

## Lifetime of Fluorescent Lamps operating with Electronic Dimming Ballasts

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### Overview

### Discussion

Fluorescent lamps are electric discharge light sources where an arc is struck in a low-pressure, gas-filled tube. The arc is sustained between two filaments by regulating the current through the lamp, using a ballast. The lamp filaments need to be kept warm during operation so that they can reliably maintain the arc and produce light. Lamp life of fluorescent lamps is defined as the time for which the lamp can operate within its performance specification (i.e. produce the specified light output and strike within specification).

The operating life of fluorescent lamps is determined by two factors:

- i) Total operating hours;
- ii) Number of times the lamp is started and the starting method.

There are three main lamp starting/operating technologies:

#### 1. Instant Start (IS)

IS is a starting and operating method for fluorescent lamps. IS lamps turn on 'instantaneously' and IS ballasts do not provide filament heating prior to starting the lamps or during operation. All Lutron® ballasts employ a programmed rapid-start technology and cannot be used with IS lamps as such. Special IS lamps are available in the market for use with IS ballasts.

#### 2. Rapid-Start (RS)

RS is a starting and operating method for fluorescent lamps. RS lamps are designed to be continuously supplied with 1 or 2 W of filament heating power (in each filament) during starting and operation. Uninterrupted filament heating is necessary for preserving lamp life. RS technology provides filament heating before applying striking voltage. RS ballasts consume 1 or 2 W extra to provide this continuous filament heat.

#### 3. Programmed Rapid-Start (PRS)

Programmed rapid-start is the combination of a 'programmed' or 'preheat' style lamp striking, followed by RS operation.

Programmed start is an advanced lamp starting method where the filament heating profile is carefully controlled. Power to the filament is kept constant, but the striking voltage is slowly ramped up before the lamp is struck. In simple preheat start, the filament power is generally discontinued after the lamp is struck. PRS gives the best possible operating condition for lamps as optimum heating is given to the filaments before striking and constant heating is provided during operation.

### Lamp operation with Lutron® dimming ballasts

Lutron® electronic dimming ballasts operate on a PRS design. There is controlled starting voltage to the lamps during the starting cycle and constant filament heating is supplied during operation. This treatment of the lamps optimizes lamp-life as the condition of filaments determines the performance of the lamp.

### Lamp seasoning

Fluorescent lamps, especially smaller diameter models, must be 'seasoned' before dimming. New fluorescent lamps always have a minimum amount of chemical impurities in the lamp. The presence of these impurities might affect the lamps' dimming performance. Lamp burn-in allows us to achieve stable light output as the lamps are dimmed.

Refer to lamp manufacturer for lamp seasoning requirements prior to dimming.

## Summary

Electronic ballasts operate fluorescent lamps with better power factor and ballast efficacy factor (BEF), allowing for superior fluorescent installations. RS and PRS lamp operating technologies preserve lamp filaments and therefore extend effective lamp life.

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