INTERNATIONAL STANDARD

IEC 60227-6

Third edition
2001-06

Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V –

Part 6: Lift cables and cables for flexible connections

*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.*

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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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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POLYVINYL CHLORIDE INSULATED CABLES OF RATED VOLTAGES UP TO AND INCLUDING 450/750 V –

Part 6: Lift cables and cables for flexible connections

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60227-6 has been prepared by IEC technical committee 20: Electric cables.

This third edition cancels and replaces the second edition, published in 1985, and its amendment 1, published in 1997.

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

FDIS	Report on voting
20/466/FDIS	20/474/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 3.

Annex A forms an integral part of this standard.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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- withdrawn;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

POLYVINYL CHLORIDE INSULATED CABLES OF RATED VOLTAGES UP TO AND INCLUDING 450/750 V –

Part 6: Lift cables and cables for flexible connections

1 Scope

This part of IEC 60227 details the particular specifications for both circular and flat lift cables and cables for flexible connections of rated voltages up to and including 450/750 V.

Each cable complies with the appropriate requirements given in IEC 60227-1, and with the particular requirements of this part of IEC 60227.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60227. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60227 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60096-0-1:1990, *Radio-frequency cables – Part 0-1: Guide to the design of detailed specifications – Coaxial cables* [1]

IEC 60227-1:1993, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements* [2]

IEC 60227-2:1997, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2: Test methods*

IEC 60228:1978, *Conductors of insulated cables*

IEC 60332-1:1993, *Tests on electric cables under fire conditions – Part 1: Test on a single vertical insulated wire or cable*

IEC 60502-1:1997, *Power cables with extruded insulation and their accessories for rated voltages from 1 kV (U_m = 1,2 kV) up to 30 kV (U_m = 36 kV) – Part 1: Cables for rated voltages of 1 kV (U_m = 1,2 kV) and 3 kV (U_m = 3,6 kV)* [3]

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[1] A consolidated edition 2.1 exists (2000) that includes IEC 60096-0-1 (1990) and its amendment 1 (2000).

[2] A consolidated edition 2.2 exists (1998) that includes IEC 60227-1 (1993), its amendment 1 (1995) and its amendment 2 (1998).

[3] A consolidated edition 1.1 exists (1998) that includes IEC 60502-1 (1997) and its amendment 1 (1998).

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 2: 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 4: Test at low temperature*

IEC 60811-3-1:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section 1: Pressure test at high temperature – Tests for resistance to cracking*

IEC 60811-3-2:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section 2: Loss of mass test – Thermal stability test*

3 Flat polyvinyl chloride sheathed lift cable and cable for flexible connections

3.1 Code designation

60227 IEC 71 f

3.2 Rated voltage

- 300/500 V for cables with conductors having nominal cross-sectional areas not exceeding 1 mm^2;

- 450/750 V for conductors larger than 1 mm^2.

3.3 Construction

3.3.1 Conductor

Number of conductors: 3, 4, 5, 6, 9, 12, 16, 18, 20 or 24.

The combination of the cross-sectional areas and the number of conductors belonging to them is given in the following table 1:

Table 1 – Cross-sectional areas and the number of conductors

Nominal cross-sectional area of conductors mm^2	Number of conductors
0,75 and 1	(3), (4), (5), 6, 9, 12, (16), (18), (20) or 24
1,5 and 2,5	(3), 4, 5, 6, 9 or 12
4, 6, 10, 16 and 25	4 or 5

Values in parentheses are the non-preferred types.

The conductors shall comply with the requirements given in IEC 60228 for class 5 conductors.

The conductors of the cores in the side position may consist of copper wires and steel wires. The nominal geometric cross-sectional area of these conductors shall be equal to that of the other conductors and the maximum resistance shall be not more than twice the maximum resistance of a copper conductor of the same nominal cross-sectional area.

3.3.2 Insulation

The insulation shall be polyvinyl chloride compound of type PVC/D applied around each conductor.

The insulation thickness shall comply with the specified value given in table 4, column 2.

The insulation resistance shall be not less than the value given in table 4, column 3.

3.3.3 Arrangements of cores and strain-bearing members, if any

The cores shall be laid parallel. It is permitted, however, that two, three, four or five cores may be laid in groups; in such cases, a tearing thread may be inserted inside each group. It shall be possible to separate the cores without damage to the insulation.

Strain-bearing member(s) of textile material may be used.

A strain-bearing member (or members) of metal may also be used; in such a case (cases) it (they) shall be covered with a non-conducting abrasion-resistant material.

If the cores are grouped, the groups shall comply with the following table 2:

Table 2 – Cores groups

Number of cores	5	6	9	12	16	18	20	24
Grouping	2+1+2	2×3	3×3	3×4	4×4	4+5+5+4	5×4	6×4

The nominal value of the clearance *e*, separating the groups is given in table 5, column 2 (see also figure 1).

There is no requirement for the mean value of the clearance e_1. However, any clearance separating the groups may be less than the nominal value e_1 provided that the difference does not exceed 0,2 mm + 20 % of the nominal value.

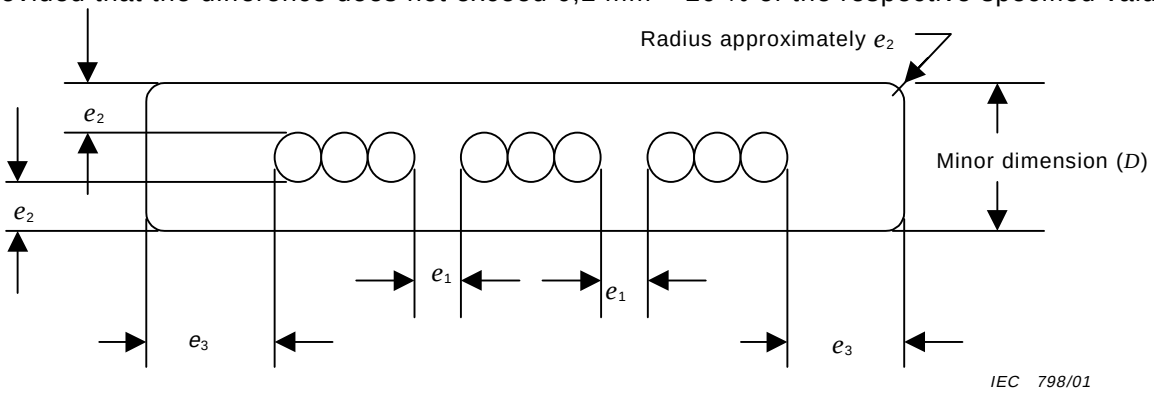
3.3.4 Sheath

The sheath shall be a polyvinyl chloride compound of type PVC/ST5 applied around the cores.

The sheath shall be applied so as to substantially avoid the formation of cavities, and shall not adhere to the cores. The edges of the cable shall be rounded off.

The sheath thickness shall comply with the specified values e_2 and e_3 given in table 5, column 3 (see also figure 1).

The mean value of e_2 and the mean value of e_3 shall be not less than the respective specified values. However, the thickness at any given place may be less than the specified value, provided that the difference does not exceed 0,2 mm + 20 % of the respective specified value.



NOTE This figure is to illustrate the thickness of sheath and clearance referred to in table 5 and does not represent an actual design.

Figure 1 – Cross-section of cable

3.4 Tests

Compliance with the requirements of 3.3 shall be checked by inspection and by the tests given in table 6 except that, owing to the rectangular cross-section of the cable, the following modifications and additions shall be taken into account. Where applicable, 3.4.1 to 3.4.5 inclusive shall be read in conjunction with the relevant tests specified in table 6.

3.4.1 Pressure test at high temperature for sheaths

If the smaller sides of the cable are fully rounded in shape, this test shall be carried out on one of the smaller sides in accordance with 8.2 of IEC 60811-3-1. To calculate the compressing force, D is the minor dimension of the cable and δ is the mean sheath thickness e_3 as determined in 8.1.4 of IEC 60811-1-1.

If the smaller sides are flat, or nearly flat, as depicted in figure 1, this test shall be carried out in accordance with 8.2 of IEC 60811-3-1, with the method modified as follows:

a) Preparation of test piece

A strip shall be cut from the wide side of the cable in the direction of the axis of the cable. On the inner side, only the ridges shall be removed by grinding or cutting. The width of the strip to be tested shall be at least 10 mm but not more than 20 mm. The thickness of the strip shall be measured at the place where the compressing force F is applied.

b) Position of test piece in the test apparatus

The strip shall be bent around a mandrel having a diameter approximately equal to the diameter of the core of the cable; the longitudinal axis of the strip shall be perpendicular to the axis of the mandrel. Provision shall be made that the inner surface of the strip shall be in contact over at least 120° of the circumference of the mandrel (see figure 2). The metal blade of the test apparatus shall be placed on the middle of the test piece.