# INSTRUCTION MANUAL

**HANNA**®
**instruments**

HI6221
# Advanced pH and ORP
# Benchtop Meter

## Dear Customer,

Thank you for choosing a Hanna Instruments® product.

Please read this instruction manual carefully before using this instrument as it provides the necessary information for correct use of this instrument, as well as a precise idea of its versatility.

If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com.

Visit www.hannainst.com for more information about Hanna Instruments and our products.

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# 1. PRELIMINARY EXAMINATION

HI6221 is Hanna's® advanced benchtop pH and ORP meter with a large touch screen display and streamlined design. Each HI6221 is supplied with:

- HI1131B pH electrode
- HI7662-TW temperature probe
- pH calibration starter kit consisting of:
  - pH 4.01 buffer solution (2 sachets)
  - pH 7.01 buffer solution sachet (4 sachets)
  - pH 10.01 buffer solution sachet (2 sachets)
- HI700601 electrode cleaning solution sachet (2 sachets)
- HI70300S storage solution for pH & ORP electrodes (25 mL)
- HI7082 3.5M KCl electrolyte solution (30 mL)
- HI764060 electrode holder with following accessories:
  - base plate (with integrated pivot pin) and screw (requires installation)
  - cable holder clip, attached
  - electrode holder with adapter, attached
- Capillary pipette
- 24 VDC power adapter
- USB-C to USB-A cable
- Probe quality certificate
- Quick reference guide with instrument quality certificate

For **ORP** (redox) measurements a separate sensor is required. See Accessories section for available ORP models.

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

# 2. SAFETY MEASURES

### Handling and usage precautions

The unit, while not fragile, can be damaged by improper handling and usage.
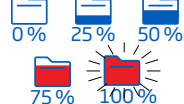
- Transport the unit with all cables removed.
- Keep the unit on a stable and even surface, away from contact with liquid.
- Avoid excessive dirt and dust.
- Protect the unit from contact with food, oils, and chemicals.
- If the device becomes wet, gently wipe the exterior with a clean, dry cloth.
- Keep away from direct sunlight.
- Use in a safe place that is appropriate to application requirements.
- Use attachments and accessories specified in this manual only.
- Capacitive touchscreen and buttons — operate without applying pressure.
- Do not puncture the capacitive touchscreen or drop the unit.
- Do not use the device near heat sources.
- Do not place objects on top of the device.
- Do not insert objects into the ports, spaces around keys, other than the intended cable, USB drive.

## 3. USER INTERFACE – ICONS

| Capacitive keys | Description |
|---|---|
| < | **Back** – return to a previous hierarchical menu level |
| ○ | **Home** – access to measurement screen & configured profile |
| ≡ | **Menu** – access to Users, System Settings, Measurement Settings, Log Recall, Help |

| Main menu | Description |
|---|---|
| 😊 | Users – login & rights configuration |
| 🔧 | System Settings – system configuration, connectivity & printing items |
| ⚙ | Measurement Settings |
| ▶ | Log Recall – access logged measurement data |
| ❓ | Help – access support |

| Measurement | Description |
|---|---|
| ⚙ | Measurement Menu, accessed from measurement screen |
| (pH electrode) | pH electrode (seen in full GLP view) |
| 🔒 | Autohold applied |
| pH / mV | Autohold, waiting stable pH/mV measurement |
| ⚠ / ⚠ | Warning on standby / active function |

| Logging | Description |
|---|---|
| ● / ■ #00002 00:00:12 | Start / Stop logging (current index and time since log start) |
| M / M #00012 | Manual logging (current index) |
| D | Triggers log session, pending next stable measurement |
| A | Autohold logging in progress |
| 💬 / 💬 | Annotated text/Annotated text in use |
| 0% 25% 50% 75% 100% | Available storage capacity (at full capacity the icon is displayed blinking) |

| Log recall | Description |
|---|---|
| ⊞ / ⊞ | Table view, function active/not selected |
| ⊞ / ⊞ | Graph view, function active/not selected |
| ⓘ / ⓘ | Information view, function active/not selected |

| General | Description |
|---|---|
| ⌗ | Profile |
| ⧗ | Background operation in progress |
| ⏰ | Alarm enabled |
| Unstable   Stable   Autohold | Stability/Autohold indicator |
| ‹ ›  ‹ › | Active buffer selection during manual or semiautomatic calibration Forward/backward navigation, sequence of steps (gray icon: function not available) |
| ← →  ← → | Calibration procedure, buffer selection, tutorial sequence of steps (gray icon: function not available) |

| Connectivity & Printing | | Description |
|---|---|---|
| Ethernet | ⬚ | Connection established (tap for IP address) |
| | ⬚ 0.5 sec. ⬚ | Connection in progress |
| | ⬚ | Connection error |
| Wi-Fi | 📶 | Connection established (tap for IP address) |
| | 📶 0.5 sec. 📶 | Connection in progress |
| | 📶 | Connection error |
| USB | ▬ | USB-A or USB-C key plugged in |
| | ▬ | High-power consumption with key plugged in |
| PC | ▭ | PC connection established through USB-C port |
| Printer | 🖶 | Printer connected - printing manual log option **enabled** |
| | 🖶 | Printer connected - printing manual log option **disabled** |
| | 🖶! | Printer not recognized or no longer connected |
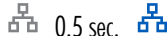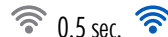
## 4.  GENERAL DESCRIPTION & INTENDED USE

HI6221 is an advanced benchtop meter with a capacitive display, comprised of a housing and an integrated pH/ORP measurement module. Compact and easy to operate, the meter is delivered with Hanna Instruments HI1131B combination pH electrode and HI7662-TW temperature probe for pH measurement.
A separate ORP sensor is required for ORP measurements.

HI1131B is a glass body, double junction, refillable pH electrode with an indicating sensor made of high temperature (HT) glass. The double junction reference and HT glass design allow the HI1131B to be used in a wide variety of applications.
Probe connection to the unit is secured through a galvanically isolated BNC connection.

HI7662-TW stainless steel temperature probe allows the meter to perform automatic temperature compensation (ATC).

This system responds to a complex range of measurement and monitoring requirements, providing accuracy, reproducibility, and reliability.

HI6221 is supplied with an electrode holder that has a flexible arm. The holder can be mounted quickly and provides secure support for electrodes while taking measurements in sample containers.

This benchtop meter supports:
  • USB type A — support for USB drive, printer, keyboard
  • USB type C — support for USB drive, PC connection
The user can select between five different views.
  • Basic measurement configuration
  • Simple GLP with calibration information
  • Full GLP with electrode status and calibration point details (pH only)
  • Live updated, interactive graph
  • Tabulated data with date, time, and notes

**Capacitive touch screen with multi-touch support**
The benchtop unit has a 7-inch color display with 800 x 480p resolution. The capacitive, multi-touch screen supports video playback and data plotting.

## 4.1. MAIN FEATURES

**Measurement & Calibration**

- Measure pH/mV (pH) or mV/Rel.mV (ORP) with temperature
- Application-specific profiles allow quick and direct measurement without the need to update the sensor and system settings
- Active log during measurement
- Measurement stability indicator (using the Stability Criteria setting)
- Reading modes: direct and direct/autohold
- pH temperature compensation can be Automatic (using temperature probe) or set manually
- Audible and/or alarm messages for measurements outside predefined limits
- Galvanic isolation for pH/ORP measurement module
- 5-point pH calibration with automatic recognition for standard buffers (Hanna and NIST buffers)
- Choice of standard or custom buffers for calibration
- Non-volatile memory saves data and settings

**Logging**

- Data log collection of at least 1 000 000 data points (with time and date stamp)
- Logging types: manual, automatic, autohold
- Sample ID for manual and autohold data

**Connectivity features & services**

- Transfer logged data to a USB thumb drive
- Log files include measurements and calibration data (as .CSV file)
- FTP and email for log export via Ethernet and Wi-Fi connection
- Download logs using the benchtop's embedded web server
- USB type A for USB drive, printer, and keyboard
- USB type C for USB drive and PC connection

**User-support feature**

- Help section — brief overview of instrument's main functionalities and features

# 5. SPECIFICATIONS

## 5.1. INSTRUMENT

| | | |
|---|---|---|
| pH | Range* | −2.0 to 20.0 pH<br>−2.00 to 20.00 pH<br>−2.000 to 20.000 pH |
| | Resolution | 0.1 pH<br>0.01 pH<br>0.001 pH |
| | Accuracy | ±0.1 pH<br>±0.01 pH<br>±0.002 pH<br>(±1 last significant digit) |
| mV | Range | −2000.0 mV to 2000.0 mV |
| | Resolution | 1 mV<br>0.1 mV |
| | Accuracy | ±0.2 mV ±1 last significant digit |
| Temperature | Range | −20.0 to 120.0 °C<br>−4.0 to 248.0 °F<br>253.2 to 393.2 K |
| | Resolution | 0.1 °C / 0.1 °F / 0.1 K |
| | Accuracy | ±0.2 °C / ±0.4 °F / ±0.2 K |
| Relative mV offset | Range | ±2000.0 mV |
| Reading | Modes | Direct<br>Direct/Autohold |
| | Stability criteria | Accurate<br>Medium<br>Fast |
| | Isopotential | −2.000 to 20.000 pH |
| | Sampling rate | 1000 ms |
| pH calibration | Calibration points | Up to 5 |
| | Type | Automatic<br>Semiautomatic<br>Manual |
| | Standard buffers | Hanna and NIST<br>pH 1.68, 3.00, 4.01, 6.86, 7.01, 9.18, 10.01, 12.45 |
| | Custom buffers | Up to 5 |
| | Custom group | Up to 5 |
| | 1st calibration point | Offset or Points (user setting) |
| | Reminder | Daily: 0 min. to 23 hours and 59 min.<br>Periodic: 1 min. to 30 days, 23 hours and 59 min.<br>Disabled |

*The range may be limited by the probe's limits.

| | | |
|---|---|---|
| Temperature user calibration | | 1 point, adjustable |
| pH views | Basic | Measurement<br>    pH: pH measurement and pH mV<br>    mV: measurement<br>    Rel.mV: measurement, Absolute mV<br>Temperature (ATC or MTC)<br>Measurement profile (when enabled)<br>Stability status |
| | Simple GLP | Basic view information<br>pH last calibration date, electrode offset, average slope, and electrode condition (for 24 hours after calibration)<br>Rel. mV: Last Calibration, Offset |
| | Full GLP (pH only) | Simple GLP information and calibration point details |
| | Graph (Plot) | pH, mV, Rel. mV and temperature versus time graph can be panned or zoomed (pinch-to-zoom technology) |
| | Table | Measurements updated every second are displayed in table. With Manual logging type, configuration displays table of logged data points. |
| pH temperature compensation | | Automatic or Manual |
| Logging | Type | Automatic<br>Manual<br>Autohold |
| | Number of records | 50 000 maximum per file<br>Stores at least 1 000 000 data points per user |
| | Automatic interval | 1, 2, 5, 10, 30 seconds<br>1, 2, 5, 10, 15, 30, 60, 120, 150, 180 minutes |
| | Sample ID | Incremental mode or manual |
| | Export option | .CSV file format |
| Users | | Up to 9 users and the default administrator account |
| Connectivity | USB-A | 2 ports for keyboard and/or printer input or USB thumb drive |
| | USB-C | 1 port for PC connectivity and USB-C type thumb drive |
| | Wi-Fi & Ethernet | FTP<br>Web server                          Log transfer and download<br>Email |
| | RS232 | Connecting peripherals |
| Power supply | | DC adapter 100-240 VAC to 24 VDC 2 A |
| Environment | | 0 - 50 °C / 32 - 122 °F / 273 - 323 K<br>maximum 95 % RH non-condensing |
| Dimensions | | 205 x 160 x 77 mm (8.0 x 6.2 x 3.0 ") |
| Weight | | Approximately 1.2 kg (26.5 lbs.) |

## 5.2. ELECTRODES

### HI1131B — pH electrode

| | |
|---|---|
| Range | 0 to 13 pH |
| Reference cell type | Double, Ag/AgCl |
| Junction type | Ceramic<br>Single<br>15-20 $\mu$L per h |
| Refill electrolyte | 3.5M KCl |
| Maximum pressure | 0.1 bar |
| Body material | Glass |
| Tip shape | Spheric (Ø 9.5 mm) |
| Operating temperature | −5 to 100 °C (23 to 212°F) — HT |
| Temperature sensor | No |
| Amplifier | No |
| Cable | Coaxial; 1 m (3.3') |
| Recommended use | Laboratory samples, general purpose |

### HI7662-TW — Temperature probe

| | |
|---|---|
| Body material | Stainless steel |
| Connector type | RCA Phono connector |
| Dimensions | Total length: 100 mm (3.94 ")<br>Active part: Ø 3 mm (0.12 ") |
| Cable | 1 m (3.3') length |

# 6. FUNCTIONAL & LCD DESCRIPTION

## 6.1. MAIN UNIT

### Front View
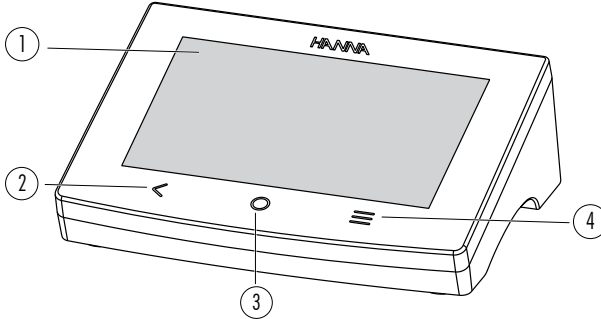


| | |
|---|---|
| 1. LCD display | 3. **Home** key |
| 2. **Back** key | 4. **Menu** key |

### LCD Description
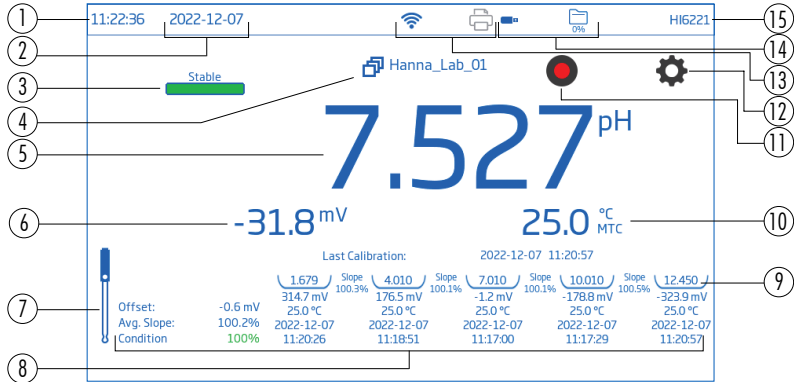


| | |
|---|---|
| 1. Current time | 9. Buffer trays |
| 2. Current date | 10. Temperature reading and temperature compensation status |
| 3. Stability indicator | 11. Start logging icon |
| 4. Measure profile | 12. Measurement Menu icon |
| 5. pH reading | 13. Connectivity and Printer icons |
| 6. pH mV reading | 14. USB connection status and Logging space availability |
| 7. pH electrode icon | 15. User name (default "Admin") |
| 8. Calibration information | |

## Status Area

| 09:27:32   07/02/2023 | 🛜 | 🔋 | 🗂️ 1% | Admin |

Continuously displayed after powering the unit, status area runs horizontally across the top of the LCD screen.
- Top left – current time & date
- Middle – connectivity status
- Top right – storage space availability & username

## Direct Keys

| Icon | Name | Function |
|------|------|----------|
| < | Back | • returns user to previous hierarchical menu level<br>• exit or escape function |
| ○ | Home | • access to measurement screen<br>• exit or escape function |
| ≡ | Menu | • access to Users, System Settings, Measurement Settings, Log Recall, Help |

## Rear View
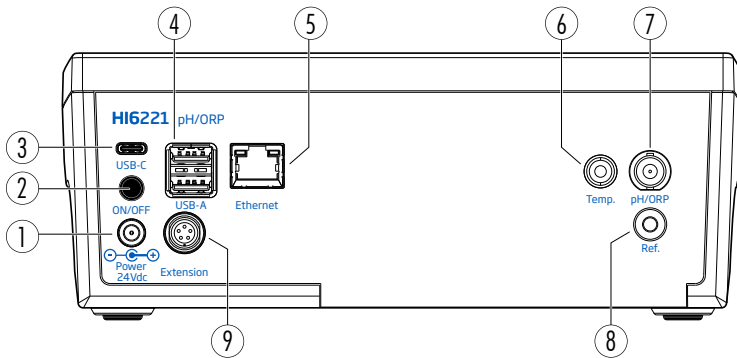


1. Input for power cable
2. Power button
3. Input for USB-C flash or PC cable
4. Input for USB-A flash (x2) or keyboard/printer
5. Ethernet port
6. Temperature probe connection port
7. pH/ORP probe connection port
8. Reference electrode socket
9. Peripherals port

## 6.2.  ELECTRODES

HI1131B

pH electrode

HI7662-TW
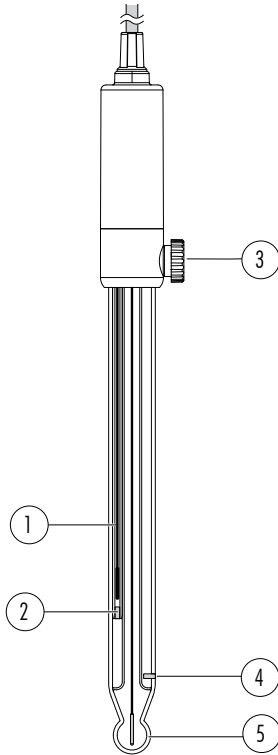
Temperature probe



1.  Reference wire
2.  Inner reference junction
3.  Reference fill cap
4.  Outer reference junction
5.  Glass bulb
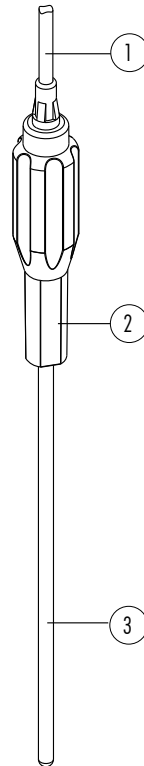
1.  Cable
2.  Handle
3.  Stainless steel tube

# 7. GETTING STARTED

## 7.1. ATTACHING THE ELECTRODE ARM

### Attaching the electrode holder base plate

- Take the HI764060 electrode arm from the box.
- Identify the metal base plate (4) with the integrated pivot pin (5) and the screw (2).
- The plate may be attached to either side of the meter, left (L) or right (R).
- Place the meter face down on a clean, dry surface.
- Align the hole on the base plate (3) over the rubber foot (6R or 6L). The pivot pin (5) should be facing downward.
- Use a screwdriver (1) to tighten the screw (2) and attach the base plate to the meter.
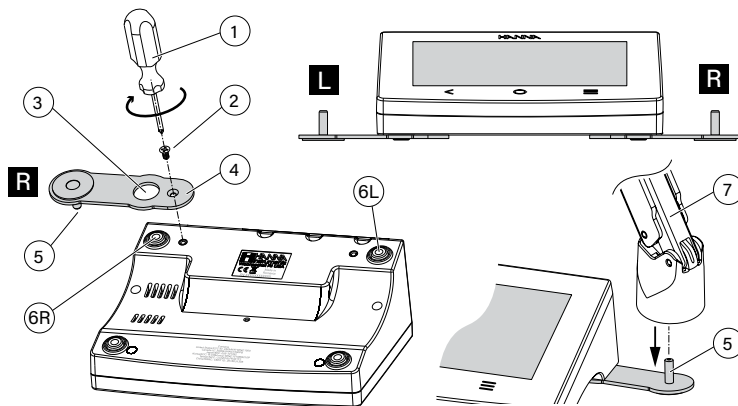


- Position the meter with the display facing up.
- Slide the electrode holder (7) over the pivot pin (5). A "slide in" motion is required to lock the arm into position.
- For increased arm rigidity, tighten the metal knobs on both sides of the electrode arm.

### Cable holder clip

The electrode holder is delivered with a cable holder clip (attached) that secures several cables whilst allowing them to move freely with the arm motion.

1. To open the latch, press the clip inward while pulling up the latch.
2. To close the latch, lower latch over cable and snap closed.
   The latch snaps in position and secures the cables inside.
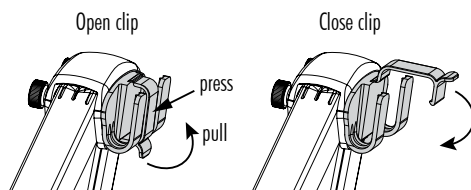
To reattach the clip onto the electrode arm:
1. Align the clip's dovetail over the slot.
2. Gently push down to slide in position.

Insert clip
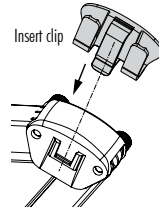
## Using the adapter

The electrode arm is ended with an electrode holder.
The holder is fitted with an adapter with three different-sized apertures:
- center-front (temperature probe only)
- center-back (adapter for pH or ORP probe)
- left and right (pH or ORP probe)

Adapter for pH probe center positioning

pH probe location

pH probe location

Temperature probe location
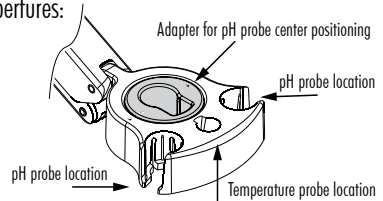
## 7.2. USING THE ELECTRODE HOLDER

Use the holder for electrode support and easy movement in and out of beakers and containers during calibration and sample measurement.

## 7.3. CONNECTING ELECTRODES & KEYBOARD

### Connecting the electrodes

HI1131B pH electrode attaches to the benchtop through a BNC connector, which makes attaching and removing the probe an easy process. When connected, the probe is automatically detected. With the meter off:
- Connect the probe to the BNC connection port (top right).
- Align the key and twist the plug into the socket.
- Place the probe into the holder and secure the cable. Power the unit.

*Note: ORP electrodes utilize the BNC connection.*

HI7662-TW temperature probe attaches to the benchtop through an RCA connector. With the meter off:
- Plug the connector into the socket.
- Place the probe into the holder and secure the cable. Power the unit.

*Note: Ensure connectors and plugs are correctly plugged in prior to operating the device.*

- Connect a pH or an ORP half cell to the BNC connector.
- Connect a reference half-cell electrode to the socket labeled **Ref**.
  A banana connector is required for a separate reference.

Temp.    pH/ORP
Ref.
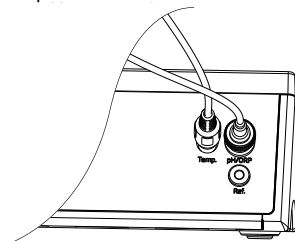
### HI6221 Electrode compatibility

- Analog pH or ORP electrode with BNC connector (non-amplified or non-digital)
- pH or ORP half-cell sensors and separate reference electrodes with suitable jack connectors
- Hanna Instruments pH electrodes with integral temperature elements. See Accessories, Electrodes section.

### Connecting a USB-A keyboard

Connect a USB's keyboard plug into the USB-A input on the back of the unit. Once connected the keyboard is automatically detected.

Users can attach a keyboard to set up calibration password, sample ID, user ID, or company/lab name.

### Connecting a printer

Hanna® aims to ensure meter compatibility with USB printers but can not ensure compatibility with all models. HI6221 can print directly to certain models of USB-dedicated printers with PCL printer language capability.

**Printer components and requirements**

- Printer, PCL driver compatible
- Cable
  - ▶ power cable
  - ▶ USB connector cable with two ends:
      type B connector (plugs into printer)
      type A connector (plugs into the USB port on the meter)

## 7.4. POWERING THE UNIT, SELECTING OPERATING LANGUAGE & REGIONAL PREFERENCES

1. Connect the power adapter to the rear panel of the meter.
2. Connect the power plug into the 24V power socket.
3. Press the black ON/OFF power button.
   At start up, the meter briefly displays the initialization screen.
4. The instrument launches into a Tutorial.
   Tap [Skip] to automatically enter measurement screen.
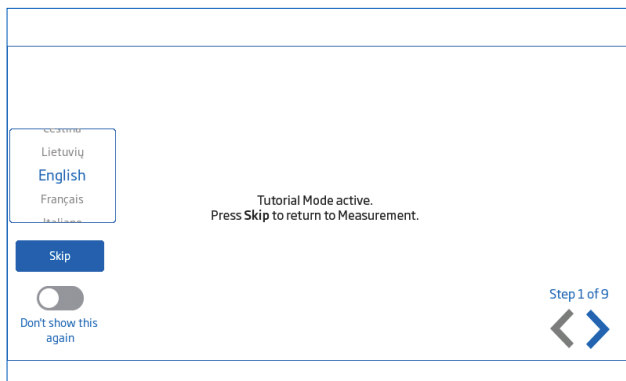


At first power on default language is English. A language window allows users to set operating language.

To configure regional preferences, from Tutorial screen:
- Tap ≡ (direct **Menu** key) to access System Menu screen.
- Tap 🔧 (System Settings icon) and select System tab.
   Users can change the date, time, and region settings, as well as language preferences.

## 7.5. BASIC OPERATIONS
General operating modes are setup, measurement, logging, and data sharing.
- Tap ≡ (**Menu** key) to access:
   - 😊 User settings
   - 🔧 System settings
   - ⚙ Measurement settings
   - ▶ Log recall files and file management.
      User can view a single sample or an interval log session, see Logging section for detailed description.
   - ❓ Help for text and video support
- Tap ◯ (**Home** key) to return to measurement.
- Tap ⚙ (Measurement Menu icon) to access sensor-related functions.

# 8. SYSTEM MENU ITEMS
Tap ≡ (**Menu** key) to access System Menu screen. Users must have previously logged in.
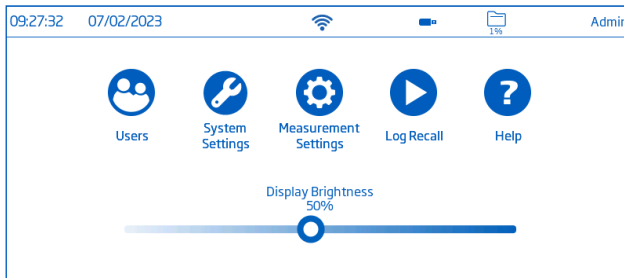


### System Menu icons

| Symbol | Name | Functionality |
|--------|------|---------------|
| 😊 | Users | Login and rights configuration & instrument accessibility |
| 🔧 | Settings | System configuration, connectivity and printing items |
| ⚙ | Measurement Settings | Tap to start configuring sensor-related functions |
| ▶ | Log Recall | Access logged measurement data |
| ❓ | Help | Access video-supported outline of main instrument functionalities |

### Brightness control bar



Drag the slider along the control bar to adjust brightness.

## 8.1. USERS

Users is the first item under the System Menu and enables multiple-users configuration, rights management, and account creation.
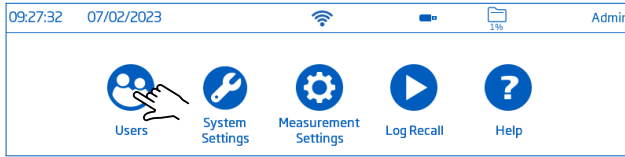


On first access, "Admin" is used as default user name and no password is required. Default options are updated from the Users menu.

| Function | Administrator Rights* | Standard User |
|---|:---:|:---:|
| Enable account creation | ✓ | — |
| Reset password | ✓ | — |
| Delete account | ✓ | — |
| Assign administrator rights | ✓ | — |
| View/Use Factory Settings reset | ✓ | — |
| Customize settings | ✓ | ✓ |
| Add FTP information | ✓ | ✓ |
| Change password | ✓ | ✓ |
| View and delete log files | ✓ | ✓ |

*Settings and configurations made by users with administrator rights can only be modified by users with identical rights.

### Log in & Create New Account

1. Power the instrument.
   Wait for the initialization process to complete.
2. Tap `Skip` to enter Measurement screen.
   **Note:** Tap ⬤ (under `Skip`) to disable Tutorial.
3. Tap ≡ followed by 😊.
4. Tap **Edit Users** to enter Account Management.
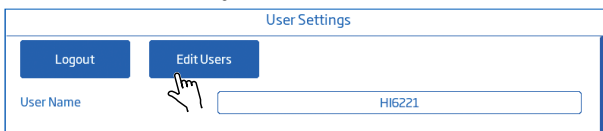


5. Tap ⬤ to enable Account Creation and Logins. Tap ＜ to return.
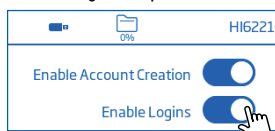
6. Tap **Logout** to enter Users screen. "Admin" account is automatically created (default).
7. Tap the **plus** symbol avatar.
8. Input user name and tap ⏎.
9. Enter password and tap ⏎. Reenter password to confirm.
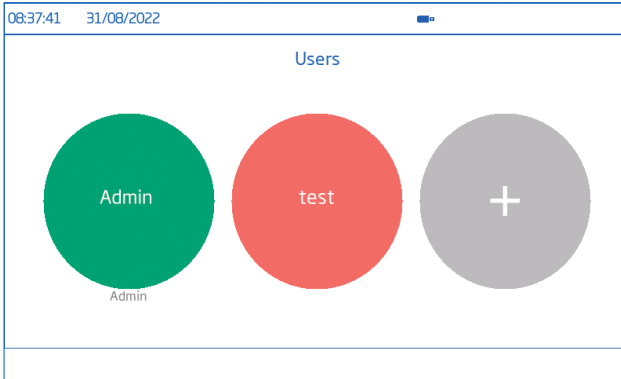


## Log Out & Switch User
1. Tap 😊 followed by **Logout**.
2. Tap on user's account avatar.
3. Input password.

## Adding & Removing Users (users with administrator rights only)
1. Tap ☰ followed by 😊.
2. Tap **Edit Users** to enter Account Management screen and start editing.
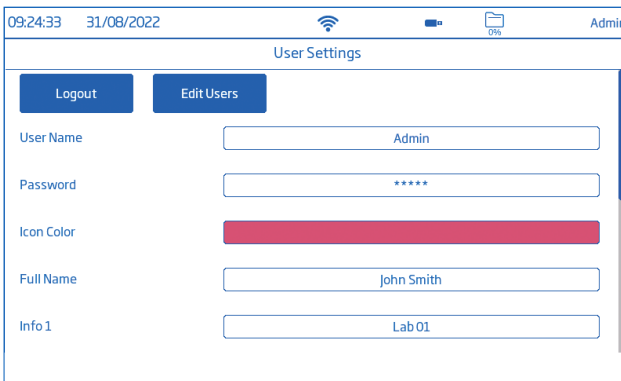


## Configure user settings
## Name, Password, Icon Color, Full Name, information fields, FTP-dedicated fields, Email Address
- To edit option, tap field and use the on-screen keypad to input information.
- Use the FTP dedicated fields and email address for file transfer of logged data.

### Account Management

Users with administrator rights are able to:
- Enable Account Creation
- Enable Logins
  Each power up requires user selection before instrument enters measurement mode.
- Enable Admin i.e. assign administrator rights to a standard user
- Reset Password
  1. Select user name from users list.
  2. Tap **Reset Password**.
     The password is removed. User can set a new password.
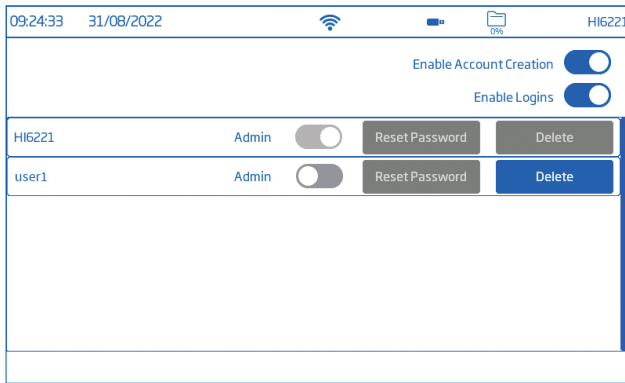


- Delete users
  Select user name and tap **Delete**. The instrument prompts for confirmation.
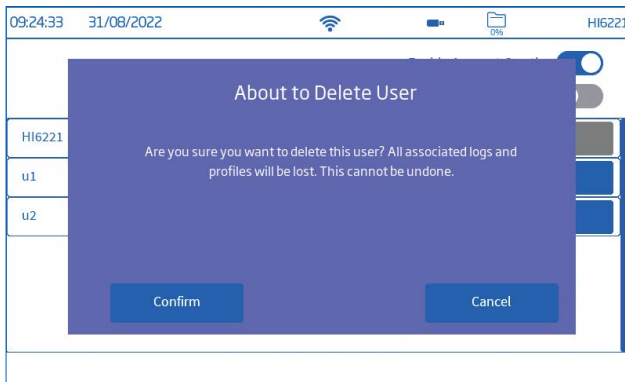
## 8.2. SYSTEM SETTINGS

System Settings is the second item under the System Menu.

**Network**, **Connect & Print**, **System** tabs permit users to navigate system settings and operations, configure network connection and architecture, connectivity and printing services, change system settings, and view meter information.

**System Settings overview**
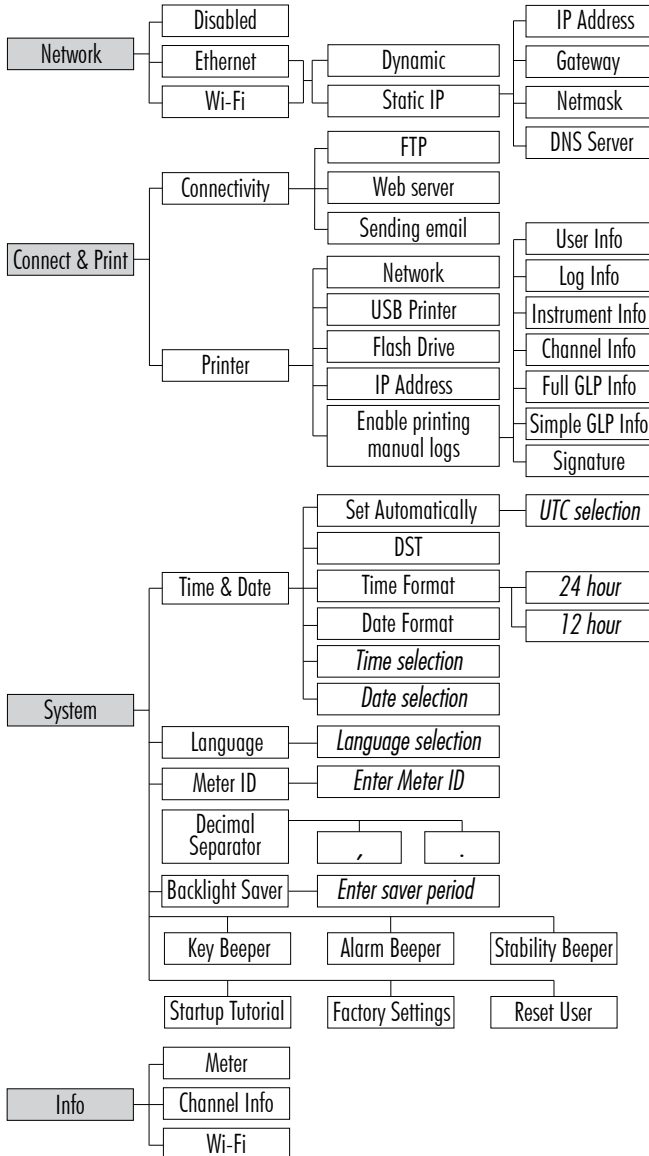
## Network

### Data sharing options: Ethernet, Wi-Fi, or Disabled

With connection established, IP assignment can be set as:
- Dynamic – IP Address, Gateway, Netmask, DNS Server are auto assigned
- Static – network details are filled in manually

To fill in network information:
1. Tap **IP Address** field.
2. Input address and tap ⏎.

Wi-Fi connectivity
1. Tap **Wi-Fi**.
2. Select the IP address type (Dynamic or Static).
3. Tap **Press to select network**.
4. Scan options and select preferred network.
   Enter password if/when prompted.
5. Tap ⏎ to confirm.
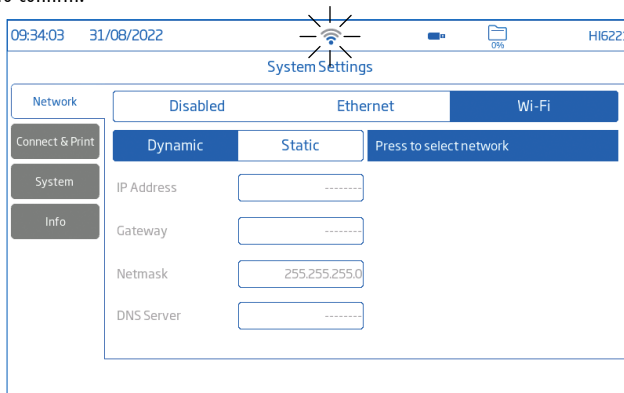


*Note:* *With connection established, tap* 🖧 *or* 📶 *to check IP address or verify connection status.*

*When attempting to connect,* 📶 *icon is displayed* 📶 *5 sec.* 📶*.*

## Connect & Print

### Options: Connectivity, Printer

Tap ⬤ to enable (disable) following **connectivity** options:
- FTP access to meter: log file transfer to an FTP site and meter FTP server connection to client (log download)
- Meter web server: log file download to a web client
- Sending emails: log file transfer via email

*Note: Email address is entered under User.*
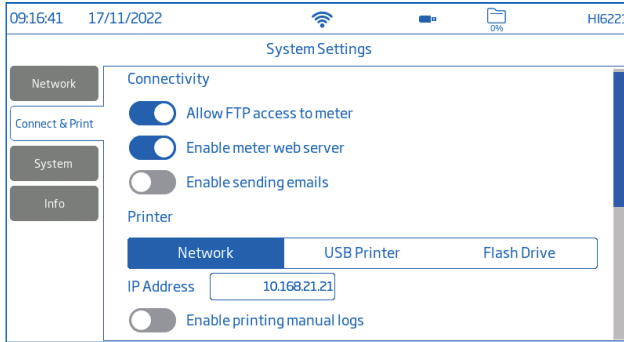
## Printer
## Options: Network, USB Printer, Flash Drive

- Select **Network** to connect a printer in the same network. Tap to enter IP address.
- Select **USB Printer** to connect a printer via USB-A port.
- Select **Flash Drive** to export log files directly to USB Flash Drive.
- Tap **Enable printing manual logs** to send files to configured printer. Tap to enable for printing: User, Log, Instrument, and Channel information, Full GLP, Simple GLP, Signature.

*Note: Printer options are available with a printer connected only.*
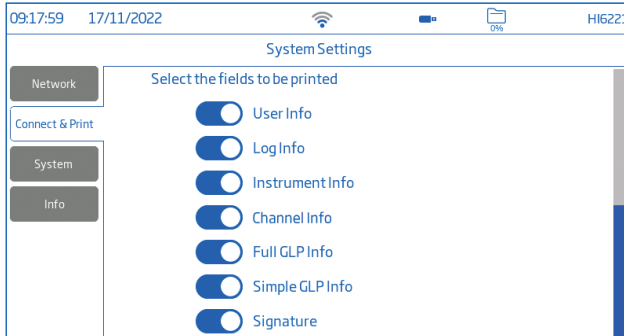
## System

**Options:** Time, Date, Language, Meter ID, Decimal Separator, Backlight Saver, Beepers, Startup Tutorial, Factory Settings, Reset User

*Note: Use the scroll bar to view or select from entire settings list.*

### Time & Date

Tap 🔵 to enable (or disable):

- **Set Automatically** (meter must be connected to the internet)
  ▸ Direct selection from scrollable list of options
  ▸ UTC options:
    from UTC 00:00 to UTC+14:00
    from UTC 00:00 to UTC -12:00 (half hour increments)
- **DST** (Daylight Savings Time) seasonal time change is used in some locations that advances clocks (typically by one hour) during warmer months.
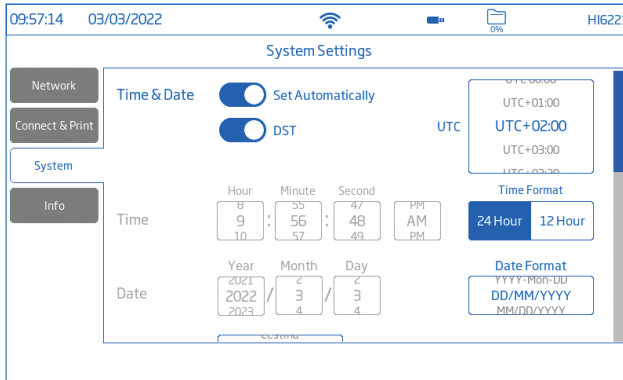




**Time:** Hour, Minute, Second, time of day (AM or PM), time format (24 or 12 Hour)
*Note: Set Automatically must be disabled*

**Date:** Year, Month, Day, choice of display formats ( DD-Mon-YYYY; YYYY-Mon-DD; DD/MM/YYYY; MM/DD/YYYY; YYY/MM/DD; YYYY-MM-DD; Mon DD, YYYY )
*Note: Set Automatically must be disabled*

**Language:** select from list of supported options to change meter's interface language

### Meter ID

Name the meter with a discrete name, location, or number.

Tap ⏎ to save.
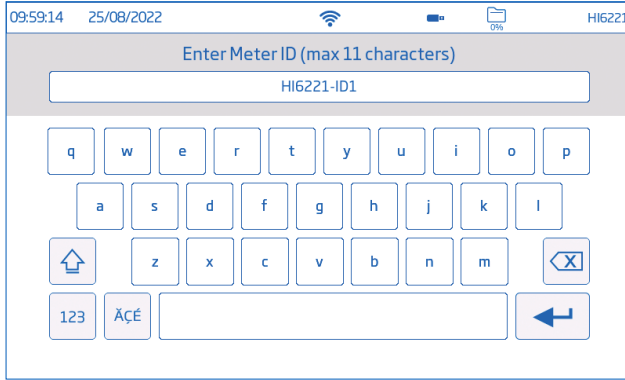


Tap ⬤ or corresponding tab to enable (or disable) following settings:

• **Decimal Separator**: comma or period
• **Backlight Saver**: enabled, 1 to 60 minutes (or disabled)
  If the backlight turns off after the set period of time, tap to turn it back on.
• **Beeper**: Key, Alarm, Stability
  When enabled, an audible signal alerts users in the event of a wrong key press, an alarm condition, or the stability threshold being exceeded.
• **Startup Tutorial:** if disabled, the meter does not launch into Tutorial at power on.
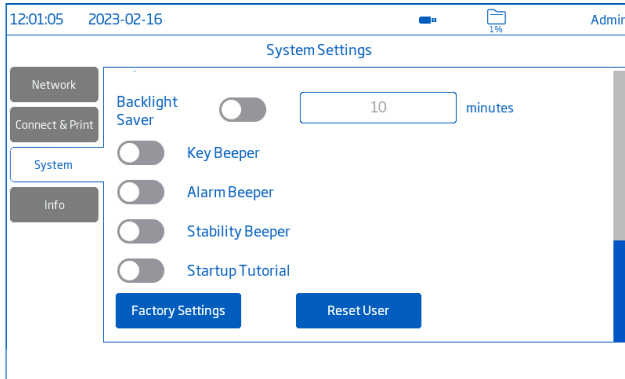


### Factory Settings

Option restores system settings i.e. resolution for measured data, temperature unit, view mode, and alarm to original factory values. Restoring factory settings deletes all user information, logs, or configured measurement profiles. When option invoked, the instrument asks for confirmation.

*Note: Option available to users with administrator rights only.*
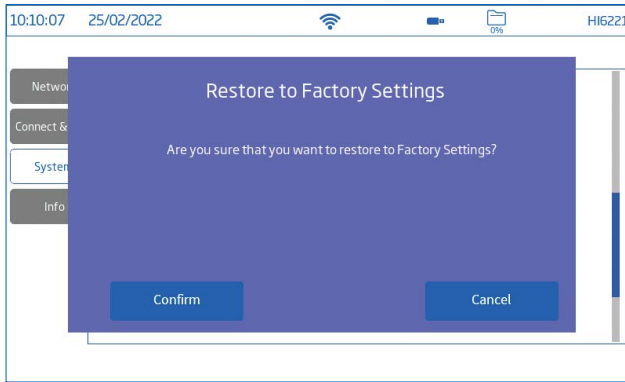


## Reset User

Option restores default settings for this user. All data (including profiles and log files) specific to this user will be permanently deleted, except for the username and password.

When option invoked, the instrument asks for confirmation.

## Info

Read-only item displays information on meter, channel serial number, and Wi-Fi firmware version.
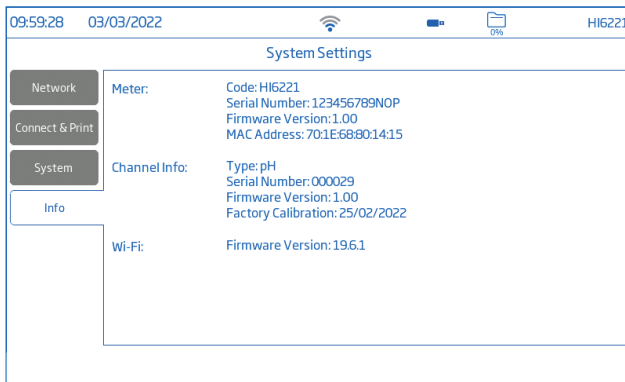


## 8.3. MEASUREMENT SETTINGS

Measurement Settings is the third item under the System Menu and allows setting calibration, reading, temperature, view, alarms, logging and measurement profile options.
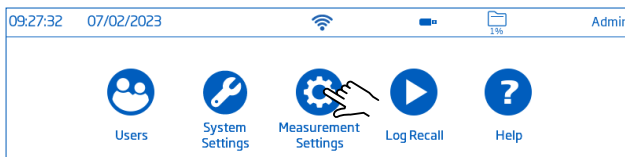
## Measurement Settings Overview

**Calibration**, **Reading**, **Temperature**, **View**, **Alarms**, **Logging**, **Profile** tabs help user navigate through all measurement operations. The following table presents an overview of possible functions.

### Calibration

|  |  | pH | mV | Rel.mV |
|---|---|---|---|---|
|  | Last Calibration | Calibrate<br>Clear | ✓ | Calibrate<br>Clear |
|  | Buffer Entry Type | Automatic<br>Semiautomatic<br>Manual | ✓ | ✓ |
|  | Buffer Auto Confirmation | Enabled<br>Disabled | − | − |
|  | First Calibration Point | Point<br>Offset | ✓ | ✓ |
|  | Calibration Reminder | Disabled<br>Daily<br>Periodic | ✓ | Disabled<br>Daily<br>Periodic |
|  | Buffer Group | User defined | ✓ | ✓ |

### Reading

|  |  | pH | mV | Rel.mV |
|---|---|---|---|---|
|  | Resolution | 0.1<br>0.01<br>0.001 | 1<br>0.1 | 1<br>0.1 |
|  | Stability Criteria | Accurate, Medium, Fast | | |
|  | Reading Mode | Direct, Direct/Autohold | | |

### Temperature

|  |  | pH | mV | Rel.mV |
|---|---|---|---|---|
|  | Temperature Source | Automatic, Manual | | |
|  | Temperature Unit | °C, °F, K | | |
|  | Manual | −20.0 to 120.0 °C<br>−4.0 to 248.0 °F<br>253.2 to 393.2 K | | |
|  | Isopotential Point | user defined<br>(−2.000 to 20.000) | ✓ | ✓ |
|  | User Temperature Calibration | Calibrate, Clear | | |

## View

|  |  | pH | mV | Rel.mV |
|---|---|---|---|---|
| | View Type | Basic<br>Simple GLP<br>Full GLP<br>Graph<br>Table | Basic<br><br><br>Graph<br>Table | Basic<br>Simple GLP<br><br>Graph<br>Table |

## Alarms

|  |  | pH | mV | Rel.mV |
|---|---|---|---|---|
| | High / Low pH | −2.000 to 20.000 | ✓ | ✓ |
| | High / Low mV | ✓ | −2000.0 to 2000.0 | |
| | High / Low Temperature | −20.0 to 120.0 °C<br>−4.0 to 248.0 °F<br>253.2 to 393.2 K | | |

## Logging

|  |  | pH | mV | Rel.mV |
|---|---|---|---|---|
| | Logging Type | Automatic<br>Manual<br>Autohold (Direct/Autohold Reading mode only) | | |
| | Sampling Period<br>(Automatic type only) | 1, 2, 5, 10, 30 sec.<br>1, 2, 5, 10, 15, 30, 60,120, 150, 180 min. | | |
| | File Name<br>(Manual & Autohold only) | Create<br>Unnamed Log | | |
| | Log Note | User defined | | |
| | Log Info 1 through to 4 | User defined | | |
| | Sample ID Prefix<br>(Manual or Autohold only) | 0 to 999 | | |

## Profiles

|  |  | pH | mV | Rel.mV |
|---|---|---|---|---|
| | Profile Feature | Enable<br>Disable | | |
| | Current Profile | Save As<br>Save<br>Delete | | |
| | Load Profile | Previously defined profiles | | |

## 8.4.  LOG RECALL

Log Recall is the forth item under the System's Menu and allows data selection, viewing, sharing, and deletion. Logged data is retrieved by the user that has logged the measurement.
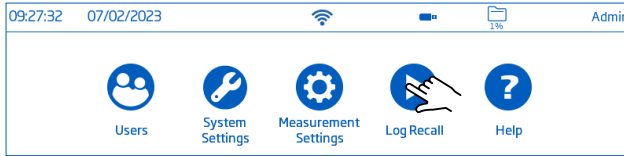


- Data is stored in parameter-specific .CSV files: pH, mV, and Rel.mV.
- Storage location is independent and organized in lots.
- A lot (file) can store 1 to 50 000 log records i.e. saved measurement data points.
- One user can store a minimum of 1 000 000 data points.

### View

Data can be viewed, plotted (graph), or tabulated (complete with date, time, notes).
From the System Menu screen:

1.  Tap ▶ (Log Recall). The instrument displays the Log Recall screen.
    Tap on corresponding table header element to set the log information ordered by Name, Parameter, Start/Stop time stamp, #Samples.
    Tap the up arrow to reverse order.
2.  Tap to select .CSV file.
3.  Tap **View**.

    *Note: Option available with .CSV file selected only.*

4. Tap 🔲 or 📈 icon to have logged data displayed in tabulated form or plotted.

| Index | Date | Time | pH | pH-mV | T[°C] ATC | Notes |
|---|---|---|---|---|---|---|
| 1 | 26/03/2022 | 14:45:23 | 9.0 | -116.7 | 25.0 | "H" |
| 2 | 26/03/2022 | 14:45:24 | 9.0 | -116.7 | 25.0 | "H" |
| 3 | 26/03/2022 | 14:45:25 | 9.0 | -116.7 | 25.0 | "H" |
| 4 | 26/03/2022 | 14:45:26 | 9.0 | -116.7 | 25.0 | "H" |
| 5 | 26/03/2022 | 14:45:28 | 9.0 | -117.1 | 25.0 | OK |
| 6 | 26/03/2022 | 14:45:29 | 8.8 | -108.0 | 25.0 | OK |
| 7 | 26/03/2022 | 14:45:30 | 8.8 | -108.2 | 25.0 | OK |
| 8 | 26/03/2022 | 14:45:31 | 8.8 | -108.2 | 25.0 | OK |
| 9 | 26/03/2022 | 14:45:32 | 8.7 | -99.4 | 25.0 | OK |
| 10 | 26/03/2022 | 14:45:33 | 8.7 | -99.5 | 25.0 | OK |

10:06:02   03/03/2022   HI6221
20220326_114523-pH_man-Lab12_003.csv

10:07:11   03/03/2022   HI6221
20220326_113957-pH_auto.csv
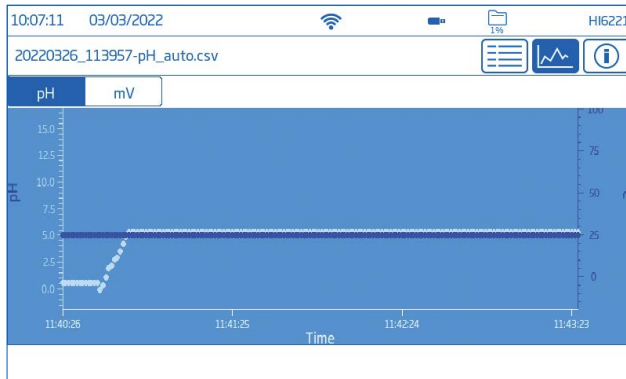
5. Tap ① icon and scroll through USER, LOG, INSTRUMENT, CHANNEL, GLP DATA information.

10:07:53   03/03/2022   HI6221
20220326_113957-pH_auto.csv

--------------------------------------------------------

USER INFO
  User Name: HI6221
  Full Name: John Smith
  Info 1: Hanna Instruments
  Info 2: Addr
  Info 3:
  Info 4:

LOG INFO
  Log Note:
  Log Info 1:
  Log Info 2:

## Select (Deselect) All

To export to a USB-A flash drive:

1. Tap ⏵ (Log Recall) to access the log history.
2. Tap **Select All** button to select entire log history.
   With all files selected, tap **Delete** to empty the log or tap **Share** to transfer data.
3. Tap **Deselect All** to clear selection.

## Delete

1. Tap ⏵ (Log Recall) to access the log history.
2. Tap to select required .CSV file (one file) or tap **Select All**.
3. Tap **Delete**.
4. The instrument prompts for confirmation.
   Deleted files can not be recovered and Log Recall screen is displayed blank.
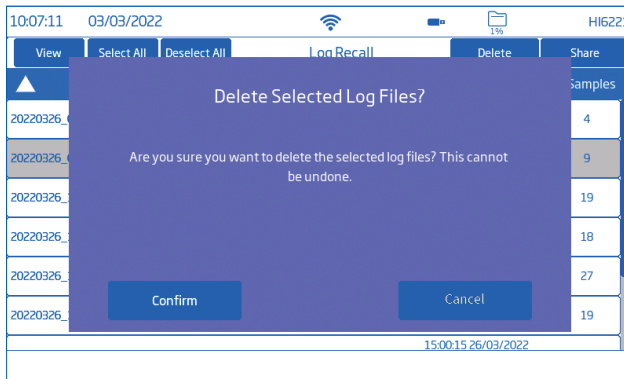


## Share

### Options: USB-A, FTP, Email, Print, Web server

### USB-A and USB-C

Plug the USB flash drive into the USB port located on the back.

1. Tap ⏵ (Log Recall) to access the log history.
2. Select file (files) for transfer or use **Select All** option.
3. Tap **Share**. Pop-up flyout is displayed.
4. Tap to select USB-A or USB-C.
   ⧖ is displayed for transfer in progress.
5. Transfer completion is confirmed and the instrument returns to Log Recall screen.

FTP

HI6221 can act as an FTP server (host) or client. Meter has to be connected to the internet and **Allow FTP access to meter** enabled.

- Use meter's IP address and password to connected and view logged files.
- Enter in the FTP dedicated fields own server information to export logged files to the FTP server.
- Configure FTP server info in the User menu (☺) to use the meter as an FTP client and upload files to an FTP server.

Connect via **FTP to meter server**:

1. On preferred FTP software, type the meter's IP address in the dedicated Host field.
2. Enter the username and password of the user currently logged in.
3. Connect to view the files logged on the meter.



Connect the **meter to an FTP server** and share logs:

1. In Users menu, type selected server's IP address, username, and password.
2. From System Menu, tap ▶ . Log Recall screen opens up.
3. Select file (files) for transfer.
4. Tap **Share**. Pop-up flyout is displayed.
5. Tap to select FTP. The files are being transferred in the root folder of the server.

FTP server installation and configuration

- PC running Windows10 or later
- Password protected Windows account
- FTP server must be allowed through the Windows Firewall

Installation

1. Navigate to **Start** › **Control Panel** › **Administrative tools** › **Server Manager**.
2. Go to **Roles** and expand **Web Server**.
3. Right click on **Web Server** and then click on **Add Role Services**.
4. Go to **Role Services** and check **FTP Server**.
5. Ensure **IIS Manager** (Internet Information Services) is checked under **Management Tools**.
6. Click **Next** followed by **Install**.
7. Wait for installation to complete.

Configuration (PC must be running Windows10 or later)

1. Navigate to **Start** › **Control Panel** › **Administrative tools** › **IIS Manager** (Internet Information Services).
2. Double click to expand the **IIS Manager** console.
3. Right click on **Sites**, on the Connection pane.
4. Click on **Add FTP Site**, to select. Type the FTP server name and the path to be used for file transfer
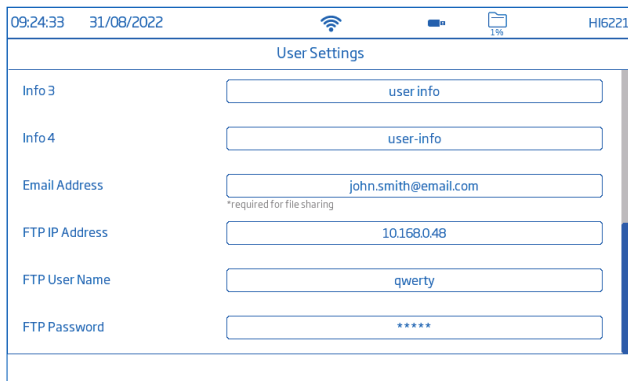
   *Note: Select Make New Folder to create a designated folder to store FTP files.*

5. Click **Next**.
6. In the Binding and SSL Settings window keep all default settings but change the SSL option to **No SSL**.
7. Click **Next**.
8. When prompted to authenticate and authorize information, select **Basic and Specified** users.
9. Type local account name to gain access to the server.
10. Check both **Read** and **Write** options.
11. Click **Finish**.

## Email

Meter has to be connected to the internet and **Enable sending emails** enabled (see System Settings, Connect & Print section).

Tap 😊 to access the Users menu and input email address.
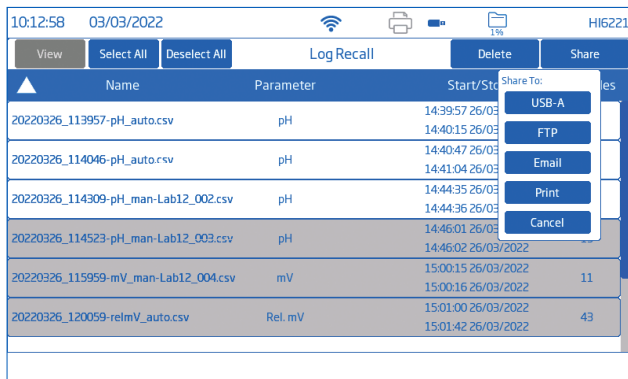


1. From System Menu, tap ▶ to access Log Recall.
2. Select file(s) for transfer or use **Select All** option.
3. Tap **Share**. Pop-up fly-out is displayed.
4. Select **Email**.
5. Transfer completion is confirmed and the instrument returns to Log Recall screen.

Print
- Connect either a printer (Network or USB) or plug-in a USB Flash Drive (see System Settings, Connect & Print section).
- Tap **Print** and follow on-screen instructions.

Web server

Any browser can be used to access the web server and download log files. Meter has to be connected to the internet and **Enable meter web server** enabled (see System Settings, Connect & Print section).

*Note: Both the meter and the device the browser is accessed from have to be connected at the same network.*

1. Tap 📶 for IP address and type address in the browser.



2. Enter the username and password of current user to gain access to logs and tags. Click on file to download to the PC.



PC Connection

The logged data can be transferred from the meter to a PC.
- Use the USB-C cable to connect the meter to the PC.
- The meter will appear as a flash drive on the computer.
- Save files to the PC. All logs will be listed as .CSV files.

The .CSV files may be opened with any text editor or spreadsheet application.

All features of the spreadsheet program can be used to analyze and graph the data.

## 8.5. HELP

Help is the fifth item under the System Menu.
- Tap ❓ to access support and navigate through an overview of system's main functionalities.
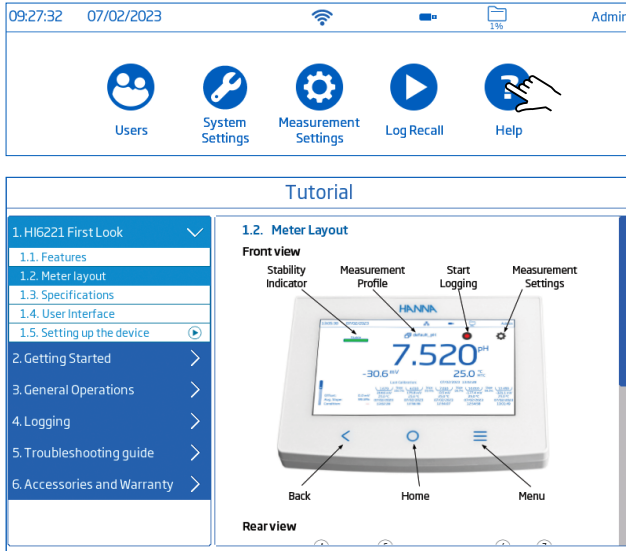


- Tap to play (stop) video-supported segments:
  - ▶ 1.5. Setting up the device
  - ▶ 3.1. Calibration
  - ▶ 3.2. Reading measurements
- Tap ≡ once to increase video speed.
  - ▶ The meter supports, with each tap, three playback speeds: normal (x1), medium (x2), and fast (x4).

# 9. MEASUREMENT & ELECTRODE SETUP MENU

From the Measurement screen, tap ⚙ to access system and measurement configuration tabs.
Alternatively, tap ≡ (**Menu** key) then tap ⊙.
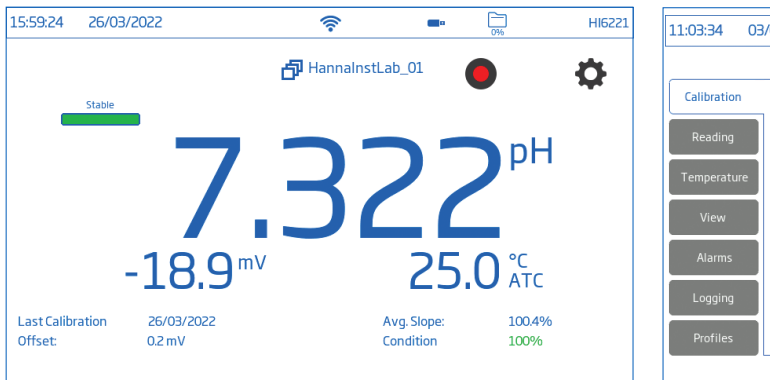


## 9.1. CALIBRATION

**Options: Last Calibration, Buffer Entry Type, Buffer Auto Confirmation, First Calibration Point, Calibration Reminder, Buffer Group**

**Last Calibration:** calibrate or clear a previous calibration

**Buffer Entry Type**

• **Automatic**: meter selects the closest buffer value to that of the pH sample being measured
• **Semiautomatic**: meter selects the closest buffers to that of the pH sample being measured
  The user has the option to manually select between buffers that are close in value.
• **Manual**: user manually selects the required buffer value

**Buffer Auto Confirmation:** recognized buffer value automatically accepted pending stable reading

**First Calibration Point**

• **Point**: a new buffer value can be added to an existing calibration. This prompts an automatic reevaluation of the electrode slope.
• **Offset**: the new buffer calibration point can create a constant offset to all existing pH calibration data performed with a minimum of two pH buffers.

**Calibration Reminder**

• **Daily**-calibration interval (hours and minutes)
• **Periodic**-calibration interval (days, hours, minutes)

"Calibrate probe" message runs along the bottom of the measurement screen if calibration is not done within set interval.
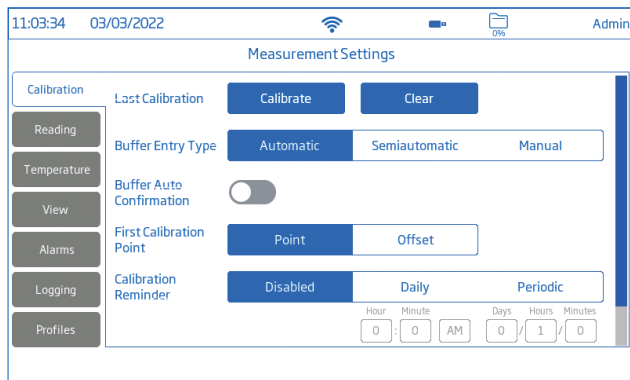


## Buffer Group

Option used for Automatic calibration.
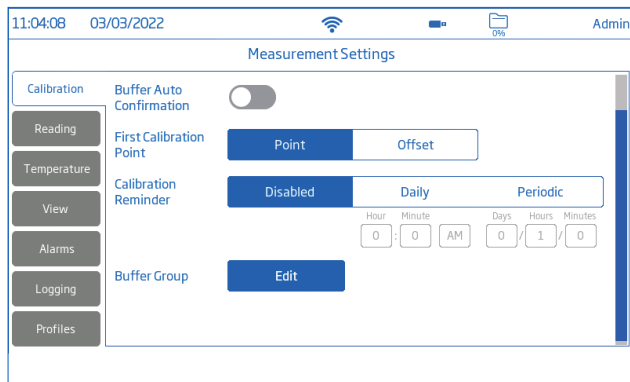


To move from **Available Standard/Custom Buffers** to the **Buffers in Use** column (up to five buffers), select buffer and forward arrow.

To edit and add a custom buffer, from the Measurement screen:

1. Tap ⚙ .
2. Tap **Reading** tab and set pH Parameter.
3. Tap **Calibration** tab.
4. Tap **Edit** next to Buffer Group.
5. Select from available input field in the Available Custom Buffers list.
6. Tap **Edit** to enter buffer value at the calibration temperature value and **Enter** to confirm.
7. Repeat with up to 5 custom values.
   Once the maximum number has been reached, to add another custom value, delete a previously set value.

## 9.2. READING

Options: Parameter, Resolution, Stability Criteria, Reading Mode
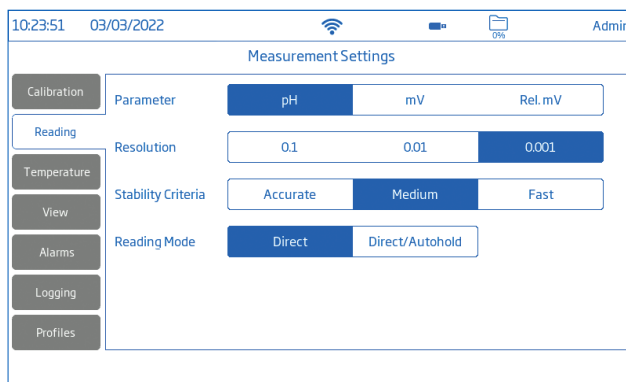


### Parameter

Options: pH, mV, Rel. mV

Tap to select desired measurement configuration: pH, mV (ORP), Rel. mV (ORP with calibration).

### Resolution

Tap to select measurement resolution based on selected parameter.

### Stability Criteria

Set the stability criterion for selected mode based upon selected stability setting.

While the measurement is changing, the stability indicator is shown partially ( ); when the criteria is reached the indicator is displayed as a full green bar ( ).

- **Accurate**: for applications where high accuracy is required

  Measurement is recognized as stable using more critical criteria evaluating measurement fluctuations.
- **Medium**: for applications where average accuracy is accepted

  Measurement is recognized as stable using less critical criteria evaluating measurement fluctuations. The measurement may still change after registering stable.
- **Fast**: for applications where speed of delivery has priority

### Reading Mode

Options: Direct, Direct/Autohold

- **Direct**: as measurement changes measurement stability is continuously evaluated. Unstable (blinking) or stable indicator are displayed above the progress bar.
- **Direct/Autohold**: 🔒 (lock icon) is displayed between the log and Measurement Menu icons.
  - ▶ Tap 🔒 to initiate a measurement.
  - ▶ 🅟🅗 or 🅜🅥 is displayed depending on selected parameter.
  - ▶ is displayed blinking until the measurement is stable.

▸ When stable, the indicator stops blinking and measurement freezes at current value.
▸ Tap 🅟🅗 or 🅜🅥 to return to direct measurement.
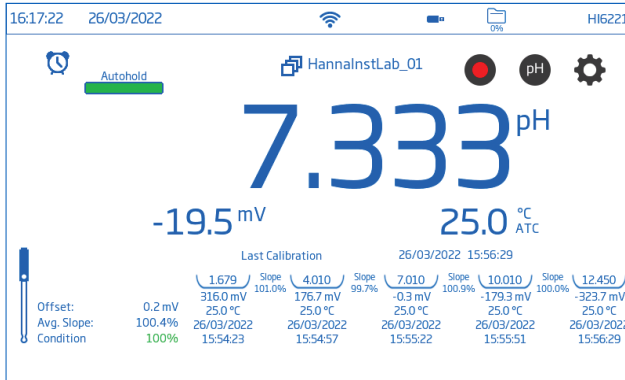


## 9.3. TEMPERATURE

Options: Temperature Source, Temperature Unit, Manual, Isopotential Point (pH parameter only), User Temperature Calibration
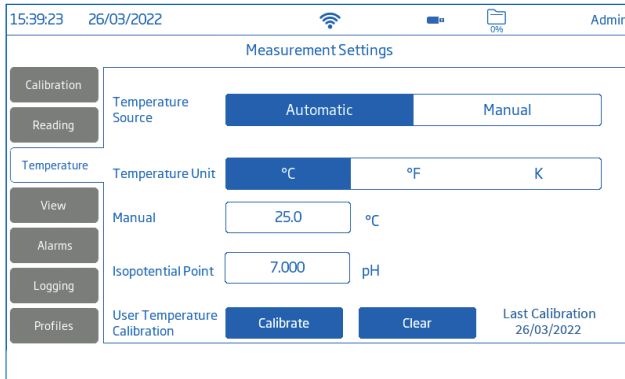


### Temperature Source: Automatic, Manual

User can select between physical temperature input source (Automatic) and entering sample temperature value manually (Manual).

- **Automatic** (with temperature probe): ATC is displayed next to the temperature measurement on the pH display. The mV/Rel. mV display indicates temperature value.
- **Manual** (without temperature probe): MTC is displayed next to the temperature measurement on the pH display. Manual is displayed next to the temperature measurement on the mV/Rel. mV display. Sample's temperature needs to be entered.

Temperature Unit: Celsius, Fahrenheit, Kelvin degrees

- Tap to select unit.

## Manual

To manually input value (**Manual** selected under Temperature Source or no temperature probe):

1. Select temperature unit.
2. Tap on Manual Temperature field. Use the on-screen keypad to enter sample's temperature.

## Isopotential Point: −2.000 pH to 20.000 pH

Isopotential point is the point at which temperature has no effect on pH readings. Unless noted with electrode, use 7.000 pH.

- Tap on the field and use the on-screen keypad to input value (pH measurement only).

## User Temperature Calibration: Calibrate or Clear

To perform a new calibration:

1. Tap **Calibrate**.
2. Place the probe and a reference thermometer (with 0.1 resolution) into a stirred container of water. Allow for the reading to stabilize.
3. If the displayed value is different than the reference thermometer reading, tap **Preset Temperature** and use the on-screen keypad to enter the value.
4. Tap **Save** to confirm and save data.

## 9.4. VIEW

**pH:** Basic, Simple GLP, Full GLP, Graph, Table
**mV:** Basic, Graph, Table
**Rel.mV:** Basic, Simple GLP, Graph, Table

• Select preferred display configuration from View Type window.
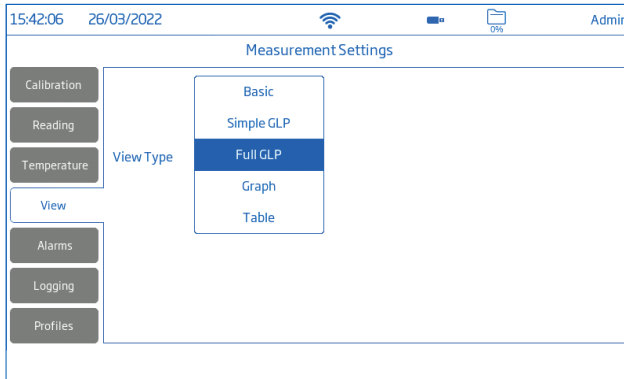


### Basic

Screen displays the measured value, measurement unit as well as temperature-probe status.
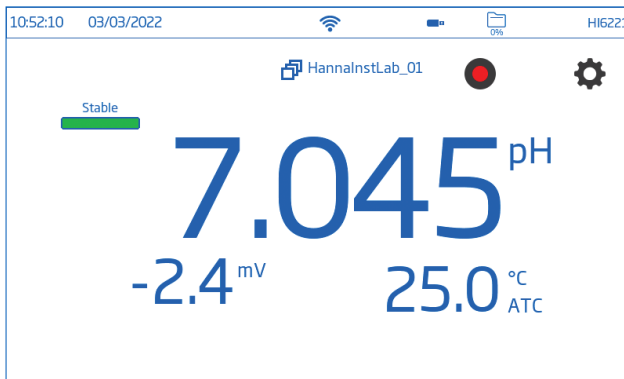
## Simple GLP

In addition to data displayed when Basic option is selected, screen displays: last calibration date and time, Offset value, average slope (Avg.Slope), and electrode condition (Condition).
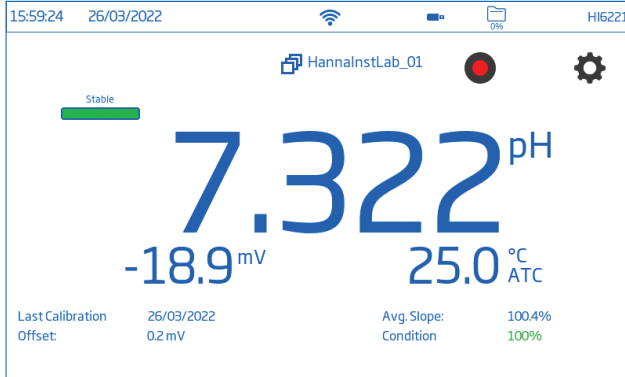


*Note:* If no calibration has been made, Not Calibrated is displayed.

## Full GLP

In addition to data displayed when Simple GLP option is selected, screen displays: electrode symbol, used buffers trays as well as calibration date, time, and temperature probe status.
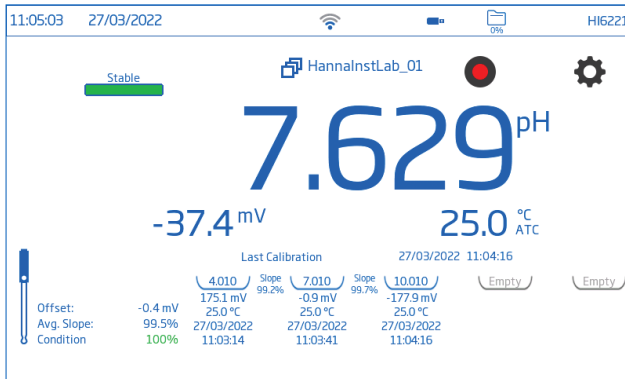


## Graph

When Graph is selected, the measured value is plotted as a graph.
To zoom in on a graph:
1. Select Time or parameter axis.
2. With axis selected, pinch or drag on the display.

## Table

When Table is selected, the measured values are displayed tabulated (complete with date, time, and notes made during logging). The newest data is displayed on the top of the table.



## 9.5. ALARMS

### Options

**pH: High or Low pH, High or Low Temperature**
**mV & Rel.mV: High or Low mV, High or Low Temperature**

Users can set the threshold limits for the measured parameters. When the measurement exceeds the high-threshold value or drops below the low-threshold value, the alarm is triggered and an alarm message is displayed on the message banner.

If the Alarm Beeper is enabled (See: System Menu Items / System Settings / Alarm Beeper), an audible beep will be heard.

*Note: High-parameter values cannot be lower than low-parameter ones.*

To set an alarm limit:
1. Tap ⬤ to enable low or high threshold option.
2. Use the on-screen keypad to enter the value.
3. Tap **Enter** to confirm or **Cancel** to exit and return to measurement setting options.
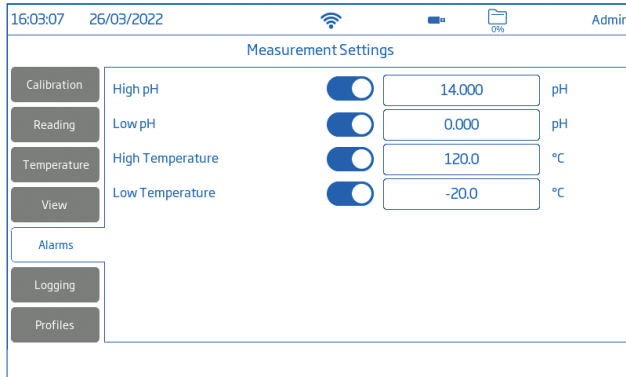


🔔 (alarm icon) is displayed on the measurement screen when an alarm is active.
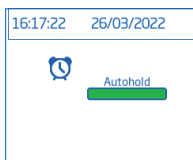


## 9.6. LOGGING

Options: Logging Type, Sampling Period, File Name, Log Note, Log Info, Sample ID
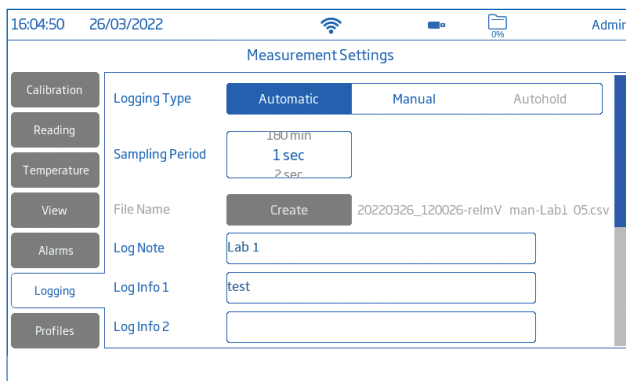
## Logging Type

- **Automatic**

  Data is logged automatically at predefined time intervals (i.e. Sampling Period). A file name is automatically generated, complete with year/month/day, and logging time. Files are identified by parameter e.g.:
  - pH log files: 20220329_085101-pH_auto.CSV
  - mV log files: 20220429_084105-mV_auto.CSV
  - Rel.mV log files: 20220309_095704-relmV_auto.CSV

- **Manual**

  Measured data is logged every time 🅜 is tapped.

- **Autohold**

  Available with Direct/Autohold reading mode only.

  *Note: Manual and Autohold records are stored in the same log file, i.e. data logged on different days is stored in the same lot. Automatic records are stored separately.*

  *Data logged with Autohold option selected, is identified by "H" in the Notes column.*

## Sampling Period

Option available with Automatic logging type selected only.

Time-interval options are selected from scrollable list.

## File Name

Available with **Manual** and **Autohold** logging type selected only.

To create a file name, from Logging screen:

1. Tap **Create**.
2. Use the keypad and enter file name (maximum 13 characters).
3. Tap **Enter** to confirm.

## Log Note & Log Info

Notes on measured data are saved together with logged data.

## Sample ID

Manual and autohold samples can be labeled with a numerical ID (increments with each new sample logged), a text label, or a text label with numerical ID.

With **Increment** selected:

1. Tap **Sample ID Prefix**.
2. Use the on-screen keypad to enter a text prefix, of maximum 15 characters, to the sample name.
3. Tap ⏎.
4. Select ID number from scrollable list.

## 9.7. PROFILES

Options: **Profile Feature**, **Current Profile** (configure), **Load Profile** (previously configured)

**Profile Feature** option can be enabled or disabled.
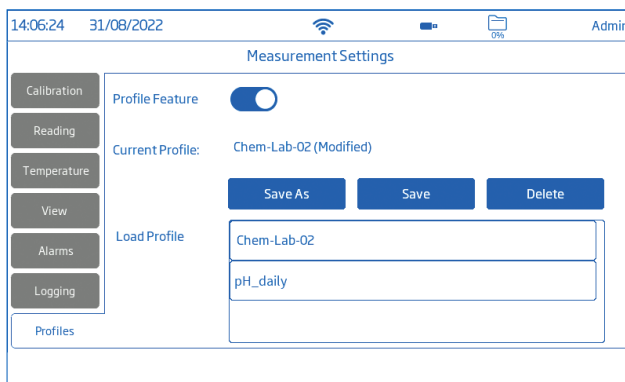


## Current Profile

A profile is a sensor setup complete with required measurement unit, temperature unit, display preference, and alarm threshold options.

Once saved the profile can be loaded for applications that require similar configurations.

To save a profile, having previously configured all other application-specific options, from the Measurement screen:

1. Tap ⚙.
2. Tap **Profiles** tab.
3. Tap **Save As** and use the keypad to enter profile name.
4. Tap ⏎ to confirm.
   Once saved, profile name is added to the Load Profile list.

## Load Profile

To select from list of predefined profiles:

1. Tap to select from the **Load Profile** list.
2. Profile name is automatically entered in the **Current Profile** field.
3. Start measuring.

# 10. CALIBRATION PROCEDURE

## Calibration Overview (compiled UI symbols)



| | |
|---|---|
| 1 | Calibration type |
| 2 | Forward or backward navigation, sequence of steps |
| 3 | Save and Confirm buffers, calibration procedure |
| 4 | Standard Buffers trays, with buffer selected for transfer (rectangular outline) |
| 5 | Custom Buffers trays |
| 6 | Buffer management |
| 7 | Buffers in use |
| 8 | Buffer symbol: **S** (standard)  or **C** (custom) |
| 9 | Electrode calibration details for used buffer |
| 10 | Electrode symbol with Offset, Average Slope, and electrode condition (indication of electrode status) |

## 10.1.  pH CALIBRATION

### Calibration Guidelines

- Set up a routine service schedule where measurement integrity is validated.
- Do not handle the sensing surfaces of the sensors.
- Avoid rough handling and abrasive environments that can scratch the reactive surfaces of the sensors.
- For best technique, use a rinse beaker and a separate calibration beaker for each buffer.
  Discard buffers after use.
- Do not return the used buffers to the bottles of "fresh" buffer.
- For measurements across a temperature gradient (when water temperature is drastically different from the buffers), allow the electrodes to reach thermal equilibrium before conducting calibrations or making measurements.
- During calibration the temperature probe should be in the calibration buffer.

### pH Calibration Type

**Automatic:** instrument automatically selects closest buffer to the pH value being measured from all active buffers selected as Buffers in Use

**Semiautomatic**: instrument automatically selects from all available standard and custom buffers. The user has the option to also manually input buffers that are close in value

**Manual:** manual buffer input from all available standard and custom values

### Automatic Calibration

**Selecting Buffers in Use, Standard or Custom** (navigation guidelines)

In addition to selecting from 8 standard options, users can define 5 custom buffers to be used for calibration. HI6221 automatically recognizes the closest buffer to the pH value being measured from all available (standard and custom) buffers.

To move buffers from **Available Standard Buffers** or **Available Custom Buffers** trays to **Buffers in Use** trays:

1. Tap ⚙ .
2. Select **pH** Reading Parameter, and tap **Calibration** tab.
3. Tap **Edit**.

| Buffer Group | Edit | |

4. Tap to select from the Available Standard Buffers or Available Custom Buffers trays.
   A rectangular outline highlights the buffer selected for transfer.
5. For standard values, tap ➡ to move the selected buffer in the Buffers in Use column.
   Ⓢ displayed next to the buffer value, indicates calibration with standard buffer.
   Repeat with up to 5 buffers.
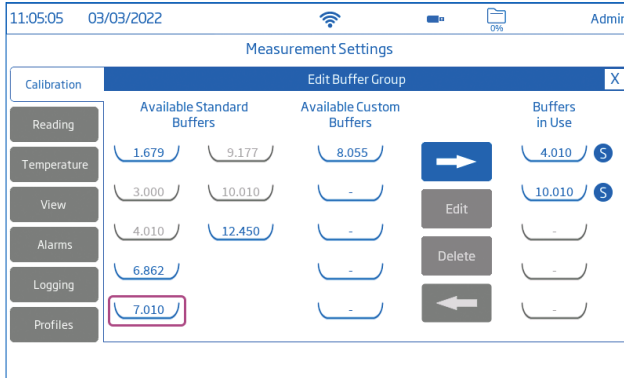
6. For custom values, tap an empty tray to input a new value or an existing tray to edit. Follow the Editing Custom Buffers Values steps.

**Editing Custom Buffer Values** (navigation guidelines)

With **Calibration** tab selected:

1. Tap **Edit** next to Buffer Group.
2. Tap a custom buffer tray from the Available Custom Buffers column.
3. Tap **Edit**.
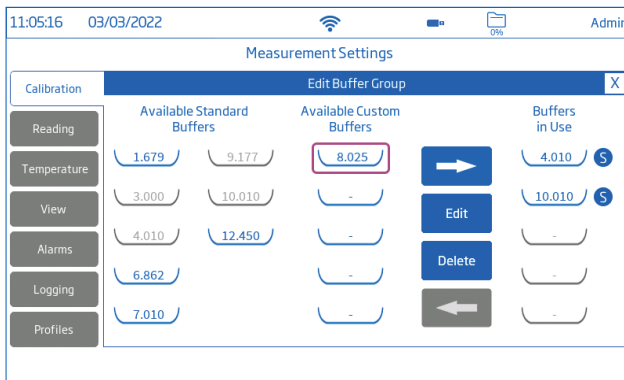
4. Use the numeric keypad to enter a value.
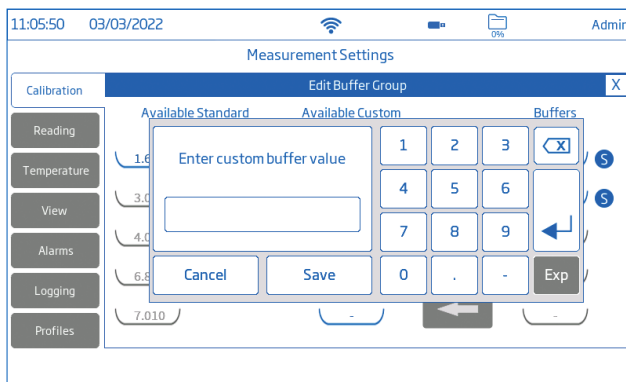


5. Tap ⬅ or tap **Save** to confirm (Cancel to return without applying changes).
6. Tap on tray with newly-entered custom value.
   A rectangular outline confirms that buffer can be transferred to Buffers in Use.
7. Use forward arrow to move custom buffer into Buffers in Use column.
   Repeat with up to 5 buffers.
   🄲 displayed next to the buffer value, indicates calibration with custom buffer.
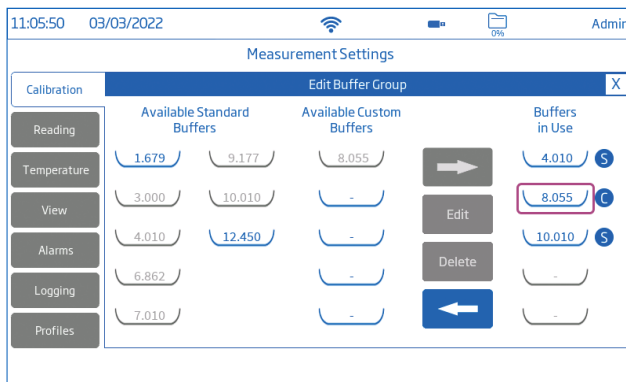


## Automatic pH Calibration Procedure

With the electrode and temperature sensor connected to the meter:

1. Select the correct buffer group or buffer value for calibration.
2. Select Manual Temperature source if calibration is done without a temperature sensor.
3. Remove the plastic protective cap from the probe and rinse the electrode with purified water.
4. Fill a rinse beaker 2/3 full with the first buffer solution.
5. Swirl the electrode and temperature sensor in the buffer solution.
6. Raise and lower the probe several times. Discard the solution.

7.  Fill the calibration beaker 2/3 full with the first buffer solution.
8.  Slowly place the electrode and temperature sensor in the selected buffer. Dislodge bubbles that may adhere to the sensors.
    For most applications it is recommended to start with pH 7.01 buffer (or pH 6.86).
    Use calibration buffers that bracket the samples pH.
    For acidic samples it is recommended to use pH 4.01, 3.00, and/or 1.68 buffers.
    For alkaline samples it is recommended to use pH 9.18, 10.01 and/or 12.45 buffers.
9.  Tap Clear Calibration to start a fresh calibration and clear all previously used buffers.
    If using a new pH electrode it is recommended to tap Clear Calibration to clear all buffers and start new.
10. Rinse the electrode and temperature sensor in the buffer, place in the rinse beaker then calibration beaker.
    **A** ⮕  Buffer has been recognized. Waiting for reading to stabilize.
    **B** ⮕  Check the buffer value and use fresh buffer if:
    - The buffer cannot be recognized.
    - The current reading is outside of the acceptable window.
    - The current buffer is generating a slope over the of acceptable window.
    - Temperature is outside of the acceptable window.
    - The current buffer is generating a low slope.
    - The current buffer cannot be confirmed due to an inconsistency with the previous calibration (additionally, clear the old calibration to continue.)
    **C** ⮕  Check the buffer value and choose a new buffer if:
    - The current buffer has already been accepted or is too close to a buffer that has been used.

    *Note: If probe's response time is slow, clean the probe then repeat the calibration.*

    Repeat procedure for a total of up to 5 calibration points.
11. Tap Save to update the calibration and return to the calibration setting screen. Tap the **Home** key ( ◯ ) to return to measurement.

## Semiautomatic Calibration
With Semiautomatic Calibration selected, users can confirm recognized buffer or change to another available buffer value by tapping the angle pointing arrow. The procedure is the same as Automatic Calibration.

## Manual Calibration
With this option selected, the HI6221 uses from all available buffer values (standard and custom).
1.  Tap **Calibration** tab.
2.  Tap to select **Manual** calibration type.
3.  Tap **Calibrate**.
4.  Tap the angle forward pointing arrow on display to select correct buffer value.

## 10.2. RELATIVE mV CALIBRATION

The Rel. mV calibration or ORP calibration allows the user to:

• Perform a single point, custom calibration (Rel. mV).
• Restore the factory calibration (Clear Calibration).

The Oxidation-Reduction Potential (ORP), displayed in mV, is the voltage that results from the difference in potential between the platinum (or gold) ORP sensor and the silver/silver chloride reference electrode.

ORP values are not temperature compensated, although ORP values can change with temperature (e.g. reference electrode potential changes, sample equilibrium changes). It is important to report ORP values together with the reference electrode used and the temperature.

The inert noble metal ORP surface provides an electron-exchange site with the sample (or standard) and its surface. The electron exchange is typically very fast in well-poised solutions (e.g. standards), but may be lengthier in actual samples.

Calibration establishes a baseline that can be used as a comparison for future work. Calibration is used to compensate for changes due to contamination of the platinum surface and drift in the reference electrode.

A relative mV calibration can also be made to remove the voltage attributable to the Ag/AgCl reference electrode, to display the ORP versus a SHE (Standard Hydrogen Electrode).

This is an arithmetic correction and is correct only at the standard temperature. For example, HI7022 ORP Test Solution reads 470 mV at 25 °C versus the Ag/AgCl reference. The ORP mV versus a SHE would be 675 mV (add 205 mV to the observed value).

*Note: The user has to change the actual electrode to an ORP sensor and Parameter must be changed to Rel. mV for use with ORP electrodes. Suggested ORP models are HI3133B, HI4430B, or HI3230B.*

Please see Measurement Settings for details on configuration parameters and values.

When switching between Parameters (pH and mV, or Rel. mV), wait a few seconds to accommodate meter reconfiguration.

### Rel. mV Calibration Procedure

1. Tap Calibrate and the meter will open a Rel. mV calibration screen.

2. Place ORP electrode tip into a beaker of standard or a sample with known value.
   HI7021 (ORP solution for platinum and gold electrodes) reads 240 mV at 25°C, HI7022 (ORP test solution for platinum and gold electrodes) reads 470 mV at 25 °C.
3. Tap the Relative mV box value.

| Enter Relative mV value | 1 | 2 | 3 | ⌫ |
|---|---|---|---|---|
| | 4 | 5 | 6 | |
| 160 | 7 | 8 | 9 | ↵ |
| Cancel    Save | 0 | . | - | Exp |

4. Tap Clear to remove previous values from the box.
5. Use the keypad to enter the value of the standard.
6. Tap Enter on keypad to confirm and enter the value.
7. When a stable value is reached, tap Save.
   The meter returns to the Rel. mV calibration setup screen.
8. Tap ◯ (**Home** key) to return to Measurement screen.

### Clear calibration
1. Tap **Clear** in calibration screen.
2. The instrument prompts for confirmation.

## 11. MEASUREMENT
**Options: Direct Readings, Direct/Autohold Readings**
With **Direct** selected, sample measurements are displayed continuously.
With **Direct/Autohold** selected, reading is kept on display when measurement stability is reached. This option removes the subjective nature of stability as a measurement that has not reached equilibrium will not be used. After stability criteria is reached, the meter enters Direct/Autohold mode.

### 11.1. MEASUREMENT TIPS
1. Connect the electrode to be used to the appropriate meter input. Make sure the electrode has been recently calibrated and is working correctly.
2. Place electrode into the HI764060 electrode holder for easy transfer in and out of containers during calibration, sample measurement, and storage.
3. Rinse with purified water between buffers and / or samples.
4. Blot (never rub) the glass pH sensor with a lint-free tissue between buffers and samples.
5. To limit sample contamination, pour 2 beakers of buffers and samples. Use one beaker to rinse the sensor, and then use the second for measurement.
6. Gently stir the test sample to ensure the sensor is measuring a representative sample.
7. Open the fill hole cover and keep the fill solution topped off to permit the fill solution to flow through the ceramic junction and maintain a stable reference signal.
   *Note: Use the same size beaker and immersion depth for samples and buffers.*

8.  If measuring across a temperature gradient, allow the sensor to reach thermal equilibrium. If using manual temperature compensation input the sample temperature.
9.  Once the reading indicates Stable, record measurement data.
10. Remove the electrodes from the sample, repeat steps 3, 4 and then place into the next rinse, then test sample.
11. Repeat the procedure for all samples. When all samples have been measured, rinse the pH electrode and replace storage cap with storage solution. Replace fill hole cover.

*Note: When working without a temperature sensor, ensure that both calibration and measurements are done at the same temperature. This requires manual input of temperature value to allow the meter to perform buffer temperature correction.*

## 11.2.  DIRECT READINGS

From Measurement screen, tap ✿ (Measurement Menu). Next:
- Tap to select from supported parameters.
- Tap **Direct** to select direct Reading Mode.
- Place the electrode tip and the temperature probe approximately 4 cm (1.5") into the sample to be measured. Allow time for the electrode to stabilize.
- Unstable status indicator on the screen until measurement is stabilized.
- The measured pH value is displayed on the LCD, together with GLP information and display preferences.
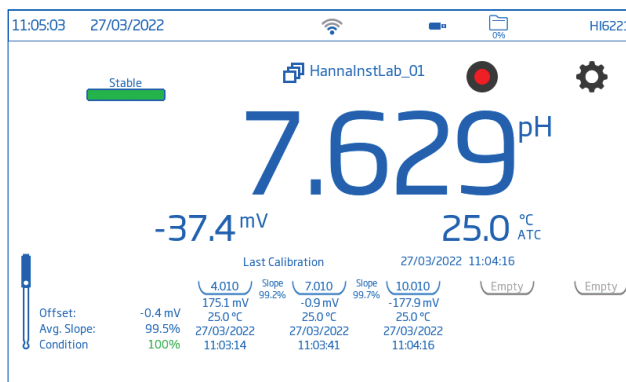


## 11.3.  DIRECT / AUTOHOLD READINGS

From Measurement screen, tap ✿ (Measurement Menu). Next:
- Tap to select from supported parameters.
- Tap **Direct/Autohold** to select direct/autohold Reading Mode.
- Place the electrode tip and the temperature probe approximately 4 cm (1.5") into the sample to be tested.
- The measured parameter value will be displayed on the LCD.
- ▬▬ is displayed blinking until the stability criteria is reached.

The measured value is kept on display and <u>Autohold</u> stops blinking.
- To return to direct Reading Mode, tap 🔵 (pH icon).
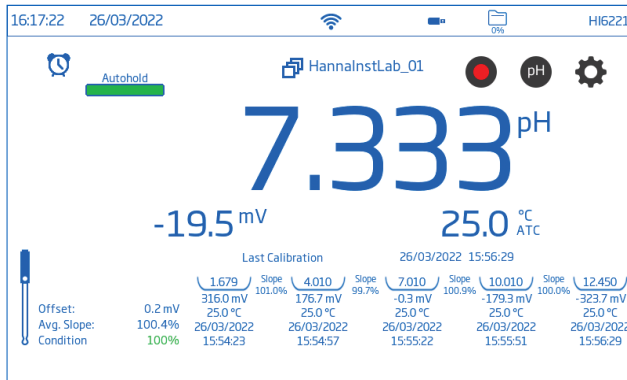


# 12. LOGGING

Three logging types are available: **Automatic**, **Manual**, and **Autohold**.



## Automatic logging
- Readings are logged (tap 🔴 ) at predefined time intervals.
  Sampling interval options range from 1 second to 180 minutes.
- Records are continuously added to it until the session stops.
- For each automatic logging session, a new log file is created.
- A complete set of GLP information including date, time, mode selection, temperature reading, and calibration information is stored with each log. User and log information e.g. company, address, sample details may also be included on the .CSV file.

## Manual logging
- Readings are logged each time 🔴 is tapped.
- All manual readings are stored in a single log (i.e. records made on different days share the same log).

Autohold logging
- Readings are logged each time 🔴 is tapped and configured stability criteria is reached.
- All Autohold readings are stored in a single log (i.e. records made on different days are logged in the same log).

  *Note: Stability criteria can be set to Fast, Medium, or Accurate for all logging types.*

## 12.1. AUTOMATIC LOGGING

1. From Measurement screen, tap ✿ (Measurement Menu).
2. Tap Reading tab and tap to select stability criteria (Accurate, Medium, or Fast).
3. Tap Logging tab and select Automatic logging type.
4. Scroll to select Sampling Period.
5. See option to define sample ID (name and prefix):
   - Tap Sample ID Prefix field to start editing.
   - Use the on-screen keypad to enter lot file name.
   - Tap Enter on keypad to save new name.
6. Tap ◯ (**Home** key) to reenter Measurement screen.
7. From Measurement screen, tap 🔴 to start/stop logging.
8. During active logging, users can track and log notes.
   To add a new log note:
   - Tap 🗨 (speech balloon symbol).
   - Use on-screen keypad to enter text.
   - Tap Enter on keypad to log entered note.
     Log Recall view, and .CSV log indicate the added log notes.

## 12.2. MANUAL LOGGING

1. From Measurement screen, tap ✿ (Measurement Menu).
2. Tap **Reading** tab and tap to select stability criteria (Accurate, Medium, or Fast).

   *Note: Manual logging doesn't use this criteria for logging. Setting this is only for the user to note the stability of the reading.*

3. Tap **Logging** tab and select Manual logging type.
4. See option to create file name:
   - Tap **Create**.
   - Use on-screen keypad to enter file name.
   - Tap ⏎ to save.
5. See option to define sample ID (name and prefix).
6. Tap ◯ (**Home** key) to return to Measurement screen.
7. From Measurement screen, tap Ⓜ (manual logging symbol) to log data.
   Data is logged every time symbol is tapped.
8. See option to track and log notes.
9. From Measurement screen, tap 🔴 to start/stop logging.

## 12.3.  AUTOHOLD LOGGING

1. From Measurement screen, tap ✿ (Measurement Menu).
2. Tap **Reading** tab to select stability criteria (Accurate, Medium, or Fast).
   *Note: Autohold logging uses this criteria for logging. Setting this will affect when data is recorded.*
3. Tap for direct selection of Direct/Autohold reading mode.
4. Tap **Logging** tab and select Autohold logging type
5. Create a file name or have a file previously set up
6. Option to define sample ID (name and prefix)
   - Tap **Sample ID Prefix** field to start editing.
   - Use the on-screen keypad to enter lot file name.
   - Tap ⏎ to save.
   - Next, scroll to select Prefix value.
7. Tap ◯ (**Home** key) to reenter Measurement screen.
8. From Measurement screen, tap 🔴 (Direct logging symbol) to start logging.
   Active Autohold logging in progress is indicated by displayed 🅐 symbol.
   Progress bar, top left corner, indicates progress status.
9. Once configured stability criteria is checked and conditions are met, data is logged.
   The instrument prompts measurement screen, displayed in configured view.

### CSV file format naming convention

To help identify measurement-specific data files within a data package (after download), logged files have the measurement unit automatically included in the file name (e.g. when reading and logging in pH Parameter, automatically logged files retain pH ID at the beginning of the file).

Manual or Autohold logged files retain the distinction between different reading modes in the file name. Users have the option to input file name:

- 20220329_085101-**pH**_auto.CSV
- 20220429_084105-**mV**_auto.CSV
- 20220309_095704-**relmV**_auto.CSV

# 13.  MAINTENANCE & CONDITIONING

### Electrode Maintenance

- Soak the pH bulb and reference junction in HI70300 Storage Solution for a minimum of 30 minutes to refresh the electrode (before calibration).
- After prolonged storage or cleaning, calibrate the electrode.
- After use, rinse the electrode with purified water and blot excess moisture with a lint free tissue.
- Inspect all sensor connectors for corrosion and replace if necessary.

### pH Sensor Maintenance

- Remove the sensor protective cap. Do not be alarmed if any salt deposits are present. This is normal with pH / ORP probes and they will disappear when rinsed with water.
- Shake down the probe as you would do with a clinical thermometer to eliminate any air bubbles inside the glass bulb.
- If the bulb and / or junction are dry, soak the electrode in HI70300 Storage solution for at least 30 minutes.
- To ensure a quick response, the glass bulb and the junction should be kept moist and not allowed to dry. This can be achieved by storing the sensor with a few drops of HI70300 Storage solution or pH 4.01 in the protective cap.

*Note: Never use distilled or deionized water to store electrode.*

### Periodic Maintenance

- Inspect the electrode for any scratches or cracks. If any are present, replace the electrode.
- Inspect the cable. The connection cable must be intact.
- Rinse off any salt deposits with water.

### pH Cleaning Procedure

1. Soak the sensor in HI7061 Electrode cleaning solution for general use or application specific cleaning solution for 15 minutes.
2. Rinse with water.
3. Soak the electrode in HI70300 Storage solution for at least 30 minutes, rinse with water and calibrate before using.

### Protein, Inorganic, Oil, or Grease Cleaning Procedure

1. Soak the sensor in application specific electrode cleaning solution (i.e. HI7073 Protein cleaning, HI7074 Inorganic cleaning for 15 minutes or HI7077 Oil and Fat cleaning solution).
2. Rinse the sensor with water.

*Note: After performing any of the cleaning procedures, rinse the electrode thoroughly with water and soak in HI70300 Storage solution for at least 30 minutes before calibrating it.*

3. Soak the electrode in HI70300 Storage solution for at least 1 hour, rinse with water, and calibrate before using.

### General Cleaning of HI6221

The following steps outline the process to ensure users keep the benchtop clean and disinfected while limiting the risk of damage from unsuitable cleaners.

- Disinfect the screen using commercially available non-ammonia glass or disinfectant cleaner.
- Apply a small amount of cleaner directly to a microfiber or lint-free disposable cloth. Make sure the cloth is damp and not wet.
- Wipe the glass touch screen clean with the cloth. Do not apply cleaner directly to the interface.

## 14. ERROR MESSAGES

The instrument shows clear warning messages (refer to the instrument's on-display message area, bottom of the screen) when erroneous conditions appear, when measured values are outside the expected range, while logging, for invalid high/low temperature alarm value as well as invalid low/high mV Alarm value, isopotential point. The information below provides an explanation of the errors and warnings, and recommended action to be taken.

| Displayed Message | Explanation & Recommended Action |
|---|---|
| "Temperature under/over range" | Temperature outside specified range.<br>Verify the temperature probe is correctly connected to the meter.<br>Replace probe if necessary. |
| "Under/over compensation range" | During pH calibration, the temperature is under/over the pH buffer compensation limit. |
| "pH over range" | Occurs when apparent pH value is more than 20.0 pH.<br>Soak electrode in HI70300 Storage solution for at least 30 minutes. |
| "pH under range" | Occurs when apparent pH value is less than -2.0 pH.<br>Soak electrode in HI70300 Storage solution for at least 30 minutes. |
| "pH out of calibration range" | Displayed when the measured value is outside calibration range. |
| "Rel. mV offset over/under range"<br><br>"mV under/over range" | Outside range in the corresponding scale. |
| "Factory calibration expired" | Contact the Hanna technical support for the periodic factory calibration. |

# 15. ACCESSORIES

## pH BUFFER CALIBRATION SOLUTIONS

| | |
|---|---|
| HI6016 | Millesimal calibration buffer pH 1.679 (500 mL) |
| HI6003 | Millesimal calibration buffer pH 3.000 (500 mL) |
| HI6004 | Millesimal calibration buffer pH 4.010 (500 mL) |
| HI6068 | Millesimal calibration buffer pH 6.862 (500 mL) |
| HI6007 | Millesimal calibration buffer pH 7.010 (500 mL) |
| HI6010 | Millesimal calibration buffer pH 10.010 (500 mL) |
| HI6124 | Millesimal calibration buffer pH 12.450 (500 mL) |
| HI8004L | Buffer solution pH 4.01 (500 mL, FDA approved bottle) |
| HI8006L | Buffer solution pH 6.86 (500 mL, FDA approved bottle) |
| HI8007L | Buffer solution pH 7.01 (500 mL, FDA approved bottle) |
| HI8009L | Buffer solution pH 9.18 (500 mL, FDA approved bottle) |
| HI8010L | Buffer solution pH 10.01 (500 mL, FDA approved bottle) |

## ELECTRODE ELECTROLYTE REFILL SOLUTIONS

| | |
|---|---|
| HI7071 | 3.5M KCl + AgCl Electrolyte for single junction electrodes, 4 pcs. (30 mL) |
| HI7072 | 1M KNO3 Electrolyte, 4 pcs. (30 mL) |
| HI7082 | 3.5M KCl Electrolyte for double junction electrodes, 4 pcs. (30 mL) |
| HI8071 | 3.5M KCl + AgCl Electrolyte in FDA approved bottle, for single junction electrodes , 4 pcs. (30 mL) |
| HI8072 | 1M $KNO_3$ Electrolyte, 4 pcs. (30 mL, FDA approved bottle) |
| HI8082 | 3.5M KCl Electrolyte for double junction electrodes, 4 pcs. (30 mL, FDA approved bottle) |
| HI8093 | 1M KCl + AgCl Electrolyte, 4 pcs. (30 mL, FDA approved bottle) |

## ELECTRODE STORAGE SOLUTIONS

| | |
|---|---|
| HI70300L | Storage solution (500 mL) |
| HI80300L | Storage solution (500 mL, FDA approved bottle) |

## ELECTRODE CLEANING SOLUTIONS

| | |
|---|---|
| HI70000P | Electrode rinse sachet, 25 pcs. (20 mL) |
| HI7061L | General purpose solution (500 mL) |
| HI7073L | Protein cleaning solution (500 mL) |
| HI7074L | Inorganic substance cleaning solution (500 mL) |
| HI7077L | Oil and Fat cleaning solution (500 mL) |
| HI8061L | General purpose solution (500 mL, FDA approved bottle) |
| HI8073L | Protein cleaning solution (500 mL, FDA approved bottle) |
| HI8077L | Oil and fat cleaning solution (500 mL, FDA approved bottle) |

## OTHER ACCESSORIES

| | |
|---|---|
| HI740036P | 100 mL beaker (10 pcs.) |
| HI740037P | 20 mL beaker (10 pcs.) |
| HI764060 | Electrode holder |
| HI900946 | 115 Vac to24 Vdc power adapter, US plug |
| HI900947 | 230 Vac to 24 Vdc power adapter, European plug |
| HI920016 | USB type A to C cable |

## ELECTRODES

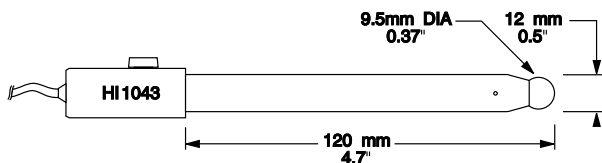Electrode part numbers ending in **B** are supplied with a BNC connector and 1 m (3.3') cable.
Electrode part number ending in **Y** are supplied with a BNC + RCA connector

### pH

**HI1043B**

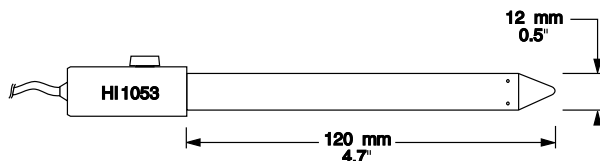Glass body, double junction, refillable, combination electrode
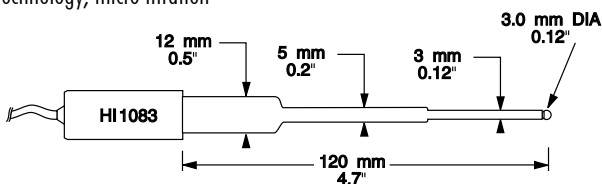Application: strong acid or alkali

## pH

### HI1053B

Glass body, triple ceramic, conical shape, refillable, combination electrode
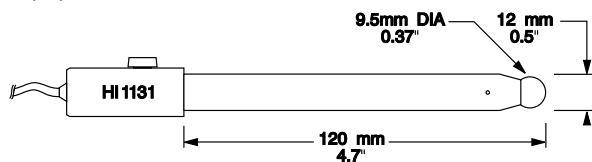Ideally suited for emulsions.



### HI1083B

Glass body, micro, viscolene, non refillable, combination electrode
Application: biotechnology, micro titration
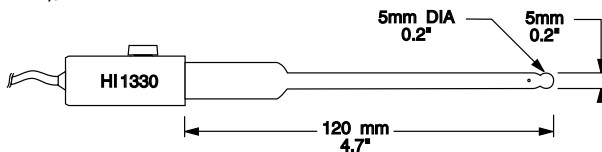


### HI1131B

Glass body, refillable, double junction, combination electrode
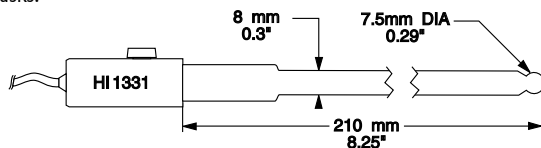Application: general purpose



### HI1330B

Glass body, semimicro, single junction, refillable, combination electrode
Application: laboratory, vials

## pH

### HI1331B

Glass body, semimicro, single junction, refillable, combination electrode
Ideally suited for flasks.



### HI1230B

Plastic body (PEI), double junction, gel filled, combination electrode
Application: general, field
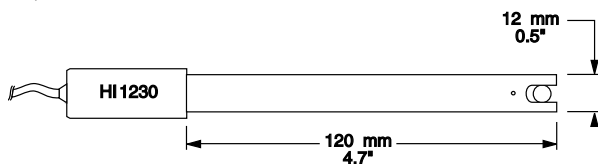


### HI2031B

Glass body, semimicro, conical, single junction, refillable, combination electrode
Application: semisolids
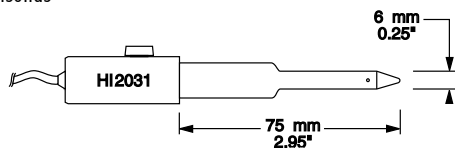


### HI1332B

Plastic body (PEI), double junction, refillable, combination electrode
Application: general purpose

## HI1413B

Glass body, single junction, flat tip, viscolene, non refillable, combination electrode
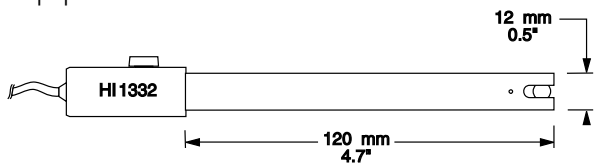Application: surface measurement

**HI 1413**

12 mm
0.5"

110 mm
4.3"
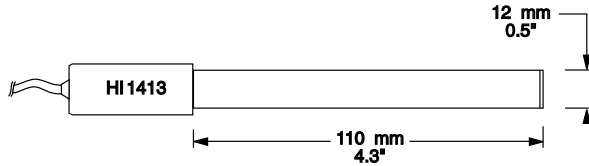
## FC100B

Plastic body (PVDF), double junction, refillable, combination electrode
Application: general purpose for food industry

**FC 100**

12 mm
0.5"

120 mm
4.7"
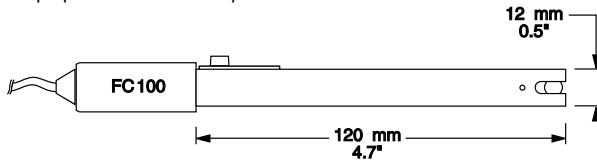
## FC200B

Plastic body (PVDF), single junction, conical, viscolene, non refillable, combination electrode
Application: meat and cheese

**FC 200**

6 mm
0.25"

75 mm
2.95"
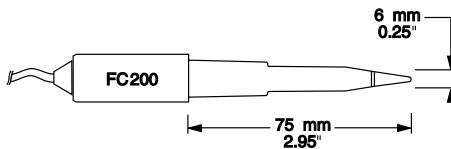
## FC210B

Glass body, double junction, conical, viscolene, non refillable, combination electrode
Application: milk and yogurt

**FC 210**

12 mm
0.5"

120 mm
4.7"
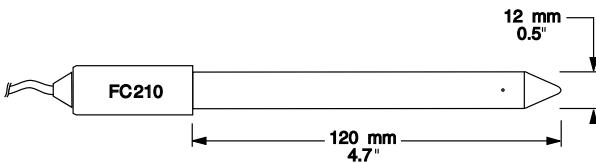
## pH

### FC220B

Glass body, triple ceramic, single junction, refillable, combination electrode
Application: food processing
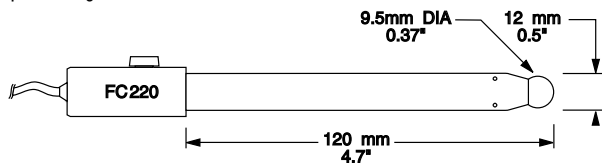
## pH with 10K NTC thermistor

### HI1131Y

Glass body, single ceramic frit, double junction, refillable, combination electrode
Application: general purpose
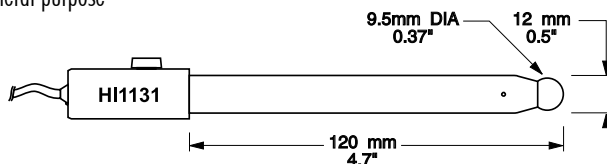
### HI1230Y

PEI body, single ceramic frit, double junction, combination electrode
Application: general purpose
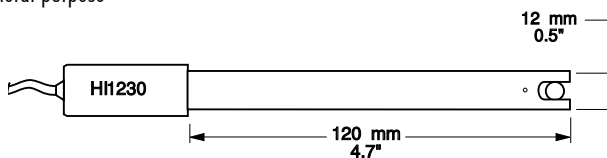
### HI1048Y

Glass body, CPS sleeve junction, combination electrode
Application: wine, must, and juice

## ORP

### HI3131B

Glass body, refillable, combination platinum electrode, ORP sensing pin
Application: titration
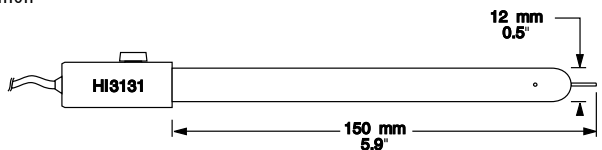
## ORP

### HI3230B

Plastic body (PEI), gel filled, combination platinum electrode, ORP sensing pin
Application: general purpose
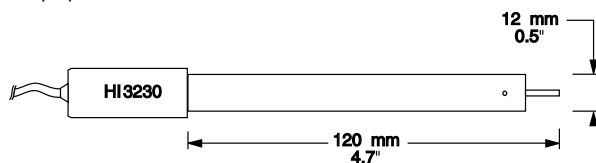


### HI4430B

Plastic body (PEI), gel filled, combination gold electrode, ORP sensing pin
Application: general purpose
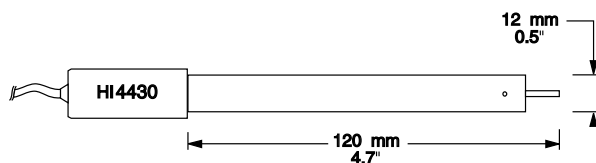


## Extension cables for screw-type electrodes (screw to BNC adapter)



CONNECT TO SCREW TYPE ELECTRODES

CONNECT TO METER BNC SOCKET
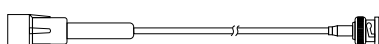
**HI7855/1**, 1 m (3.3') long
**HI7855/3**, 3 m (9.9') long
Connector and 3.0 mm (0.12") cable with BNC

Please refer to the Hanna Instruments general catalog for more electrodes with screw-type or BNC connectors.

## 16. ABBREVIATIONS

**ATC**   Automatic Temperature Compensation
**CSV**   Comma-Separated Values
**FTP**   File Transfer Protocol
**GLP**   Good Laboratory Practice
**IIS**   Internet Information Services
**MTC**   Manual Temperature Compensation
**NIST**  National Institute of Standards
        and Technology

## CERTIFICATION

All Hanna® instruments conform to the **CE European Directives** and **UK standards.**

CE    UK CA    RoHS compliant

**Disposal of Electrical & Electronic Equipment.** The product should not be treated as household waste. Instead hand it over to the appropriate collection point for the recycling of electrical and electronic equipment which will conserve natural resources.

Ensuring proper product disposal prevents potential negative consequences for the environment and human health. For more information, contact your city, your local household waste disposal service, or the place of purchase.

## RECOMMENDATIONS FOR USERS

Before using this product, make sure it is entirely suitable for your specific application and for the environment in which it is used. Any variation introduced by the user to the supplied equipment may degrade the meter's performance. For yours and the meter's safety do not use or store the meter in hazardous environments.

## WARRANTY

HI6221 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. Electrodes and probes are warranted for a period of six months. This warranty is limited to repair or replacement free of charge. Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered.

If service is required, contact your local Hanna Instruments office. If under warranty, report the model number, date of purchase, serial number (see engraved on the bottom of the meter) and the nature of the problem. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the meter is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization number from the Technical Service department and then send it with shipping costs prepaid. When shipping any meter, make sure it is properly packed for complete protection.

## REGULATORY NOTICES FOR THE WI-FI MODULE

**United States (FCC)** FCC ID: 2ADHKATWINC1500.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**Canada (ISED)**   IC: 20266-WINC1500PB
                   HVIN: ATWINC1500-MR210PB
                   PMN: ATWINC1500-MR210PB

This device complies with Industry Canada's license exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établisse-ment d'une communication satisfaisante.

**Japan (MIC)** 005-101762

**South Korea (KCC)** R-CRM-mcp-WINC1510MR210P

**Taiwan (NCC)** CCAN18LP0321T2

注意！依據 低功率電波輻射性電機管理辦法 第十二條 經型式認證合格之低功率射頻電機, 非經許 可, 公司、商號或使用者均不得擅自變更頻率、加大功率或 變更原設計 之特性及功能。第十四條 低功率射頻電機之使用不得影響飛航安全及 干擾合法通信；經發現有干擾現象時, 應立即停用, 並改善至無干擾時 方得繼續使用。前項合法通信, 指依電信規定作業之無線電信。低功率射頻電機須忍受合法通信或工業、科學及醫療用 電波輻射性 電機設備之干擾。

**China (SRRC)** CMIIT ID: 2018DJ1305

**ANATEL** 08497-18-08759

*Note: FCC information is marked on the back of the device.*