Fuses

A fuse comprises a wire fuse element or a metal strip of small cross-section in comparison to the circuit conductors, and is typically mounted between a pair of electrical terminals. Usually, the fuse is enclosed by a non-combustible and non-conducting housing. The fuse is arranged in series which can carry all the current passing throughout the protected circuit. The resistance of the element generates heat due to the current flow. The construction and the size of the element is empirically determined in order to be sure that the heat generated for a standard current does not cause the element to attain a high temperature. In instances where too high of a current flows, the element either melts directly or it rises to a higher temperature and melts a soldered joint inside the fuse that opens the circuit.

Whenever the metal conductor parts, an electric arc is formed between un-melted ends of the fuse. The arc starts to grow until the required voltage to be able to sustain the arc is in fact greater as opposed to the circuits existing voltage. This is what truly causes the current flow to become terminated. Where alternating current circuits are concerned, the current naturally reverses direction on each cycle. This particular method really enhances the speed of fuse interruption. When it comes to current-limiting fuses, the voltage required in order to sustain the arc builds up fast enough so as to really stop the fault current before the first peak of the AC waveform. This effect greatly limits damage to downstream protected devices.

Usually, the fuse element is made up of copper, alloys, silver, aluminum or zinc which will provide predictable and stable characteristics. Ideally, the fuse will carry its rated current indefinitely and melt fast on a small excess. It is essential that the element must not become damaged by minor harmless surges of current, and must not change or oxidize its behavior subsequent to possible years of service.

The fuse elements can be shaped to be able to increase the heating effect. In bigger fuses, the current can be divided amongst many metal strips, whereas a dual-element fuse might have metal strips that melt immediately upon a short-circuit. This particular kind of fuse can likewise have a low-melting solder joint that responds to long-term overload of low values as opposed to a short circuit. Fuse elements could be supported by steel or nichrome wires. This will make sure that no strain is placed on the element however a spring could be incorporated to increase the speed of parting the element fragments.

It is common for the fuse element to be surrounded by materials that are meant to speed the quenching of the arc. Air, non-conducting liquids and silica sand are some examples.