90.29 - Revolution counters, production counters, taximeters, mileometers, pedometers and the like; speed indicators and tachometers, other than those of heading 90.14 or 90.15; stroboscopes.

9029.10 - Revolution counters, production counters, taximeters, mileometers, pedometers and the like

9029.20 - Speed indicators and tachometers; stroboscopes

9029.90 - Parts and accessories

This heading includes :

(A) Counters indicating a total number of units of any kind (revolutions, items, length, etc.), or an amount to be paid. But the heading **excludes** totalling devices of a kind falling in **heading 84.73**, the gas, liquid or electricity supply or production meters of **heading 90.28**, and opisometers or planimeters of **heading 90.17** or **90.31**.

(B) Apparatus indicating a speed of revolution or a linear speed in relation to a time factor (tachometers and speed indicators), **other than** those of **heading 90.14** or **90.15**.

(C) Stroboscopes of all kinds.

Such apparatus and instruments remain classified here whether or not they incorporate a clockwork recording device, and whether or not they are fitted with simple mechanical or electric devices for bringing a signalling apparatus, machine controls, brakes, etc., into action.

(A) COUNTING DEVICES

(1) **Revolution counters**.

These instruments count the number of revolutions of a mechanical part (e.g., machine shaft). They consist mainly of a driving spindle geared to pointer or drum indicators. They usually have a device for re-setting the counter to zero. The counters may be coupled to the revolving part either directly (in some cases the part drives the gearing itself) or by remote control. The driving spindle may be operated by a rotary, alternating or pulsating movement of the turning part (e.g., encoders).

It should, however, be noted that the heading **excludes** yarn grading winding reels, torsiometers and similar testing or checking apparatus incorporating revolution counters (**heading 90.31**).

(2) **Production counters**.

These are similar in construction to revolution counters. They are used, in particular, for measuring lengths (e.g., on spinning or twisting machines); for counting the movements of a machine (an automatic balance, a pump, the picks of a spinning machine, etc.); or for counting a number of articles (printed sheets delivered by a rotary press, articles carried by a conveyor belt, bank notes, etc.). In practice, the appliances used for these purposes are generally revolution counters which have been adapted to indicate the length or number of units in terms of the revolutions of the driving spindle.

Electronic production counters. The articles to be counted interrupt a beam falling on a photoelectric cell. A recording apparatus then computes the number of articles which have passed through the beam.

This group also covers multiple counters (e.g., those used to check the output of several operators working on the same machine).

This group also includes the electro-magnetic counters used in automatic telephone exchanges to count the number of telephone calls made by a subscriber; they usually incorporate an electro-magnet which moves the recording mechanism (cyclometer-type rollers, etc.) one position each time a pulse of electric current is passed through its winding.

(3) **Counters for indicating the working hours of machines, motors, etc., (time or hour meters).**

In practice, these are revolution counters calibrated in working hours.

(4) **Entry counters.**

These counters are operated by turnstiles or other appliances placed at the entrances of museums, parks, sports grounds, etc., where they record the number of visitors or spectators.

(5) **Billiards meters.**

These are mechanical counters (roller-type and the like), usually hand-operated, for recording the score.

The heading **excludes** meters which employ a clock movement to indicate the time in play or the amount payable based on that time (**heading 91.06**). Billiard markers, ball or slide type, fall in **heading 95.04**.

(6) **Instruments and apparatus for measuring short time intervals** by counting, and which, not having a movement of the watch or clock type (including synchronous movements), **do not** fall in Chapter 91. The heading also covers **electronic impulse counters (scalers)** (e.g., passenger counters on motor coaches, trains, etc.).

(7) **Taximeters.**

These usually have a clock movement. They indicate the fare payable in relation to time **and** to the distance covered.

(8) **Mileometers.**

These are revolution counters for vehicles, and are usually graduated in linear units (miles, kilometres, etc.). Most mileometers are combined with speed indicators.

(9) **Pedometers.**

These instruments have a watch type mechanism and are used for an approximate measurement of distances. They contain a pendulum which, at each step, advances the train of wheels by one unit. The distance covered is calculated from the number of steps taken and their length.

(10) **Hand-held counters.**

These counters usually read no more than four numbers in fixed categories. The user depresses a button in the category being counted to activate the display.

(B) SPEED INDICATORS AND TACHOMETERS

These instruments differ from the revolution counters and production counters of Part (A) above in that they indicate the number of revolutions, speed, output, etc., **per unit of time** (e.g., revolutions per minute, miles per hour, kilometres per hour, metres per minute). They are usually mounted on vehicles (cars, motorcycles, bicycles, locomotives, etc.) or machines (motors, turbines, paper-making machines, printing machinery, textile machinery, etc.).

The speed indicators and tachometers classified here normally function on one of the following principles :

(1) **Chronometric system.**

The measuring mechanism is combined with a clock or watch movement. Sometimes the time is measured by means of a separate chronograph; in this case, the two instruments are classified in their appropriate headings.

(2) **Centrifugal system.**

A vertical governor arm, held by a spring, rotates with the driving spindle. A pair of weights carried by the governor arm are thrown outwards by centrifugal force, so that the distance the governor arm is displaced is proportional to the speed. This displacement is transmitted to the instrument pointer.

(3) **Vibration system.**

This type is used for high speed machines such as steam turbines, pumps, compressors, electric motors, etc. The mechanical resonance of vibrations of the frame or bearings of the machine cause graduated reeds to oscillate at a rate corresponding to the number of revolutions of the machine.

(4) **Magnetic (induction) system.**

A system of permanent magnets rotating with the driving spindle generates eddy-currents in a disc of copper or aluminium placed in the magnetic field. This current is proportional to the rotating speed of the magnets. The disc is thus "dragged" or pulled round, but its rotation is retarded by a restraining spring. The disc is connected to a pointer indicating the speed.

(5) **Electrical systems.**

These are either fitted with a photoelectric cell or operated by an impulse generator mounted on the machine.

Speed indicators and tachometers of this heading may be fixed or portable, simple or multi-function (e.g., maximum or minimum), differential (in which case they give the difference between two speeds as a percentage), combined with an adding counter or a time meter or graphical recording device, etc. The heading also covers certain instruments which simultaneously record speed, mileage, time in motion and at a standstill, etc.

(C) STROBOSCOPES

Stroboscopes enable machines in operation to be observed as though they were moving slowly or were stationary; they can also be used to measure the speed of rotating or reciprocating movements. In the latter case, they are known more particularly as **stroboscopic tachometers**. Stroboscopes operate on the principle of producing apparent immobility or reduced speed in the mechanism to be observed, by means of successive glimpses (flashes) at fixed intervals. The mechanism under observation may be permanently illuminated for examination through an optical instrument (a disc with one or more radial slots or "windows") which interrupts the line of sight; or the mechanism may be placed in the dark and illuminated periodically for very short periods (flashes). The speed of the rotating or reciprocating mechanism under observation can be ascertained by adapting the speed of the disc or the frequency of the flashes until the impression of immobility is obtained.

Stroboscopes based on the principle of **permanent illumination** consist essentially of a clockwork driven with one or more windows, a speed regulator, an eyepiece and a graduated drum (usually graduated in revolutions per minute).

Stroboscopes functioning on the principle of **periodic illumination** differ appreciably according to the device producing the light flashes. The most simple types consist of an ordinary lamp, a motor with a speed regulator controlling the frequency of the flashes, and a graduated dial. The flashes may also be produced by a gas discharge lamp. These gas discharge stroboscopes are much more complex in structure and can be used for taking photographs or making films; they are sometimes mounted on castors or rollers. The flashes required for the observation of a rotating or reciprocating mechanism may be controlled by the mechanism itself. Synchronisation is achieved by means of a spring-type interrupter, a photoelectric cell, an electro-magnetic relay, etc.

Except when permanently incorporated in stroboscopes, the photographic or cinematographic cameras fall in their appropriate heading.

Stroboscopes are used, in particular, for observing or measuring the speed of motors, transmission gear, textile machinery (parts such as spindles, winders, cards, shuttles), paper-making machines, printing machinery or machine-tools. They are also used in medicine for examination of the vibration of the vocal chords.

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 apparatus or appliances of this heading remain classified here.