



Safe Loading of Lighting Dimmers

Subject: How to check stage lighting dimmer loads are safe.		
Revised: 11 Oct 2010	By: Steve Reader	
Category: Stage Lighting	File Reference: SA000003	
© Copyright 2010, Adena Limited		Page: 1 of 1

Correctly calculating the power loadings for any given lighting rig is easy and provides the information necessary for ensuring all dimmers are loaded safely within the manufacturer's specified ratings. Overloading dimmers, cables, or electricity supply circuits by connecting too many luminaires (lights) to dimmer channels, or attempting to run too many dimmer packs from an inadequate power source, creates an electrical hazard that could start a fire.

The standard NZ 3-pin power socket is rated for 10 Amps maximum load and most stage lighting dimmer channels use these same sockets. The NZ mains power voltage is specified as 230V +/- 6% so any voltage between 216V and 244V is normal. The lamps in theatre luminaires are rated in Watts at a given Voltage, usually 240 Volts. The relationship between Volts, Amps and Watts is given by the formula **Watts = Volts x Amps**.

This chart gives the current drawn, in Amps, for some common 230V and 240V tungsten halogen theatre lamps, when used at different operating voltages. Note that a 230V lamp draws more current than a 240V lamp for the same wattage. A 240V lamp running on only 230V will draw less current and therefore operate at a lower wattage.

Lamp Rating		Current Drawn (in Amps) at Different Operating Voltages						
Watts	Volts	220V	225V	230V	235V	240V	245V	250V
500	240	1.91	1.95	2.00	2.04	2.08	2.13	2.17
	230	2.08	2.13	2.17	2.22	2.27	2.32	2.36
600	240	2.29	2.34	2.40	2.45	2.50	2.55	2.60
	230	2.50	2.55	2.61	2.67	2.72	2.78	2.84
650	240	2.48	2.54	2.60	2.65	2.71	2.76	2.82
	230	2.70	2.76	2.83	2.89	2.95	3.01	3.07
1000	240	3.82	3.91	3.99	4.08	4.17	4.25	4.34
	230	4.16	4.25	4.35	4.44	4.54	4.63	4.73
1200	240	4.58	4.69	4.79	4.90	5.00	5.10	5.21
	230	4.99	5.10	5.22	5.33	5.44	5.56	5.67

When checking the dimmer loads, it is the total current in Amps that will be drawn from each individual dimmer channel that should be determined. Add up the Amps for all the lamps on each individual dimmer channel and ensure the total does not exceed 10 Amps on any channels.

A more practical, although less accurate, method is to assume that all lamps are 240V types and use 2400 Watts (240V x 10A = 2400W) as the maximum that can be on a 10A dimmer channel. Add up the wattage of all the lamps on each individual dimmer channel and ensure the total does not exceed 2400 Watts on any channel.

Dimmer packs usually contain twelve dimmer channels with four channels connected to each of the three incoming mains phases. Usually Channels 1-4 are on P1, 5-8 are on P2 and 9-12 are on P3. If all four channels on any given phase are fully loaded to 10 Amps then the incoming mains supply for that phase needs to be capable of supplying 40 Amps (approx 9200W of lights) safely.

The connector most commonly used to connect dimmer packs to the mains supply in NZ is only rated for 32 Amps per phase (only 8 Amps per dimmer channel if all channels are equally loaded) so this becomes the limiting factor. The current rating on a three phase power socket is the maximum current per phase, so add up the Amps for all the luminaires on all the dimmer channels that connect to phase-1 then do the same for phases 2 and 3 and make sure that none of the phases exceeds the maximum rated capacity of the available power supply socket.

If some sort of splitter box is being used to connect multiple dimmer packs into a single power socket, a practice we do not recommend, add up the Amps for phase-1 of each dimmer pack then do the same for phases 2 and 3 then make sure that total number of Amps for each phase does not exceed the maximum rated capacity of the power socket that the splitter box is plugged into.

If in any doubt, have a qualified electrician or theatre technician check it before switching anything on!