einstein™

imagine • explore • learn

Electrostatic Charge Sensor

Product Number: ENCRG261

Overview

The Electrostatic Charge sensor is a dual range, all-purpose sensor that can be used in many electrostatic experiments. It is not affected by humidity and can perform quantitative measurements and indicate charge polarity making it superior to the traditional electroscope.

The Charge sensor can be connected to all types of einstein™ data loggers.
It can be used for various Physics experiments.

Typical experiments

Electricity and Magnetic Fields

- Measuring the charge produced by friction
- Measuring the charge produced by induction
- Investigating conductive and isolating materials
- Quantifying the charge on a capacitor plate
- Investigating how wave patterns change when the amplitude and the frequency are changed
- Exploring the relationship between the charge and voltage drops across a parallel plate capacitor

How it works

The Charge sensor is a voltage amplifier with a very high input resistance. A capacitor is connected to the amplifier input. The applied charge charges the input capacitor, causing a voltage drop. The voltage is amplified and adjusted to the range of 0-3 Volts, which is the range accepted by the Analog-Digital converter. The proper result is then recorded and displayed.

Sensor specification

Range:	±250 nC ±25 nC
Resolution (12-bit)::	0.12 nC for ±0.25 µC 12.2 pC for ±0.025 µC
Input Capacitance:	180nF
Input Resistance:	Infinite (few gΩ)
Input Over Voltage Protection:	±50 V

Note: sensor cables sold separately

Technical Notes

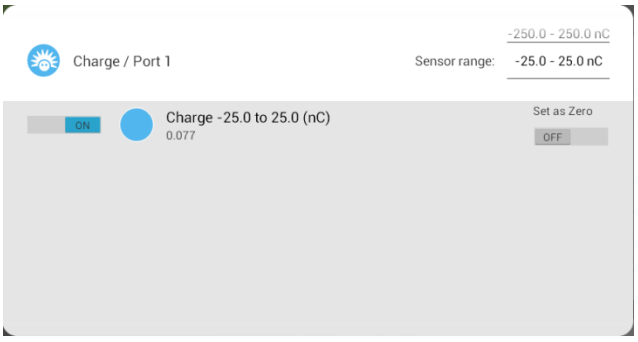
- **Warning** – extreme caution should be taken when experimenting with electricity. These experiments should only be conducted in the presence of a teacher or supervisor
- **Warning** – Keep all liquids away from any electricity experiments
- **Warning** - This sensor is designed for up to 50 volts, never use for higher voltages
- **Warning** - This sensor is not designed to measure line voltage. Never connect this sensor to a wall socket

Calibration

Calibration – MiLAB™

Set Zero Calibration

1. Tap the Settings button next to the sensor's name
2. Flip the Set as Zero switch to set the current value as the zero or base value.



Calibration – MiLAB™ Desktop

Set Zero Calibration

In the Current Reading column, click Set 

to set the current value as the zero or base value. Reset 

cancels this action

Equipment List

- Charge sensor

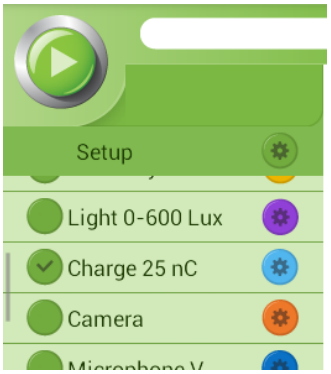
Technical Notes

- Due to the sensor's high sensitivity, use of a shielded BNC/alligator cable connecting the sensor to the charge under test is recommended.

Data logging and analysis

MiLAB™

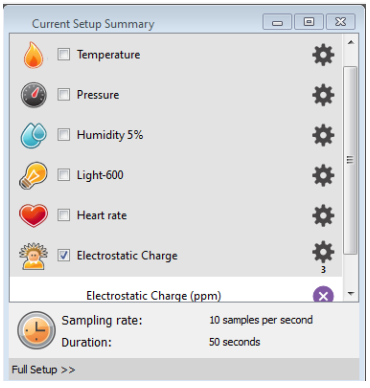
1. Take your einstein™ Tablet OR pair your einstein™LabMate™ with your Android or iOS tablet via Bluetooth
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLAB
4. In Launcher View, tap the box marked Electrostatic Charge
5. Make sure the icon next to the sensor is checked ( ) to enable it for logging



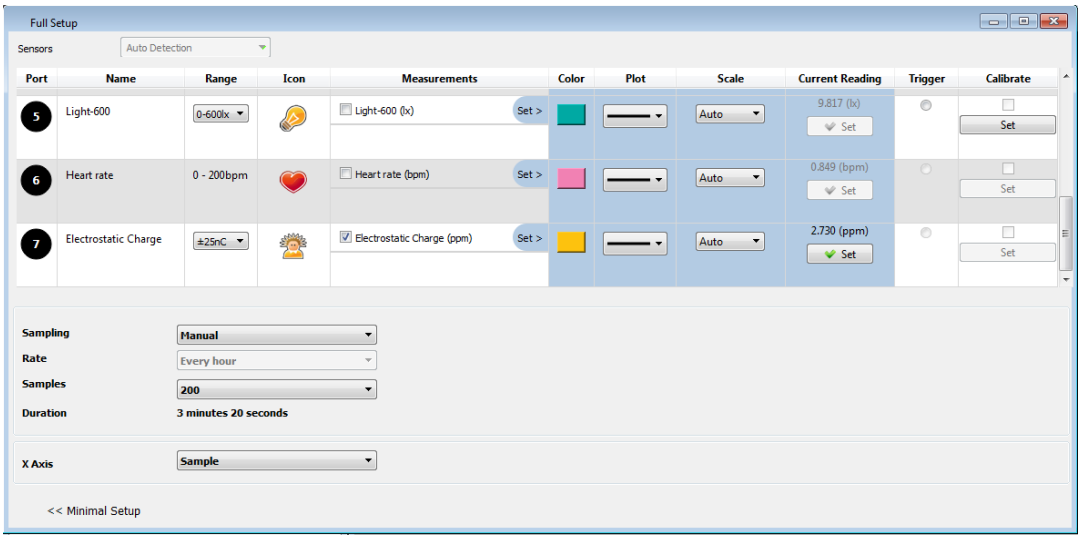
6. Tap the Setup button to calibrate or change the sensor's range

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 sensor cable into one of the sensor ports
3. Launch MiLAB
4. Electrostatic sensor should be selected



5. Click Full Setup, located at the bottom of the Current Setup Summary window to program the data logger's range, sample rate, number of samples, units of measurement, and other options.



6. Click the Run button ( )on the main toolbar to start logging

An Example of using the Electrostatic Charge Sensor

Measuring the Charge and Voltage Drop Across a Parallel Plate Capacitor

Note: the measured capacitor should be at the range of ~pF or less.

When a parallel plate capacitor is connected to a power supply, the surfaces of the plates are charged with equal and opposite charges. The graph in Figure 1 below shows this relationship:

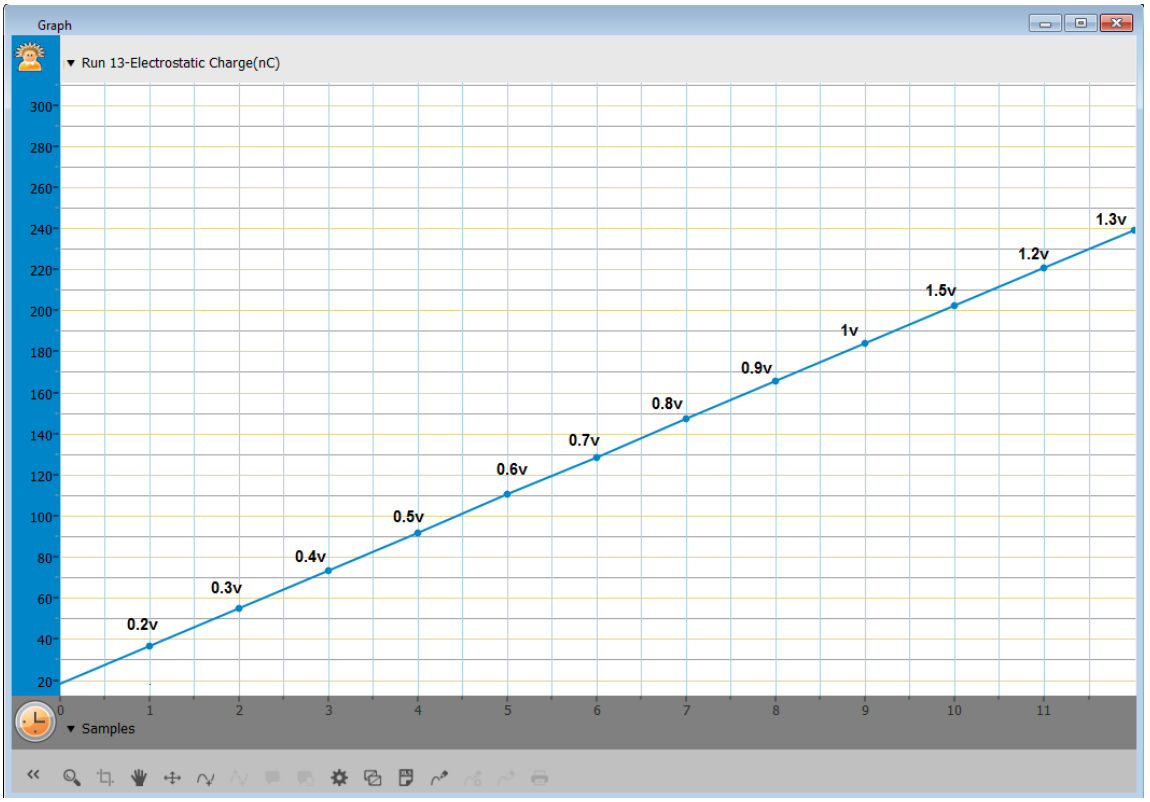


Figure 1: Relationship between charge and voltage drop across a parallel plate capacitor

Troubleshooting

If the Electrostatic Charge sensor isn't automatically recognized by MiLAB, 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.