

CEETM Commercial Lighting Systems Initiative

T8 Replacement Lamp Specification

Effective August 30, 2018

Description

This performance specification describes energy efficiency levels for four-foot linear T8 replacement lamps, either of fluorescent construction or using LED light sources, that are operable on existing T8 ballasts and do not require any modifications to the fixture such as rewiring or installation of an additional driver.

Manufacturers submitting lamps for inclusion in the associated Qualified Products List must attest to the accuracy of product performance data to CEE as explained below in “Definitions and Required Information for Submission,” acknowledge as such on the Commercial Lighting T8 Replacement Lamp Submission Form and notify CEE of any changes to either product data or contact information in a timely manner, preferably within 30 days. Additionally, manufacturers should adhere to all safety guidelines as applicable to the jurisdiction(s) in which a product is intended for use, which may include certifications and guidelines developed by the Occupation Safety and Health Administration (OSHA) and its Nationally Recognized Testing Laboratory (NRTL) program, the National Electrical Manufacturers Association (NEMA), UL, and the Canadian Standards Association (CSA).

Application Guidance

Reduced wattage (28W and 25W) fluorescent lamps are best used to replace 32W T8 lamps in existing lighting systems. Reduced wattage lamps are typically incompatible with full-wattage-only dimming ballasts and should not be used in dimming applications unless the dimming ballast is compatible with the wattage of lamps being used.

Reduced wattage fluorescent lamps may demonstrate dim light, spiraling, pulsing, and other undesirable behavior in cooler temperature rooms and while warming up. System performance varies based on lamp or ballast components. CEE recommends testing compatibility before proceeding to replace 32W lamps with any reduced wattage fluorescent product, unless the ballast is listed for the wattage of lamps being used.

When replacing a fluorescent T8 lamp with a tubular LED (TLED) lamp compatible with a fluorescent ballast, installers should carefully review all manufacturer installation instructions, restrictions, and cautions applicable for the intended application and use to ensure lamp compatibility with the existing luminaire and ballast. Such information is typically found in manufacturer catalogs, application guides, and other product literature.

Performance Requirements: Reduced Wattage Fluorescent T8		
Tier	Tier 0	Tier 1
Wattage	≤28W	≤28W
Efficacy (lm/W)	≥92.4	≥96
Lamp Life	≥24,000	≥36,000
Luminous Flux Maintenance	≥94%	
CRI	≥80	
Other Required Information	Nominal wattage Initial lumen output Recommendation for dimming	

Performance Requirements: UL Type A TLED		
Tier	Tier 1	Tier 2
Efficacy (lm/W)	≥110	≥125
Beam Angle	≥120°	≥160°
Luminous Flux Maintenance	L ₇₀ of ≥50,000 hours	
CRI	≥80	
Other Required Information	Nominal wattage Initial lumen output Recommendation for dimming Ballasts evaluated for compatibility Beam angle and aperture finish	

Definitions and Required Information for Submissions

Efficacy Efficacy is calculated by dividing initial lumen output by nominal (bare lamp) wattage, based on published lumen and wattage values as listed on specification sheets. Fluorescent lamp submissions must report efficacy, nominal wattage, and initial lumen output values that have been determined based on operation in combination with an ANSI reference ballast, as specified in ANSI C82.3-2016 and ANSI C78.81-2016. For consistency, LED T8 replacement lamp submissions must report those efficacy, nominal wattage, and initial lumen output values that have been evaluated on a commercial fluorescent ballast with a normal (0.88) ballast factor. If the lamp delivers differing lumens and wattage based on the ballast factor of a commercial ballast, CEE recommends that specification sheets indicate the range of nominal wattage, system wattage, and initial lumen values demonstrated by their product in combination with a range of low, normal, and high ballast factors.

Lamp Life For fluorescent lamps, lamp life is the number of operating hours that a lamp lasts at three hours duty cycle when operated on a programmed start, instant start, or rapid start ballast according to methods described by IES LM-40-10. Lifetime may be slightly reduced when operated on an instant start ballast as compared to a programmed rapid start or rapid start ballast. As such, information should be provided for operation under both conditions.

Beam Angle Beam angle is calculated as twice the angle (from center beam) where luminous intensity is 50 percent of the maximum intensity. Lamps may be submitted as either “omnidirectional” or “directional.” Omnidirectional lamps are assumed to have an omnidirectional beam angle. Directional lamps must report a minimum beam angle of 120° based on IES LM-79-08 photometric testing and data and should indicate whether the aperture finish is clear or diffuse.

Luminous Flux Maintenance A luminous flux maintenance calculation is used to derive the minimum efficacy and lumen output for fluorescent T8 lamps, required at 40 percent of the rated lamp life, which is 94 percent of the initial efficacy and lumen requirements. The table following is provided to help clarify these requirements. Fluorescent luminous flux maintenance is calculated as the ratio of initial lumens to mean lumens.

Luminous Flux Maintenance Requirements for Fluorescent T8 Replacement Lamps

Tier	40% of Rated Life (hours)	Efficacy at 40% of Rated Life (lm/W)
Fluorescent Tier 0	9,600	86.8
Fluorescent Tier 1	14,400	89.3

Solid state lamp luminous flux maintenance is calculated according to methods described by IES TM-21-11 and IES LM-80-15 and may be documented as “hours to 70 percent luminous flux maintenance” or “L70.”

Color Rendering Index (CRI) Lamps are to have a CRI of 80 or greater.

Nominal Wattage Fluorescent lamp submission should submit published values for nominal wattage (28W or 25W) when operated on an ANSI reference ballast. LED T8 replacement tube submissions should include published values for total input power, not including ballast losses, from operation on a commercial ballast with a normal (0.88) ballast factor. CEE recommends that specification sheets clearly indicate how this nominal wattage was calculated.

Initial Lumen Output Fluorescent lamp initial lumens are measured after 100 hours of operation at 25°C ambient. Solid state lamp initial lumens are measured according to methods described by IES LM-79-08, and where the lamp is driven by a commercial ballast with a normal (0.88) ballast factor.

Recommendation for Dimming Submissions should include information on whether a lamp is recommended for use on dimming systems or not recommended for use on dimming systems. If a lamp is recommended for use on dimming systems, submissions should either indicate that the lamp is compliant with the dimming requirements described in ANSI C78.81-2016 or include a list of or link to dimming ballasts with which the lamp has been evaluated and the lowest level to which the listed dimming ballasts will operate the lamp.

Ballasts Evaluated for Compatibility Performance claims indicated on specification sheets for LED T8 lamps should reflect the performance of the lamp in combination with a commercial electronic ballast and normal (0.88) ballast factor. Submissions should be accompanied by a list of or link to the ballasts with which a product was evaluated and indicate that the evaluations showed that the system power factor and total harmonic distortion are not below 0.9 and 20 percent, respectively.

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