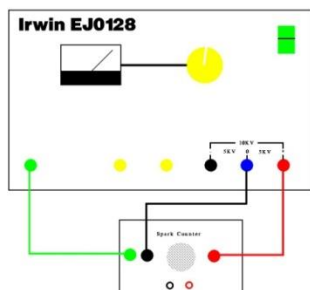


## Irwin Spark Counter



### Electromagnetic Compatibility

The use of this apparatus outside the classroom, laboratory, study area or similar such place invalidates the conformity with the protection requirements of the Electromagnetic Conformity Directive (89/336/EEC) and could lead to prosecution.

The Irwin Spark Counter is designed to show the presence of  $\alpha$  particles by producing a spark. The unit is supplied with a low power (0.9 $\mu$ Ci) Americium 241  $\alpha$  source which emits  $\alpha$  particles with energy 5.4MeV and also low level  $\gamma$  rays.

### Is exposure to the source dangerous?

Provided the source is used as directed (i.e. held by the clear end) it is perfectly safe. The  $\alpha$  particles are stopped by about 5cm (2") of air or a sheet of paper and the dose from the  $\gamma$  rays, per year, is less than half what you would receive from eating one banana.

The supplied radioactive source is mounted on the end of a Perspex rod and is a small metallic disc bonded to one end of the rod. The end with the source is marked red – please only handle from the other end. When not in use the source should be stored in a plastic bag which will block the  $\alpha$  radiation.

$\alpha$  particles are helium nuclei (He <sup>2+</sup> ions) and are heavily ionising. This means that by the time that they have travelled through about 5cm of air they will have dispersed all their energy in ionising air molecules. They collide with air molecules which cause the air molecules to ionise and therefore form a conductive path.

The Irwin Spark Counter takes advantage of this by utilising a stainless steel grille with a wire beneath it. The grille is connected to a negative EHT supply whilst the wire is connected to the positive. When correctly set up the electric field between the two is not quite enough to cause arcing. When an  $\alpha$  source is introduced the ionised air forms a slightly conductive path which allows a spark to occur.

### Using the Irwin Spark Counter

Connect the red socket to the EHT + socket and the black socket to the EHT – socket or 0V socket. **For safety's sake also connect the green socket to an earth point;** this will ensure that the grille is at 0V, and thus may be touched without harm. Switch on the EHT unit and increase the output until sparking occurs. Now reduce down the voltage slightly until the sparking just stops.

Handling the Perspex rod by the clear end, bring the  $\alpha$  source close to the grille and the unit should start sparking. If, when the  $\alpha$  source is removed, the unit continues to spark, then reduce the EHT down a little bit more and try again.

The Spark Counter requires approximately 5.25KV – 8.25KV to operate correctly. Suitable EHT units are the Irwin EJ0126 or EJ0128.

Once the spark counter is properly set up, bring the source close enough to cause sparking. How far away must the source be for sparking to stop? Now try introducing different materials, e.g. tissue paper, photocopy paper, cardboard, thin plastic etc. between the source and the grille.

The smaller red and black sockets below the main sockets give a low voltage counting output and are designed to be connected to a counter such as the Irwin Event Counter. **Do not connect HT to these sockets.**

**Note.** It will be noticed that when correctly set, the spark counter still sparks occasionally, even when no alpha source is close. This is because it is reacting to cosmic rays, which also ionise the air.