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Apr 2024

Conductivity Sensor

Product Number: ENCNT435A



Overview

The Conductivity sensor is designed to measure electrical conductivity of solutions capable of measuring the entire range of 0.05 - 80 Mili Siemens (MS). Conductivity is one of the most basic tests applied on solutions. It determines the total concentration of ions in a sample using the direct relationship between conductivity and ion concentration in a solution.

The Conductivity sensor can be connected to all types of einstein™ data loggers. It can be used for various experiments in Biology, Chemistry and Environmental Science.

Typical experiments



Environmental Science
and Biology

- Conducting environmental studies
- Studying the permeability of cell membrane



Chemistry

- Determining the concentration of ions in the solution



Water Quality

- Determining the concentration of ions in the solution



Electricity

- Measuring conductivity when dissolving salts in water

How it works

In a solution, current flows by ion transport. An increasing concentration of ions in the solution will result in higher conductivity values. The Conductivity sensor contains two carbon electrodes. A potential difference is applied to these electrodes which results in a current proportional to the conductivity of the solution.

Sensor specification

Range:	0.05 - 80 mS/cm
Accuracy:	±8% over entire range
Resolution (12-bit):	5 µS
Conductivity Cell Material:	Carbon, 2-Cell
K Cell Value:	1.0
K cell Value Tolerance:	±20%
Temperature Range:	0 to 80 °C
Minimum Sample Size:	25mL
Response time for 95% of reading:	5 seconds
Default Sample Rate:	10 samples per second

Note: Sensor cable sold separately

Technical Notes

- For best results soak the probe in distilled water (DI) before use.
- During measurement, avoid particulate matter. Allow it to settle. Do not let sediment build up on the sensors.
- Rinse the electrode after measurements with DI water.
- Do not touch the probe cell surface with any hard object. If the probe cell surface is contaminated, clean the electrode (see Cleaning below).
- Store the electrode dry.
- The Conductivity sensor was designed only for educational purposes and shouldn't be used for industrial, medical, or research applications.

Electrode Maintenance

Cleaning the Electrode General Method

Prepare a solution of 1/2 teaspoon of liquid soap in 200 mL warm water. Soak the electrode for a few minutes and then gently wipe the element with a cotton swab. Rinse thoroughly with DI water.

Inorganic Build-up Method

When there is a buildup of inorganic material on the electrode soak the electrode tip in 0.1 M HCl for 10 minutes, then rinse thoroughly with DI water.

Greasy Film Method

When there is a buildup of greasy film on the electrode rinse the electrode tip with acetone or methanol (do not soak), then wash with the general method above. Rinse thoroughly with DI water.

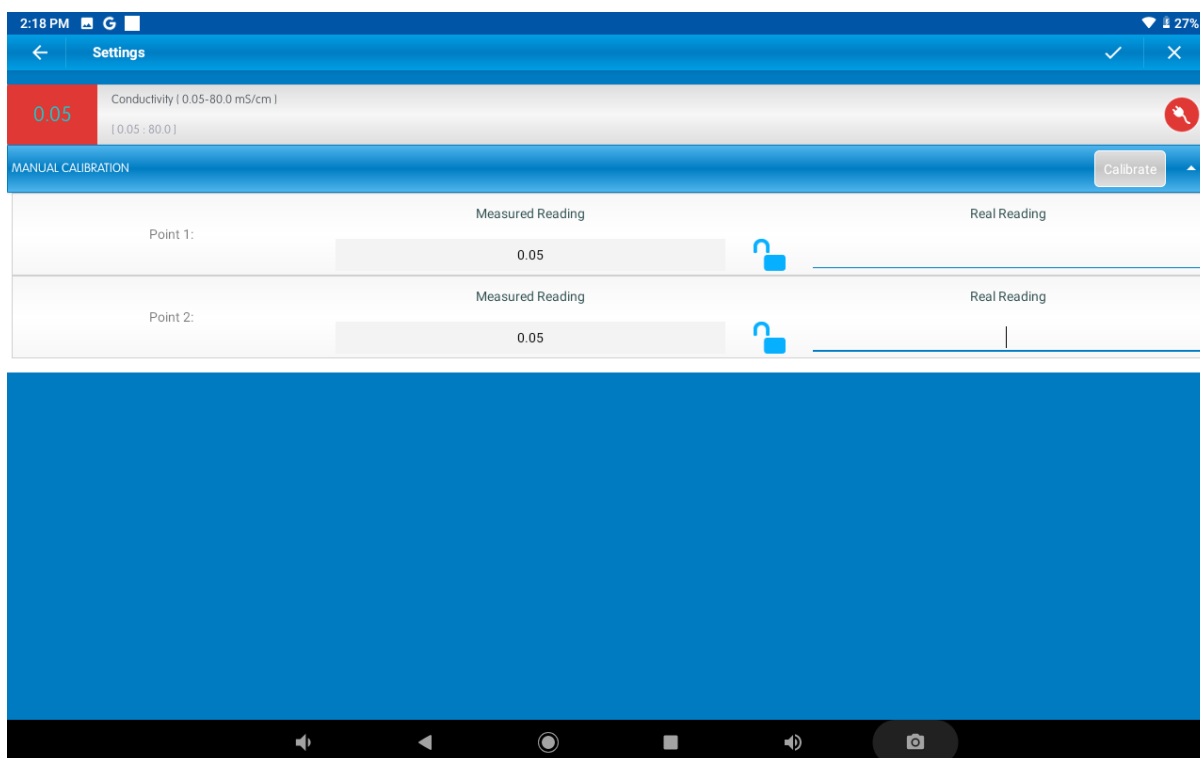
Calibration and Data Logging

Calibrating in MiLABEx Android

1. Launch MiLABEx
2. Go to Sensors
3. Connect the sensor to your LabMate or Einsten device.



4. Tap on the arrow on the right in the conductivity sensor, and then click Manual Calibration



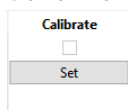
5. For point 1 - Prepare a solution with a known conductivity (e.g., distilled water). Enter this known value in Point Real Reading field
6. Measure the substance and wait for the readings to stabilize
7. Tap the lock icon
8. For point 2 - Prepare a second substance with a (different) known conductivity. Enter this known value in the
9. Measure the substance and wait for the readings to stabilize

10. Tap the lock icon
11. Tap Calibrate
12. Tap V to save changes and then V again in the list of sensors
13. Your sensor is ready and you are ready to experiment !
14. Touch Setup in case you want to change the sample rate and duration of experiment
15. Touch Run to start the experiment

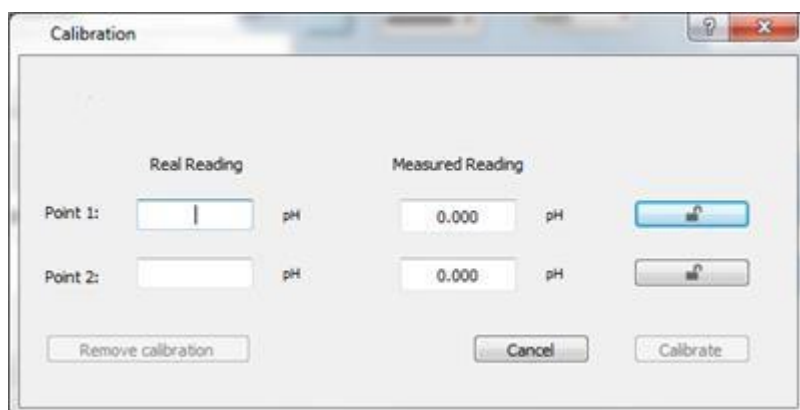
Note: For the most accurate results try to calibrate the sensor with one Real Reading under the expected results and one Real Reading over the expected results. (e.g. 0-2 mS/cm, 2-20 mS/cm, 20-80 mS/cm)

Calibrating in MiLAEBx™ Desktop

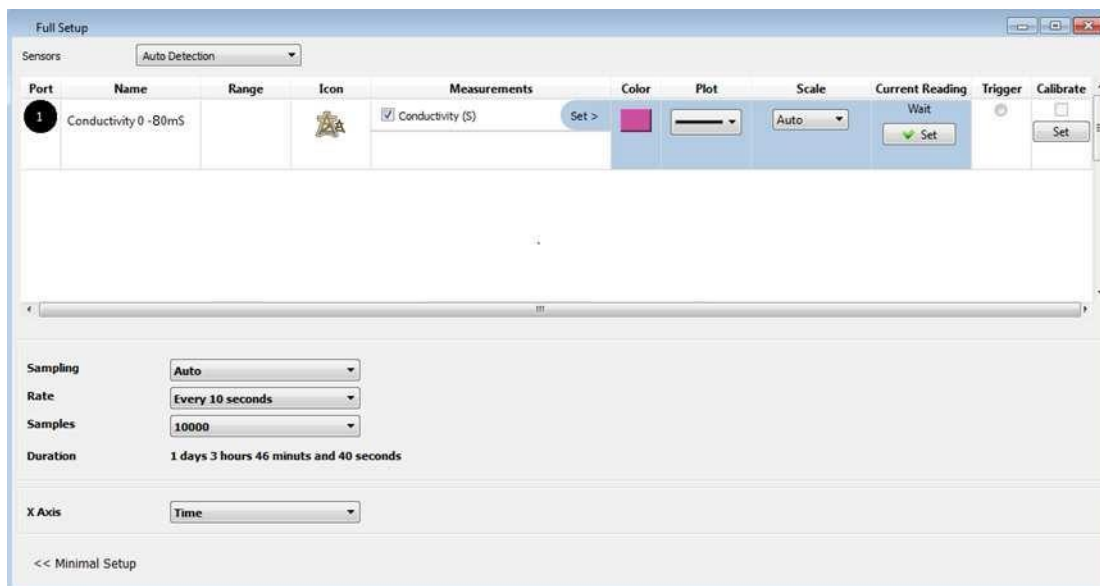
1. Go to the Full Setup window and in the Calibrate column click Set



2. The Calibration window will appear



3. Prepare a solution with a known conductivity (e.g., distilled water). Enter this known value in the Point 1 Real Reading field
4. Measure the substance and wait for the readings to stabilize. Enter the known value as the Point 1 Measured Reading field and click the lock button
5. Prepare a second substance with a (different) known conductivity. Enter this known value in the Point 2 Real Reading field
6. Measure the substance and wait for the readings to stabilize. Enter the known value as the Real Reading on the first line and click the lock button
7. Click Calibrate
8. You may want to change your sample rate or duration.
9. Minimize the full setup



- Click Run to start the experiment!

An example of using the Conductivity Sensor

Measuring the conductivity of NaCl solutions

Set up

Prepare several NaCl solutions according the table below:

Salt (NaCl) Concentration (mg/L)	Conductivity ($\mu\text{S}/\text{cm}$)
*47.4 mg	100 $\mu\text{S}/\text{cm}$
*491 mg	1000 $\mu\text{S}/\text{cm}$
*1005 mg	2000 $\mu\text{S}/\text{cm}$
*5566 mg	10,000 $\mu\text{S}/\text{cm}$

- *Add the above amount of NaCl to make 1 liter of solution
- Alternatively, one can use premade conductivity calibration solutions from companies such as Eutech and Reagecon.

The experiment

- Perform the calibration process with solutions of 2mS/cm and 13 mS/cm.
- Rinse the electrode with DI water and perform a measurement of 10 mS/cm solution.
- Click the Run button to start logging.
- After calibration you will be able to measure other solutions and show the correlation between NaCl concentration and conductivity.

Troubleshooting

- If the conductivity values are out of the range, are drifting, or are generally inaccurate:
 - Verify cell constant compatibility with a standard solution
 - Use fresh standards or glassware
 - Calibrate with standards at the same temperature as the sample

- Tap the cell against the container bottom to dislodge air bubbles
- Clean the electrode
- Condition the electrode in DI water overnight

Note: Attempt each of the above suggestions in the order listed above.

If the sensor isn't automatically recognized by MiLAEBx, please contact Fourier Education's technical support.

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

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.

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