

# Description of temperature controls



## Disc thermostats

Used as control thermostats or as a safety thermostat with manual reset, these thermostats have a disc made of two different metals laminated together for temperature sensing element. These two metals have different expansion coefficients. Therefore a dome bumped disc will gradually change shapes with increasing temperature until it suddenly snaps from concave to convex. It also comes back with a snap action to its original form when temperature drops. This sudden change activates a contact blade. These thermostats exist with one, two or three pole contacts. Technology to obtain accurate temperatures and low differentials is complex and few manufacturers offer accurate values and low differentials. JPC is one of the very few manufacturers offering three poles models.



## Surface mounting Bimetal strip thermostats

These control devices, adjustable, slow break, have a very high precision, and low differential: less than 1 ° C. They are mounted on a flat wall, fixed by 2 screws. However, due to their slow break, generating 230 parasites, their use in Europe is marginal, limited to laboratory uses or when low differential are sought. Common temperature ranges are from 20 to 250 ° C.



## Energy regulators

The energy regulators are a type of thermostat bimetal having a heating resistor in contact with this miniature blade. The power of this internal resistance heats the blade, which is deformed and cuts off the supply of the resistance. The blade is then cooled and the contact closes and a new cycle begins, like a flash. The setting pin to change the ratio between the time of opening and closing, and provides the electrical connection to an external load in parallel with the internal resistance. This simple system allows you to adjust continuously the resulting power a heater. The power supply circuit must be specified as the miniature internal heater is made in terms of this tension.



## Bulb and capillary control thermostats

Bulb and capillary thermostats sensing device, usually named "Diastat" is a closed chamber made of a bulb, a capillary and a bellow made of two membranes, filled under vacuum with liquid. When temperature around the bulb increases, the liquid volume expands and inflates the membrane. This displacement is used to actuate a snap-action switch mechanism. A threaded shaft, used to modify the bellow position allows temperature adjustments. In standard devices (not fail safe), when a leak occurs in the Diastat, the bellow deflates and electrical contacts remains closed when the temperature rises. The most common ranges go from -35 to +320°C. Higher set points up to 750°C are possible but they require capillary liquids that withstand these temperatures without boiling. JPC is one the very few companies manufacturing these models. These high temperature versions (ranges above 400 °C) use a liquid metal as filling liquid, usually a Sodium Potassium eutectic. In case of breakage or leak of the Diastat, this liquid is flammable on contact with water or atmospheric moisture. It is therefore necessary to take this point into account in their applications.

The capillary thermostats are subject to drift due to temperature variations on the capillary and the bellows. The bulb and capillary thermostat differential is usually not adjustable, and is about 2.5% of the temperature range. They are available in single pole or three pole versions.



## Invar Rod thermostats for temperature control

These thermostats are the oldest systems of temperature control, and the first of them was invented by French engineer Jean Simon Bonnemain in 1783. They use the differential expansion of two metals to activate a mechanism. They are widely used in storage water heaters and in boilers. Their calibration is not subject to ambient temperature variation drift such as liquid expansion bulb and capillary thermostats. They are available with control action or manual reset action. Their specificity is that the measuring rod is secured to the adjustment head and electrical contacts.

Current models, using a brass or stainless steel tube and invar rod, have measuring ranges between -50 and +400 ° C. JPC is currently the oldest French manufacturer of this type of thermostats.



## Bulb and capillary thermostats with explosion proof electrical contacts

Built on the same mechanical basis than the standard thermostats, and achievable within the same temperature ranges, these thermostats use an explosion-proof micro switch which is a unique design concept developed by JPC. The advantage of this system is to avoid heavy and expensive IIB or IIC metal boxes, and to allow temperature set point adjustment without need to switch off the electrical power supply. The thermostat can be fitted in Y8 series standard waterproof enclosures, but its output cable connection must necessarily take place in an "increased safety" enclosure or outside the hazardous areas. The most recent versions include a built in increased safety enclosure. Depending of models, electrical rating can go from 5A 250V SPDT to 15A400V SPDT. 2 poles versions are also available