

UL 1309

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Marine Shipboard Cable





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July 14, 1995

Standard for

Marine Shipboard Cable

UL 1309, First Edition

Accompanying this transmittal notice is a copy of the First edition of UL 1309.

THIS EDITION OF THE STANDARD IS NOW IN EFFECT

The requirements in this standard are substantially in accordance with UL's bulletins on this subject dated November 23, 1993 and September 30, 1994. These bulletins are now obsolete and may be discarded.

Revised and/or additional pages may be issued from time to time.

Canadian Standards Association
C22.2 No. 245
First Edition

Underwriters Laboratories Inc.
UL 1309
First Edition

Marine Shipboard Cable

July 14, 1995

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.

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Preface

This is the common UL and CSA Standard for Marine Shipboard Cable. It is the first edition of CSA Standard C22.2 No. 245, and the first edition of UL 1309.

This common Standard was prepared by the Canadian Standards Association and Underwriters Laboratories Inc.

This Standard was reviewed by the Technical Committee on Wiring Products under the jurisdiction of the Steering Committee on the Canadian Electrical Code, Part II and was approved by these Committees. It is intended to meet the electrical regulations of the Canadian Coast Guard and U.S. Coast Guard.

July 14, 1995

UL Effective Date

These new and revised requirements are now in effect.

CSA Effective Date

The effective date for CSA will be announced through *CSA Informs*.

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.*

Foreword (CSA)

The Canadian Standards Association provides certification services for manufacturers who, under license from CSA, wish to use the appropriate registered CSA Marks on certain products of their manufacture to indicate conformity with CSA Standards.

CSA Certification for a number of products is provided in the interest of maintaining agreed-upon standards of quality, performance, interchangeability and/or safety, as appropriate. Where applicable, certification may form the basis for acceptance by inspection authorities responsible for enforcement of regulations. Where feasible, programs will be developed for additional products for which certification is desired by producers, consumers or other interests.

In performing its functions in accordance with its objectives, CSA does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of the Association represent its professional judgement given with due consideration to the necessity limitations of practical operation and state of the art at the time the Standard is processed.

Products in substantial accord with this Standard but which exhibit a minor difference or a new feature may be deemed to meet the Standard providing the feature or difference is found acceptable utilizing appropriate CSA Certification Division Operating Procedures. Products which comply with this Standard shall not be certified if they are found to have additional features which are inconsistent with the intent of this Standard. Products shall not be certifiable if they are discovered to contravene applicable Federal laws or regulations.

Testing techniques, test procedures and instrumentation frequently must be prescribed by the CSA Certification Division in addition to the technical requirements contained in Standards of CSA. In addition to markings specified in the Standard the CSA Certification and Testing Division may require special cautions, markings and instructions that are not specified by the Standard.

Some tests required by CSA Standards may be inherently hazardous. The Association neither assumes nor accepts any responsibility for any injury or damage that may occur during or as the result of tests, wherever performed, whether performed in whole or in part by the manufacturer or the Association, and whether or not any equipment, facility or personnel for in connection with the test is furnished by the manufacturer or the Association.

Manufacturers should note that, in the event of the failure of the CSA Certification and Testing Division to resolve an issue arising from the interpretation of requirements, there is an appeal procedure: the complainant should submit the matter, in writing, to the Secretary of the Canadian Standards Association.

If this Standard is to be used in obtaining CSA Certification please remember, when making application for certification, to request all current Amendments, Bulletins, Notices and Technical Information Letters that may be applicable and for which there may be a nominal charge. For such information or for further information concerning details about CSA Certification please address your inquiry to the Applications and Records Section, Canadian Standards Association, 178 Rexdale Boulevard, Etobicoke (Toronto), Ontario M9W 1R3.

Foreword (UL)

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.



Documents

Document Sharing Hub

Marine Shipboard Cable

1 Scope

1.1 This Standard specifies the requirements for distribution (power), control, and signal cables for use aboard commercial ships and mobile offshore drilling units (MODU's), rated 8000 V maximum, in single or multiconductor construction, with or without metal armour, and with or without an overall jacket.

1.2 This Standard may not cover all types, sizes, and voltage ratings of marine shipboard cable that may be required for particular applications.

1.3 The performance requirements of this Standard include the performance requirements of IEEE Standard 45-1983.

2 General

2.1 Reference publications

2.1.1 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 approved.

CSA Standards

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

CAN/CSA-C22.2 No. 0.3-92,
Test Methods for Electrical Wires and Cables;

C22.2 No. 38-M1986,
Thermoset Insulated Wires and Cables;

C22.2 No. 123-M1985 (R1992),
Aluminum Sheathed Cables;

C22.2 No. 124-M1986 (R1992),
Mineral-Insulated Cable;

CAN/CSA-C68.3-M92,
Shielded and Concentric Neutral Power Cables Rated 5–46 kV.

UL Standards

44-1994,
Rubber-Insulated Wires and Cables;

83-1993,
Thermoplastic-Insulated Wires and Cables;

1072-1993,
Medium Voltage Power Cables;

1569-1994,
Metal-Clad Cables;

1581-1994,
Reference Standard for Electrical Wires, Cables and Flexible Cords;

1685-1992,
Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables.

ASTM¹ Standards

B 3-1990,
Standard Specification for Soft or Annealed Copper Wire;

B 8-1993,
Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft;

B 33-1991,
Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes;

B 172-1990,
Standard Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors;

B 173-1990,
Standard Specification for Rope-Lay-Stranded Copper Conductors Having Concentric-Stranded Members, for Electrical Conductors;

B 174-1990,
Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors;

B 189-1990,
Standard Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes;

B 496-1992,
Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors;

B 787-1993,
Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation;

D 746-79 (1987),
Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact (R1987) DoD Adopted;

D 4496-87 (1993),
Standard Test Method for D-C Rated Resistance of Conductance of Moderately Conductive Materials.

IEC² Publications

228-1978,
Conductors of Insulated Cables;

331-1970,
Fire-resisting Characteristics of Electrical Cables.

IEEE³ Standards

45-1983 (R1989),
IEEE Recommended Practice for Electrical Installation of Shipboard;

S-135-1962,
Power Cable Ampacities;

1202-1991,
IEEE Standard for Flame Testing of Cables for use in Cable Tray in Industrial and Commercial Occupancies.

Military Standard

MIL-C-24643-1994,
General specification for cable and cord, electrical, low smoke, for ship board use.

ICEA⁴ Publication

S-61-402,
Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

¹American Society for Testing and Materials.

²International Electrotechnical Commission.

³Institute of Electrical and Electronics Engineers.

⁴Insulated Cables Engineers Association.

3 Construction

3.1 Copper conductors

3.1.1 General

3.1.1.1 All conductors shall be of soft annealed stranded copper wire. The conductors may be tinned or alloy-coated where necessary to ensure compatibility with primary insulation. Conductor sizes and resistances shall comply, within allowable tolerances, with CSA Standard C22.2 No. 0.3 or UL Standard 1581.

3.1.2 Composition

3.1.2.1 Stranded conductors shall comply with the requirements of ASTM Standard B 3, B 8, B 33, B 172, B 173, B 174, B 189, B 496, or B 787, as applicable. Metric sizes complying with IEC Publication 228 are acceptable.

3.1.3 Stranding

3.1.3.1 Except as specified in Clauses 3.1.3.2 to 3.1.3.5, the conductors shall be stranded Class B concentric conductors as specified in ASTM Standard B 8. (See Table 1A.)

3.1.3.2 Class B stranded conductors, compressed to a reduction in diameter of 3% maximum of concentric stranded conductors shall also be permitted.

3.1.3.3 Unilay stranded conductors complying with ASTM Standard B 787 shall also be permitted.

3.1.3.4 Flexible rope lay stranded conductors may be substituted for concentric conductors. Bunch-

stranded conductors in sizes 6 AWG and smaller may be substituted for concentric stranded conductor. (See Table 1B.)

3.1.3.5 Compact round concentric lay stranded copper conductors complying with ASTM Standard B 496 shall also be permitted. (See Table 1C.)

3.1.4 Joints

3.1.4.1 Joints in the individual wires of a stranded conductor shall neither increase the diameter nor substantially decrease the strength of the conductor or the individual wire. Joints in stranded conductors larger than 16 AWG shall only be permitted in the individual wires of the strand. The distance between brazes or welds in individual strand wires shall be not less than 0.3 m (1 ft) of conductor.

3.1.4.2 For rope-lay stranded conductors, a stranded member (primary group) may be jointed as a unit; these joints shall not be closer than two lay lengths.

3.1.4.3 Joints in stranded conductors 16 AWG and smaller may be made in the whole conductor provided that the solid section of the braze or weld does not exceed 13 mm (0.5 in) in length and the distance between brazes or welds is greater than 1000 mm (3280 ft) apart.

3.1.5 Conductor stress control layer (for cables rated above 2 kV)

3.1.5.1 The conductor stress control layer shall be an extruded semiconducting material of a thickness as shown in CSA Standard C68.3 or UL Standard 1072. This layer shall be applied over the surface of the conductor and bonded to the inner surface of the insulation. The conductor stress control layer material shall be compatible with all materials coming into contact with it.

3.1.5.2 The contact surface between the conductor stress control layer and the insulation shall be cylindrical and free from protrusions and irregularities that extend more than 0.13 mm (0.005 in) into the insulation or more than 0.25 mm (0.01 in) into the conductor stress control layer.

3.1.5.3 The conductor stress control layer shall have a maximum volume resistivity of 1000 $\Omega \cdot m$ at $90 \pm 1^\circ C$, and other physical properties in accordance with CSA Standard C68.3 or UL Standard 1072.

3.1.5.4 The extruded conductor stress control layer may be supplemented by a semiconducting tape applied directly over the conductor. The maximum dc resistance of the semiconducting tape at room temperature shall be 10 000 Ω per unit square, when determined according to ASTM Standard D4496.

3.1.5.5 The extruded conductor stress control layer material shall have a brittleness temperature not warmer than $-25^\circ C$ when tested in accordance with ASTM Standard D746.

3.1.5.6 The conductor stress control layer shall be easily removable from the conductor when terminating or splicing.

3.2 Insulation

3.2.1 Separator Where required to ensure free stripping, a suitable opaque separator tape may be applied to the conductor of a cable rated 2000 V or less.

3.2.2 General The insulation shall be one of the following types:

Marking code symbol	Material	Maximum conductor operating temperature °C
T75	polyvinyl chloride	75
T90	polyvinyl chloride	90
TPE 90	thermoplastic elastomer	90
T/N75	polyvinyl chloride/nylon	75
T/N90	polyvinyl chloride/nylon	90
E90	ethylene propylene rubber	90
X90	cross-linked/polyolefin	90
X100	cross-linked/polyolefin	100
X110	cross-linked/polyolefin	110
M90	mineral (MI)	90 ^a
S100	silicone rubber	100

Note: The maximum short circuit temperature of all thermoplastic materials is 150°C, and of the thermoset materials is 250°C.
^aA maximum conductor temperature of 250°C for Type M shall be permitted for special applications. For Type M, standard end fittings may be used providing the temperature does not exceed 85°C at the end fittings. However, when the temperature at the end fitting is higher than 85°C, appropriately rated end fittings are required.

3.2.3 Thickness of extruded insulation

3.2.3.1 The average thickness of the insulation shall not be less than the values given in Table 2.

3.2.3.2 The minimum thickness of the insulation at any point shall not be less than 90% of the average value shown in Table 2.

3.2.3.3 For silicone insulated conductor sizes larger than 8 AWG, refer to MIL-C-24643 for construction details using silicone impregnated tape insulation.

3.2.4 Properties of Insulation

3.2.4.1 The physical and electrical properties of the insulation materials shall meet the requirements of Table 3.

3.2.4.2 Type M cables are rated 600 V and shall conform to the requirements of CSA Standard C22.2 No. 124. Single conductor cables with stainless steel sheath shall not be permitted.

3.3 Insulation shield

3.3.1 The use of an insulation shield is optional for 5 kV cables. The use of an insulation shield is mandatory for 8 kV cables. Where an insulation shield is used, both the metallic and nonmetallic components shall comply with the requirements of CSA Standard C68.3 or UL Standard 1072.