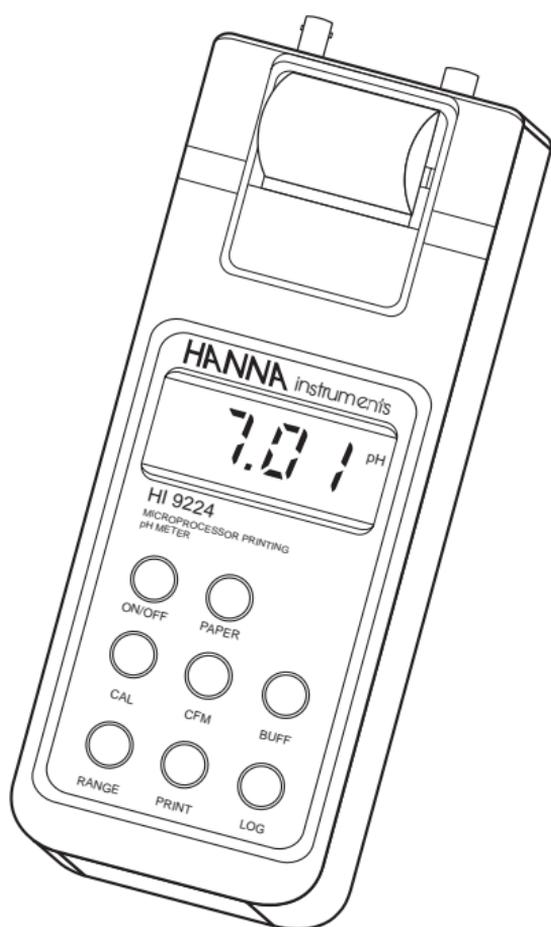


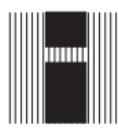
# Instruction Manual

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## **HI9224 - HI92240** **Portable** **Microprocessor** **Printing and Logging** **pH Meters**



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 **HANNA**  
instruments  
<http://www.hannainst.com>

**CE**

This Instrument is in  
Compliance with the CE Directives

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 all the necessary information for the correct use of the instrument, as well as a precise idea of its versatility in a wide range of applications.

These instruments are in compliance with **CE** directives EN 50081-1 and EN 50082-1.

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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.

Each printing/logging pH meter is supplied complete with:

- **HI1230B** Combination pH Electrode
- **HI7669/2W** Temperature Probe
- AA size Alkaline Batteries (4 pcs)
- Paper rolls (5 pcs)
- Rugged Carrying Case.

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

## GENERAL DESCRIPTION

**HI9224** and **HI92240** respectively, are the first printing and printing/logging microprocessor-based portable pH/°C meters in the world.

All pH measurements are automatically compensated for temperature (ATC). The instruments' housing is made of rugged, lightweight material, making it truly portable.

Three memorized buffers (4.01, 7.01 and 10.01pH) and automatic buffer recognition technology make calibration simple. One or two point calibration is possible, and the meter has a stability indicator. The meters come equipped with a large, easy-to-read LCD.

Measurements can be performed with lab-grade precision in the field as well as in the laboratory without compromising accuracy.

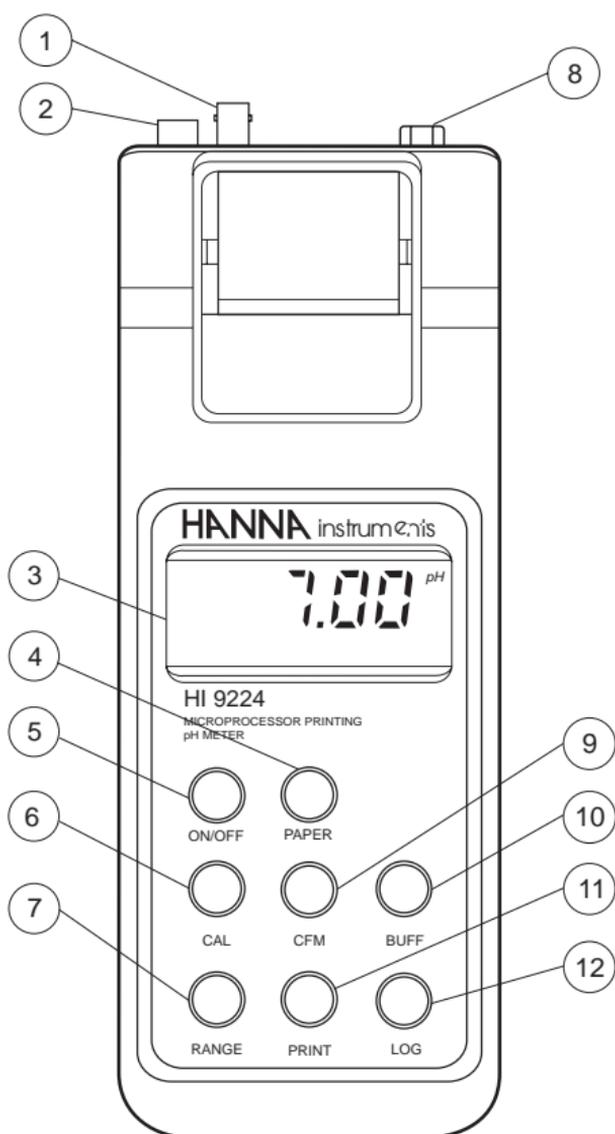
For long term field and lab applications, these meters can be connected to a 12VDC adapter.

When in the logging mode **HI92240** will store the present measurement into memory at a user selected interval from 1 to 180 minutes. This information can be retrieved at a later date for printing or can be transferred to a computer through an infrared transmitter. The internal software allocates memory space to store up to 8000 measurements.

An optional **HI9200** transmitter can be connected to a computer's RS232 port.

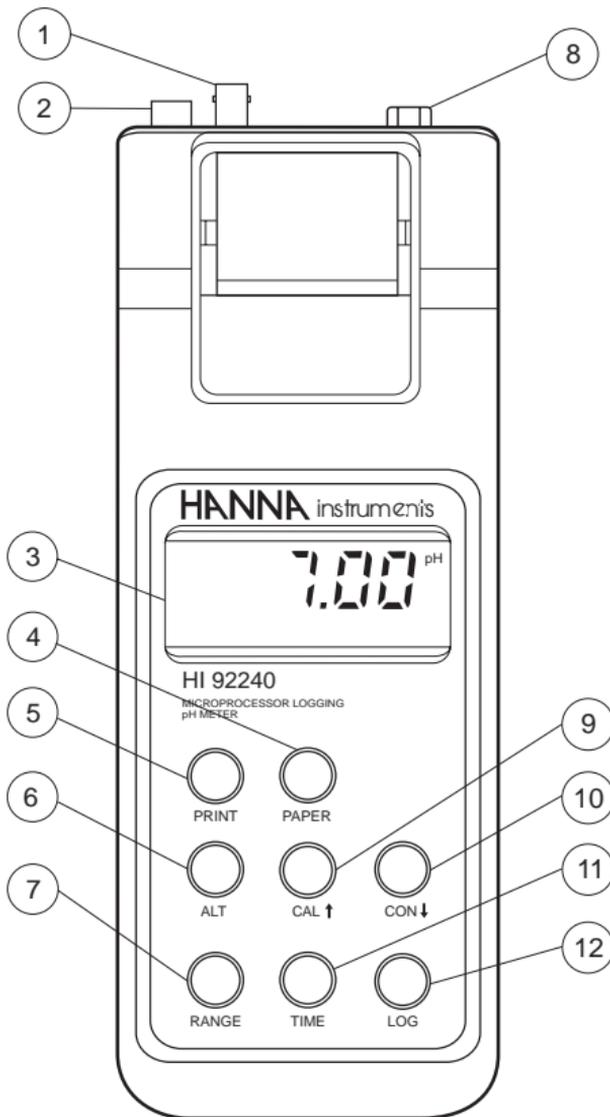
The **HI92240** will transfer the data in seconds through the infrared lights with no need for a cable between the transmitter and the meter.

## FUNCTIONAL DESCRIPTION HI9224



- 1) Electrode Connector
- 2) Temperature Probe Connector
- 3) LCD Display
- 4) **PAPER** key to move the paper up
- 5) **ON/OFF** key, to turn the meter on or off
- 6) **CAL** key to enter or exit calibration mode
- 7) **RANGE** key, to select the pH or the °C measurement modes
- 8) Power adapter plug
- 9) **CFM** key to confirm the calibration reading
- 10) **BUFF** key to select the second buffer value for calibration
- 11) **PRINT** key to obtain a printout
- 12) **LOG** key to enter the printing mode

## FUNCTIONAL DESCRIPTION HI92240

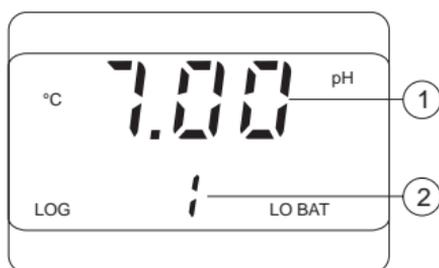


- 1) Electrode Connector
- 2) Temperature Probe Connector
- 3) LCD Display
- 4) **PAPER** key to move the paper up
- 5) **PRINT** key to obtain a printout
- 6) **ALT** key Alternate Function Key
- 7) **RANGE** key to display the temperature or the pH
- 8) Power Adapter Plug for 12VDC battery charger
- 9) **CAL ↑** key to enter or exit the calibration mode and to set up the interval, the date and the time.
- 10) **CON ↓** key to confirm the calibration reading and to set up the interval, the date and the time.
- 11) **TIME** key to display the present time and the printing interval
- 12) **LOG** key to enter the logging mode

## SPECIFICATIONS

<b>Range</b>	<b>pH</b> <b>°C</b>	0.00 to 14.00 -10.0 to 100.0
<b>Resolution</b>	<b>pH</b> <b>°C</b>	0.01 0.1
<b>Accuracy</b> (@20°C/68°F)	<b>pH</b> <b>°C</b>	±0.01, excluding probe error ±0.5, excluding probe error
<b>Typical EMC Deviation</b>	<b>pH</b> <b>°C</b>	±0.03 ±0.8
<b>Calibration</b>		Automatic 1 or 2 points with 3 memorized buffers (4.01, 7.01 and 10.01 pH)
<b>Temperature Compensation</b>		Automatic from -10 to 100°C (14 to 212°F) or fixed at 25°C without temperature probe
<b>Electrode</b>		<b>HI 1230B (included)</b>
<b>Temp. probe</b>		<b>HI 7669/2W (included)</b>
<b>Input Impedance</b>		10 <sup>12</sup> ohms
<b>Printer</b>		Low power impact type-belt, 14 characters per line; 38 mm plain paper (HI 710034)
<b>Printing Interval</b> (HI9224 only)		5 minutes
<b>Printing/Logging Interval</b> (HI92240 only)		1, 2, 5, 10, 15, 30, 60, 120 and 180 minutes
<b>Power supply</b>		4x1.5V AA alkaline type/250 hours without printing. Auto-off after 5 minutes. External 12 VDC supply.
<b>Environment</b>		0 to 50°C (32 to 122°F); 0-95% RH not condensing
<b>Dimensions</b>		220 x 82 x 66 mm (8.7 x 3.2 x 2.6")
<b>Shipping Weight</b>		Instrument: 500 g (18 oz); Kit: 1.4 kg (3.1 lb.)

## LCD FUNCTIONAL DESCRIPTION

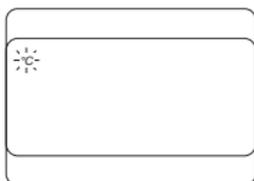


- 1) Primary Display
- 2) Secondary Display

## INITIAL PREPARATION

Each meter is supplied complete with batteries. Remove the back cover, unwrap the batteries and install them while paying attention to the polarity.

To prepare the instrument for use, connect the pH electrode to the BNC connector located on the top of the instrument. Then connect the temperature probe to the appropriate connector. The temperature probe can be used independently to take temperature measurements, or it can be used in conjunction with the pH electrode to utilize the meter's ATC capability. If the temperature probe is left disconnected, a default temperature of 25°C is assumed and the "C" symbol blinks.



To switch the HI9224 on, press the ON/OFF key.



To switch the HI92240 on, press the RANGE key.



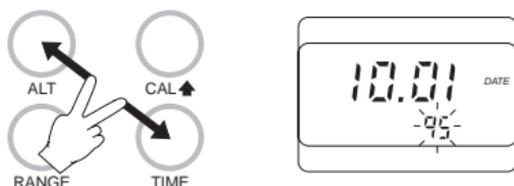
To maximize battery life, the display is automatically switched off after 5 minutes of non-use. However, the meter will continue to monitor (if in the logging or recording mode) pH and temperature. To revive the display, press the RANGE key. Before proceeding with pH measurements follow the calibration procedure.



## OPERATIONAL GUIDE

### SET DATE / TIME / PRINTING INTERVAL (FOR HI92240 ONLY):

Press the ALT and the TIME keys simultaneously. The display will show the date setting. At the bottom of the display the year will be flashing.



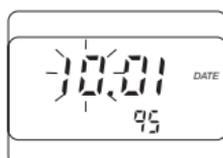
Use the UP or the DOWN arrow key to select the year.



When the correct year is selected, press the TIME key once.



The left digits of the display flash, showing the month.



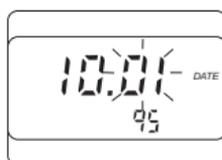
Select the month by using the UP or the DOWN arrow key.



Press the TIME key.



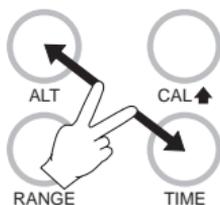
The right hand side of the display showing the day will flash.



Use the UP or the DOWN arrow key to select the correct day.



Press the ALT and the TIME keys simultaneously.



The display will now show the clock time with the printing interval flashing.



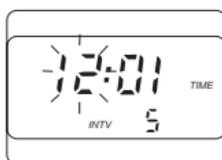
Any interval can be selected from 1, 2, 5, 10, 15, 30, 60, 120 or 180 minutes by using the UP and the DOWN arrow keys.



Once the desired interval is selected press the TIME key once to set it.



The left digits of the display flash showing the hour.



To select the hour, press the UP or the DOWN arrow key (24 hour clock).



To set the hour press the TIME key once.



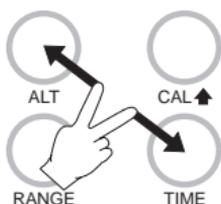
The right hand side of the display showing the minutes will flash.



Use the UP or the DOWN key to select the minute.



Press the ALT and the TIME keys simultaneously to leave this mode.



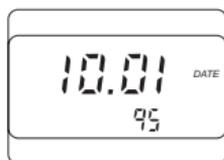
Your clock, date and printing interval are now set and stored in memory even when the display is switched off.

### TO VIEW DATE/TIME/PH/TEMPERATURE (FOR HI92240 ONLY)

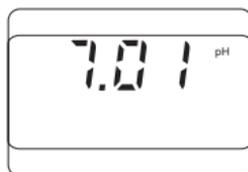
To view time press the TIME key. This also displays the selected interval time.



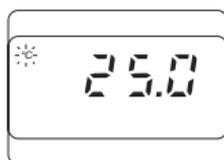
To view the date, press the CAL ↑ arrow key when the LCD is displaying time.



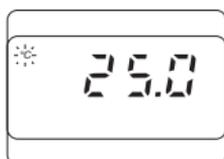
To view pH press the RANGE key.



To view temperature when in pH mode, press the RANGE key.



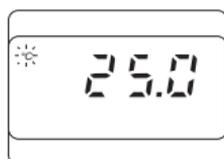
If the "25.0" value with the flashing "°C" symbol is shown, it indicates that the temperature probe is not connected.



**Note:** the pH value will be displayed without any symbol. The temperature value will be displayed together with the °C symbol.

### TO VIEW PH / TEMPERATURE (WITH HI9224 ONLY)

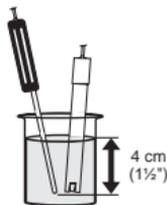
When the instrument is turned on the display will be in pH measurement mode. To view temperature simply press the RANGE key. If the "25.0" value with the flashing "°C" symbol is shown, it indicates that the temperature probe is not connected.



**Note:** the pH value will be displayed without any symbol. The temperature value will be displayed together with the °C symbol.

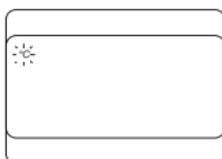
## TAKING PH MEASUREMENTS

To take pH measurements, simply submerge the bottom 4 cm (1½") of the electrode and the temperature probe in the reading solution to be tested, stir gently and allow for the electrode to adjust and stabilize.



For greatest accuracy, it is recommended to calibrate the meter regularly (see page 13).

The pH reading of any sample is directly effected by temperature. In order for the meter to measure the pH accurately, it must know the temperature. To use the meter's Automatic Temperature Compensation capability, submerge the temperature probe in the sample as close to the electrode as possible. If the temperature probe is disconnected, the meter assumes that the temperature of the solution is 25°C (default temperature) and the "°C" symbol blinks. Press the RANGE key to show the temperature reading.



If measurements are taken successively in different samples, it is recommended to rinse the electrode thoroughly with deionized water or if not available tap water first and then with some of the next sample to condition the electrode before immersing it in the sample.

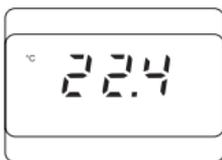
## TAKING TEMPERATURE MEASUREMENTS

The temperature probe that is supplied with the HI 9224 and HI 92240 is a liquid/general purpose probe.

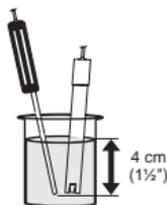
Taking a temperature measurement with HI 9224 and HI92240 is very easy.

Press the "RANGE" key to get into the °C mode. The temperature value and the "°C" symbol will be displayed on the primary display.

Secure the connection of the probe to the top of the meter, and take the measurement (allow 1 or 2 minutes for the temperature to stabilize).



**Note:** When taking pH measurements, in order to have the best accuracy and proper temperature compensation, immerse the temperature probe as close as possible to the pH electrode.



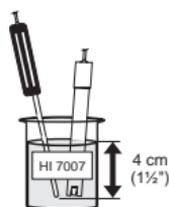
## pH CALIBRATION PROCEDURE

For greatest accuracy, it is recommended that the instrument is calibrated frequently. For a faster procedure, it is possible to calibrate at 1 point (pH 7.01), but it is always a good practice to calibrate at 2 points.

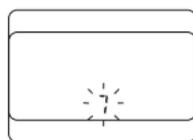
Due to electrode conditioning time the electrode must be kept immersed a few seconds to stabilize. The meters are equipped with a stability indicator and the user will be guided step by step with easy indications on the display during the pH calibration. This will make the calibration a simple and error-free procedure.

### PH CALIBRATION HI 9224

1. Rinse the electrode with some pH 7.01 (HI7007) solution or clean water. Dip the bottom 4 cm (1½") of the electrode and the temperature probe into a beaker containing pH 7.01 solution.



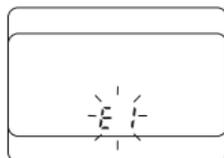
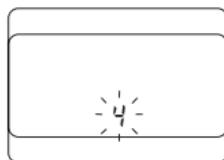
2. Press the CAL key. The secondary (lower) LCD will blink "7" to indicate that pH 7.01 is expected and the electrode is conditioning.



3. When the "7" stops blinking, the calibration can be confirmed. Wait 30 seconds and press the CFM key to confirm the first buffer.



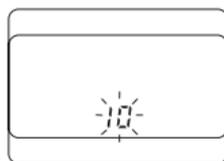
4. If everything is satisfactory the secondary LCD will blink "4" expecting the second buffer at pH 4.01. If wrong solution or electrode have been used or if the buffer is out of specifications, E1 will blink to alert the user.



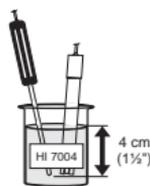
**Note:** If only a single point calibration is required, press CAL to leave the calibration mode. However, it is always better to proceed as follows with a two point calibration.



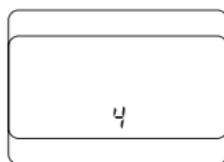
5. "4" can be changed to "10" (indicating pH 10.01) by pressing BUFF button. If you are measuring acid samples (pH 7 or less) use the pH 4.01 buffer (HI7004). For alkaline solutions (pH 7 or greater) use pH 10.01 (HI7010).



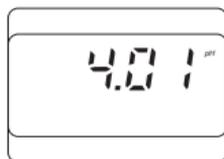
6. Rinse the electrode with clean water or some pH4.01 (or 10.01) solution. Dip the bottom 4 cm (1½") of the electrode in a beaker containing the second buffer.



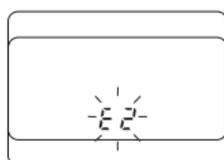
7. When "4" (or "10") stops blinking, indicating that the electrode has stabilized, wait 30 seconds and then press CFM again to confirm the second calibration point.



8. The buffer reference disappears from the secondary display and the meter is calibrated and ready to use.

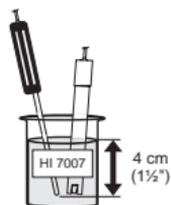


9. If the buffer is incorrect or the electrode is defective, E2 will blink to alert the user. Repeat the calibration procedure from the beginning with fresh buffers. If you cannot complete the calibration, check your electrode by following the conditioning and maintenance procedure on page 29 and repeat calibration. The pH electrode might have to be replaced if calibration cannot be successfully performed.

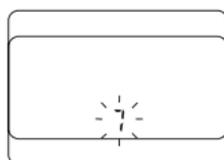


## PH CALIBRATION HI 92240

1. Rinse the electrode with some pH 7.01 (HI7007) solution or clean water. Dip the bottom 4 cm (1½") of the electrode and the temperature probe into a beaker containing pH7.01 solution.



2. Press the CAL key. The secondary (lower) LCD will blink "7" to indicate that pH 7.01 is expected and the electrode is conditioning.



3. When the "7" stops blinking, the calibration can be confirmed. Wait 30 seconds and press the CON key to confirm the first buffer. If wrong solution or electrode has been used or if the buffer is out of specifications the "7" symbol will not stop blinking to alert the user.



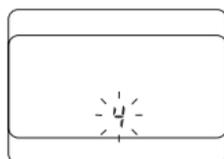
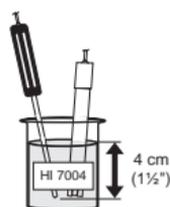
4. If everything is satisfactory the instrument will print a set of data (see page 16) and will expect the second buffer at pH 4.01 or pH 10.01.

**Note:** If only one a single point calibration is required, press CAL to leave the calibration mode. However, it is always better to proceed as follows with two point calibration.



5. If you are measuring acid samples (pH 7 or less) use the pH 4.01 buffer (HI7004). For alkaline solutions (pH 7 or more) use pH 10.01 (HI7010) buffer.

6. Rinse the electrode and the temperature probe with clean water or some pH4.01 (or 10.01) solution. Dip the bottom 4 cm (1½") of the electrode in a beaker containing the second buffer. The HI92240 will recognize the buffer solution and automatically switches to the appropriate value shown by the blinking "4" or "10" symbol.



7. When "4" (or "10") stops blinking, indicating that the electrode has stabilized, wait 30 seconds and then press CON again to confirm the second calibration point.



8. A new set of data will be printed (see page 16), the buffer reference disappears from the secondary display and the meter is calibrated and ready to use.

9. If you cannot complete the calibration, check your electrode by following the conditioning and the maintenance procedure on page 29 and repeat the calibration. The pH electrode might have to be replaced if calibration cannot be successfully completed.

## CALIBRATION PRINTOUT (FOR HI92240 ONLY)

During calibration, the characteristics of the electrode will be printed to record the electrode's performance over time.

After the first point calibration a first set of data will be printed. This will consist of: date, time, the temperature compensated pH buffer solution value and the offset characteristic of the electrode in pH units.

```
10-01-96
*02.13
pH 7.04
-0.05 pH
```

The offset pH value should be between  $\pm 0.50$ pH. If values are higher than +0.50 or lower than -0.50pH, the electrode is no longer reliable and should be replaced.

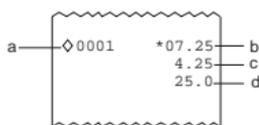
After the second point calibration, a second set of data will be printed. This will consist of: date, time, temperature compensated pH buffer solution value and the slope characteristic of the pH electrode in percentage of the theoretical value of 58.17mV per pH at 20°C.

```
10-01-96
*02.15
pH 4.00
97 %
```

## PRINTING / RECORDING WITH HI

To print the measured values press the PRINT key. The printout provides the following information:

- a - Running sample numbers
- b - Total accumulative time
- c - pH value
- d - Temperature in Degrees Centigrade.



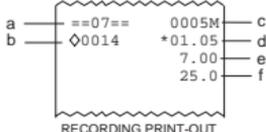
### RECORDING MODE (PROGRAMMED PRINTOUTS)

Press the LOG key to enter the recording mode. The log number and page number will appear for a few seconds on the display to indicate the current operational mode. The meter will print the first measurement taken in that moment, and will print every 5 minutes thereafter until the ON/OFF key is pressed.



The printout provides the following information:

- a - A running log number.
- b - A running sample number in that particular log.
- c - 5 minute printing interval indicator.
- d - The total accumulative time since printing started.
- e - pH value.
- f - Temperature in Degrees Centigrade.



When the meter is in recording mode "LOG" is displayed on the bottom left corner of the LCD with the pH value on the primary display.



Press the RANGE key to read the temperature on the primary display.

If no keys are pressed, the meter enters standby mode to prolong the battery life.



While logging, during the sleep mode, the display will periodically flash on. This is a normal indication that the meter is in the logging mode and is currently logging readings.

**Note:** If the PRINT key is pressed while still in recording mode, a printout is produced without affecting the running number.



```
10-01-96
==05==  0005M
        *00.01
         7.01
         25.0
```

PRINTING DURING RECORDING

## TO STOP RECORDING

In order to quit the recording mode, press the ON/OFF key.

The running log number can be reset by simply removing the batteries.

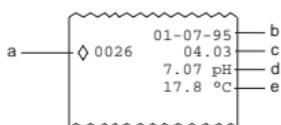


## PRINTING / LOGGING WITH HI

To print the measured values shown on display, press the PRINT key. This function can be activated in normal operational mode as well as during logging and scanning data on display (see below). When in measurement mode, the printout provides the following information:



- a - running sample number
- b - date (DD-MM-YY)
- c - time (HH-MM)
- d - pH value
- e - temperature value

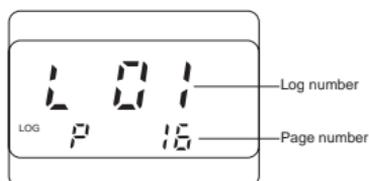
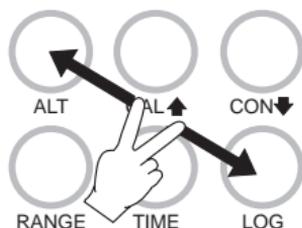


### LOGGING MODE

This function is suggested when remote measurements have to be taken automatically without the necessity of an operator and for a long period of time. In this mode data will be stored directly into memory.

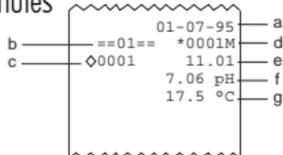
Set the appropriate logging interval (see Operational Guide section on page 8).

Press the ALT and the LOG keys simultaneously to enter the logging mode. The log number and page number will appear for a few seconds on the display to indicate the current operational mode. The instrument will print a complete set of data and the "LOG" symbol will appear on the bottom left hand-side of the LCD.

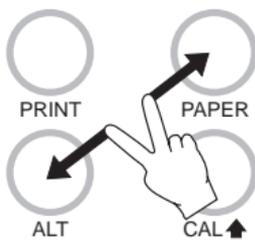


The printout provides the following information:

- a - Date (DD-MM-YY)
- b - A running log number
- c - A running sample number (in that particular log)
- d - Printing interval indicator in minutes
- e - time (HH-MM)
- f - pH value
- g - temperature value



To log without printing press the ALT and the PAPER keys at the same time and the "LOG" symbol on display will start to blink. Press ALT and PAPER again to resume logging with printing.



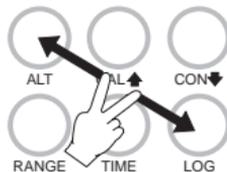
After approximately 5 minutes the display will switch off but the logging function remains active.

While logging, during the sleep mode, the display will periodically flash on. This is a normal indication that the meter is in the logging mode and is currently logging readings.

To reactivate the display press the RANGE key.



**Note** Once in the logging mode, the interval cannot be changed. Exit the logging mode first (pressing the ALT and the LOG keys) before setting the new interval.

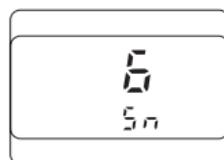


**Note** If the PRINT key is pressed while in logging mode, a printout is produced without affecting the running sample number.



### SAMPLE NUMBER

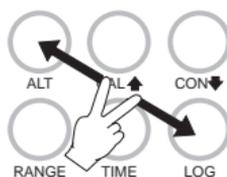
During logging it is possible to know the running sample number. Press the LOG key twice and the display will show the number of values that have been taken since the start of the current log.



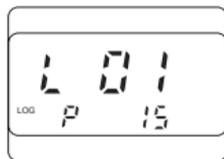
### LOGGING MODE WITH PRINTING

This function is suggested when an immediate report of the measurement is required in addition to the recording of the data into memory.

Press the ALT and the LOG key simultaneously to enter the logging mode. The log number and page number will appear for a few seconds on the display to indicate the correct operational mode. The printer will



print a complete set of data and the "LOG" symbol will appear on the bottom left hand side of the display.



If no key is pressed, the display goes blank after about 5 minutes. During printing, the display shows the time, interval and the "LOG" symbol.

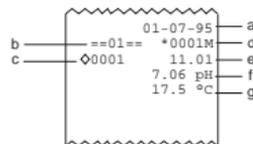


To reactivate the display press the RANGE key.

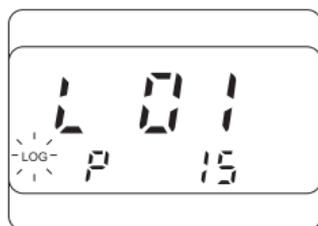
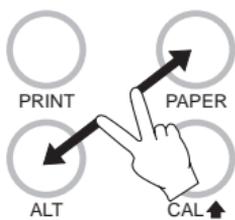


The printout provides the following information:

- a - Date (DD-MM-YY)
- b - A running log number
- c - A running sample number (in that particular log)
- d - Printing interval indicator in minutes
- e - Time (HH-MM)
- f - pH value
- g - Temperature value



It is always possible to switch from the logging with printing function to the logging function. Press the ALT and the PAPER keys at the same time and the "LOG" symbol will start to blink to indicate that the data is now stored only into memory.

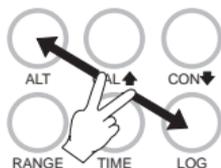


### Notes:

- It is recommended to use the adapter during logging in printing mode, especially when many printouts are going to be taken.
- Before proceeding with logging with printing, make sure there is enough paper for your measurements. When the paper is finished the meter will not advise the operator and the printouts could be lost. If this happens, data will continue to be stored in memory, and it is always possible to print the

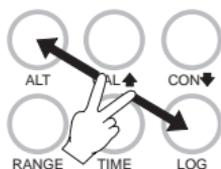
data at different time (see above).

- It is possible to insert a new paper roll during logging session (see page 27)
- Once in the logging mode, the interval cannot be changed. Exit the logging mode first (pressing the ALT and the LOG keys) before setting the new interval.
- If the PRINT key is pressed while in logging mode, a printout is produced without affecting the running sample number.



### TO STOP LOGGING

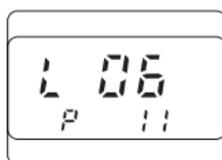
Press the ALT and the LOG keys simultaneously, this will generate a log exit status print out.



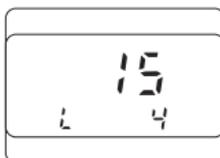
Log number	}	<pre> 01-07-95 ==02==  0005M &lt;&gt;0010  *7.01                 </pre>	<b>LOG EXIT Date/Time</b>
Total sample number			

### TO SCAN STORED DATA ON DISPLAY

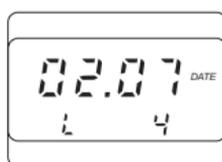
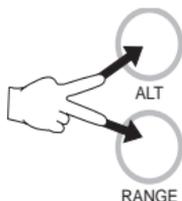
Exit the log mode. Press the LOG key. On the display will appear the log number and the page number of the previous logging session.



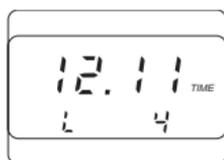
While pressing the ALT key, press the CON key until the log number to scan appears on the secondary display. The primary display will show the number of samples in that particular log.



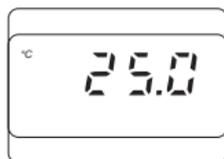
Press the ALT and the RANGE keys simultaneously. This now shows the date in which that log has been recorded.



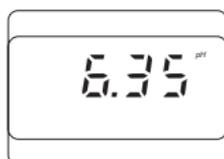
Press the **CAL↑** key and the time will be displayed.



Press the **CAL↑** key and the temperature will be displayed.



Press the **CAL↑** key and the pH value will be displayed.



Continue pressing the **CAL↑** key to display one by one all the memorized data of the same log in the above sequence i.e. time, temperature, pH value.



Press the **CON↓** key to revert back to sampling time and scroll back through the samples.



To exit from the recall mode press the LOG key.



**Note:** this mode will not alter data into memory.

## TO PRINT STORED DATA

Having selected a log number by using ALT and CON keys, as detailed in the chapter "TO SCAN STORED DATA ON DISPLAY" you can print all or part of that log section by using the ALT and PRINT keys. The printer will then start to print the logged section beginning with the selected sample number without altering the content of the memory.

**Note:** It is always possible to print only the sample shown on the display by pressing the PRINT key.

For example if 10 samples are stored in the logging section, use the CON↓ key to display sample No. 5.

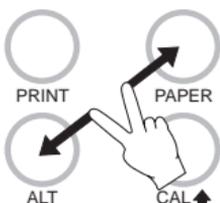
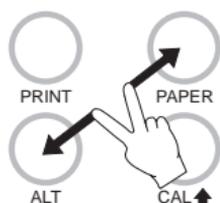
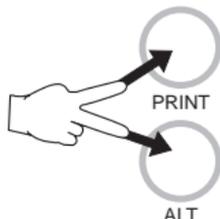
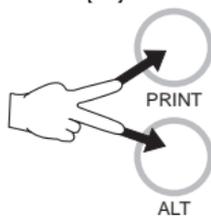
Sample 5 can be printed on its own using the PRINT key.

Samples 5, 6, 7, 8, 9 and 10 can be printed by pressing ALT and PRINT keys.

If you wish to stop the printer during the download session press the ALT and PAPER keys and the printer will immediately stop.

**Note** Before proceeding with printing, make sure there is enough paper for the data to be printed. When the paper is finished the meter will not advise the operator and the printouts could be lost. If this happens, stop the printer by pressing ALT and PAPER key simultaneously. Data will be kept in memory.

Insert a new paper roll and repeat the instructions above starting from the last printed sample number (see chapter "PRINTER MAINTENANCE" on page 27 for changing paper roll).

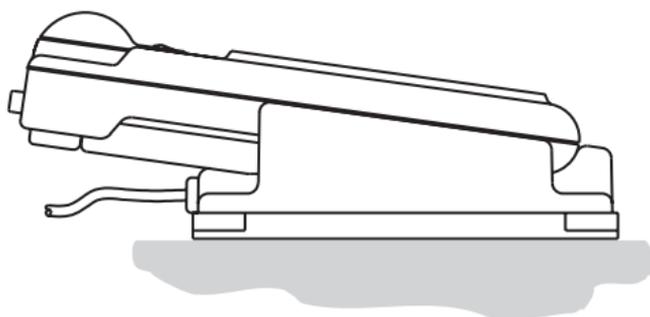
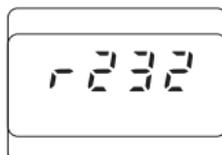


## DATA TRANSFER TO PC

**HI92240** contains infrared emitting circuitry.

Set the meter to TIME mode and simply place your data-logger on a **HI9200** Infrared Transmitter (ensuring that the two infrared LEDs are placed on top of each other) and the memory can then be downloaded to your PC through the **HI9200's** RS232 port.

During the data transfer the instrument displays the message "r 232".



Using the **HI9200** Infrared Transmitter, all recorded data can be fed to your Personal Computer for easy reproduction, storage or elaboration without the interference of cables or cords between the meter and the transmitter.

Data transmission from the instrument to the PC is now much easier with new **HI92000** Windows<sup>®</sup> compatible application software offered by Hanna Instruments.

**HI92000** allows you to use the powerful means of the most spread sheet programs (e.g. Excel<sup>®</sup>, Lotus 1-2-3<sup>®</sup>). Simply open your file downloaded by **HI92000** from your spread sheet program and then it is possible to make any elaboration available with your software (e.g. graphics, statistic analysis).

User friendly, **HI92000** offers a variety of features and has an on line help to support you throughout any situation.

To install **HI92000** you need a 3.5" drive and a few minutes to follow the instructions conveniently printed on the disk label.

Windows<sup>®</sup> is registered Trademark of "Microsoft Co."  
Excel<sup>®</sup> Copyright "Microsoft Co."  
Lotus 1-2-3<sup>®</sup> Copyright "Lotus Co."

## FAULT FUNCTIONS

**HI 9224** and **HI 92240** are factory programmed to automatically diagnose a fault. This is displayed with error codes on the LCD.

Error codes:

**PEr0, PEr1, PEr2** = Short circuit on the system, the meter should be returned for repair (see Warranty section).

**PEr3** = Printer mechanism fault - repair needed (see Warranty section).

**PEr4** = Printer clutch jammed - reset the printer (see page 28).

**PEr9** = Printer jammed - reset the printer (see page 28).

## MEMORY ORGANIZATION

Capacity: 8,000 data samples which are divided into 16 pages.

Each time a new logging period starts, it automatically starts from a new page.

If "LOGGING" is still on, and the available page is "0" the meter will overwrite the first LOT DATA in the existing meter memory. During logging the meter automatically returns to the oldest page in the memory and if it contains data, it will overwrite. In this case the first log will not correspond to the oldest set of data

It is recommended to periodically "clean" the memory. Save data with PC if you need to keep a record and then disconnect the batteries for about 1 minute. If you do this, remember to set the date and time, once the batteries have been connected again.

### **ATTENTION:**

Data are stored into memory until batteries are removed.

If replacement of the batteries is needed and data are not to be lost, plug the adapter in and proceed with batteries replacement as described below. Only once batteries have been replaced it is possible to unplug the adapter without losing the stored data.

## PRINTER MAINTENANCE

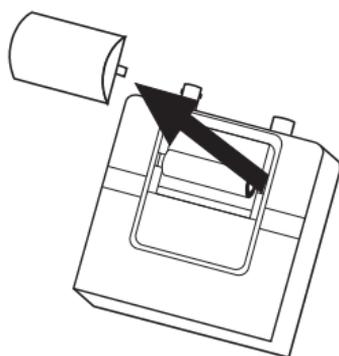
### TO CHANGE THE INK CARTRIDGE

When printouts become faint, it might be necessary to change the ink cartridge. Contact your Hanna authorized center.

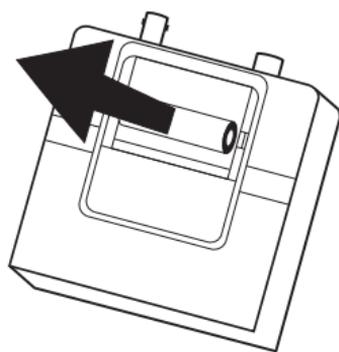
### TO INSERT THE PAPER ROLL

The **HI9224** and **HI92240** use plain paper rolls 38 mm width. To insert a new roll is very easy.

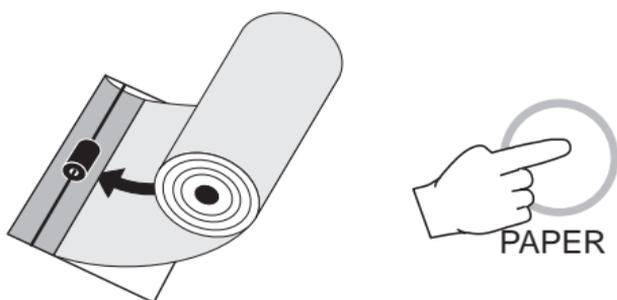
Open the paper cover pulling it gently.



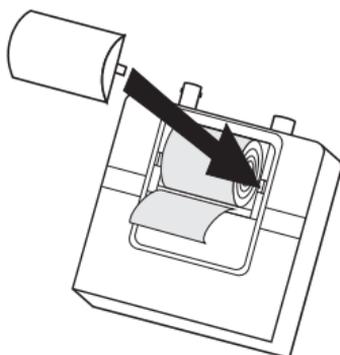
Take the cylinder away.



Insert the paper edge in the printer slot and feed the printer by pressing the PAPER key.



Allow about 5 cm (2") to exit from the printer and replace the paper cover.

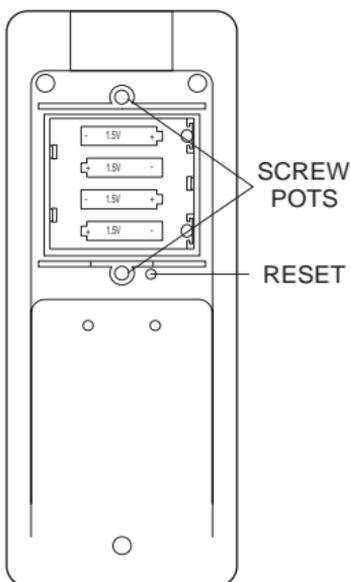


### **TO RESET PRINTER**

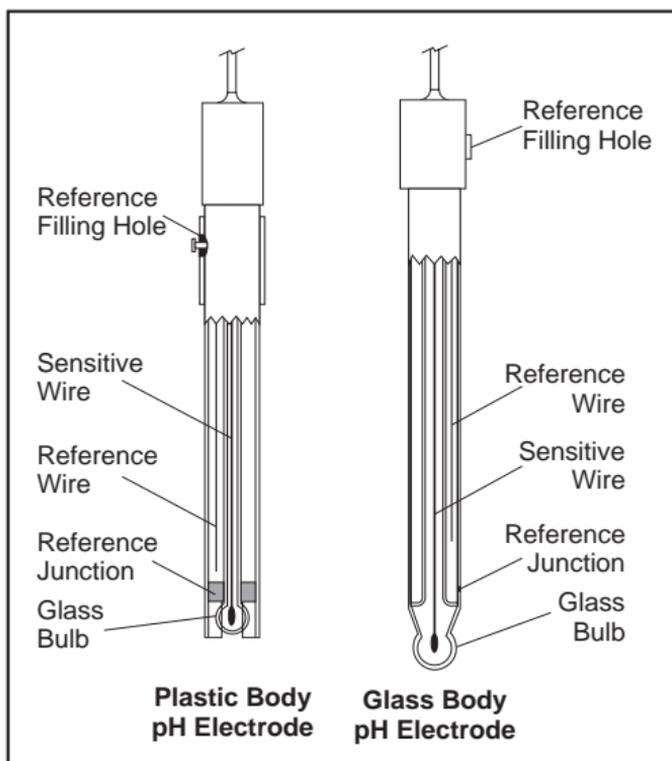
Take the battery cover off by removing the screws. Using a pencil press the black button. This will reset the printing mechanism.

Before replacing the battery cover investigate the cause of the printer jam (e.g. the paper caught under the cover and prevented printer from advancing paper feed).

Replace the battery cover and secure screws.



## ELECTRODE CONDITIONING AND MAINTENANCE



### PREPARATION

Remove the protective cap.

DO NOT BE ALARMED IF ANY 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. The electrode cannot function properly under these conditions. These bubbles can be removed by "shaking down" the electrode as you would do with a glass thermometer.

If the bulb and/or junction are dry, soak the electrode in **H170300** or **H180300** Storage Solution for at least one hour.

#### ***For refillable electrodes:***

If the fill solution (electrolyte) is less than 1 cm (1/2") below the fill hole, add **H17082** or **H18082 3,5M KCl Electrolyte Solution** for double junction or **H17071** or **H18071 3,5M KCl + AgCl Electrolyte Solution** for single junction electrodes.

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

### ***For AmptHel 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 (4 cm /1½") in the sample and stir gently for approx. 30 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 ensure a quick response time, the glass bulb and the junction should be kept moist and not allowed to dry out.

Replace solution in the protective cap with a few drops of **HI70300 or HI80300 Storage Solution** or, in its absence, **Filling Solution (HI7071 or HI8071 for single junction or HI7082 or HI8082 for double junction electrodes)**. Follow the Preparation Procedure above before taking measurements.

**Note:** NEVER STORE THE ELECTRODE IN DISTILLED WATER OR DRY.

### **PERIODIC MAINTENANCE**

Inspect the electrode and the 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 with water.

#### **For refillable electrodes:**

Refill it with fresh electrolyte (**HI7071 or HI8071 for single junction or HI7082 or HI8082 for double junction electrodes**). Allow the electrode to stand upright for 1 hour.

Follow the Storage Procedure above.

### **CLEANING PROCEDURE**

**General** Soak in Hanna **HI7061 or HI8061 General Cleaning Solution** for approximately 1 hour.

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

- **Protein** Soak in Hanna **HI7073 or HI8073 Protein Cleaning**

**Solution** for 15 minutes.

- *Inorganic* Soak in Hanna **HI7074** or **HI8074 Inorganic Cleaning Solution** for 15 minutes.

- *Oil/grease* Rinse with Hanna **HI7077** or **HI8077 Oil and Fat Cleaning Solution**.

**IMPORTANT:** After performing any of the cleaning procedures rinse the electrode thoroughly with distilled water, drain and refill the reference chamber with fresh electrolyte, (not necessary for GEL filled electrodes) and soak the electrode in **HI70300** or **HI80300 Storage Solution** for at least 1 hour before taking measurements.

## **TROUBLESHOOTING**

Evaluate your electrode performance based on the following possibilities.

- **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 **HI7071** or **HI8071** for single junction or **HI7082** or **HI8082** for double junction electrodes.
- **Dry Membrane/Junction:** Soak in **Storage Solution HI70300** or **HI80300** for at least 1 hour.
- **Drifting:** Soak the electrode tip in warm Hanna Solution **HI7082** or **HI8082** for one hour then flush tip with distilled water. Refill with fresh **HI7071** or **HI8071** for single junction electrodes and **HI7082** or **HI8082** for double junction electrodes.
- **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 Hanna Solution **HI7061** or **HI8061** for 30 minutes, rinse thoroughly in distilled water and then follow the Cleaning Procedure above.

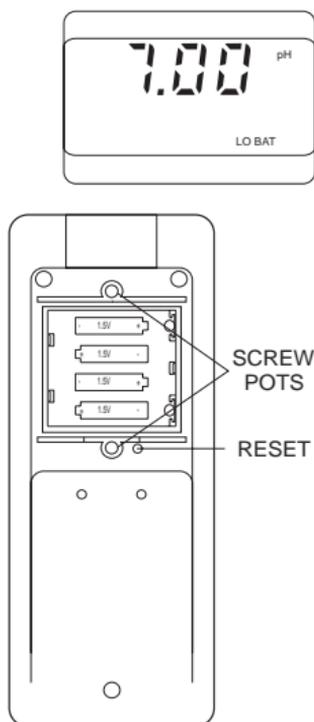
## BATTERY REPLACEMENT

When the batteries are run down "LOBAT" is displayed on the Liquid Crystal Display to warn the user.

Battery replacement must only take place in a non hazardous area using 1.5V alkaline AA type batteries .

In order to replace run down batteries, simply remove the two screws on the rear cover of the instrument and replace the four 1.5V AA batteries with new ones, paying attention to the correct polarity.

A 12VDC power source can also be used to power the unit (see the Accessories section page 40).



**Note** The instrument uses the following configuration.

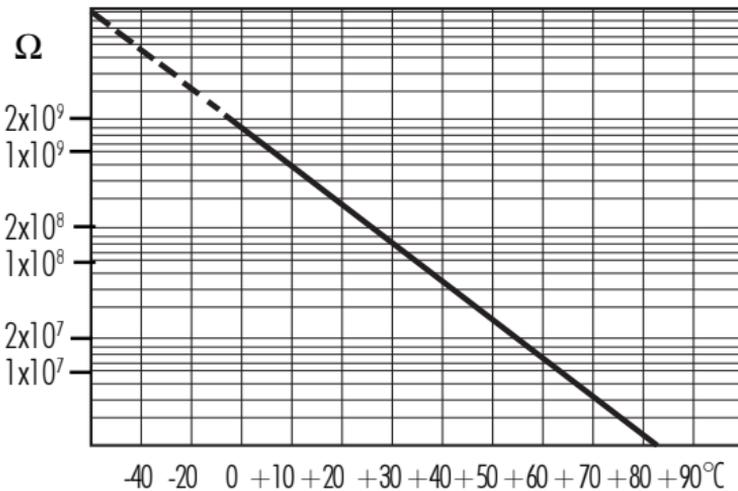


It is recommendable to purchase the Hanna **HI710005** and **HI710006** voltage adapters that use the proper polarity configuration.

Anyway, **HI 9224** and **HI 92240** can be used with other adapters. In this case, remember to check the correct polarity of your adapter before connecting it to the meter.

## TEMPERATURE-RESISTANCE CORRELATION FOR HANNA 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 for 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**  
 90 °C  
 120°C

**1- 3 years**  
**Less than 4 months**  
**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 <sup>-1</sup> Na <sup>+</sup>	13.00	0.10
	13.50	0.14
	14.00	0.20
1.0 Mol L <sup>-1</sup> Na <sup>+</sup>	12.50	0.10
	13.00	0.18
	13.50	0.29
	14.00	0.40

## ACCESSORIES

### pH CALIBRATION SOLUTIONS

HI 70004P	pH 4.01 Buffer Sachets, 20mL, 25 pcs
HI 70007P	pH 7.01 Buffer Sachets, 20mL, 25 pcs
HI 70010P	pH 10.01 Buffer Sachets, 20mL, 25 pcs
HI 7004L	pH 4.01 Buffer Solution, 460 mL
HI 7006L	pH 6.86 Buffer Solution, 460 mL
HI 7007L	pH 7.01 Buffer Solution, 460 mL
HI 7009L	pH 9.18 Buffer Solution, 460 mL
HI 7010L	pH 10.01 Buffer Sol., 460 mL

### pH CALIBRATION SOLUTIONS IN FDA APPROVED BOTTLES

HI 8004L	pH 4.01 Buffer Solution, 460 mL
HI 8006L	pH 6.86 Buffer Solution, 460 mL
HI 8007L	pH 7.01 Buffer Solution, 460 mL
HI 8009L	pH 9.18 Buffer Solution, 460 mL
HI 8010L	pH 10.01 Buffer Solution, 460 mL

### ELECTRODE STORAGE SOLUTION

HI 70300L	Storage Solution, 460 mL
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### ELECTRODE STORAGE SOLUTION IN FDA APPROVED BOTTLES

HI 80300L	Storage Solution, 460 mL
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### ELECTRODE CLEANING SOLUTIONS

HI 70000P	Electrode Cleaning Sachets, 20 mL, 25 pcs
HI 7061L	General Cleaning Sol., 460 mL
HI 7073L	Protein Cleaning Sol., 460mL
HI 7074L	Inorganic Cleaning Sol., 460mL
HI 7077L	Oil & Fat Cleaning Sol.,460 mL

### ELECTRODE CLEANING SOLUTIONS IN FDA APPROVED BOTTLES

HI 8061L	General Cleaning Solution, 460 mL
HI 8073L	Protein Cleaning Solution, 230 mL
HI 8077L	Oil & Fat Cleaning Solution, 460mL

### REFILL ELECTROLYTE SOLUTIONS

HI 7071	3.5M KCl + AgCl Electrolyte, 4x50mL, for single junction electrodes
HI 7072	1M KNO <sub>3</sub> Electrolyte, 4x50 mL

**HI 7082** 3.5M KCl Electrolyte, 4x50 mL, for double junction electrodes

## **REFILL ELECTROLYTE SOLUTIONS IN FDA APPROVED BOTTLES**

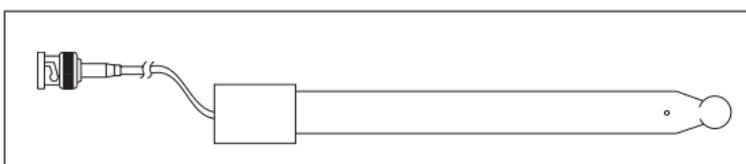
**HI 8071** 3.5M KCl + AgCl Electrolyte, 4x50mL, for single junction electrodes

**HI 8072** 1M KNO<sub>3</sub> Electrolyte, 4x50 mL

**HI 8082** 3.5M KCl Electrolyte, 4x50 mL, for double junction electrodes

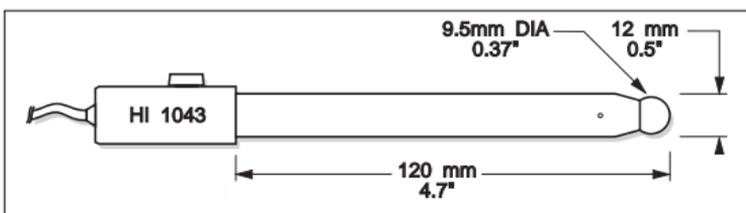
## **pH ELECTRODES**

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



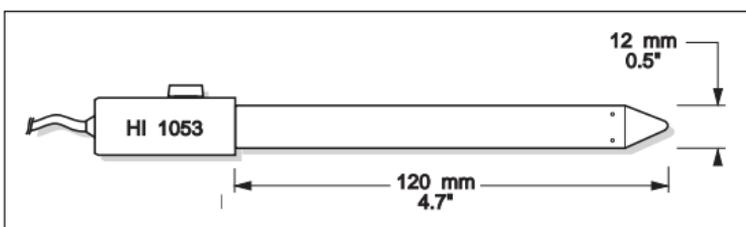
### **HI 1043B**

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



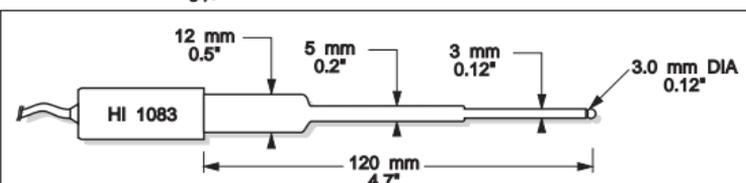
### **HI 1053B**

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



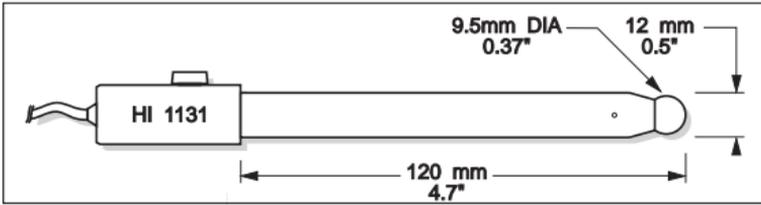
### **HI 1083B**

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



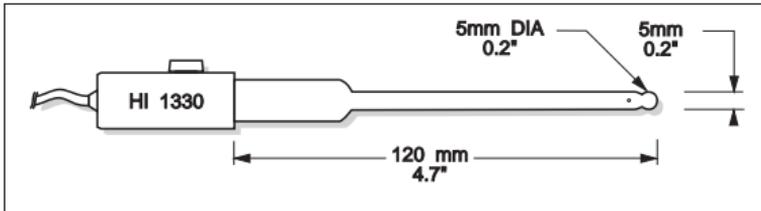
### HI 1131B

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



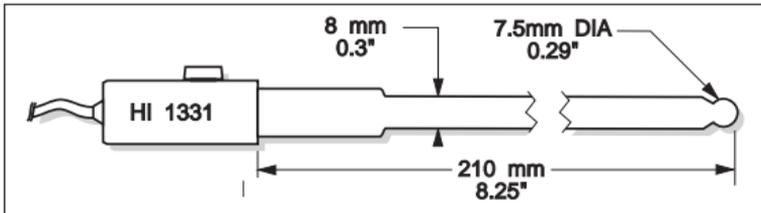
### HI 1330B

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



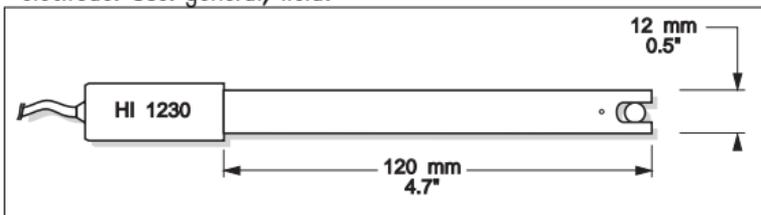
### HI 1331B

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



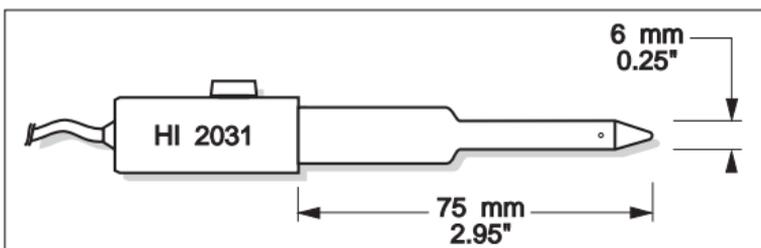
### HI 1230B

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



### HI 2031B

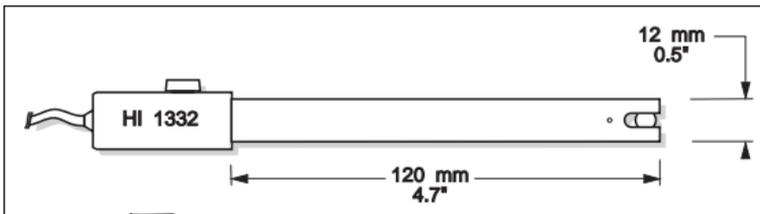
Glass-body, semimicro, conic, refillable, combination pH electrode. Use: semisolid products.



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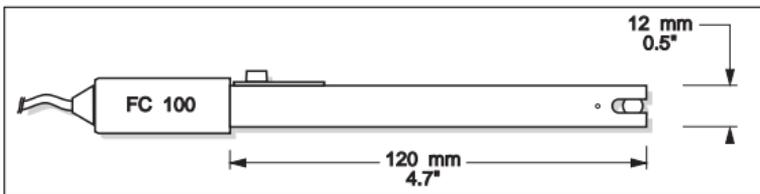
### HI 1332B

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



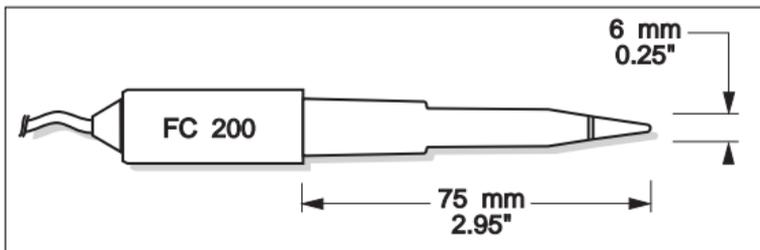
### FC 100B

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



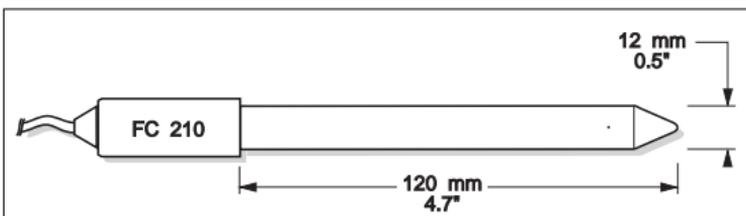
### FC 200B

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



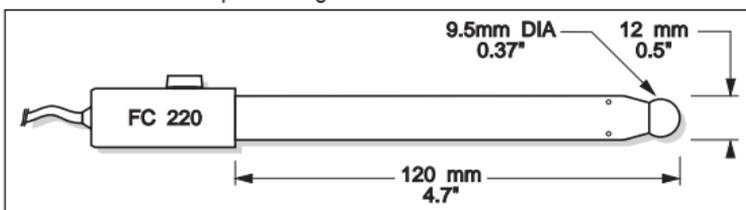
### FC 210B

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



### FC 220B

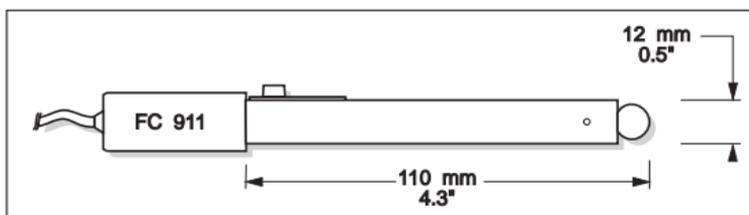
Glass-body, triple-ceramic, single junction, refillable, combination pH electrode. Use: food processing.



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Ultem® is registered Trademark of "General Electric Co."

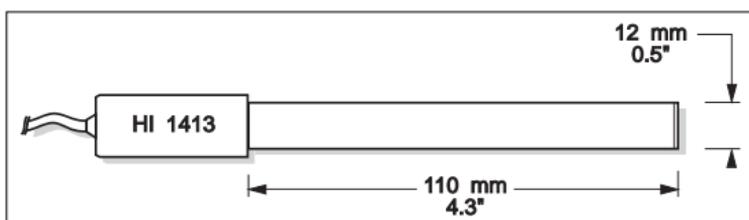
## FC 911B

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



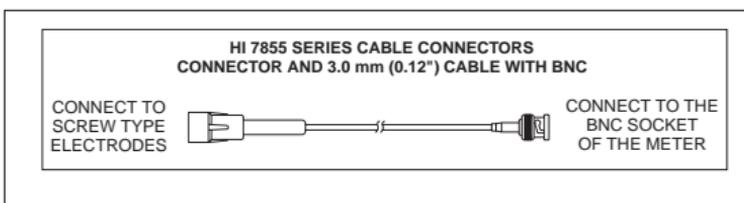
## HI 1413B

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



## EXTENSION CABLES FOR SCREW-TYPE ELECTRODES ONLY (SCREW TO BNC CONNECTOR):

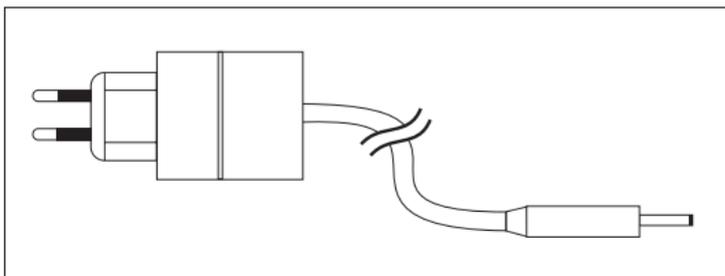
- HI7855/1 Extension cable 1m (3.3') long
- HI7855/3 Extension cable 3m (9.9') long
- HI7855/5 Extension cable 5m (16.5') long
- HI7855/10 Extension cable 10m (33') long
- HI7855/15 Extension cable 15m (49.5') long



## POWER UNITS:

**HI710005** Voltage adapter from 115 VAC to 12 VDC

**HI710006** Voltage adapter from 230 VAC to 12 VDC



## OTHER ACCESSORIES

**HI 710031** Rugged carrying case

**HI 710034** Plain Paper Spare Rolls (10 pcs)

**HI 710035** Spare Ink Cartridge (1 pc)

**HI 721308** 1.5V AA batteries (10 pcs)

**HI 76405** Electrode holder

**HI 7669/2W** Temperature probe with 1 m (3.3') screened cable

**HI 8427** pH and ORP electrode simulator with 1 m (3.3') coaxial cable ending in female BNC connectors (HI 7858/1)

**HI 9200** Infrared Transmitter

**HI 92000/16** Windows® 3.11 compatible software for data transfer to PC

**HI 92000/32** Windows® 95 compatible software for data transfer to PC

**HI 931001** pH and ORP electrode simulator with LCD display 1 m (3.3') coaxial cable ending in female BNC connectors (HI 7858/1)

**MANPHPRNR2** Instruction manual

# ELECTRODE APPLICATION REFERENCE GUIDE

Application	Electrodes
1. Aquarium	HI 1332B, HI 1911B, HI 1312S
2. Bath-water	HI 1910B, HI 1130B, HI 1110S
3. Beer	HI 1131B, HI 1111S
4. Bread	HI 2031B, FC 200B, HI 2020S, FC 200S
5. Cheese	FC 200B, FC 200S
6. Dairy products	FC 911B, FC 100B
7. Dirty water	HI 1910B, HI 1912B
8. Emulsions	HI 1053B, HI 1050S
9. Environment	HI 1230B, HI 1210S
10. Flasks	HI 1331B, HI 1310S
11. Food industry general use	FC 911B, FC 100B
12. Fruit	FC 200B, FC 220B, FC 200S
13. Fruit juices, organic	FC 210B
14. Galvanizing waste solution	HI 1130B, HI 1912B, HI 1110S
15. Heavy-duty applications	HI 1135B, HI 1115S
16. High purity water	HI 1053B, HI 1050S
17. Horticulture	HI 1053B, FC 200B, HI 1050S, FC 200S
18. In-line applications	HI 1134B, HI 1135B, HI 2114B, HI 2910B, HI 1114S, HI 1115S
19. Laboratory general use	HI 1131B, HI 1230B, HI 1332B, HI 1330B, HI 1111S, HI 1210S, HI 1312S, HI 1310S
20. Leather	HI 1413B, HI 1410S
21. Lemon juice	FC 100B
22. Meat	FC 200B, HI 2031B, FC 200S, HI 2020S
23. Micro plate sampling of less than 100 mL	HI 1083B, HI 1080S
24. Milk and Yogurt	FC 210B
25. Paints	HI 1053B, HI 1050S
26. Paper	HI 1413B, HI 1410S
27. Photographic chemicals	HI 1230B, HI 1210S
28. Quality control	HI 1332B, HI 1312S
29. Sausages	FC 200B, HI 2031B, FC 200S, HI 2020S
30. Semi-solid products	HI 2031B, HI 2020S
31. Skin	HI 1413B, HI 1410S
32. Soil samples	HI 1230B, HI 1210S
33. Solvents	HI 1043B, HI 1040S
34. Strong acid	HI 1043B, HI 1040S
35. Submersion application	HI 1130B, HI 1110S
36. Surface measurements	HI 1413B, HI 1410S
37. Swimming pool	HI 1130B, HI 2114B, HI 2910B
38. Titrations with constant temperature range	HI 1131B, HI 1111S
39. Titrations with wide temperature range	HI 1131B, HI 1111S
40. Very high humidity	FC 911B, HI 1912B, HI 1911B
41. Vials and test tube	HI 1330B, HI 1310S
42. Wine processing	FC 220B

B = BNC-type connector

S = Screw-type connector

## WARRANTY

All Hanna Instruments **meters are warranted for two years** against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. **The electrodes and the probes are warranted for a period of six months.** This warranty is limited to repair or replacement free of charge.

Damages 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 failure. 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 Customer Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

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

# CE DECLARATION OF CONFORMITY



## DECLARATION OF CONFORMITY

We

Hanna Instruments Srl  
V.le delle industrie 12  
35010 Ronchi di Villafranca (PD)  
ITALY

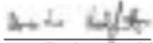
herewith certify that the pH meters

**HI 9224 HI 92240**

have been tested and found to be in compliance with the following regulations:

<b>IEC 801-2</b>	Electrostatic Discharge
<b>IEC 801-3</b>	RF Radiated
<b>IEC 801-4</b>	Fast Transient
<b>EN 55022</b>	Radiated, Class B

Date of Issue: 30-11-1995

  
D. Volpato - Engineering Manager

On behalf of  
Hanna Instruments S.r.l.

### 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 equipments, requiring the operator to take all necessary steps to correct interferences.

The glass bulb at the end of the electrode is sensitive to electrostatic discharges. Avoid touching this glass bulb at all time.

During calibration of instruments, ESD wrist straps should be worn to avoid possible damage to the electrode by electrostatic discharge.

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 24VAC or 60 VDC.

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

In particular cases HI 9224 and HI 92240 could turn off. In these cases they can be turned on by pressing the ON/OFF key and the RANGE key respectively.

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07/98



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<http://www.hannainst.com>