

## 1.5 STATE CHANGE

In state change devices, a linear displacement against temperature is not used. What is used is the instant change of volume that appears at specific temperatures at melting, freezing, and boiling points on various elements.

For example, the freezing point of water at 0 ° C causes an increase in volume, melting at 0 ° C causes a reduction in volume, but also the transition from the solid state to the liquid state : when water is boiling at 100 ° C steam causes large volume increase.

State change systems will therefore use these special properties of a number of elements and compounds.

### 1.5.1 WAXES

Thermostatic wax is a complex mixture of many components providing a different Melting / Freezing temperature depending on the composition. At this temperature there occurs a high volume change. Waxes have the characteristic increase in volume when they melt.

This system, which causes a high displacement, is used for car thermostats, to open the flow path of water. It is also common in central heating radiators thermostat, as well as in mini-jacks locking the doors of ovens, washing machines and other appliances.



### 1.5.2 LOW FUSE TEMPERATURE ALLOYS

These fusible alloys are all descendants of those discovered by Darcey at the beginning of the nineteenth century. An alloy of tin, antimony, lead, bismuth and other metals, will have melting temperatures between 25 and 200 ° C depending on the percentage of each ingredient.

Their first applications were opening the steam pressure locomotive blowdown valve. The melting of the alloy at a predetermined temperature is used to release a mechanical system (fire fusible links) or directly open an electrical circuit (thermal cut-out electrical fuses ).



### 1.5.3 BOILING

The boiling of a liquid causes, in a closed circuit, a sharp increase in pressure. This increase in pressure may be due to local boiling in a capillary thermostat diastat. This allows to make thermostats sensitive to temperature on a long distance, detecting hot spot at any place on the capillary.

Boiling is also used in glass bulbs, which breaks when the liquid inside boils and releases a mechanical or electrical system. The best-known application is the control of the "sprinkler" systems, common in building fire detection.



## 1.6 OTHER SYSTEMS

### 1.6.1 THE CURIE POINT

The Curie temperature is the temperature at which a magnet loses its magnetization. This temperature can be changed by altering the composition of the magnetic alloy. This loss of magnetization releases a mechanical or electrical system.

This application is limited to a few specific uses, such as rice cookers



### 1.6.2 FORM MEMORY

Some alloys or compounds, subject to a certain temperature, return to the form they had before their mechanical processing. Heat treatment and composition determine these temperatures.

### 1.6.3 EXPANSION OF GAS

This system is mainly used for the production of thermometer, because the available forces are weak and can hardly operate a contact. Is linear expansion and allows a linear scale in a wide range of temperatures.

The gases used are mainly helium and argon

These systems are sensitive to atmospheric pressure and demand a compensation system