LED Measurement Series:

Solid State Lighting Standards

Like traditional lighting products, LED-based luminaires sold in the US are subject to industry standards governing safety and performance. To accommodate LEDs, some existing standards and test procedures are being modified, while in other cases, new standards have been developed. This fact sheet lists the key performance and safety standards applicable to LED-based lighting products.

Product Performance and Measurement Standards

ANSI Standards

ANSI oversees the creation, promulgation and use of thousands of industry norms and guidelines, including the following key standards of relevance to SSL products.

C78.377-2008	Specifications for the Chromaticity of Solid State Lighting Products • Specifies the recommended chromaticity (color) ranges for white light LEDs with various correlated color temperatures (CCTs).
C82.SSL1†	Power Supply • Will specify operational characteristics and electrical safety of SSL power supplies and drivers.
C82.77-2002	Harmonic Emission Limits – Related Power Quality Requirements for Lighting • Specifies the maximum allowable harmonic emission of SSL power supplies.

IESNA Documents

IESNA is the recognized North American technical authority on illumination.

TM-16-05	IESNA Technical Memorandum on Light Emitting Diode (LED) Sources and Systems • This technical memorandum provides a general description of LED devices and systems, and answers common questions about the use of LEDs.
RP-16-05 Addendum a	Nomenclature and Definitions for Illuminating Engineering • This document provides industry standard definitions of lighting terms, including all lighting technologies. Addendum a provides definitions of solid state lighting terms.
LM-79-08	IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products • Specifies procedures for measuring total luminous flux, electrical power, luminous efficacy, and chromaticity of SSL luminaires and replacement lamp products.
LM-80-08	IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources • Specifies procedures for determining lumen maintenance of LEDs and LED modules (but not luminaires) related to effective useful life of the product.

†*Currently under development.*

Photo credit: Labsphere

Standards Organizations

ANSI - American National Standards Institute, *www.ansi.org*

CIE - International Commission on Illumination, *www.cie.co.at*

FCC - Federal Communications Commission, *www.fcc.gov*

IEC - International Electrotechnical Commission, *www.iec.ch*

IESNA - Illuminating Engineering Society of North America, *www.iesna.org*

NFPA - National Fire Protection Association, *www.nfpa.org*

UL - Underwriters Laboratories Inc., *www.ul.com*

CIE Reference Publications

13.3-1995

Method of Measuring and Specifying Colour Rendering Properties of Light Sources

- The official document defining the CRI metric. Referenced by ANSI C78.377.

15:2004

Colorimetry, Third Edition

- The official document defining various CIE chromaticity and CCT metrics. Referenced by ANSI C78.377.

127:2007

Measurements of LEDs

- Addresses LED luminous intensity measurement; applies only to individual LEDs, not to arrays or luminaires.

S 009/E:2002

Photobiological Safety of Lamps and Lamp Systems

- Specifies measurement techniques to evaluate optical radiation hazards and eye safety risks of LEDs and LED clusters.

Safety, Installation, and Other Requirements

NFPA Requirements

70-2005	National Electrical Code • Most SSL products must be installed in accordance with the National Electrical Code.

FCC Requirements

47 CFR Part 15	Radio Frequency Devices • Specifies FCC requirements for maximum allowable unintended radio-frequency emissions from electronic components, including SSL power supplies and electronic drivers.

UL Standards

UL is currently developing a safety standard for "Light-Emitting Diode (LED) Light Sources for Use in Lighting Products," which will be designated UL standard 8750. Currently, UL has in place an "Outline of Investigation" (also numbered 8750) that references all existing UL standards applicable to LED lighting products. The purpose of the outline is to provide a comprehensive approach and listing of applicable standards for UL treatment of lighting products based on LEDs. The Outline will be used until the full LED specific document is completed. The table below lists the key UL standards referenced in the Outline.

8750	Outline of Investigation for Light-Emitting Diode (LED) Light Sources for Use in Lighting Products • Will specify the minimum safety requirements for SSL components, including LEDs and LED arrays, power supplies, and control circuitry.
1598	Luminaires • Specifies the minimum safety requirements for luminaires. The requirements in this document may be referenced in other documents such as UL 8750 or separately used as part of the requirements for SSL products.
153	Portable Electric Luminaires • Specifies the minimum safety requirements for corded portable luminaires.
1012	Power Units Other Than Class 2 • Specifies the minimum safety requirements for power supplies other than Class 2 (as defined in NFPA 70-2005).
1310	Class 2 Power Units • Specifies the minimum safety requirements for Class 2 power supplies (as defined in NFPA 70-2005).
1574	Track Lighting Systems • Specifies the minimum safety requirements for track lighting systems.
2108	Low Voltage Lighting Systems • Species the minimum safety requirements for low-voltage lighting systems.

Disclaimer: This list is not comprehensive, as other existing and future industry standards, recommended practices, and regulatory requirements may apply to specific solid state lighting products.

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For Program Information on the Web:

http://www.netl.doe.gov/ssl
DOE sponsors a comprehensive program of SSL research, development, and commercialization.

For Program Information:

Kelly Gordon
Pacific Northwest National Laboratory
Phone: (503) 417-7558
E-mail: kelly.gordon@pnl.gov

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