PAKISTAN STANDARD

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

Part-6: Lift cables and cables for flexible connections

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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

0. FOREWORD

0.1 This Pakistan Standard was adopted by the authority of the Board of Directors of Pakistan Standard and Quality Control Authority after the draft prepared by the Technical Committee for **"Electric Cables"** (TC-7)" had been approved and endorsed by the National Standards Committee on 27 June 2007.

0.2 This Pakistan Standard was adopted on the basis of IEC: 60227-6 since IEC Standard have been established in 2001, hence it is deemed necessary to adopt the International standard to keep abreast with the latest technology and as par with IEC standard.

0.3 This Pakistan Standard is an adoption of IEC: 60227-6-2007 Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V Part-6 Lift cables and cables for flexible connections," and its use hereby acknowledged with thanks.

0.4 This standard is subject to periodical review in order to keep pace with the development in industry. Any suggestions for improvement shall be recorded and placed before the revising committee in due course.

0.5 This standard is intended chiefly to cover the technical provisions relating to this standard and it does not include all the necessary provisions of a Contract.

CONTENTS

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- withdrawn;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.

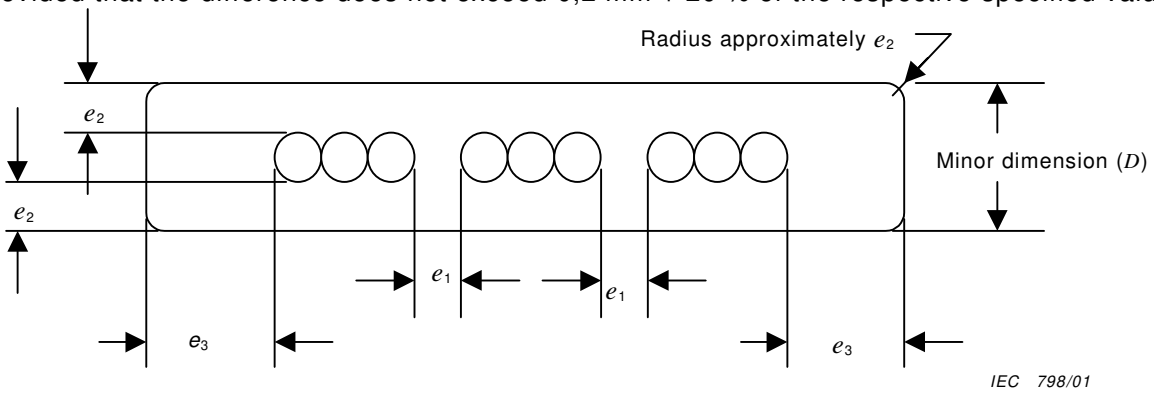
3.3.4 Sheath

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.

c) Calculation of the compressing force

See 8.2.4 of IEC 60811-3-1; *d* (in mm) is the thickness of the strip at the place where the force is applied. *D* (in mm) is the diameter of the mandrel plus twice the value of *d* .

d) Indentation

The depth of indentation shall be related to the original value *d* as described above.

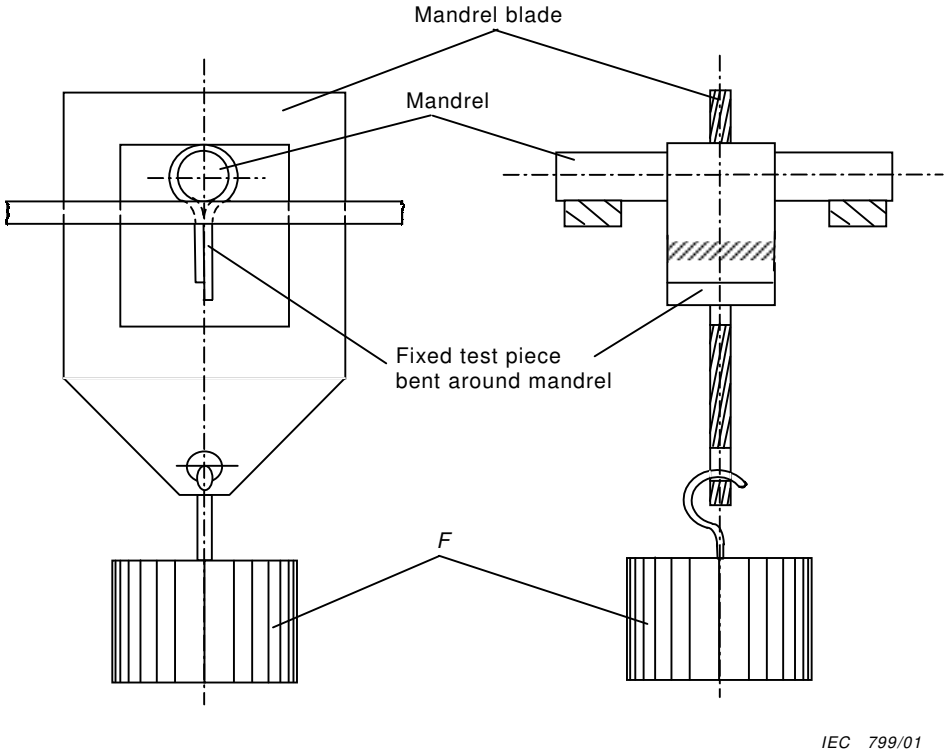


Figure 2 – Indentation device

3.4.2 Impact test on completed cable at low temperature

The values of the mass of the hammer, specified in 8.5.4 of IEC 60811-1-4, shall be chosen by reference to the minor dimension of the flat cable.

3.4.3 Flexing test

This test is not applicable to lift cables. (A more appropriate test for these cables is under consideration.)

This test shall be carried out only on cables having a nominal conductor cross-sectional area of either 0,75 mm^2, 1 mm^2, 1,5 mm^2, 2,5 mm^2 or 4 mm^2 and a number of cores not exceeding five.

The mass of the weight loaded on each end of the cable and the diameters of the pulleys A and B shall be as given in the following table 3.

Table 3 – Flexing test

Type of flexible cable	**Mass of weight** kg	**Diameter of pulleys** mm
Flat polyvinyl chloride sheathed cable for flexible connections of nominal cross-sectional area of conductors		
0,75 mm^2 and 1 mm^2	1,0	80
1,5 mm^2 and 2,5 mm^2	1,5	120
4 mm^2	2,0	200

3.4.4 Static flexibility test

This test shall be carried out in accordance with 3.5 of IEC 60227-2.

The distance *l'* to be complied with shall be not more than 0,70 m.

3.4.5 Test of flame retardance

In this test, the flame shall impinge on the middle of the flat side of the cable.

3.5 Guide to use

For lifts and hoists this type of cable is intended for installations where the freely suspended length does not exceed 35 m, and the speed of travel does not exceed 1,6 m/s. The use of the cables beyond these limits shall be a matter of negotiation between purchaser and manufacturer, for instance by adding a strain-bearing element.

This particular specification does not apply to cables to be used at temperatures below 0 °C.

Maximum conductor temperature in normal use: 70 °C.

NOTE Other guidelines are under consideration.

Table 4 – General data for type 60227 IEC 71 f

1	2	3
Nominal cross-sectional area of conductors	**Insulation thickness, specified value**	**Minimum insulation resistance at 70 °C**
mm^2	mm	MΩ×km
0,75	0,6	0,011
1	0,6	0,010
1,5	0,7	0,010
2,5	0,8	0,009
4	0,8	0,007
6	0,8	0,006
10	1,0	0,0056
16	1,0	0,0046
25	1,2	0,0044

Table 5 – Clearance between groups, if any, and sheath thickness for type 60227 IEC 71 f

1	2	3	
Nominal cross-sectional area of conductors	**Clearance nominal value**	**Sheath thickness, specified values**	
	e_1	e_2	e_3
mm^2	mm	mm	mm
0,75	1,0	0,9	1,5
1	1,0	0,9	1,5
1,5	1,0	1,0	1,5
2,5	1,5	1,0	1,8
4	1,5	1,2	1,8
6	1,5	1,2	1,8
10	1,5	1,4	1,8
16	1,5	1,5	2,0
25	1,5	1,6	2,0

Table 6 – Tests for type 60227 IEC 71 f

1	2	3	4
Reference no.	**Test**	**Category of test**	**Test method described in**
1	Electrical		IEC 60227-2
1.1	Resistance of conductors	T,S	2.1 of IEC 60227-2
1.2	Voltage test on cores according to voltage rating:		
1.2.1	– at 1 500 V for U_o/U 300/500 V and insulation thickness up to and including 0,6 mm	T	2.3 of IEC 60227-2
1.2.2	– at 2 500 V for U_o/U 450/750 V and insulation thickness exceeding 0,6 mm	T	2.3 of IEC 60227-2
1.3	Voltage test on completed cable according to voltage rating:	T,S	2.2 of IEC 60227-2
1.3.1	– at 2 000 V for U_o/U 300/500 V		
1.3.2	– at 2 500 V for U_o/U 450/750 V		
1.4	Insulation resistance at 70 °C	T	2.4 of IEC 60227-2
2	Provisions covering constructional and dimensional characteristics		IEC 60227-1 and IEC 60227-2
2.1	Checking of compliance with constructional provisions	T,S	IEC 60227-1 Inspection and manual tests
2.2	Measurement of insulation thickness	T,S	1.9 of IEC 60227-2
2.3	Measurement of sheath thickness	T,S	1.10 of IEC 60227-2
3	Mechanical properties of insulation		
3.1	Tensile test before ageing	T	9.1 of IEC 60811-1-1
3.2	Tensile test after ageing	T	8.1.3 of IEC 60811-1-2
3.3	Loss of mass test	T	8.1 of IEC 60811-3-2
4	Mechanical properties of sheath		
4.1	Tensile test before ageing	T	9.2 of IEC 60811-1-1
4.2	Tensile test after ageing	T	8.1.3 of IEC 60811-1-2
4.3	Loss of mass test	T	8.2 of IEC 60811-3-2
5	Pressure test at high temperature		IEC 60811-3-1
5.1	Insulation	T	8.1 of IEC 60811-3-1
5.2	Sheath	T	8.2 of IEC 60811-3-1 See also 3.4.1 of this standard
6	Elasticity and impact strength at low temperature		IEC 60811-1-4
6.1	Bending test for insulation at low temperature	T	8.1 of IEC 60811-1-4
6.2	Bending test for sheath at low temperature	T	8.2 of IEC 60811-1-4
6.3	Elongation test for sheath at low temperature	T	8.4 of IEC 60811-1-4
6.4	Impact test on completed cable	T	8.5 of IEC 60811-1-4 See also 3.4.2 of this standard
7	Heat shock test		IEC 60811-3-1
7.1	Insulation	T	9.1 of IEC 60811-3-1
7.2	Sheath	T	9.2 of IEC 60811-3-1
8	Mechanical strength of completed cable		IEC 60227-2
8.1	Flexing test	T	3.1 of IEC 60227-2 See also 3.4.3 of this standard
8.2	Static flexibility test	T	3.5 of IEC 60227-2 See also 3.4.4 of this standard
9	Test of flame retardance	T	IEC 60332-1 See also 3.4.5 of this standard

4 Circular polyvinyl chloride sheathed lift cable and cable for flexible connections

4.1 Code designation

60227 IEC 71 c

4.2 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.

4.3 Construction

4.3.1 Conductor

The combination of the cross-sectional areas and the preferred number of conductors belonging to them is given in table 7.

Table 7 – Combination of cross-sectional areas and the number of conductors

Nominal cross-sectional area of conductors mm^2	**Preferred number of conductors** [a]
0,75; 1; 1,5 and 2,5	6; 9; 12; 18; 24 or 30
4; 6; 10; 16 and 25	4 or 5
[a] The preferred numbers mentioned for the conductors do not preclude the construction of cables having another number of cores or more cores.	

The conductors shall comply with the requirements given in IEC 60228 for class 5 conductors, except that the values of the maximum resistance of the conductors up to and including 2,5 mm^2 shall be increased by 5 %. The wires may be plain or tinned.

The following telecommunication units may be included in any layer of the cable:

– optical fibre cables;
– coaxial cables;
– screened communication pairs and screened single cores with conductors having a nominal cross-sectional area of at least 0,5 mm^2.

The conductors of the communication pairs and single cores shall comply with the requirements of IEC 60228 for class 5 conductors.

Any telecommunication unit shall be provided with a suitable extruded non-metallic covering, or binder tape.

4.3.2 Insulation for the control and power cores

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

The insulation thickness shall comply with the specified value given in table 8, column 2.

The insulation resistance shall be not less that the value given in table 8, column 3.

Table 8 – General data for type 60227 IEC 7I c

1	2	3
Nominal cross-sectional area of conductors mm^2	**Insulation thickness, specified value** mm	**Minimum insulation resistance at 70 °C** MΩ× km
0,75	0,6	0,011
1	0,6	0,010
1,5	0,7	0,010
2,5	0,8	0,009
4	0,8	0,007
6	0,8	0,006
10	1,0	0,0056
16	1,0	0,0046
25	1,2	0,0044

4.3.3 Assembly of cores, central heart and telecommunication units and fillers, if any

For lift cables the cores, with optional fillers or telecommunication units shall be twisted round a central heart.

The central heart shall consist of either

a) hemp, jute or similar material, or

b) a strain-bearing member, or

c) a combination of a) and b) above.

The strain-bearing member shall consist of either a non-metallic material or of a metal covered with a non-conducting, abrasion resistant material.

NOTE The purpose of this covering is to prevent damage to the cores by broken strands of the strain-bearing member.

The fillers, if any, shall consist of dry cotton or other suitable fibrous material.

For cables used for applications other than lift cables a central heart and/or a strain-bearing member is optional.

The cores shall be so assembled as to form one layer for 6-, 9- and 12-core cables and one or two layers for cables having more than 12 cores up to 30 cores.

As it is possible to manufacture cables with more than 30 cores (see the footnote in table 7), in such a case, the numbers of layers can be increased accordingly. The assembly of the cores shall have a practically circular cross-section.

The pitch of the laid-up cores shall not exceed 11 times the diameter of the circle passing through the centres of the laid-up cores themselves.

4.3.4 Covering of the core assembly

A covering, consisting of a braid or a tape, may be applied over the completed core assembly.

The braid shall be based on natural material (e.g. cotton or treated cotton) or synthetic material (e.g. rayon). The braid shall be uniform without knots or gaps.

The tape shall be based on natural or synthetic material, compatible with the insulation and sheathing materials. It shall be applied helically with suitable overlap.

4.3.5 Screen

A screen may be applied over the covering of the core assembly.

The screen shall consist of a symmetrically applied wire braid of plain or tinned, annealed copper wires with a maximum diameter of 0,21 mm.

The braid shall consist of a copper wire braid or a copper wire screen cross-meshed with a suitable textile yarn (e.g. polyester).

The percentage of coverage of the braid, related to the copper part, shall be at least 85 % calculated according to a suitable method (e.g. IEC 60096-0-1).

4.3.6 Sheath

The sheath shall be a polyvinyl chloride compound of type PVC/ST5 applied over the covering of the core assembly or the screen (if any).

It shall be possible to remove the sheath without damaging the underlying layer, other than the braid specified in 4.3.4.

The sheath thickness shall comply with the specified value given in table 9.

Table 9 – Sheath thickness

Fictitious diameter over covering of core assembly [a] mm	**Sheath thickness, specified value** mm
– 9,0	1,0
9,1 – 14,0	1,3
14,1 – 18,0	1,6
18,1 – 22,0	2,0
22,0 and larger	2,4
[a] Including the screen, if any.	

4.4 Tests

Compliance with the requirements of 4.3 shall be checked by inspection and by the tests given in table 11.

4.4.1 Flexing test

4.4.1.1 Flexing test for lift cables

4.4.1.1.1 Test apparatus

The mechanical flexing mechanism consists of two carriages mounted at the same height and move horizontally toward and away from each other in simple harmonic motion, the instantaneous speed of the carriages being equal. The carriages reach a maximum relative acceleration of 4 m/s^2 and complete (1 500 ± 10) cycles within an hour (a cycle being the movement of the carriages from the outermost position to the innermost position and then return to the original outermost position).

Each carriage supports a rocker tube to which are attached cable clamps comprising wooden split clamping blocks with a tapered “lead in” section for the cable. For cable test samples having support members, the clamps also provide means of securing these members.

The distance between cable clamp pivot points shall be (1 700 ± 10) mm with the carriages in the outermost position and (760 ± 10) mm with the carriages in the innermost position (see figure 3).

4.4.1.1.2 Setting up the apparatus

The carriages of the apparatus shall be placed in the outermost position and the test sample of cable measured and cut so that when clamped at each end, there will be (40 ± 5) mm static deflection at the centre of the test sample (sufficient length of core needs to protrude beyond the cut ends to allow for the electrical connections referred to in 4.4.1.1.3; see figure 3).

The carriages of the apparatus shall then be placed in the innermost position and the cable clamped, one end in each carriage; any support members shall also be secured. The tapered section of the split clamp shall then be filled with an epoxy or polyurethane resin compound.

NOTE It is essential that the clamps grip firmly with some degree of flexibility so that premature failure of the conductors does not occur within the cable clamps.

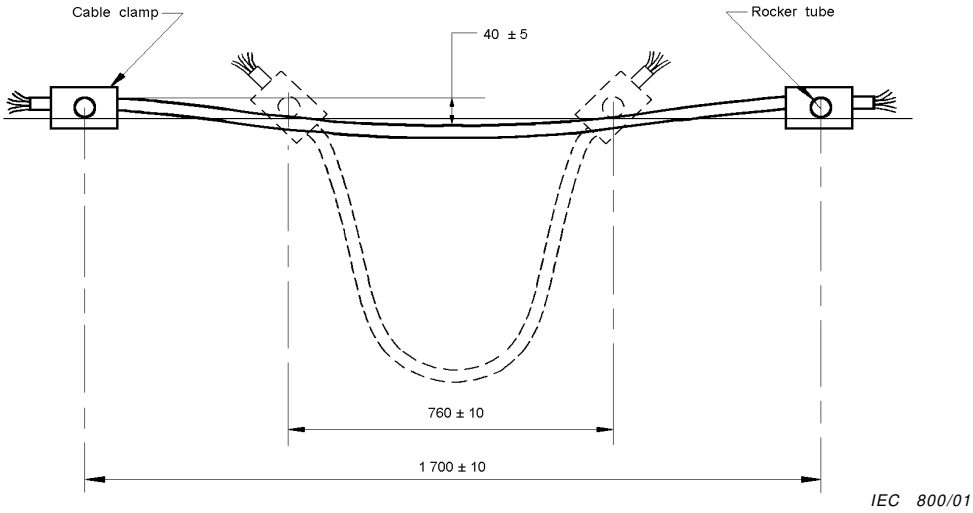
4.4.1.1.3 Electrical connections to cable

The individual cores of the cable shall be connected so as to form a continuous series circuit. The open ends of the circuit shall be connected to a 12 V d.c. supply and arranged to monitor the continuity of the cable cores continuously. Means shall also be provided to stop the test apparatus automatically in the event of an open circuit occurring in the cable cores. Provision shall be made for applying a high voltage test (1,5 kV a.c. or 2,5 kV d.c. for 5 min) to the cable at weekly intervals.

4.4.1.1.4 Test requirements

After installation in the test apparatus, the cable shall be subjected to 3 000 000 cycles of flexing. The flexing shall be continuous except that once a week, the apparatus shall be stopped to undertake the high-voltage test. Monitoring of the continuity of each core shall be performed continuously throughout the flexing.

No conductor opening circuit shall occur during the cycles of flexing and no flashover or insulation breakdown shall occur during the high-voltage test.



Dimensions in millimetres

Figure 3 – Flexing test apparatus

4.4.1.2 Flexing test for other types of cables (non-lift cables)

For non-lift cables the flexing test shall be carried out with the modification as shown in table 10.

Table 10 – Flexing test

Type of flexible cable	Mass of weight kg	Diameter of pulleys mm
Circular polyvinyl chloride sheathed cable for flexible connections:		
– of nominal cross-sectional area not exceeding 1 mm^2	1,0	80
– of nominal cross-sectional area 1,5 mm^2 and 2,5 mm^2	1,5	120
– of nominal cross-sectional area 4 mm^2	2,0	200

4.4.2 Static flexibility test

This test shall be carried out in accordance with 3.5 of IEC 60227-2.

The distance *l'* to be complied with shall be not more than 30 times the measured overall diameter of the cable to be tested.

4.4.3 Tensile strength of strain-bearing member

Unless otherwise agreed between manufacturer and user, the tensile strength of the central heart comprising a strain-bearing member shall be tested in accordance with the requirements of 3.6 of IEC 60227-2.

The central heart or strain-bearing centre shall not rupture during the test.

4.4.4 Other tests

Other tests and requirements may be added upon mutual agreement between manufacturer and user.

4.5 Guide to use

For lifts and hoists, this type of cable is intended for installations where the freely suspended length does not exceed 45 m and the speed of travel does not exceed 4,0 m/s.

For guidance on the use of cables beyond these limits, local, regional, national and other codes should be consulted for the maximum allowable length for suspension and other requirements for all cables.

This particular specification does not apply to cables to be used at temperatures below 0 °C.

Maximum conductor temperature in normal use: 70 °C.

Table 11 – Tests for circular flexible cable type 60227 IEC 71 c

1	2	3	4
Reference no.	**Test**	**Category of test**	**Test method described in**
1	Electrical		IEC 60227-2
1.1	Resistance of conductors	T,S	2.1 of IEC 60227-2
1.2	Voltage test on cores according to voltage rating:		
1.2.1	– at 1 500 V for U_o/U 300/500 V and insulation	T	2.3 of IEC 60227-2
1.2.2	– at 2 500 V for U_o/U 450/750 V and insulation	T	2.3 of IEC 60227-2
1.3	Voltage test on completed cable according to voltage rating:	T,S	2.2 of IEC 60227-2
1.3.1	– at 2 000 V for U_o/U 300/500 V		
1.3.2	– at 2 500 V for U_o/U 450/750 V		
1.4	Insulation resistance at 70 °C	T	2.4 of IEC 60227-2
2	Provisions covering constructional and dimensional characteristics		IEC 60227-1 and IEC 60227-2
2.1	Checking of compliance with constructional provisions	T,S	IEC 60227-1 Inspection and manual tests
2.2	Measurement of insulation thickness	T,S	1.9 of IEC 60227-2
2.3	Measurement of sheath thickness	T,S	1.10 of IEC 60227-2
3	Mechanical properties of insulation		
3.1	Tensile test before ageing	T	9.1 of IEC 60811-1-1
3.2	Tensile test after ageing	T	8.1.3 of IEC 60811-1-2
3.3	Loss of mass test	T	8.1 of IEC 60811-3-2
4	Mechanical properties of sheath		
4.1	Tensile test before ageing	T	9.2 of IEC 60811-1-1
4.2	Tensile test after ageing	T	8.1.3 of IEC 60811-1-2
4.3	Loss of mass test	T	8.2 of IEC 60811-3-2
5	Pressure test at high temperature		IEC 60811-3-1
5.1	Insulation	T	8.1 of IEC 60811-3-1
5.2	Sheath	T	8.2 of IEC 60811-3-1
6	Elasticity and impact strength at low temperature		IEC 60811-1-4
6.1	Bending test for insulation at low temperature	T	8.1 of IEC 60811-1-4
6.2	Bending test for sheath at low temperature	T	8.2 of IEC 60811-1-4
6.3	Elongation test for sheath at low temperature	T	8.4 of IEC 60811-1-4
6.4	Impact test on completed cable	T	8.5 of IEC 60811-1-4
7	Heat shock test		IEC 60811-3-1
7.1	Insulation	T	9.1 of IEC 60811-3-1
7.2	Sheath	T	9.2 of IEC 60811-3-1
8	Mechanical strength of completed cable		IEC 60227-2
8.1	Tensile strength of central heart provided with a strain-bearing member	T	3.6 of IEC 60227-2 See also 3.4.3 of this standard
8.2	Flexing text	T	
8.2.1	Lift cables	T	4.4.1.1 of this standard
8.2.2	Other cables	T	3.1 of IEC 60227-2 See also 4.4.1.2 of this standard
8.3	Static flexibility test	T	3.5 of IEC 60227-2 See also 4.4.2 of this standard
9	Test of flame retardance	T	IEC 60332-1

Annex A
(normative)

Fictitious calculation method for determination of the sheath dimension

A.1 General

The fictitious calculation method to determine the dimension of the cable sheath shall be in accordance with annex A of IEC 60502-1, taking into account the following supplementary information.

A.2 Conductors

The values of table A.1 of IEC 60502-1 apply, as well as the additional values of the following table A.1:

Table A.1 – Fictitious diameter of conductor

Nominal cross-section of conductor mm^2	d_L mm
0,75	1,0
1	1,1

A.3 Diameter over laid-up cores

The values of table A.2 of IEC 60502-1 apply, as well as the additional values of the following table A.2:

Table A. 2 – Assembly coefficient *k* for laid up cores

Numbers of cores	Assembly coefficient *k*
24	6,00
24 [a]	9,00
30	7,00
30 [a]	11,00
[a] Cores assembled in one layer.	

A.4 Inner coverings

Neglect the thickness of the non-metallic core assembly covering.

A.5 Concentric conductors and metallic screens

Increase the diameter by adding four times the braiding wire diameter.

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