

Dimming Basics

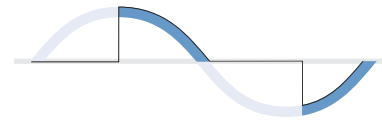
Matching the Dimmer to the Load

A wide variety of lighting sources exist on the market. These sources have individual characteristics which require special types of dimmers. It is important to use a dimmer that is designed, tested, and **UL listed for your specific lighting source**.



Incandescent

Line-voltage tungsten filament lamps, including halogen lamps
 Electrical Characteristic: Resistive
 Special Requirements: Rated for cold filament inrush (positive and negative periods may not be equal, resulting in a net DC voltage; do not use on MLV)

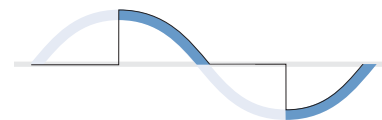


Forward Phase-Control



Magnetic Low Voltage (MLV)

Magnetic (core and coil, toroidal) transformer-supplied low voltage lighting
 Electrical Characteristic: Inductive
 Special Requirements: Symmetric cycles ($VDC \leq 2$), smooth turn off (positive and negative periods are equal for safe MLV transformer operation)

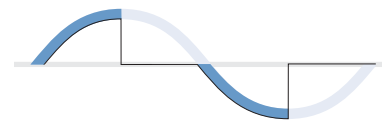


Symmetric Forward Phase-Control



Electronic Low Voltage (ELV)

Electronic (solid-state) transformer-supplied low voltage lighting
 Electrical Characteristic: Capacitive
 Special Requirements: Smooth turn on at zero voltage (reverse phase-control for no damaging current spikes), neutral wire connection



Reverse Phase-Control



Neon/Cold Cathode

Highly inductive boost transformer for neon/cold cathode lighting
 Electrical Characteristic: Highly inductive
 Special Requirements: Very smooth turn off (positive and negative periods are equal for safe magnetic transformer operation), symmetric cycles ($VDC \leq 2$), neutral wire connection

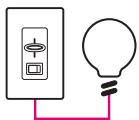


Fluorescent

Electronic fluorescent dimming ballast
 Special dimmers are designed and UL listed to send power and control signals to each type of electronic fluorescent dimming ballast: 3-wire, 2-wire and 0-10V.

Single Pole

Single-Pole Dimmer

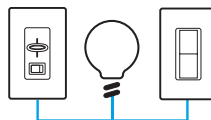


Dimmer

Single-pole dimmers provide control from one location.

3-Way

3-Way Dimmer with Switches

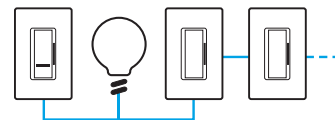


Dimmer Switch

3-way dimmers adjust the light level from one location. When used with 3-way and 4-way switches, the lights can be turned on to the dimmer level or off from many locations.

Multi-Location

Multi-Location Control from Each Location



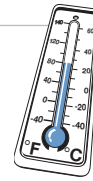
Dimmer Accessory Dimmers

Multi-location dimmers can be used with accessory dimmers for full control of the lights from up to 10 locations.

Dimming Basics

Heat Dissipation

During normal operation, dimmers do get warm to the touch. Wallbox dimmer efficiency is typically around 99%. The other 1% is dissipated in the dimmer as heat. So a dimmer on a 600W load would produce around 6 watts of heat. This is on the order of a small night light. Operating on it's rated load, Lutron dimmers will stay below the UL limits of 140°F (60°C).

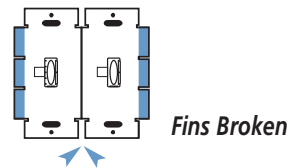
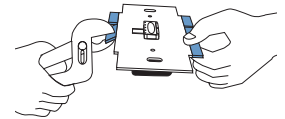


Ganging and Derating

A typical dimmer is wider than a switch. This increased size helps the dimmer dissipate the internal heat normal to operation (see above).

Dimmers can be ganged together such that the space between them is the same as for switches. To do this, a portion of the fins (heat sink) must be removed. The fins are grooved to make the removal of fins easy with a pair of pliers.

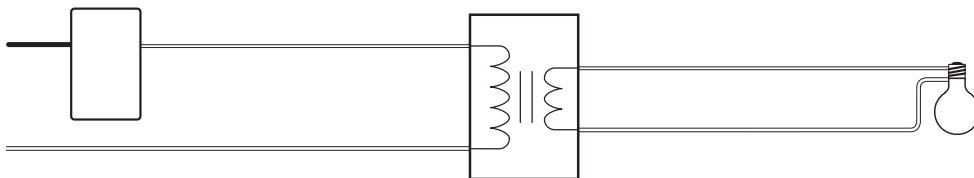
The removal of these fins **reduces the capacity** (load) the dimmer can control. Derating information is provided: Vareo®, NovaT☆®, pg.51. Designer and Traditional products, pg.103.



Magnetic Low-Voltage Dimmer Ratings



The stated VA (volt-ampere) rating is the rated capacity of the dimmer which includes the magnetic transformer heat losses and the lamp load. A transformer dissipates less than 20% of the connected load as heat. Added together, the lamp load and the transformer loss determine the dimmer capacity required. See the example below.



$$\begin{array}{l} 1000\text{VA} \\ \text{Power to transformer and} \\ \text{Power through dimmer} \end{array} = \begin{array}{l} 200\text{W Heat} \\ \text{Transformer Losses} \\ (\text{UL limit: } \geq 80\% \text{ efficient}) \end{array} + \begin{array}{l} 800\text{W} \\ \text{Lamp Load} \end{array}$$

Electronic Low-Voltage Dimmer Ratings



Electronic low voltage transformers do dissipate some heat. These inefficiencies are small enough to be accounted for in the dimmer rating. A Lutron ELV dimmer UL approved for 600W can be loaded with a full 600W of lamp load.

Fan Controls

There are two styles of fan control, select the one that is right for your application:



Fully Variable

- Fully variable fan speed
- Used for controlling one or more ceiling paddle fan or exhaust fan



Quiet 3-Speed

- Three speeds plus off
- Won't cause fan motor hum
- Used for controlling one ceiling paddle fan only