

HI 2221 • HI 2223

## Calibration Check™ pH Benchtop Meters

- pH Calibration Check™
- On-screen electrode condition and response time
- Up to five point calibration with seven standard buffers
- Diagnostic alerts through icons
- Automatic Temperature Compensation
- Log up to 500 samples (HI 2223)
- GLP features
- PC interface via USB



A properly manufactured and maintained pH electrode will retain its measuring integrity for a long time. As a result of many factors such as age, poor maintenance or improper handling, any electrode in time will lose its integrity.

The most common cause for pH measurement inaccuracies is an unclean or improperly cleaned electrode. This is very important to note, because during calibration, the instrument assumes that the electrode is clean and that the standardization curve created during the calibration process will remain a valid reference until the next calibration.

A dirty electrode or wrong calibration approach can contribute to buffer solution contamination. A contaminated buffer solution can present a major problem during calibration due to the fact that it is considered the only reference.

The HI 2221 and HI 2223 are pH benchtop meters featuring our exclusive Calibration Check™ diagnostics for both pH electrodes and buffer solutions during calibration. These instruments compare the characteristics of the pH electrode from one calibration to the next.

In the case of large variances in the electrode condition, these meters alert the user that the electrode needs to be properly cleaned prior to calibration and measuring.

The second feature is to detect if the calibration buffer solution is contaminated. After calibration, the probe condition is evaluated and an indicator is displayed informing the user of the overall pH electrode status.

These instruments can measure using ORP electrodes (pH channel input), due to its capability to measure mV with a resolution up to 0.1 mV.

These instruments also feature five point calibration with seven standard buffers, Automatic Temperature Compensation and GLP capabilities that allow for the storage and retrieval of all data regarding pH. With a built-in logging function, measurements are stored in non volatile memory and can be transferred to a PC through the USB port. Users can manually log up to 200 records and interval log up to 500 records.



### Calibration Messages

The calibration history is used to alert users during calibration in the case of an unclean electrode or contaminated buffer to reduce calibration errors and assist in ensuring the highest accuracy.

Electrode aging is a slow process, if a substantial change is seen from a previous calibration, it is likely due to a temporary problem with the electrode or buffers. Calibrating under these conditions will give measurement errors.

Error messages such as to clean or check the electrodes and/or buffers appear if the calibration parameters are out of accepted windows. Calibrations cannot be completed until the errors are corrected.



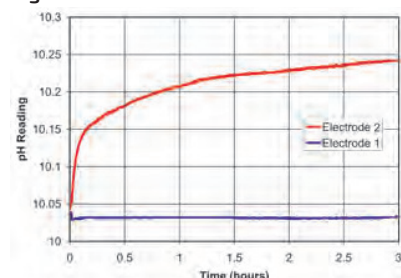
### Diagnostic Messages

When using an appropriate HANNA P Type BNC electrode with pin, HI 2221 and HI 2223 will assess electrode condition and response time during each calibration and display the status for the rest of the day.

The digital gauge for electrode condition is a representation of the offset and slope performance of the electrode. The response time gauge is a function of the stabilization time evaluated between the first and second calibration buffers.

The condition and response are also visible when viewing GLP data.

Figure A



Electrode 1 has been properly cleaned before calibration. Electrode 2 has not been properly cleaned.

Figure A (above) shows that the pH measured by a dirty electrode changes over a short 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.

SPECIFICATIONS		HI 2221	HI 2223
Range	pH	-2.00 to 16.00 pH	-2.00 to 16.00 pH; -2.000 to 16.000 pH
	mV	± 699.9 mV; ± 2000 mV	±999.9 mV; ±2000 mV
	Temperature	-20.0 to 120.0 °C	
Resolution	pH	0.01 pH	0.01 pH; 0.001 pH
	mV	0.1 mV (±699.9 mV); 1 mV (±2000 mV)	0.1mV(±999.9 mV); 1 mV(±2000 mV)
	Temperature	0.1 °C	
Accuracy	pH	± 0.01 pH	±0.01 pH; ±0.002 pH
	mV	± 0.2 mV (± 699.9 mV); ± 1 mV (± 2000 mV)	±0.2 mV (± 999.9 mV); ±1 mV (± 2000 mV)
	Temperature	± 0.2 °C excluding probe error	
pH Calibration	automatic, up to five point calibration with seven standard buffers available (1.68, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45)		
pH Calibration Check™	yes		
Temperature Compensation	manual or automatic from -20.0 to 120.0 °C (-4.0 to 248.0°F)		
pH Electrode	HI 1131P glass body pH electrode with BNC + pin connectors and 1 m (3.3') cable (included)		
Temperature Probe	HI 7662 stainless steel temperature probe and 1 m (3.3') cable (included)		
PC Connection	opto-isolated USB		
Data Logging	100 points	500 points	
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% non-condensing		
Dimensions	235 x 222 x 109 mm (9.2 x 8.7 x 4.3")		
Weight	1.3 Kg (2.9 lb)		

### ORDERING INFORMATION

HI 2221-01 (115V), HI 2221-02 (230V) and HI 2223-01 (115V) and HI 2223-02 (230V) are supplied with HI 1131B pH electrode, HI 7662 temperature probe, HI 76404N electrode holder, HI 70004 pH 4.01 buffer solution sachet, HI 70007 pH 7.01 buffer solution sachet, HI 700661 cleaning solution sachet, HI 7071S electrolyte solution (30 mL), 12 VDC adapter and instructions.

### ELECTRODES

Combination pH electrodes. All part codes ending with P are provided with BNC & Pin connectors, and 1 m (3.3') cable:

- HI 1043P** Use: strong acids and bases. glass-body, double junction, refillable
- HI 1053P** Use: emulsions. glass-body, triple ceramic junction, refillable
- HI 1083P** Use: biotechnology. glass-body, open junction, refillable
- HI 1131P** Use: general purpose. glass-body, ceramic junction, refillable
- HI 1332P** Use: general purpose. PEI body, double junction, refillable
- HI 7662** Temperature probe

### SOLUTIONS

- HI 5004L** pH 4.01 buffer solution, 500 mL
- HI 5007L** pH 7.01 buffer solution, 500 mL
- HI 5010L** pH 10.01 buffer solution, 500 mL
- HI 7061L** Electrode cleaning solution, 500 mL
- HI 70300L** Electrode storage solution, 500 mL

### ACCESSORIES

- HI 92000** Windows® compatible software
- HI 920013** USB cable for PC connection
- HI 76404N** Electrode holder

For a complete list of Solutions and Electrodes, see the end of this section.