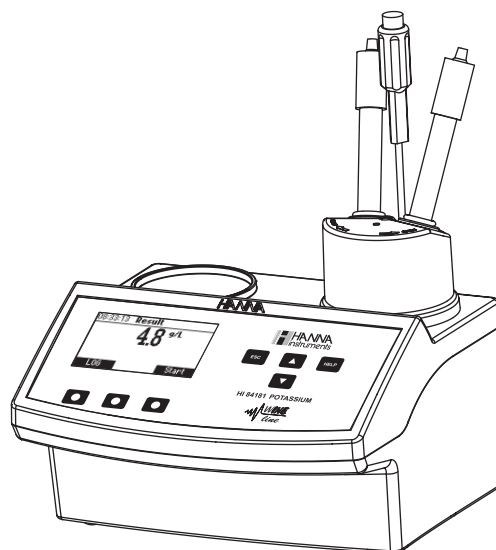**Instruction Manual**

HI 84181
ISE Potassium
Meter

Dear Customer,

Thank you for choosing a Hanna product. This manual will provide you with the necessary information for the correct use of the instrument. Please read it carefully before using the meter. If you need additional technical information, do not hesitate to e-mail us at **tech@hannainst.com.** This instrument is in compliance with C€ directives.

TABLE OF CONTENTS

MODEL IDENTIFICATION

Two models are available:

HI 84181-01 - 115 Vac power supply

HI 84181-02 - 230 Vac power supply

PRELIMINARY EXAMINATION

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

Each **HI 84181** instrument is supplied complete with:
- Reagents set for 20 tests
- One 2000 μL automatic pipette
- Six plastic tips for the 2000 μL automatic pipette
- Two 50 mL beakers
- **HI 61014** Potassium half cell
- **HI 5315** Reference half cell
- **HI 7662-T** Temperature probe
- Stir bar (2 pcs)
- Power cable
- **HI 7076** Refilling solution (4×30 mL)
- One 1 mL syringe
- One 1 mL pipette
- Instruction sheet
- Instruction manual

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

GENERAL DESCRIPTION

The **HI 84181** is a low cost, easy to use, potassium ISE instrument that performs automatic analysis with all the necessary calculations assuring to the user a simple and effective interface.

The instrument comes with a powerful and effective built-in algorithm to analyze the shape of the ISE electrode response and to determine the reaction completion.

By simply pressing the **Start** key, the instrument performs automatic analysis, all the necessary calculations and verifications. The result is immediately displayed in convenient units, then the instrument is ready for another measurement.

SIGNIFICANCE OF USE

Potassium ion (K^+) is absorbed in vine from earth. Unlike other essential nutrients potassium remains in ionic form and passes to the grapes.

Potassium ion is by far the most important ion that can be found in wine with concentrations between 0.7-2 g/L (ppt) and is mostly deriving from grapes.

Potassium ion is greatly influencing the taste of wine, the absence of potassium ion giving a sour taste of wine.

The alcohol content and low temperature make potassium to precipitate as potassium bitartrate.

Red wines have an increased content of potassium compared to white wines because the phenols inhibit the precipitation of potassium bitartrate in the red wine.

The **HI 84181** ISE Potassium meter measures the potassium content in wine using an ion selective electrode. The used method is double standard addition, a simple and rapid method of analysis, and the result is readily displayed in g/L K^+ (ppt).

Above 2.5 g/L the instrument provides information about the approximate potassium content.

SPECIFICATIONS

Range	0.0 to 5.0 g/L (ppt) K$^+$
Resolution	0.1 g/L (ppt) K$^+$
Accuracy	±5% of reading (see note)
Sample volume	50 mL
Temperature Compensation	Automatic from 0 to 80 °C
Electrodes	**HI 61014** Potassium half cell
	HI 5315 Reference half cell
Temperature Probe	**HI 7662-T** (included)
LOG feature	50 samples
Stirring speed	500 rpm
Environment	0 to 50 °C (32 to 122 °F); max 95% RH non-condensing
Power supply	220V/50Hz; 10VA
Dimensions	208 x 214 x 163 mm (8.2 x 8.4 x 6.4") (with beaker)
Weight	2200 g (77.6 oz.)

Note: Above 2.5 g/L the instrument provides information about the approximate potassium content.

REQUIRED REAGENTS

Code	Description	Quantity/Test
HI 84181-0	ISA	2 mL
HI 84181-1	Standard 1	2 mL
HI 84181-2	Standard 2	2 mL

PRINCIPLE OF OPERATION

The determination of potassium concentration is made according to double standard addition method. This technique enables an unknown concentration and the electrode's slope factor to be determined simultaneously.

The Automatic Temperature compensation is available using **HI 7662-T** temperature probe. By setting the electrode isopotential point and enabling temperature compensation option in **Setup** menu, the obtained concentration is temperature compensated.
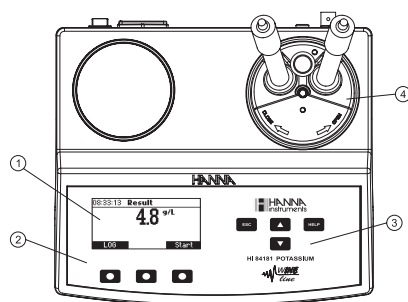
The accuracy of the obtained result depends on the stability of the mV reading in every step of the measurement.

Three selectable stability criteria can be selected in **Setup** menu. Select **Medium** or **Accurate** criteria in order to have accurate analysis.
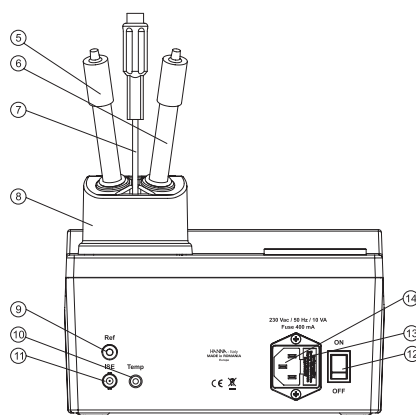
5

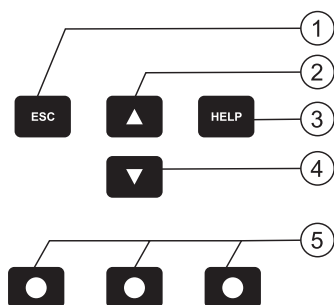# FUNCTIONAL DESCRIPTION

<u>INSTRUMENT DESCRIPTION</u>

FRONT PANEL

1) Graphic LCD
2) Functional keys
3) Keypad
4) Electrode holder

REAR PANEL

5) Potassium half cell
6) Reference half cell
7) Temperature probe
8) Electrode holder
9) Reference socket
10) Temperature probe socket
11) BNC electrode connector
12) Power switch
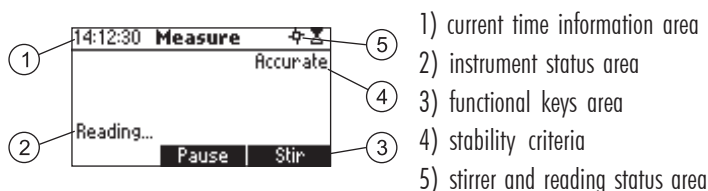13) Fuse
14) Power cable connector

KEYPAD DESCRIPTION

1) **ESC** - to leave the current screen and to return either to the previous screen or to the main screen. In the setup parameter modifying mode by pressing **ESC** the value is not modified.

2) ▲ - to modify a parameter value, to scroll the information from the instrument's setup

3) **HELP** - to access/leave the instrument's contextual help

4) ▼ - to modify a parameter value, to scroll the information from the instrument's setup

5) Functional Keys

START UP

- Place the instrument on a flat table. Do not place the instrument in direct sunlight.
- Connect the instrument to mains socket with ground connection and the correct voltage and frequency. See the label on the instrument rear for this.
- Connect the **HI 61014** potassium half cell, the **HI 5315** reference half cell and the **HI 7662-T** temperature probe.
- Turn the instrument ON using the power switch from the rear panel of the instrument and wait until main screen is displayed.

GUIDE TO DISPLAY CODES

During the instrument's operation a series of informations are displayed on the LCD.

1) current time information area
2) instrument status area
3) functional keys area
4) stability criteria
5) stirrer and reading status area

Icons from the stirrer and reading status area

⌛ When the input reading is unstable.

⊥ When the stirrer is on.

🌡°C Temperature warning (only if the **"Temperature compensation"** is disabled). The warning symbol will be displayed if the temperature difference between the temperature of the sample confirmed at the first step and the subsequent readings is greater than 3 °C.
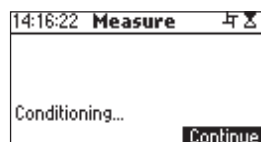
Measure screens
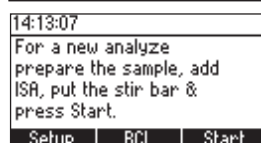
Main screen display
Press **Setup** to acces the instrument's setup.
Press **RCL** to view logged data.
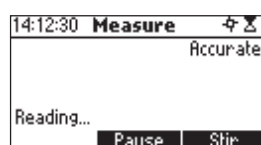Press **Start** to begin a new measurement cycle.
Press **HELP** at any moment to view the contextual help.

Conditioning screen
A two minutes conditioning period is initiated.
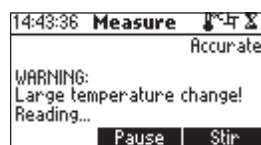Press **Continue** to stop the conditioning period and skip the message.
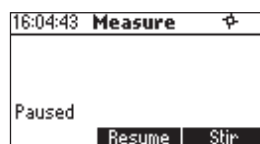

Measure screen
Press **ESC** at any moment during the measurement cycle and the instrument will return to the main screen.
Press **Pause** to pause the measurement process.
Press **Stir** to start/stop the stirrer.

If the difference between the temperature of the sample confirmed at the first step and the subsequent readings is greater than 3°C and the temperature compensation feature is disabled in **Setup**, the temperature warning icon will blink and the message **"WARNING: Large temperature change!"** will be displayed.

8

Pause screen

Press **Resume** to continue the measurement process.
Press **Stir** to start/stop the stirrer.
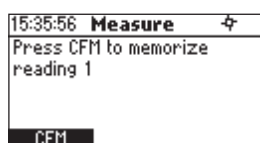
Sample reading confirm screen (only if this feature is enabled in setup)
Press **CFM** to memorize the reading.

Wrong input error screen

This screen is displayed if the current reading is out of $\pm 2000mV$ range.

Wrong standard error screen

This screen is displayed if step 2 and 3 of the current reading is out of $\pm 2000mV$ range or if the difference between the stable readings from the current and the previous step is too small ($\pm 3mV$) or, if in auto confirm mode, the standard addition is not detected.
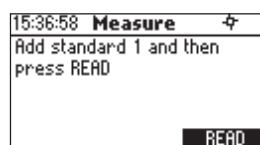
Add standard screen

Add the corresponding standard. Press **READ** to start the next step analysis if "**Reading confirm**" option is enabled in the **Setup** menu. If "**Reading confirm**" option is disabled, the instrument will start the next step analysis.
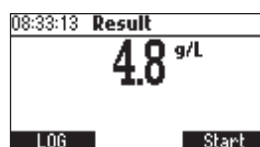
Result screen

The ion concentration is displayed in g/L (ppt) K^+. If the concentration is out of range, the instrument displays the upper range limit blinking.
Press **LOG** to save the measured concentration. A message indicating the free log space will be displayed for a few seconds. If the free log space is under 10% this message will be permanently displayed.
Press **Start** to begin a new measurement cycle.
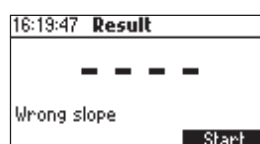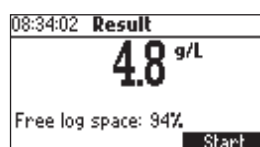
Wrong slope screen

This screen appears if the computed slope isn't in the acceptable range. The acceptable range is 30% to 140% default slope (53mV/decade).
Press **Start** to begin a new measurement cycle.

Setup screens

While in the **Setup** menu it is possible to modify the instrument's parameters. By pressing the ▲/▼ keys it is possible to move between the **Setup** options. Each menu item displays the current option. Press **HELP** to view the contextual help.
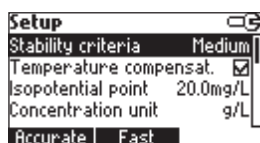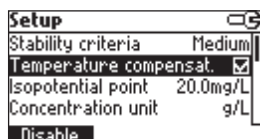
Stability criteria

Options: **Accurate**, **Medium**, **Fast**.

Press the corresponding functional key to select the desired option.

Select **Accurate** for accurate measurements; long duration.

Select **Medium** for normal measurements.

Select **Fast** only for quick estimations; low accuracy in short time.

Temperature compensation

Options: **Enable**, **Disable**

Enable this feature only if **HI 7662-T** temperature probe is connected and electrode isopotential point is known.

If enabled, the meter will take into account the temperature of the readings when evaluating the final result.

If disabled, the computed concentration will not be temperature compensated.

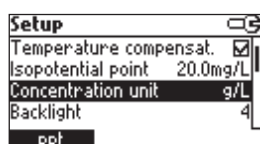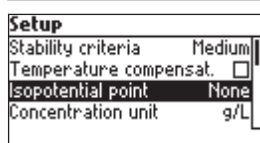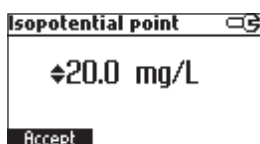Press the functional key to select the desired option.
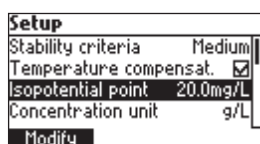
Isopotential point

Options: **1.0 to 50.0 mg/L (ppm)**.

Press **Modify** to access the isopotential point concentration modify screen.

Press ▲/▼ to increase/decrease the isopotential point concentration.

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

If the temperature compensation feature is disabled the meter will display **"None"** for the isopotential point, and the isopotential point modify screen cannot be accessed.

Concentration unit

Options: **g/L, ppt**

Press the corresponding functional key to select the desired concentration unit to be used in displaying measurements results.
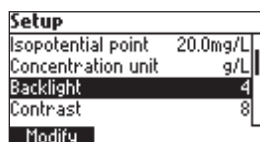
Backlight

Options: **On-Off, 1 to 8 levels.**

Press **Modify** to access the backlight modify screen.

Press ▲/▼ or ←/→ in order to increase/decrease the display's backlight intensity.

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

Contrast

Options: **0 to 20.**

Press **Modify** to access the contrast value modify screen.

Press ▲/▼ or ←/→ in order to increase/decrease the display's contrast.

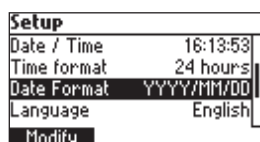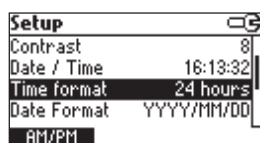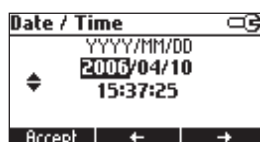Press **Accept** to confirm the value or **ESC** to return to **Setup** menu without saving.

Date/Time

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

Press **Modify** to access the date/time modify screen.

Date/Time modify screen

Press ←/→ to select the value to be modified (year, month, day, hour, minute or second) and then press ▲/▼ in order to increase/decrease the value.

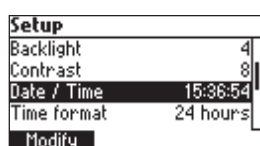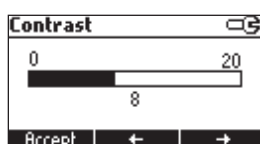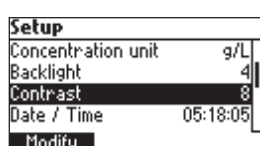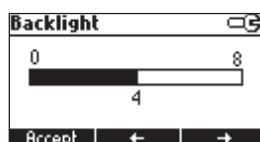Press **Accept** to confirm the new values or **ESC** to return to **Setup** menu without saving.

Time format

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

Press the functional key in order to change the time format.

Date format

Press **Modify** to access the date format modify screen.

11

```
┌─────────────────────────┐
│ Date Format        ⊏⊊   │
│ DD/MM/YYYY              │
│ MM/DD/YYYY              │
│ ▓YYYY/MM/DD▓            │
│ YYYY-MM-DD              │
│  Accept                 │
└─────────────────────────┘
```
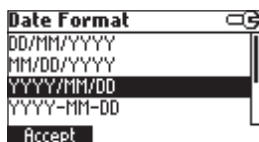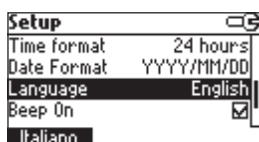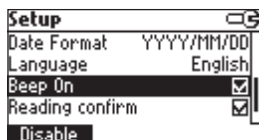
Press ▲/▼ or in order to select the desired date format. Press **Accept** to confirm the desired date format or **ESC** to return to the **Setup** menu without saving.

```
┌─────────────────────────┐
│ Setup              ⊏⊊   │
│ Time format   24 hours  │
│ Date Format YYYY/MM/DD  │
│ ▓Language      English▓ │
│ Beep On            ☑    │
│  Italiano               │
└─────────────────────────┘
```

Language
Options: **Up to four languages**
This option is used to change the instrument's display language. Press the corresponding functional key in order to select the new option. If the new selected language cannot be loaded, the previously selected language will be kept. The **HELP** information is not available if no language file can be loaded.

```
┌─────────────────────────┐
│ Setup              ⊏⊊   │
│ Date Format YYYY/MM/DD  │
│ Language       English  │
│ ▓Beep On           ☑▓   │
│ Reading confirm    ☑    │
│  Disable                │
└─────────────────────────┘
```
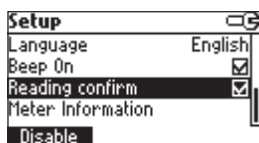
Beep status
Options: **Enable, Disable**
This option enables/disables the beep feature.
Press the functional key in order to select the new option.
When enabled, beep sounds as a short beep every time a key is pressed or when the reading must be confirmed.
In auto confirm mode the instrument will beep until the standard addition is detected.
A long beep alerts that the pressed key is not active.

```
┌─────────────────────────┐
│ Setup              ⊏⊊   │
│ Language       English  │
│ Beep On            ☑    │
│ ▓Reading confirm   ☑▓   │
│ Meter Information       │
│  Disable                │
└─────────────────────────┘
```
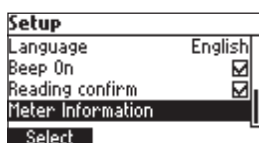
Reading confirm
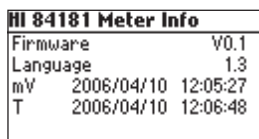Options: **Enable, Disable**
Enable this feature to manually confirm a stable reading. If disabled, the instrument will automatically store a reading when it becomes stable, and move to the next step of the measurement cycle.
Press the functional key in order to select the new option.

```
┌─────────────────────────┐
│ Setup                   │
│ Language       English  │
│ Beep On            ☑    │
│ Reading confirm    ☑    │
│ ▓Meter Information▓     │
│  Select                 │
└─────────────────────────┘
```

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

```
┌─────────────────────────┐
│ HI 84181 Meter Info     │
│ Firmware          V0.1  │
│ Language           1.3  │
│ mV   2006/04/10 12:05:27│
│ T    2006/04/10 12:06:48│
│                         │
└─────────────────────────┘
```

12

Recall screens

Displays the list of all the memorised results. This list includes the record's number, the concentration value, the concentration unit and the date.

Press ▲/▼ to toggle between the stored records.

Press **More** to view a complete set of data corresponding to the selected record. To return to the previous screen press **ESC**.

Press ▲/▼ to toggle between complete record information screens.

Press **Delete** to erase the currently selected record from the instrument's memory. After pressing **Delete** the instrument will ask for confirmation. Press **CFM** to delete the record or **ESC** to return to the previous screen without deleting.

Deleting a record will reorganise the list of records.

Press **Delete All** to erase all the stored records. After pressing **Delete All** the instrument will ask for confirmation. Press **CFM** to delete all the records or **ESC** to return to the previous screen without deleting.

If the log is empty the message "**No Records!**" will be displayed.

TIPS FOR AN ACCURATE MEASUREMENT

The instructions listed bellow should be carefully followed during analysis to ensure best accuracy.

- Rinse the electrode pair with distilled or deionized water between samples, and blot dry with a lab wipe or other soft disponible absorbent toweling.

- Select the adequate stability criteria.

- Analyse the wine sample at room temperature.

MEASUREMENT PROCEDURE

- Fill the beaker up to the 50 mL mark with sample. Use the 2000 μL automatic pipette to add 2 mL of **HI 84181-0** ISA, place the stir bar into the beaker and then place the beaker in the appropriate place on the instrument top.

2 mL HI 84184-0

50 mL WINE SAMPLE
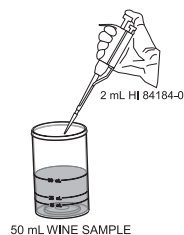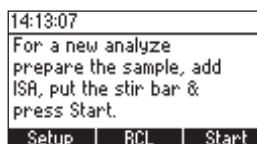
- Place the electrode holder on the top of the beaker and secure it by turning clockwise.
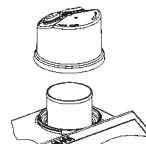
- Immerse **HI 61014** potassium electrode, **HI 5315** reference and the **HI 7662-T** temperature probe approximately 2 cm (0.8") into the sample to be tested paying attention to not touch the stir bar, and press **Start**.
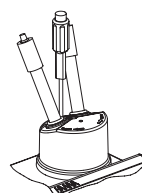
- Wait until the reading is stable, **CFM** key displayed, if the "**Reading confirm**" option is selected, and then press **CFM**. If the "**Reading confirm**" option is disabled the instrument automatically memorizes the reading when this is stable and waits to add standard. Until the standard addition is detected the instrument will beep if beeper is enabled in **Setup**.

14
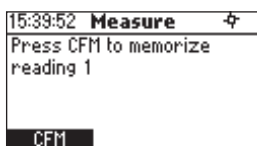
- Use the 2000 μL automatic pipette to add exactly 2 mL of **HI 84181-1** Standard when the meter asks for it. If the instrument is not in auto confirm mode, press **READ** to start next measurement step.

- Wait until the reading is stable, **CFM** key displayed, if the "**Reading confirm**" option is selected, and then press **CFM**. If the "**Reading confirm**" option is disabled the instrument automatically memorizes the reading when this is stable and waits to add standard. Until the standard addition is detected the instrument will beep if beeper is enabled in **Setup**.

```
15:43:11  Measure        ⊣┐
Press CFM to memorize
reading 2

 CFM
```

- Use the 2000 μL automatic pipette to add exactly 2 mL of **HI 84181-2** Standard when the meter asks for it. If the instrument is not in auto confirm mode, press **READ** to start next measurement step.

- Wait until the reading is stable, **CFM** key displayed, if the "**Reading confirm**" option is selected, and then press **CFM**. If the "**Reading confirm**" option is disabled the instrument automatically memorizes the reading when this is stable and computes result.

```
15:50:14  Measure        ⊣┐
Press CFM to memorize
reading 3

 CFM
```

- At the end of the measurement procedure the result is displayed as g/L (ppt) K^+.

```
08:33:13  Result
             4.8 g/L

 LOG                  Start
```
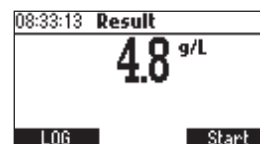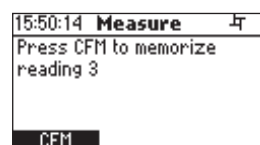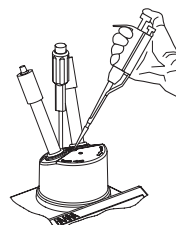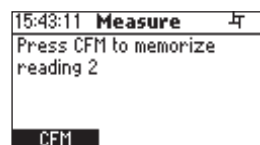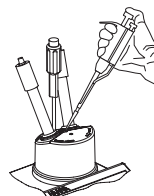
Notes:
- If the reading is out of range, the upper range value is displayed blinking.
- If the evaluated slope is out of 30-140 % range the instrument displays "- - - -" and "**Wrong slope**" message.
- If auto confirm mode is selected and beep feature is enabled, the instrument will beep after reading is confirmed until the addition of the standard is detected. If the addition of the standard is not detected after a period of time between 10 to 20 minutes, according with the stability criteria, "**Wrong standard**" message will be displayed.

```
16:19:47  Result

    - - - -

Wrong slope
                      Start
```
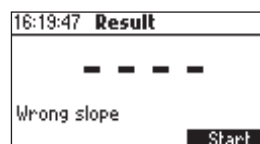
FUSE REPLACEMENT

To change the fuse follow next steps:
- Disconnect the power cord from the rear panel of the instrument.
- Pull out the fuse holder located near the power cord connector.
- Replace the fuse with a similar one.
- Push the fuse holder with the fuse in the appropriate place.
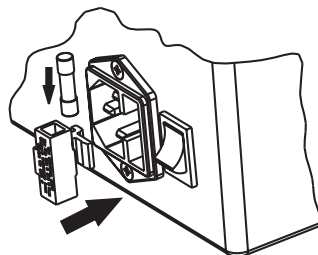
ELECTRODE CONDITIONING & MAINTENANCE
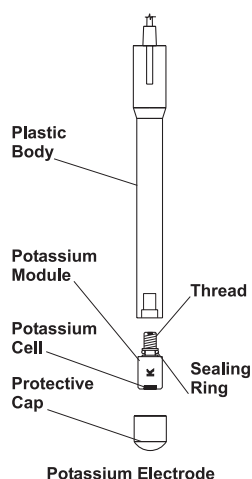
Potassium Electrode
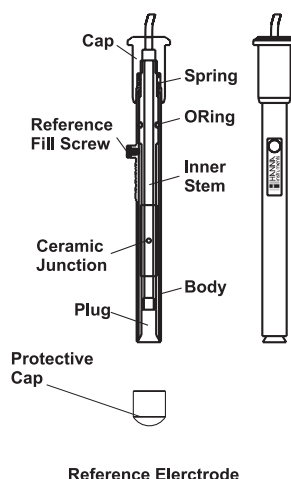
Reference Elerctrode

PREPARATION PROCEDURE

Preparation of potassium electrode:
- Remove the protective cap from the **HI 61014** potassium sensor's tip.
- Screw the potassium cell into the electrode body. Ensure the Sealing Ring is installed before screwing.
- Due to shipping or storage the internal solution inside the sensing modules may have developed an air pocket near the membrane. Gently shaking the sensor down (like the old style mercury thermometers) will place the internal solution next to the membrane.
- Soak in potassium standard 10^{-2} M for at least half-hour before measurements in order to optimize the sensor response.

16

Preparation of reference electrode:
- Unwrap Parafilm™ seal found over ceramic junction on inner stern of the reference electrod and discard. This is only used for shipping.
- Rinse inner stern with deionized water making certain to wet o-ring found on the inner stern.
- Reassemble reference electrode by gently pushing the inner assembly into the outer body, sliding spring down cable, and screwing cap into place.
- Remove fill hole cover and o-ring or fill hole spout.
- Using the dropper pipette provided, add a few drops of **HI 7076** filling solution to the reference electrode, wetting the o-ring and rinsing out the fill solution chamber.
- Holding the body of the electrode depress the black cap with your thumb. This permits the fill solution to drain out of the body. Verify if the electrode returns to its original position. (You may need to gently assist for this to occur).
- Tighten the electrode cap onto the body and fill electrode body with **HI 7076** filling solution until fill solution volume is just below fill hole.
- Place sensor and reference electrode into electrode holder and connect the Cable Connectors to the instrument.

Note: During measurement always operate reference electrode with the fill hole open.

CLEANING PROCEDURE
- Rinse the potassium electrode with deionised water. Check to see if the small scratches have been eliminated.
- Soak the potassium electrode in a standard for one hour.
- Rinse with deionised water and blot dry.

REFERENCE ELECTRODE CLEANING
- Drain the old filling solution, rinse with an adequate **HI 7076** solution, drain, then refill with **HI 7076** solution.
- Do not use an electrode if cristalised salts are visible inside the electrode. Drain electrode, disassemble and rinse internal body with deionised water. Reassemble and refill with fresh refill solution.
- The internal chamber of this electrode is gell filled. If the electrode has been left dry for long periods of time the gell may be dehydrated and stable measurements may not be obtainable. Disassemble electrode and soak internal assembly in **HI 7076** filling solution. Verify the ceramic is wetted by the fill solution. Warming the solution slightly (50 °C) before soaking will hasten this process. Permit the electrode to cool completely while immersed in this solution.

QUICK CHECK OF THE ELECTRODE SLOPE
- Connect the electrode and the reference electrode to the instrument.
- Press and hold down **ESC**, ▲ and **HELP** keys simultaneously and power on the meter. Wait until the instrument enters in the reading check mode.
- Place 50 mL of deionized water into the beaker with a stir bar.

17

- Add 1 mL of **HI 84181-1** Standard. Record the mV value when stable.
- Add an additional 10 mL of **HI 84181-1** Standard to the solution. Wait for the reading to stabilize and record the mV value.
- The difference between the two recorded mV values give the slope of the electrode. An acceptable value for this slope is 53 ± 4 mV.
- Press **ESC** to leave the reading check mode.

PERIODIC MAINTENANCE

Inspect the electrode and the cable. The cable used for connection to the instrument must be intact and there must be no points of broken insulation on the cable, or cracks on the electrode stem or bulb. Connectors must be perfectly clean and dry. If any scratches or cracks are present, replace the electrode. Rinse off any salt deposits with deionized water.

Add filling solution dosing to maintain a good head pressure. For optimal electrode response this level should be maintained and not be allowed to drop more than 2-3 cm (1 inch below fill hole).

STORAGE PROCEDURE

The **HI 61014** sensor can be stored in standards for short periods of time and should be stored dry with the protective cap on, when not in use, for long periods of time.

The **HI 5315** reference electrode may be stored in air or aqueous solutions between sample measurements.

If the electrode will be used frequently and needs to be ready for use, take measures to prevent evaporation of fill solution. Top off fill solution, replace o-ring, fill hole cover on the fill hole opening, and place protective cap over junction tip. Store the electrode upright. Before using, flush junction once and top off fill solution.

For long term storage, disassemble electrode and wash all salts from assembly with deionized water. Wrap ceramic junction on inner stern in Parafilm™ or other sealing film. Store dry and disassembled.

MALFUNCTIONING

Reading fluctuates or drifts:

Could be due to dirty or blocked reference electrode junction: follow the cleaning procedure above. Repeat the measurement with a fresh potassium electrode.

ACCESSORIES

<u>REAGENTS</u>

HI 7076	Electrode filling solution
HI 84181-20	Reagent set for 20 tests
HI 84181-0	ISA for Potassium electrode (500 mL)
HI 84181-1	Standard 1 for Potassium electrode (500 mL)
HI 84181-2	Standard 2 for Potassium electrode (500 mL)

<u>OTHER ACCESSORIES</u>

HI 61014	Potassium half cell
HI 5315	Reference half cell
HI 731316	Stir bar (5 pcs.)
HI 731342	Automatic pipette 2000 μL
HI 731352	Tips for 2000 μL automatic pipette (25 pcs.)
HI 740036P	Beaker 50 mL (10 pcs.)
HI 740143	Syringe 1mL (6 pcs.)
HI 740144	Syringe tips (6 pcs.)
HI 741355P	Capilary pipette
HI 7662-T	Temperature probe

WARRANTY

HI 84181 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to the instructions.

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

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

If service is required, contact your dealer. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charges incurred.

If the instrument is to be returned to Hanna Instruments, first obtain a **Returned Goods Authorization Number** from the **Customer Service Department** and then send it with shipment costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

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

SALES AND TECHNICAL SERVICE CONTACTS

Australia:
Tel. (03) 9769.0666 • Fax (03) 9769.0699

China:
Tel. (10) 88570068 • Fax (10) 88570060

Egypt:
Tel. & Fax (02) 2758.683

Germany:
Tel. (07851) 9129-0 • Fax (07851) 9129-99

Greece:
Tel. (210) 823.5192 • Fax (210) 884.0210

Indonesia:
Tel. (210) 4584.2941 • Fax (210) 4584.2942

Japan:
Tel. (03) 3258.9565 • Fax (03) 3258.9567

Korea:
Tel. (02) 2278.5147 • Fax (02) 2264.1729

Malaysia:
Tel. (603) 5638.9940 • Fax (603) 5638.9829

Singapore:
Tel. 6296.7118 • Fax 6291.6906

South Africa:
Tel. (011) 615.6076 • Fax (011) 615.8582

Taiwan:
Tel. 886.2.2739.3014 • Fax 886.2.2739.2983

Thailand:
Tel. 66.2619.0708 • Fax 66.2619.0061

United Kingdom:
Tel. (01525) 850.855 • Fax (01525) 853.668

USA:
Tel. (401) 765.7500 • Fax (401) 765.7575

For e-mail contacts and a complete list of Sales and Technical offices, please see
www.hannainst.com.