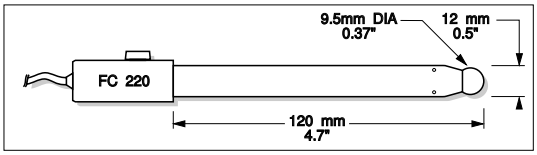
FC 210B

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



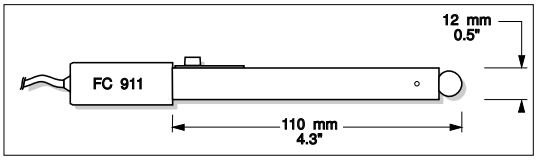
FC 220B

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



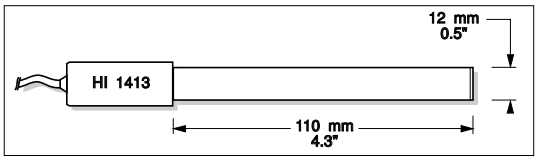
FC 911B

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



HI 1413B

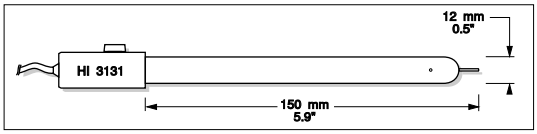
Glass-body, single junction, flat tip, Viscolene, non-refillable, combination **pH** electrode. Use: surface measurement.



ORP ELECTRODES

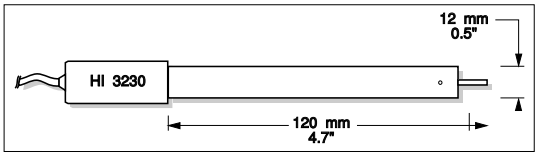
HI 3131B

Glass-body, refillable, combination platinum **ORP** electrode.
Use: titration.



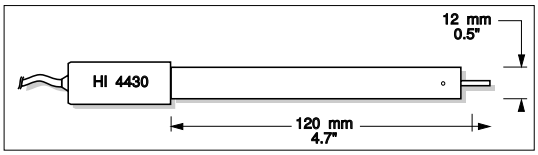
HI 3230B

Plastic-body (Ultem®), gel-filled, combination platinum **ORP** electrode.
Use: general purpose.



HI 4430B

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

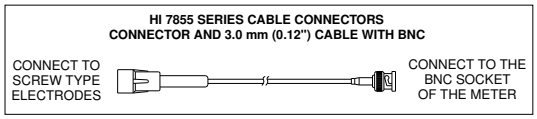


Consult the Hanna General Catalog for more electrodes with screw-type or BNC connectors.

Ultem® is registered Trademark of "General Electric Co."
Kynar® is registered Trademark of "Pennwalt Corp."

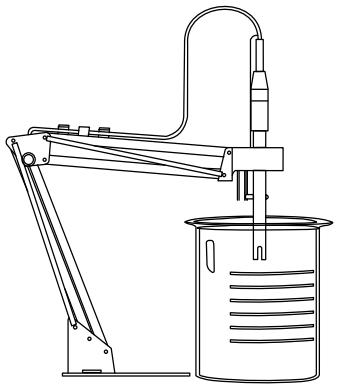
EXTENSION CABLE FOR SCREW-TYPE ELECTRODES (SCREW TO BNC ADAPTER)

HI 7855/1 Extension cable 1 m (3.3') long
HI 7855/3 Extension cable 3 m (9.9') long



OTHER ACCESSORIES

HI 710005 Voltage adapter from 115 VAC to 12 VDC (USA plug)
HI 710006 Voltage adapter from 230 VAC to 12 VDC (European plug)
HI 710012 Voltage adapter from 240 VAC to 12 VDC (UK plug)
HI 710013 Voltage adapter from 230 VAC to 12 VDC (South Africa plug)
HI 710014 Voltage adapter from 230 VAC to 12 VDC (Australia plug)
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
HI 76310 Platinum 4-ring conductivity/TDS probe with temperature sensor and 1 m (3.3') cable
HI 7662 Temperature probe with 1 m (3.3') cable
HI 92000 Windows® compatible software
HI 920010 9 to 9-pin RS232 cable.

RECOMMENDATIONS FOR USERS

Before using this product, make sure that it is entirely suitable for the environment in which it is used.

Operation of this instrument in residential areas 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 operation, ESD wrist straps should be worn to avoid possible damage to the electrode by electrostatic discharges.

Any variation introduced by the user to the supplied equipment may degrade the instrument's EMC performance.

To avoid electrical shock, do not use this instrument 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.