



IES Approved Method: **Electrical and Photometric
Measurement of General
Service Incandescent
Filament Lamps**

IES LM-45-15

IES Approved Method for the Electrical and Photometric Measurement of General Service Incandescent Filament Lamps

**Publication of this Guide
has been approved by the IES.
Suggestions for revisions
should be directed to IES.**

**Prepared by the IES Testing Procedures
Sub-Committee on Photometry of Light Sources**

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Contents

Foreword	1
Introduction	1
1.0 Scope	1
2.0 Normative References	1
3.0 Nomenclature and Definitions	1
4.0 Ambient and Physical Conditions	2
4.1. General	2
4.2. Temperature	2
4.3. Air Movement	2
4.4. Vibration	2
5.0 Electrical Conditions	2
5.1. Waveshape	2
5.2. Voltage or Current Regulation	2
5.3. Circuits and Lamp Connections	2
6.0 Lamp Test Procedures	2
6.1. Lamp Orientation	2
6.2. Lamp Stabilization	2
6.2.1. Seasoning	2
6.2.2. Preburning	2
6.2.3. Determination of Stabilization time	3
6.3. Electrical Settings	3
6.4. Electrical Instrumentation	3
6.4.1. Instrument Tolerance	3
6.4.1.1 DC Operation	4
6.4.1.2 AC Operation	4
6.4.2. Impedance Limitations	4
7.0 Photometric Test Procedures	4
7.1. Total Luminous Flux Measurements with an Integrating Sphere	4
7.1.1. Photo-detector	4
7.1.2. Spectroradiometer	4
7.2. Luminous Intensity (candela)	4
7.3. Luminous Intensity (Candela) Distribution	4
7.4. Color Measurements	5
8.0 Test Report	5
Informative Reference List	5

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FOREWORD

This approved method is a revision of *IES LM-45-09, IES Approved Method for the Electrical and Photometric Measurements of General Service Incandescent Filament Lamps*. Changes have been made to update information, to give clearer guidelines for requirements and to promote uniformity in measurement procedures. Measurement of incandescent reflector lamps is not included in this approved method.

INTRODUCTION

Incandescent filament lamps produce radiant power as a result of electric current passing through a tungsten filament, which is surrounded by an inert atmosphere or vacuum within a glass or quartz envelope. Some lamps contain halogens that are employed to maintain a clean bulb wall. Such lamps may also employ bulb coatings that redirect infrared energy back to the filament for improved efficacy or to filter radiation for color control.

As long as the filament remains intact, current will flow, heating the filament to incandescence. Since the desired incandescence occurs at high filament temperatures, the surface of the tungsten filament is continually vaporized during lamp operation. As a result, the filament wire diameter is non-uniformly decreased along its length until at some point, the high current density causes excessive local heating and vaporization, which causes filament failures. The rate of evaporation is dependent on the local filament temperature, plus gas density and pressure.

Incandescent filament lamps are typically affected by variables such as operating cycle, conditions imposed by the fixture, orientation and vibration. In general, the test conditions should not diverge widely from conditions of service. Practical considerations require that any test conditions and programs be designed to give comparable results when used by various laboratories. The recommendations of this IES Approved Method have been made with these objectives in mind.

For special purposes, it may be desirable to determine the characteristics of lamps when they are operated at other than the standard conditions described in this approved method. Where this is done, such results are meaningful only for the particular conditions under which they were obtained.

All such non-standard operating conditions shall be stated in the test report.

The photometric information usually required is total luminous flux (lumens), luminous intensity (candelas) in one or more directions, and chromaticity. For the purposes of this approved method, the determination of these data will be considered photometric measurements.

The electrical characteristics usually measured are lamp current, lamp voltage, and lamp power. Incandescent filament lamps are usually measured on DC and the power can be calculated from voltage and current. For the purpose of this approved method, the determination of these data will be considered electrical measurements.

1.0 SCOPE

This approved method describes the procedures to be followed and the precautions to be observed in performing uniform and reproducible measurements of the electrical and photometric characteristics of general service incandescent filament lamps under standard conditions.

2.0 NORMATIVE REFERENCES

ANSI/IES RP-16-10, *ANSI/IESNA Nomenclature and Definitions for Illuminating Engineering*, New York: Illuminating Engineering Society of North America, 2010.

LM-54-12, *IES Guide to Lamp Seasoning*, New York: Illuminating Engineering Society of North America.

LM-78-07, *IES Approved Method for Total Luminous Flux Measurement of Lamps Using an Integrating Sphere Photometer*, New York: Illuminating Engineering Society of North America.

3.0 NOMENCLATURE AND DEFINITIONS

The units of electrical measurement used in this approved method are the volt, the ampere, and the watt. The ambient temperature measurement unit is degree Celsius/Fahrenheit. The units of photometric measurement are the lumen for luminous flux, and the candela for luminous intensity.¹ Color is specified in terms of CIE recommended systems.²