

Electrostatics  
Electric charges

## Charge separation

Electrometer amplifier and friction foils

## Objects of the experiments

1. Detecting charge separation when a friction rod is rubbed with a friction foil
2. Investigating the polarity of charged friction rods after they have been rubbed with various friction foils

## Setup



## 1. Detecting charge separation

- Rub the discharged acrylic rod with the leather, hold it in the Faraday's cup so that about a quarter of its length is inside the cup, and observe the deflection of the multimeter pointer.
- Remove the acrylic rod.
- If necessary, discharge the Faraday's cup, hold the leather over the opening of the cup, and observe the deflection of the multimeter pointer.
- Remove the leather.

## 2. Investigating the polarity of friction rods

- One after another rub the PVC and the acrylic rod with leather and paper. Each time hold the respective rod in the Faraday's cup so that about a quarter of its length is inside the cup.
- Observe the deflections of the multimeter pointer, each time taking down the polarity of the charged friction rods.

## Measuring example

## 1. Polarity of the friction rod and the friction foil after charge separation

Friction rod	Polarity of the friction rod	Friction foil	Polarity of the friction foil
Acrylic	-	Leather	+

## 2. Polarity of friction rods after being rubbed with various friction foils

Friction rod	Friction foil	Polarity of the friction rod
Acrylic	Polyethylene	+
PVC	Polyethylene	+
Acrylic	Leather	-
PVC	Leather	-
Acrylic	Paper	+
PVC	Paper	-

## Evaluation

When a friction rod is rubbed with a friction foil, charge separation takes place.

In the course of charge separation electrons are transferred from one body (friction rod or friction foil) to the other.

The body which has lost electrons (friction rod or friction foil) carries a positive charge after the process of friction.

The body which has acquired electrons (friction rod or friction foil) carries a negative charge.

The polarities of the charges on the friction rod and the associated friction foil are always of opposite signs.

The polarity of the charges carried by a friction rod after being rubbed depends on the materials the friction rod and the friction foil are made from.

## Apparatus

1 electrometer amplifier.....	532 14
1 connecting rod .....	532 16
1 Faraday's cup .....	546 12
1 clamping plug.....	590 011
1 capacitor, 1 nF, STE 2/19.....	578 25
1 capacitor 10 nF, STE 2/19.....	578 10
1 pair of friction rods.....	541 00
1 leather.....	541 21
1 polyethylene friction foils .....	200 70 750
1 cartridge burner DIN type .....	666 714
1 demo-multimeter, passive .....	531 905
1 power supply, 450 V, 230 V .....	522 27
1 pair of cables, 50 cm, black .....	501 451
1 pair of cables, 50 cm, red/blue .....	501 45
1 connecting lead, 50 cm, yellow/green.....	500 420

## Carrying out the experiment

Remark:

Before carrying out the experiments, discharge the friction rods and the Faraday's cup in order to obtain reproducible experiment results.

For discharging the friction rods, quickly move them longitudinally through the non-luminous flame of the cartridge burner several times. The Faraday's cup is discharged by touching it with the connecting rod until the multimeter displays a voltage of  $U = 0$  V.