EQUIPMENT PROTECTION

Fuses and circuit breakers are a fundamental component of electrical equipment. They perform the vital duty of protecting both equipment and electrical networks and ensure that the effects of faults, which inevitably occur, are limited and that the continuity of supply to other equipment is unaffected.

It is helpful to have some understanding of the types of fuses and their common applications to help differentiate between them.

Fuses utilised in Strand Lighting product fall broadly into two categories:

1. Instrument Fuses

These fuses are not recommended for use on mains voltages, but are used extensively to protect printed circuit boards and components operating at lower voltages typically (but not always) about 50 volts. Their current ratings range from a few milliamperes (0.00X of an amp) to about 15 amps.

These fuses are of glass construction with cylindrical bodies and ferrule-type end caps. They are categorised according to their current capacities and speeds of operation. An important point to note is that for instrument fuses the stated fuse rating is the current at which the fuse will blow rather than the current which the fuse carries in normal operation. (To be technically correct, a fuse doesn't in fact blow, but is said to "operate").

Another term used to classify fuses is their "Breaking Capacity" (not to be confused with their rated current ! The breaking capacity is the maximum fault current that the fuselink can interrupt without damage to the integrity of the fuse body itself. For instrument fuses this is typically 35 x the rated current but with a maximum limit of 50 amps

2. HBC or High Breaking Capacity

These are the second category. There are commonly known as HRC or High Rupture Capacity fuses in European countries and are commonly found in Strand Lighting Dimmers.

The fuses are either glass or ceramic, and are filled with quartz granules which are added to minimise arcing at the moment when the fuse ruptures or "operates". The stated current rating printed on the body or stamped on the end cap is the operating current that the fuselink is capable of passing continuously.

The breaking capacity of these fuses is again dependant on the circuit voltage and power factor with typical values of 1500 amps for 240 volts and a power factor of 0.8.

Some types have higher breaking capacity such as 6000 amps in the case of the BS 1362 domestic plugtop fuse used in the United Kingdom.

The categories of speed of operation applicable to both instrument fuses and HBC types are signified by internationally accepted letters that are marked on the fuse-link bodies:

FF Super quick acting (for semiconductor protection)
F Quick acting
M Medium time lag
T Time-lag (anti-surge or semi-delay)
TT Super time-lag

Where the load consists of tungsten lamps with a total wattage close to the fuse rating, M type fuses are required so that surge at switch-on does not cause the fuse to operate.

Type T or anti-surge fuses, despite having a name which suggests that the fuse might operate in the event of a surge, will actually tolerate a surge of a specified level for a specified time without failing.

For this reason they are often used in low voltage lighting applications particularly where toroidal transformers are used as they have high inrush currents.

There have been many instances where equipment has been damaged as a result of an incorrect replacement fuse being fitted, or worse, the fuse has been replaced with a piece of wire or silver paper which is potentially lethal. Circuit breakers are another form of protection found increasingly in electrical equipment. Whilst they would appear to be an ideal protection device, they are expensive when compared to their fuse equivalent. MCBs also have particular switching characteristics which have to be carefully matched to the load if the correct protection is to be afforded.

If an MCB trips, switching it back on attempts to re-connect the power. Should the MCB resist turn-on you have an indication that a fault requiring professional attention exists. Fuse,s on the other hand, need to be replaced and it is here that problems arise. Few users possess spare fuses (particularly the instrument types), and when one does blow they often fit whatever is to hand. An incorrect fuse and the fact that the original fuse may have blown as a result of a real fault exposes the user and equipment to further dangers.

The following guidelines should be observed:

1. Always fit the correct fuse as recommended by the manufacturer.

2. Should a fuse blow the action depends on the application:

   With HBC fuses - used in dimmers for example - firstly isolate power and check for the more obvious faults such as a failed lamp. If none are found, the fuse could be replaced and power re-connected. If the fuse blows a second time, seek professional advice.

   For instrument fuses, tracing faults is often not possible as they are likely to be within the internal electronics. Only qualified personnel should attempt to rectify these, partic-particularly as safety covers may have to be removed. Reference to user manuals may reveal some useful points to check before seeking advice.

3. Do not automatically assume that a failed fuse was the correct type or rating; refer to the the instruction leaflet or handbook supplied with the equipment, or the rating label on which fuse details are often printed.