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AMERICAN NATIONAL STANDARD




# ANSI C78.5-1997

# AMERICAN NATIONAL STANDARD

## FOR ELECTRIC LAMPS—

# SPECIFICATIONS FOR PERFORMANCE OF SELF-BALLASTED COMPACTED FLUORESCENT LAMPS

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
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**ANSI C78.5-1997**
**Revision of ANSI C78.5-1991**

# American National Standard

*for electric lamps:*

# Specifications for Performance of Self-Ballasted Compact Fluorescent Lamps

Secretariat

**National Electrical Manufacturers Association**
1300 North 17th Street, Suite 1847, Rosslyn, VA 22209

Approved September 25, 1997
American National Standards Institute

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# Foreword (This Foreword is not part of ANSI C78.5-1997.)

Suggestions for improvement of this standard should be submitted to the Secretariat C78, National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209.

This standard was processed and approved by Accredited Standards Committee on Electric Lamps, C78, and its Sub-Committee, C78-2 for Fluorescent Lamps. Committee approval of the standard does not necessarily imply that all committee members voted for that approval. At the time it approved this standard, the C78 Committee had the following members:

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*for electric lamps—*

# Specifications for Performance of Self-ballasted Compact Fluorescent Lamps

## 1 Scope

This standard specifies the performance requirements together with the test methods and conditions required to show compliance of self-ballasted compact fluorescent lamps up to 60 watts which are intended for domestic and similar general lighting purposes. Globe and reflector types are excluded. Such lamps shall have a rated input voltage of 120 or 127 volts at 60 Hz and an Edison screw base.

## 2 Normative references

The following publications contain provisions which, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the publications indicated below.

ANSI C78.375-1997 *Guide for Electrical Measurements of Fluorescent lamps.*
CIE Publication No. 13.2 ,1974
CIE Publication No. 15, Supplement No. 2, 1978
IES LM-65-1991 *Lifetesting of Single-ended Compact Fluorescent Lamps*
IES LM-66-1991 *Electrical and Photometric Measurements of Single-Compact Fluorescent Lamps*
UL 1993-1993 *Standard for Self-Ballasted Lamps and Lamp Adapters*

## 3 Definitions

### 3.1 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.

The unit is intended as an alternative to an incandescent lamp in an existing Edison screw lampholder. For test purposes, self-ballasted lamp units shall be regarded as conventional lamps.

### 3.2 Rated voltage

The voltage marked on the lamp.

### 3.3 Rated wattage

The wattage marked on the lamp.

### 3.4 Rated supply frequency

The frequency marked on the lamp.

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### 3.5 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 unless otherwise specified by the manufacturer.

### 3.6 Rated luminous flux

Initial lumen rating declared by the manufacturer.

### 3.7 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.

### 3.8 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.

### 3.9 Lamp color

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

#### 3.9.1 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. For color coordinates near the black body loci, the correlated color temperature (Kelvin) can be used to define color appearance. For further clarification see CIE Publication No. 15, Supplement No.2, CIE Publication No. 13.2, and the IES Handbook.

#### 3.9.2 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.

### 3.10 Starting time

The time needed after switching on for the lamp to start fully and remain lighted at the supply voltage and temperature defined in the requirements section.

### 3.11 Run-up time

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

### 3.12 Starting temperatures

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


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### 3.13 Harmonic content

The square root of the sum of the rms values squared of the harmonic components, excluding the fundamental.

### 3.14 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).

### 3.15 Total harmonic distortion (THD)

The ratio of the harmonic content to the rms value of the periodic current (all of the harmonic components including the fundamental).

$$THD(rms) = \frac{\sqrt{I_2^2 + I_3^2 + I_4^2 + \ldots}}{I_{rms}}$$

## 4 Requirements

### 4.1 General

Self-ballasted compact fluorescent lamps shall be so constructed that, in normal use, they are without danger to the user and the general surroundings.

Electrical and photometric performance of compact fluorescent lamps can be appreciably affected by drafts, ambient temperature, and burning position. For proper measurements of these characteristics, the requirements of clause 4, Ambient conditions, and clause 8, Lamp stabilization, in ANSI C78.375 must be met. Photometric procedures are covered under clauses 10, 11, and 12 of IES LM-66. The lamps shall be stabilized base-up at 25°C.

### 4.2 Marking

The unit shall be marked in accordance with clause 27 of UL1993, Standard for safety, Self-ballasted Lamps and Lamp Adaptors.

### 4.3 Other markings

**4.3.1** The unit shall include instructions per clause 28 of UL1993 if so required.

**4.3.2** A warning regarding possible interaction with IR remote controls may be needed on the packaging of some units.

**4.3.3** If the luminous flux in other burning positions varies by more than 5% from the rated position it shall be marked on the packaging.

### 4.4 Electro-magnetic interference

Units with electronic high frequency circuits shall comply with FCC regulations, Title 47 of the US Code of Federal Regulations, Part 18 for Consumer equipment.

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### 4.5 Color rendering index

Self-ballasted compact fluorescent lamps shall have a minimum rated CRI of 75 when measured in accordance with CIE Publication 13.2. The CRI value of an individual unit shall not be less than the rated value decreased by three.

### 4.6 Input power

The input to the unit at rated supply voltage shall not exceed the rated value by more than 10% plus 0.5 watts.

### 4.7 Starting time

The time to start when tested at the rated supply voltage in a 25°C ambient shall not exceed 2 seconds for electronic high frequency units and 4 seconds for magnetic units. The time to start for these units when tested at 90% of the rated supply voltage and at the minimum specified starting temperature shall not exceed 5 and 10 seconds respectively.

### 4.8 Run-up time

The run-up time shall not exceed 3 minutes when tested at rated supply voltage in an ambient of 25°C.

### 4.9 Luminous flux

The initial luminous flux of the units tested shall average not less than 90% of the rated value.

### 4.10 Lumen maintenance

The lumen maintenance at 40% of rated life shall not be less than 80%.

### 4.11 Efficacy

The minimum rated efficacy of a self-ballasted compact fluorescent lamp shall be at least 40 lpw.

### 4.12 Lifetest

Lifetesting shall be done in accordance with the requirements on clauses 2, 3, 5, and 6 of IES LM-65.

### 4.13 Total Harmonic Distortion

Low THD units shall have a THD, as defined in this standard of less than or equal to 32%

## 5 Selection of test specimens

**5.1** Lamps shall be selected so as to ensure proper representation of the current design.

**5.2** At least 3 specimens shall be procured for each sample. It is prudent to select one or more additional specimens to serve as potential replacements in the event of breakage or if the specimens become defective during the test for reasons not connected to the test, or if one or more specimens exhibit abnormal behavior or fail to stabilize.


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# 6 Tests

## 6.1 General

**6.1.1** Each test shall be performed at least once with each of the three specimens. Each specimen shall meet the described test criteria.

**6.1.2** If a specimen breaks or becomes defective for reasons not as a result of the testing, the specimen shall be discarded. Similarly if a unit fails to stabilize or exhibits abnormal behavior, the lamp shall be discarded. Testing shall resume with a suitable replacement specimen procured and prepared in the same manner as the original specimen. The use of replacement specimens shall be documented in the test report.

## 6.2 Power supply

For other than lifetests, the voltage to the unit under test shall meet the requirements of clause 3, Electrical supply characteristics in ANSI C78.375.

## 6.3 Electrical instruments

The electrical instruments used in the testing shall meet the requirements of clause 9, Instruments. in ANSI C78.375-1991.

## 6.4 Lifetest

Tests to establish life ratings require a larger sample size. Guidance is given in LM-66 and the requirements cited above must be met.

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# ANNEXES

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# Annex A
(Informative)
# Bibliography

IEC 969-1988 *Self-ballasted lamps for general lighting service, performance requirements*
IEC 968-1988 *Self -ballasted lamps for general lighting service, safety requirements*
CSA C861-1995 *Performance of Compact Fluorescent Lamps and Ballast Adaptors*
IES Handbook

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