Application guide on the transition from Halogen to LED lamps

Introduction

From September 2016 it will no longer be possible to place on the market mains voltage directional halogen lamps such as halogen GU10, R50, R63 etc.

With the obvious alternative being LEDs, this guide aims at providing information on what to take into account when buying replacements for existing installations, and also best practices for new installations.

Electrical Characteristics

The first thing to know is that LEDs have different inrush current characteristics from those of a halogen lamp. In order to avoid permanent damage to control equipment special care should be taken when replacing a halogen lamp with an LED lamp on existing installations.
For more information on this topic please refer to LIA's Technical Statement on LED Inrush Current. (LIA TS35)
Consideration also needs to be given to the minimum load requirements of the control gear.

Dimming

Dimming is often a sticking point with LED replacement lamps.
Filament lamps are basically a resistor that gets hot and glows when applying a current through them, and traditional dimmers had no issue dimming them. However with LED lamps there are a number of components to consider, which can be split into two main groups: power supply and LEDs.

The power supply, also sometimes referred to as Electronic Control Gear or LED driver, needs to have enough power available to it in order for the LED lamp to emit light. When connected to a traditional dimmer we are in effect reducing the amount of power available to the power supply.

When a dimmer starves the power supply, or when the power supply does not allow for current to flow, compatibility problems arise, which can result in unexpected behaviour. It is not enough to connect a dimmer to a lamp and see that 'it works' as it is sometimes the case that there are non-visible undesired effects. Examples are high frequency flicker, harmonic distortion or inducing noise on the line, and these can have a long term negative impact to the performance of the electrical installation, including, but not limited to its energy consumption.
To mitigate these issues manufacturers of both LED lamps and lighting controls often keep their own compatibility lists. It is recommended to check with the manufacturer to verify compatibility and in some cases request that a compatibility test is performed.

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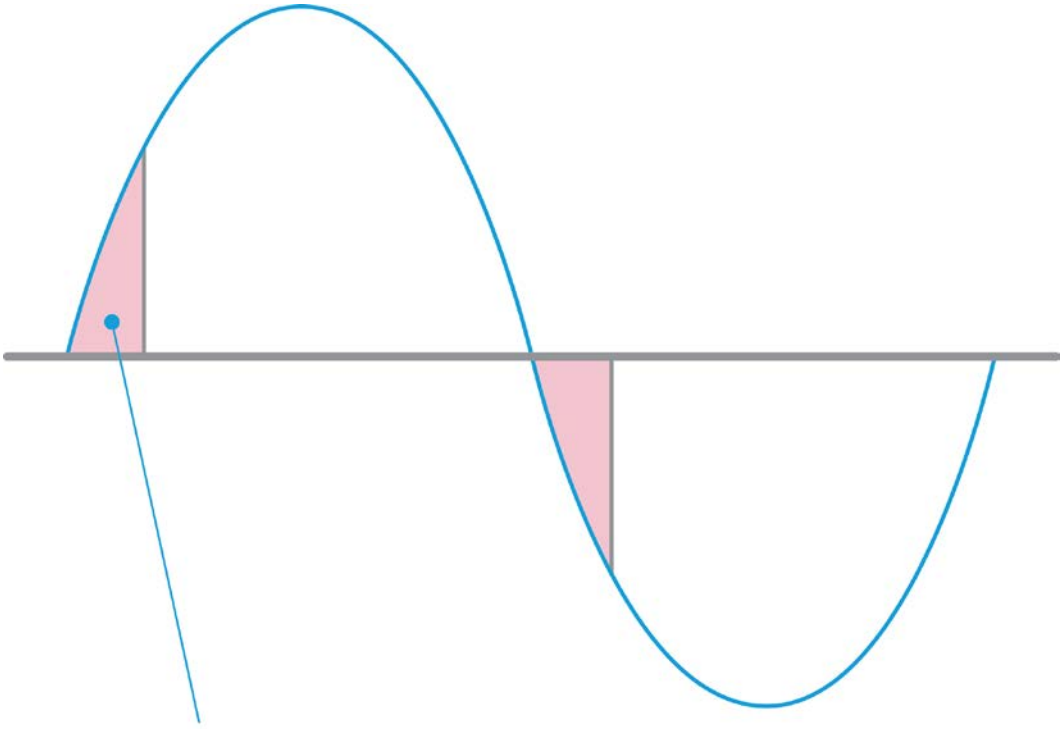
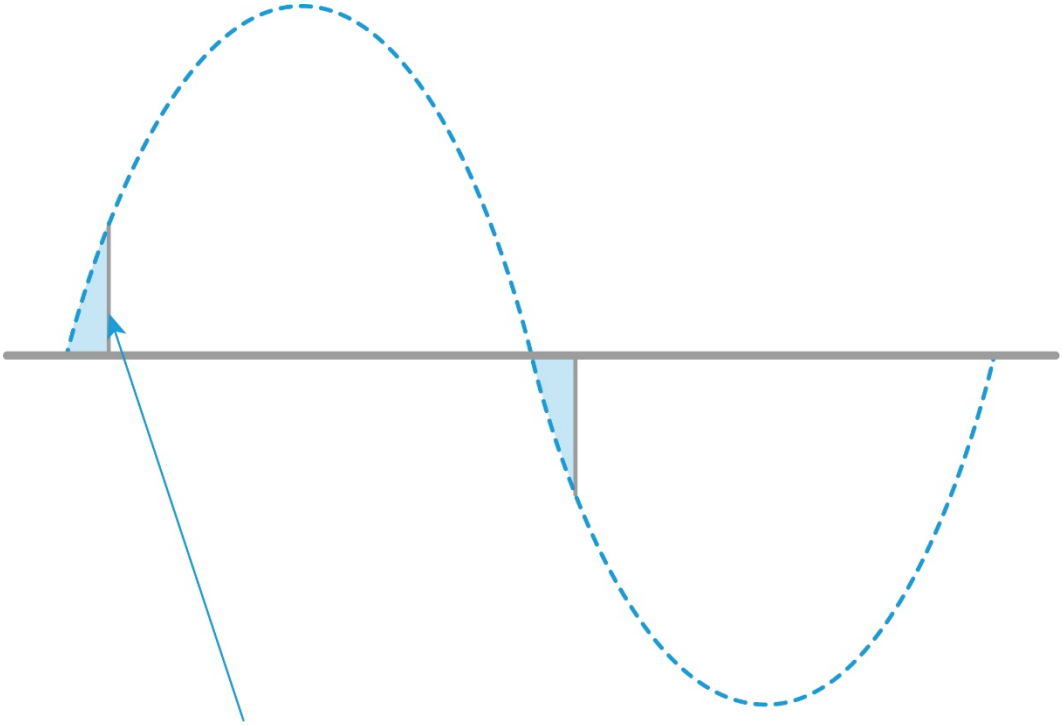
It is also worth noting that the dimming range of an LED lamp is often reduced from that of a filament lamp, so in order to achieve the best performance it is recommended that dimmers with dimming curve adjustment capabilities are used. In some cases it will be necessary to adjust the high end trim, while in other cases it will be necessary to adjust the low end trim. Please keep in mind that the LEDs may exhibit drift due to thermal changes in the environment, so always allow yourself some margin when making these adjustments.
Additionally, since LEDs present a capacitive load to the dimmer, in order to minimize issues due to the higher inrush currents and repetitive peak currents of LEDs, the use of trailing edge dimmers is recommended.

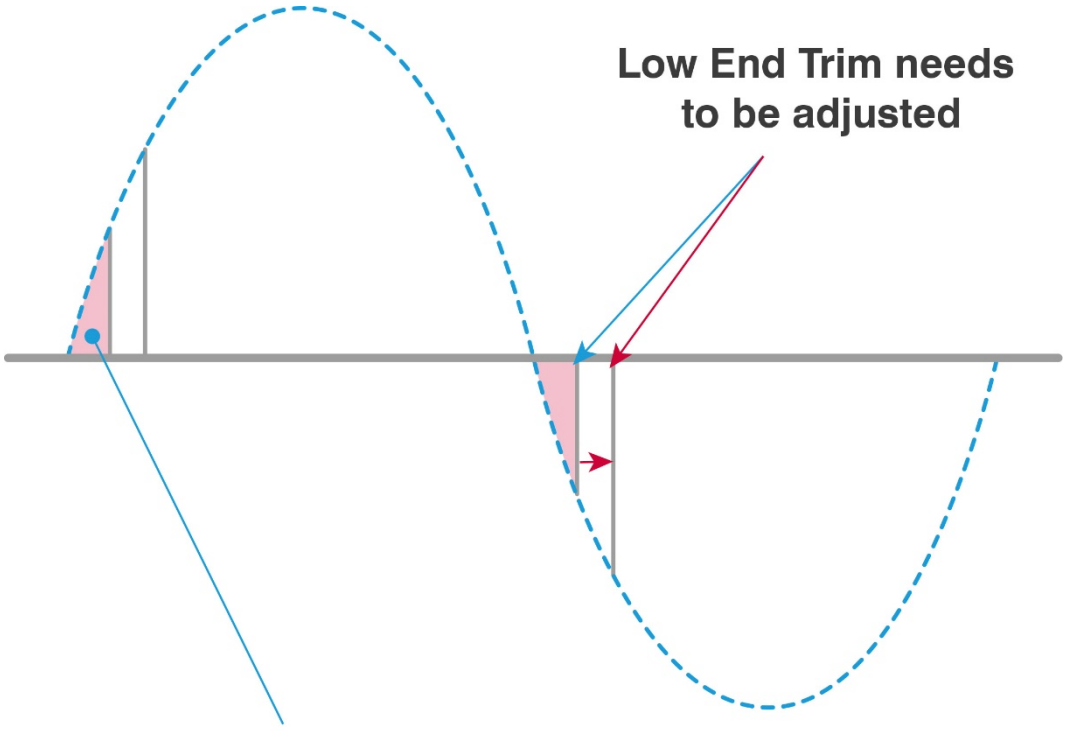
Example with Trailing Edge Dimmer



Power required by the LED Power Supply



Low End on Trailing Edge Dimmer



The LED does not get enough power

Lifetime

An LED lamp is often rated on tens of thousands of hours with practical life indicated as a period of operating hours after which the lumen output (light) falls below a stated value, as opposed to halogens, which are rated for a few thousand hours. This may need to be considered if used with dimmers with pre-set level settings.

Colour

LED lamps tend to have a very consistent colour temperature across their dimming range, while halogens offer a gradual shift from cool white at full on to warm white at low light levels. Special LED lamps that match this change in colour temperature when dimmed are now available.

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