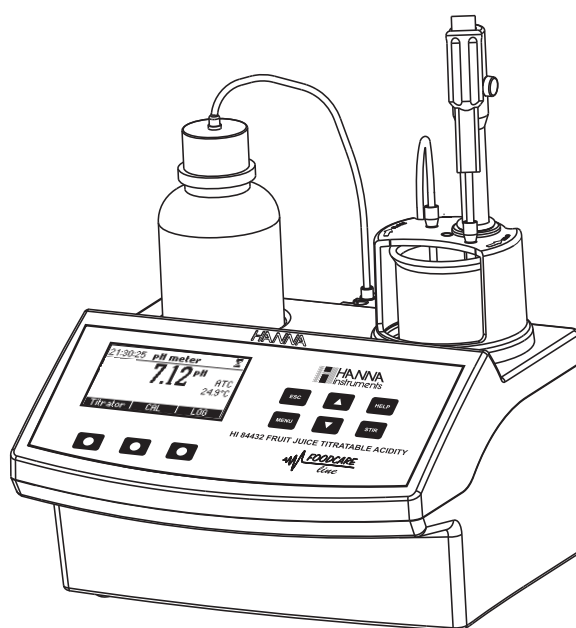


## Instruction Manual

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# HI 84432 TITRATABLE ACIDITY MINITRATOR & pH METER for Fruit Juices



Dear Customer,

Thank you for choosing a Hanna product. This manual will provide you with the necessary information for the correct use of the instrument. Please read it carefully before using the meter. If you need additional technical information, do not hesitate to e-mail us at [tech@hannainst.com](mailto:tech@hannainst.com).

## TABLE OF CONTENTS

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PRELIMINARY EXAMINATION .....	4
GENERAL DESCRIPTION .....	4
SPECIFICATIONS .....	6
PRINCIPLE OF OPERATION .....	7
FUNCTIONAL AND PHYSICAL DESCRIPTION .....	8
TITRATOR STARTUP .....	11
SETUP CONFIGURATION MENU .....	12
ELECTRODE PREPARATION .....	16
ELECTRODE CALIBRATION PROCEDURE .....	17
pH BUFFER TEMPERATURE DEPENDENCE .....	22
PUMP TUBE INSTALLATION .....	23
PURGE .....	24
PUMP CALIBRATION PROCEDURE .....	26
TITRATION PROCEDURE .....	29
pH MEASUREMENT .....	34
TEMPERATURE CALIBRATION PROCEDURE (for technical personnel only) .....	38
TROUBLESHOOTING GUIDE .....	40
ELECTRODE CONDITIONING AND MAINTENANCE .....	41
ACCESSORIES .....	42
WARRANTY .....	43

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## PRELIMINARY EXAMINATION

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Please examine this product carefully. Make sure that the instrument is not damaged. If any damage occurred during shipment, please notify your Dealer.

Each HI 84432 minititrator is supplied complete with:

- HI 1131B pH electrode
- HI 7662-M Temperature probe
- HI 84432-50 Titrant solution (100 mL)
- HI 84432-55 Pump calibration solution (100 mL)
- HI 70004 pH 4.01 buffer solution (2 x 20 mL)
- HI 70007 pH 7.01 buffer solution (2 x 20 mL)
- HI 700082 pH 8.20 buffer solution (2 x 20 mL)
- Two 100 mL beakers
- Tube set with dispensing tip
- Stir bars (medium 2 pcs.)
- 12 Vdc power adapter
- Instruction manual

**Note:** Save all packing material until you are sure that the instrument works correctly. Any defective item must be returned in its original packing.

## GENERAL DESCRIPTION

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The HI 84432 is an easy to use microprocessor-based automatic minititrator and pH meter designed for the rapid and accurate analysis of Total Titratable Acidity in fruit juices. By eliminating subjective factors including color indicators, errors in mathematical calculations or erratic titrant additions from the measurement, the HI 84432 makes Total Titratable acidity analysis precisely. This will quickly become a valuable acidity analysis tool of fruit juices.

The instrument benefits from Hanna's many years of experience as a manufacturer of quality analytical instruments. A clear and well-designed user interface makes the instrument intuitive and simple to use. A dedicated **HELP** key aids in set-up, calibration, status and troubleshooting.

By simply pressing the **START** key, the HI 84432 automatically starts pump operation and titrates the sample to the end point. The HI 84432 has a simple and accurate peristaltic pump to ensure the best accuracy and repeatability. By performing pump calibration with the Hanna standard provided, the instrument accuracy is ensured.

The instrument employs a powerful and effective built-in algorithm to analyze the pH response to determine the exact pH endpoint, then uses this to make the necessary calculations.

The Titratable Acidity determination is instantaneously displayed in selected measurement units on the large dot matrix display. The instrument is ready for the next analysis immediately.

Other features:

- Log on demand up to 100 samples (50 for pH measurement; 50 for titration results)
- GLP feature, to view last calibration data for pH electrode and pump

#### **MEASUREMENT SIGNIFICANCE**

The **HI 84432** measures the concentration of titratable hydrogen ions contained in the fruit juice samples, by neutralization with a strong base solution to a fixed pH. This value includes all the substances of an acidic nature in the fruit juice: free hydrogen ions, organic acids, acid salts and cations. Because the organic acid is the most acidic component of fruit juices that react with strong bases solutions, the titratable acidity is usually expressed as g/L or g/100 mL of the predominant acid contained:

- Citric acid is present in many fruit species.
- Tartaric acid is essentially found in grapes.
- Malic acid is present in many fruit species, sometimes together with citric acid or tartaric acid in unripe grapes.

The titratable acidity of fruit is an important parameter in determining fruit maturity.

<b>Fruits, juices</b>	<b>Titratable acidity (g/100 mL)</b>	<b>Predominant acid</b>
Apple, pear	0.36-0.80	Malic acid
Cranberry	1.6-3.6	Citric acid
Grapefruit	1.2-2.0	Citric acid
Lemon	4-6.2	Citric acid
Mango	0.34-0.84	Citric acid
Orange	0.8-1.4	Citric acid
Peach, nectarine, sweet cherry	0.24-0.94	Citric acid
Pineapple	0.7-1.6	Citric acid
Plum/Sour cherry	0.94-1.64	Malic acid
Strawberry	0.6-1.1	Citric acid
Table grape	0.4-0.9	Tartaric acid
Tomato	0.34-1.00	Citric acid

The **HI 84432** minititrator uses a method based on the Official Methods of Analysis of AOAC International. The fruit juice is titrated with a sodium hydroxide solution until the end point at 8.2 pH is reached (determined by potentiometric method).

Additionally the **HI 84432** has a built-in pH meter for pH measurement (electrode and meter must be calibrated).

## SPECIFICATIONS

---

Titrator	Range	Titratable acidity (low range): <b>15 mL sample</b> g/100 mL as citric acid: 0.20 - 1.20% CA g/100 mL as tartaric acid: 0.23 - 1.41% TA g/100 mL as malic acid: 0.21 - 1.26% MA Titratable acidity (high range): <b>2 mL sample</b> g/100 mL as citric acid: 0.80 - 8.00% CA g/100 mL as tartaric acid: 0.94 - 9.30% TA g/100 mL as malic acid: 0.84 - 8.30% MA	
	Resolution	0.01%	
	Accuracy	5% of reading or $\pm 0.02$	
	Titration method	Acid-base titration	
	Principle	End point titration: 8.20 pH	
	Pump debit	0.5 mL/min	
	Stirring speed	600 rpm	
	Log data	Up to 50 samples	
	pH meter	pH meter	-2.0 to 16.0 pH / -2.00 to 16.00 pH
		pH Resolution	0.1 pH / 0.01 pH
		pH Accuracy	$\pm 0.01$ pH
		pH Calibration	1, 2 or 3 calibration points; 3 available buffers (4.01; 7.01; 8.20)
		Temperature compensation	manual or automatic from -20 to 120 °C (-4 to 248 °F)
Temperature	Log data	Up to 50 samples	
	Range	-20.0 to 120.0 °C (-4.0 to 248.0 °F)	
	Resolution	0.1 °C	
Electrode	Accuracy	$\pm 0.4$ °C without probe error	
	Temperature Probe	<b>HI 1131B</b> (included)	
Environment	Temperature Probe	<b>HI 7662-M</b> (included)	
	Power supply	0 to 50 °C (32 to 122 °F); max 95% RH non-condensing	
Dimensions	Power supply	12 Vdc power adapter	
Weight	Dimensions	208 × 214 × 163 mm (8.2×8.4×6.4") (with beaker)	
	Weight	2200 g (77 oz.)	

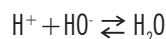
## REQUIRED REAGENTS

<u>Code</u>	<u>Description</u>	<u>Quantity/Test</u>
HI 84432 - 50	Titrant	1 mL
HI 84432 - 55	Pump Calibration Solution	2 mL

## PRINCIPLE OF OPERATION

---

Fruit juice acidity is determined by neutralization of all available hydrogen ions present in the sample, with a strong base solution:



In an ideal solution, the end point of an acid titration corresponds stoichiometrically to the complete neutralization of the acids present.

The **HI 84432** minititrator is designed to determine the acidity of fruit juices by potentiometric titration. The result of the titration are displayed in % (g/100 mL) of the predominant acid (citric, malic or tartaric acid).

Using a pH electrode allows an end point at 8.2 pH to be automatically detected. End point detection by potentiometric method is more objective than the end point detection using the indicators.

For precise results the sample and titrant volume and the titrant concentration must be known.

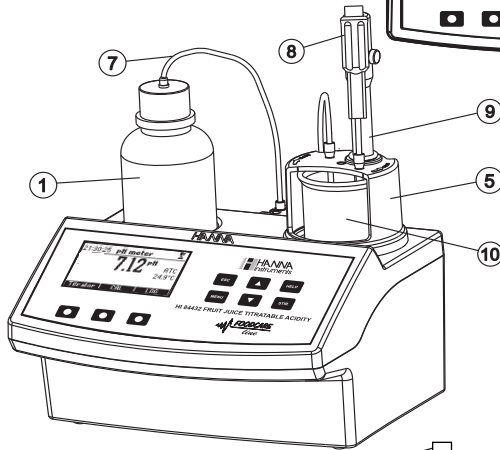
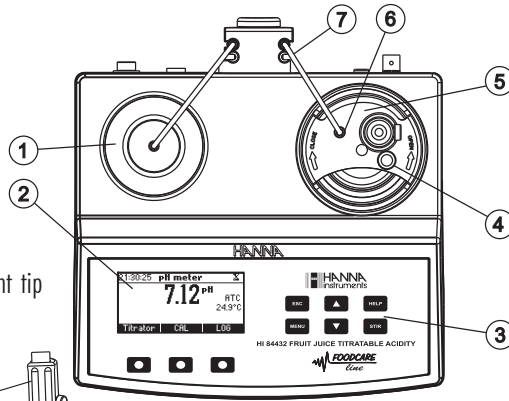
It is important to titrate fresh samples of the fruit juice. For increased measurement precision keep the fruit juices in capped vessels (avoid prolonged exposure to air). Also avoid refrigerating the juice as significant portion of the tartaric acid (ex. grapes juice) will precipitate out and the results obtained will be lower than expected results.

Titrateable Acidity in fruit juices, as performed on the **HI 84432** minititrator, utilizes a simple sample preparation, a high quality peristaltic dosing pump for titrant, potentiometric endpoint detector and instantaneous computations. To maintain the high precision of the titrator, a simple pump calibration procedure is required. The pump calibration involves the analysis of a known volume of a known solution (standard provided) and compensates for changes in pump dosing that may occur due to many factors including tube stretching or aging. This procedure should be performed a minimum of daily.

## FUNCTIONAL AND PHYSICAL DESCRIPTION

### OVERHEAD VIEW

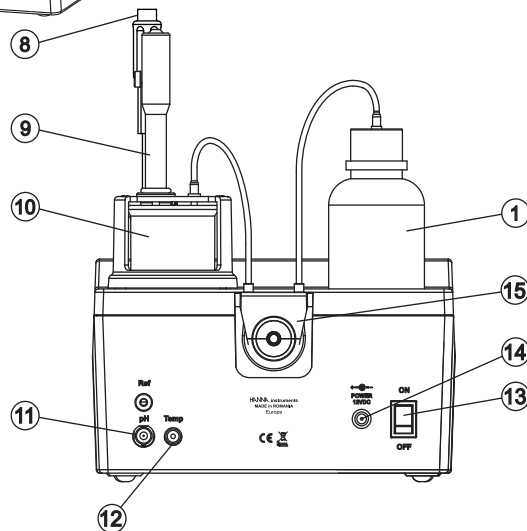
1. Titrant bottle
2. Graphic LCD
3. Keypad
4. Dedicated guide tube for Temperature Probe
5. Electrode holder
6. Dedicated guide tube for titrant tip
7. Peristaltic pump tube



### FRONT VIEW

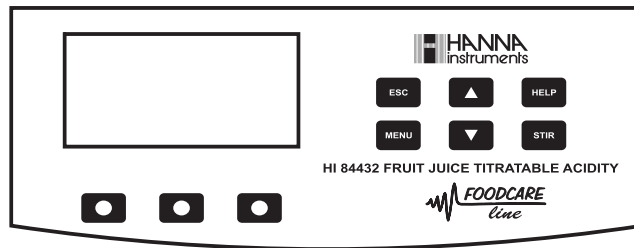
### REAR VIEW

8. Temperature probe
9. pH Electrode
10. Beaker
11. BNC electrode connector
12. Temperature probe socket
13. Power switch
14. Power adapter connector
15. Peristaltic pump





## KEYPAD FUNCTION AND INDICATORS



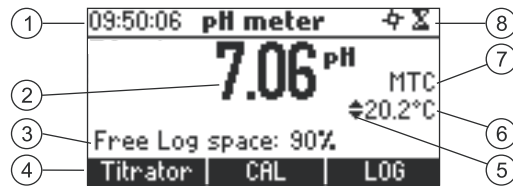
- ESC** - used to leave the current screen and to return either to the previous screen or to the main screen. When pressed while modifying a parameter within the **SETUP** menu, exits parameter without changing it.
- ▼/▲** - used to modify the parameters' values, to scroll the information displayed while viewing a help or to move between the options from the instrument's **SETUP**
- HELP** - used to access/leave the instrument's contextual help
- MENU** - used to enter **SETUP**, **Recall** or **GLP** selection menu, while instrument is in **pH** or **Titration** main screen
- STIR** - used to start/stop the stirrer.
- Note:** The stirrer starts automatically during pump calibration and titration and cannot be stopped by pressing **STIR** key.

## GUIDE TO INDICATORS

During the instrument's operation information is displayed on the LCD.

Displayed icons:

	Unstable reading.		Pump running.
	Stirrer on.		Parameter can be changed.



1. Current time and instrument mode information (pH meter or Titrator)
2. Main reading information
3. Instrument status information
4. Functional key area
5. Indicates that the displayed value can be changed using ARROW keys
6. Temperature value (Manual or Automatic)
7. pH temperature compensation mode (Manual or Automatic)
8. Stirrer and reading status area

## PERISTALTIC PUMP

Peristaltic pumps are self priming. Liquid never contacts the pump components. The titrant tubing is pressed along the rotating rollers of the pump. The rollers compress the tubing, driving the titrant to the dispensing tip.

**Note:** It may be necessary to compress the tubing against rollers with your finger to hasten the filling of the tubing the first time.

## TITRATOR STARTUP

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This is a general outline of the steps required to make a titration. The following topics are expanded upon each section that follows.

- Place the instrument on a flat table. Do not place the instrument in direct sun light.
- Connect the power adapter to the instrument.
- Turn the instrument ON using the power switch from the rear panel of the instrument.
- Set up the instrument. See the “Setup Configuration Menu” section for details. Pay attention to the Acidity Unit.
- Connect the pH sensor and temperature probe to the instrument.
- Calibrate the pH electrode. At least a single point calibration is necessary for titration.
- Place the peristaltic pump tube on the pump (inlet tube is connected with the reagent bottle, outlet tube is connected with the dosing tip). See the “Pump Tube Replacement” section for the procedure.
- Remove the reagent bottle cap and replace with the bottle cap with tubes. Place the reagent bottle in the appropriate place on the titrator top.
- Purge the titrant. Verify titrant is leaving titrant tip.
- Calibrate the pump.
- Prepare the sample.

**Note:** Different volumes of juice are required for measurement accuracy. See SAMPLE PREPARATION for details.

- Run a titration and log sample results.

## SETUP CONFIGURATION MENU

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The titrator's setup configuration menu may be accessed from the pH or titration screens by pressing the **MENU** key, then **Setup**.

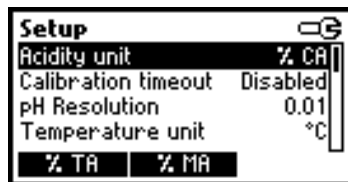
A list of setup parameters will be displayed with currently configured setting.

While in the setup menu it is possible to modify the instrument's operation parameters. The **ARROW** keys permit the user to scroll the setup parameters.

Press **HELP** to view the contextual help.

Press **ESC** to return to the main screen.

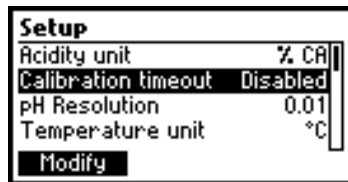
### Concentration unit



Options: %CA; %TA; %MA.

Press the corresponding function key to change the option.

### Calibration timeout



Options: Disabled or 1 to 7 days.

This option is used to set the number of days before the pH calibration expired warning message is flagged.

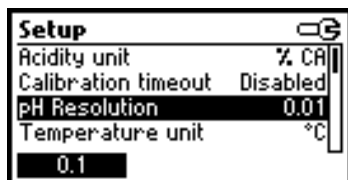
Press **Modify** to access the calibration timeout value modify parameter.



Use the **ARROW** keys in order to increase/decrease the value.

Press **Accept** to confirm or **ESC** to return to the setup menu without saving the new value.

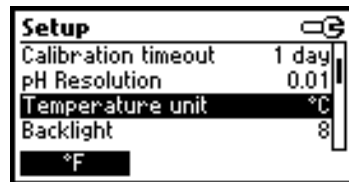
### pH resolution



Options: 0.1, 0.01.

Press the displayed function key in order to change the pH resolution.

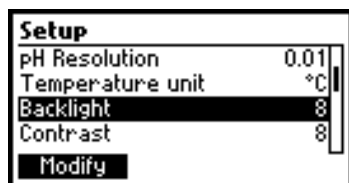
### Temperature unit



Options: °C, °F.

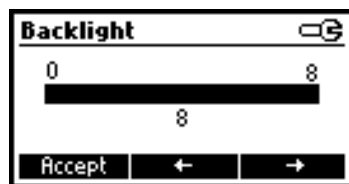
Press the function key in order to change the temperature unit.

### Backlight



Options: 0 to 8.

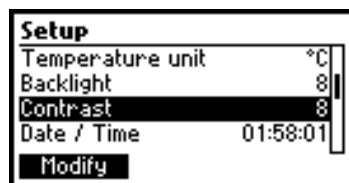
Press **Modify** to access the backlight level.



Use the **ARROW** keys or ← / → in order to increase/decrease the displayed contrast.

Press **Accept** to confirm or **ESC** to return to the setup menu.

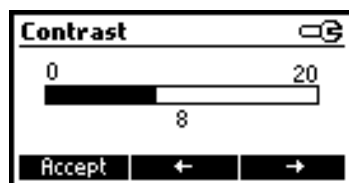
### Contrast



Option: 0 to 20.

This option is used to set the display's contrast.

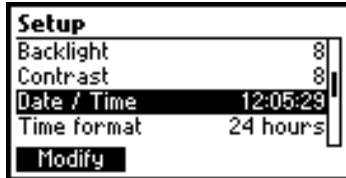
Press **Modify** to change the display's contrast.



Use the **ARROW** keys or ← / → in order to increase/decrease the value.

Press **Accept** to confirm the value or **ESC** to return to the setup menu.

## Date / Time



This option is used to set the instrument's date and time.

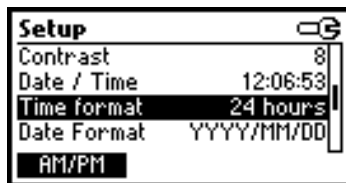
Press **Modify** to change the date/time.



Press ← / → to highlight the value to be modified (year, month, day, hour, minute or second). Use the **ARROW** keys to change the value.

Press **Accept** to confirm the new value or **ESC** to return to the setup.

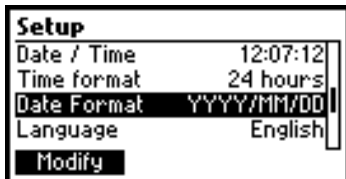
## Time format



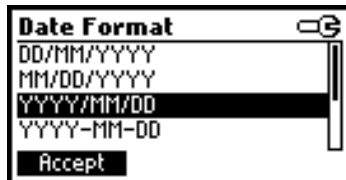
Option: **AM/PM** or **24 hours**.

Press the functional key to select the new value.

## Date format



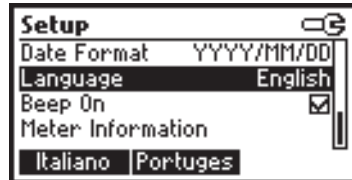
Press **Modify** to change the Date Format.



Use the **ARROW** keys to select the desired format.

Press **Accept** to confirm the value or **ESC** to return to the setup menu.

## Language

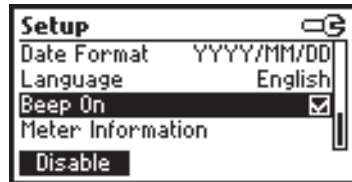


Press the corresponding function key to change the language.

If the new selected language cannot be loaded, the previously selected language will be reloaded.

If no language can be loaded at startup the instrument will work in the "safe mode". In "safe mode" all the messages are displayed in English and help information are not available.

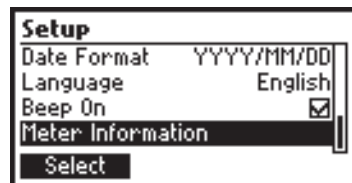
## Beep On



Press the function key to select the new option. When enabled, a short beep is heard every time a key is pressed or when the calibration can be confirmed.

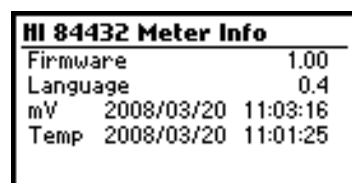
A long beep alert sounds when the pressed key is not active or a wrong condition is detected while in calibration.

## Meter information



Press **Select** to view the firmware version, language version, mV factory calibration date and time and temperature factory calibration date and time.

Press **ESC** to return to the **Setup** mode.



## **ELECTRODE PREPARATION**

---

### **PREPARATION PROCEDURE**

Remove the electrode protective cap.

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

During transport, tiny bubbles of air may have formed 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.

For better performance, soak the electrode in **HI 70300** Storage Solution for at least one hour, before using.



## ELECTRODE CALIBRATION PROCEDURE

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It is recommended to calibrate the instrument frequently, especially if high accuracy is required. The pH electrode should be recalibrated:

- a) Whenever the pH electrode is replaced
- b) At least once a week, but daily is advised
- c) After electrode is cleaned
- d) When high accuracy is required
- e) If the pH calibration expired warning is displayed during measurement. Every time you clean the electrode calibrate the instrument (see the "pH Cleaning Procedure" section) and use fresh buffers.

### PROCEDURE

A single, two or three-points calibration can be performed, using the three predefined buffers 4.01, 7.01 and 8.20 pH. For a single point calibration any of the three buffers may be used, but using 8.20 pH is recommended.

**Note:** The HI 84432 will not accept other pH buffers for calibration.

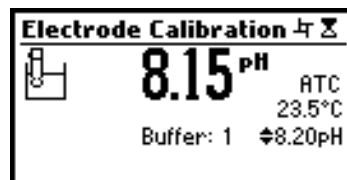
- Pour small quantities of selected buffer solutions into clean beakers. For accurate calibration use two beakers for each buffer solution, the first one for rinsing the electrode and the second one for calibration.
- Put a magnetic stir bar in each beaker with the calibration buffer solution.
- Remove the protective cap, open the fill hole and rinse the electrodes with some of the buffer solution to be used for the first calibration point.
- Put the first beaker with calibration buffer in the beaker holder.
- Place the electrode holder on the top of the beaker and secure it by turning clockwise.
- Immerse the pH and the temperature probe approximately 2 cm (0.8") into the buffer paying attention not to touch the stir bar.

To select Electrode calibration screen follow the next steps:

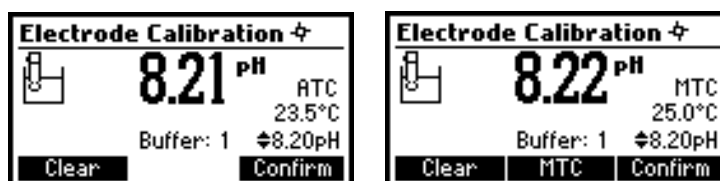
- From pH meter screen press **CAL** function key then Electrode.
- From Titrator screen press **CAL** function key then Electrode.
- The electrode calibration screen will be displayed.

### Point 1 calibration

- The 8.20 buffer will be selected by default. If necessary press the **ARROW** keys in order to select a different buffer value.



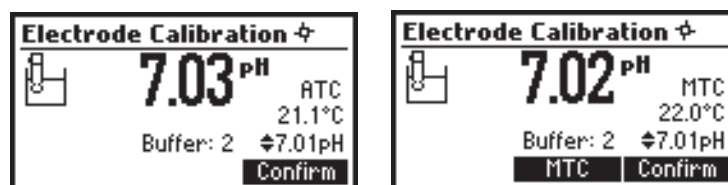
- The **⊠** (unstable measurement) symbol will be shown on the display until the reading becomes stable.



- When the reading is stable and close to the selected buffer, the **⊠** (unstable measurement) symbol will disappear and the **Confirm** key will become active.
- Press **Confirm** to confirm the calibration.
- Press **ESC** to exit calibration.

#### Point 2 calibration

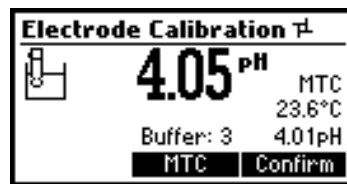
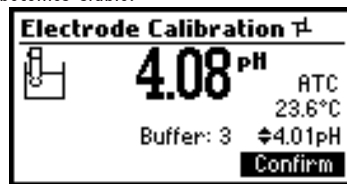
- The calibrated value will be shown on the display and the second expected buffer value will be displayed.
- Remove the electrode holder with electrodes from the top of the beaker.
- Place the second buffer into beaker and place in beaker holder. Rinse the electrodes in a beaker containing the second buffer rinsing solution.
- Place the electrode holder (with electrodes) on the top of the beaker, lock holder by turning.
- If necessary press the **ARROW** keys in order to select a different buffer value.
- The **⊠** (unstable measurement) symbol will be shown on the display until the reading becomes stable.



- When the reading is stable and close to the selected buffer, the **⊠** (unstable measurement) symbol will disappear and the **Confirm** key will become active.
- Press **Confirm** to confirm the calibration.
- The calibrated value will be shown on the display and the third expected buffer value will be automatically selected.
- After the second calibration point has been confirmed, press **ESC** to exit without performing the third calibration point.

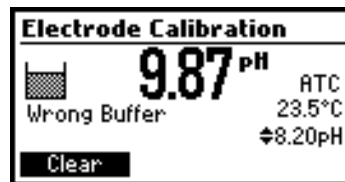
### Point 3 calibration

- Remove the electrode holder with electrode from the top of the beaker.
- Place the third buffer solution in a beaker and place in beaker holder. Rinse the probes in a beaker with third buffer rinsing solution.
- Place the electrode holder (with electrode) in the beaker with third buffer and secure holder by locking.
- The  $\Sigma$  (unstable measurement) symbol will be shown on the display until the reading becomes stable.



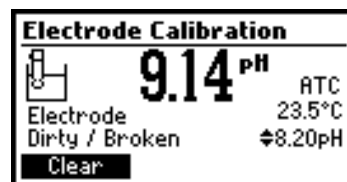
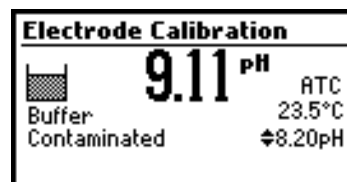
- When the reading is stable and close to the selected buffer, the  $\Sigma$  (unstable measurement) symbol will disappear and the **Confirm** key will become active.
- Press **Confirm** to confirm the calibration. The instrument stores the calibration value and returns to pH meter/titrator calibration menu, where the date and time for the last pH will be updated.

- Notes:**
- A buffer confirmed during the calibration process is removed from the list of calibration buffers available for further calibration points.
  - If the value measured by the instrument is not close to the selected buffer a "Wrong Buffer" error message will be shown on the display.

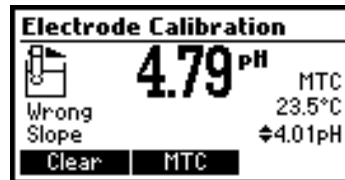
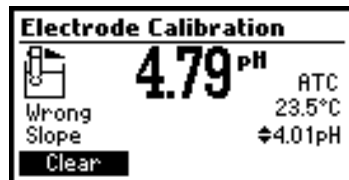
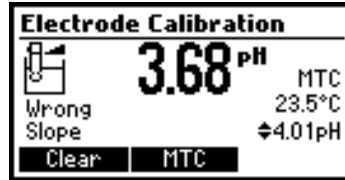
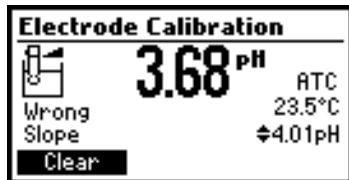


Check if the correct buffer has been used or regenerate the pH electrodes by following the Cleaning Procedure (see the "pH Cleaning Procedure" section). If necessary change the buffer or the electrode.

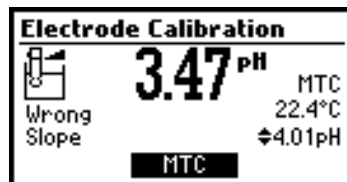
- If the measured offset isn't within the preset limits the meter will display the message "Buffer Contaminated" alternatively with "Electrode Dirty/Broken".



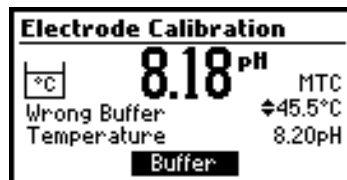
- If the computed slope isn't within the preset limits the meter will display the message "Wrong Slope". If the slope is too high the symbol  $\blacktriangleleft$  will be displayed. If the slope is too low the symbol  $\blacktriangleright$  will be displayed.



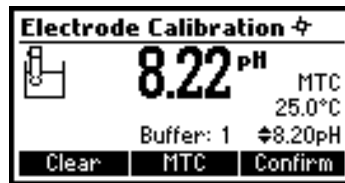
- If the "Wrong Old Slope" error message is displayed, an inconsistency exists between the current and the previous (old) calibration. Clear the calibration parameters by pressing **Clear** and proceed with calibration from the current calibration point. The instrument will keep all the confirmed values during the current calibration point.



- If the temperature reading is out of the defined temperature range of the buffer (0 to 45°C) the "Wrong Buffer Temperature" error message will be displayed, and the symbol °C will blink on the display. Calibration cannot be confirmed in this situation.



- Notes:**
- To clear a previous calibration and to return to the default value, press **Clear** at any time after entering calibration mode. The **"Calibration cleared"** message will be shown for a few seconds on the display. If **Clear** is invoked during the first calibration point the instrument returns to the measurement mode.
  - The **Clear** key is displayed only if a previous calibration exists.



## **pH BUFFER TEMPERATURE DEPENDENCE**

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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.

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

<b>TEMP</b>		<b>pH BUFFERS</b>		
<b>°C</b>	<b>°F</b>	<b>4.01</b>	<b>7.01</b>	<b>8.20</b>
<b>0</b>	<b>32</b>	4.01	7.13	8.38
<b>5</b>	<b>41</b>	4.00	7.10	8.34
<b>10</b>	<b>50</b>	4.00	7.07	8.31
<b>15</b>	<b>59</b>	4.00	7.04	8.27
<b>20</b>	<b>68</b>	4.00	7.03	8.23
<b>25</b>	<b>77</b>	4.01	7.01	8.20
<b>30</b>	<b>86</b>	4.02	7.00	8.17
<b>35</b>	<b>95</b>	4.03	6.99	8.14
<b>40</b>	<b>104</b>	4.04	6.98	8.11

## PUMP TUBE INSTALLATION

To mount the new peristaltic pump tube follow next steps:

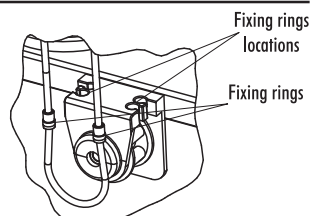
- Position one tubing ferrule ring on its location.
- Stretch the tube over the peristaltic pump rollers.
- Fix the second tube ferrule ring on its location.
- Attach the tube to the reagent bottle.

**Note:** Purge the peristaltic pump until drops of reagent appears on the dosing tip by pressing the **PURGE** key from the titrator main screen. It may be necessary to press the tubing against rollers with your finger to hasten the filling of the tubing the first time.

To remove the tube of the peristaltic pump follow next steps:

**Caution:** Purge line with water to flush titrant solution from tube.

- Detach the tubes system from the reagent bottle.
- Grasp one ferrule ring of the peristaltic pump tube.
- Pull the tube until the ferrule rings are taken out from their location.
- Remove the other side of the tube.



## PURGE

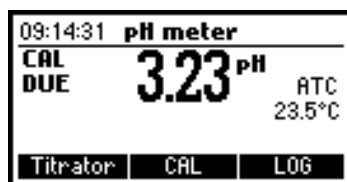
Purging should be performed:

- if you notice there is no titrant in the tip;
- whenever the tube of the peristaltic pump is replaced;
- whenever the titrant is changed or a new bottle is used;
- before starting a pump calibration;
- before starting a lot of titrations.

In order to start purging, press the **Purge** key from the titrator main screen. The purging stops automatically after 5 minutes.

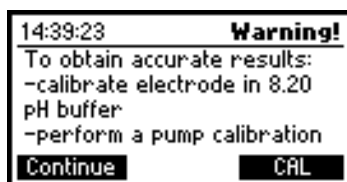
To access the **Purge** key follow the next steps.

- From the instrument main screen (pH meter screen) press "Titrator" function key.

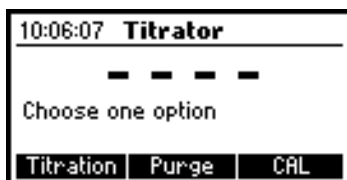


The instrument will display the next screen if any of the following conditions exist:

- the meter hasn't been calibrated in 8.20 pH buffer
- the pH calibration has expired
- a pump calibration hasn't been performed or more than 3 days have passed since the last pump calibration.

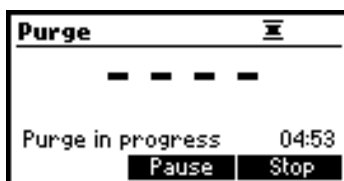


- Press **CAL** to access the titration calibration menu where electrode and pump calibration may be accessed.
- Press **HELP** to view the contextual help.
- Press **Continue** or **ESC** to skip the message and enter titrator main screen.





- Press **Purge** to begin a purge cycle.



The purging stops automatically after 5 minutes.

To stop purging at any time and return to the main screen press **ESC** or **Stop**.

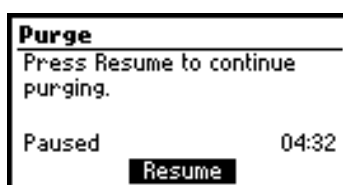
During a purge, a countdown timer displays remaining time in 5 minute purge.

Press **Pause** to interrupt the purge process.

Press **Pause** or **Stop** (by pressing the corresponding function key in the purge screen)

- after the first drops of fresh titrant appear at the dosing tip
- in case an error condition is observed (empty titrant bottle, tubes or dosing tip disconnected, pump error)
- if you want to resume at a later time

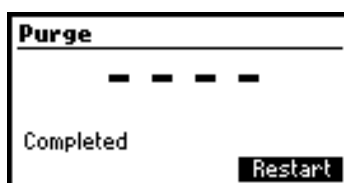
If **Pause** is pressed the next screen is displayed:



Press **Resume** to continue purging.

After the 5 minutes purging interval has elapsed the "Completed" message is displayed.

Another purge period can be initiated by pressing **Restart** or press **ESC** to return to main titrator screen.



## PUMP CALIBRATION PROCEDURE

Please set up the instrument before performing the pump calibration.

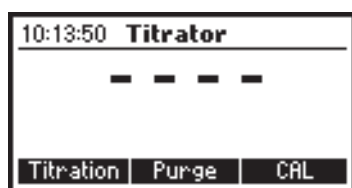
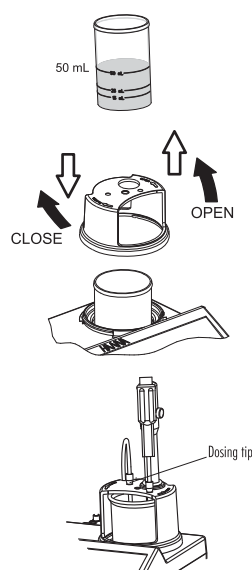
The calibration of the pump must be performed each time the pump tube, the reagent bottle or the pH electrode is changed. It is recommended to daily perform the pump calibration before you start titrations.

**Verify:** The electrode has been calibrated in 8.20 pH buffer.

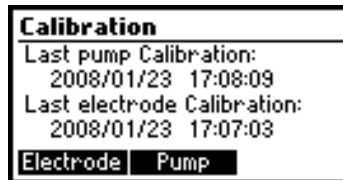
- **Sample preparation:** Precisely measure 2 mL of **HI 84432-55 Pump Calibration Solution** and add it to a clean beaker. Fill the beaker up to the 50 mL mark with the distilled or deionized water.
- Place the stir bar into the beaker and then place the beaker in the appropriate place on the instrument top.
- Place the electrode holder on the top of the beaker and secure it by turning clockwise.
- Before immersing the pH electrode and temperature probe carefully rinse with deionized water.
- Blot dry using soft tissue. Do not rub.
- Insert the calibrated pH electrode and the temperature probe through the electrode holder and immerse pH electrode bulb approximately 2 cm (0.8") into the standard paying attention not to touch the stir bar.
- Insert the dosing tip in the appropriate holder place through guide tube. Immerse the tip into solution.

**Note:** The chemical reagents may be hazardous if improperly handled. Read Health and Safety Data Sheets before performing the test.

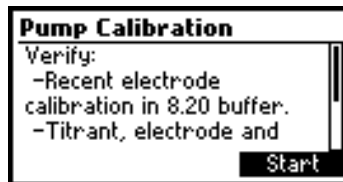
- From the titrator main screen press **CAL**.



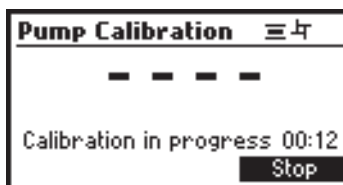
The instrument displays the date and time of the last electrode calibration, and the date and time of the last pump calibration, or calibration expired messages.



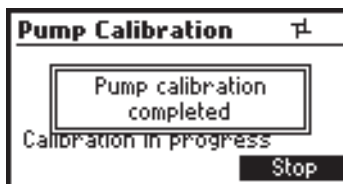
- Press **Pump**.  
The next screen will be displayed.



- Press **Start**.
- After the pump calibration is started, on the upper right side of the display two animations will be shown in order to indicate that the pump and the stirrer are working. On the lower right side of the display is shown the amount of time that has passed since the beginning of the calibration.



- After the pump calibration is complete a confirmation message is displayed for a few seconds, then the instrument will return to the titrator calibration menu and will display the new time and date for the last pump calibration.



- Notes:**
- The calibration of the pump is dependent on concentration unit selected during SETUP.
  - If an erroneous situation is encountered during the calibration, an error message is displayed and the calibration can be restarted by pressing **Restart**.
  - Use a new sample of standard and clean electrode and temperature probe before pressing **Restart**.



- If the calibration doesn't complete within 6 minutes the error message "**Too much standard**" will be displayed and the calibration can be restarted by pressing **Restart** after a new standard is prepared.



## TITRATION PROCEDURE

**Verify:** The instrument has been calibrated (pH and pump) before performing a lot of titrations.

An electrode calibration in at least one point (8.20 pH buffer) is recommended.

In order to increase the result accuracy, the measuring range was divided in two ranges:

Low range (LR): 0.20 to 1.20% CA

High range (HR): 0.80 to 8.00% CA

Depending on the expected sample concentration, different sample volume must be used for each range, as followings:

- **Sample preparation:** Accurately measure volume of juice required to a clean dry beaker.

For Low range        0.20 to 1.20% CA use 15.00 mL

For High range      0.80 to 8.00% CA use 2.00 mL

Fill the beaker to the 50 mL volume mark with deionized water.

**Notes:**

- Check the pH of distilled water. If necessary, adjust the pH to 8.2 by adding 1-2 drops of titrant solution.

- Fruit juices samples must be stored in capped bottles. Avoid disturbing any sediment in the sample.

- Place the stir bar into the beaker and then place the beaker in the appropriate place on the instrument top.

- Rinse off pH electrode and temperature probe with deionized water into a waste container. Blot dry. Do not rub.

- Place the electrode holder with electrodes on the top of the beaker and secure it by turning clockwise.

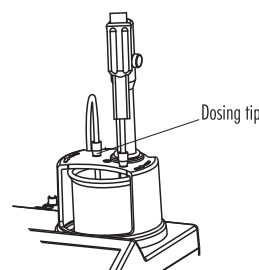
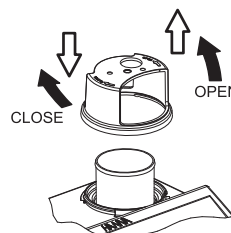
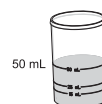
- Verify the pH and the temperature probes do not to touch the stir bar. Use **O-Rings** provided to secure the pH electrode in holder if necessary.

- Verify the dosing tip in the appropriate holder place and immersed into the sample.

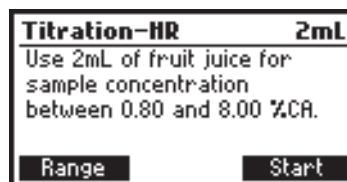
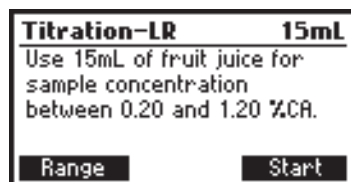
- From the titrator main screen press **Titration**. To enter titrator main screen from pH meter mode press **Titrator** and then **Titration**.

- Press **Range** to switch between low range (LR) and high range (HR).

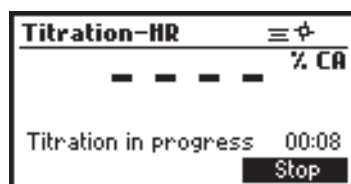
- Verify the correct sample size is configured on instrument by seeing volume set displayed in upper right corner.



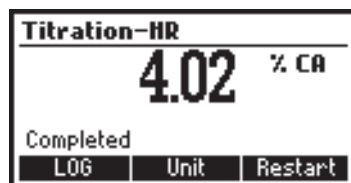
- Press **Start** to begin the titration process.



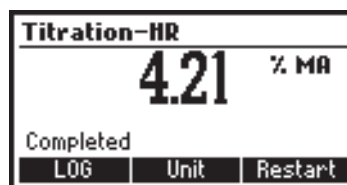
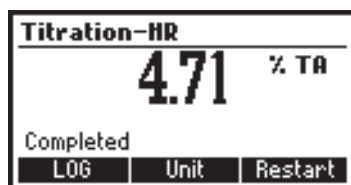
- After the titration is started two animations will be shown on the upper right side of the display to indicate that the pump and the stirrer are running. On the lower right side of the display is shown the period of time since the titration has been started.



- After the titration is complete, the concentration value is displayed in the selected unit.

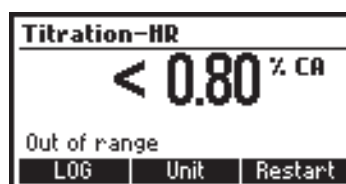
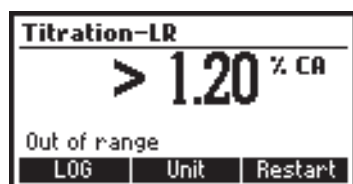


- Press **Unit** to change the display unit.



- Press **LOG** to record the concentration value into the instrument's memory. A message will be displayed for a few seconds indicating the amount of the free log space. 50 log samples can be recorded in the instrument's memory. When the titrator free log space is under 12% the message will be shown permanently.

- If the concentration is out of limits an exceeded range limit message will be displayed blinking and the message “Out of range” will be shown. Another titration can be initiated by pressing **Restart**. Prepare a fresh sample and then press **Restart**.



**Note:** If the end-point is not reached or it is not recognized or the input reading is out of range, an error message will be displayed. Also the sign “<” underrange or “>” overrange is shown. The titration can be restarted after a new sample is prepared by pressing **Restart**.

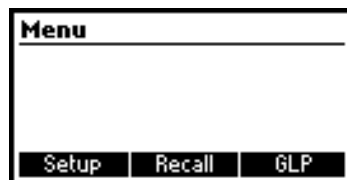


#### **TIPS FOR AN ACCURATE MEASUREMENT**

- Calibrate the instrument in 8.20 pH buffer solution at least once a day, before you start to perform measurements.
- Purge the peristaltic pump to have the fresh titrant when starting a new calibration.
- Calibrate the peristaltic pump daily before performing a set of analyses.
- Clean the electrode in order to remove possible coatings from bulb.
- Precision of the measurement can be improved by using volumetric pipettes for standard and sample additions.
- Pump calibration can be checked by running 2 mL pump standard as an unknown. It should read 3.2% CA on HR, and 0.42% CA on LR setting.

#### **VIEW/DELETE TITRATOR RECORDED LOG DATA**

Press **MENU** key while in Titrator main screen.



Press **Recall** to access the titrator recorded data.

The instrument will display a list of all the titration records stored in the titration log.

Use the **ARROW** keys to scroll the stored records list.


If the saved concentration was out of range the "!" and "<" / ">" symbol (underrange/overrange) is displayed in front of the reading.

	Acidity	Unit
1	4.07	% CA
2	3.18	% CA
3!	< 0.80	% CA
4	2.87	% CA
Delete All   Delete   More		

Press **Delete** to enter record deleting mode.

Press **Delete All** to enter all records deleting mode.

Press **More** to view more information.

<b>Record number: 1</b>
Date: 2009/04/24
Time: 12:24:17
Acidity: 4.07% CA
Unit 

Press **Unit** to convert the result to other unit.

Use the **ARROW** keys when  is displayed to scroll between the log records.

Press **ESC** to return to the previous screen.

If **Delete** was pressed the instrument will ask for confirmation.

<b>Delete Record?</b>		
1	4.07	% CA
2	3.18	% CA
3!	< 0.80	% CA
4	2.87	% CA
Confirm		

Use the **ARROW** keys to focus on the record to be deleted.

Press **Confirm** to delete the record or **ESC** to return to the previous screen.

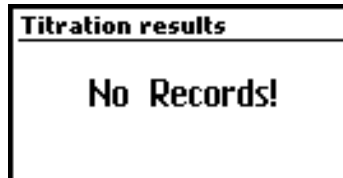
Deleting a record will renumber the list of records.

If **Delete All** was pressed the instrument will ask for confirmation.

<b>Delete all records?</b>		
1	4.07	% CA
2	3.18	% CA
3!	< 0.80	% CA
4	2.87	% CA
Confirm		



Press **Confirm** to delete all the records or **ESC** to return to the previous screen.  
If the titrator log is empty the message "No Records!" will be displayed.



### TITRATOR GLP INFORMATION

Press **MENU** while in Titration mode and then **GLP**.

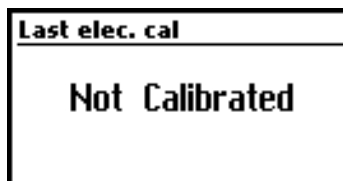


From this screen it is possible to select between viewing the **electrode GLP** or the **pump GLP**.  
Press **GLP elec.** to view the **electrode's last calibration parameters and date**.  
Press **GLP pump** to view the **pump's last calibration time and date**.  
If **GLP elec.** is pressed one of the next screens will be displayed.

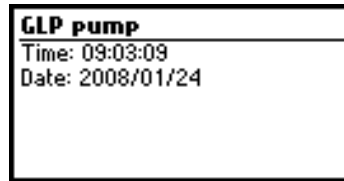
<b>Last elec. cal</b>	<b>Buffer</b>
Date: 2008/02/22	8.20
Time: 09:21:23	7.01
Cal Expire: 3 days	4.01
Offset: -2.5mV	
Slope: 97.9%	

**GLP** contains a set of information regarding electrode calibration. The following items are included in electrode GLP: the time and date of the last calibration, offset, slope, calibration timeout and the calibration buffers. The buffers displayed in video inverse mode are from the previous calibration.

If a calibration hasn't been performed the message "Not Calibrated" will be displayed.

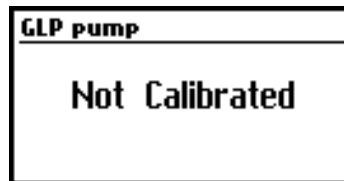


If GLP pump is pressed, one of the next screens is displayed.



The pump GLP displays the Time and Date of the last pump calibration.

If a calibration hasn't been performed the message "Not Calibrated" will be displayed.



## pH MEASUREMENT

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The HI 84432 may be used as a pH meter for direct measurements.

Verify that the instrument has been calibrated before taking pH measurements. Set the instrument to **pH meter**. At power up the instrument enters **pH meter** mode. From titrator mode press **ESC** until pH units are displayed.

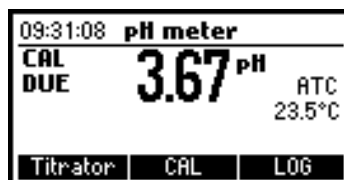
If an electrode calibration hasn't been performed, or the number of days exceeds calibration time out value set, the message "CAL DUE" will blink on the left side of the display (see **Calibration timeout** option in **Setup** for details).

Place calibrated pH electrode into electrode holder. Open the fill hole.

Rinse the pH tip with distilled or deionized water. Immerse the pH bulb (bottom 2 cm / 0.8") 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. Press **LOG** to record sample pH in instrument pH log.

If **CAL DUE** is displayed perform an electrode calibration.



Press **MENU** to access the instrument's menu.

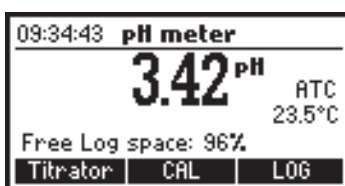
Press **HELP** to view the contextual help, every time you need supplementary information. The help is customized for every situation that can appear during instrument usage.

Press **STIR** to start/stop the stirrer.

Press **Titrator** to enter titrator mode.

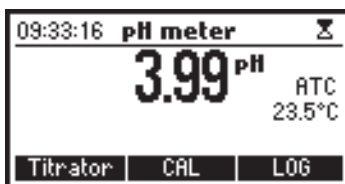
Press **CAL** to access the calibration menu.

Press **LOG** to memorize the current reading. A message indicating the free log space will be displayed for a few seconds.



In order to take pH measurements follow the next steps:

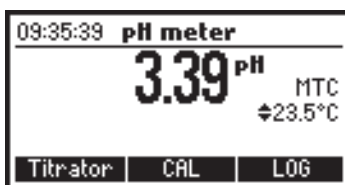
- Submerge the pH bulb 2 cm (0,8") and the temperature probe into the sample to be tested and stir gently. Allow time for the electrode to stabilize. When the reading becomes stable the  $\Sigma$  (unstable measurement) symbol will disappear.



- If the pH reading is less than -2.00 pH or greater than 16.00 pH the closest full-scale value (-2.00 pH or 16.00 pH) will be displayed blinking.

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

The pH measurement is affected by temperature. In order to have accurate pH measurements,

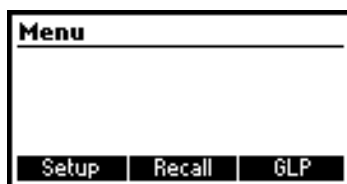


the temperature effect must be compensated for. To use the Automatic Temperature Compensation (ATC) feature, connect and submerge the HI 7662-M temperature probe into the sample in the dedicated guide tube and wait for a few seconds. The "ATC" message will be shown on the display. Automatic Temperature Compensation will provide pH corrected values at the temperature

of measurements. If Manual Temperature Compensation (MTC) is desired, the temperature probe must be disconnected from the instrument. The default temperature of 25 °C (77 °F) or the last temperature reading will be displayed preceded by the symbol  $\blacklozenge$  and the "MTC" message. The manually set temperature can now be adjusted with the **ARROW** keys (from -20.0 to 120.0 °C).

### VIEW/DELETE RECORDED pH DATA

To view or delete previously logged pH records press **MENU** key while in pH meter screen.



Press **Recall** to access the pH recall. A list of records is stored in the pH log.

	pH	Date
5	8.14	2008/01/24
6	8.15	2008/01/24
7	8.19	2008/01/24
8	8.25	2008/01/24

At the bottom of the table are three buttons: "Delete All", "Delete", and "More".

Use the **ARROW** keys to scroll the list of records.

Press **More** to see detailed information about the highlighted record.

Press **Delete** to enter record deleting mode. Press **Delete All** to enter all records deleting mode.

If **More** is pressed a complete set of data is displayed.

Record number: 6	
2008/01/24	09:15:45
8.15pH	21.3°C
Offset: 4.7mV	
Slope: 102.7%	

A small  $\blacklozenge$  symbol is located at the bottom right of the table.

Use **ARROW** keys when  $\blacklozenge$  is displayed to scroll between the records.

If **Delete** was pressed the instrument will ask for confirmation.

Delete Record?		
1	3.40	2008/02/15
2	2.95	2008/02/15
3	5.30	2008/02/15
4	7.36	2008/02/15

At the bottom of the table is a button labeled "Confirm".

Use the **ARROW** keys to focus on the record to be deleted.

Press **Confirm** to delete the record or **ESC** to return to the previous screen without deleting.

Deleting a record will renumber the list of records.  
If **Delete All** was pressed the instrument will ask for confirmation.

Delete all records?		
1	3.40	2008/02/15
2	2.95	2008/02/15
3	5.30	2008/02/15
4	7.36	2008/02/15

**Confirm**

Press **Confirm** to delete all records or **ESC** to return to the previous screen without deleting.  
If the pH log is empty the message "No Records!" will be displayed.

pH log on demand
<b>No Records!</b>

### **pH METER GLP INFORMATION**

The pH meter GLP screens references the last pH calibration data. **GLP** is an acronym for **Good Laboratory Practice**.

To view this information, press **MENU** key then **GLP**.

A set of information regarding electrode calibration is displayed.

Last elec. cal	Buffer
Date: 2008/02/22	8.20
Time: 09:21:23	7.01
Cal Expire: 3 days	4.01
Offset: -2.5mV	
Slope: 97.9%	

The following items are included in electrode GLP: the time and date of the last calibration, offset, slope, calibration timeout and the calibration buffers.

Last elec. cal
<b>Not Calibrated</b>

If a calibration hasn't been performed the message "Not Calibrated" will be displayed.

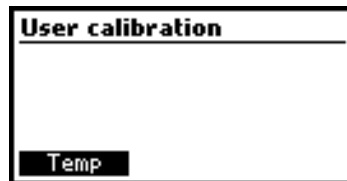
## **TEMPERATURE CALIBRATION PROCEDURE (for technical personnel only)**

All the instruments are factory calibrated for temperature.

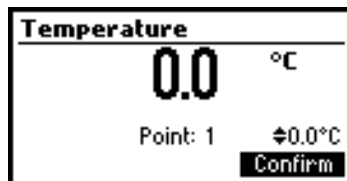
HANNA's temperature probes are interchangeable and no temperature calibration is needed when they are replaced.

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 below.

- 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.
- To enter user calibration screen press and hold down the **ARROW** keys simultaneously, then power on the instrument. After a few seconds the **User calibration** screen is displayed.

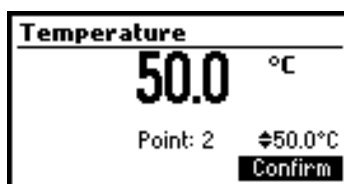


- Press **Temp** function key to enter temperature calibration.
- Immerse the temperature probe in the vessel with ice and water as near as possible to the reference thermometer. Allow a few seconds for the probe to stabilize.
- Use the **ARROW** keys to set the calibration point value to that of the ice and water measured by the reference thermometer.
- The **⊠** (unstable measurement) symbol will be shown on the display until the reading becomes stable.
- When the reading is stable and close to the selected calibration point, the **⊠** (unstable measurement) symbol will disappear and the **Confirm** key will become active.



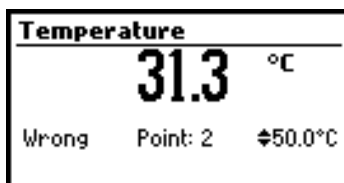
- Press **Confirm** to confirm the calibration point.
- The meter will be automatically move to the second calibration point, and will display 50 °C for the buffer value.

- Immerse the temperature probe in the second vessel as near as possible to the reference thermometer. Allow a few seconds for the probe to stabilize.
- Use the **ARROW** keys to set the calibration point value to that of the hot water, measured by the reference thermometer.
- The **Σ** (unstable measurement) symbol will be shown on the display until the reading becomes stable.
- When the reading is stable and close to the selected calibration point, the **Σ** (unstable measurement) symbol will disappear and the **Confirm** key will become active.

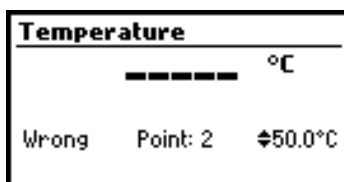


- Press **Confirm** to confirm the calibration point. The instrument will return to the pH meter/ titrator main screen.

**Note:** If the reading is not close to the selected calibration point, the "Wrong" message will be displayed. Change the temperature probe and restart the calibration.



If the temperature probe is disconnected or the measured temperature is out of the - 20 to 120 °C range the instrument will display "----". The calibration point value can be changed using the **ARROW** keys.



## TROUBLESHOOTING GUIDE

SYMPTOMS	PROBLEM	SOLUTION
Slow response/excessive drift.	Dirty pH electrode.	Soak the electrode tip in <b>HI 7061</b> cleaning solution for 30 minutes. Refill with fill solution.
Reading fluctuates up and down (noise).	Clogged/dirty junction. Low electrolyte level (refillable pH electrodes only). Cable connection.	Soak the electrode tip in <b>HI 7061</b> cleaning solution for 30 minutes. Refill with fill solution. Check cable connection to meter and verify protective cap is off.
While in pH reading mode, -2.00 or 16.00 pH is displayed blinking.	Reading out of range.	Check cable connection to meter and verify protective cap is off. Check the quality of the sample. Clean the electrodes. Refill with fresh fill solution.
The meter does not accept the pH buffer solution for calibration.	Broken pH electrode.	Replace the electrode or contact the vendor.
The pump calibration can't be performed	Broken pump tubing. Wrong or contaminated pump calibration solution. Broken pH electrode.	Verify tubing is intact and solution passed when purged. Check the pump calibration solution. Verify electrode is calibrated in fresh pH buffers. Prepare another standard, purge to have fresh titrant and restart the calibration.
The temperature probe is connected, but the meter displays "MTC".	Broken temperature probe.	Replace temperature probe.
After a titration the instrument displays 1.20% CA, 1.41% TA or 1.26% MA for low range; 8.00% CA, 9.30% TA or 8.30% MA for high range, with the selected unit blinking.	Broken electrodes. Instrument not calibrated. Wrong sample. Concentration out of range.	Check/clean the electrodes. Recalibrate the instrument (pump and pH). Use care during sample preparation. Check sample size and permitted range.
At startup the meter displays the HANNA logo permanently.	One of the keys is stuck.	Check the keyboard or contact the vendor.
"Error xx" message is displayed.	Internal error.	Power off the meter and then power it on again. If the error persists, contact the vendor.



## **ELECTRODE CONDITIONING AND MAINTENANCE**

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### **STORAGE PROCEDURE**

To assure a quick response time, the glass bulb 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. Follow the Preparation Procedure section before taking measurements.

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

### **PERIODIC MAINTENANCE**

Inspect the electrodes and the cables. The cable used for connection to the instrument must be intact and there must be no 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 CLEANING PROCEDURE**

- *General* Soak in Hanna **HI 7061** or **HI 8061** General Cleaning Solution for approximately ½ hour.

**IMPORTANT:** After performing any of the cleaning procedures, rinse the electrode thoroughly with distilled or deionized water and soak the electrode in **HI 70300** or **HI 80300** Storage Solution for at least 1 hour before use. Recalibrate electrode before taking measurements.

## ACCESSORIES

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### REAGENTS

HI 84432-50	Titration solution (100mL)
HI 84432-55	Pump calibration solution (100mL)
HI 84432-70	Reagents kit (about 150 titrations)

### pH CALIBRATION SOLUTIONS

HI 7004M	Buffer solution pH 4.01 (230mL)
HI 7007M	Buffer solution pH 7.01 (230mL)
HI 70082M	Buffer solution pH 8.20 (230mL)
HI 7004M-6	Buffer solution pH 4.01 (6 x 230mL)
HI 7007M-6	Buffer solution pH 7.01 (6 x 230mL)
HI 70082M-6	Buffer solution pH 8.20 (6 x 230mL)

### ELECTRODES

HI 1131B	pH Electrode
HI 7662-M	Temperature probe

### ELECTRODE FILL SOLUTION

HI 7071	Filling solution for HI 1131B (4x30 mL)
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### ELECTRODE STORAGE SOLUTION

HI 70300M	Storage Solution, 230 mL bottle
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### CLEANING SOLUTION

HI 7061M	Electrode Cleaning Solution, 230 mL bottle
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### OTHER ACCESSORIES

HI 70483M	Tube set with cap and tip for titrant bottle
HI 731319	Stir bar 25 x 7 mm (10 pcs)
HI 731342	2000 $\mu$ L fixed - volume pipette for automatic dosage
HI 731352	Tip for 2000 $\mu$ L fixed - volume pipette (4pcs.)
HI 731341	1000 $\mu$ L fixed - volume pipette for automatic dosage
HI 731351	Tip for 1000 $\mu$ L fixed - volume pipette (25pcs.)

## **WARRANTY**

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HI 84432 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to the instructions.

This warranty is limited to repair or replacement free of charge.

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

If service is required, contact your dealer. 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 shipment 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.

## **RECOMMENDATION FOR USERS**

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

Operation of this instrument may cause unacceptable interferences to other electronic equipments, this requiring the operator to take all necessary steps to correct interferences.

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

To avoid damages or burns, do not put the instrument in microwave ovens. For yours and the instrument safety do not use or store the instrument in hazardous environments.

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