85.40 - Thermionic, cold cathode or photo-cathode valves and tubes (for example, vacuum or vapour or gas filled valves and tubes, mercury arc rectifying valves and tubes, cathode-ray tubes, television camera tubes).

- Cathode-ray television picture tubes, including video monitor cathode-ray tubes :

8540.11 - - Colour

8540.12 - - Monochrome

8540.20 - Television camera tubes; image converters and intensifiers; other photo-cathode tubes

8540.40 - Data/graphic display tubes, monochrome; data/graphic display tubes, colour, with a phosphor dot screen pitch smaller than 0.4 mm

8540.60 - Other cathode-ray tubes

- Microwave tubes (for example, magnetrons, klystrons, travelling wave tubes, carcinotrons), excluding grid-controlled tubes :

8540.71 - - Magnetrons

8540.79 - - Other

- Other valves and tubes :

8540.81 - - Receiver or amplifier valves and tubes

8540.89 - - Other

- Parts :

8540.91 - - Of cathode-ray tubes

8540.99 - - Other

This heading covers only those valves and tubes which, for different purposes, utilise the effect of electrons emitted from a cathode either in a vacuum or in gas.

There are three types : thermionic valves and tubes, in which the cathode must be heated before the electrons are emitted; cold cathode valves and tubes; and photo-cathode valves and tubes, in which the cathode is excited by the action of light. According to the number of their electrodes they are termed diodes, triodes, tetrodes, etc. The same envelope may contain two or more systems with different functions (compound valves). The envelopes are of glass, ceramic or metal or of combinations of these materials and may incorporate means of cooling (cooling fins, water circulation system, etc.).

There are many kinds of valves and tubes, some of which are designed for special purposes such as microwave tubes (e.g., magnetrons, travelling wave tubes, carcinotrons, klystrons), disc-sealed (lighthouse) tubes, stabilising valves, thyratrons, ignitrons, etc.

The heading includes :

(1) **Rectifying tubes and valves**. These are designed for rectifying AC into DC. They may be vacuum type, gas-filled or filled with vapour (e.g., mercury vapour), and in general have two electrodes. Certain types (e.g., thyratrons) have control grids so that their operation can be regulated and even reversed (thus converting DC into AC).

(2) **Cathode-ray tubes**.

(a) Television camera tubes (image pick-up tubes, e.g., image orthicons or vidicons). These are electron-beam tubes for the conversion of an optical image into a corresponding electrical signal, usually by a scanning process.

(b) Image converter tubes. These are vacuum tubes in which an image (usually of infra-red radiation) is projected on to a photoemissive surface which in turn produces a corresponding visible image on a luminescent surface.

(c) Image intensifier tubes. These are electronic tubes in which an image projected on to a photoemissive surface produces a corresponding intensified image on a luminescent surface.

(d) Other cathode-ray tubes in which electrical signals are converted, directly or indirectly, into visible images. An example of this type is the storage tube. In television receiver or video monitor tubes, the electrons from the cathode(s), after being focussed, deflected, etc., fall in the form of a beam on a part of the inner wall (usually the end of the tube) covered with fluorescent material, which constitutes a screen showing the picture the viewer sees.

Cathode-ray tubes are also used in radar, in oscilloscopes and in certain automatic data processing system terminals (display tubes).

(3) **Photoemissive tubes, vacuum or gas-filled** (also known as **photoemissive cells**). These consist of a glass or quartz tube containing two electrodes, of which the cathode is coated with a layer of photosensitive material (usually alkaline metal); under the action of the light, this layer emits electrons which establish conductibility between the electrodes and are collected on the anode.

Photomultipliers are photosensitive vacuum tubes comprising a photoemissive cathode and an electron multiplier.

(4) **Other valves and tubes**. These are usually vacuum type, and some have several electrodes. They are used for producing high frequency oscillations, as amplifiers, as detectors, as scan converters (without the use of a photocathode), etc.

85.40

PARTS

Subject to the general provisions regarding the classification of parts (see the General Explanatory Note to Section XVI), parts of the goods of this heading are also classified here, for example, electrodes (cathodes, grids, anodes), envelopes (of materials other than glass) for tubes, anti-implosion casings for cathode-ray tubes, deflection coils for mounting around the necks of cathode-ray tubes for scanning purposes.

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The heading **excludes** :

(a) Glass face-plates and cones of envelopes for cathode-ray tubes (**heading 70.11**).

(b) Metal tank mercury arc rectifiers (**heading 85.04**).

(c) X-ray tubes (**heading 90.22**).