90.32 - Automatic regulating or controlling instruments and apparatus.

9032.10 - Thermostats

9032.20 - Manostats

- Other instruments and apparatus :

9032.81 - - Hydraulic or pneumatic

9032.89 - - Other

9032.90 - Parts and accessories

In accordance with Note 7 to this Chapter, this heading covers :

(A) Instruments and apparatus for automatically controlling the flow, level, pressure or other variables of liquids or gases, or for automatically controlling temperature, whether or not their operation depends on an electrical phenomenon which varies according to the factor to be automatically controlled, which are designed to bring this factor to, and maintain it at, a desired value, stabilised against disturbances, by constantly or periodically measuring its actual value; and

(B) Automatic regulators of electrical quantities, and instruments or apparatus for automatically controlling non-electrical quantities, the operation of which depends on an electrical phenomenon varying according to the factor to be controlled, which are designed to bring this factor to, and maintain it at, a desired value, stabilised against disturbances, by constantly or periodically measuring its actual value.

(I) INSTRUMENTS AND APPARATUS FOR AUTOMATICALLY CONTROLLING THE FLOW, LEVEL, PRESSURE OR OTHER VARIABLES OF LIQUIDS OR GASES, OR FOR AUTOMATICALLY CONTROLLING TEMPERATURE

Automatic control apparatus for liquids or gases and apparatus for automatically controlling temperature form part of complete automatic control systems and consist essentially of the following devices :

(A) **A device for measuring** the variable to be controlled (pressure or level in a tank, temperature in a room, etc.); in some cases, a simple device which is sensitive to changes in the variable (metal or bi-metal rod, chamber or bellows containing an expanding liquid, float, etc.) may be used instead of a measuring device.

(B) **A control device** which compares the measured value with the desired value and actuates the device described in (C) below accordingly.

(C) **A starting, stopping or operating device**.

Apparatus for automatically controlling liquids or gases or temperature, within the meaning of Note 7 (a) to this Chapter, consists of these three devices forming a single entity or in accordance with Note 3 to this Chapter, a functional unit.

Some instruments and apparatus do not incorporate devices which compare the measured value with the desired value. They are directly activated by means of a switch, e.g., when the predetermined value is reached.

Instruments and apparatus for automatically controlling the flow, level, pressure and other variables of liquids or gases or for automatically controlling temperature are connected to an appliance which carries out the orders (pump, compressor, valve, furnace burner, etc.) which restores the variable (e.g., liquid measured in a tank or temperature measured in a room) to the prescribed value, or which, in the case of a safety system, for instance, stops the operation of the machine or apparatus controlled. This appliance, generally remote controlled by a mechanical, hydraulic, pneumatic or electric control, is to be classified in its own appropriate heading (pump or compressor : **heading 84.13** or **84.14**; valve : **heading 84.81**, etc.). If the automatic control apparatus is combined with the appliance which carries out the orders, the classification of the whole is to be determined under either Interpretative Rule 1 or Interpretative Rule 3 (b) (see Part (III) of the General Explanatory Note to Section XVI and the Explanatory Note to heading 84.81).

This group includes :

(A) **Pressure controllers** or **regulators**, also called **manostats**. These consist essentially of a pressure sensitive device, a controlling device which compares (e.g., by means of an adjustable spring) the pressure to be controlled with the prescribed pressure, and an electric contact or a small valve operating a servo-circuit.

This apparatus may be used, for instance, to control a motor pump or compressor which supplies a pressure tank, or to operate pneumatic valve positioners, or with a valve to regulate the flow, pressure, etc., of liquids or gases.

These pressure regulators differ from the pressure reducing valves of **heading 84.81** (sometimes also called " pressure regulators ").

(B) **Level regulators or controllers** for the automatic control of a level.

In the **float-type level controller**, the float acts on a diaphragm or a magnetic or other device which operates an electric switch; this in turn switches on or off a pump, a valve, etc.

In the **electrode system** the liquid is connected to earth and forms part of the circuit. One pole of the transformer is also earthed. When the surface of the liquid comes into contact with the electrode, the circuit is closed and a relay comes into operation.

(C) **Humidity regulators**, sometimes also called **humidistats**, are instruments for automatically controlling humidity in steaming cabinets, furnaces, workshops, warehouses, etc.

The operation depends on variations in the length of a bundle of hair or some other element sensitive to humidity and they generally operate a signalling device or control an apparatus which can modify the degree of humidity found (steam input valve, humidifier or de-humidifier, fan, etc.).

(D) **Thermostats** are used for automatically controlling temperature. The main components of a thermostat are :

(1) An element sensitive to changes in temperature whose action may depend on :

(a) The change in shape of a bi-metal strip (straight, U or spiral-shaped, etc.);

(b) The vapour pressure of a liquid;

(c) The expansion of a liquid or of a metal rod;

(d) An electrical resistor or a thermocouple.

In bi-metal strip thermostats, the strip is fixed inside a plunger tube or in a case. In metal rod thermostats, the rod fits in a plunger tube. In vapour pressure or liquid types, the sensitive element may consist of a folded diaphragm enclosing a fluid, or of a system incorporating a diaphragm, a capillary tube and a bulb or elbow.

(2) A drum, disc or other device for pre-setting the desired temperature.

(3) A triggering or operating device which consists mainly, depending on the type of transmission used (mechanical, servo-fluid, electrical), of a lever assembly, springs, etc., a valve, or an electrical switch. This device operates a signal or an appliance (generally remote) such as a steam or hot water intake valve, boiler burner, air conditioning unit, fan, etc., which regulates the temperature.

Thermostats are used, in particular, for controlling temperature in houses or other buildings, in ovens, cookers, boilers, water heaters, cold storage installations, chimneys or flues, steaming apparatus or cabinets, and other industrial or laboratory equipment.

(E) **Temperature regulators** for setting and maintaining pre-set temperatures on electrical heating appliances (cookers, grills, percolators, etc.) consist essentially of a bi-metal strip which, when deflected by the heat from a shunt resistor on the power circuit, operates a switch to make and break the power circuit, the " On " and " Off " periods (and consequently the temperature of the heating elements) being determined by the position of a manual control dial; the " Full " position renders the bi-metal assembly inoperative and thus, particularly in the initial stages of heating, permits continuous operation of the heating element.

This heading **excludes** :

(a) " Thermostatic " or " thermostat " steamers, cabinets, etc., in which the temperature is kept constant by means of a thermostat, which are to be classified in their respective headings.

(b) Thermostatically controlled valves (**heading 84.81**).

(F) **Oven-draught regulators** are used, for example, in central heating or air conditioning plants, to control automatically the air intake by reference to the temperature, pressure, etc.

(II) AUTOMATIC REGULATORS OF ELECTRICAL QUANTITIES,AND INSTRUMENTS OR APPARATUS FOR AUTOMATICALLY CONTROLLING NON-ELECTRICAL QUANTITIES THE OPERATION OF WHICH DEPENDS ON AN ELECTRICAL PHENOMENON VARYING ACCORDING TO THE FACTOR TO BE CONTROLLED

The automatic regulators of this heading are intended for use in complete automatic control systems which are designed to bring a quantity, electrical or non-electrical, to, and maintain it at, a desired value, stabilised against any disturbances, by constantly or periodically measuring its actual value. They consist essentially of the following devices :

(A) **A measuring device** (sensing device, converter, resistance probe, thermocouple, etc.) which determines the actual value of the variable to be controlled and converts it into a proportional electrical signal.

(B) **An electrical control device** which compares the measured value with the desired value and gives a signal (generally in the form of a modulated current).

(C) **A starting, stopping or operating device** (generally contacts, switches or circuit breakers, reversing switches or, sometimes, relay switches) which supplies current to an actuator in accordance with the signal received from the control device.

An automatic regulator within the meaning of Note 7 (b) to this Chapter consists of the devices described in (A), (B) and (C) above, whether assembled together as a single entity or in accordance with Note 3 to this Chapter, a functional unit.

If they do not conform to the definitions outlined above, these devices are to be classified as follows :

(1) Electrical measuring devices generally fall in **heading 90.25, 90.26** or **90.30**.

(2) Electrical control devices are to be classified in this heading as incomplete automatically controlling instruments or apparatus.

(3) Starting, stopping or operating devices are generally to be classified in **heading 85.36** (switches, relays, etc.).

Automatic regulators are connected to an electrical, pneumatic or hydraulic actuator, which brings the controlled variable back to the desired value. This actuator may be the clamps which adjust the gap between the electrodes of an arc furnace, the motorised valve which controls the intake of water or steam in a boiler, a furnace, a pulping machine, etc.

The actuators are to be classified in their own appropriate headings (adjustable clamp : **heading 84.25**; motorised or solenoid valve : **heading 84.81**; electro-magnetic positioner : **heading 85.05**; etc.). If the automatic regulator is combined with the actuator, the classification of the whole is to be determined under either Interpretative Rule 1 or Interpretative Rule 3 (b) (see Part (III) of the General Explanatory Note to Section XVI and the Explanatory Note to heading 84.81).

Electronic regulators function on a strictly electrical principle, and not electro-mechanically. Their characteristic features are semiconductors (transistors) or integrated circuits.

These regulators are used not only for electrical quantities, such as voltage, amperage, frequency and power, but also for other quantities such as revolutions per minute, torque, traction force, level, pressure, flow or temperature.

This heading also **excludes** :

(a) Cut-outs combined, in a single housing, with a voltage regulator or a current regulator, for use in conjunction with internal combustion piston engines (**heading 85.11**).

(b) " Programmable controllers " of **heading 85.37**.

PARTS AND ACCESSORIES

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