



GE Consumer & Industrial Lighting

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USA

High Intensity Discharge Lamp Dimming

There is an increasing demand to maximize energy savings of lighting sources. While HID lamps are inherently very efficient, many users would like to further increase the energy savings of HID lamps through dimming.

There are two general classes of HID dimming systems. In bi-level dimming, when less light is required, HID lamps are run at reduced power. Lamps then can be switched to 100% lamp power (high mode) when full illumination is needed. The other common class of systems is called "continuous dimming" which allows 0% to 100% change in lamp power, and thus, complete light control.

This dimming statement is valid for any kind of dimming system that meets the stated criteria. In general, most bi-level dimming systems meet the criteria, while many of the continuous dimming systems do not.

GE Lighting will warrant its metal halide lamps, mercury vapor lamps, and high pressure sodium lamps on bi-level or continuous dimming systems provided the approved operational guidelines in this document, in addition to those provided on the lamp packaging and in the GE lamp catalog, are met:

GE High Watt CMH®SPXX and CMH®ChromaFit™ Ceramic Metal Halide Lamps:

- Dimming is permitted Vertical base up (+/- 15) operation for all types, except
- CMH® Chromafit™ HPS retrofit lamps can be operated in any burning position.

Minimum lamp operating wattage for ceramic metal halide lamps approved for dimming is 50% of full rated power.

GE PulseArc®, Multi-Vapor®, Watt-Miser®, and ChromaFit™ HPS-Retrofit Metal Halide Lamps:

- Dimming is permitted Vertical base up (+/-15°) operation only for all types, except:
- Universal burn position (/U) PulseArc® metal halide lamps can be operated in any burning position.

- Multi-Vapor® MVR1000/U lamp can be operated in any angle between vertical base up (+/- 15°) and horizontal (+/- 15°) position
- Dedicated horizontal burn position (/HOR), I-Line, and Saf-T-Guard metal halide lamps cannot be dimmed.

Minimum lamp operating wattage for metal halide lamps is approved for dimming to 50% of full rated power, except for lamp wattages 250-watts and lower where dimming is approved for 60% of full rated power.

Mercury Vapor Lamps

- Guidelines listed for Multivapor® metal halide lamps in the previous section apply for mercury vapor lamps, except:
- Saf-T-Guard and E-Z-Merc mercury vapor lamps are not dimmable.

Lucalox®, Ecolux® High Pressure Sodium Lamps

- Dimming in any burning position is allowed, except:
- Deluxe and E-Z-Lux Lucalox® and NC Non-Cycling Ecolux® lamps are not dimmable.

Minimum lamp operating wattage for high pressure sodium lamps approved for dimming is 35% of full rated power.

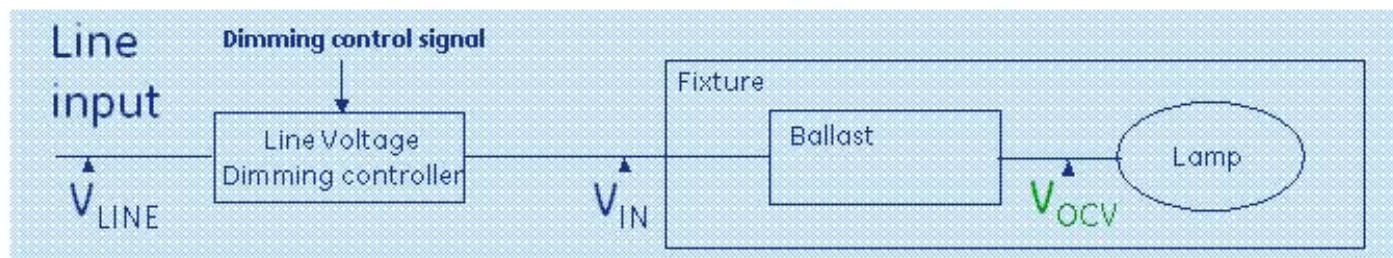
General Comments

- Operate lamps in open or enclosed fixtures according to the fixture requirements specified on the lamp labeling and caution notices.
- Lamp must be started in full-power mode and must be operated in that mode for a minimum of fifteen minutes prior to reduced-power operation.
- HID Lamps do not require 100 hours of continuous operation at full power prior to initial dimming. However an initial ageing of 100 hours at full power (continuous or intermittent) is recommended to help to stabilize the lamp's color and lumen output.
- The dimming device should maintain the lamp current crest factor, current off time and line dip tolerance within ANSI and IEC specifications at all operating levels of the lamp.
- Minimum open circuit voltage (OCV) of dimming system must meet ANSI and IEC requirements in both high and low modes of operation. See appropriate ANSI and IEC documents for specific metal halide, high pressure sodium and mercury vapor lamp minimum OCV requirements.

- The effects of line voltage fluctuation, ballast wattage control and lamp operating voltage variation within the range of the ANSI specifications must be considered so that no combination of factors causes the lamp power to go below the specified minimum limits.
- Dimming systems that reduce line voltage are generally not recommended. For such systems, it is important to reduce the line voltage slowly to avoid premature lamp cycling, especially with older lamps that are already high in voltage and close to the normal dropout point. In changing from the full-power mode to the reduced-power mode, the time between full power and reduced power must be no less than ninety seconds, and the rate of change of power at any power level between full power and reduced power must be no greater than that corresponding to a linear (uniform) reduction between those extremes in a ninety-second time interval. Below are additional Line Voltage Dimming requirements to assure proper compatibility with the lamp and dimming systems.
- For dimming systems that instantaneously switch capacitors into the system, but retain the ANSI ballast OCV value at all times, normal lamp performance can be expected.
- With dimming, the color of metal halide lamps shifts to a cooler (higher Kelvin) temperature and CRI decreases. The dimming of 20-150w CMH® lamps is normally not recommended.
- HID should be brought up to full power for a minimum of 15 minutes each day to minimize a decline in lamp performance.
- Rated life of HID lamps is the total burning time in dimmed and full-power modes.
- GE Lighting warrants life, lumens and lumen maintenance will meet published rating performance on bi-level or continuous dimming systems, however, performance criteria such as CCX, CCY, CCT and CRI and lumen maintenance may vary from specification when lamps are used at lower than full-wattage mode. Lamp efficacy will be lower in dimmed modes than in full power modes.
- GE Lighting continues to develop new products and systems that may not be listed in the categories above. Guidelines for such new lamps and systems will be published at a later date. Please contact your GE representative for more information.

See below: Line Voltage Dimming Requirements

Line Voltage Dimming Requirements



Line Voltage Dimming Requirements:
 $V_{OCV} \geq \text{ANSI minimum OCV}$

Ballast characteristic:

$V_{OCV} \geq \text{ANSI minimum OCV at 90\% nominal } V_{LINE}$

Dimming controller characteristics:
Modifies V_{LINE} to V_{IN} based on dimming control input signal.

ANSI minimum OCV (Open Circuit Voltage) enables lamps to work reliably over life. Lamps are typically less sensitive to low OCV at the beginning of life than in the late second half of life. There are also differences between lamp types on how sensitive they become to low OCV over life. The typical failure mode is non-start or cycling when the OCV is too low.

Ballasts are generally designed to maintain ANSI minimum OCV at 90% of line voltage. Many ballasts have enough headroom to continue to operate even at lower input voltages, but there are some ballasts that are right on or fail the limit. OCV can also change over the life of the ballast due to component aging.

The controller should not drive V_{IN} below 90% of nominal line voltage based on the lamp and ballast descriptions to maintain V_{OCV} above ANSI minimum at any condition for all lamp and ballast types, regardless of age of the lamps and ballasts. When the controller drives V_{IN} below 90% of nominal line, the system becomes selective and will not operate properly with all combinations of ballasts and lamps. Some combinations might work but the risk of non-starts and dropouts, especially in the second half of the lamp life, will increase. In some combinations this can happen even early in life.

The GE Lighting Institute
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