NEMA Standards Publication

NSI C78.389-2004 (S2018)

American National Standard for electric lamps— High Intensity Discharge— Methods of Measuring Characteristics

National Electrical Manufacturers Association

National Electrical Manufacturers Association
1300 North 17th Street, Suite 900 • Rosslyn. VA 2220
www.NEMA.org

ANSI C78.389--2004 (S2018)
Consolidation and Revision:
ANSI C78.386-1989, C78.387-1990, C78.388-1989 and all Supplements/Amendments

American National Standard

Approved: June 8, 2018 Secretariat: ANSLG-- National Electrical Manufacturers Association

for electric lamps—

High Intensity Discharge—
Methods of Measuring Characteristics

American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer. An American National Standard implies a consensus of those substantially concerned with its scope and provisions. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The existence of an American National Standard does not in any respect preclude anyone, whether s/he has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards. It is intended as a guide to aid the manufacturer, the consumer, and the general public.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the Committee Secretariat referred to on the title page.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Editor's Note: During the final editorial review, changes were made to select sections of this published document only, and not to the working base document.

Printed and distributed by:
Information Handling Services/Global Engineering Documents
15 Inverness Way East, Englewood, CO 80112-5776
Under Contract with National Electrical Manufacturers Association

Printed in the United States of America

(This language is not part of the American National Standard.)
This Standard is being maintained under the stabilized maintenance option. Proposals for modification or improvement of this Standard are welcome. They should be sent to the National Electrical Manufacturers Association, 1300 N 17th Street, Suite 900, Arlington, VA 22209 or sent via the NEMA website (http://www.nema.org).

Foreword (This foreword is not part of ANSI C78.389-2004.)

Suggestions for improvement of this standard should be submitted to the Secretariat C78, American National Standard Lighting Group, 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 Working Group, C78 WG 04 for High-Intensity Discharge Lamps. Committee approval of the standard does not necessarily imply that all committee members voted for that approval.

David Mullen, Chairman, ASC C78
Ernesto Mendoza, Technical Coordinator
Randolph N. Roy, Secretariat
Matthew C. Clark, Senior Coordinating Editor

Table of Contents

Introduction

This standard is a consolidation of three previous Method of Measurement standards:

C78.386, Mercury Lamps – Methods of Measuring Characteristics
C78.387, Metal Halide Lamps – Methods of Measuring Characteristics
C78.388, High-Pressure Sodium Lamps – Methods of Measuring Characteristics.

The reason for the consolidation is that in most cases the method of measurement is identical for all three High Intensity Discharge (HID) lamp types. However, some statements refer to only one or two of the three types. When reference to one or two lamp types is necessary the given lamp type discussed is either given a separate sub-clause or the name of the lamp type is shown in bold text.

1. Scope and purpose

This standard describes the procedures to be followed and the precautions to be observed in measuring the electrical characteristics of high intensity discharge lamps as specified in the American National Standard Specifications for Mercury (Hg), High-pressure Sodium (HPS) and Metal Halide (MH) Lamps, as referenced in clause 2, Normative references.[1]

It is the purpose of this standard to outline methods of measurement that will make it possible to obtain reproducible and accurate measurements of High Intensity Discharge lamp characteristics.

Deviations from the procedures given in this standard are permissible for production or other testing, provided that the methods used give results in substantial agreement with the methods given herein. In cases of doubt, reference shall be made to the methods specified in the appropriate American National standard, referenced in clause 2, to establish the validity of the results obtained by any alternate procedure.

2. Normative references

The following standards contain provisions that, 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/IEC C78.60360-1992, Electric lamps – Standard Method of Measurement of Lamp Cap Temperature Rise

ANSI C78.40-1992, American National Standard – Specifications for Mercury Lamps

ANSI C78.42-2001, American National Standard for Electric Lamps – High-pressure Sodium Lamps

ANSI C78.43-2004, American National Standard for Electric Lamps — Single-Ended Metal Halide Lamps

[1] In the absence of an appropriate lamp standard, consult with particular lamp manufacturer offering the lamp in question

ANSI C78.380-2002, American National Standard for Electric Lamps — High-Intensity Discharge Lamps, Method of Designation

ANSI C78.1381-1989 (R1996), American National Standard for Electric Lamps – 70-Watt M85 Metal Halide Lamp

ANSI C78.1385-1998, American National Standard for Electric Lamps – 150-Watt M81 Metal Halide Lamp

ANSI C78.1386-1998, American National Standard for Electric Lamps – 100-Watt M91 Metal Halide Lamp

ANSI C78.1387-2001, American National Standard for Electric Lamps — 250-Watt, M80 Double-Ended Metal Halide Lamps

ANSI C82.5-1990 (R1995), Reference Ballasts for High-Intensity-Discharge Lamps

ANSI C82.6-1985, Ballasts for High Intensity Discharge Lamps—Method of Measurement

ANSI C82.9-1996, Definitions for High-Intensity-Discharge Lamps, Ballasts and Transformers

ANSI MC96.1-1982, Temperature Measurement Thermocouples

ANSI/UL 496-1986, Standard for safety – Edison-base Lampholders

UL 1598-2000 — Luminaires

3 Measurement of Lamp Voltage, Current, and Power

3.1. General

This section covers the measurement of lamp current, voltage, and power for mercury, high-pressure sodium and metal halide lamps, i.e., High Intensity Discharge (HID) lamps, as measured on a reference ballast having a sinusoidal voltage input. In order to start the lamp on a reference ballast, a voltage higher than the specified voltage may be required. An external starting aid is preferred (for example, a Tesla coil) in this case.

Due to their temperature behavior double-ended metal halide lamps must be operated in luminaires exclusively. Therefore, for measurement purposes, lamps must be operated within a luminaire simulator

Most HID lamps have a glass outer jacket to absorb UV radiation. If this jacket is broken, the lamp should immediately be extinguished. Some lamps require additional UV protection. Refer to the luminaire code letter, ANSI C78.380 and the manufacturer's instructions for additional information.

Some metal halide lamps may rupture resulting in the discharge of glass fragments and extremely hot particles. Follow the safety instructions from the lamp manufacturer to minimize the risk to personnel and property.

3.2. Power supply

3.2.1. Harmonic content

The supply voltage shall have a voltage wave shape such that the root-mean-square (rms) summation of the harmonic components shall not exceed 3% of the fundamental.

3.2.2. Voltage regulation

The supply voltage should be as steady and free from changes as possible. For best results, the voltage shall be regulated to within ± 0.5%. If adequate automatic regulation is not available, constant checking and readjustments are essential if accurate measurements of lamp characteristics are to be obtained.

3.2.3. Source Impedance

The power supply impedance, as measured at the point where the reference ballast and lamp are connected, shall not exceed 2 % of the reference ballast impedance. This requires that variable autotransformers or other voltage transformation devices have a kVA rating of at least five times the normal lamp wattage to ensure compliance with the preceding requirements.

3.3. Ambient condition

The ambient in which the lamp is operated shall be maintained at 25°C ± 5°C and shall be draft-free.

3.4 Ballasts

When the electrical characteristics of a given high intensity discharge lamp are being measured, the lamp shall be operated with a reference ballast of the appropriate rating. The use of a ballast having different characteristics (even though of the same impedance) can materially alter the electrical characteristics of the lamp. For the proper reference ballast to be used, refer to the