CSA Group

C22.2 No. 245-17

Marine shipboard cable

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Preface

This is the third edition of CSA C22.2 No. 245, *Marine shipboard cable*. It supersedes the previous editions published in 2015 and 1995. It is one of a series of Standards issued by CSA Group under Part II of the *Canadian Electrical Code*.

This Standard was originally published as a harmonized Standard with Underwriters Laboratories Inc. It is now a non-harmonized CSA Group Standard.

This edition includes the following changes:

a) changes in the low smoke halogen free compliance which is now in Clause 5.3.10;
b) Clause 5.2.4 has been added to clarify the required production tests for cables above 2 kV;
c) in Clause 5.3.10, the halogen content is to be calculated for halogen free type only;
d) a note has been added in Table 5 to address the testing of cable jacket when the cables diameter is less than 16 AWG; and
e) various changes to the values in Table 7.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was prepared by the Integrated Committee on Control, Instrument, Communication, and Marine Cables, under the jurisdiction of the Technical Committee on Wiring Products and the Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the Technical Committee. It is intended to meet the electrical regulations of the Canadian Coast Guard.

Interpretations: The Strategic Steering Committee on Requirements for Electrical Safety has provided the following direction for the interpretation of standards under its jurisdiction: "The literal text shall be used in judging compliance of products with the safety requirements of this Standard. When the literal text cannot be applied to the product, such as for new materials or construction, and when a relevant committee interpretation has not already been published, CSA Group's procedures for interpretation shall be followed to determine the intended safety principle."

Notes:

1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
2) *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.*
3) *This Standard was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
4) *To submit a request for interpretation of this Standard, please send the following information to* ***inquiries@csagroup.org*** *and include "Request for interpretation" in the subject line:*
   a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
   b) *provide an explanation of circumstances surrounding the actual field condition; and*
   c) *where possible, phrase the request in such a way that a specific "yes" or "no" answer will address the issue.*

   Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are available on the* Current Standards Activities *page at* ***standardsactivities.csa.ca****.*

5) *This Standard is subject to review within five years from the date of publication. Suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to* ***inquiries@csagroup.org*** *and include "Proposal for change" in the subject line:*
   a) *Standard designation (number);*
   b) *relevant clause, table, and/or figure number;*
   c) *wording of the proposed change; and*
   d) *rationale for the change.*

C22.2 No. 245-17
Marine shipboard cable

1 Scope

1.1
This Standard specifies the requirements for distribution (power), control, and signal cables, for use aboard marine vessels and fixed and floating offshore drilling or production platforms, that are

a) rated up to 35 kV (ac or dc, phase-to-phase) maximum;
b) in single or multi-conductor constructions;
c) with or without metal armour; and
d) with or without an overall jacket.

Cables rated up to 1 kV ac can be rated at 2.8 kV dc.

1.2
The installations described in Clause 1.1 are designed to be installed in accordance with *Canadian Electrical Code (CE Code), Part I*.

Note: *Installation of cables is subject to requirements found in industry standards and local regulations.*

1.3
In this Standard, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; and “may” is used to express an option or that which is permissible within the limits of the standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

1.4
The values given in SI units are the units of record for the purposes of this Standard. The values given in parentheses are for information and comparison only.

2 Reference publications
This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

CSA Group

C22.1-15
Canadian Electrical Code, Part I

CAN/CSA-C22.2 No. 0-10 (R2015)
General requirements — Canadian Electrical Code, Part II

C22.2 No. 38-14
Thermoset-insulated wires and cables

C22.2 No. 75-14
Thermoplastic-insulated wires and cables

C22.2 No. 123-16
Metal sheathed cables

C22.2 No. 124-16
Mineral-insulated cable

C22.2 No. 210-15
Appliance wiring material products

C22.2 No. 2556-15
Wire and cable test methods

C68.10-14
Shielded power cable for commercial and industrial applications, 5–46 kV

ASTM International

B3-13
Standard Specification for Soft or Annealed Copper Wire

B8-11
Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

B33-10
Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes

B172-10
Standard Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors

B173-10
Standard Specification for Rope-Lay-Stranded Copper Conductors Having Concentric-Stranded Members, for Electrical Conductors

B174-10
Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors

B189-05 (2010)
Standard Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes

B286-07 (2012)
Standard Specification for Copper Conductors for Use in Hookup Wire for Electronic Equipment

B496-14
Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors

B784-01 (2012)
Standard Specification for Modified Concentric-Lay-Stranded Copper Conductors for Use in Insulated Electrical Cables

B787/B787M-2004 (2009)
Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation

ICEA/NEMA (Insulated Cable Engineers Association/ National Electrical Manufacturers Association)

ICEA S-82-552/NEMA WC 55-1992 (withdrawn)
Instrumentation Cables and Thermocouple Wire

ICEA S-73-532/NEMA WC 57-2004
Standard for Control, Thermocouple Extension, and Instrumentation Cables

IEC (International Electrotechnical Commission)

60331-1 :2009
Tests for electric cables under fire conditions — Circuit integrity — Part 1: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter exceeding 20 mm

60331-2:2009
Tests for electric cables under fire conditions — Circuit integrity — Part 2: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV and with an overall diameter not exceeding 20 mm

60331-3:2009
Tests for electric cables under fire conditions — Circuit integrity — Part 3: Test method for fire with shock at a temperature of at least 830 °C for cables of rated voltage up to and including 0,6/1,0 kV tested in a metal enclosure

60331-23:1999
Tests for Electric Cables under Fire Conditions — Circuit Integrity — Part 23: Procedures and Requirements — Electric Data Cables

60331-25:1999
Tests for Electric Cables under Fire Conditions — Circuit Integrity — Part 25: Procedures and Requirements — Optical Fibre Cables

ULC (Underwriters Laboratories Canada Inc.)

CAN/ULC-S139-12
Standard Method of Fire Test for Evaluation of Integrity of Electrical Power, Data and Optical Fibre Cables

U.S. Department of Defense

MIL-DTL-24643C Supplement 1A (2011)
Detail Specification — Cables, Electric, Low Smoke Halogen-Free, for Shipboard Use, General Specification for

3 General requirements

General requirements applicable to this Standard are given in CAN/CSA-C22.2 No. 0.

4 Construction

4.1 Copper conductors

4.1.1 General

All conductors shall be of soft annealed stranded copper wire. The conductors shall be tin-coated where necessary for the application. Conductor sizes and resistances shall comply within allowable tolerances with Tables 1, 2, and 3 where applicable. Compliance shall be determined in accordance with Clause 3 of CSA C22.2 No. 2556.

4.1.2 Stranding

4.1.2.1

Solid conductors shall not be used. Stranded conductors shall be manufactured to meet the requirements of ASTM B3, B8, B33, B172, B173, B174, B286, B189, B496 (compact conductors shall not be used in circuits rated 2 kV or less for flexing applications), B784, or B787, as applicable. Metric sizes complying with IEC 60228 are acceptable.

4.1.2.2

Compact conductors shall not be used in circuits rated 2 kV or lower.

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

4.1.3.1

The conductor stress control layer shall be an extruded semiconducting material of a thickness and physical properties as specified in CSA C68.10. 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.

4.1.3.2

When rope-lay conductors are used, a semiconducting tape shall be applied over the conductor and under the extruded semiconducting material described in Clause 4.1.3.1.

4.2 Insulation

4.2.1 General

The insulation shall be one of the following types:

Marking code symbol	Material	Maximum conductor operating temperature, °C
T75	Polyvinyl chloride (PVC)	75
TPE 90	Thermoplastic elastomer	90
T/N90	Polyvinyl chloride/nylon	90
E90	Ethylene propylene rubber (EPR)	90
X90	Cross-linked/polyolefin (XLPO)	90
X100	Cross-linked/polyolefin	100
X110	Cross-linked/polyolefin	110
S100	Silicone rubber	100
LSE90	Low smoke zero halogen EPR	90
LSX90	Low smoke zero halogen XLPO	90
LSX100	Low smoke zero halogen XLPO	100
LSX110	Low smoke zero halogen XLPO	110
LSS	Low smoke zero halogen silicon	100

Note: *The maximum short-circuit temperature of all thermoplastic materials is 150 °C. The maximum short-circuit temperature of the thermoset materials is 250 °C.*

4.2.2 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.

4.2.3 Thickness of extruded insulation

4.2.3.1

The average thickness of the insulation shall not be less than the values given in Table 4.

4.2.3.2

The minimum thickness of the insulation at any point shall not be less than 90% of the average value shown in Table 4 for cables rated 2 kV or less.

4.2.3.3

For silicone-insulated conductor sizes larger than 8 AWG, refer to MIL-DTL-24643C Supplement 1A for construction details using silicone-impregnated tape insulation.

4.2.4 Properties of insulation

4.2.4.1

The physical and electrical properties of the insulation materials shall meet the requirements of Table 5.