85.15 - Electric (including electrically heated gas), laser or other light or photon beam, ultrasonic, electron beam, magnetic pulse or plasma arc soldering, brazing or welding machines and apparatus, whether or not capable of cutting; electric machines and apparatus for hot spraying of metals or cermets.

- Brazing or soldering machines and apparatus :

8515.11 - - Soldering irons and guns

8515.19 - - Other

- Machines and apparatus for resistance welding of metal :

8515.21 - - Fully or partly automatic

8515.29 - - Other

- Machines and apparatus for arc (including plasma arc) welding of metals :

8515.31 - - Fully or partly automatic

8515.39 - - Other

8515.80 - Other machines and apparatus

8515.90 - Parts

(I) SOLDERING, BRAZING OR WELDING MACHINES AND APPARATUS

This group covers certain soldering, brazing or welding machines and apparatus, whether portable or fixed. They are also classified here when they are capable of cutting.

Welding operations may be performed manually or be fully or partly automatic.

These include :

(A) **Brazing or soldering machines and apparatus**.

The heat is normally generated by induction or conduction using electrical power sources.

Brazing and soldering are operations in which metal parts are joined by means of a filler metal with a lower melting point that wets the parent metal(s). The parent metal(s) does(do) not participate by fusion in making the joint. The filler metal is usually distributed between the surfaces of the joint by capillary attraction. Brazing can be distinguished from soldering by the melting point temperature of filler metals used. In brazing it is generally above 450 °C, whereas in soldering the melting point is achieved at a lower temperature.

Only machines and apparatus which, by reason of their special equipment (for example, a system for feeding in solder wire), are identifiable as solely or principally intended for brazing or soldering belong to this group. Other appliances are to be considered as furnaces, ovens or heating equipment within the meaning of **heading 85.14**.

This heading also covers electrically heated hand soldering irons and guns.

(B) **Machines and apparatus for resistance welding of metal.**

The heat required for forming welded joints is produced by the resistance to the flow of an electric current through the parts to be joined (Joule heat). During welding the parts are held together under pressure and fluxes or filler metals are not used.

These machines are of many kinds varying according to the type of article to be welded. They include, for example, butt welding or flash butt welding machines; single-spot welding machines comprising guns with or without built-in power sources; multispot machines and associated equipment; projection welding machines; seam welding machines; high-frequency resistance welding apparatus.

(C) **Machines and apparatus for arc or plasma arc welding of metals, whether or not capable of cutting.**

(1) **Arc welding.**

The source of heat is an electric arc struck either between two electrodes or between one such electrode and the work piece.

There are many machines of this kind, e.g., for manual metal arc welding with coated electrodes; for gas-shielded arc welding; for welding or cutting with consumable or non-consumable electrodes or with covered arc (inert-gas metal arc welding (MIG-Metal Inert Gas); active-gas metal arc welding (MAG- Metal Active Gas); inert-gas tungsten arc welding (TIG-Tungsten Inert Gas); submerged arc welding (SA), electro-slag or electro-gas welding, etc.).

(2) **Plasma arc welding.**

The source of heat is a constricted arc which, by ionisation and dissociation, converts auxiliary gas into a plasma (plasma jet). The gas may be inert (argon, helium), polyatomic (nitrogen, hydrogen) or a mixture of the two.

(D) **Machines and apparatus for induction welding of metals.**

The heat is produced by passing a current through one or more inductor coils.

(E) **Machines and apparatus for electron beam welding, whether or not capable of cutting.**

The heat is produced in the piece(s) to be welded or cut by impact of the electrons of a focussed electron beam generated in vacuum.

(F) **Machines and apparatus for vacuum diffusion welding.**

The heat is generally produced by induction but may be produced by electron beam or resistance.

The apparatus consists essentially of a vacuum chamber, vacuum pump, means of exerting pressure and heating equipment.

(G) **Machines and apparatus for photon beam welding, whether or not capable of cutting.**

Photon beam welding may be divided into :

(1) **Laser beam welding.**

The heat is derived from a source of essentially **coherent**, monochromatic radiation, which can be focussed into a high-intensity beam. It is produced by the impact of this beam on the piece to be welded.

(2) **Light beam welding.**

The heat is produced by impact of a **non-coherent** focussed light beam.

(H) **Machines and apparatus for welding thermoplastic materials.**

(1) **Welding with electrically heated gas (hot gas welding).**

The surfaces to be joined are warmed by electrically heated gas (generally air) and joined under pressure with or without additives.

(2) **Welding with electrically heated elements (heating element welding).**

The surfaces to be joined are warmed by means of electrically heated elements and joined under pressure with or without additives.

(3) **High-frequency welding.**

Surfaces of thermoplastic materials (e.g. acrylic polymers, polyethylene, poly(vinyl-chloride), polyamide (e.g. nylon)) with reasonably high dielectric losses are heated in a high-frequency alternating field and then joined under pressure. Additives may be used.

(IJ) **Machines and apparatus for ultrasonic welding.**

The parts to be joined are held together and subjected to ultrasonic vibrations. This process makes it possible to join metals or alloys which do not respond to ordinary welding techniques, and to weld metallic foils, parts of two or more different metals, or plastic films.

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Electric soldering, welding or brazing machines are usually fed with low-voltage DC from a DC generator, or with low-voltage AC from a step-down transformer. The transformer, etc., is usually incorporated in the machine, but in some cases (e.g., in certain mobile machines), the welding head or welding appliance is connected to the transformer, etc., by electric cable. Even in the latter case the heading covers the whole apparatus **provided** the transformer, etc., is presented with its associated welding head or welding appliance; presented separately, the transformer or generator is classified in its own appropriate heading (**heading 85.02** or **85.04**).

This heading also covers industrial robots specially designed for welding purposes.

The heading also **excludes** :

(a) Packaging machines fitted with electric welding appliances (**heading 84.22**).

(b) Fusing presses (**heading 84.51**).

(c) Machines designed exclusively for cutting (generally **heading 84.56**).

(d) Friction welding machines (**heading 84.68**).

(e) Soldering, brazing or welding machines and apparatus of a kind solely or principally used for the assembly of semiconductors (**heading 84.86**).

(II) ELECTRIC MACHINES AND APPARATUS FOR HOT SPRAYING OF METALS OR CERMETS

These are electric arc apparatus which melt down metals or cermets and at the same time spray them by means of compressed air.

The heading **does not cover** separately presented metal spraying pistols of **heading 84.24**.

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.

These include, *inter alia*, soldering heads and tongs, electrode holders and metal contact electrodes (for example, contact points, rollers and jaws) as well as torch points and sets of nozzles for atomic hydrogen hand welding equipment.

The following, however, are **excluded** from this heading :

(a) Consumable electrodes made of base metal or metal carbides (classified according to constituent material or in **heading 83.11**, as the case may be).

(b) Electrodes of graphite or other carbon, with or without metal (**heading 85.45**).