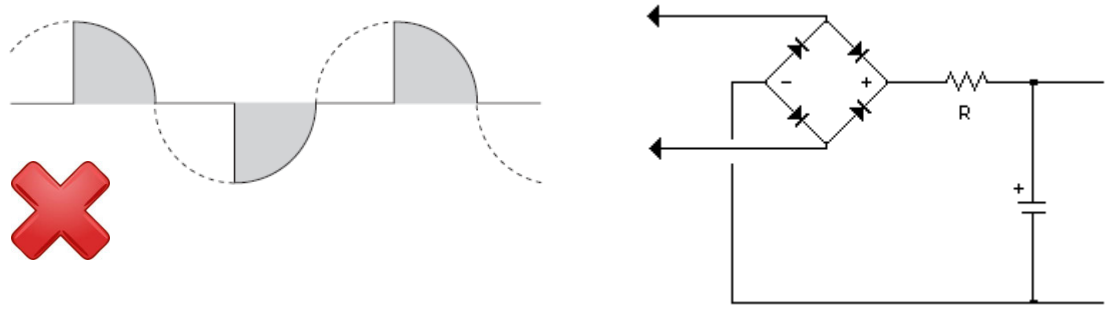
Whitepaper on selecting dimmers for ELV halogen transformers

When selecting dimmers for use with ELV transformers, consideration must be given to the type of load connected. In the case of an electronic transformer, it presents a capacitive rectifier to the incoming AC waveform which can have detrimental consequences with certain dimmer configurations. Indice has tested many electronic transformers that are specified to be dimmable with leading edge phase control. The results are extremely poor with the electronic transformer generally failing in a short period of time. The information below provides some fundamental engineering reasons for such failures.

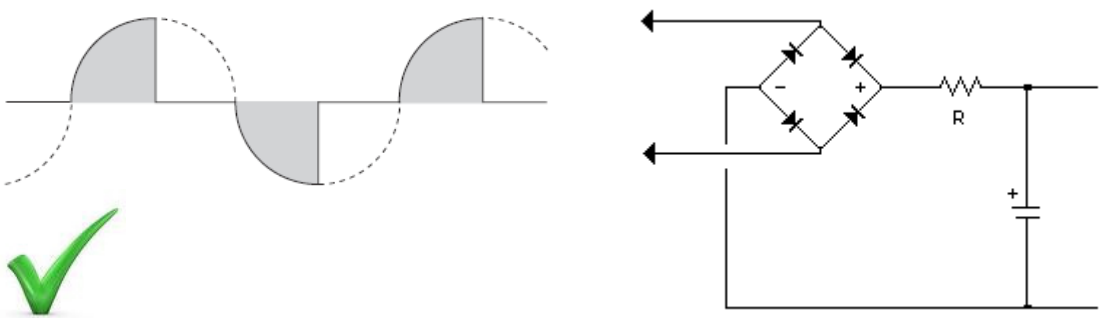
Electronic Transformers & Leading edge dimmers or standard phase control

The waveform below shows the leading edge dimmer results in a step response being delivered to the capacitive rectifier of the electronic transformer. The result is a large dI/dt spike which can be destructive to the dimmer, the input rectifier and input capacitor.



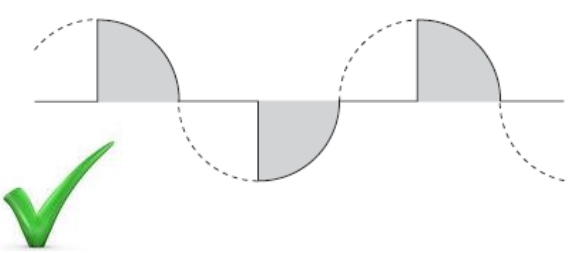
Electronic Transformers & Trailing edge dimmers or reverse phase control

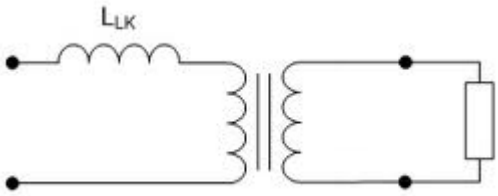
This dimmer configuration is optimal for use with an electronic transformer as there is no large dI/dt as the phase control is on the trailing edge. This dimmer cannot be used with a magnetic transformer as it results in large current and voltage spikes.



Magnetic Transformers & Leading edge dimmers or standard phase control

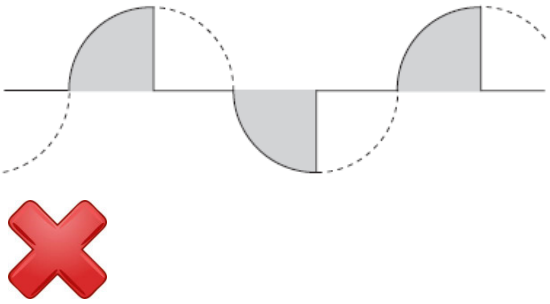
When an appropriate leading edge dimmer is used with a magnetic transformer, the primary inductance (often in the order of 6mH for a 240V/12V variant) prevents a large dI/dT.

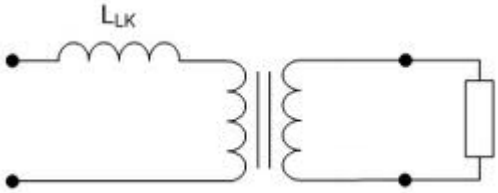




Magnetic Transformers & Trailing edge dimmers or reverse phase control

Using a trailing edge dimmer on a magnetic transformer will result in large voltage spikes that will damage the dimmer and connected lamp. Magnetic transformers have inherent inductance which stores energy during the AC cycle in the core flux. When the trailing edge dimmer stops mid cycle the current in the primary of the magnetic transformer will attempt to continue conduction which results in a large dV/dT.





References

LUTRON Application note #19: Guide to Dimming Low-Voltage Lighting

http://www.lutron.com/ResourceLibrary/362219.pdf

Transformer dimming guideline

http://www.light11.eu/cms/1_225_250/Transformer_dimming.html