APPLICATION NOTE
SURGE IMMUNITY ON THE
LUNERA HID LED GEN 3

L LUNERA®

What are surges and why do lamps need immunity?

Surges, also known as electrical fast transients (EFT), are disruptions in the normal electrical grid caused by three primary causes:

1. Electrical storms and lighting hits of the electrical grid or building.
2. High power devices on premises switching on/off without zero crossing control.
3. Switching activity off premises which is conducted into the building (utility or other customer).

When one of these causes occurs, the normal 60Hz voltage waveform is disrupted with a much higher voltage "spike" which may damage attached electronics. The size of this spike depends on how close to the device is and what damping you have in effect.

The IEC defines the required levels of surge immunity based on what circuits the lamp is attached to in IEC-6100-4-5 defines the classes of surge immunity based upon the circuitry driving the device.

Class	Environment	Surge Voltage Test Level
0	Well protected environment, often in a special room	25V
1	Partially protected environment	500V
2	Electrical environment where the cables are well separated, even at short runs	1,000V
3	Electrical environment where power and signal cables run in parallel	2,000V
4	Electrical environment where the interconnections include outdoor cables along with the power cable, and cables are used for both electronics and electric circuits	4,000V
5	Electrical environment for electronic equipment connected to telecommunication cables and overhead power lines in a non-densely populated area	4,000V

Normal indoor residential or commercial lighting circuits are class 3, and ENERGY STAR requires lamps to be surge tested to 2,500V of immunity.

However, HID replacement lamps are often used in outdoor applications or where cables are exposed to outdoor environments and thus class 4 or 5 immunity is appropriate.

Where conductors run in parallel in the same metal-clad cable, they will often arc across their insulation above 4,000V thus the infrastructure provides some protection to surges above 4,000V.

How do you protect lamps against surges and why the different classes?

There are three primary methods to protect lamps against incoming surges:

1. Use a surge arresting devices such as a metal-oxide varistor (MOV) to absorb the surge
   a. The physical size of this MOV determines how much energy it can absorb

2. Use a shunting device such as an input capacitor to bypass the surge
   a. The size & number of these capacitors determine how effective they are at shunting

3. Use a blocking device such as an input filter to prevent the surge from progressing into the lamp and damaging active circuitry
   a. The size and number of these filters determine how effective they are at shunting

---

Example: Lunera CFL LED GX23 Lamp – 5V replacement lamp - Designed for Indoor Commercial Use
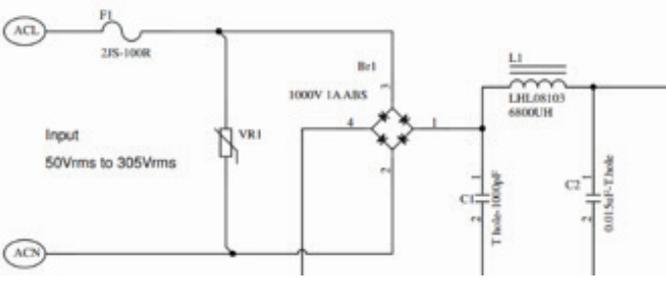
Designed to ENERGY STAR 2,500V
Class 3 Surge spec.

1. 5mm input MOV – rated to 800 Amps
2. (1) Shunting capacitor – 100 pF
3. (1) Input filter

Example: Lunera HID LED Lamp – 50W–200W HID replacement lamp - Designed for Industrial Use
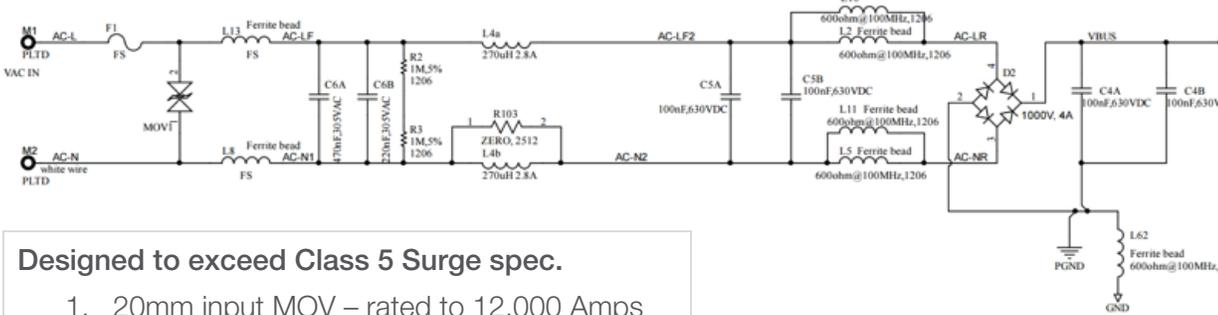
Designed to exceed Class 5 Surge spec.

1. 20mm input MOV – rated to 12,000 Amps
2. (6) Shunting capacitors – total 1,090,000 pf
3. (9) Input filters

Fig. 1 If we compare the design of one of Lunera's commercial office lamps to a Lunera industrial lamp such as the HID LED Lamp you can see the difference in components to achieve class 3 vs. class 5+ compliance.

The surge protection of the Lunera CFL LED GX23 lamp is sufficient for its intended use – in fixtures well inside the building with no exposed wiring. However, for an industrial product such as the Lunera HID LED Lamp, a substantially more robust surge protection circuit is required.

Lamp Warranty and Recommended Use

Lunera HID LED Lamp Specifications

- Lamps are tested to 7,000V (75% higher than Class 4 specification)
- No need to install any additional surge protection
- Unconditional 5 year warranty