NEMA SSL 7A-2013

Phase Cut Dimming for Solid State Lighting: Basic Compatibility

Published by

National Electrical Manufacturers Association 1300 North 17th Street, Suite 900 Rosslyn, Virginia 22209

Approved April 18, 2013

www.nema.org

© Copyright 2013 by the National Electrical Manufacturers Association. All rights including translation into other languages, reserved under the Universal Copyright Convention, the Berne Convention for the Protection of Literary and Artistic Works, and the International and Pan American Copyright Conventions.

This is a preview. Click here to purchase the full publication.

NOTICE AND DISCLAIMER

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

National Electrical Manufacturers Association (NEMA) standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. While NEMA administers the process and establishes rules to promote fairness in the development of consensus, it does not write the document and it does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

NEMA disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. NEMA disclaims and makes no guaranty or warranty, expressed or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any of your particular purposes or needs. NEMA does not undertake to guarantee the performance of any individual manufacturer or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, NEMA is not undertaking to render professional or other services for or on behalf of any person or entity, nor is NEMA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

NEMA has no power, nor does it undertake to police or enforce compliance with the contents of this document. NEMA does not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health or safety–related information in this document shall not be attributable to NEMA and is solely the responsibility of the certifier or maker of the statement.

FOREWORD

The NEMA Solid State Lighting section has prepared this standard, *Phase Cut Dimming for Solid State Lighting: Basic Compatibility*. This standard provides compatibility requirements for phase cut dimming for LED light engines and is suitable for global use.

In the preparation of this standard, input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product subdivision by contacting:

Senior Technical Director, Operations National Electrical Manufacturers Association 1300 North 17th Street, Suite 900 Rosslyn, Virginia 22209

Section approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development.

At the time the standard was approved, the Solid State Lighting section was composed of the following members:

Acuity Brands Lighting Cree, Inc.

Dialight Corporation Eaton Cooper Lighting

EiKO, Ltd.

EYE Lighting International of N.A., Inc.

GE Lighting Solutions

Hatch Transformers, Inc.

Hubbell Lighting, Inc.

Leviton Lighting & Energy Solutions

Lighting Science Group Corporation

Luminus Devices, Inc.

Lutron Electronics Company, Inc.

Optiled Technology LLC

OSRAM SYLVANIA Inc.

Philips Electronic North America

Ruud Lighting Inc. Cree Company

Satco Products, Inc.

Schneider Electric

Soraa Inc.

Technical Consumer Products, Inc.

TerraLUX INC.

Toshiba LED Lighting

Universal Lighting Technologies

<This Page Intentionally Left Blank.>

© Convright 2013 by National Electrical Manufacturers Association

This is a preview. Click here to purchase the full publication.

TABLE OF CONTENTS

	FOREWORD	.iii
1.1 1.2 1.3 1.4	GENERAL SCOPE ORGANIZATION NORMATIVE REFERENCES. INFORMATIVE REFERENCES	. 1 . 2 . 2
1.5	DEFINITIONS	. 2
2 2.1 2.2	PHASE CONTROL DIMMINGLLE/DIMMER COMPATIBILITY FACTORS	. 5
3	DIMMER	. 7
3.1	GENERAL	
3.2	RATED WATTAGE	. 7
3.3	FORWARD PHASE-CONTROL STABILITY REQUIREMENTS	
3.4	INRUSH CURRENT	.7
3.5	REPETITIVE PEAK CURRENT	
3.6 3.7	OVERLOADREPETITIVE PEAK VOLTAGE	. გ
3.7	MINIMUM ON-STATE CONDUCTION ANGLE	
3.9	MAXIMUM ON-STATE CONDUCTION ANGLE	
3.10	OFF-STATE OPERATION	
3.10.1	Background	
3.10.2	Test	
3.11	ON-STATE DIMMER SUPPLY CURRENT	12
3.12	MARKING REQUIREMENTS	
3.12.1	Maximum Rated Wattage	
3.12.2	Minimum Load	
3.12.3	Off-state	
3.12.4	Operating Voltage	
3.12.5	Dimmers with Multiple Modes	14
4	LLE	15
4.1	PHASE-CONTROL REQUIREMENTS	15
4.2	RATED WATTAGE	
4.3	POWER FACTOR	15
4.4	MAXIMUM RMS CURRENT	
4.5	INRUSH CURRENT	
4.6	REPETITIVE PEAK CURRENT	_
4.7	REPETITIVE PEAK VOLTAGE	
4.8	LIGHT OUTPUT	
4.8.1 4.8.2	Maximum Light Output on a Dimmer.	
4.6.2 4.9	Minimum Light Output on a Dimmer	Ι <i>Ι</i> 1Ω
4.9.1	Background	
4.9.1	Testing	
4.10	ON-STATE OPERATION	
4.10.1	Background	
4.10.2	Testing	
4.10.2.1	Type 2 LLE Testing	19
4.10.2.2	Type 1 LLE Testing	
4.11	MARKING REQUIREMENTS	
4.11.1	RMLO	20