



ENERGY STAR® Program Requirements Product Specification for Decorative Light Strings

Eligibility Criteria Version 1.5

Following is the **Version 1.5** product specification for ENERGY STAR qualified decorative light strings. A product shall meet all of the identified criteria to earn the ENERGY STAR.

1) Definitions: Below are the definitions of the relevant terms in this document.

- A. Decorative Light String (DLS): A string of lamps that operates on AC power in North America (120 V RMS AC, 60 Hz) or via a power adapter or controller that connects directly to AC power, and is used for decorative, residential lighting purposes. The lamps may be replaceable or sealed into the lamp holder/wiring harness.
- B. Decorative Form: A stationary frame onto which an ENERGY STAR qualified decorative light string is attached. The frame has no electromechanical function and consumes no input power. Examples include: bell, heart, star, holiday trees, snowman, snowflake and pumpkin shapes composed of plastic or metal framing with qualified decorative light strings attached.
- C. Failed Lamp: A lamp has failed if the light output is less than half the expected output for a comparable lamp of the same age in good condition. This will normally be determined by comparison with a good lamp of the same color on the same string.
- D. Input Power: The average total power used by the decorative light string during operation, measured in watts, including (if any) the transformer, adapter, controller, etc. For decorative light strings that operate with power adapters that can accommodate more than one string, the input power is defined as the average total power consumed with the rated maximum number of strings attached.
- E. Maintained Light Output: The average light output of a decorative light string after a testing period expressed as a percentage of light output of that same string following a 24-hour seasoning period.
- F. Product Family: A group of product models that are (1) made by the same manufacturer, (2) subject to the same ENERGY STAR qualification criteria, and (3) of a common design and construction delivering similar function and performance, but varying in physical appearance.
- G. Series Block: A number of lamps connected in series, or utilizing a series connection. Additional series blocks can be added to the circuit (i.e., decorative light string) utilizing parallel connections (e.g., a 70-lamp light string could have two 35-lamp series blocks connected in parallel).
- H. Watts per Lamp: The input power divided by the number of lamps on the decorative light string (or strings, in the case of power adapters or controllers that can accommodate multiple strings).
- I. V RMS AC: The measured root-mean-square value of a voltage with alternating current.

2) Scope:

- A. Included Products: Products that meet the definition of a Decorative Light String as specified herein are eligible for ENERGY STAR qualification, with the exception of products listed in Section 2.B. ENERGY STAR qualified decorative light strings attached to decorative forms are also eligible for the ENERGY STAR.
- B. Excluded Products: Rope lighting (light string inside a tube or diffuser fully enclosing the lighted length of the string), and replacement lamps are not eligible to earn the ENERGY STAR.

3) Qualification Criteria:

- A. Performance Requirements:

Table 1: ENERGY STAR Requirements for Qualification

Criteria Item	ENERGY STAR Requirements	Sample Size/Specific Requirements
A. Inspection		
Decorative Forms	All decorative light strings attached to a decorative form shall be ENERGY STAR qualified for indoor/outdoor use, meet all applicable electrical safety requirements for indoor/outdoor use, and be rated as such.	Total power consumption shall be reported, based on power consumption of the attached ENERGY STAR qualified decorative light string on the decorative form.
Number of Lamps per String	For all strings in the sample, the number of lamps indicated on the packaging shall equal the number of lamps on the strings.	3 decorative light strings of the same model shall be used to determine compliance with all of the inspection requirements. This same sample of strings may also be used for one of the three tests (i.e., electrical, life or weathering).
Replaceable Lamps	If the string has replaceable lamps, the socket and lamp shall have a marking or means to ensure correct insertion of replacement lamps.	
Safety Requirements	All strings shall comply with UL 588 (for the United States) and/or CSA C22.2 No.37-M1989 (for Canada).	UL and/or CSA requirements, as appropriate.
Rated for indoor or indoor/outdoor applications	A label on the string shall indicate whether it is rated for indoor-only or indoor/outdoor use.	3 decorative light strings of the same model shall be used to determine compliance with all of the inspection requirements. This same sample of strings may also be used for one of the three tests (i.e., electrical, life or weathering).
Warranty	A warranty shall be provided and may either be printed on the packaging or included as an insert. Warranty statement shall: 1) include minimum 3-year warranty under normal residential seasonal use against all product defects; and 2) provide either a toll-free telephone number, or mailing address, or email and website address for consumer complaint resolution.	

B. Electrical Requirements

Input Power	<p>The input power consumption per lamp on each of the three strings in the sample shall not exceed 0.20 watts.</p> <p>For decorative light strings that modulate in their power use (e.g., flashing, changing color), energy use shall be measured over a time period of 5 or more complete modulation cycles, averaged, and recorded as the input power.</p>	3 decorative light strings of the same model.
Over-Voltage	Average percentage of failed lamps on all three strings in the sample shall be no greater than 3%.	

C. Output and Reliability Requirements (previously referred to as Lifetime Requirements)

Maintained Light Output	For strings with colored lamps, the average maintained light output shall be no less than 70%. For strings with white lamps, the average shall be no less than 50%.	<p>3 decorative light strings of the same model.</p> <p>See ENERGY STAR Test Method for Decorative Light Strings, November 2011 (Annex A) for string testing configuration and test steps.</p>
Failed Lamps	The average percentage of failed lamps on all three strings in the sample shall be no greater than 3%.	

D. Weathering Requirements

(NOTE: Strings rated for indoor-only use shall not be subjected to this test.)

Maintained Light Output	For strings with colored lamps, the average maintained light output shall be no less than 70%. For strings with white lamps, the average shall be no less than 50%.	<p>3 decorative light strings of the same model.</p> <p>Weathering condition as specified in Cycle 7 of Table X2.1 of ASTM G154-06.</p> <p>See ENERGY STAR Test Method for Decorative Light Strings, November 2011 (Annex A) for string testing configuration and test steps.</p>
Failed Lamps	The average percentage of failed lamps on all three strings in the sample shall be no greater than 3%.	

E. Product Packaging for Consumer Awareness Requirements

Product Suitability	Packaging shall state product's suitability for use indoor-only or indoor/outdoor use.	Electronic draft or hard copy of packaging for the specific model or product family. One copy per family if the labeling is the same for all models.
Product Description	1) Number of lamps on the decorative light string, 2) Total lighted length of string in metric and imperial units, and 3) Total rated wattage of decorative light string.	
Correlated Color Temperature for White-light Strings	Packaging shall indicate if "warm-white," "pure-white" or "cool-white" lamps. These three terms pertain to the correlated color temperature (CCT) of the white-light lamps: Warm-white < 3500 CCT Pure-white 3500 – 5000 CCT Cool-white > 5000 CCT	

B. Significant Digits and Rounding:

- a. All calculations shall be carried out with directly measured (unrounded) values.
- b. Unless otherwise specified, compliance with specification limits shall be evaluated using directly measured or calculated values without any benefit from rounding.
- c. Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.

4) Test Requirements:

- A. When testing decorative light strings, the following test methods shall be used to determine ENERGY STAR qualification:

Table 2: Test Methods for ENERGY STAR Qualification

ENERGY STAR Requirement	Test Method Reference
Electrical	ENERGY STAR Test Method for Decorative Light Strings, November 2011 (Annex A)
Output and Reliability (previously referred to as Lifetime)	ENERGY STAR Test Method for Decorative Light Strings, November 2011 (Annex A) and CIE 084-1989, <i>The Measurement of Luminous Flux</i>
Weathering	ENERGY STAR Test Method for Decorative Light Strings, November 2011 (Annex A); ASTM G 154 – 06, <i>Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials</i> ; and CIE 084-1989, <i>The Measurement of Luminous Flux</i>
Safety	UL 588-2009, <i>Standard for Seasonal and Holiday Decorative Products</i> or CSA C22.2 No.37-M1989 (R2009) <i>Christmas Tree and Other Decorative Lighting Outfits</i>

- B. Different samples shall be used for the electrical test, the output and reliability test, and the weathering test. The samples used for inspection may also be used for one of the subsequent tests.
- C. Representative Models shall be selected for testing per the following requirements:
- a. For qualification of an individual product model, the representative model shall be equivalent to that which is intended to be marketed and labeled as ENERGY STAR.
 - b. For qualification of a product family, representative models shall meet the following requirements.
 - o **Test Group A. Electrical Tests:** Decorative light string models meeting all of the following criteria may share the same electrical test data for purposes of product family qualification.
 - Utilize the same light source technology – all decorative light strings shall be of the same light source.
 - Have the same number of lamps per series block – the decorative light strings may have different total lamps overall, but shall all share the same number of lamps per series block.
 - Have the same wattage per series block.
 - Are otherwise equivalent electrical circuits – there are no other features in the electrical circuit that affect the power consumption / efficiency of the string.
 - o **Test Group B. Output and Reliability (previously referred to as Lifetime) Test:** Decorative light string models meeting all of the following criteria may share the same output and reliability test data for purposes of product family qualification.
 - Produce the same color light – all decorative light strings shall be of the same lamp color. For multiple colored strings, the string shall be qualified by testing and qualifying solid color strings, one for each color contained in the multi-colored string.

- Have the same RMS current per series block.
 - Have a lamp lens cover of equivalent or smaller size, meaning less surface area and a smaller diameter. For example, if a manufacturer tests and qualifies a C6 shape, an M5 or a G3 could be included in the same product family; however, testing and qualifying a G3 would not enable C6 lamps to be included in the same output and reliability test family.
 - Half-wave and full-wave may be grouped together in the same family, but only if half-wave strings are tested. If full-wave strings are tested, these results shall not be used to qualify half-wave strings.
- **Test Group C. Weathering Test:** For the weathering test, white lamps and colored lamps shall be treated in separate families. In addition, multi-colored decorative light strings may be used to qualify solid-color decorative light strings having those colors represented on the multi-colored string. Decorative light string models meeting these requirements and all of the following criteria may share the same weathering test data for purposes of product family qualification.
 - Be either all white lamps or all colored lamps.
 - Have the same socket types (i.e., replaceable versus non-replaceable).
 - Incorporate the same material in the lamp lens cover / diffuser, wire and socket.
 - Have a lamp lens cover of equivalent or smaller size, meaning less surface area and a smaller diameter. For example, if a manufacturer tests and qualifies a C6 shape, an M5 or a G3 could be included in the same product family and be qualified without testing; however, testing and qualifying a G3 would not enable C6 lamps to be included in the same family.
- 5) **Effective Date:** The ENERGY STAR Decorative Light Strings Specification shall take effect on March 1, 2008. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on the model's date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.
- 6) **Future Specification Revisions:** EPA reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry discussions. In the event of a specification revision, please note that the ENERGY STAR qualification is not automatically granted for the life of a product model.