90.22 - Apparatus based on the use of X-rays or of alpha, beta or gamma radiations, whether or not for medical, surgical, dental or veterinary uses, including radiography or radiotherapy apparatus, X-ray tubes and other X-ray generators, high tension generators, control panels and desks, screens, examination or treatment tables, chairs and the like (+).

- Apparatus based on the use of X-rays, whether or not for medical, surgical, dental or veterinary uses, including radiography or radiotherapy apparatus :

9022.12 - - Computed tomography apparatus

9022.13 - - Other, for dental uses

9022.14 - - Other, for medical, surgical or veterinary uses

9022.19 - - For other uses

- Apparatus based on the use of alpha, beta or gamma radiations, whether or not for medical, surgical, dental or veterinary uses, including radiography or radiotherapy apparatus :

9022.21 - - For medical, surgical, dental or veterinary uses

9022.29 - - For other uses

9022.30 - X-ray tubes

9022.90 - Other, including parts and accessories

(I) APPARATUS BASED ON THE USE OF X-RAYS

The fundamental element of this apparatus is the unit containing the X-ray generating tube or tubes. This unit, which is usually suspended or mounted on a pedestal or other support with a directing or elevating mechanism, is fed with appropriate voltages from special equipment consisting of an assembly of transformers, rectifiers, etc. In most other respects, the structural characteristics of X-ray apparatus vary according to the use for which they are designed, for example :

(A) **X-ray apparatus used in diagnosis**. These depend on the facts that X-rays can penetrate bodies which are impervious to ordinary light and that their absorption increases with the density of the bodies traversed. They include :

(1) **Radioscopic (fluoroscopic) apparatus**. X-rays which have traversed the organ under examination are made to cast a shadow on a screen; the varying densities of the shadow image represent the state of the organ.

(2) **Radiographic apparatus**. After leaving the body under examination, the X-rays strike a photographic plate or film and are recorded thereon. The same apparatus may be used for radioscopy and radiography.

(3) **Apparatus consisting of X-ray apparatus combined with a specially designed camera**. These photograph the image of which is produced on an X-ray screen mounted in the camera itself. **Provided** the apparatus and specialised camera are presented at the same time, they are to be classified together in this heading even if they are separately packed for convenience of transport. Separately presented cameras, however, are classified in **heading 90.06**.

(B) **Radiotherapy apparatus**. Both the penetrating power of X-rays and their destructive effect on certain living tissues are used in the treatment of many diseases, e.g., certain skin diseases and certain tumours. This treatment is known as "superficial" or "deep" according to the depth reached by the rays.

(C) **X-ray apparatus for industrial use**. There are many industrial applications of X-rays. They are used, for example, in metallurgy to locate blisters or to check the uniformity of alloys; in engineering to check the accuracy of assemblies; in the electrical industry to check heavy cables or frosted glass lamps; in the rubber industry to check the reactions of the inner casings of tyres (e.g., stretching of canvases); in various industries for checking or measuring the thickness of materials. For all these various applications the apparatus generally resembles that used for diagnostic purposes described above, except that it may be equipped with adaptors and ancillary equipment for particular purposes.

The heading also covers :

(1) Special apparatus (X-ray diffraction and X-ray spectrometry equipment) used for the examination of the crystalline structure as well as the chemical composition of materials; the X-rays are diffracted by crystals and then made to fall on a photographic film or an electronic counter.

(2) Apparatus for radioscopic examination of bank notes or other documents.

(II) APPARATUS BASED ON THE USE OF ALPHA, BETA OR GAMMA RADIATIONS

Alpha, beta or gamma radiations emanate from a radioactive substance with the property of emitting radiations by spontaneous transformation of its atoms. This radioactive substance is placed in a container, normally of steel coated with lead (bomb), which has an aperture designed to let the radiations pass in one direction only. Gamma radiations can be used for much the same purpose as X-rays.

The following types may be distinguished, according to the radiations employed and the use for which they are designed :

(1) **Therapy apparatus**, in which the radioactive source is a charge of radium, radio-cobalt or some other radioactive isotope.

(2) **Apparatus for radiological examinations**, used mainly in industry for checking metal parts, etc., without damaging their structure.

(3) **Apparatus** having a measuring instrument such as beta and gamma ray thickness gauges for measuring the thickness of materials (sheets, linings and the like), apparatus for monitoring the contents of packages containing any product (pharmaceutical products, foodstuffs, sporting gun cartridges, perfumes, etc.) or ionisation anemometers. In these apparatus, the required information is generally obtained by measuring the change in the amount of radiation applied to the factor under examination.

(4) **Fire alarms** incorporating smoke detectors containing a radioactive substance.

The heading **does not cover** instruments and apparatus which are not designed to incorporate a radioactive source and which merely measure or detect radiation even when such instruments are calibrated in arbitrary terms (**heading 90.30**).

(III) X-RAY TUBES AND OTHER X-RAY GENERATORS, HIGH TENSION GENERATORS, CONTROL PANELS AND DESKS, SCREENS, EXAMINATION OR TREATMENT TABLES, CHAIRS AND THE LIKE

This group includes :

(A) **X-ray tubes**. These are devices in which electrical energy is transformed into X-rays.

The characteristics of such tubes vary according to the use for which they are designed. They consist essentially of a cathode from which the electrons are emitted, and a target (anti-cathode or anode) on which the electrons impinge, thus causing it to emit X-rays. In some cases, the tubes also have a number of intermediate electrodes for accelerating the stream of electrons. The electrodes are mounted in a tube or container, usually of glass, with the appropriate electrical contacts. The tube is often mounted in an electrically insulated metal container filled with oil. Sometimes the tube is gas filled, but more usually it is maintained at a high degree of vacuum.

The heading **excludes** glass envelopes for X-ray tubes (**heading 70.11**).

(B) **Other X-ray producing apparatus**, e.g., apparatus incorporating a betatron which greatly accelerates the stream of electrons and so produces X-rays of a very high penetrating power. Betatrons and other electron accelerators not adapted for the production of X-rays nor incorporated in X-ray apparatus are **excluded** (**heading 85.43**).

(C) **X-ray screens**. Radioscopic screens are fluorescent surfaces on which the radiations are received. The active surface usually consists of barium cyanoplatinate, cadmium sulphide or cadmium tungstate. They are often also coated with a lead-glass facing. Some screens, known as intensifying screens, produce an image which consists of actinic light that adds to the density of the photographic image formed purely by the X-rays.

(D) **X-ray high tension generators**. These incorporate a transformer and rectifying valves mounted inside an insulating screen; they also have detachable high tension contacts for making connections to the X-ray tube. It should be noted that this heading is **restricted** to generators which are specialised for use with X-ray apparatus.

(E) **X-ray control panels and desks**. These incorporate devices for controlling the exposure time and voltage, and often also include a dosimeter forming an integral part of the apparatus. It should be noted that this heading is **restricted** to panels and desks which are specialised for use with X-ray apparatus.

(F) **Examination or treatment tables, chairs and the like specialised for X-ray work**, whether designed to be incorporated in the X-ray apparatus or to form separate articles. **Provided** they are exclusively or primarily designed for use with X-ray apparatus, such tables, chairs, etc., remain classified in this heading even if presented separately; but tables, chairs, etc., not specialised for X-ray work are **excluded** (usually **heading 94.02**).

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This heading also includes lightning arresters based on the principle of radioactivity.

PARTS AND ACCESSORIES

Subject to the provisions of Notes 1 and 2 to this Chapter (see the General Explanatory Note), parts and accessories identifiable as being solely or principally for use with X-ray apparatus, etc., are also classified in this heading. Such parts and accessories include :

(1) **Applicators**, usually lead-lined, for fitting to the X-ray tube port or radioactive "bomb"; they are sometimes called "localisers".

(2) **Electric incandescent centring devices**, used particularly in radiotherapy to check the area treated, by direct sighting on the skin. Like the previous accessories, these devices are usually mounted on the outlet port of the X-ray tube or of the "bomb".

(3) **Protective casings** of lead-glass or of other substances based on certain salts opaque to X-rays. These casings are placed around the X-ray tubes to protect operators against harmful radiations.

(4) **Lead covered or lead-glass protective screens or shields** for placing between the operator and the X-ray tubes.

The heading **does not**, however, **cover** protective devices designed to be worn by the operator, such as overalls or gloves of lead-filled rubber (**heading 40.15**), or lead-glass goggles (**heading 90.04**).

* * *

The heading also **excludes** :

(a) Radium needles, and tubes, needles and the like containing other radioactive materials (**Chapter 28**).

(b) Photographic plates and film (**Chapter 37**).

(c) Kenotrons and other rectifying tubes or valves, used in power supply units for X-ray apparatus (**heading 85.40**).

(d) Apparatus for examining radiophotographs (including image projectors) (**heading 90.08** or **90.10**), and apparatus for developing radiographic or radiophotographic photographs (**heading 90.10**).

(e) Medical apparatus for application of ultra-violet or infra-red rays (actinotherapy) (**heading 90.18**).

(f) Instruments for measuring or detecting alpha, beta, gamma or X-radiations; these fall in **heading 90.30**, unless incorporated in radiology apparatus.

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Subheading Explanatory Note.

Subheading 9022.12

This subheading includes so-called whole-body computed tomographs. These are radiodiagnosis systems for wholebody examination by electronic body-section radiography (tomography). The regions of the body are scanned by an X-ray beam in individual steps and layers and the varying attenuation of the X-rays in the body is measured by hundreds of detectors arranged annularly around the tunnel in which the patient lies on a table.

The system's own automatic data processing machine converts the data from the sensors into an image which is displayed on the system monitor. The tomographic images are usually photographed by a special camera incorporated in the system and if necessary they are stored electromagnetically.