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REDLINE VERSION

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

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FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60245-4:2011. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60245-4 has been prepared by IEC technical committee TC 20: Electric cables. It is an International Standard.

This fourth edition of IEC 60245-4 cancels and replaces the third edition published in 2011. This edition constitutes a technical revision.

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

a) reference to tests according to IEC 60245-2 has been deleted and replaced by IEC 63294;

b) normative references have been updated.

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

Draft	Report on voting
20/2273/FDIS	20/2282/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.

This document is to be used in conjunction with IEC 60245-1:2026.

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– withdrawn, or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 General~~

~~1.~~1 Scope

This part of IEC 60245 defines the particular ~~specifications~~ requirements for rubber insulated and braided cords and for rubber insulated and rubber or polychloroprene or other equivalent synthetic elastomer sheathed cords and flexible cables of rated voltages up to and including 450/750 V which apply in addition to the general requirements specified in IEC 60245-1, which apply to all cables.

~~All cables should comply with the appropriate requirements given in IEC 60245-1 and the individual types of cables should each comply with the particular requirements of this part.~~

The tests for cables specified in the IEC 60245 series are described in IEC 63294.

~~1.~~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.

~~NOTE The IEC 60811 series is currently undergoing a revision, which will lead to a restructuring of its parts. A description of this, as well as a cross-reference table between the current and planned parts will be given in IEC 60811-100.~~

IEC 60228, *Conductors of insulated cables*

IEC 60245-1:~~2003~~2026, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 1: General requirements*
~~Amendment 1:2007~~

~~IEC 60245-2:1994, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 2: Test methods*
Amendment 1:1997
Amendment 2:1997~~

IEC 60245-8:~~1998~~2026, *Rubber insulated cables - Rated voltages up to and including 450/750 V - Part 8: Cords for applications requiring high flexibility*
~~Amendment 1:2004~~
~~Amendment 2:2011~~

~~IEC 60811-1-1:1993, *Common Test methods for insulating and sheathing materials of electric cables and optical cables – Part 1-1: Methods for general application – Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*
Amendment 1:2001~~

~~IEC 60811-1-2:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Two: Thermal ageing methods*
Amendment 1:1989
Amendment 2:2000~~

~~IEC 60811-1-4:1985, *Common Test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Four: Tests at low temperature*
Amendment 1:1993
Amendment 2:2001~~

~~IEC 60811-2-1:1998, *Insulating and sheathing materials of electric and optical cables – Common test methods – Part 2-1: Methods specific to elastomeric compounds – Ozone resistance, hot set and mineral oil immersion tests*~~
~~Amendment 1:2001~~

IEC 60719, *Calculation of the lower and upper limits for the average outer dimensions of cables with circular copper conductors and of rated voltages up to and including 450/750 V*

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

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 terms and definitions given in IEC 60245-1 and the following 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 test
T
test required before supplying a type of cable covered by this document on a general commercial basis, in order to demonstrate satisfactory performance characteristics to meet the intended application

Note 1 to entry: Type tests are of such a nature that, after they have been carried out, they do not have to be repeated unless changes are made in the cable materials or design which can change the performance characteristics.

3.2
sample test
S
test carried out on samples of a completed cable, or components taken from a completed cable, to check that the finished product meets the design standard

~~2~~4 Braided cord

~~See Clause 5 of IEC 60245-8:1998, as introduced in Amendment 1 (2004).~~

Braided cord is described in IEC 60245-8:2026, Clause 6.

~~3~~5 Ordinary tough rubber sheathed cord

~~3~~5.1 Code designation

60245 IEC 53.

~~3~~5.2 Rated voltage

300/500 V.

~~3~~5.3 Construction

~~3~~5.3.1 Conductors

Number of conductors: 2, 3, 4 or 5.

The conductors shall comply with the requirements given in IEC 60228 for class 5 conductors. The wires ~~may~~ can be plain or tinned.

~~3~~5.3.2 Separator

A separator of ~~suitable~~ material ~~may~~ can be applied around each conductor.

~~3~~5.3.3 Insulation

The insulation shall be a rubber compound of type IE4 applied around each conductor.

The insulation shall be applied by extrusion.

~~The insulation thickness shall comply with the specified value given in Table 1, column 2.~~

The specified value of the insulation thickness is given in Table 1

~~3~~5.3.4 Assembly of cores and filler, if any

The cores shall be twisted together.

A ~~centre~~ central filler ~~may~~ can be used.

~~3~~5.3.5 Sheath

The sheath shall be made of rubber compound of type SE3, applied around the cores.

~~The thickness of sheath shall comply with the specified value given in Table 1.~~

The specified value of the sheath thickness is given in Table 1.

The sheath shall be extruded in a single layer and applied in such a way that it fills the spaces between the cores.

~~The sheath shall be capable of being removed without damage to the cores.~~

It shall be possible to remove the sheath without damaging the cores.

~~3~~5.3.6 Overall diameter

The mean overall diameter shall be within the limits given in Table 1.

~~3~~5.4 Tests

~~Compliance with the requirements of 3.3 shall be checked by inspection and by the tests given in Table 2.~~

The test methods specified in Table 2 shall be used to perform the tests to check the compliance with the requirements specified in 5.3.

~~3~~5.5 ~~Guide to use~~ Guidance on use of the cables

Maximum conductor temperature in normal use: 60 °C.

~~NOTE Other guidelines are under consideration.~~

The use of the cable type 60245 IEC 53 shall comply with IEC 62440, which provides guidance on the safe use of electric cables with a rated voltage not exceeding 450/750 V.

Table 1 – Dimensions of type 60245 IEC 53

Number and nominal cross-sectional area of conductors	Thickness of insulation	Thickness of sheath [b]	Mean overall ~~dimensions~~ diameters[a]	
mm^2	Specified value mm	Specified value mm	Lower limit mm	Upper limit mm
2 × 0,75	0,6	0,8	5,7	7,4
2 × 1	0,6	0,9	6,1	8,0
2 × 1,5	0,8	1,0	7,6	9,8
2 × 2,5	0,9	1,1	9,0	11,6
2 × 4	1,0	1,2	10,6	13,7
3 × 0,75	0,6	0,9	6,2	8,1
3 × 1	0,6	0,9	6,5	8,5
3 × 1,5	0,8	1,0	8,0	10,4
3 × 2,5	0,9	1,1	9,6	12,4
3 × 4	1,0	1,2	11,3	14,5
4 × 0,75	0,6	0,9	6,8	8,8
4 × 1	0,6	0,9	7,1	9,3
4 × 1,5	0,8	1,1	9,0	11,6
4 × 2,5	0,9	1,2	10,7	13,8
4 × 4	1,0	1,3	12,7	16,2
5 × 0,75	0,6	1,0	7,6	9,9
5 × 1	0,6	1,0	8,0	10,3
5 × 1,5	0,8	1,1	9,8	12,7
5 × 2,5	0,9	1,3	11,9	15,3
5 × 4	1,0	1,4	14,1	17,9

[a] The mean overall ~~dimensions~~ diameters have been calculated in accordance with IEC 60719.

[b] In case of extension of cross sectional area, the thickness of sheath shall be calculated according to IEC 60245-1:2026, Annex B.

Table 2 – Tests for type 60245 IEC 53

Ref. No	Tests	Category of test	Test methods[a]
1	Electric tests		
1.1	Resistance of conductors	T, S	~~60245-2 2.1~~ IEC 63294:2021, 5.1
1.2	Voltage test on cores according to specified insulation thickness:		
1.2.1	at 1 500 V ~~up to and including~~ for 0,6 mm	T	~~60245-2 2.3~~ IEC 63294:2021, 5.3
1.2.2	at 2 000 V exceeding 0,6 mm	T	~~60245-2 2.3~~ IEC 63294:2021, 5.3
1.3	Voltage test on completed cable at 2 000 V	T, S	~~60245-2 2.2~~ IEC 63294:2021, 5.2
2	Provisions covering constructional and dimensional characteristics		IEC 60245-1 and ~~60245-2~~ IEC 63294: 2021
2.1	Checking of compliance with constructional provisions	T, S	60245-1 Inspection and manual tests
2.2	Measurement of thickness of insulation	T, S	~~60245-2 1.9~~ IEC 63294:2021, 6.2
2.3	Measurement of thickness of sheath	T, S	~~60245-2 1.10~~ IEC 63294:2021, 6.3
2.4	Measurement of overall diameter:		~~60245-2 1.11~~
2.4.1	mean value	T, S	~~60245-2 1.11~~ IEC 63294:2021, 6.4
2.4.2	ovality	T, S	~~60811-1-1 9.1~~ IEC 63294:2021, 6.4
3	Mechanical properties of insulation		~~60245-2 Clause 4~~
3.1	Tensile test before ageing	T	~~60811-1-2 8.2~~ IEC 60811- 501
3.2	Tensile test after ageing in the air oven	T	~~60811-2-1 Clause 9~~ IEC 60811-401 and IEC 60811-501
3.3	Tensile test after ageing in the air bomb	T	~~60811-2-1 Clause 8~~ IEC 60811-412 and IEC 60811-501
3.4	Hot set test	T	~~60811-1-1 9.2~~ IEC 60811-507
3.5	Ozone resistance test	T	~~60811-1-2 8.1.3.1~~IEC 60811-403
4	Mechanical properties of sheath		~~60811-2-1 Clause 9~~
4.1	Tensile test before ageing	T	IEC 60811-501
4.2	Tensile test after ageing in the air oven	T	IEC 60811-401 and IEC 60811-501
4.3	Hot set test	T	~~60245-2~~ IEC 60811-507
5	Mechanical strength of completed cable		~~60245-2~~
5.1	Flexing test followed, after immersion in water, by a voltage test:		
	at 2 000 V on completed cable having two cores	T	~~60245-2 3.1 and 2.2~~ IEC 63294:2021, 6.6 and IEC 63294:2021, 5.2 and IEC 60245-1:2026, 6.6.3.1
	For cables having more than two cores:		
	at 1 500 V on cores with a specified insulation thickness ~~up to and including~~ of 0,6 mm	T	~~60245-2 3.1 and 2.3~~ IEC 63294:2021, 6.6 and IEC 63294:2021, 5.3 and IEC 60245-1:2026, 6.6.3.1
	at 2 000 V on cores with specified insulation thickness exceeding 0,6 mm	T	~~60245-2 3.1 and 2.3~~ IEC 63294:2021, 6.6 and IEC 63294:2021, 5.3 and IEC 60245-1:2026, 6.6.3.1

~~[a] All documents cited in this table refer to the dated editions that are listed in the normative references clause.~~

46 Ordinary polychloroprene or other equivalent synthetic elastomer sheathed cord

46.1 Code designation

60245 IEC 57.

46.2 Rated voltage

300/500 V.

46.3 Construction

46.3.1 Conductors

Number of conductors: 2, 3, 4 or 5.

The conductors shall comply with the requirements given in IEC 60228 for class 5 conductors. The wires ~~may~~ can be plain or tinned.

46.3.2 Separator

A separator of suitable material ~~may~~ can be applied around each conductor.

46.3.3 Insulation

The insulation shall be made of rubber compound of type IE4 applied around each conductor.

The insulation shall be applied by extrusion.

~~The insulation thickness shall comply with the specified value given in Table 3, column 2.~~

The specified value of the insulation thickness is given in Table 3.

46.3.4 Assembly of cores and filler, if any

The cores shall be twisted together.

A centre filler ~~may~~ can be used.

46.3.5 Sheath

The sheath shall be rubber compound of type SE4 applied around the cores.

~~The thickness of sheath shall comply with The specified value given in Table 5, column 3.~~

The specified value of the sheath thickness is given in Table 3.

The sheath shall be extruded in a single layer and applied in such a way that it fills the spaces between the cores.

~~The sheath shall be capable of being removed without damage to the cores.~~

It shall be possible to remove the sheath without damaging the cores.

~~4~~6.3.6 Overall diameter

The mean overall diameter shall be within the limits given in Table 3.

~~4~~6.4 Tests

~~Compliance with the requirements of 4.3 shall be checked by inspection and by the tests given in Table 4.~~

6.4.1 General

The test methods specified in Table 4 shall be used to perform the tests to check the compliance with the requirements specified in 6.3.

6.4.2 Flexing test

The requirements are given in IEC 60245-1:2026, 6.6.3.1.

~~4~~6.5 ~~Guide to use~~ Guidance on use of the cables

Maximum conductor temperature in normal use: 60 °C.

The use of the cable type 60245 IEC 57 shall comply with IEC 62440, which provides guidance on the safe use of electric cables with a rated voltage not exceeding 450/750 V.

~~NOTE Other guidelines are under consideration.~~

Table 3 – Dimensions of type 60245 IEC 57

Number and nominal cross-sectional area of conductors	Thickness of insulation	Thickness of sheath [b]	Mean overall ~~dimensions~~ diameters[a]	
mm^2	Specified value	Specified value	Lower limit	Upper limit
	mm	mm	mm	mm
2 × 0,75	0,6	0,8	5,7	7,4
2 × 1	0,6	0,9	6,1	8,0
2 × 1,5	0,8	1,0	7,6	9,8
2 × 2,5	0,9	1,1	9,0	11,6
2 × 4	1,0	1,2	10,6	13,7
3 × 0,75	0,6	0,9	6,2	8,1
3 × 1	0,6	0,9	6,5	8,5
3 × 1,5	0,8	1,0	8,0	10,4
3 × 2,5	0,9	1,1	9,6	12,4
3 × 4	1,0	1,2	11,3	14,5
4 × 0,75	0,6	0,9	6,8	8,8
4 × 1	0,6	0,9	7,1	9,3
4 × 1,5	0,8	1,1	9,0	11,6
4 × 2,5	0,9	1,2	10,7	13,8
4 × 4	1,0	1,3	12,7	16,2
5 × 0,75	0,6	1,0	7,6	9,9
5 × 1	0,6	1,0	8,0	10,3
5 × 1,5	0,8	1,1	9,8	12,7
5 × 2,5	0,9	1,3	11,9	15,3
5 × 4	1,0	1,4	14,1	17,9

[a] The mean overall ~~dimensions~~ diameters have been calculated in accordance with IEC 60719.

[b] In case of extension of cross sectional area, the thickness of sheath shall be calculated according to IEC 60245-1:2026, Annex B.