

Application Guide on Inrush Currents with LED light sources, LED luminaires, drivers and controls

Whilst the “Industry” is familiar with the characteristics of fluorescent luminaires, the market trend towards LED lighting has created some situations where large inrush currents are causing damage to contactors or lighting controls which were not previously experienced when using fluorescent lighting.

The inrush current that is sometimes experienced is often much higher from LED luminaires and LED retrofit lamps.

Inrush current refers to the briefly occurring high input current which flows into the ECG (electronic control gear) during the initial mains power-up to charge the capacitors on the input side.

These inrush currents may cause damage to the following types of components:

- PIR or Microwave type sensors
- Light switches
- Switching Contactors
- Lighting Control Modules (LCM's)
- Contactors in Central Battery Emergency back-up systems























Below are some frequently asked questions:

1. How do I know I'm going to have a problem?
You do not know but if there is a problem this may occur when connecting multiple LED luminaires to one mains switching device. Issues may also arise when retrofitting installations. Luminaires with LED electronic control gear may exhibit higher inrush characteristics compared to non-LED luminaires.
2. How many LED circuits can I connect to a component with a contactor?
You cannot assume you can connect the same number of LED luminaires to a switching device compared with the number of non-LED luminaires. You will need to check with the manufacturer's data sheets.
3. What is inrush current measured in?
Inrush current is measured in amps per microsecond. This should not be confused with the running load of a luminaire.
4. Can I find useful data in manufacturers data sheets?
Below are some examples of data that can be found in electronic control gear and switching equipment manufacturer's technical data sheets.

PIR outdoor motion detector- example data

- 180° detection, range up to 12m at 2.5m mounting height.
- Sensor head can be turned by $\pm 90^\circ$ horizontally and 30° downward.
- Timer adjustment – from 1 second to 20 minutes.
- LUX adjustment – from 5 to 1000 LUX.
- Total switching: 2300W incandescent/halogen, 400W fluorescent, 150W low energy CFLi or **90W LED**.
- Mixed light measurement suitable for fluorescent, halogen and incandescent lighting types as well as LEDs.
- Pulse function.
- IP55 weatherproof rating.

Electronic dimmer- example data sheet for a product specifically designed for LEDs

 35°C 0°C 100 Vac 240 Vac 50/60 Hz	 2 x 2.5 mm ²		 	 	 (*) 	 (*) 			
									
240 Vac	Max.	300 W	300 W	300 VA	300 VA	160 VA	160 VA	160 VA	160 VA
	Min.	40 W	40 W	40 VA	40 VA	16 VA	16 VA	8 VA	8 VA
110 Vac	Max.	150 W	150 W	150 VA	150 VA	80 VA	80 VA	80 VA	80 VA
	Min.	40 W	40 W	40 VA	40 VA	16 VA	16 VA	8 VA	8 VA

(*) Use only with transformers designed to function with electronic switches

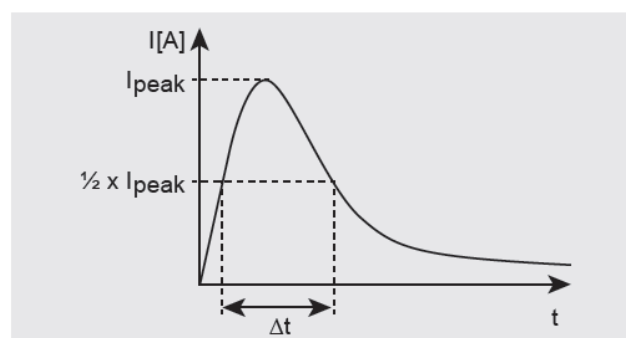
LED Driver (LED Control gear) data sheet

Circuit breaker / Inrush current

Model	typ. $I_{peak} / \Delta t$	Number of ECG at one single-pole circuit breaker (CB)				
		LS-Typ	10 A	16 A	20 A	25 A
CCD250-50LS...	41 A / 140 μ s	B	14	23	29	36
CCD159.130-44LS...			23	36	46	57
CCD174.137-56LS...		C	23	36	46	57
CCD180.140-60LS...			23	36	46	57

- Data for $U_{supply} = 230$ VAC, mains impedance = 1 Ω
- In case of multi-polar CB the maximum number is reduced by 20 %
- The max. number may differ depending on CB manufacturer. Please consider the specifications of the manufacturer.
- Basically, CB with C-characteristics are recommended to be used in lighting groups.

Typical current - time profile when switching on



5. My luminaires are going to have DALI controls, will I still have problems?

5(a) The inrush will only occur after initial mains power up, switch on, or following interruption of the mains supply.

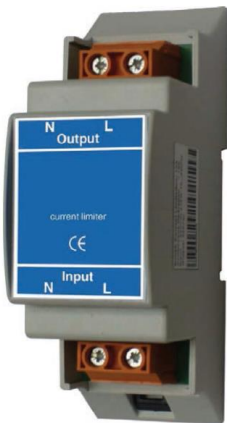
5(b) Any system using DALI electronic and dimming controls is less likely to experience relay related issues.

6. My luminaires have simple controls (e.g. mains PIR or light switch). Will I still get problems? You may get a problem as the switch or contacts will see the lighting circuit inrush every time the circuit is made.

7. I am experiencing issues on a refurbishment project, what can I do to resolve these problems? Where a site is experiencing problems, the existing electrical installation must be surveyed for suitability based on the information in this publication.

Lastly, the addition of a current limiting device between the LED products and the controls may be considered to help resolve the site issue.

If further information is required on inrush current related issues please also refer to LIA TS31 Application Guide on the use of Mains Circuit Breakers with Luminaires Containing Electronic Control Gear (ECG) for LEDs.



Specification

Device:	Peak / RMS Current Limiter
Voltage:	184-265Vac Range, 230Vac Continuous
Current Rating:	16A Continuous
Capacity Load:	1.500uf (max)
Frequency:	16.33Hz to 440Hz
Mounting:	DIN-Rail TS35mm EN60715 (TS35/7.5 and TS35/15) or 2 screw holes for surface mounting (do not mount the unit on its side, only with the unit vertical or base down on a horizontal surface)
Terminals:	Spring Type: 0.5-6mm ² / 21-10AWG
Housing:	ABS UL94V-0, IP20 Rated, with Ventillation Slots
Ambient Temperature:	-40°C to +70°C with Integrated Temperature Protection