

Coulomb's Law Apparatus

ES-9070

- ▶ Accurately measure charge, force, and distance
- ▶ Symmetric design minimizes stray and mirror charges
- ▶ Magnetic damping for quick, accurate measurements

How It Works

A conductive sphere is mounted on the end of an insulating, counterbalanced rod and suspended from a thin torsion wire. An identical sphere is mounted on a calibrated linear track. This second sphere can be positioned at various distances from the first. When the conductive spheres are charged, the force between them is proportional to the twist of the torsion wire that is required to bring the balance back to its equilibrium position. Beginning students can determine the Inverse Square Law in a simple experiment. Advanced students can perform a more sophisticated investigation into all the variables of electrostatic repulsion.

Insulated Track

The calibrated track is designed to minimize mirror charges, which can significantly affect results.

Additional Equipment

To perform a basic experiment, the conductive spheres can be charged with a piezoelectric gun or by contact with a charged rod. This allows the Inverse Square Law to be verified with reasonable accuracy. However, for more accurate and thorough investigations, we strongly recommend the following additional equipment (see ordering information):

- ▶ **A Kilovolt Power Supply**, which provides a fixed and repeatable charge. The charge can be refreshed before each measurement, which practically eliminates errors due to leakage currents.
- ▶ **A Basic Electrometer and a Faraday Ice Pail**, for accurate measurement of the charge on the spheres (required only if you wish to measure the Coulomb Constant).

Built-in Scale

A degree scale on the torsion balance provides accurate measurements of the torsion wire's twist angle.

Magnetic Damping

Allows measurements to be made quickly.

Milligram Masses

Included so determining the torsion constant and verifying its linearity can be part of the experiment.

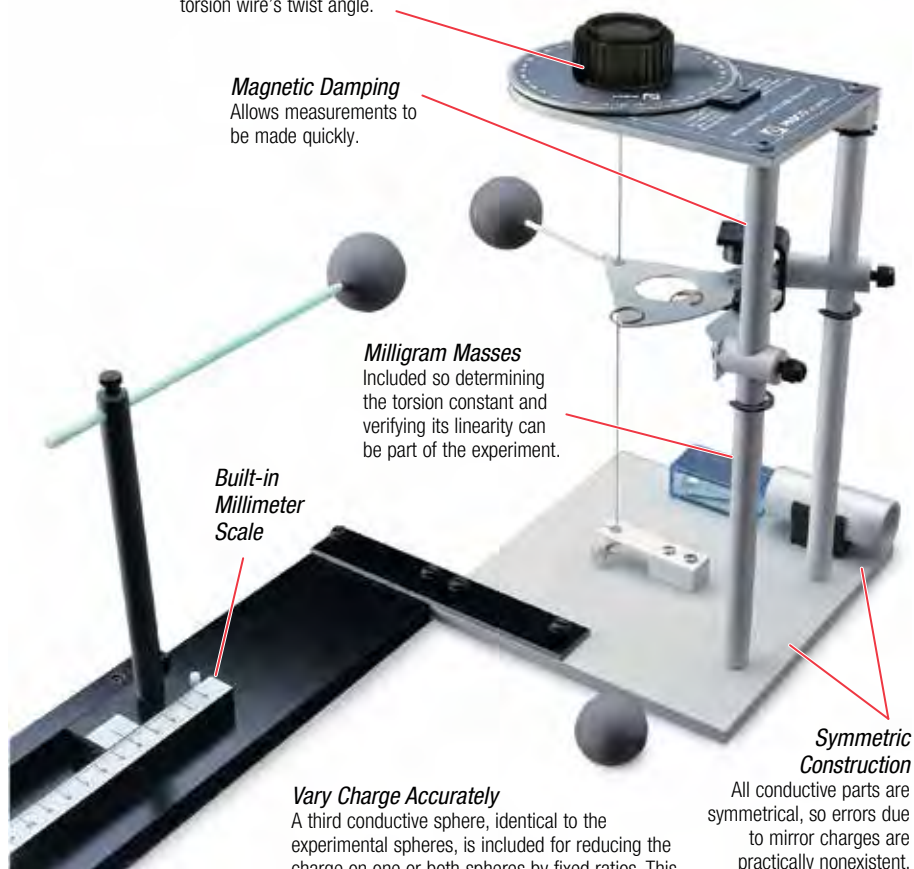
Built-in Millimeter Scale

Vary Charge Accurately

A third conductive sphere, identical to the experimental spheres, is included for reducing the charge on one or both spheres by fixed ratios. This method is quick and accurate.

Symmetric Construction

All conductive parts are symmetrical, so errors due to mirror charges are practically nonexistent.



Specifications

Torsion Balance:

- Torsion Assembly:** 38 mm dia. conductive sphere on 12 cm rod with counterbalance vane
- Torsion Wire:** equals 10^{-6} Newtons/degree
- Degree Plate:** 1° increments
- Magnetic Damping:** dampens oscillations for quick measurements

Calibrated Linear Track:

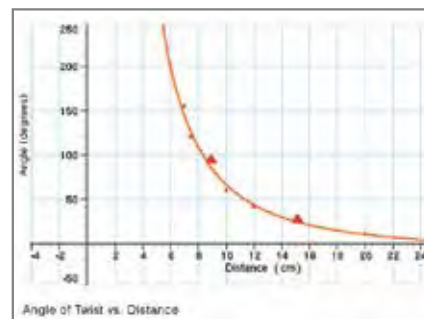
- Sphere:** 38 mm dia. conductive sphere
- Range of Movement:** 350 mm in 1 mm increments
- Material:** phenolic (to minimize mirror charges)

Miscellaneous Equipment:

- Charging Probe:** 17 cm long plus 1.5 m cable; banana plug connector; 200 $\mu\Omega$ internal resistance
- Calibration Masses:** 50 mg (1), 20 mg (2)
- Conductive Sphere on Insulating Thread:** for reducing charge by fixed ratios
- Spare Torsion Wire:** 3 m

Shipping Information:

- Size:** 28 x 38 x 61 cm (11 x 15 x 24 in.)
- Weight:** 9.5 kg, 21 lbs



Actual data of the Angle (force) vs. Distance

Order Information

Coulomb's Law Apparatus.....	ES-9070
<i>Recommended:</i>	
Kilovolt Power Supply	SF-9586B p. 251
Basic Electrometer.....	ES-9078A p. 218
Faraday Ice Pail	ES-9042A p. 219
Charge Producers.....	ES-9057C p. 219
<i>Complete System:</i>	
Coulomb's Law.....	EX-9930B p. 365