Fuses

A fuse consists of either a wire fuse element or a metal strip within a small cross-section which are attached to circuit conductors. These units are usually mounted between a pair of electrical terminals and usually the fuse is cased inside 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 produces heat because of the current flow. The construction and the size of the element is empirically determined to be able to be certain that the heat produced for a regular current does not cause the element to attain a high temperature. In cases where too high of a current flows, the element either rises to a higher temperature and melts a soldered joint in the fuse that opens the circuit or it melts directly.

An electric arc forms between the un-melted ends of the element if the metal conductor components. The arc grows in length until the voltage considered necessary to be able to sustain the arc becomes higher than the obtainable voltage in the circuit. This is what actually causes the current flow to become terminated. When it comes to alternating current circuits, the current naturally reverses course on each cycle. This particular method greatly improves the fuse interruption speed. When it comes to current-limiting fuses, the voltage required in order to sustain the arc builds up fast enough so as to basically stop the fault current prior to the first peak of the AC waveform. This particular effect greatly limits damage to downstream protected units.

Generally, the fuse element consists if alloys, silver, aluminum, zinc or copper that will offer predictable and stable characteristics. Ideally, the fuse would carry its rated current indefinitely and melt rapidly on a small excess. It is vital that the element should not become damaged by minor harmless surges of current, and should not change or oxidize its behavior following potentially years of service.

The fuse elements may be shaped to increase the heating effect. In larger fuses, the current could be divided among several metal strips, while a dual-element fuse might have metal strips that melt immediately upon a short-circuit. This particular type of fuse may likewise contain a low-melting solder joint that responds to long-term overload of low values compared to a short circuit. Fuse elements could be supported by steel or nichrome wires. This ensures that no strain is placed on the element but a spring can be included so as to increase the speed of parting the element fragments.

It is normal for the fuse element to be surrounded by materials which are meant to speed the quenching of the arc. Silica sand, air and non-conducting liquids are a few examples.