IEC 60245-4

Edition 3.0 2011-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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

Conducteurs et câbles isolés au caoutchouc – Tension assignée au plus égale à 450/750 V – Partie 4: Câbles souples

IEC 60245-4:2011

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RUBBER INSULATED CABLES – RATED VOLTAGES UP TO AND INCLUDING 450/750 V –

Part 4: Cords and flexible cables

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60245-4 has been prepared by IEC technical committee 20: Electric cables.

This third edition of IEC 60245-4 cancels and replaces the second edition published in 1994, amendment 1 (1997) and amendment 2 (2003). The document 20/1262/FDIS, circulated to the National Committees as amendment 3, led to the publication of this new edition.

The main changes with respect to the previous edition are as follows:

– updating of the normative references;
– updating of Table 3 and Table 5 on dimensions for type 53 and type 57.

The text of this standard is based on the following documents:

FDIS	Report on voting
20/1262/FDIS	20/1272/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This standard should be read in conjunction with parts 1 and 2.

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 publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

RUBBER INSULATED CABLES – RATED VOLTAGES UP TO AND INCLUDING 450/750 V –

Part 4: Cords and flexible cables

1 General

1.1 Scope

This part of IEC 60245 details the particular specifications 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.

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.

1.2 Normative references

The following referenced documents are indispensable for the application 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, *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, *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

2 Braided cord

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

3 Ordinary tough rubber sheathed cord

3.1 Code designation

60245 IEC 53.

3.2 Rated voltage

300/500 V.

3.3 Construction

3.3.1 Conductor

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 be plain or tinned.

3.3.2 Separator

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

3.3.3 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.

3.3.4 Assembly of cores and filler, if any

The cores shall be twisted together.

A centre filler may be used.

3.3.5 Sheath

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

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

3.3.6 Overall diameter

The mean overall diameter shall be within the limits given in Table 1, columns 4 and 5.

3.4 Tests

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

3.5 Guide to use

Maximum conductor temperature in normal use: 60 °C.

NOTE Other guidelines are under consideration.

Table 1 – Dimensions of type 60245 IEC 53

1	2	3	4	5
Number and nominal cross-sectional area of conductors	**Thickness of insulation**	**Thickness of sheath**	**Mean overall dimensions[a]**	
mm²	**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 have been calculated in accordance with IEC 60719.

Table 2 – Tests for type 60245 IEC 53

1	2	3	4	
Ref. No.	Test	Category of test	Test method described in IEC[a]	Subclause
1	*Electric tests*			
1.1	Resistance of conductors	T, S	60245-2	2.1
1.2	Voltage test on cores according to specified insulation thickness:			
1.2.1	at 1 500 V up to and including 0,6 mm	T	60245-2	2.3
1.2.2	at 2 000 V exceeding 0,6 mm	T	60245.2	2.3
1.3	Voltage test on completed cable at 2 000 V	T, S	60245-2	2.2
2	*Provisions covering constructional and dimensional characteristics*		60245-1 and 60245-2	
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
2.3	Measurement of thickness of sheath	T, S	60245-2	1.10
2.4	Measurement of overall diameter			
2.4.1	mean value	T, S	60245-2	1.11
2.4.2	ovality	T, S	60245-2	1.11
3	*Mechanical properties of insulation*			
3.1	Tensile test before ageing	T	60811-1-1	9.1
3.2	Tensile test after ageing in the air oven	T	60245-2	Clause 4
3.3	Tensile test after ageing in the air bomb	T	60811-1-2	8.2
3.4	Hot set test	T	60811-2-1	Clause 9
3.5	Ozone resistance test	T	60811-2-1	Clause 8
4	*Mechanical properties of sheath*			
4.1	Tensile test before ageing	T	60811-1-1	9.2
4.2	Tensile test after ageing in the air oven	T	60811-1-2	8.1.3.1
4.3	Hot set test	T	60811-2-1	Clause 9
5	*Mechanical strength of completed cable*			
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
	For cables having more than two cores:			
	at 1 500 V on cores with specified insulation thickness up to and including 0,6 mm	T	60245-2	3.1 and 2.3
	at 2 000 V on cores with specified insulation thickness exceeding 0,6 mm	T	60245-2	3.1 and 2.3

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

4 Ordinary polychloroprene or other equivalent synthetic elastomer sheathed cord

4.1 Code designation

60245 IEC 57.

4.2 Rated voltage

300/500 V.

4.3 Construction

4.3.1 Conductor

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 be plain or tinned.

4.3.2 Separator

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

4.3.3 Insulation

The insulation shall be 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.

4.3.4 Assembly of cores and filler, if any

The cores shall be twisted together.

A centre filler may be used.

4.3.5 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 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.

4.3.6 Overall diameter

The mean overall diameter shall be within the limits given in Table 3, columns 4 and 5.

4.4 Tests

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

4.5 Guide to use

Maximum conductor temperature in normal use: 60 °C.

NOTE Other guidelines are under consideration.

Table 3 – Dimensions of type 60245 IEC 57

1	2	3	4	5
Number and nominal cross-sectional area of conductors mm²	**Thickness of insulation** **Specified value** mm	**Thickness of sheath** **Specified value** mm	**Mean overall dimensions**[a] **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 have been calculated in accordance with IEC 60719.