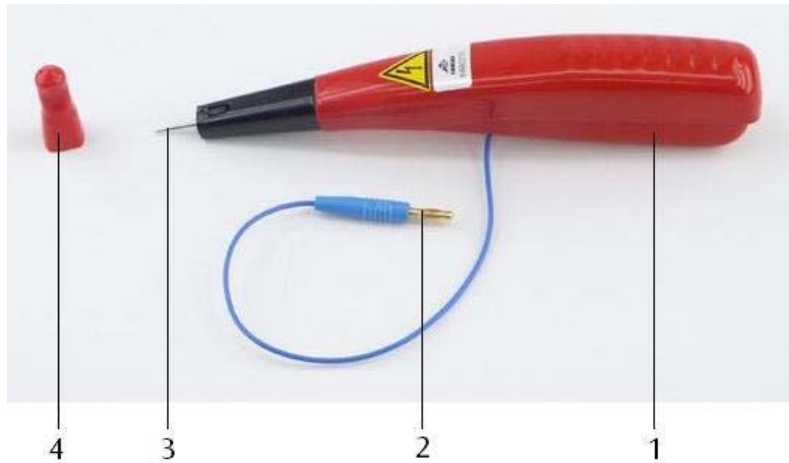


## Piezoelectric Charge Source U8490210

### Instruction sheet

01/11 SP/ALF



- 1 Button
- 2 Earthing lead
- 3 Charge-carrier
- 4 Protective cap

### 1. Description

The piezoelectric charge source enables safe voltages to be generated for electrostatic experiments.

The instrument is, in principle, a piezoelectric gas-lighter that is adapted for the special requirements of electrostatic experiments. For that reason it is fitted with a shortened earthing shell onto which a lead is soldered.

The heart of the charge source is a piezoelectric crystal of lead-zirconate-titanate ( $\text{Pb}(\text{Zr},\text{Ti})\text{O}_3$ ). Pressing the button causes a separation of charges,  $Q$ , in the crystal. In the absence of an external circuit, the voltage thus produced is limited by the breakdown voltage and the intrinsic capacitance  $C_K$  of the crystal. When an external capacitance  $C_{\text{ext}}$  is present, the resulting voltage is:  $U = Q/(C_{\text{ext}} + C_K)$ .

### 2. Technical data

Voltage:	4.5 kV max.
Cable connection:	4 mm plug
Dimensions:	240x30x40 mm <sup>3</sup> approx.
Weight:	100 g approx.

### 3. Operation

When the button is pressed, a positive charge is produced at the tip, whereas if pressure is released after the instrument has already been earthed, a negative charge is obtained.

To positively charge a capacitor (e.g., a conducting sphere), proceed as follows:

- While pressing the button, touch the capacitor with the charge-carrier.
- Earth the charge source while it remains in contact and release the button.
- If necessary, repeat the charging process until the desired charging voltage is obtained.

Considered from a physical standpoint, the process is as follows: When the capacitor is touched, the positive charge produced by the piezoelectric crystal is shared between the crystal and the external capacitor in proportion to their capacitances. Only if the capacitor has a very large capacitance ( $\gg 100$  pF) will the charge be completely transferred to the capacitor. When the pressure is released, the negative charge generated is dissipated through the earthing cable, and the crystal is then uncharged.