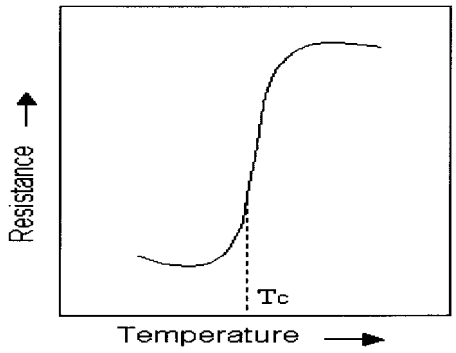
"The Principles of PTC Heating"

DBK Technitherm's Cirrus, Nimbus, HP, HR, and HT range of heaters incorporate PTC heating elements. Most consumers are not directly aware of what a "**P**ositive **T**emperature **C**oefficient" heater is, so it may be useful to explain in greater detail.

Unlike traditional heating elements that use a resistance wire such as Nichrome to generate heat, PTC heating elements are made as ceramic stones, based on barium titanate. These manufactured ceramic stones have very unique characteristics as semiconductors and their ferro-electric properties can be precisely determined during their design.

In other words, if a voltage is placed across a PTC, current will flow and begin to heat the part. Initially, the resistance drops, allowing more current to flow, not unlike the "inrush" of an electric motor, and thus begins to heat more quickly. Once the heater starts to rise in temperature, this ceramic element exhibits a truly remarkable feature. It reaches the point where the heat generated by the part is sufficient to make up for the loss of heat to the ambient. In this situation, the heater is in equilibrium. In other words, the resistance value of the heater has suddenly increased several times to the factor of 10, and current flow diminishes towards zero, thus making the heater self-limiting in many cases. If the ambient temperature starts to decrease, the heater's resistance will decrease drawing more current and countering the cooling tendency. Conversely, any tendency to increase its temperature has the opposite effect.

The PTC ceramics can be manufactured to have different fixed temperatures at which the dramatic resistance change takes place. This temperature point is called the Curie point of the PTC heater.



R-T Curve of PTCR

Even with the regard to voltage changes, the constant temperature mechanism will be effective. If the operating voltage increases, the PTC initially consumes more power, but as a result, its temperature increases more rapidly, and thus the current stabilizes more quickly at a lower level. Therefore, unlike traditional resistance wire, the performance of the PTC is not proportional to the square of the voltage as in the case of the ohmic resistance. For this reason, we can use the same heater at either 120Vac, or 240Vac and provide essentially the same wattage output.

A PTC heater can therefore be an effective low cost solution because it provides a highly efficient source of heat in a very small package and this can result in using a smaller enclosure than previously used. The heater also provide lower operating costs because the wattage constantly varies from minimum to maximum based on the temperature required. In some cases, because PTC heaters have this self limiting temperature characteristic, they can be operated without the traditional need of thermostatic control. Of course, there are instances where the use of a supplementary thermostat is useful, as well as a low cost snap disc style that is preset to control the heater near the required operating point.

The heaters are very easy to install, as they come with a clip that snaps onto standard din rail, and the connection wires are already attached to the heaters. The wattage range available is very comprehensive, ranging from 10 watts right up to 800 watts. Most of the products in the DBK range carry CSA, UL and VDE approvals.

Most of us have already had some experience of PTC style heaters without even knowing it! For example, plug-in air fresheners, curling irons, espresso machines, and many styles of heating cables used for de-icing pipes have used this technology for years.

PTC style heaters have a virtually unlimited service life, and do not generate RFI noise. Typical outdoor applications in the UK marketplace are ticket dispensers, parking gates, metering boxes, pump houses, crane cabs, control panels, surveillance cameras, liquid crystal displays, traffic light control boxes, transformer enclosures, telecommunication cabins, medical machinery, railway signalling, rolling stock, and many more.