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Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 1: General requirements

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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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IEC 60245-1 has been prepared by IEC technical committee TC 20: Electric cables. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2003, and Amendment 1:2007. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) reference to IEC 60245-2 for the tests has been deleted and replaced by IEC 63294;
b) reference to lift cable according to IEC 60245-5 has been deleted;
c) normative references have been updated.

The text of this International Standard is based on the following documents:

Draft	Report on voting
20/2271/FDIS	20/2280/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all the parts in the IEC 60245 series, published under the general title *Rubber insulated cables - Rated voltages up to and including 450/750 V*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

1 Scope

This part of IEC 60245 applies to rigid and flexible cables with insulation, and sheath if any, based on vulcanized rubber of rated voltages U_o/U up to and including 450/750 V used in power installations of nominal voltage not exceeding 450/750 V AC.

Particular types of cables are specified in IEC 60245-3, IEC 60245-4, IEC 60245-6, IEC 60245-7, IEC 60245-8. The code designations of these types of cables are provided in Annex A of this document.

The test methods specified in Part 1 to Part 8 of the IEC 60245 series are given in IEC 63294 and in the relevant parts of IEC 60811.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60228, *Conductors of insulated cables*

IEC 60245-3, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 3: Heat resistant silicone insulated cables*

IEC 60245-4, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 4: Cords and flexible cables*

IEC 60245-6, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 6: Arc welding electrode cables*

IEC 60245-7, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 7: Heat resistant ethylene-vinyl-acetate rubber insulated cables*

IEC 60245-8, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 8: Cords for applications requiring high flexibility*

IEC 60811-401, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 401: Miscellaneous tests - Thermal ageing methods - Ageing in an air oven*

IEC 60811-403, *Electric and optical fibre cables - Test methods for non-metallic materials - Miscellaneous tests - Ozone resistance test on cross-linked compounds*

IEC 60811-404, *Electric and optical fibre cables - Test methods for non-metallic materials - Miscellaneous tests - Mineral oil immersion tests for sheaths*

IEC 60811-412, *Electric and optical fibre cables - Test methods for non-metallic materials - Part 412: Miscellaneous tests - Thermal ageing methods - Ageing in an air bomb*

IEC 60811-501, *Electric and optical fibre cables - Test methods for non-metallic materials - Mechanical tests - Tests for determining the mechanical properties of insulating and sheathing compounds*

IEC 60811-504, *Electric and optical fibre cables - Test methods for non-metallic materials - Mechanical tests - Bending tests at low temperature for insulation and sheaths*

IEC 60811-505, *Electric and optical fibre cables - Test methods for non-metallic materials - Mechanical tests - Elongation at low temperature for insulations and sheaths*

IEC 60811-507, *Electric and optical fibre cables - Test methods for non-metallic materials - Mechanical tests - Hot set test for cross-linked materials*

IEC 60811-508, *Electric and optical fibre cables - Test methods for non-metallic materials - Mechanical tests - Pressure test at high temperature for insulation and sheaths*

IEC 62440, *Electric cables - Guide to use for cables with a rated voltage not exceeding 450/750 V*

IEC 63294:2021, *Test methods for electric cables with rated voltage up to and including 450/750 V*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

– IEC Electropedia: available at https://www.electropedia.org/
– ISO Online browsing platform: available at https://www.iso.org/obp

3.1
type of compound
category in which a compound is placed according to its properties, as determined by specific tests

Note 1 to entry: The type designation is not directly related to the composition of the compound.

3.2
rubber compound
combination of materials suitably selected, proportioned, treated and vulcanized, of which the characteristic constituent is a rubber or synthetic elastomer, or both

Note 1 to entry: Vulcanization is defined as a post-application treatment taking place after the insulation or sheath, or both has been applied in order to induce permanent cross-linking of the elastomer.

3.3
polychloroprene compound
PCP
cross-linked compound in which the elastomer is the polychloroprene or other equivalent synthetic elastomer providing a compound with properties similar to PCP

3.4
ethylene-vinyl acetate rubber compound
EVA
cross-linked compound in which the elastomer is ethylene-vinyl acetate or other equivalent synthetic elastomer providing a compound with properties similar to EVA

3.5
ethylene-propylene rubber compound
EPR
cross-linked compound in which the elastomer is ethylene-propylene or equivalent synthetic elastomer providing a compound with properties similar to EPR

3.6
rated voltage
reference voltage for which the cable is designed, and which serves to define the electrical tests

Note 1 to entry: The rated voltage is expressed by the combination of two values U_o/U expressed in volts:

U_o being the RMS value between any insulated conductor and "earth" (metal covering of the cable or the surrounding medium)

U being the RMS value between any two phase conductors of a multicore cable or of a system of single-core cables

In an alternating-current system, the rated voltage of a cable is at least equal to the nominal voltage of the system for which it is intended.

This condition applies both to the value U_o and to the value U.

In a direct current system, the nominal voltage of the system is not higher than 1,5 times the rated voltage AC value of U_o.

Note 2 to entry: The operating voltage of a system can permanently exceed the nominal voltage of such a system by 10 %. A cable can be used at a 10 % higher operating voltage than its rated voltage if the latter is at least equal to the nominal voltage of the system.

4 Marking

4.1 Indication of origin and cable identification

4.1.1 General

Cables shall be provided with an indication of the manufacturer, which shall be either an identification thread or a repetitive marking of the manufacturer's name or trademark.

Cables for use at a conductor temperature exceeding 70 °C shall also be marked either with the code designation according to Annex A or with the maximum conductor temperature.

Marking can be by printing or by reproduction in relief on, or in, the insulation or sheath, or by printing on a proofed tape or a separate marker tape.

4.1.2 Continuity of marks

Each specified mark shall be regarded as continuous if the distance between the end of the mark and the beginning of the next identical mark does not exceed

– 550 mm if the marking is on the outer sheath of the cable,
– 275 mm if the marking is
  - on the insulation of an unsheathed cable,
  - on the insulation of a sheathed cable,
  - on a tape within a sheathed cable.

4.2 Durability

Printed markings shall be durable. Compliance with this requirement shall be checked by the test given in IEC 63294:2021, 6.1.

4.3 Legibility

All markings shall be legible.

The colours of the identification threads shall be easy to recognize or easily made recognizable, if necessary, by cleaning with petrol or other suitable solvent.