

American National Standard

Approved June 6, 2002

Secretariat: ANSLG National Electrical Manufacturers Association

For Lamp Ballasts-- Ballasts For High-Intensity-Discharge and Low- Pressure Sodium Lamps (Multiple-Supply Type)

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Foreword (This Foreword is not part of ANSI C82.4-2002.)

Suggestions for improvement of this standard should be submitted to the Secretariat C82, American National Lighting Group of the National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209. This standard was processed and approved by Accredited Standards Committee on Lamp Ballasts, C82, and its Work Group, C82-2. Committee approval of the standard does not necessarily imply that all committee members voted for that approval.

Information concerning the approval of this standard is based on the documents listed in the table below:

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Revision of ANSI C82.4-1992	82(2)/m670	82(2)/m671v2

At the time it approved this standard, the ASC 82 Committee had the following members:

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AMERICAN NATIONAL STANDARD

For Lamp Ballasts— Ballasts For High-Intensity-Discharge and Low- Pressure Sodium Lamps (Multiple-Supply Type)

1 Scope

This standard provides specifications for and operating characteristics of ballasts for mercury, metal-halide, high-pressure sodium (HPS), and low-pressure sodium (LPS) lamps. The ballasts operate from multiple-supply sources of 600 volts maximum at a frequency of 60 hertz. They may be designed for operation under either indoor or outdoor conditions.

The following types of ballasts are excluded from this standard:

- (1) Ballasts consisting of resistance only
- (2) Transformers for constant current (series) operation of mercury lamps (see American National Standard for Mercury Lamp Transformers - Constant Current (Series) Supply Type, ANSI C82.7-1983 (R1988))
- (3) All ballasts that use semiconductors to control the lamp power.

2 Normative references

The following standards 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 standards indicated below.

ANSI C78.40 - 1998	<i>Specifications for Mercury Lamps</i>
ANSI C78.41 - 1995	<i>Guidelines for Low Pressure Sodium Lamps</i>
ANSI C78.42 - 1995	<i>High Pressure Sodium Lamps</i>
ANSI C78.1372 - 1996	<i>70 Watt M98 Metal-Halide Lamp</i>
ANSI C78.1374 - 1996	<i>50 Watt M110 Metal-Halide Lamp</i>
ANSI C78.1375 - 1996	<i>400 Watt M59 Metal-Halide Lamp</i>
ANSI C78.1376 - 1996	<i>1000 Watt M47 Metal-Halide Lamp</i>
ANSI C78.1377 - 1996	<i>175 Watt M57 Metal-Halide Lamp</i>
ANSI C78.1378 - 1996	<i>250 Watt M58 Metal-Halide Lamp</i>

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ANSI C78.1379 - 1996	<i>1500 Watt M48 Metal-Halide Lamp</i>
ANSI C78.1381 - 1998	<i>70 Watt M85 Metal-Halide Lamp</i>
ANSI C78.1382 - 1996	<i>100 Watt M90 Metal-Halide Lamp</i>
ANSI C78.1384 - 1997	<i>150 Watt M102 Metal-Halide Lamp</i>
ANSI C78.380 - 1997	<i>High Intensity Discharge Lamps - Method of Designation</i>
ANSI C82.6 - 1996	<i>Methods of Measurement of High-Intensity-Discharge Lamp Ballasts</i>
ANSI C82.9 - 1998	<i>Definitions for High-Intensity-Discharge Lamp Ballasts and Transformers</i>
ANSI C84.1 - 1995	<i>Electric Power Systems and Equipment - Voltage Ratings (60 Hz)</i>
IEEE 1313.1 - 1996	<i>IEEE Standard for Insulation Coordination - Definitions, Principles, and Rules</i>
ANSI/IEEE C62.1 - 1989	<i>Surge Arresters for AC Power Circuits</i>
ANSI/IEEE 100 - 1984	<i>Dictionary of Electrical and Electronics Terms</i>
ANSI/UL 1029 - 1994	<i>High Intensity Discharge Lamp Ballasts</i>

3 Definitions

Definitions of terms that apply specifically to the subject treated in this American National Standard are given in ANSI C82.9. For additional definitions, see ANSI/IEEE 100.

4 Ratings

4.1 Rated supply voltage

The design center rated supply voltage ratings for ballasts covered by this standard are 120, 208, 240, 277, and 480 volts.

4.2 Rated supply voltage range

The designated rated supply voltage ranges specified in the various parts of Section 5 shall be made available by the manufacturer in ballast catalogs or other technical literature.

4.3 Load

The rated load of a ballast shall be specified in terms of the wattage and lamp designations in accordance with C78.380, for the lamp it is intended to operate.

4.4 Lamp starting temperature

Ballasts are commonly designated to start and operate lamps over one of the following ambient lamp temperature ranges:

- (1) 10°C(50°F) and above
- (2) -15°C(5°F) and above
- (3) -30°C(-22°F) and above
- (4) -40°C(-40°F) and above

4.5 Ballast/external starting-aid capacitive load rating

The external starting-aid capacitive load rating shall be the maximum value of capacitance with which the external starting-aid may be loaded and still meet all minimum pulse requirements. The capacitive loading of the ballast/external starting-aid/lamp system varies widely with different wiring methods and materials. Recommendations should be sought from the external starting-aid or ballast manufacturer, or both.

5 Ballast performance

5.1 General

All measurements necessary to determine compliance with the ballast performance requirements of this standard shall be made in accordance with ANSI C82.6.

5.2 Lamp operating position

Ballasts may be designed for the operation of lamps in the vertical, horizontal, or other designated position. The ballast shall be tested with a reference lamp in its designated operating position. Lamps labeled as U, HBU, or BUH, should be operated in the base up orientation.

5.3 Starting voltage

When operated within the designated supply voltage range including 92% to 105%¹ of its rated supply voltage (95% to 105% for high reactance autolag and reactor ballasts), a ballast shall provide root-mean-square (rms) and peak voltages that equal or exceed the appropriate minimum values specified in applicable American National Standards for lamps. For lamps requiring starting pulses, a ballast shall provide pulse voltage, width, repetition, and position within the limits specified in the applicable ANSI lamp standard listed (not inclusive) in Section 2.

¹ The voltage limits of 92% to 105% of rated supply voltage closely approximate the range of utilization voltages provided by public utility systems. For more detailed information refer to ANSI C84.1.

5.4 Starting current

When operated within the designated supply voltage range including 92% to 105%¹ of its rated supply voltage (95% to 105% for high reactance autolag and reactor ballasts), a ballast shall provide starting current in compliance with the appropriate requirements as specified in the applicable lamp standard listed (not inclusive) in Section 2.

5.5 Additional starting and sustaining requirements

Ballasts for metal-halide and high-pressure sodium lamps shall also meet additional starting and sustaining requirements within the designated supply voltage range including 92% to 105%¹ of their rated supply voltage (95% to 105% for high reactance auto lag and reactor ballasts) as specified in the applicable ANSI lamp standard listed (not inclusive) in the Section 2.

5.6 Lamp operating power

When operated at its rated supply voltage, a ballast shall deliver to a reference lamp a wattage within the specified percentage (given in the following table) of the wattage delivered to the same reference lamp in the identical position by the appropriate reference ballast. Both the reference ballast and the ballast under test shall have the same rated frequency. In this test, both ballasts shall be operated at their rated supply voltage.

Lamp Type	Wattage Range
Mercury	$\pm 7\text{-}1/2\%$
Metal Halide ²	$\pm 5\%$
High-Pressure Sodium	$\pm 7\text{-}1/2\%$
Low-Pressure Sodium	$\pm 7\text{-}1/2\%$

Table 1 Reference lamp wattage ranges

5.7 Regulation

5.7.1 Ballasts for mercury lamps

The power delivered to a reference lamp by a ballast operating at any supply voltage within its designated range (the range shall not be less than 95% to 105% of its rated voltage) shall be not less than 88% or more than 112% of the power delivered to the same reference lamp by the same ballast when operated at its rated supply voltage.

² Wattage excursions greater than $\pm 5\%$ increase the risk of noticeable lamp-color variation.

5.7.1 Ballasts for metal-halide lamps

The power delivered to a reference lamp by a ballast operating at any supply voltage within its designated range (the range shall not be less than 95% to 105% of its rated voltage) shall be not less than 85% or more than 115% of the power delivered to the same reference lamp by the reference ballast when operated at its rated supply voltage.

5.7.2 Ballasts for high-pressure sodium lamps

At any supply voltage within its designated range (the range shall not be less than 95% to 105% of its rated voltage), a ballast shall have a load characteristic (voltage-wattage curve) such that the characteristic curve of the ballast passes through the diagram of the lamp operating limits (trapezoidal) as given on the relevant data sheet of the lamp standards in ANSI C78.42. The ballast curve within its designated range of supply voltage shall intersect both of the lamp-voltage limit lines between the wattage limit lines and shall remain between the wattage limit lines throughout the full range of lamp voltage.

Note: Preferably, a ballast characteristic curve should be such that the lamp wattage attains a maximum at or below the maximum lamp-voltage line and then decreases substantially as the lamp voltage increases beyond this point. A relatively flat ballast characteristic curve located near the line of rated lamp wattage is also preferable to one that rises or falls relatively steeply.

5.7.3 Ballasts for low-pressure sodium lamps

The power delivered to a reference lamp by a ballast operating at any supply voltage within its designated range (the range shall not be less than 95% to 105% of its rated voltage) shall be not less than 88% or more than 112% of the power delivered to the same reference lamp by the same ballast when operated at its rated supply voltage.

5.8 Lamp dropout voltage (high-pressure sodium lamps only)

At any constant supply voltage within its designated range (the range shall not be less than 95% to 105% of its rated voltage), a ballast shall have a load characteristic (voltage-wattage curve) such that the dropout voltage shall not be less than the maximum voltage line of the diagram of the lamp operating limits (trapezoidal) as given in the applicable lamp standard of ANSI C78.42.

5.9 Operating current

With rated supply voltage applied to the ballast, the current delivered to a reference lamp shall not exceed 110% of the current delivered by a reference ballast to the same lamp.

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5.10 Current waveshape

5.10.1 Ballasts for mercury lamps

When operated at its rated supply voltage, a ballast shall provide to the reference lamp a current whose crest factor does not exceed the limit specified in ANSI C78.40.

5.10.2 Ballasts for metal-halide lamps

When operated at any supply voltage within its designated range, a ballast shall provide to the reference lamp a current whose crest factor does not exceed the limit as specified in the applicable lamp standard listed (not inclusive) in section 2.

5.10.3 Ballasts for high-pressure sodium lamps

When operated at its rated supply voltage, a ballast shall provide to the reference lamp a current whose crest factor does not exceed the limit specified in ANSI C78.42.

5.10.4 Ballasts for low-pressure sodium lamps

When operated at its rated supply voltage, a ballast shall provide to the reference lamp a current whose crest factor does not exceed the limit specified in the ANSI C78.41.

5.11 Extinction voltage

5.11.1 Ballasts for mercury or metal-halide lamps

When rated supply voltage is applied to a ballast operating an appropriate reference lamp, the ballast shall withstand a dip in supply voltage of at least 20% below its rated supply voltage without extinguishing the lamp.

5.11.2 Ballasts for high-pressure sodium and low-pressure sodium lamps

When rated supply voltage is applied to a ballast operating an appropriate reference lamp, the ballast shall withstand a dip in supply voltage of at least 20% below its rated supply voltage without extinguishing the lamp.

5.12 Ballast safety

Ballasts shall comply with ANSI/UL 1029.

6 Ballast temperature

6.1 External starting-aid

An external starting-aid used as a component part of a ballast for high intensity discharge lamps shall be capable of withstanding the temperature and voltage to

which it is subjected during normal operation of the ballast. For methods of measuring external starting-aid temperature, see ANSI C82.6.

Caution: Failure of a high intensity discharge lamp using an external starting-aid frequently presents an open circuit to the ballast and external starting-aid which may reduce the external starting-aid and ballast life. Consult the ballast manufacturer for expected performance and life under prolonged open-circuit conditions.

6.2 Application note

Caution: The 1000-watt high pressure sodium lamp frequently fails in a short-circuit condition. Consult the ballast manufacturer for expected performance under prolonged short-circuit conditions.

7 Basic impulse insulation requirements

Ballasts intended for roadway lighting service shall be designed to have a minimum basic insulation level (BIL), as follows:

Maximum Rated Supply Voltage (Volts)	BIL (kV)
250	7 ½
600	10

Table 2 Minimum basic insulation level

A standard positive full-impulse voltage wave as defined in IEEE 1313.1 shall be applied. The Basic Impulse Insulation Level test shall be made in accordance with ANSI C82.6.

Ballasts meeting the 250V criteria are for use on multiple protected circuits. The following types of ballasts are conditionally excepted:

Encased Ballasts. When component interconnections are sealed within the ballast enclosure and leads are not available from the capacitor cases or the core or both, specially constructed prototypes of such ballasts may be required to determine compliance with these requirements.

8 Audible sound level

Ballast noise is primarily produced by the core at a fundamental frequency of twice the applied frequency. Noise of this nature is an inherent characteristic of the core and cannot be completely eliminated. Unintentional amplification of the ballast noise can be caused by reflections from surrounding objects, resonance of mechanical mounting and electrical connections. Since HID ballasts are not sound rated care should be exercised in the selection of the ballast location and the mounting method used to minimize noise. The ballast or luminaire manufacturer should be consulted for specific recommendations for a quiet installation.

9 Ballast marking

9.1 Permanent marking

Ballasts shall be permanently marked to give the following information. When the ballast is originally built into or integrated with the luminaire or enclosure, the marking may be appropriately located on or in the luminaire or enclosure:

- (1) Name or trademark of manufacturer or vendor responsible
- (2) Catalog number
- (3) Supply voltage rating (see 4.1 and 9.2)
- (4) Frequency, supply frequency
- (5) Maximum input amperes or volt-amperes under any mode of operation.
- (6) Quantity, classification letters (In accordance with ANSI C78.380), characteristic numbers, and wattage of lamps (see 9.3)
- (7) Wiring instructions and termination identifications (see 9.2)
- (8) Autotransformer type if applicable
- (9) Catalog number of external starting-aid to be used with the ballast
- (10) Minimum lamp ambient temperature for which ballast provides specified starting voltage, expressed as: _____ °C (_____ °F)

9.2 Rated supply voltage designation

For ratings other than those listed in 4.1, the designation shall be specified as given in 9.2.1 through 9.2.3.

9.2.1 Tapped windings

A virgule (/) shall be used to separate voltage ratings of successive taps. Ratings shall be given in ascending order.

For example:

115/120/125 signifies an input winding with taps at nominal voltages of 115, 120, and 125 volts.

9.2.2 Series or parallel windings

The letter (X) shall be used to separate the voltage ratings of windings designed for either series or parallel connection. The winding configurations shall be designated by:

- (1) The parallel voltage rating.
- (2) The letter (X).
- (3) The series voltage rating.

For example:

120 X 240 signifies a winding suitable for parallel connection to a 120-volt source or for series connection to a 2-wire 240-volt source but not suitable for a 3-wire connection.

9.2.3 Rated supply voltage range

A hyphen (-) shall be used to separate the minimum and maximum recommended supply voltages that may be applied to a voltage range rated ballast.

For example:

105-135 signifies a winding designed for continuous operation at any supply voltage between 105 and 135 volts, inclusive.

9.3 Lamp types

When ballasts are designed to be suitable for more than one type of lamp of the same or different wattage rating, the applicable lamp designations (as specified in C78.380) shall be shown separated by a virgule (/) with related wattage's indicated as well and also separated by a virgule (/).

For example:

H38/H44 100/100W
H37/H39 250/175W

9.4 Ballast marking for matching ballast capacitors

Ballasts may be color coded for designs requiring a specific tolerance range of capacitance to maintain lamp wattage as defined in 5.6.

9.4.1 Marking

The coding shall consist of a permanent 1/4 inch diameter color dot, located in a prominent place adjacent to all other ballast markings. The color dot shall be overlaid on a distinct background color if the color of the ballast in the location of the dot is similar to the dot color.

9.4.2 Color identification

The following color codes shall be used on the core and coil assembly. These are the same colors that are used on the capacitors.

Red -to indicate that a +6% to +3% value of nominal capacitance is to be used
Yellow -to indicate that a +3% to 0% value of nominal capacitance is to be used
White -to indicate that a 0% to -3% value of nominal capacitance is to be used
Black -to indicate that a -3% to -6% value of nominal capacitance is to be used





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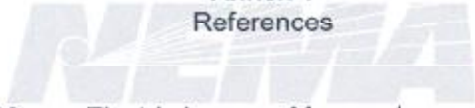


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Informative
Annex 1
References



- | | |
|---------------------|--|
| ANSI C78.386 – 1989 | <i>Electric Lamps - Mercury Lamps - Methods of Measuring Characteristics</i> |
| ANSI C78.387 – 1995 | <i>Methods of Measurement of Metal-Halide Lamp Characteristics</i> |
| ANSI C78.388 – 1990 | <i>High Pressure Sodium Lamps - Methods of Measuring Characteristics</i> |
| ANSI C82.5 – 1990 | <i>Reference Ballasts for High-Intensity-Discharge Lamps</i> |
| ANSI C136.2 – 1996 | <i>Luminaire Voltage Classification</i> |



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