



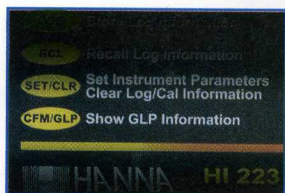
A pH electrode, when it is properly manufactured and kept clean, will retain its physical characteristics for a long time.

A common problem associated with pH measurements is the use of a pH electrode that hasn't been properly cleaned. This is very important because, during calibration, the instrument assumes that the electrode used is clean and that the standardization curve created during the calibration process will remain the same until the next calibration.

pH meters on the market today will allow an offset of approximately  $\pm 60$  mV. The deviation from 0 mV is not unusual, in fact it represents the true characteristics of the pH electrode.

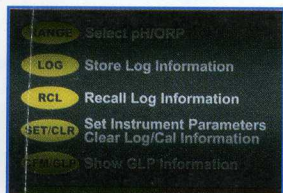
The deviation from 0 mV becomes a problem if it is the result of calibrating a dirty electrode.

The figure below shows that the pH measured by a dirty electrode changes over a period of time. This results from the residue on the pH electrode bulb dissolving into the solution and the electrode gradually returning close to its true characteristics. The resulting pH measurements, based upon the calibration of a dirty electrode, will then be incorrect.



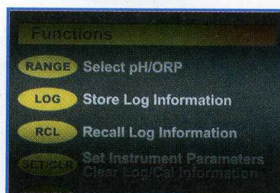
### GLP

These instruments can be programmed to give an alarm when a new calibration is required.



### Recall

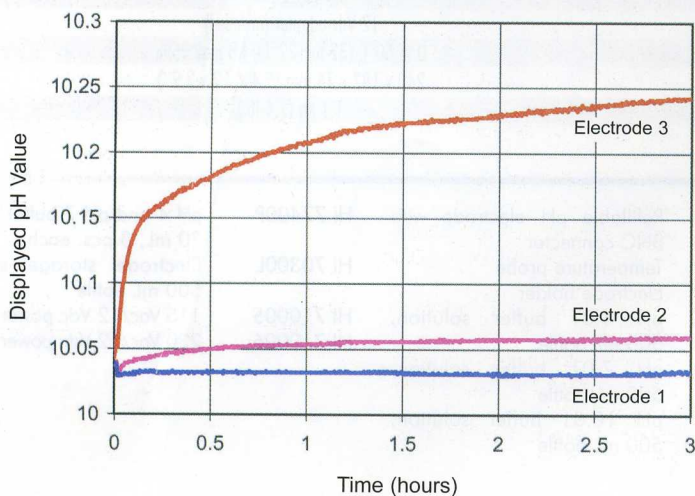
With HI 221 and HI 223, the logged readings can be recalled at a later time.



### Log-on-demand

Both models feature a "log-on-demand" function to record up to 100 (HI 221) or 500 (HI 223) readings.

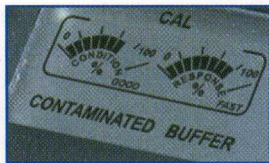
Electrode nr. 1: correct cleaning has been performed before calibration.  
Electrodes nr. 2 & 3: correct maintenance not performed.



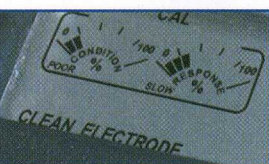
HANNA instruments' HI 221 & HI 223 compare the characteristics of the pH electrode from one calibration to the next. In case of large variances in electrode condition that can only be the result of dirt, these meters alert the user that the electrode needs to be properly cleaned prior to the calibration process.

**How does the Calibration Check™ work?**

HI 221 and HI 223 are able to detect a contaminated calibration buffer solution.

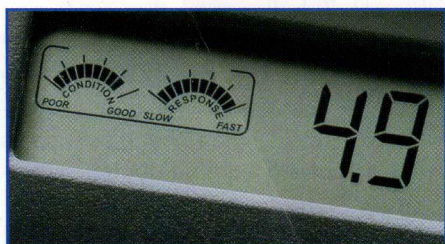


When a pH electrode is dirty, it has a slow response time and unstable reading. HI 221 and HI 223 warn the user in the event of a dirty electrode.



**Calibration Check™ features**

- Electrode offset & slope condition
- Electrode response time
- Calibration time-out



During calibration, the user is advised whether one or more parameters are unsuitable to perform the operation.

**Ordering Information**

HI 221 and HI 223 are supplied complete with HI 1131P refillable pH electrode (glass-body, BNC & Pin with 1 m cable), HI 7669/2W stainless steel temperature probe, HI 76404 electrode holder, pH 4 and pH 7 buffer sachets, electrode refilling solution, 12 Vdc power adapter and instructions.

**Specifications**

|            |             | HI 221                          | HI 223  |
|------------|-------------|---------------------------------|---|
| Range      | pH          | -2.00 to 16.00                  | -2.00 to 16.00; -2.000 to 16.000                        |
|            | mV          | ± 699.9 mV; ± 2000 mV           | ± 999.9 mV; ± 2000 mV                                   |
|            | Temperature | -20.0 to 120.0°C                |   |
| Resolution | pH          | 0.01                            | 0.01; 0.001   |
|            | mV          | 0.1 (± 699.9 mV); 1 (± 2000 mV) | 0.1 (± 999.9 mV); 1 (± 2000 mV)                         |
|            | Temperature | 0.1°C                           |   |
| Accuracy   | pH          | ± 0.01                          | ± 0.01; ± 0.002   |
|            | mV          | ± 0.2 mV; ± 1 mV                | ± 0.2 (± 699.9 mV); ± 0.5 (± 999.9 mV); ± 1 (± 2000 mV) |
|            | Temperature | ± 0.4°C                         |   |

|                          |  |  |             |
|--------------------------|--|--|-------------|
| Calibration Check        | status of electrode condition and response time, status of the buffer solutions during calibration |  |             |
| pH Calibration           | automatic, 1 or 2 point with 7 memorized values (pH 1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45)    |  |             |
| Temperature Compensation | manual or automatic, -20.0 to 120.0°C (-4 to 248°F)  |  |             |
| pH Electrode             | HI 1131P glass-body, single junction, refillable, BNC + pin (included)                             |  |             |
| Temperature Probe        | HI 7669/2W stainless steel temperature probe (included)  |  |             |
| PC Connection            | RS232C opto-isolated serial port   |  |             |
| Data Logging             | 100 samples  |  | 500 samples |
| Input Impedance          | 10 <sup>12</sup> Ohm   |  |             |
| Power Supply             | 12 Vdc adapter (included)  |  |             |
| Environment              | 0 to 50°C (32 to 122°F); RH max 95%  |  |             |
| Dimensions / Weight      | 240 x 182 x 74 mm (9.4 x 7.2 x 2.9") / 1.1 kg (2.4 lb.)  |  |             |

**Accessories**

| pH Electrodes  |  |                      |   |
|--|--|----------------------|---|
| All part codes ending with P are provided with BNC & Pin connectors, and 1 m (3.3') cable. |  | HI 7007/1L           | pH 7.01 buffer solution, 1 L bottle   |
| HI 1043P Use: strong acids and bases.  |  | HI 7007/1G           | pH 7.01 buffer solution, 1 gallon (approx. 3.8 L)   |
| HI 1053P Use: emulsions. Glass-body, triple ceramic junction, refillable                   |  | HI 7009L             | pH 9.18 buffer solution, 500 mL bottle  |
| HI 1083P Use: biotechnology Glass-body, open junction, refillable                          |  | HI 7009/1L           | pH 9.18 buffer solution, 1 L bottle   |
| HI 1131P Use: general purpose Glass-body, ceramic junction, refillable                     |  | HI 7009/1G           | pH 9.18 buffer solution, 1 gallon (approx. 3.8 L)   |
| HI 1332P Use: general purpose Ultem® body, double junction, refillable                     |  | HI 7010L             | pH 10.01 buffer solution, 500 mL bottle   |
|  |  | HI 7010/1L           | pH 10.01 buffer solution, 1 L   |
|  |  | HI 7010/1G           | pH 10.01 buffer solution, 1 gallon (approx. 3.8 L)  |
|  |  | HI 70300L            | Electrode storage solution, 500 mL  |
|  |  | HI 70000P            | Electrode rinsing solution, 20 mL sachet, 25 pcs  |
|  |  | HI 7061L             | Cleaning solution, 500 mL bottle  |
|  |  | HI 7073L             | Cleaning solution for proteins, 500 mL bottle   |
|  |  | HI 7074L             | Cleaning solution for inorganic substances, 500 mL bottle                                 |
|  |  | HI 7077L             | Cleaning solution for oil and fat, 500 mL bottle  |
|  |  | HI 7071              | Electrolyte solution 3.5M KCl + AgCl, 30 mL bottle, 4 pcs, for single-junction electrodes |
|  |  | HI 7072              | Electrolyte solution 1M KNO <sub>3</sub> , 30 mL bottle, 4 pcs.                           |
|  |  | HI 7082              | Electrolyte solution 3.5M KCl, 30 mL bottle, 4 pcs, for double-junction electrodes        |
|  |  | <b>PC Connection</b> |   |
|  |  | HI 920010            | Serial cable for PC connection  |
|  |  | HI 92000             | Windows® compatible software  |
|  |  | HI 7004P             | pH 4.01 buffer solution, 20 mL sachet, 25 pcs   |
|  |  | HI 70007P            | pH 7.01 buffer solution, 20 mL sachet, 25 pcs   |
|  |  | HI 70010P            | pH 10.01 buffer solution, 20 mL sachet, 25 pcs  |
|  |  | HI 7001L             | pH 1.68 buffer solution, 500 mL bottle  |
|  |  | HI 7004L             | pH 4.01 buffer solution, 500 mL bottle  |
|  |  | HI 7004/1L           | pH 4.01 buffer solution, 1 L bottle   |
|  |  | HI 7004/1G           | pH 4.01 buffer solution, 1 gallon (approx. 3.8 L)   |
|  |  | HI 7006L             | pH 6.86 buffer solution, 500 mL bottle  |
|  |  | HI 7006/1L           | pH 6.86 buffer solution, 1 L bottle   |
|  |  | HI 7006/1G           | pH 6.86 buffer solution, 1 gallon (approx. 3.8 L)   |
|  |  | HI 7007L             | pH 7.01 buffer solution, 500 mL bottle  |

For a complete range of calibration, cleaning and maintenance solutions, see section F. For pH and ORP electrodes, see section E. For accessories, see section U.