

Do you need advice on how to select the best Geiger tube for your application?

How do I select a Geiger counter for a particular application?

The type of Geiger counter to be purchased will depend on the radiation to be detected. The application will involve the detection of either Alpha, beta, gamma or X radiation.

For the detection of **Alpha particles** a thin end window Geiger tube is required like the ZP1401. This type of radiation is stopped very easily so the window should be no more than 1.5mg/cm² in thickness, otherwise the detection efficiency will be too low. Beta particles also need an end window tube which can be 2/3mg/cm². The exception is high energy betas above 2.5MeV which can be detected by thin side wall tubes. However the thickness of the metal wall of the tube should ideally be no more than 30/40mg/cm².

Gamma rays are high energy rays so the tube thickness is not important. All tubes will detect gamma radiation. The two main gamma ray emission energies are 633KeV (Cs137) and 1.33MeV (Co60).

X-Rays are low energy gamma rays and again end window tubes are normally used as the typical X-Ray emission energy is around 20-30keV. You can also use an X-Ray proportional counter like the ZP1600 series.

How does the radiation dose level affect my selection?

As a rule of thumb the higher the dose rate level the less volume you need inside the Geiger counter tube. The larger the volume of gas in the tube the more sensitive it will be and hence as the radiation increases the quicker the Geiger will go into saturation. Once the Geiger saturates it becomes non linear and is no longer useful as a measuring device, so it is always important to consider very carefully the dose rate range over which you need to use the device to always ensure it is in the unsaturated state no matter what the dose rate. Very high dose rates will require a small volume tube like the ZP1300 for example.

If I am trying to detect the radiation from various isotopes how can I compensate for the different energy levels?

This can be done by a method called “energy compensation” of the Geiger. A shield normally made of plastic and metal can be placed around the tube to flatten the response of the Geiger tube over a wide energy band. Energy compensation is a technique used on many small tubes used in hand held pocket dosimeters for example so irrespective of the isotope being used the reading can be correct over a guaranteed energy range to within a specified tolerance (+/- 15% is typical).

How can I power my Geiger tube?

Most current day Geiger tubes have an halogen quenching agent for the gas and this means the typical operating voltage of the Geiger will be around 400 -600 volts. Because of the low current consumption the tubes actually require very little power. Typical power supplies are small high voltage blocks although they can also be easily driven from fairly basic laboratory power supplies.

Are there any special requirements in mounting Geiger tubes?

Most Geiger tubes have two connections only one for cathode and one for the anode so the electrical connection is very simple. However when mounting the Geiger it is important not to let the Geiger connection become too hot (i.e.: don't linger with the soldering iron for too long) as many of the tubes have fragile glass to metal seals which can crack if heat is applied for any length of time. It is often a good idea to sit the tube on a soft material particular if they are used in portable equipment as this will help to absorb any shock and vibration in transit and also take stress off the connections.

Why is the glass components of all Geiger tubes painted black?

The reason is to prevent the Geiger tubes from being light sensitive. The sun is an excellent radiation emitter and as such if a Geiger is used externally as a probe for example with no case protection the Geiger would be light sensitive if the glass was not paint black. This is not an important issue if the Geiger is fully enclosed in a light tight box. In these applications unpainted Geiger's can be used.

What are the typical applications for Geiger tubes?

The main application areas are as follows:-

- Radiation detection equipment for nuclear power installations or military or civil use.
- Industrial non contact gauging applications. (Liquid level and density gauges).
- Educational aids for the teaching of radiation and its detection.

If you need further information or assistance on Geiger tubes please call 01635 30345 now or email your questions to sales@alrad.co.uk