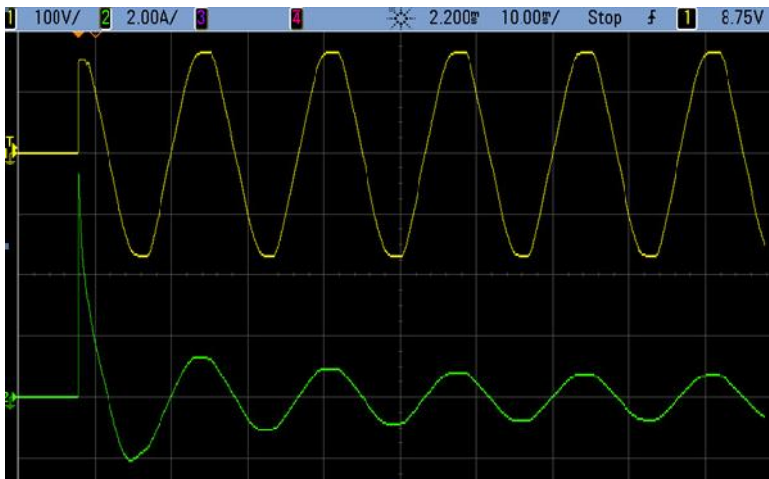


## Application Guide on the use of Mains Circuit Breakers with luminaires containing Electronic control gear (ECG) for LEDs

The market trend towards LED lighting has led to situations where mains circuit breakers maybe nuisance tripped when connected to similar loads to that of fluorescent circuits due to the higher inrush current that is drawn by some devices.

Inrush current refers to the briefly occurring high input current which flows into the ECG during the initial start-up to charge the capacitors on the input side. Typically, the amplitude is much greater than the operating or steady-state current, as illustrated below:



Note: Yellow trace = Supply Voltage    Green trace = Supply Current

It is this inrush current that can lead to nuisance tripping of circuit breakers.

BS EN 60898 relates to low voltage circuit breakers for use in household and similar installations. In the UK these are traditionally known as miniature circuit breakers or MCB's.

BS EN 60947 relates to low voltage circuit breakers for use in industrial and similar installations and are traditionally known as moulded case circuit breakers or MCCB's.

Mains circuit breakers in their simplest form come in 3 main ranges of sensitivity known as B, C and D Type

Type B: Suitable for general, domestic and commercial installations having little or no switching surges. These are not suitable for lighting circuits containing electronic control gear (ECG).

Type C: Suitable for general use in commercial or industrial applications where the greater use of fluorescent lighting and small motors can produce switching surges, which may cause nuisance tripping of Type B breakers.

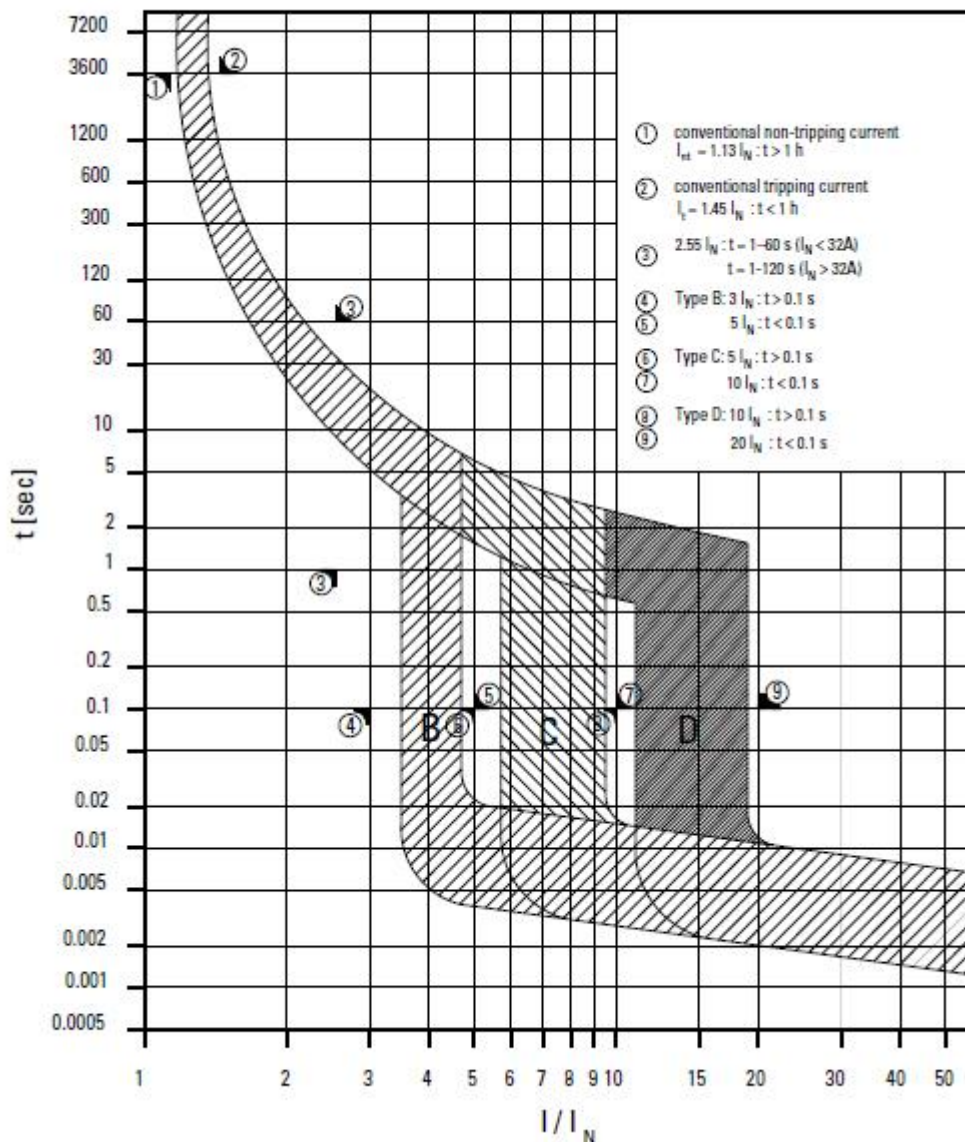


Type D: Suitable for general Industrial applications where there are a lot of high inrush switching surges associated with equipment such as transformers, large motors, welding and X ray equipment.

These sensitivities relate to their normal trip current as follows:

IEC/EN 60598 Type	Instantaneous Trip Current (x I <sub>N</sub> )	Typical Application
B	3 to 5	General Distribution
C	5 to 10	Commercial Light Industrial
D	10 to 20	General Industrial

### Tripping characteristic Type B, C & D





The above graph helps to calculate the maximum number of luminaires you can connect to a circuit protected by a mains circuit breaker. From this it can be seen that the time period that the breaker will cope with the initial inrush surge is extended by the use of C or D type breakers over B type.

It should also be noted that:

- The impedance of the mains supply plays a contributing factor; the higher the impedance then the number of ECGs connected to a MCB may be increased.
- In some cases the maximum number of ECGs is not determined by the MCB but by the maximum electrical load of the installation.
- The number of ECG's connected to a MCB may be increased if they are not going to be switched simultaneously.
- Some luminaires may contain more than one ECG
- When considering multiple ECG's on one breaker, the individual surge currents from each ECG must be added together when choosing the correct breaker.

Note: Use manufacturer's data to ensure you do not exceed the 30 mA limit.

### **Conclusion**

The information above should help in determining the quantity of luminaires that can be connected to a MCB. It should be noted that some LED luminaires contain more than one ECG, and that in retro fit installations the number of ECG in the new luminaire may be different to the one being replaced. Surge current limiting devices are available which may be helpful if trying to use an existing breaker whilst updating the lighting to incorporate LED technology, as the inrush characteristics of LED luminaires may not be identical to the existing control gear.

Most quality manufacturers of luminaires publish data which can assist in the correct choice of breaker.