

CEI IEC 60227-5

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

Part 5 : Flexible cables (cords)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**POLYVINYL CHLORIDE INSULATED CABLES
OF RATED VOLTAGES UP TO AND INCLUDING 450/750 V -****Part 5: Flexible cables (cords)**

FOREWORD

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International Standard IEC 60227-5 has been prepared by subcommittee 20B: Low-voltage cables, of IEC technical committee 20: Electric cables.

This consolidated version of IEC 60227-5 is based on the second edition (1997) [documents 20B/228/FDIS and 20B/243/RVD] and its amendment 1 (1997) [documents 20B/255/FDIS and 20B/263/RVD].

It bears the edition number 2.1.

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

**NORME
INTERNATIONALE
INTERNATIONAL
STANDARD**

**CEI
IEC**

60227-5

Edition 2.1

1998-02

Edition 2:1997 consolidée par l'amendement 1:1997
Edition 2:1997 consolidated with amendment 1:1997

**Conducteurs et câbles isolés au polychlorure
de vinyle, de tension nominale au plus égale
à 450/750 V –**

**Partie 5:
Câbles souples**

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

**Part 5:
Flexible cables (cords)**



Numéro de référence
Reference number
CEI/IEC 60227-5:1997+A.1:1997

Numéros des publications

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Terminologie, symboles graphiques et littéraux

En ce qui concerne la terminologie générale, le lecteur se reportera à la CEI 60050: *Vocabulaire Electrotechnique International (VEI)*.

Pour les symboles graphiques, les symboles littéraux et les signes d'usage général approuvés par la CEI, le lecteur consultera la CEI 60027: *Symboles littéraux à utiliser en électrotechnique*, la CEI 60417: *Symboles graphiques utilisables sur le matériel. Index, relevé et compilation des feuilles individuelles*, et la CEI 60617: *Symboles graphiques pour schémas*.

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* Voir adresse «site web» sur la page de titre.

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IEC publications prepared by the same technical committee

The attention of readers is drawn to the end pages of this publication which list the IEC publications issued by the technical committee which has prepared the present publication.

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

Part 5: Flexible cables (cords)

1 General

1.1 Scope

This part of IEC 60227 details the particular specifications for polyvinyl chloride insulated flexible cables (cords), of rated voltages up to and including 300/500 V.

All cables comply with the appropriate requirements given in IEC 60227-1 and each individual type of cable complies with the particular requirements of this part.

1.2 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 60227-1:1993, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60227-2:1979, *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. Guide to the dimensional limits of circular conductors*

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

IEC 60811-1-1:1993, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general applications – 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 applications – 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 applications – Section 4: Tests 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*

IEC 60885, *Electrical test methods for electric cables*

2 Flat tinsel cord

2.1 Code designation

60227 IEC 41.

2.2 Rated voltage

300/300 V.

2.3 Construction

2.3.1 Conductor

Number of conductors: 2.

Each conductor shall comprise a number of strands or groups of strands, twisted together, each strand being composed of one or more flattened wires of copper or copper alloy, helically wound on a thread of cotton, polyamide or similar material.

The conductor resistance shall not exceed the value given in table 1, column 5.

2.3.2 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 1, column 1.

The insulation resistance shall be not less than the value given in table 1, column 4.

2.3.3 Assembly of cores

The conductors shall be laid parallel and covered with the insulation.

The insulation shall be provided with a groove on both sides, between the conductors, to facilitate separation of the cores.

2.3.4 Overall dimensions

The mean overall dimensions shall be within the limits given in table 1, columns 2 and 3.

2.4 Tests

Compliance with the requirements of 2.3 shall be checked by inspection and by the tests given in table 2.

2.5 Guide to use

Maximum conductor temperature in normal use: 70 °C.

NOTE - Other guidelines are under consideration.

Table 1 – General data for type 60227 IEC 41

1	2	3	4	5
Insulation thickness	Mean overall dimensions		Minimum insulation resistance at 70 °C	Maximum conductor resistance at 20 °C
Specified value mm	Lower limits mm	Upper limits mm	MΩ·km	Ω/km
0,8	2,2 × 4,4	3,5 × 7,0	0,019	270

Table 2 – Tests for type 60227 IEC 41

1	2	3	4	
Ref. No.	Test	Category of test	Test method described in:	
			IEC Standard	Subclause
1	<i>Electrical tests</i>			
1.1	Resistance of conductors	T, S	IEC 60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T, S	IEC 60227-2	2.2
1.3	Insulation resistance at 70 °C	T	IEC 60227-2	2.4
2	<i>Provisions covering constructional and dimensional characteristics</i>		IEC 60227-1 IEC 60227-2	
2.1	Checking of compliance with constructional provisions	T, S	IEC 60227-1	Inspection and manual test
2.2	Measurement of insulation thickness	T, S	IEC 60227-2	1.9 1.11
2.3	Measurement of overall dimensions	T, S		
3	<i>Mechanical properties of insulation</i>			
3.1	Tensile test before and after ageing	T	IEC 60540	5.1 and 6.1
3.2	Loss of mass test	T	IEC 60540	7.1
4	<i>Pressure test at high temperature</i>	T	IEC 60540	8.1
5	<i>Elasticity at low temperature</i>			
5.1	Bending test for insulation at low temperature	T	IEC 60540	9.1
6	<i>Heat shock test</i>	T	IEC 60540	10.1
7	<i>Mechanical strength of completed cable</i>			
7.1	Bending test	T	IEC 60227-2	3.2
7.2	Snatch test	T	IEC 60227-2	3.3
8	<i>Test of flame retardance</i>	T	IEC 60332-1	

3 Flat non-sheathed cord

3.1 Code designation

60227 IEC 42.

3.2 Rated voltage

300/300 V.

3.3 Construction

3.3.1 Conductor

Number of conductors: 2.

The conductors shall comply with the requirements given in IEC 60228 for class 6 conductors.

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 3, column 2.

The insulation resistance shall be not less than the value given in table 3, column 5.

3.3.3 Assembly of cores

The conductors shall be laid parallel and covered with the insulation.

The insulation shall be provided with a groove on both sides, between the conductors, to facilitate separation of the cores.

3.3.4 Overall dimensions

The mean overall dimensions shall be within the limits given in table 3, columns 3 and 4.

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: 70 °C.

NOTE - Other guidelines are under consideration.

Table 3 – General data for type 60227 IEC 42

1	2	3	4	5
Nominal cross-sectional area of conductor mm ²	Thickness of insulation Specified value mm	Mean overall dimensions		Minimum insulation resistance at 70 °C MΩ.km
		Lower limit mm	Upper limit mm	
0,5	0,8	2,4 × 4,9	3,0 × 5,9	0,016
0,75	0,8	2,6 × 5,2	3,1 × 6,3	0,014

Table 4 – Tests for type 60227 IEC 42

1	2	3	4	
Ref. No.	Test	Category of test	Test method described in:	
			IEC Standard	Subclause
1	<i>Electrical tests</i>			
1.1	Resistance of conductors	T, S	IEC 60227-2	2.1
1.2	Voltage test on cores at 2 000 V	T, S	IEC 60227-2	2.3
1.3	Voltage test on completed cable at 2 000 V	T, S	IEC 60227-2	2.2
1.4	Insulation resistance at 70 °C	T		2.4
2	<i>Provisions covering constructional and dimensional characteristics</i>		IEC 60227-1 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	IEC 60227-2	1.9 1.11
2.3	Measurement of overall dimensions	T, S		
3	<i>Mechanical properties of insulation</i>			
3.1	Tensile test before and after ageing	T	IEC 60540	5.1 and 6.1
3.2	Loss of mass test	T	IEC 60540	7.1
4	<i>Pressure test at high temperature</i>	T	IEC 60540	8.1
5	<i>Elasticity and impact strength at low temperature</i>			
5.1	Bending test for insulation at low temperature	T	IEC 60540	9.1
5.2	Impact test for insulation at low temperature	T	IEC 60540	9.5
6	<i>Heat shock test</i>	T	IEC 60540	10.1
7	<i>Mechanical strength of completed cable</i>			
7.1	Flexing test	T	IEC 60227-2	3.1
7.2	Test of separation of cores	T	IEC 60227-2	3.4
8	<i>Test of flame retardance</i>	T	IEC 60332-1	

4 Cord for indoor decorative lighting chains

4.1 Code designation

60227 IEC 43.

4.2 Rated voltage

300/300 V.

4.3 Construction

4.3.1 Conductor

Number of conductors: 1.

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

4.3.2 Insulation

The insulation shall be polyvinyl chloride of the type PVC/D, it shall consist of two layers and applied by dual extrusion around the conductor.

The outer layer of insulation shall be of a colour contrasting with that of the inner layer, but shall adhere to the inner layer.

The combined thickness of the inner and outer layer of insulation shall comply with the overall thickness specified in table 5, columns 3 and 4, but at no point the thickness of either layer shall be less than the value specified in column 2.

The insulation resistance at 70 °C shall be not less than the values given in table 5, column 6.

4.3.3 Cord identification

Preferred colour of outer layer: green.

4.3.4 Overall diameter

The mean overall diameter shall not exceed the upper limit given in table 5, column 5.

4.4 Tests

Compliance with the requirements of 4.3 shall be checked by inspection and by the tests given in table 6.

4.5 Guide to use

Maximum conductor temperature in normal use: 70 °C.

Table 5 – General data for type 60227 IEC 43

1	2	3	4	5	6	7
Nominal cross-sectional area of conductor mm ²	Thickness of each layer of insulation Minimum value mm	Overall insulation thickness Minimum value mm	Overall insulation thickness Mean value mm	Mean overall diameter		Minimum insulation resistance at 70 °C MΩ.km
				Lower limit mm	Upper limit mm	
0,5	0,2	0,6	0,7	2,3	2,7	0,014
0,75	0,2	0,6	0,7	2,4	2,9	0,012

Table 6 – Tests for type 60227 IEC 43

1	2	3	4	
Ref. No.	Tests	Category of test	Test method described in:	
			IEC Standard	Subclause
1	<i>Electrical tests</i>			
1.1	Resistance of conductors	T, S	IEC 60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T, S	IEC 60227-2	2.3
1.3	Insulation resistance at 70 °C	T	IEC 60227-2	2.4
2	<i>Constructional/dimensional characteristics</i>		IEC 60227-1 IEC 60227-2	
2.1	Compliance with constructional provisions	T, S	IEC 60227-1	Inspection and manual tests
			IEC 60227-4	4.3
2.2	Measurement of insulation thickness of inner layer (minimum thickness only)	T, S	IEC 60227-2	1.9
2.3	Measurement of insulation thickness of outer layer (minimum thickness only)	T, S	IEC 60227-2	1.9
2.4	Measurement of overall thickness (note)	T, S	IEC 60227-2	1.9
2.5	Measurement of overall diameter	T, S	IEC 60227-2	1.11
3	<i>Mechanical properties of insulation</i>			
3.1	Tensile test before ageing (note)	T	IEC 60811-1-1	9.1
3.2	Tensile test after ageing (note)	T	IEC 60811-1-2	8.1.3.1
3.3	Loss of mass test (note)	T	IEC 60811-3-2	8.1
4	<i>Pressure test at high temperature (note)</i>	T	IEC 60811-3-1	8
5	<i>Elasticity at low temperature</i>			
5.1	Bend test for insulation (note)	T	IEC 60811-1-4	8.1
6	<i>Heat shock test (note)</i>	T	IEC 60811-3-1	9.1
7	<i>Test of flame retardance</i>	T	IEC 60332-1	–
NOTE – Because of the simultaneous extrusion of the same compound for both layers of insulation, the composite layer shall be tested as one layer and evaluated accordingly.				

5 Light polyvinyl chloride sheathed cord

5.1 Code designation

60227 IEC 52.

5.2 Rated voltage

300/300 V.

5.3 Construction

5.3.1 Conductor

Number of conductors: 2 and 3.

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

5.3.2 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 7, column 2.

The insulation resistance shall be not less than the values given in table 7, column 6.

5.3.3 Assembly of cores

Circular cord: the cores shall be twisted together.

Flat cord: the cores shall be laid parallel.

5.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST 5 applied around the cores.

The sheath thickness shall comply with the specified value given in table 7, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores. The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cord shall have a practically circular cross-section.

5.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 7, columns 4 and 5.

5.4 Tests

Compliance with the requirements of 5.3 shall be checked by inspection and by the tests given in table 8.

5.5 Guide to use

Maximum conductor temperature in normal use: 70 °C.

NOTE - Other guidelines are under consideration.

Table 7 – General data for type 60227 IEC 52

1	2	3	4	5	6
Number and nominal cross-sectional area of conductors mm ²	Thickness of insulation Specified value mm	Thickness of sheath Specified value mm	Mean overall dimensions		Minimum insulation resistance at 70 °C
			Lower limit mm	Upper limit mm	
2 × 0,5	0,5	0,6	4,6 or 3,0 × 4,9	5,9 or 3,7 × 5,9	0,012
2 × 0,75	0,5	0,6	4,9 or 3,2 × 5,2	6,3 or 3,8 × 6,3	0,010
3 × 0,5	0,5	0,6	4,9	6,3	0,012
3 × 0,75	0,5	0,6	5,2	6,7	0,010

Table 8 – Tests for type 60227 IEC 52

1 Ref. No.	2 Test	3 Category of test	4 Test method described in:	
			IEC Standard	Subclause
1	<i>Electrical tests</i>			
1.1	Resistance of conductors	T, S	IEC 60227-2	2.1
1.2	Voltage test on cores at 1 500 V	T, S	IEC 60227-2	2.3
1.3	Voltage test on completed cable at 2 000 V	T, S	IEC 60227-2	2.2
1.4	Insulation resistance at 70 °C	T	IEC 60227-2	2.4
2	<i>Provisions covering constructional and dimensionsl characteristics</i>		IEC 60227-1 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	IEC 60227-2	1.9
2.3	Measurement of sheath thickness	T, S	IEC 60227-2	1.10
2.4	Measurement of overall dimensions:			
2.4.1	mean value	T, S	IEC 60227-2	1.11
2.4.2	ovality	T, S	IEC 60227-2	1.11
3	<i>Mechanical properties of insulation</i>			
3.1	Tensile test before and after ageing	T	IEC 60540	5.1 and 6.1
3.2	Loss of mass test	T	IEC 60540	7.1
4	<i>Mechanical properties of sheath</i>			
4.1	Tensile test before and after ageing	T	IEC 60540	5.2 and 6.1
4.2	Loss of mass test	T	IEC 60540	7.2
5	Pressure test at high temperature			
5.1	Insulation	T	IEC 60540	8.1
5.2	Sheath	T	IEC 60540	8.2
6	<i>Elasticity and impact strength at low temperature</i>			
6.1	Bending test for insulation at low temperature	T	IEC 60540	9.1
6.2	Bending test for sheath at low temperature	T	IEC 60540	9.2
6.3	Impact test on completed cable at low temperature	T	IEC 60540	9.5
7	<i>Heat shock test</i>			
7.1	Insulation	T	IEC 60540	10.1
7.2	Sheath	T	IEC 60540	10.2
8	<i>Mechanical strength of completed cable</i>			
8.1	Flexing test	T	IEC 60227-2	3.1
9	<i>Test of flame retardance</i>	T	IEC 60332-1	

6 Ordinary polyvinyl chloride sheathed cord

6.1 Code designation

60227 IEC 53.

6.2 Rated voltage

300/500 V.

6.3 Construction

6.3.1 Conductor

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

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

6.3.2 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 9, column 2.

The insulation resistance shall be not less than the value given in table 9, column 6.

6.3.3 Assembly of cores and fillers, if any

Circular cord: the cores and the fillers, shall be twisted together.

Flat cord: the cores shall be laid parallel.

For circular cord having two cores, the space between the cores shall be filled either by separate fillers or by the sheath filling the interstices.

Any filler shall not adhere to the cores.

6.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST 5 applied around the cores.

The sheath thickness shall comply with the specified value given in table 9, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores. The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cords shall have a practically circular cross-section.

6.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 9, columns 4 and 5.

Table 9 – General data for type 60227 IEC 53

1 Number and nominal cross-sectional area of conductors mm ²	2 Thickness of insulation Specified value mm	3 Thickness of sheath Specified value mm	4		5 Mean overall dimensions Lower limit mm	6 Minimum insulation resistance at 70 °C MΩ·km
			5 Upper limit mm			
2 x 0,75	0,6	0,8	5,7 or 3,7 x 6,0	7,2 or 4,5 x 7,2	0,011	
2 x 1	0,6	0,8	5,9	7,5	0,010	
2 x 1,5	0,7	0,8	6,8	8,6	0,010	
2 x 2,5	0,8	1,0	8,4	10,6	0,009	
3 x 0,75	0,6	0,8	6,0	7,6	0,011	
3 x 1	0,6	0,8	6,3	8,0	0,010	
3 x 1,5	0,7	0,9	7,4	9,4	0,010	
3 x 2,5	0,8	1,1	9,2	11,4	0,009	
4 x 0,75	0,6	0,8	6,6	8,3	0,011	
4 x 1	0,6	0,9	7,1	9,0	0,010	
4 x 1,5	0,7	1,0	8,4	10,5	0,010	
4 x 2,5	0,8	1,1	10,1	12,5	0,009	
5 x 0,75	0,6	0,9	7,4	9,3	0,011	
5 x 1	0,6	0,9	7,8	9,8	0,010	
5 x 1,5	0,7	1,1	9,3	11,6	0,010	
5 x 2,5	0,8	1,2	11,2	13,9	0,009	

6.4 Tests

Compliance with the requirements of 6.3 shall be checked by inspection and by the tests given in table 10.

6.5 Guide to use

Maximum conductor temperature in normal use: 70 °C.

NOTE – Other guidelines are under consideration.

Table 10 – Tests for type 60227 IEC 53

1	2	3	4	
Ref. No.	Test	Category of test	Test method described in:	
			IEC Standard	Subclause
1	<i>Electrical tests</i>			
1.1	Resistance of conductors	T, S	IEC 60227-2	2.1
1.2	Voltage test on cores according to specified insulation thickness:	T, S	IEC 60227-2	2.3
1.2.1	at 1 500 V up to and including 0,6 mm	T	IEC 60227-2	2.3
1.2.2	at 2 000 V exceeding 0,6 m	T	IEC 60227-2	2.3
1.3	Voltage test on complete cable at 2 000 V	T	IEC 60227-2	2.2
1.4	Insulation resistance at 70 °C	T	IEC 60227-2	2.4
2	<i>Provisions covering constructional and dimensional characteristics</i>		IEC 60227-1 IEC 60227-2	
2.1	Checking of compliance with constructional provisions	T, S	IEC 60227-1 IEC 60227-2	Inspection and manual tests
2.2	Measurement of insulation thickness	T, S	IEC 60227-2	1.9
2.3	Measurement of overall dimensions	T, S	IEC 60227-2	1.10
2.4	Measurement of overall dimensions:			
2.4.1	mean value	T, S	IEC 60227-2	1.11
2.4.2	ovality	T, S	IEC 60227-2	1.11
3	<i>Mechanical properties of insulation</i>			
3.1	Tensile test before and after ageing	T	IEC 60540	5.1 and 6.1
3.2	Loss of mass test	T	IEC 60540	7.1
4	<i>Mechanical properties of sheath</i>			
4.1	Tensile test before and after ageing	T	IEC 60540	5.2 and 6.1
4.2	Loss of mass test			
5	<i>Test of non-contamination</i>	T	IEC 60540	6.1.4
6	<i>Pressure test at high temperature</i>			
6.1	Insulation	T	IEC 60540	8.1
6.2	Sheath	T	IEC 60540	8.2
7	<i>Elasticity and impact strength at low temperature</i>			
7.1	Bending test for insulation at low temperature	T	IEC 60540	9.1
7.2	Bending test for sheath at low temperature	T	IEC 60540	9.2
7.3	Impact test on completed cable at low temperature	T	IEC 60540	9.5
8	<i>Heat shock test</i>			
8.1	Insulation	T	IEC 60540	10.1
8.2	Sheath	T	IEC 60540	10.2
9	<i>Mechanical strength of completed cable</i>			
9.1	Flexing test	T	IEC 60227-2	3.1
10	<i>Test of flame retardance</i>	T	IEC 60332-1	

7 Heat-resistant light PVC-sheathed cord for a maximum conductor temperature of 90 °C

7.1 Code designation

60227 IEC 56

7.2 Rated voltage

300/300 V

7.3 Construction

7.3.1 Conductor

Number of conductors: 2 and 3.

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

7.3.2 Insulation

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

The insulation thickness shall comply with the specified value given in table 11, column 2.

The insulation resistance shall be not less than the values given in table 11, column 6.

7.3.3 Assembly of cores

Circular cord: the cores shall be twisted together.

Flat cord: the cores shall be laid parallel.

7.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST10, applied around the cores.

The sheath thickness shall comply with the specified value given in table 11, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores. The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cord shall have a practically circular cross-section.

7.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 11, columns 4 and 5.

7.4 Tests

Compliance with the requirements of 7.3 shall be checked by inspection and by the tests given in table 12.

7.5 Guide to use

Maximum conductor temperature in normal use: 90 °C.

NOTE – Other guidelines are under consideration.

Table 11 – General data for type 60227 IEC 56

1	2	3	4	5	6
Number and nominal cross-sectional area of conductors mm ²	Insulation thickness Specified value mm	Sheath thickness Specified value mm	Mean overall dimensions		Minimum insulation resistance at 90 °C MΩ·km
			Lower limits mm	Upper limits mm	
2 × 0,5	0,5	0,6	4,6 or 3,0 × 4,9	5,9 or 3,7 × 5,9	0,012
2 × 0,75	0,5	0,6	4,9 or 3,2 × 5,2	6,3 or 3,8 × 6,3	0,010
3 × 0,5	0,5	0,6	4,9	6,3	0,012
3 × 0,75	0,5	0,6	5,2	6,7	0,010

NOTE – The mean overall dimensions have been calculated in accordance with IEC 60719.

Table 12 – Tests for type 60227 IEC 56

1	2	3	4	5
Reference No.	Test	Category of test	IEC standard	Test methods described in: clause/ subclause
1	<i>Electrical tests</i>			
1.1	Resistance of conductors	T,S	60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T,S	60227-2	2.2
1.3	Voltage test on cores at 1 500 V	T	60227-2	2.3
1.4	Insulation resistance at 90 °C	T	60227-2	2.4
2	<i>Provisions covering constructional and dimensional characteristics</i>			
2.1	Checking of compliance with constructional provisions	T,S	60227-1	Inspection and manual tests
2.2	Measurement of thickness of insulation	T,S	60227-2	1.9
2.3	Measurement of thickness of sheath	T,S	60227-2	1.10
2.4	Measurement of overall dimensions			
2.4.1	Mean value	T,S	60227-2	1.11
2.4.2	Ovality	T,S	60227-2	1.11
3	<i>Mechanical properties of insulation</i>			
3.1	Tensile test before ageing	T	60811-1-1	9.1
3.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
3.3	Loss of mass test	T	60811-3-2	8.1
4	<i>Mechanical properties of sheath</i>			
4.1	Tensile test before ageing	T	60811-1-1	9.2
4.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
4.3	Loss of mass test	T	60811-3-2	8.2
5	<i>Pressure test at high temperature</i>			
5.1	Insulation	T	60811-3-1	8.1
5.2	Sheath	T	60811-3-1	8.2
6	<i>Tests at low temperature</i>			
6.1	Bending test for insulation	T	60811-1-4	8.1
6.2	Bending test for sheath	T	60811-1-4	8.2
6.3	Impact test	T	60811-1-4	8.5
7	<i>Heat shock test</i>			
7.1	Insulation	T	60811-3-1	9.1
7.2	Sheath	T	60811-3-1	9.2
8	<i>Thermal stability</i>			
8.1	Insulation	T	60811-3-2	9
8.2	Sheath	T	60811-3-2	9
9	<i>Mechanical strength of complete cable</i>			
9.1	Flexing test	T	60227-2	3.1
10	<i>Test of flame retardance</i>	T	60332-1	-

8 Heat-resistant ordinary PVC-sheathed cord for a maximum conductor temperature of 90 °C

8.1 Code designation

60227 IEC 57

8.2 Rated voltage

300/500 V

8.3 Construction

8.3.1 Conductor

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

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

8.3.2 Insulation

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

The insulation thickness shall comply with the specified value given in table 13, column 2.

The insulation resistance shall be not less than the value given in table 13, column 6.

8.3.3 Assembly of cores and fillers, if any

Circular cord: the cores and the fillers, if any, shall be twisted together.

Flat cord: the cores shall be laid parallel.

For circular cord having two cores, the space between the cores shall be filled either by separate fillers or by the sheath filling the interstices.

Any filler shall not adhere to the cores.

8.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST10 applied around the cores.

The sheath thickness shall comply with the specified value given in table 13, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores.

The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cords shall have a practically circular cross-section.

8.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 13, columns 4 and 5.

Table 13 – General data for type 60227 IEC 57

1 Number and nominal cross-sectional area of conductors mm ²	2 Insulation thickness Specified value mm	3 Sheath thickness Specified value mm	4		6 Minimum insulation resistance at 90 °C MΩ·km
			5 Mean overall dimensions		
			Lower limit mm	Upper limit mm	
2 × 0,75	0,6	0,8	5,7 or 3,7 × 6,0	7,2 or 4,5 × 7,2	0,011
2 × 1	0,6	0,8	5,9	7,5	0,010
2 × 1,5	0,7	0,8	6,8	8,6	0,010
2 × 2,5	0,8	1,0	8,4	10,6	0,009
3 × 0,75	0,6	0,8	6,0	7,6	0,011
3 × 1	0,6	0,8	6,3	8,0	0,010
3 × 1,5	0,7	0,9	7,4	9,4	0,010
3 × 2,5	0,8	1,1	9,2	11,4	0,009
4 × 0,75	0,6	0,8	6,6	8,3	0,011
4 × 1	0,6	0,9	7,1	9,0	0,010
4 × 1,5	0,7	1,0	8,4	10,5	0,010
4 × 2,5	0,8	1,1	10,1	12,5	0,009
5 × 0,75	0,6	0,9	7,4	9,3	0,011
5 × 1	0,6	0,9	7,8	9,8	0,010
5 × 1,5	0,7	1,1	9,3	11,6	0,010
5 × 2,5	0,8	1,2	11,2	13,9	0,009

NOTE – The mean overall dimensions have been calculated in accordance with IEC 60719.

8.4 Tests

Compliance with the requirements of 8.3 shall be checked by inspection and by the tests given in table 14.

8.5 Guide to use

Maximum conductor temperature in normal use: 90 °C.

NOTE – Other guidelines are under consideration.

Table 14 – Tests for type 60227 IEC 57

1	2	3	4	5
Reference No.	Tests	Category of test	Test methods described in: IEC standard	clause/subclause
1	<i>Electrical tests</i>			
1.1	Resistance of conductors	T,S	60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T,S	60227-2	2.2
1.3	Voltage test on cores according to specified insulation thickness:			
1.3.1	– at 1 500 V up to and including 0,6 mm	T	60227-2	2.3
1.3.2	– at 2 000 V exceeding 0,6 mm	T	60227-2	2.3
1.4	Insulation resistance at 90 °C	T	60227-2	2.4
2	<i>Provisions covering constructional and dimensional characteristics</i>			
2.1	Checking of compliance with constructional provisions	T,S	60227-1	Inspection and manual tests
2.2	Measurement of thickness of insulation	T,S	60227-2	1.9
2.3	Measurement of thickness of sheath	T,S	60227-2	1.10
2.4	Measurement of overall dimensions			
2.4.1	Mean value	T,S	60227-2	1.11
2.4.2	Ovality	T,S	60227-2	1.11
3	<i>Mechanical properties of insulation</i>			
3.1	Tensile test before ageing	T	60811-1-1	9.1
3.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
3.3	Loss of mass test	T	60811-3-2	8.1
3.4	Compatibility test ¹⁾	T	60811-1-2	8.1.4
4	<i>Mechanical properties of sheath</i>			
4.1	Tensile test before ageing	T	60811-1-1	9.2
4.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
4.3	Loss of mass test	T	60811-3-2	8.2
5	<i>Pressure test at high temperature</i>			
5.1	Insulation	T	60811-3-1	8.1
5.2	Sheath	T	60811-3-1	8.2
6	<i>Tests at low temperature</i>			
6.1	Bending test for insulation	T	60811-1-4	8.1
6.2	Bending test for sheath ²⁾	T	60811-1-4	8.2
6.3	Elongation test for sheath ³⁾	T	60811-1-4	8.4
6.4	Impact test	T	60811-1-4	8.5
7	<i>Heat shock test</i>			
7.1	Insulation	T	60811-3-1	9.1
7.2	Sheath	T	60811-3-1	9.2
8	<i>Thermal stability</i>			
8.1	Insulation	T	60811-3-2	9
8.2	Sheath	T	60811-3-2	9
9	<i>Mechanical strength of complete cable</i>			
9.1	Flexing test	T	60227-2	3.1
10	<i>Test of flame retardance</i>	T	60332-1	–

¹⁾ See 5.3.1 of IEC 60227-1.

²⁾ Only applicable to cables having mean overall diameters up to and including 12,5 mm.

³⁾ Only applicable if the mean overall diameter of the cable exceeds 12,5 mm.

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AMENDEMENT
AMENDMENT

1997-1

Amendement 1

**Conducteurs et câbles isolés au
polychlorure de vinyle, de tension nominale
au plus égale à 450/750 V –**

**Partie 5:
Câbles souples**

Amendment 1

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

**Part 5:
Flexible cables (cords)**

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International Electrotechnical Commission
Telefax: +41 22 919 0300

3, rue de Varembe Geneva, Switzerland
e-mail: inmail@iec.ch IEC web site <http://www.iec.ch>



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FOREWORD

This amendment has been prepared by subcommittee 20B: Low-voltage cables, of IEC technical committee 20: Electric cables.

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

FDIS	Report on voting
20B/255/FDIS	20B/263/RVD

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

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CONTENTS

Add the titles of the following clauses and tables:

- 7 Heat-resistant light PVC-sheathed cord for a maximum conductor temperature of 90 °C
- 8 Heat-resistant ordinary PVC-sheathed cord for a maximum conductor temperature of 90 °C
- Table 11 – General data for type 60227 IEC 56
- Table 12 – Tests for type 60227 IEC 56
- Table 13 – General data for type 60227 IEC 57
- Table 14 – Tests for type 60227 IEC 57

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Add, after table 10, the following new clauses:

- 7 **Heat-resistant light PVC-sheathed cord for a maximum conductor temperature of 90 °C**
 - 7.1 **Code designation**
- 60227 IEC 56

7.2 Rated voltage

30/300 V

7.3 Construction

7.3.1 Conductor

Number of conductors: 2 and 3.

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

7.3.2 Insulation

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

The insulation thickness shall comply with the specified value given in table 11, column 2.

The insulation resistance shall be not less than the values given in table 11, column 6.

7.3.3 Assembly of cores

Circular cord: the cores shall be twisted together.

Flat cord: the cores shall be laid parallel.

7.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST10, applied around the cores.

The sheath thickness shall comply with the specified value given in table 11, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores. The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cord shall have a practically circular cross-section.

7.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 11, columns 4 and 5.

7. Tests

Compliance with the requirements of 7.3 shall be checked by inspection and by the tests given in table 12.

7.5 Guide to use

Maximum conductor temperature in normal use: 90 °C.

NOTE - Other guidelines are under consideration.

Table 11 - General data for type 60227 IEC 56

1	2	3	4	5	6
Number and nominal cross-sectional area of conductors mm ²	Insulation thickness Specified value mm	Sheath thickness Specified value mm	Mean overall dimensions		Minimum insulation resistance at 90 °C MΩ·km
			Lower limits mm	Upper limits mm	
2 × 0,5	0,5	0,6	4,6 or 3,0 × 4,9	5,9 or 3,7 × 5,9	0,012
2 × 0,75	0,5	0,6	4,9 or 3,2 × 5,2	6,3 or 3,8 × 6,3	0,010
3 × 0,5	0,5	0,6	4,9	6,3	0,012
3 × 0,75	0,5	0,6	5,2	6,7	0,010

NOTE - The mean overall dimensions have been calculated in accordance with IEC 60719.

Table 12 – Tests for type 60227 IEC 56

1	2	3	4	5
Reference no.	Test	Category of test	Test methods described in:	
			IEC standard	clause/subclause
	Electrical tests			
1.1	Resistance of conductors	T,S	60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T,S	60227-2	2.2
1.3	Voltage test on cores at 1 500 V	T	60227-2	2.3
1.4	Insulation resistance at 90 °C	T	60227-2	2.4
2	Provisions covering constructional and dimensional characteristics			
2.1	Checking of compliance with constructional provisions	T,S	60227-1	Inspection and manual tests
2.2	Measurement of thickness of insulation	T,S	60227-2	1.9
2.3	Measurement of thickness of sheath	T,S	60227-2	1.10
2.4	Measurement of overall dimensions			
2.4.1	Mean value	T,S	60227-2	1.11
2.4.2	Ovality	T,S	60227-2	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	T	60811-1-2	8.1.3.1
3.3	Loss of mass test	T	60811-3-2	8.1
4	Mechanical properties of sheath			
4.1	Tensile test before ageing	T	60811-1-1	9.2
4.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
4.3	Loss of mass test	T	60811-3-2	8.2
5	Pressure test at high temperature			
5.1	Insulation	T	60811-3-1	8.1
5.2	Sheath	T	60811-3-1	8.2
6	Tests at low temperature			
6.1	Bending test for insulation	T	60811-1-4	8.1
6.2	Bending test for sheath	T	60811-1-4	8.2
6.3	Impact test	T	60811-1-4	8.5
7	Heat shock test			
7.1	Insulation	T	60811-3-1	9.1
7.2	Sheath	T	60811-3-1	9.2
8	Thermal stability			
8.1	Insulation	T	60811-3-2	9
8.2	Sheath	T	60811-3-2	9
9	Mechanical strength of complete cable			
9.1	Flexing test	T	60227-2	3.1
10	Test of flame retardance	T	60332-1	-

8 Heat-resistant ordinary PVC-sheathed cord for a maximum conductor temperature of 90 °C

8.1 Code designation

60227 IEC 57

8.2 Rated voltage

300/500 V

8.3 Construction

8.3.1 Conductor

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

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

8.3.2 Insulation

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

The insulation thickness shall comply with the specified value given in table 13, column 2.

The insulation resistance shall be not less than the value given in table 13, column 6.

8.3.3 Assembly of cores and fillers, if any

Circular cord: the cores and the fillers, if any, shall be twisted together.

Flat cord: the cores shall be laid parallel.

For circular cord having two cores, the space between the cores shall be filled either by separate fillers or by the sheath filling the interstices.

Any filler shall not adhere to the cores.

8.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST10 applied around the cores.

The sheath thickness shall comply with the specified value given in table 13, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores.

The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cords shall have a practically circular cross-section.

8.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 13, columns 4 and 5.

Table 13 – General data for type 60227 IEC 57

1 Number and nominal cross- sectional area of conductors mm ²	2 Insulation thickness Specified value mm	3 Sheath thickness Specified value mm	4		5	6 Minimum insulation resistance at 90 °C MΩ·km
			Mean overall dimensions		Upper limit mm	
			Lower limit mm			
2 × 0,75	0,6	0,8	5,7 or 3,7 × 6,0	7,2 or 4,5 × 7,2	0,011	
2 × 1	0,6	0,8	5,9	7,5	0,010	
2 × 1,5	0,7	0,8	6,8	8,6	0,010	
2 × 2,5	0,8	1,0	8,4	10,6	0,009	
3 × 0,75	0,6	0,8	6,0	7,6	0,011	
3 × 1	0,6	0,8	6,3	8,0	0,010	
3 × 1,5	0,7	0,9	7,4	9,4	0,010	
3 × 2,5	0,8	1,1	9,2	11,4	0,009	
4 × 0,75	0,6	0,8	6,6	8,3	0,011	
4 × 1	0,6	0,9	7,1	9,0	0,010	
4 × 1,5	0,7	1,0	8,4	10,5	0,010	
4 × 2,5	0,8	1,1	10,1	12,5	0,009	
5 × 0,75	0,6	0,9	7,4	9,3	0,011	
5 × 1	0,6	0,9	7,8	9,8	0,010	
5 × 1,5	0,7	1,1	9,3	11,6	0,010	
5 × 2,5	0,8	1,2	11,2	13,9	0,009	

NOTE – The mean overall dimensions have been calculated in accordance with IEC 60719.

8.4 Tests

Compliance with the requirements of 8.3 shall be checked by inspection and by the tests given in table 14.

8.5 Guide to use

Maximum conductor temperature in normal use: 90 °C.

NOTE – Other guidelines are under consideration.

Table 14 – Tests for type 60227 IEC 57

1	2	3	4	5
Reference No.	Tests	Category of test	Test methods described in: IEC standard	clause/ subclause
1	Electrical tests			
1.1	Resistance of conductors	T,S	60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T,S	60227-2	2.2
1.3	Voltage test on cores according to specified insulation thickness:			
1.3.1	– at 1 500 V up to and including 0,6 mm	T	60227-2	2.3
1.3.2	– at 2 000 V exceeding 0,6 mm	T	60227-2	2.3
1.4	Insulation resistance at 90 °C	T	60227-2	2.4
2	Provisions covering constructional and dimensional characteristics			
2.1	Checking of compliance with constructional provisions	T,S	60227-1	Inspection and manual tests
2.2	Measurement of thickness of insulation	T,S	60227-2	1.9
2.3	Measurement of thickness of sheath	T,S	60227-2	1.10
2.4	Measurement of overall dimensions			
2.4.1	Mean value	T,S	60227-2	1.11
2.4.2	Ovality	T,S	60227-2	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	T	60811-1-2	8.1.3.1
3.3	Loss of mass test	T	60811-3-2	8.1
3.4	Compatibility test ¹⁾	T	60811-1-2	8.1.4
4	Mechanical properties of sheath			
4.1	Tensile test before ageing	T	60811-1-1	9.2
4.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
4.3	Loss of mass test	T	60811-3-2	8.2
5	Pressure test at high temperature			
5.1	Insulation	T	60811-3-1	8.1
5.2	Sheath	T	60811-3-1	8.2
6	Tests at low temperature			
6.1	Bending test for insulation	T	60811-1-4	8.1
6.2	Bending test for sheath ²⁾	T	60811-1-4	8.2
6.3	Elongation test for sheath ³⁾	T	60811-1-4	8.4
6.4	Impact test	T	60811-1-4	8.5
7	Heat shock test			
7.1	Insulation	T	60811-3-1	9.1
7.2	Sheath	T	60811-3-1	9.2
8	Thermal stability			
8.1	Insulation	T	60811-3-2	9
8.2	Sheath	T	60811-3-2	9
9	Mechanical strength of complete cable			
9.1	Flexing test	T	60227-2	3.1
10	Test of flame retardance	T	60332-1	–

¹⁾ See 5.3.1 of IEC 60227-1.

²⁾ Only applicable to cables having mean overall diameters up to and including 12,5 mm.

³⁾ Only applicable if the mean overall diameter of the cable exceeds 12,5 mm.