INTERNATIONAL STANDARD

IEC 60245-4

Edition 2.2
2004-02

Edition 2:1994 consolidated with amendments 1:1997 and 2:2003

Rubber insulated cables – Rated voltages up to and including 450/750 V –

Part 4: Cords and flexible cables

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*

Reference number
IEC 60245-4:1994+A1:1997+A2:2003(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (www.iec.ch/searchpub) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (www.iec.ch/online_news/ justpub) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 60245-4

Edition 2.2
2004-02

Edition 2:1994 consolidated with amendments 1:1997 and 2:2003

Rubber insulated cables – Rated voltages up to and including 450/750 V –

Part 4: Cords and flexible cables

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE CL

For price, see current catalogue

CONTENTS

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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60245-4 has been prepared by sub-committee 20B: Low-voltage cables, of IEC technical committee 20: Electric cables.

This consolidated version of IEC 60245-4 consists of the second edition (1994) [documents 20B(CO)116+136+138+145 and 20B(CO)126+142+147+148], its amendment 1 (1997) [documents 20B/230/FDIS and 20B/245/RVD] and its amendment 2 (2003) [documents 20/577/CDV and 20/660/RVC].

The technical content is therefore identical to the base edition and its amendments and has been prepared for user convenience.

It bears the edition number 2.2.

A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2.

IEC 60245 consists of the following parts, under the general title: *Rubber insulated cables – Rated voltages up to and including 450/750 V:*

Part 1:1994, General requirements

Part 2:1994, Test methods

Part 3:1994, Heat resistant silicone insulated cables

Part 4:1994, Cords and flexible cables

Part 5:1994, Lift cables

Part 6:1994, Arc welding electrode cables

Part 7:1994, Heat resistant ethylene-vinylacetate rubber insulated cables.

Part 8:1998, Cords for applications requiring high flexibility

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

The committee has decided that the contents of the base publication and its amendments will remain unchanged until 2009. 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

Les documents de référence suivants sont indispensables pour l'application du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60228: 1978, *Conductors of insulated cables*

IEC 60245-1:1994, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 1: General requirements*

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

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)

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

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*

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*

IEC 60811-2-1:1986, *Common test methods for insulating and sheathing materials of electric cables – Part 2: Methods specific to elastomeric compounds – Section 1: Ozone resistance test – Hot set test – Mineral oil immersion test*

2 Braided cord

See IEC 60245-8, Clause 5.

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 3, 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 3, 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 3, 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 4.

3.5 Guide to use

Maximum conductor temperature in normal use: 60 °C.

NOTE Other guidelines are under consideration.

Table 3 – Dimensions of type 60245 IEC 53

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 diameter** **Lower limit** mm	**Upper limit** mm
2 x 0,75	0,6	0,8	5,7	7,4
2 x 1	0,6	0,9	6,1	8,0
2 x 1,5	0,8	1,0	7,6	9,8
2 x 2,5	0,9	1,1	9,0	11,6
3 x 0,75	0,6	0,9	6,2	8,1
3 x 1	0,6	0,9	6,5	8,5
3 x 1,5	0,8	1,0	8,0	10,4
3 x 2,5	0,9	1,1	9,6	12,4
4 x 0,75	0,6	0,9	6,8	8,8
4 x 1	0,6	0,9	7,1	9,3
4 x 1,5	0,8	1,1	9,0	11,6
4 x 2,5	0,9	1,2	10,7	13,8
5 x 0,75	0,6	1,0	7,6	9,9
5 x 1	0,6	1,0	8,0	10,3
5 x 1,5	0,8	1,1	9,8	12,7
5 x 2,5	0,9	1,3	11,9	15,3
NOTE The mean overall dimensions have been calculated in accordance with IEC 60719.				

Table 4 – Tests for type 60245 IEC 53

1	2	3	4	
Ref. No.	Test	Category of test	Test method described in	
			IEC	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