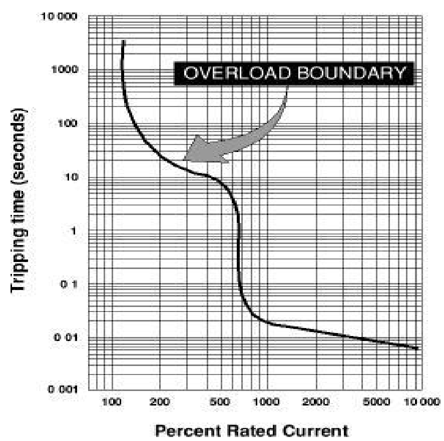
Overload protection

Every component making up an electrical installation is designed for use at a particular rated current. When it is used within these limits it will have a specific service life expectancy, which is the length of time for which the insulation will remain operationally safe.

When a component is overloaded, the temperature in the insulation exceeds the limit beyond which the insulation begins to deteriorate and the service life will be shortened. This deterioration depends on both the temperature rise and time for which the insulation is exposed to the overload. Precautions should be taken to avoid, or at least reduce to a minimum, overloading of electrical components. It is possible to detect an overload condition by monitoring the current flowing into an item of equipment and the time for which it flows.

A typical time/current curve showing the boundary between the normal and overloaded condition of an item of electrical equipment is shown in the figure below



The overload sensing means that is incorporated into circuit breakers is usually achieved through one of three different technologies including

i) Solid state electronic sensing.
ii) Thermal-magnetic sensing
iii) Hydraulic-magnetic sensing

Solid state electronic sensing, which is often combined with microprocessor controllers, is generally restricted to larger frame circuit breakers mainly due to cost considerations.

Thermal sensing is the oldest technology that has been used since the first appearance of miniature and moulded case circuit breakers. Thermal sensing components such as bimetals are supported by instantaneously operated magnetic trips, for short circuit protection.

Hydraulic-magnetic sensing, which is widely used in South Africa, eliminates the inconvenience of early tripping of thermally operated circuit breakers at elevated ambient temperatures. Hydraulic-magnetic circuit breakers also offer the advantages of more accurate calibration of tripping curves, together with the ease of achieving a variety of tripping curves to suit specific application requirements including fractional ampere ratings.

Hydraulic-magnetic circuit beakers operate on the principle of the opposing forces of a spring and a viscous fluid controlling the magnetic attraction on a ferrous piston inside a non-magnetic cylinder. The design has both a time delay operation (overload trip) and an instantaneous operation in the case of a short circuit.

When an overcurrent occurs, the magnetic force produced in the coil overcomes the core spring and the core moves towards the pole piece. The closer the core gets to the pole piece, the more magnetised the pole piece becomes. This attracts the armature, which in turn actuates the trip bar. The viscosity of the fluid and the characteristics of the spring govern the time delay. If the overcurrent is excessive, the magnetic field is such that the armature is immediately attracted to the pole piece without the influence of the core.

CBI-electric: low voltage is a South African company with a proud record of more than 50 years experience in the design and manufacture of a comprehensive range of technically advanced products for electrical protection. These include miniature circuit breakers (MCBs) and residual current devices (RCDs) for residential and commercial applications, as well as moulded case circuit breakers (MCCBs) for commercial, industrial and mining applications.

CBI-electric: low voltage has a wide range of protection devices that can be tailored to your specific requirements. Should you require any further information, please contact:

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