



UL 1441

Underwriters Laboratories Inc. Standard for Safety

Coated Electrical Sleeving



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UL Standard for Safety for Coated Electrical Sleeving, UL 1441

Fourth Edition, Dated September 16, 2005

Summary of Topics

The revision of ANSI/UL 1441 is being issued to reaffirm approval as an American National Standard. No changes in requirements are involved.

As noted in the Commitment for Amendments statement located on the back side of the title page, UL and CSA are committed to updating this bi-national standard jointly. However, the revision pages dated November 9, 2009 will not be jointly issued by UL and CSA as these revision pages address only UL ANSI approval dates.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The revisions are substantially in accordance with Proposal(s) on this subject dated August 28, 2009.

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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 preface. 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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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Canadian Standards Association
CSA C22.2 No. 198.3-05
Second Edition



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UL 1441
Fourth Edition

Coated electrical sleeving

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Commitment for Amendments

This standard is issued jointly by Canadian Standards Association (CSA) and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of CSA and UL. CSA and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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This ANSI/UL Standard for Safety consists of the Fourth edition including revisions through November 9, 2009.

The most recent designation of ANSI/UL 1441 as a Reaffirmed American National Standard (ANS) occurred on November 9, 2009. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

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Preface

This is the common CSA and UL standard for Coated electrical sleeving. It is the second edition of CSA C22.2 No. 198.3 and the fourth edition of UL 1441. This edition of CSA C22.2 No. 198.3 supersedes the previous edition published in 1995. This edition of UL 1441 supersedes the previous edition published in 1995.

This common standard was prepared by the Canadian Standards Association (CSA) and Underwriters Laboratories Inc. (UL). The efforts and support of the Technical Harmonization Committee 15C (Electrical Tubing and Sleeving Products) of the Council on the Harmonization of Electrotechnical Standards of the Nations of the Americas (CANENA) are gratefully acknowledged.

This standard was reviewed by the CSA Subcommittee on Insulation Systems, under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee.

This standard will be submitted to the Standards Council of Canada (SCC) for approval as a National Standard of Canada.

This standard has been approved by the American National Standards Institute (ANSI) as an American National Standard.

Where reference is made to a specific number of samples to be tested, the specified number shall be considered a minimum quantity.

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 uses the IEC format but is not based on, nor is it to be considered equivalent to, an IEC standard. This standard is published as an equivalent standard for CSA and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Reasons for differences from IEC

The Technical Harmonization Subcommittee identified the following standard as being within the scope of this standard: IEC 60684, Flexible Insulating Sleeving. IEC 60684 and UL 1441/CSA C22.2 No. 198.3 are similar but not identical. Both standards cover multiple, but not identical, products and similar methods. The THC agreed to address the issues involved in the harmonization of these standards during the next revision of UL 1441/CSA C22.2 No. 198.3.

Interpretations

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

CSA effective date

The effective date for CSA International will be announced through *CSA Informs* or a CSA certification notice.

UL effective date

As of September 16, 2005 all products Listed or Recognized by UL must comply with the requirements in this standard except for Clause 6 which is effective September 16, 2006. New product submittals to UL may be evaluated under all requirements in this standard or, if requested in writing, evaluated under presently effective requirements only. The presently effective requirements are contained in the Third edition of UL 1441.

A UL effective date is one established by Underwriters Laboratories Inc. and is not part of the ANSI approved standard.

Coated electrical sleeving

1 Scope

1.1 The requirements of this Standard apply to Grades A and B acrylic-polymer-coated, silicone-polymer-coated, or vinyl-polymer-coated electrical sleeving that consists of closely woven fabric made from glass (see Table 1 for materials and ratings) and intended for use in equipment designed to be installed and used in accordance with the rules of the Canadian Electrical Code, Part I (CEC), or ANSI/NFPA 70, National Electrical Code (NEC). A product for use at temperatures greater than indicated in Clause 1.2 or a different polymer coating or fibre may be acceptable provided that

- (a) it meets the performance tests in this Standard; and
- (b) long-term heat-aging tests are conducted as covered in UL 746B or CAN/CSA-C22.2 No. 0.17, using dielectric strength as a primary property and flammability as a secondary property.

1.2 These requirements apply to coated electrical sleeving having a standard temperature index classification of 105, 130, 155, 180, 200, 220, and 240 °C.

1.3 These requirements apply to coated electrical sleeving intended for use in connection with the internal wiring of electrical devices and appliances located in dry or damp locations where it is not feasible to employ a standard insulated conductor, such as appliance-wiring material, specifically intended for the purpose. Coated electrical sleeving is intended for insulating one or more uninsulated or partially insulated conductors, bus bars, component leads, or assemblies of electrical components. Coated electrical sleeving may be employed in equipment where it is not subjected to repeated flexing or severe mechanical stress.

1.4 These requirements apply to oil-resistant coated electrical sleeving intended for occasional or intermittent contact with oil.

1.5 These requirements do not apply to unimpregnated or uncoated fabric sleeving, which is generally not considered acceptable for sole (functional) insulation because of the openings inherent in the weave construction of the sleeving fabric.

1.6 These requirements do not apply to tubing extruded with reinforcement, extruded electrical tubing, or tubing intended only for mechanical protection, since they are covered by other requirements.

1.7 These requirements do not apply to coated electrical sleeving when it is employed as splice insulation in an insulation system above 105 °C (Class A) operation.

2 Reference publications and definitions

2.1 Reference publications

For undated references to standards, such reference shall be considered to refer to the latest edition and all revisions to that edition up to the time when this Standard was approved.

For dated references to standards, such reference shall be considered to refer to the dated edition and all revisions published to that edition up to the time the standard was approved.

CSA (Canadian Standards Association)

C22.1-02

Canadian Electrical Code, Part I

C22.2 No. 0.3-01

Test Methods for Electrical Wires and Cables

CAN/CSA-C22.2 No. 0.17-00

*Evaluation of Properties of Polymeric Materials***UL (Underwriters Laboratories Inc.)**

UL 746B

Standard for Polymeric Materials – Long Term Property Evaluations

UL 1581

*Reference Standard for Electrical Wires, Cables, and Flexible Cords***ANSI/NFPA (American National Standards Institute/National Fire Protection Association)**

NFPA 70-2005

*National Electrical Code***ASTM (American Society for Testing and Materials)**

D 257-99

Standard Test Methods for DC Resistance or Conductance of Insulating Materials

D 350-01

Standard Test Methods for Flexible Treated Sleeving Used for Electrical Insulation

D 2671-00

Standard Test Method for Heat-Shrinkable Tubing for Electrical Use

D 5025-99

Standard Specification for Laboratory Burner Used for Small-Scale Burning Tests on Plastic Materials

D 5207-03

Standard Practice for Confirmation of 20-mm (50-W) and 125-mm (500-W) Test Flames for Small-Scale Burning Tests on Plastic Materials

D 5423-93 (1999)

Standard Specification for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation

2.2 Definitions

2.2.1 For the purposes of this standard, the following definitions apply.

2.2.2 Coated electrical sleeving – a sleeving base that is coated with an electrical insulating material that completely covers the fabric interstices and is then cured.

2.2.3 Sizing – a compound that, when applied to sleeving, forms a more or less continuous film around the individual fibres.

3 General requirements

The values given in SI (metric) units shall be normative. Any other values given shall be for information purposes only, except for conductor sizes where the equivalent metric values are in parentheses.

4 Construction

4.1 General

4.1.1 The coated electrical sleeving shall be made with the degree of uniformity and quality of work that are practicable in a well-equipped factory.

4.1.2 The sleeving base shall be made from closely woven fibres or monofilaments that may or may not employ a sizing agent.

4.1.3 The surface of the coated electrical sleeving shall be relatively smooth and free from blisters, cracks, and other defects that can be detrimental to the coated electrical sleeving in its intended use.

4.1.4 The acceptability of the coated electrical sleeving in any particular device or appliance depends on the conditions that prevail in actual service. Accordingly, for a particular application, the coated electrical sleeving will in some cases be affected by the requirements for the device or appliance in which the sleeving will be used, and it will be necessary to employ a coated electrical sleeving having features other than, or in addition to, those specified in these requirements. For example, coated electrical sleeving may be required to have a heavier wall thickness or a cross-section other than round; or it may be required to have an inherent resistance to the effects of immersion in water, oil, solvents, or other liquids or their vapours; or it may be required to be resistant to the development of fungi and similar organisms.

4.1.5 Sleeving may be of intermediate sizes, providing such sleeving complies with the minimum thickness requirement for the next larger size of sleeving.

4.1.6 Coated electrical sleeving designated as Grade A shall meet the following requirements:

(a) a 7000 V minimum average of 10 readings and a 5000 V minimum individual dielectric breakdown after being conditioned for 40 hours at 23.0 ± 2.0 °C (73.4 ± 3.6 °F) and 50 ± 5 percent relative humidity; and

(b) a 2200 V minimum average of 10 readings dielectric breakdown after being conditioned for 96 hours at 35.0 ± 2.0 °C (95.0 ± 3.6 °F) and 90 ± 5 percent relative humidity.