safety information sheet
photomultipliers in general

ET Enterprises electron tubes

1 scope

Beginning with a description of the product and its intended use, this document provides information on safety precautions and disposal applicable to this product. The hazardous materials contained within the product are listed.

2 description

- light sensor
- sealed high vacuum device
- component in a light detection system

3 intended use

The photomultiplier is an extremely sensitive light detector which gives a current output proportional to light intensity. As a component in a light detection system it can be used to measure any process that directly or indirectly emits light. No other use is implied or intended.

4 handling precautions

glass component - handle with care to avoid damage to the glass envelope, glass to metal seals and base pins.
high vacuum component - for photomultipliers of diameter less than 90mm wear hand and eye protection when handling to avoid danger from implosion.
-for photomultipliers of diameter greater than or equal to 90mm wear full face and body protection when handling to avoid danger from implosion.
high voltage - the high voltages used by the photomultiplier present an electrical shock hazard. Manufacturers of systems incorporating photomutlipliers should take appropriate precautions to prevent access to these high voltages when power is applied

mounting - avoid clamping around the unsupported body of the glass envelope to avoid fracture
-insert into, and remove from, the matching socket axially to avoid damage to the glass to metal seals.

5 operating precautions

Refer to the ET Enterprises Limited photomultiplier brochure or individual data sheet for operating and environmental limits applicable to these products.

6 general precautions

The photomultiplier, or its components, are not to be ingested in whole or part.

7 disposal

Refer to international, national and local legislation for definitive rules. As a guide, the photomultiplier is often classified with similar devices that include incandescent lamps (light bulbs), thermionic valves, vidicons and cathode ray tubes, and can be disposed of with normal waste.

- not to be ingested in whole or part
- not to be further machined in whole or part
- take suitable general and handling precautions detailed above

It is recommended that photomultipliers are returned to ET Enterprises for recycling and safe disposal. A charge may be made for this.

8 hazardous materials

The photomultiplier contains very small amounts (milligrams) of chemically hazardous materials which are listed below and quantified in the table. The user will only become exposed to these materials if the glass envelope is fractured.

The chemically hazardous materials contained within a photomultiplier are as follows:

1 internal alkali dispensers (generators) containing small quantities (milligrams) of fired alkali metal molybdates of potassium (K), caesium (Cs) and sodium (Na).

2 thin (<1µm) internal layers and beads of antimony (Sb) activated with potassium (K), caesium (Cs), sodium (Na) and rubidium (Rb). In air, the antimony-alkali alloys will oxidise and discolour to light grey.

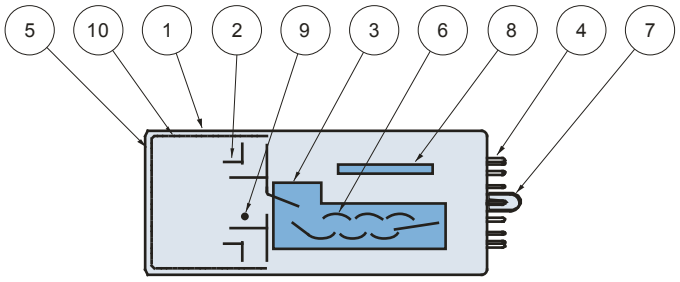
3 thin (<1µm) beryllium oxide (BeO) layer bound to the surface of the internal beryllium copper (BeCu) electrodes which, although stable in air, may be hazardous if machined/abraded or heated above red heat.

If the product is broken, or is being disposed of, due account should be taken of these hazardous materials.
If the glass envlope is fractured, care should be taken in order to prevent injury from glass fragments and sharp edges.
Some external parts (refer to section 9 external) are made from plastic materials; these should not be burned.

The table below illustrates the quantities of hazardous materials that may be contained within the product:

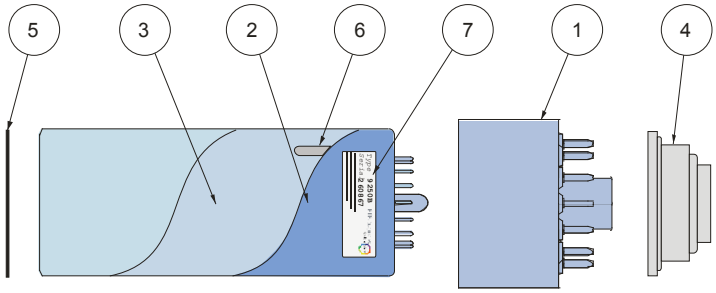
photomultiplier diameter mm	alkali metal molybdate mg (see note 1 above)	antimony alkali mg (see note 2 above)	beryllium oxide mg (see note 3 above)
up to 52	< 100	< 10	< 6
52 and greater	< 350	< 30	< 15

9 typical construction and materials



internal

1	envelope	borosilicate
2	metal parts	copper-nickel alloys, nickel-iron alloys stainless steel, titanium, nickel
3	insulative supports	aluminium oxide (ceramic)
4	glass-to-metal seals	borosilicate glass, nickel-iron alloys
5	window	borosilicate glass or quartz
6	dynodes	beryllium copper with secondary emissive layers of antimony-caesium (SbCs) and beryllium oxide (BeO)
7	vacuum seal-off	borosilicate glass
8	internal akali dispensers (generators)	fired alkali metal molybdate (of potassium, caesium, sodium) contained in a titanium foil capsule
9	processing bead	antimony
10	photosensitive surface	antimony activated with potassium (K), caesium (Cs), sodium (Na) and rubidium (Rb)



external

1	plastic cap	polyethersulphone (pes) with plated brass base pins
2	plastic sleeving	polyvinyl chloride (pvc)
3	conductive coating	liquid graphite or copper foil
4	base pin protector	polyethylene (pe)
5	window protector	polyvinyl chloride (pvc)
6	cathode contact strip	stainless steel
7	label	metallised polyester

the presence of the components listed here is dependent upon product type

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