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# Potassium Sealed Electrode Sensor Bundle

Product Number: ENPOT-A008

## Overview

Potassium plays a key role on many of our bodily functions including the nervous and pulmonary systems. Fruits and vegetables are an excellent source of potassium and it plays an important part in crop fertilization. Potassium's chemical symbol is K. The Potassium Sensor measures the level of potassium molecules in a solution.
The Potassium Sealed Electrode Sensor can be connected to all types of einstein™ data loggers.

## Typical experiments

### Chemistry

- Potassium levels in fruit juice
- Potassium levels in soil

## How it works

The Potassium sensor contains a Permafil (non-refillable) electrode containing an oxidized form of potassium

inside a membrane. When inserted into a solution containing potassium molecules the potassium in the solution is attracted to the oxidized potassium in the membrane. By measuring the electrical potential of this attraction the sensor can determine the level of potassium in the solution. Because they only attract other potassium molecules sealed electrode sensors work well even in solutions containing numerous elements.

## Sensor specification

| | |
|---|---|
| Concentration Range: | *1 x $10^{-6}$ to 1 M (0.04-39,000 ppm)* |
| Resolution (12-bit): | 0.15 mV |
| Minimum Sample Size: | 5 mL in a 50 mL beaker |
| Default Sample Rate | 10 samples per second |
| pH Range: | 2 to 12 pH |
| Temperature Range : | 0 to 50 °C |
| Reproducibility : | ± 2% |
| Electrode Resistance | 10 to 20 MΩ |
| Interfering Ions | $Cs^+$, $Nh^{4+}$, $Ti^+$, $H^+$, $Ag^+$, $Tris^+$, $Li^+$, $Na^+$ |

**Note: Sensor cables sold separately**

### Contents

The Potassium Sealed Electrode Sensor comes equipped with:

- The Potassium Sealed Electrode Sensor
- ISE (Ion Selective Electrode) Amplifier
- 1 oz. $K^+$ Ionic Strength Adjuster (ISA) (AJ0015)
- 1 oz. $K^+$ 10 ppm as K Standard (SD2055)
- 1 oz. K+ 1000 ppm as K Standard (SD2038)

### Solutions

| | |
|---|---|
| ISA 1M NaCl: | 58.443g NaCl in 1000mL DI water |
| 10ppm K (0.256 mM K): | Dissolve 19.1 mg KCl in DI water and dilute to 1000 mL |
| 1000ppm K (25.6 mM K): | Dissolve 1910 mg KCl in DI water and dilute to 1000 mL |

## Experimental set up

### Electrode Preparation

1. Remove the protective plastic cover from the tip of the electrode and gently shake the electrode downward like a thermometer to remove any air bubbles trapped inside. Caution: Do not touch the PVC membrane with your fingers.
2. Rinse the electrode with DI water and blot dry. Do not rub dry.
3. Condition the electrode by soaking it in the provided 10 ppm $K^+$ standard solution for 30 minutes.
4. After the conditioning period, rinse the tip of the electrode with DI water and blot dry.
5. The electrode is now ready to use.

This sensor must be calibrated before use (see the **Data Logging, Calibrating and Analysis** below).

Two solutions of different concentrations (depending on the range of measurements) are used to calibrate the electrode. ISA is added to all solutions to ensure that the samples and the standards have the same ionic

strength.

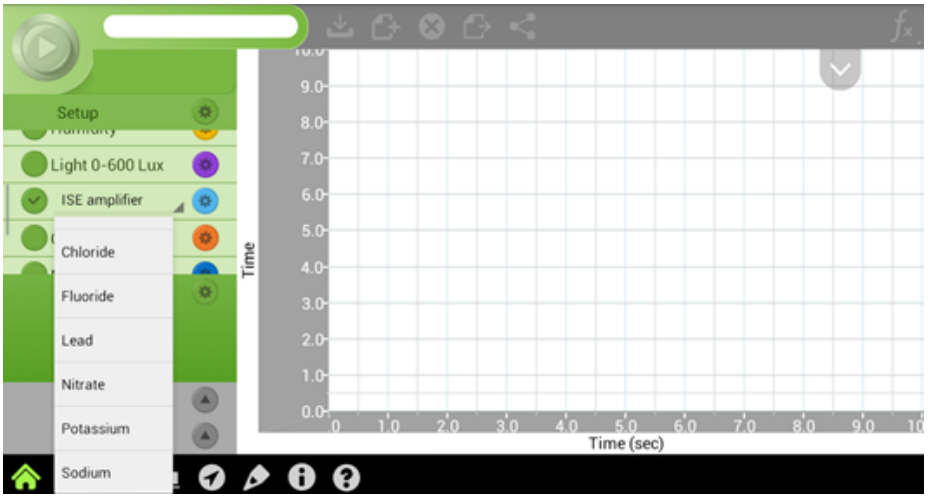
In addition to the aforementioned contents you will also need:

- Wash Bottle with Distilled (DI) or deionized water.
- Several clean beakers.
- 1mL, 10mL pipettes.

# Data logging, Calibrating and Analysis

## MiLAB™ Android & IOS

1. Take your einstein™ Tablet or pair your einstein™LabMate™ with your Android or iOS tablet via Bluetooth
2. Insert the electrode into the ISE amplifier
3. Insert the ISE amplifier cable into one of the sensor ports
4. Launch MiLAB
5. MiLAB will automatically detect the ISE amplifier and show it in the Launcher View
6. Tap ISE amplifier and select the Potassium electrode




7. Make sure the icon is checked ( ) to enable it for logging

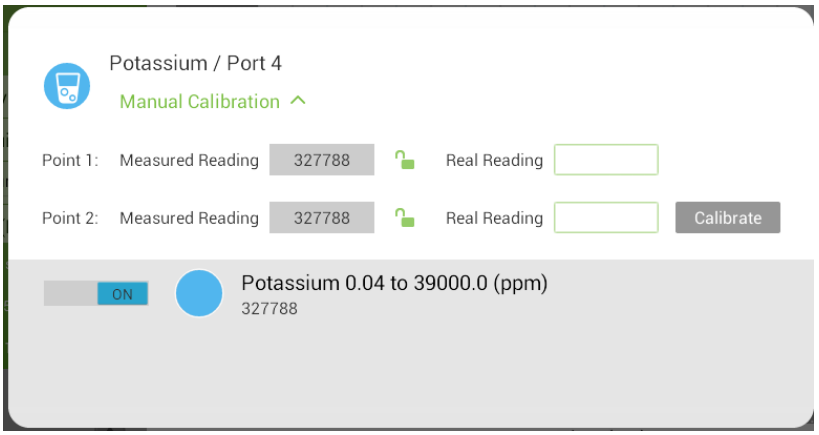
### *Calibration in MiLAB™*

**Preparing the calibration solutions**

1. Add 10 mL of the 10 ppm solution into a 50 mL beaker.
2. Add 0.2 mL of ISA and stir thoroughly.
3. Add 10 mL of the 1000 ppm solution into a 50 mL beaker.
4. Add 0.2 mL of ISA and stir thoroughly.

**Calibrating the sensor**

1. Tap the Settings button next to the sensor's name and tap "Manual Calibration"



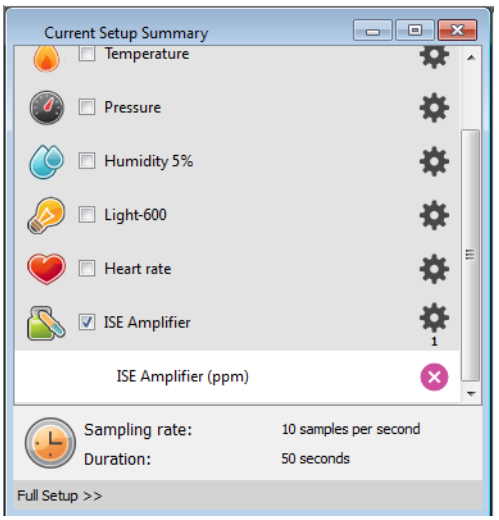

2. Prepare the electrode as described in “Electrode preparation” above
3. Tap the “Real Reading” box of Point 1
4. Enter the value “10”
5. Rinse the electrode with DI water, blot dry and place in the beaker with the 10 ppm solution. Wait for a stable reading, and then tap the “Lock” icon
6. Tap the “Real Reading” box of Point 2
7. Enter the value “1000”
8. Rinse the electrode with DI water, blot dry and place in the beaker with the 1000 ppm solution. Wait for a stable reading, and then tap the “Lock” icon
9. Tap “Calibrate”
10. You are ready to run your experiment

**Note**: It is best to calibrate the electrode with one Real Reading below your expected reading and one Real Reading above your expected reading. For example if you expect a reading of around 100 ppm it is best to calibrate with one Real Reading below 100 ppm and one Real Reading above 100 ppm

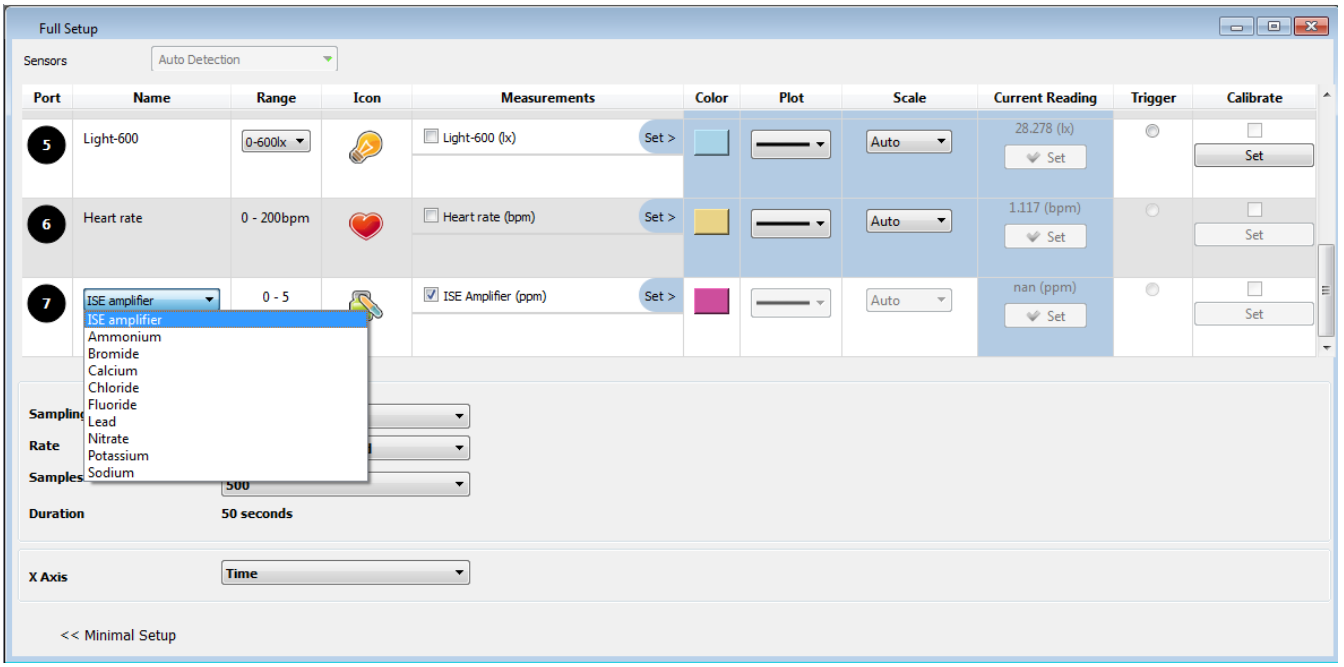
**Note**: You can prepare your own ppm solutions for calibration, using the strength of your solution as the “Real Reading”

## MiLAB™ Desktop

1. Pair your einstein™LabMate™ with your PC, MAC, or Linux machine via Bluetooth, or connect it via the USB cable (found in the einstein™LabMate™ box).
2. Insert the electrode into the ISE amplifier
3. Insert the ISE amplifier cable into one of the sensor ports
4. Launch MiLAB
5. MiLAB will automatically detect the ISE amplifier and show it in the **Current Setup Summary** window




6. Click **Full Setup**, located at the bottom of the **Current Setup Summary** window to set which ISE electrode you are using and to program the data logger's sample rate, number of samples, units of measurement, and other options



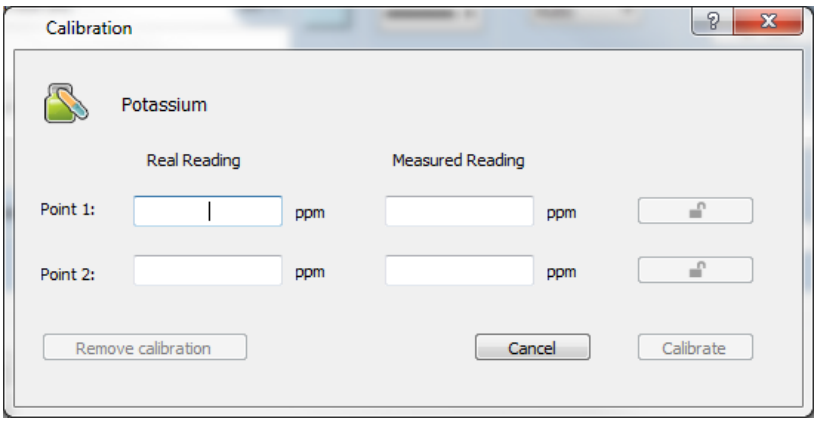

## Calibrating in MiLAB™Desktop

### *Calibrating in MiLAB Desktop*

**Preparing the calibration solutions**

1. Add 10 mL of the 10 ppm solution into a 50 mL beaker
2. Add 0.2 mL of ISA and stir thoroughly
3. Add 10 mL of the 1000 ppm solution into a 50 mL beaker
4. Add 0.2 mL of ISA and stir thoroughly

1. Start MiLAB™ ( ) and select the Potassium electrode as described above.
2. Under the Calibrate column tap “Set” to bring up the Calibration menu




3. Prepare the electrode as described in “Electrode preparation” above.
4. Tap the “Real Reading” box of Point 1
5. Enter the value “10”
6. Rinse the electrode with DI water, blot dry and place in the beaker with the 10 ppm . Wait for a stable reading, and then click the “Lock” icon
7. Tap the “Real Reading” box of Point 2
8. Enter the value “1000”
9. Rinse the electrode with DI water, blot dry and place in the beaker with the 1000 ppm solution. Wait for a stable reading, and then click the “Lock” icon
10. Click “Calibrate”
11. Tap the Run button ( )on the main toolbar of the Launcher View to start logging

**Note**: It is best to calibrate the electrode with one Real Reading below your expected reading and one Real Reading above your expected reading. For example if you expect a reading of around 100 ppm it is best to calibrate with one Real Reading below 100 ppm and one Real Reading above 100 ppm

**Note**: You can prepare your own ppm solutions for calibration, using the strength of your solution as the “Real Reading”

# Example of using the Potassium Sealed Electrode Sensor

## Reading a Sample with the Electrode using Direct Calibration

There are several methods to determine the concentration of a sample. The most common is the Direct Calibration method.

In Direct Calibration a series of standard solutions with differing concentrations are used to calibrate the electrode before testing an unknown solution.

In this experiment we are going to test the concentration of potassium in orange juice.

ISA must be added to all solutions to ensuring they all have the same ionic strength.

### The Experiment

1. Connect the electrode to the ISE amplifier, and then connect the amplifier to the data logger.
2. Prepare and calibrate the sensor as described in Preparing the Sensor and Calibrating the Sensor above.
3. Pipette 100 mL of orange juice into a 150 mL beaker. Add 2 mL of ISA and stir thoroughly.
4. Rinse electrode with Dl water, blot dry and place in the beaker with the orange juice.
5. Wait for a stable reading and click Stop on the main toolbar.

## Maintenance and Electrode Storage

**Short Term:**

Rinse the electrode thoroughly with Dl water and place the tip in a diluted standard solution (10 ppm) between measurements.

**Long Term:**

Rinse the electrode thoroughly with Dl water, blot and store dry. Replace the cap to protect the sensing element.

Follow procedures in the sections **Electrode Preparation** before using the electrode again.

## Troubleshooting

If the electrode slope is not within the normal range, the following procedure may restore the electrode.

1. Soak the electrode in the 10 ppm standard solution for 10 minutes before use.
2. Repeat the procedure outlined **Electrode Preparation** again.

## Technical support

For technical support, you can contact the Fourier Education's technical support team at:
Web: www.einsteinworld.com/support
Email: support@fourieredu.com
Phone (in the US): (877) 266-4066

## Copyright and Warranty

All standard Fourier Systems sensors carry a one (1) year warranty, which states that for a period of twelve months after the date of delivery to you, it will be substantially free from significant defects in materials and workmanship.
This warranty does not cover breakage of the product caused by misuse or abuse.
This warranty does not cover Fourier Systems consumables such as electrodes, batteries, EKG stickers, cuvettes and storage solutions or buffers.