



ENERGY STAR® Program Requirements for Lamps and Luminaires

Start Time Test Method

October-2017

1 OVERVIEW

The following test method shall be used for determining product compliance with start time requirements in the ENERGY STAR Eligibility Criteria for Lamps and the ENERGY STAR Eligibility Criteria for Luminaires.

2 APPLICABILITY

This start time test method applies to all integrated and externally ballasted compact fluorescent lamps (CFLs), integrated LED lamps, LED light engines, and LED luminaires as defined within the ENERGY STAR Eligibility Criteria for Lamps and ENERGY STAR Eligibility Criteria for Luminaires. It does not apply to individual LED drivers.

3 DEFINITIONS

Unless otherwise specified below, all terms used in this document are consistent with the definitions in the ENERGY STAR Eligibility Criteria for Lamps and ENERGY STAR Eligibility Criteria for Luminaires.

Device Under Test (DUT): the integrated or externally ballasted CFL, integrated LED lamp, LED light engine, or LED luminaire which is undergoing the start time test.

Start Time: the time between the application of power to the DUT¹ and:

- For fluorescent DUTs, the point where light output reaches 98% of the initial plateau.
- For solid-state lighting DUTs, the point where the light source is continuously illuminated, and the light output is either constant or increasing.

Initial Plateau: the point at which the average increase in the light output over time levels out (reduces in slope). This can be determined mathematically or visually based on the output trace. For examples, see section 9, below.

4 METHODS OF MEASUREMENT AND REFERENCE DOCUMENTS

- A. IES LM-66-14: 2014. IES Approved Method for Electrical and Photometric Measurements of Single-Based Compact Fluorescent Lamps, Illuminating Engineering Society, New York.
- B. IES LM-79-08: 2008. IES Approved Method for Electrical and Photometric Measurements of Solid-State Lighting Products, Illuminating Engineering Society, New York.
- C. IES LM-54-12: 2012. IES Guide to Lamp Seasoning, Illuminating Engineering Society, New York.

¹ DUTs with integral controls (e.g., motion sensors, photosensors, wireless control, standby mode, or connected functionality) may have these controls disabled or bypassed for this testing.

5 TEST SETUP

A. Test Setup and Instrumentation:

1. Regulated AC or DC power supply (as applicable to the DUT)
2. Multichannel oscilloscope with data storage capability
3. Appropriate attenuator probe(s)
4. Photodetector

B. Seasoning and Preburning: Prior to the first readings, compact fluorescent lamps (CFL) shall be seasoned for 100 hours in accordance with IES LM-54-12. CFLs shall be preburned in accordance with IES LM-66-14. SSL sources shall not be seasoned.

C. Input Power for Start Time Measurements: The power requirements shall be per IES LM-66-14 or LM-79-08 as applicable. When selecting a power supply for use with integrated lamps and luminaires, it is necessary to apply an appropriate power factor when specifying the Volt-Amp capacity of the power supply.

D. Storage: Lamps and luminaires shall be stored at $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for a minimum of 16 hours prior to the test, after which the temperature range shall be $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ for at least two hours immediately prior to the test. CFL lamp and ballast (if applicable) samples shall be off for 20 hours \pm 4 hours prior to the test. If the CFL lamp and ballast sample has been off more than 24 hours, it shall be operated for 3 hours and then turned off for 20 hours \pm 4 hours prior to conducting the test.

E. Ambient Temperature: Testing shall take place in an ambient temperature of $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. Drafts shall be minimized.

F. Power Meter: Power meters shall be capable of measuring to the appropriate requirements of IES LM-66-14 or IES LM-79-08 as applicable.

G. Environmental Conditions: The test environment shall be clean and free from large amounts of dust and moisture.

H. Orientation: Test samples in orientation(s) as specified by the ENERGY STAR specification or manufacturer specified position if different.

I. Sample Selection: Samples shall be representative of the manufacturer's typical product. The samples shall be clean and thoroughly inspected before testing. Any flaws or inconsistencies in the DUT samples shall be noted.

6 TEST CONDUCT

A) Photometric Measurements:

1. For integrating sphere measurements, refer to IES LM-66-14 or IES-LM-79-08 as applicable.
2. For non-integrating sphere measurements, the photodetector used for photometric measurements shall be a silicon detector corrected to closely fit the Commission Internationale de l'Eclairage (CIE) spectral luminous efficiency curve (V_{λ}).

B) Transfer of Fluorescent Systems after Seasoning:

Fluorescent sources and ballasts shall be stored per requirements in section 5D above before being transported to the start time testing equipment. Care shall be exercised to maintain lamp orientation and avoid shaking or bumping the lamp during the transfer from seasoning.

7 TEST PROCEDURE

- A. Install the DUT in the test environment. The ballast or driver may be external to the test environment, if applicable.
- B. For non-integrating sphere measurements, position the photocell so it sees the main body of the discharge tube or array (as applicable). Shield from extraneous light as needed.
- C. For integrating sphere measurements, see test conduct section 6.A.1
- D. When testing a covered CFL, the photocell only needs to see the outer luminous face of the sample.
- E. When testing DUTs with sensors (e.g. motion sensors, photosensors) the sensors may be disabled or bypassed for this testing.
- F. Connect oscilloscope probe to measure the input voltage to the sample, and light output.
- G. Set the scope to trigger off the input voltage signal. Set trigger level at 10V.
- H. Set power supply to rated voltage and frequency of the DUT. If a range is specified, test sample at the midpoint of the range.
- I. Use an exemplar sample to determine the proper voltage and time base settings. Suggested initial time base is 200 ms/div.
- J. Apply rated voltage/frequency to the DUT.
- K. Record the input voltage and light output waveform on which the starting time was based.
- L. Record Start Time. See Examples 1 and 2 in section 9, below.

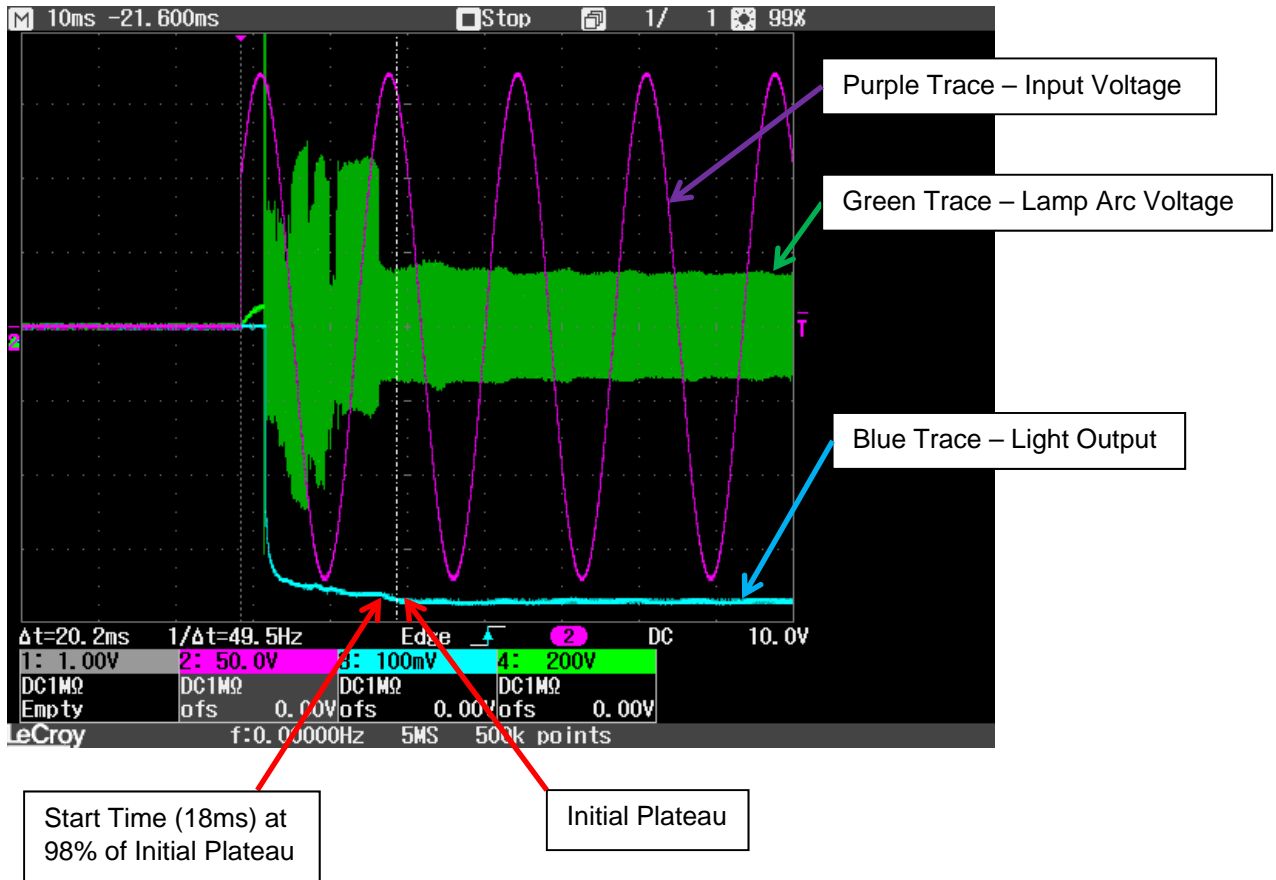
8 TEST REPORT

Start Time test report data shall include the following test information:

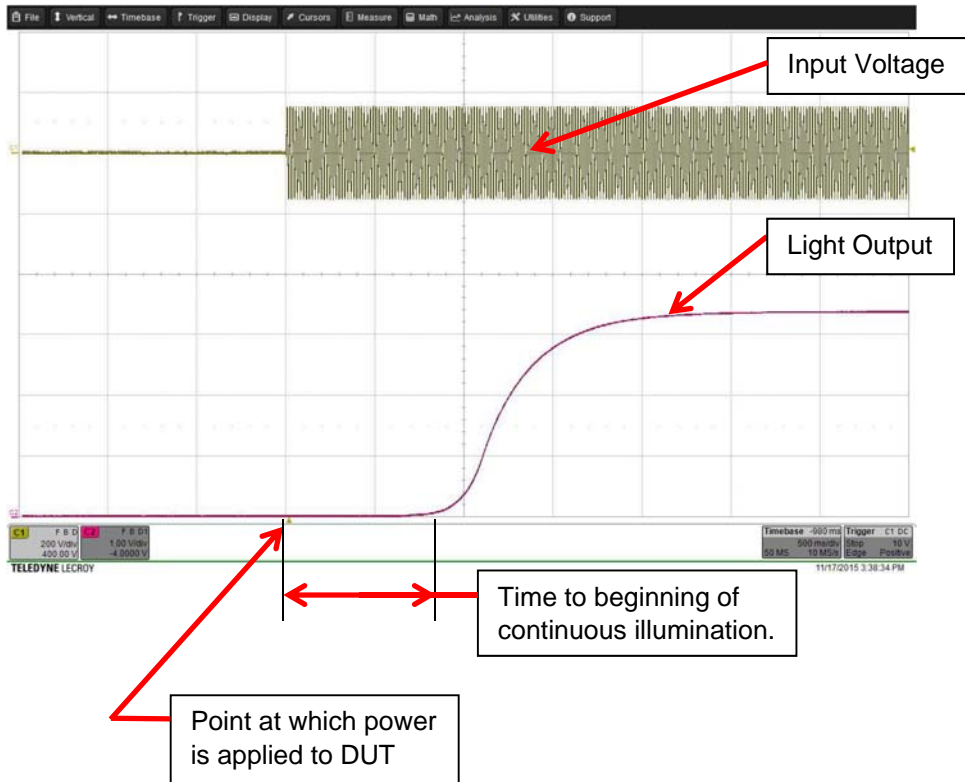
- A. Luminaire, Light Engine, Lamp and ballast/driver (if applicable) Manufacturer name(s) and product identification
- B. Name and location of testing facility
- C. Test date
- D. DUT test orientation (if applicable)
- E. Test voltage (V)
- F. Test frequency (Hz)
- G. Time base setting (ms/div)
- H. Input voltage and light output waveform on which the start time is based
- I. Start Time (ms)
- J. Indicate whether sensors were disabled or bypassed for this testing and detail methodology as applicable.

9 EXAMPLES:

9.1 Example 1 – Fluorescent Source

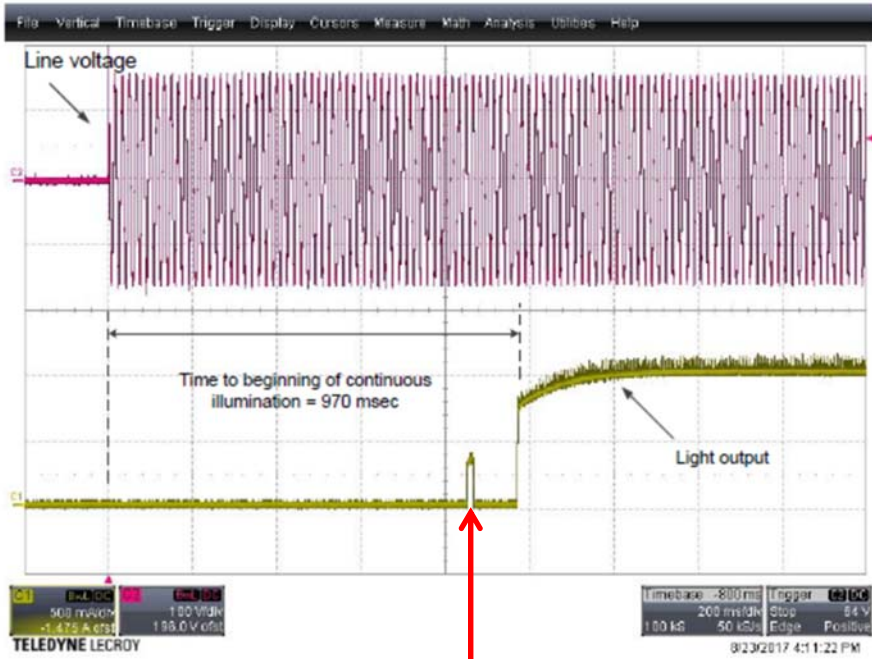


9.2 Example 2 – SSL Source



9.3 Example 3: SSL Source

Non-compliant Source Start Time of Solid State non-connected luminaire



This example of light source flashing is not considered continuous illumination. This is unlike products using pulse width modulation which should be perceived by the human eye as constant or increasing.