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84.13 - Pumps for liquids, whether or not fitted with a measuring device; liquid elevators (+).

- Pumps fitted or designed to be fitted with a measuring device :
 - 8413.11 - - Pumps for dispensing fuel or lubricants, of the type used in filling-stations or in garages
 - 8413.19 - - Other
 - 8413.20 - Hand pumps, other than those of subheading 8413.11 or 8413.19
 - 8413.30 - Fuel, lubricating or cooling medium pumps for internal combustion piston engines
 - 8413.40 - Concrete pumps
 - 8413.50 - Other reciprocating positive displacement pumps
 - 8413.60 - Other rotary positive displacement pumps
 - 8413.70 - Other centrifugal pumps
 - Other pumps; liquid elevators :
 - 8413.81 - - Pumps
 - 8413.82 - - Liquid elevators
 - Parts :
 - 8413.91 - - Of pumps
 - 8413.92 - - Of liquid elevators

This heading covers most machines and appliances for raising or otherwise continuously displacing volumes of liquids (including molten metal and wet concrete), whether they are operated by hand or by any kind of power unit, integral or otherwise.

The heading also includes delivery pumps equipped with measuring or price-calculating mechanisms such as are used for supplying petrol or oil in garages, and also pumps specially designed for use with other machines, vehicles, etc. (including petrol, oil or water pumps for internal combustion engines, and pumps for man-made textile fibre spinning machines).

The machines of this heading can be subdivided, according to their system of operation, into the following five categories.

(A) RECIPROCATING POSITIVE DISPLACEMENT PUMPS

These use the linear suction or forcing action of a piston or plunger driven within a cylinder, the inlet and outlet being regulated by valves. “Single-acting” pumps utilise the thrust or suction of one end of the piston only; “double-acting” types pump at both ends of the piston thus using both the forward and reverse strokes. In simple “lift” pumps the liquid is merely raised by suction and discharged against atmospheric pressure. In “force” pumps, the compression stroke is used, in addition to the suction stroke, to force the liquid to heights or against pressure. Multi-cylinder pumps are used for increased output. The cylinders may be either in line or in a star shape.

This category includes :

- (1) **Diaphragm pumps.** These incorporate a vibrating membrane of metal, leather, etc. (actuated either directly or through a fluid transmission) by which the liquid is raised.
- (2) **“Oil-cushion” pumps** (for drainage, irrigation, pumping viscous liquids, acids, etc.). In these, a fluid immiscible with the pumped liquid acts as the membrane.
- (3) **Electro-magnetic pumps.** In these, the forward and reverse strokes of the piston are produced by electro-magnetic action (oscillation of a wing placed in a magnetic field).
- (4) **Machines using the suction or forcing action of two pistons**, such as those pumps designed to deliver wet concrete (concrete pumps). However, special purpose vehicles permanently equipped with the concrete pumps of this heading are **excluded (heading 87.05)**.

(B) ROTARY POSITIVE DISPLACEMENT PUMPS

In these also, the intake and discharge of the liquid is effected by suction and compression, in this case produced by cams (lobes) or similar devices, rotated continuously on an axis. These devices make contact, at one or more points with the wall of the body of the pump, and form in this way the chambers in which the liquid is displaced.

They may be classified according to the nature of the rotating mechanism, viz. :

- (1) **Gear pumps.** The liquid is displaced by the teeth of specially shaped gears.
- (2) **Vane pumps.** The rotor is in the form of a cylinder revolving eccentrically and having projecting vanes free to move radially. The rotation permits the sliding vanes to maintain contact with the internal walls of the casing thereby displacing the liquid. This category also includes pumps which, in place of vanes, have rollers or a wheel with small flexible vanes or have a radial sliding vane attached to the body of the pump and rubbing on a smooth rotor turning with an eccentric movement.

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- (3) **Rotary piston lobe type pumps** with two interacting displacing elements rotating in a casing.
- (4) **Helicoidal pumps** (screw pumps). In these the liquid is displaced longitudinally in the body of the pump under the pressure of several helicoidal threads meshed together and turning (pumps with two or more screws, pumps with helicoidal spindles, endless screw pumps).
- (5) **Peristaltic pumps**. These have a flexible tube containing the liquid running along the length of the body of the housing and a rotor with rollers at each end. The rollers exert pressure on the flexible tube and the liquid is displaced by the rotational movement.

(C) CENTRIFUGAL PUMPS

In these pumps, liquid taken in axially is set in rotation by the revolving blades of a rotor (impeller), the resulting centrifugal action forcing the liquid outwards to the periphery of an annular casing containing an outlet placed tangentially. The casing is sometimes fitted with divergent vanes (diffuser vanes) to transform the kinetic energy of the fluid into high pressure.

For very high pressures, multi-stage centrifugal pumps are used in which the liquid is directed in stages through a number of impellers on a common shaft.

Centrifugal pumps may be driven by an electric or internal combustion motor or by a turbine. Because of their high working speed they are suitable for direct coupling, whereas piston or rotary pumps require to be driven through reduction gears.

This group also covers submersible pumps, central heating circulating pumps, channel impeller pumps, side channel pumps and radial flow impeller pumps.

(D) OTHER PUMPS

The following pumps fall in this group :

- (1) **Electro-magnetic pumps**. These pumps have no moving parts, the liquid being put into circulation by the phenomenon of electrical conduction. These pumps should not be confused with certain reciprocating positive displacement pumps in which the in-and-out movement of a piston is obtained by electro-magnetic effect, nor with those which function by magnetic induction.
- (2) **Ejectors**. In this type of pump, the kinetic energy of a jet of air, steam, water, etc., under pressure ejected from a tube, induces a suction and entrainment effect on the liquid handled. These pumps comprise a complex system of divergent and convergent pipes in a closed chamber from which the system of pipes emerges.

Injectors of the Giffard type for supplying water to boilers, and injection pumps for internal combustion piston engines, working on the same principle, are also classified here.

- (3) **Emulsion pumps (gas lift pumps)**. In these, the liquid is mixed with compressed gas in the outlet pipe, the decrease in density of the emulsified liquid thus providing the lift. When compressed air is used, the pump is referred to as an air lift pump.

- (4) Pumps in which the steam or gas pressure acts directly on the surface of the liquid. Examples are :
- (a) **Gas combustion pumps** employing the explosive force of a suitable fuel or gas to lift liquids.
 - (b) **Steam pulsators (pulsometers)**, in which the delivery of the liquid pumped is achieved by displacement due to the steam entering the chamber of the pulsator; the suction is created by the subsequent pressure drop due to the condensation of the steam in the chamber.
 - (c) **Compressed air chamber elevators (Montejus)** using compressed air.
 - (d) **Hydraulic rams**, in which the increase in the energy of a moving liquid column resulting from the periodic and sudden arrest of the flow of the liquid in the supply line is used to pump a portion of the driving liquid in the discharge pipe of the apparatus.

(E) LIQUID ELEVATORS

These include :

- (1) **Elevating wheels**, with buckets, scoops, etc.
- (2) **Chain or cable elevators** with buckets, scoops, rubber cups, etc.
- (3) **Band elevators**. These consist of endless bands of textile or metal (corrugated, multi-cellular or spiral), in which the water is held by capillarity and ejected centrifugally.
- (4) **Archimedean screw-type elevators**.

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, e.g., pump housings or bodies; rods specially designed to connect and drive the piston in pumps placed at some distance from the prime mover (e.g., pumping rods, "sucker rods"); pistons, plungers, vanes; cams (lobes); helicoidal screws, impeller wheels, diffuser vanes; buckets and bucket-fitted chains; bands for band-type liquid elevators; pressure chambers.

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The heading also **excludes** :

- (a) Pumps (e.g., for corrosive fluids) of ceramic material (**heading 69.09**).
- (b) Hand powered oil cans and grease guns (**heading 82.05**) and compressed air grease guns (**heading 84.67**).
- (c) Bottle-filling machines, etc., of **heading 84.22**.
- (d) Appliances for projecting, dispersing or spraying liquids (**heading 84.24**).
- (e) Motor fire-engines (**heading 87.05**).



Subheading Explanatory Note.

Subheadings 8413.11 and 8413.19

These subheadings cover only those pumps, of whatever type, which form, or have been designed to form, a unit with a device permitting the volumetric control of the quantity of liquid discharged, whether or not this device is presented at the same time as the pump.

This control device may be very simple (for example, a calibrated globe or unit) or, on the contrary, consist of more complex mechanisms automatically controlling the stopping of the pump when a given total quantity is discharged (such as, for example, a delivery pump comprising a calibrated cylinder (measuring cylinder) and a device permitting, on the one hand, the determining of a desired quantity and, on the other, stopping the pump motor when the predetermined quantity is obtained) or fulfilling other operations connected with volumetric control proper (for example, pumps for integration of totals, prepayment pumps, price-calculating pumps, sampling pumps, automatic mixture regulating pumps and automatic dosage pumps).

On the other hand, when, for example, the measuring device is designed to be simply mounted on the tube through which the liquid set in motion by the pump flows, each of the two units (pump and measuring device) are to be classified in their own headings, even when presented together.

These subheadings cover, for example, pumps for delivering petrol or other motor fuels and lubricants as well as pumps with a measuring device for use in food shops, laboratories and various industrial activities.