90.28 - Gas, liquid or electricity supply or production meters, including calibrating meters therefor.

9028.10 - Gas meters

9028.20 - Liquid meters

9028.30 - Electricity meters

9028.90 - Parts and accessories

These meters are generally fitted with a device driven at a speed proportional to the rate of fluid flow or to the electrical quantity being measured. They are often fitted in a bypass or shunt off the main or connected to measuring transformers, so that only part of the flow passes through them, but are calibrated so as to indicate the total quantity passing through the service pipes or through the main.

Gas, liquid or electricity supply or production meters fall in this heading whether or not fitted with a clockwork recording device, or with a simple mechanical or electrical device for bringing controlling, signalling, etc., appliances into action.

(I) GAS OR LIQUID SUPPLY OR PRODUCTION METERS

These meters are used to measure in volumetric units the amount of fluid passing through a pipe. Flowmeters, which measure rate of flow are **excluded** (**heading 90.26**).

This heading includes household supply meters, plant production or supply meters, and standard meters (for checking the accuracy of ordinary meters). In addition to simple meters, the heading also includes special meters such as maximum, prepayment, price-calculating, etc., meters.

Supply or production meters consist essentially of the measuring device (turbine, piston, diaphragm, etc.), the mechanism for regulating the admission of fluid (generally slide valves), the transmission (endless screw, camshaft, gears or other systems), and a recorder or an indicator (pointer or drum type) or both.

(A) **Gas supply or production meters**.

(1) **Wet meters**.

The measuring device generally consists of a drum or wheel partitioned into compartments; this revolves in a cylindrical casing rather more than half filled with a liquid (water, oil, etc.). The drum is rotated by the gas which on entering the meter, fills the submerged compartments and thus raises them above the level of the water. The revolutions of the drum are indicated on a counting mechanism.

Another type of meter (nutating bell meter), consists of a bell in which the gas passes in and out of a succession of chambers; the bell, which is centrally guided, is thus made to nutate around an inclined axis which engages a cranked arm attached to the driving spindle of the counting mechanism.

(2) **Dry meters**.

These are of several types. The measuring device may consist of pistons, diaphragms or of a fan wheel, driven by the pressure of the gas, and connected to a counter mechanism. The usual meter consists of a box divided in two compartments by a partition. Each compartment is itself divided by a central diaphragm; the gas passes successively in and out of these four compartments. The alternating motion of the diaphragm operates the counting mechanism.

(B) **Liquid supply or production meters** (cold or hot water, mineral oil, alcohol, beer, wine, milk, etc.), but **not** including pumps for liquids (even if fitted with measuring devices) of **heading 84.13**.

These meters include :

(1) **Impeller or fan wheel meters**.

These are also called **inferential meters** since the volume of liquid is inferred from its speed. The measuring device consists of a fan wheel or impeller which revolves at a speed proportional to the flow of the liquid. These revolutions operate a counting mechanism.

(2) **Diaphragm meters.**

These are similar to the dry gas meters described above. A cast iron cylinder is divided into two compartments by a flexible diaphragm which extends or retracts when the compartments are alternately filled or emptied. This motion operates the counter mechanism.

(3) **Reciprocating piston meters.**

These meters may consist of one or more pistons which perform a reciprocating movement inside the cylinders. As in a steam engine, a system of slide valves alternately directs the liquid under measure to the top and bottom sides of the piston and opens or closes the plug cocks. The motion of the pistons is geared to the counter mechanism.

(4) **Disc-piston meters.**

In these meters the piston is replaced by a revolving disc which divides a spherical chamber into two equal compartments alternately filled and emptied. The resulting oscillating motion of the disc is geared to the counter mechanism.

(5) **Rotary piston meters**.

One type of these meters consists of a cylindrical working chamber fitted with a radial partition which projects partially across the chamber. The measuring device is a cylindrical piston, the wall of which is split, and which fits over the partition. The filling and emptying of the compartment imparts an oscillating (semi-rotary) motion to the cylinder and this motion is geared to the counter mechanism.

In another type of meter there is no partition in the working chamber, and a true rotary motion of an elliptical piston is obtained. In some cases, the meter consists of a nutating cone in a partitioned spherical chamber.

The meters referred to in items (2) to (5) above are known as *positive displacement* type.

(II) ELECTRICITY SUPPLY OR PRODUCTION METERS

These meters measure the amount of electricity consumed (in ampere-hours or multiples thereof) (quantity meters), or the amount of energy consumed (in watt-hours or multiples thereof) (energy meters). When the voltage is constant, quantity meters may be calibrated in watt-hours (or in multiples of watt-hours). Some meters are devised for use with direct current, others for alternating current.

The heading **excludes** apparatus such as voltmeters, ammeters, wattmeters, etc., which simply measure electrical quantities and are not designed for registering the total amount of electricity or energy consumed (**heading 90.30**).

This heading includes the following main types of electricity supply meters :

(A) **Motor meters**.

These meters consist essentially of one or more inductors, a revolving element (armature) whose speed of revolution is proportional to the amount of electricity or energy consumed, a counting mechanism and a pointer or drum indicator (or a combination of both).

Motor meters are usually fitted with an eddy current brake, a metal brake-disc in which eddy currents are generated as it revolves between the poles of one or more permanent magnets.

(B) **Static meters**.

These meters consist essentially of electronic static sub-assemblies, such as multipliers or quantifiers equipped with an indicating device. They produce an electrical current or resistance directly proportional to the amount of electrical energy consumed. The indicating device may be mechanical (fitted with a pointer or drum indicator) or electronic.

These include :

(1) **Prepayment meters**.

(2) **Multiple-rate meters** (calculating the electrical energy supplied at two or more different rates).

(3) **Maximum meters** (indicating the maximum value of the average load during a given period).

(4) **Peak meters** (indicating the consumption above a certain peak value).

(5) **Excess meters** (similar to peak meters but also indicating the total energy used).

(6) **Impulsing meters** (fitted with a pulse transmitter).

(7) **Reactive meters**.

(8) **Demonstration meters**.

(9) **Direct current meters** (volt-hour (Vh) meters, ampere-hour (Ah) meters, watt-hour (Wh) meters).

(10) **Meters with pulse input** for connection to impulsing meters, fitted with a consumption register and a totalling device or a maximum device (indicating or recording) or an excess device, etc.

(11) **Standard meters** for checking and calibrating other meters.

PARTS AND ACCESSORIES

Subject to the provisions of Notes 1 and 2 to this Chapter (see the General Explanatory Note), separately presented parts and accessories of meters of this heading remain classified here.