

UL 1472

ISBN 1-55989-944-1

Solid-State Dimming Controls



*UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL*



Documents

Document Sharing Hub

Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety for Solid-State Dimming Controls, UL 1472

First Edition, Dated January 2, 1996

Revisions: This Standard contains revisions through and including June 19, 2006.

Summary of Topics

The revisions dated June 19, 2006 were issued to:

- 1. Clarify the scope with respect to ratings and uses for dimmers***
- 2. Update references for requirements for cover plates for flush-mounted dimmers***
- 3. Clarify markings for dimmers with respect to air-gap switches, electronic ballasts, electronic transformers, and location of model and catalog numbers***
- 4. Clarify the use of a synthetic load in place of a magnetic ballast***
- 5. Add requirements for electronic transformers for low voltage incandescent lighting***
- 6. Clarify the acceptance criteria for the Air-Gap Switch Test***
- 7. Update wording for consistency and clarification reasons***

UL Standards for Safety are developed and maintained in the Standard Generalized Markup Language (SGML). SGML -- an international standard (ISO 8879-1986) -- is a descriptive markup language that describes a document's structure and purpose, rather than its physical appearance on a page. Due to formatting differences resulting from the use of UL's new electronic publishing system, please note that additional pages (on which no requirements have been changed) may be included in revision pages due to relocation of existing text and reformatting of the Standard.

Text that has been changed in any manner is marked with a vertical line in the margin.

The new requirements are substantially in accordance with UL's Proposal(s) on this subject dated September 23, 2005 and March 17, 2006.

The revisions dated June 19, 2006 include a reprinted title page (page1) for this Standard.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

The UL Foreword is no longer located within the UL Standard. For information concerning the use and application of the requirements contained in this Standard, the current version of the UL Foreword is located on ULStandardsInfoNet at: <http://ulstandardsinfo.net/ulforeword.html>

The master for this Standard at UL's Northbrook Office is the official document insofar as it relates to a UL service and the compliance of a product with respect to the requirements for that product and service, or if there are questions regarding the accuracy of this Standard.

UL's Standards for Safety are copyrighted by UL. Neither a printed copy of a Standard, nor the distribution diskette for a Standard-on-Diskette and the file for the Standard on the distribution diskette should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

Revisions of UL Standards for Safety are issued from time to time. A UL Standard for Safety is current only if it incorporates the most recently adopted revisions.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

UL will attempt to answer support requests concerning electronic versions of its Standards. However, this support service is offered on a reasonable efforts basis only, and UL may not be able to resolve every support request. UL supports the electronic versions of its Standards only if they are used under the conditions and operating systems for which it is intended. UL's support policies may change from time-to-time without notification.

UL reserves the right to change the format, presentation, file types and formats, delivery methods and formats, and the like of both its printed and electronic Standards without prior notice.

Purchasers of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgement (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

If a single-user version electronic Standard was purchased, one copy of this Standard may be stored on the hard disk of a single personal computer, or on a single LAN file-server or the permanent storage device of a multiple-user computer in such a manner that this Standard may only be accessed by one user at a time and for which there is no possibility of multiple concurrent access.

If a multiple-user version electronic Standard was purchased, one copy of the Standard may be stored on a single LAN file-server, or on the permanent storage device of a multiple-user computer, or on an Intranet server. The number of concurrent users shall not exceed the number of users authorized.

Electronic Standards are intended for on-line use, such as for viewing the requirements of a Standard, conducting a word search, and the like. Only one copy of the Standard may be printed from each single-user version of an electronic Standard. Only one copy of the Standard may be printed for each

authorized user of a multiple-user version of an electronic Standard. Because of differences in the computer/software/printer setup used by UL and those of electronic Standards purchasers, the printed copy obtained by a purchaser may not look exactly like the on-line screen view or the printed Standard.

An employee of an organization purchasing a UL Standard can make a copy of the page or pages being viewed for their own fair and/or practical internal use.

The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

Copyright © 2006 Underwriters Laboratories Inc.

This Standard consists of pages dated as shown in the following checklist:

Page	Date
1-3	June 19, 2006
4	January 6, 2003
5-15	June 19, 2006
16	January 2, 1996
16A-17.....	June 19, 2006
18	January 2, 1996
19-20B.....	June 19, 2006
21	October 30, 1998
22	January 2, 1996
23-24B.....	June 19, 2006
25-26	October 30, 1998
27	January 2, 1996
28-28B.....	June 19, 2006
29-36	January 2, 1996
37	October 30, 1998
38.....	June 19, 2006
39	October 30, 1998
40	January 2, 1996
A1-A2.....	January 6, 2003
B1-B2.....	January 2, 1996

No Text on This Page



Canadian Standards Association
CSA-C22.2 No. 184.1-96
First Edition

Underwriters Laboratories Inc.
UL 1472
First Edition



Solid-State Dimming Controls

January 2, 1996

(Title Page Reprinted: June 19, 2006)



ANSI/UL 1472-2006

UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL



Documents

Document Sharing Hub

Commitment for Amendments

This Standard is issued jointly by Canadian Standards Association and Underwriters Laboratories Incorporated. Amendments to this Standard will be made only after processing according to the Standards writing procedures by both Canadian Standards Association and Underwriters Laboratories Incorporated.

The most recent designation of ANSI/UL 1472 as an American National Standard (ANSI) occurred on June 16, 2006 and covers the first edition including revisions through June 19, 2006. The ANSI approval does not include the Cover Page, Transmittal, Title Page, Appendix A, or Appendix B. Approval of ANSI/UL 1472 as an American National Standard is maintained using the continuous maintenance process. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

ISSN 0317-5669

ISBN 1-55989-944-1

Copyright © 1996

Canadian Standards Association

All rights reserved. No part of this publication may be reproduced in any form whatsoever without the prior permission of the publisher.

Copyright © 1996, 2006

Underwriters Laboratories Inc.

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL**



Documents

Document Sharing Hub

CONTENTS

Preface	5
1 Scope	11
2 Definitions	11
3 General requirements	12
3.1 Components	12
3.2 Normative references	13
3.3 Units of measurement	14
4 Construction	14
4.1 Polymeric materials	14
4.2 Actuating member	14A
4.3 Spacings	14A
4.4 Means for mounting	14C
4.5 Current-carrying parts	14C
4.6 Grounding and bonding	16
4.7 Switches	16A
4.8 Flush-device cover plates	16B
4.9 Touch dimmers	16B
5 Tests	18
5.1 Test conditions	18
5.2 Test loads	18
5.3 Overload tests	20
5.4 Endurance test	20A
5.5 Temperature test	21
5.6 Dielectric voltage-withstand test	23
5.7 Air-gap switch test	23
5.8 Security of lead test	24
5.9 Torque and pull-out tests	24
5.10 Limited short-circuit test	24
5.11 D-C offset test	25
5.12 Mold stress-relief distortion test	25
5.13 Leakage current test for touch dimmers	25
5.14 Grounding and bonding conductor test	26
6 Manufacturing and production tests	26
6.1 Dielectric voltage-withstand test	26
7 Markings	27
7.1 General	27
7.2 Field wiring terminals	28A
7.3 Cautionary	29

Appendix A

Standards for Components

A1 Component Standards	A1
------------------------------	----

Appendix B

French translations and markings

Preface

This is the common UL and CSA Standard for Solid-State Dimming Controls. It is the first edition of both CSA-C22.2 No. 184.1-96 and UL 1472.

This common Standard was prepared by a Task Force comprised of members representing CSA, UL, NEMA (National Electrical Manufacturers Association) and the EFC (Electro-Federation of Canada).

This standard includes all items presently covered in C22.2 No. 184-M1988 except the following:

- a) Lighting controls without integral switching (disconnecting control).
- b) Devices used as table mounted unit to which a portable luminaire can be temporarily connected.
- c) Devices installed in lampholders.
- d) Devices permanently installed in the supply line of a lamp.
- e) Direct plug-in devices.

The above will be accommodated either in a new edition of C22.2 No. 184, or in future revisions of this standard.

Note: *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*

Level of Harmonization

This Standard is published as an identical standard for UL and CSA.

An identical standard is a standard that is the same in technical content except for conflicts in Codes and Governmental Regulations. Presentation shall be word for word except for editorial changes.

Interpretations

The interpretation by the SDO of an identical or equivalent standard shall be based on the literal text to determine compliance with the standard in accordance with the procedural rules of the SDO. If more than one interpretation of the literal text has been identified, a revision shall be proposed as soon as possible to each of the SDOs to more accurately reflect the intent.

UL Effective Date

As of May 26, 2006 all products Listed or Recognized by UL must comply with the requirements in this Standard.

CSA Effective Date

The effective date for CSA will be announced through CSA Informs or CSA Certification Notice.

SDO Forewords

The UL Foreword is no longer located within the UL Standard. The CSA Foreword is included as an SDO-specific page in the CSA version of this co-published standard. The current version of the UL Foreword is located on ULStandardsInfoNet at: <http://ulstandardsinfo.net.ul.com/ulforeword.html>.

*UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL*



Documents

Document Sharing Hub

This page intentionally left blank.



This page intentionally left blank.

*UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL*



Documents

Document Sharing Hub

Solid-State Dimming Controls

1 Scope

1.1 These requirements cover permanently installed devices, hereafter referred to as dimmers, that employ a dimming function intended for control of lighting loads of the ballast, transformer, or tungsten-filament type, and are intended to be installed in a wallbox or are provided with an enclosure for flush or surface mounting in accordance with the Canadian Electric Code, Part 1 (CEC), and the National Electrical Code (NEC), ANSI/NFPA 70.

1.2 These requirements cover dimmers, other than touch dimmers, rated 600 volts ac or less, for installation on a 20-ampere or less branch circuit.

1.2A These requirements cover touch dimmers rated 120 volts ac or less for installation on a 20-ampere or less branch circuit.

1.3 These requirements cover dimmers, including touch dimmers, and electronic switches, having a minimum power rating of 300 watts or 300 volt-amperes in increments of 50 watts or 50 volt-amperes.

1.4 A device incorporating other functions (for example, speed control) in addition to a dimming function is investigated on the basis of compliance with the applicable requirements for the dimming function in this Standard as well as requirements for the other functions in the applicable standards.

1.5 These requirements do not cover dimmers that use only a resistor or a transformer to perform the dimming function.

1.6 These requirements do not cover modular, cabinet or console type constructions.

1.6A These requirements do not cover dimmers intended primarily for use in theaters. Dimmers for use in theaters are covered by the Standard for Industrial Control Equipment, UL 508/CSA C22.2 No. 14.

1.7 *deleted June 19, 2006.*

2 Definitions

2.1 The following definitions apply in this Standard.

Actuating member – Part of the operating mechanism that is used for the dimming control functions. This member may also be used to operate the air-gap switch.

Dimmer – A device intended to change lighting to various intensities. For the purposes of these requirements, the term “dimmer” refers to all products covered by this Standard.

Electronic switch – A solid-state device that performs strictly an on-off function and meets the requirements of this standard including the air-gap switch requirement.

Off position – The air-gap switch is in the open position.

Opposite polarity – A difference of potential between two points where shorting of these two points would result in a condition involving overload, rupturing of printed wiring board tracks, components, fuses, or the like.

Touch dimmer – A device using circuitry for touch actuation in accordance with Clauses 4.9 and 5.13. Examples of such circuitry are non-isolated sensing or conductively connected dead metal.

Type I dimmer – A dimmer in which the air-gap switch is used to energize preset lighting levels.

Type II dimmer – UL A dimmer with an air-gap switch that opens and closes the load circuit at the minimum output voltage setting only.

Type IIa dimmer – A dimmer with an air-gap switch that opens and closes the load circuit at the maximum output voltage setting only.

Type III dimmer – A dimmer incorporating solid-state components providing preestablished rectified output settings.

Type IV dimmer – A dimmer not covered by Types I – III.

3 General requirements

3.1 Components

3.1.1 Except as indicated in Clause 3.1.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of Standards covering components generally used in the products covered by this Standard. A component shall comply with both the Underwriters Laboratories Inc. and Canadian Standards Association Standards for the component.

3.1.2 A component need not comply with a specific requirement that:

- a) involves a feature or characteristic not needed in the application of the component in the product covered by this Standard, or
- b) is superseded by a requirement in this Standard.

3.1.3 A component shall be used in accordance with its rating for the intended conditions of use.

3.1.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3.2 Normative references

3.2.1 Where reference is made to other publications, such reference shall be considered to refer to the latest edition and all amendments published to that edition up to the time when this Standard was published:

UL Standards

Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances,
UL 94

Standard for Wire Connectors and Soldering Lugs for Use With Copper Conductors,
UL 486A

Standard for Wire Connectors for Use With Aluminum Conductors,
UL 486B

Standard for Equipment Wiring Terminals for Use With Aluminum and/or Copper Conductors,
UL 486E

Standard for Metallic Outlet Boxes,
UL 514A

Standard for Nonmetallic Outlet Boxes, Flush Device Boxes, and Covers,
UL 514C

Standard for Polymeric Materials – Long Term Property Evaluations,
UL 746B

Standard for Polymeric Materials – Use in Electrical Equipment Evaluations,
UL 746C

Standard for Insulation Coordination Including Clearances and Creepage Distances for Electrical Equipment,
UL 840

Standard for Across-the-Line, Antenna-Coupling, and Line-By-Pass Capacitors for Radio-and-Television-Type Appliances,
UL 1414

CSA Standards

C22.2 No. 0.17,
Evaluation of Properties of Polymeric Materials

C22.2 No. 18-92,
Outlet Boxes, Conduit Boxes and Fittings

C22.2 No. 65-93,
Wire Connectors

3.2.2 This Standard refers to the following publications and where such reference is made it shall be to the edition listed below.

ANSI Standards

ANSI MC96.1-1982,
Temperature Measurement Thermocouples

ANSI/NFPA 70-1993,
National Electrical Code (NEC)

CSA Standards

C22.1-1994,
Canadian Electrical Code, Part 1

3.3 Units of measurement

3.3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Construction

4.1 Polymeric materials

4.1.1 A polymeric material used for electrical insulation or as an enclosure part shall have a flammability class rating of 5VA, 5VB, V-0, V-1, or V-2 in accordance with UL 94 and C22.2 No. 0.17. The flammability class rating shall be investigated at the nominal minimum thickness of a polymeric material used within 0.8 mm (1/32 inch) of uninsulated live parts.

Exception No. 1: A polymeric material that complies with either the 12 mm or 3/4 inch flame flammability test described in UL 746C and C22.2 No. 17, need not have a flammability class rating.

Exception No. 2: If the polymeric material is not used in place of the spacings specified in Table 4, a polymeric material used in a rear housing totally contained within the volume of the outlet box may have a minimum flammability class rating of HB.

4.1.2 A polymeric material used for electrical insulation or as an enclosure part shall have a performance level category (PLC), determined in accordance with UL 746C, that complies with the requirements specified in Table 1 for electrical insulation or Table 2 for enclosure parts, respectively.

Exception No. 1: A polymeric material that complies with the requirements in UL 746C is considered to comply with both Table 1 and Table 2.

Exception No. 2: If the spacings to a polymeric material used as an enclosure part are not greater than the through-air and over-surface spacings specified in Table 4, the polymeric material shall comply with both Table 1 and Table 2.

Exception No. 3: If the polymeric material is not used in place of the spacings specified in Table 4, a polymeric material that does not contact uninsulated live parts and that is used as a rear housing totally contained within the volume of the outlet box need not comply with the performance level categories.