

## ENERGY STAR<sup>®</sup> Compact Fluorescent Lamp Specification

### Scope

This ENERGY STAR compact fluorescent lamp specification covers the requirements for screw-based compact fluorescent lamps and lamp systems, comprising:

- (a) Single based compact fluorescent lamps with twin tube, triple tube, quad tube, square or multiple limb configurations and having integral electronic ballasts;
- (b) Circle and square lamps with a maximum diameter of 9 inches or a maximum side length of 8 inches and having electronic ballast adapters that are packaged with the lamp.
- (c) Single based compact fluorescent lamps with integral electronic ballasts and which have a translucent cover over the bare fluorescent tube. The cover may be globe, bullet, pear or other shape.
- (d) Single based compact fluorescent lamps with integral electronic ballasts and which have a reflector that may be open or enclosed. The lamp shall be primarily intended to replace wide beam incandescent reflector lamps.

The intent of this ENERGY STAR program is to move consumers from incandescent to energy efficient compact fluorescent lighting. ENERGY STAR qualified compact fluorescent lamps are primarily intended for residential applications.

### Definitions

Self-ballasted compact fluorescent lamp – A compact fluorescent lamp unit that incorporates, permanently enclosed, all elements that are necessary for the starting and stable operation of the lamp, and which does not include any replaceable or interchangeable parts.

Rated voltage – The voltage marked on the lamp.

Rated wattage – The wattage marked on the lamp.

Rated supply frequency – The frequency marked on the lamp.

Initial performance values – The photometric and electrical characteristics at the end of the 100 hour aging period. The lamp operating position shall be base-up when measuring the initial performance values unless otherwise specified by the manufacturer.

Rated luminous flux – Initial lumen rating declared by the manufacturer.

Lumen maintenance – The luminous flux at a given time in the life of the lamp and expressed as a percentage of the initial luminous flux. The mean lumens are the value at 40% of rated life.

Average rated lamp life – The length of time declared by the manufacturer during which 50% of any large number of lamps reach the end of their individual lives.

Lamp color – The color characteristics of a lamp as defined by the color appearance and the color rendition.

Color appearance – The actual color of the lamp is called the color appearance and is defined in terms of the spectral tri-stimulus values (color coordinates) according to the recommendations of the CIE Publication No. 13.3 – 1995. For color coordinates near the black body loci, the correlated color temperature (Kelvin) can be used to define color appearance.

Color rendition – The effect that the spectral characteristics of the light emitted by the lamp has on the color appearance of the objects illuminated by it is called color rendition. The color rendering index is

defined in terms of a comparison of the spectral tri-stimulus values of the objects under test illumination and standard illumination according to the recommendations of CIE Publication No. 13.2

Starting time – The time needed after switching on for the lamp to start fully and remain lighted.

Run-up time – The time needed after switching on the supply for the lamp to reach 80% of its stabilized luminous flux.

Starting temperature – The minimum and maximum temperatures at which the lamp will reliably start.

Power factor – The active power divided by the apparent power (i.e. product of the rms input voltage and rms input current of a ballast).

### Reference Standards

ENERGY STAR qualified compact fluorescent lamps and lamp systems shall comply with the relevant clauses of the following standards, unless the requirements of the ENERGY STAR specification are more restrictive.

ANSI C78.1 – 1991	<i>Fluorescent Lamps – Rapid-Start Types</i>
ANSI C78.4 – 1995	<i>Fluorescent Lamps – Self-Supporting Single-Based Compact Types</i>
ANSI C78.5 – 1997	<i>Specifications for Performance of Self-Ballasted Compacted Fluorescent Lamps</i>
ANSI C78.375 – 1997	<i>Guide for Electrical Measurements of Fluorescent Lamps</i>
ANSI/IEEE C62.41 – 1991	<i>Surge Voltages in Low-Voltage AC Power Circuits, Recommended Practice for</i>
CIE Publication No. 13.3 – 1995	<i>Method of Measuring and Specifying Color Rendering of Light Sources</i>
IESNA LM-9 – 1998	<i>Electric &amp; Photometric Measurement of Fluorescent Lamps</i>
IESNA LM-40 – 1987	<i>Approved Method for Life Performance Testing of Fluorescent Lamps</i>
IESNA LM-65 – 1991	<i>Life Testing of Single-ended Compact Fluorescent Lamps</i>
IESNA LM-66 – 1991	<i>Electrical and Photometric Measurements of Single-Compact Fluorescent Lamps</i>
UL 1993 – 1993	<i>Standard for Self-Ballasted Lamps and Lamp Adapters</i>

ENERGY STAR qualified compact fluorescent lamps and lamp systems shall comply as applicable with the labeling requirements of the U.S. Federal Trade Commission and the EMI requirements of the U.S. Federal Communications Commission.

<b>Performance Characteristics</b>	<b>ENERGY STAR Specification</b>
Lamp Efficacy ( The performance and electrical requirements of compact fluorescent lamps are taken at the end of the 100 hour aging period in accordance with ANSI C78.5.)	Lumens per watt (Based upon initial lumen data)
Scope (a) (b) <u>Bare lamps:</u>	
< 15 watts	45
≥ 15 watts	60
Scope (c) <u>Covered lamps (except for reflector type):</u>	
≤ 14 watts	40
15 - 19 watts	48
20 - 24 watts	50

<p>≥ 25 watts</p> <p>Scope (d)</p> <p>  <u>Reflector type:</u></p> <p>  ≤ 19 watts</p> <p>  ≥ 20 watts</p>	<p>55</p> <p>33</p> <p>40</p> <p>For multi-level or dimmable systems, measurement shall be at the highest setting.</p>
Burning Position	The lamp efficacy shall be the lesser of the lumens per watt measured in the base up and base down positions.
Lumen Depreciation	Per ANSI C78.5, Clause 4.10, The lumen depreciation at 40% of rated life shall not be less than 80%.
Starting Time	The time needed after switching on for the lamp to start fully and remain lighted, shall be an average of 1 second.
Color Quality	Color Rendering Index ≥ 80
Starting Temperature	Lamp package must declare the minimum starting temperatures or geographical zone of use and any other conditions (e.g. use in enclosed luminaire) for reliable starting to meet the starting time requirements of ANSI C78.5, Clause 4.7
Run-up Time	Per ANSI C78.5, clause 3.11 and 4.8, shall not exceed 3 minutes.
Correlated Color Temperature	If a product has a color temperature that does not fall between 2700K and 3000K, the packaging should clearly describe the color of the product (cool or warm) and state the intended use for the product.
<b>Electrical Requirements</b>	<b>ENERGY STAR Specification</b>
Input voltage and frequency	120 volts, 60 Hz
Power Factor	≥ 0.5
Electromagnetic Interference	Compliance with FCC 47 CFR Part 18 requirements for consumer limits
Operating Frequency	> 40 kHz
Transient Protection	Per ANSI/IEEE C62.41, Category A, 7 strikes
Base	Medium screw E26/24
Compatibility with Controls	Lamp package shall clearly state any known incompatibility with photo controls, dimmers or timing devices.
<b>Durability</b>	<b>ENERGY STAR Specification</b>
Average Rated Lamp Life	6,000 hours, or greater as declared by the manufacturer
Warranty (applicable to normal residential use)	Either 12 months from date of purchase, or an equivalent, such as an “800” number or address for consumer complaint resolution.
<b>Labeling</b>	In English, or English with additional languages

Performance Characteristic	Test Procedure	Test Procedure
	Compact Fluorescent (see note below)	Circle design
Lumen Output and Efficacy	IESNA – LM66	IESNA – LM9
Lumen Depreciation and Life	IESNA – LM65 & ANSI – C78.5	IESNA – LM40
Color Rendering Index	CIE Publication 13.3	

Transient Protection	ANSI/IEEE C62.41, Category A, 7 strikes
Electromagnetic Interference	FCC 47 CFR Part 18 for consumer limits

*Note: Testing with a reference ballast shall not apply to integrally ballasted compact fluorescent lamps. These lamps shall be measured with their integral ballasts at 120 volts and 60 Hz.*

### **Certification**

Manufacturers shall certify that ENERGY STAR qualified compact fluorescent lamps and lamp systems have met the required safety acceptance and performance tests.

### **Testing**

Manufacturers shall certify that the compact fluorescent lamps and lamp systems sold using the ENERGY STAR label have met the ANSI/UL Standard 1993. ENERGY STAR qualified compact fluorescent lamps and lamp systems must be tested, listed, and labeled by an organization accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) or the American Association for Laboratory Accreditation (A2LA) as having the capability for safety testing, listing, and labeling of those products. These organizations include Canadian Standards Association (CSA), Underwriters Laboratories (UL), Intertek Testing Services Performance Division (formerly ETL Testing Laboratories), Factory Mutual (FM), and others. Manufacturers shall certify that the compact fluorescent lamps and lamp systems meet the manufacturers' declared performance criteria, and the minimum performance criteria contained in this ENERGY STAR specification for the characteristics shown above (and within three percent of the minimum performance criteria contained in the specification for efficacy). The sample size required for compliance with the ENERGY STAR performance criteria is 10 units per individual model (5 units in the base up position, and 5 units in the base down position). For new models, and/or models not previously tested, listed or labeled, and 18 month delay will be allowed in the submission of data to DOE for ENERGY STAR qualification that identifies the average rated lamp life and lumen depreciation. This specification shall be updated and revised to incorporate industry-accepted testing procedures for predicting lamp failure, average lifetime and other criteria as new industry standard test procedures become available. This specification will be reviewed with manufacturer and other interested parties' input no later than 1 year after the effective date to assess the need to revise accordingly.