

INTERNATIONAL STANDARD

**Polyvinyl chloride insulated cables of rated voltages up to and including
450/750 V –
Part 5: Flexible cables (cords)**

IECNORM.COM : Click to view the full PDF of IEC 60227-5:2024



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2024 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IECNORM.COM : Click to view the full text of IEC 60275:2024

INTERNATIONAL STANDARD

**Polyvinyl chloride insulated cables of rated voltages up to and including
450/750 V –
Part 5: Flexible cables (cords)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.060.20

ISBN 978-2-8322-8262-5

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	9
4 Flat tinsel cord.....	9
4.1 Code designation.....	9
4.2 Rated voltage	9
4.3 Construction	10
4.3.1 Conductors.....	10
4.3.2 Insulation.....	10
4.3.3 Assembly of cores	10
4.3.4 Overall dimensions	10
4.4 Tests	10
4.4.1 General	10
4.4.2 Bending test	10
4.4.3 Drop test	10
4.5 Guidance on use.....	10
5 (Vacant)	11
6 Cord for indoor decorative lighting chains.....	11
6.1 Code designation.....	11
6.2 Rated voltage	12
6.3 Construction	12
6.3.1 Conductors.....	12
6.3.2 Insulation.....	12
6.3.3 Cord identification.....	12
6.3.4 Overall diameter.....	12
6.4 Tests	12
6.4.1 General.....	12
6.4.2 (Vacant)	12
6.5 Guidance on use.....	12
7 Light polyvinyl chloride sheathed cord	14
7.1 Code designation.....	14
7.2 Rated voltage	14
7.3 Construction	14
7.3.1 Conductors.....	14
7.3.2 Insulation.....	14
7.3.3 Assembly of cores	14
7.3.4 Sheath.....	14
7.3.5 Overall dimensions	14
7.4 Tests	14
7.4.1 General	14
7.4.2 Flexing test.....	15
7.5 Guidance on use.....	15
8 Ordinary polyvinyl chloride sheathed cord	16
8.1 Code designation.....	16

8.2	Rated voltage	17
8.3	Construction	17
8.3.1	Conductors	17
8.3.2	Insulation	17
8.3.3	Assembly of cores and fillers, if any	17
8.3.4	Sheath	17
8.3.5	Overall dimensions	17
8.4	Tests	18
8.4.1	General	18
8.4.2	Flexing test	18
8.5	Guidance on use	19
9	Heat-resistant light PVC-sheathed cord for a maximum conductor temperature of 90 °C	20
9.1	Code designation	20
9.2	Rated voltage	20
9.3	Construction	20
9.3.1	Conductors	20
9.3.2	Insulation	21
9.3.3	Assembly of cores	21
9.3.4	Sheath	21
9.3.5	Overall dimensions	21
9.4	Tests	21
9.4.1	General	21
9.4.2	Flexing test	21
9.5	Guidance on use	22
10	Heat-resistant ordinary PVC-sheathed cord for a maximum conductor temperature of 90 °C	24
10.1	Code designation	24
10.2	Rated voltage	24
10.3	Construction	24
10.3.1	Conductors	24
10.3.2	Insulation	24
10.3.3	Assembly of cores and fillers, if any	24
10.3.4	Sheath	24
10.3.5	Overall dimensions	24
10.4	Tests	25
10.4.1	General	25
10.4.2	Flexing test	25
10.5	Guidance on use	26
	Bibliography	28
	Table 1 – General data for type 60227 IEC 41	11
	Table 2 – Tests for type 60227 IEC 41	11
	Table 3 – General data for type 60227 IEC 43	13
	Table 4 – Tests for type 60227 IEC 43	13
	Table 5 – Mass of weight and diameter of pulleys	15
	Table 6 – General data for type 60227 IEC 52	15

Table 7 – Tests for type 60227 IEC 52	16
Table 8 – General data for type 60227 IEC 53	18
Table 9 – Mass of weight and diameter of pulleys	19
Table 10 – Tests for type 60227 IEC 53	19
Table 11 – Mass of weight and diameter of pulleys	22
Table 12 – General data for type 60227 IEC 56	22
Table 13 – Tests for type 60227 IEC 56	23
Table 14 – General data for type 60227 IEC 57	25
Table 15 – Mass of weight and diameter of pulleys	26
Table 16 – Tests for type 60227 IEC 57	26

IECNORM.COM : Click to view the full PDF of IEC 60227-5:2024

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**POLYVINYL CHLORIDE INSULATED CABLES
OF RATED VOLTAGES UP TO AND INCLUDING 450/750 V –****Part 5: Flexible cables (cords)****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 itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60227-5 has been prepared by IEC technical committee 20: Electric cables. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2011. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the reference to tests according to IEC 60227-2 has been withdrawn and replaced with a reference to IEC 63294;
- b) normative references have been updated.

The text of this International Standard is based on the following documents:

Draft	Report on voting
20/2143/FDIS	20/2156/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 60227 series, published under the general title *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*, can be found on the IEC website.

This document is to be used in conjunction with IEC 60227-1:—¹.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

¹ Fourth edition under preparation. Stage at the time of publication IEC FDIS 60227-1:2023.

INTRODUCTION

The IEC 60227 series, published under the general title *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*, consists of the following parts:

IEC 60227-1, General requirements;

IEC 60227-2, Test methods (withdrawn and replaced by IEC 63294);

IEC 60227-3, Non-sheathed cables for fixed wiring;

IEC 60227-4, Sheathed cables for fixed wiring;

IEC 60227-5, Flexible cables (cords);

IEC 60227-6, Lift cables and cables for flexible connections;

IEC 60227-7, Flexible cables screened and unscreened with two or more conductors and of rated voltages up to and including 300/500 V.

This part of IEC 60227, when used in conjunction with IEC 60227-1, forms the complete standard for flexible cables (cords).

IECNORM.COM : Click to view the full PDF of IEC 60227-5:2024

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

Part 5: Flexible cables (cords)

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.

This document provides the particular requirements for flexible cables (cords) which apply in addition to the appropriate requirements specified in IEC 60227-1, which apply to all cables.

The tests for cables specified in the IEC 60227 series are described in IEC 63294.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60228, *Conductors of insulated cables*

IEC 60332-1-2, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

IEC 60811-401, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 401: Miscellaneous tests – Thermal ageing methods – Ageing in an air oven*

IEC 60811-405, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 405: Miscellaneous tests – Thermal stability test for PVC insulations and PVC sheaths*

IEC 60811-409, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 409: Miscellaneous tests – Loss of mass test for thermoplastic insulations and sheaths*

IEC 60811-501, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 501: Mechanical tests – Tests for determining the mechanical properties of insulating and sheathing compounds*

IEC 60811-504, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 504: Mechanical tests – Bending tests at low temperature for insulation and sheaths*

² Fourth edition under preparation. Stage at the time of publication IEC FDIS 60227-1:2023.

IEC 60811-505, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 505: Mechanical tests – Elongation at low temperature for insulations and sheaths*

IEC 60811-506, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 506: Mechanical tests – Impact test at low temperature for insulations and sheaths*

IEC 60811-508, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 508: Mechanical tests – Pressure test at high temperature for insulation and sheaths*

IEC 60811-509, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 509: Mechanical tests – Test for resistance of insulations and sheaths to cracking (heat shock test)*

IEC 62440, *Electric cables with a rated voltage not exceeding 450/750 V – Guide to use*

IEC 63294:2021, *Test methods for electric cables with rated voltages up to and including 450/750 V.*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60227-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

type test

test made before supplying a type of cable covered by this document on a general commercial basis in order to demonstrate satisfactory performance characteristics to meet the intended application

Note 1 to entry: Type tests are of such a nature that, after they have been made, it is not necessary for them to be repeated, unless changes are made in the cable materials or design which can change the performance characteristics.

Note 2 to entry: The symbol T is used to refer to type tests.

3.2

sample test

test made on samples of completed cable or components taken from a completed cable to verify that the finished product meets the design standards

Note 1 to entry: The symbol S is used to refer to sample tests.

4 Flat tinsel cord

4.1 Code designation

60227 IEC 41.

4.2 Rated voltage

300/300 V.

4.3 Construction

4.3.1 Conductors

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.

4.3.2 Insulation

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

The specified value of the insulation thickness is given in Table 1, column 1.

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

4.3.3 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.

4.3.4 Overall dimensions

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

4.4 Tests

4.4.1 General

Compliance with the requirements of 4.3 shall be checked by inspection and by the sample tests and type tests given in Table 2.

4.4.2 Bending test

The requirements are given in IEC 60227-1:—, 6.6.3.3.

4.4.3 Drop test

The requirements are given in IEC 60227-1:—, 6.6.3.4.

4.5 Guidance on use

The maximum conductor temperature in normal use is 70 °C.

The use of the cable type 60227 IEC 41 shall comply with IEC 62440, which provides guidance on the safe use of electric cables with a rated voltage not exceeding 450/750 V.

Table 1 – General data for type 60227 IEC 41

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

^a The mean overall dimensions have been calculated in accordance with IEC 60719.

Table 2 – Tests for type 60227 IEC 41

1	2	3	4
Ref. No.	Test	Category of test	Test method described in
1	Electrical tests		
1.1	Resistance of conductors	T, S	IEC 63294:2021, 5.1
1.2	Voltage test on completed cable at 2 000 V	T, S	IEC 63294:2021, 5.2
1.3	Insulation resistance at 70 °C	T	IEC 63294:2021, 5.4 IEC 60227-1:—, Table 3
2	Provisions covering constructional and dimensional characteristics		
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 63294:2021, 6.2
2.3	Measurement of overall dimensions	T, S	IEC 63294:2021, 6.4
3	Mechanical properties of insulation		
3.1	Tensile test before and after ageing	T	IEC 60811-501
3.2	Loss of mass test	T	IEC 60811-409
4	Pressure test at high temperature	T	IEC 60811-508
5	Elasticity at low temperature		
5.1	Bending test for insulation at low temperature	T	IEC 60811-504
6	Heat shock test	T	IEC 60811-509
7	Mechanical strength of completed cable		
7.1	Bending test	T	IEC 63294:2021, 6.8 See also 4.4.2 of this document
7.2	Drop test	T	IEC 63294:2021, 6.10 See also 4.4.3 of this document
8	Test of flame retardance	T	IEC 60332-1-2

5 (Vacant)**6 Cord for indoor decorative lighting chains****6.1 Code designation**

60227 IEC 43.

6.2 Rated voltage

300/300 V.

6.3 Construction

6.3.1 Conductors

Number of conductors: 1.

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

6.3.2 Insulation

The insulation shall be polyvinyl chloride of 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 specified value of combined thickness of the inner and outer layers of insulation is given in Table 3, column 4, the minimum thickness of the combined layers at any point is given in Table 3, column 3 but at no point the thickness of either layer shall be less than the value specified in Table 3, column 2.

The insulation resistance at 70 °C shall be not less than the values given in Table 3, column 7.

6.3.3 Cord identification

Preferred colour of outer layer: green.

6.3.4 Overall diameter

The mean overall diameter shall be within the limits given in Table 3, columns 5 and 6.

6.4 Tests

6.4.1 General

Compliance with the requirements of 6.3 shall be checked by inspection and by the sample tests and type tests given in Table 4.

6.4.2 (Vacant)

6.5 Guidance on use

Maximum conductor temperature in normal use: 70 °C.

The use of the cable type 60227 IEC 43 shall comply with IEC 62440, which provides guidance on the safe use of electric cables with a rated voltage not exceeding 450/750 V.

Table 3 – General data for type 60227 IEC 43

1	2	3	4	5	6	7
Nominal cross-sectional area of conductor	Thickness of each layer of insulation	Overall insulation thickness	Overall insulation thickness	Mean overall diameter ^a		Minimum insulation resistance at 70 °C
mm ²	Minimum value mm	Minimum value mm	Specified value mm	Lower limit mm	Upper limit mm	MΩ · km
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

^a The mean overall dimensions have been calculated in accordance with IEC 60719.

Table 4 – Tests for type 60227 IEC 43

1	2	3	4
Ref. No.	Tests	Category of test	Test method described in
1	Electrical tests		
1.1	Resistance of conductors	T, S	IEC 63294:2021, 5.1
1.2	Voltage test on completed cable at 2 000 V	T, S	IEC 63294:2021, 5.3
1.3	Insulation resistance at 70 °C	T	IEC 63294:2021, 5.4 IEC 60227-1:—, Table 3
1.4	Long term resistance of insulation to direct current at 60 ± 5 °C for a period of 240 h	T	IEC 63294:2021, 5.6
2	Constructional and dimensional characteristics		
2.1	Checking of compliance with constructional provisions	T, S	IEC 60227-1 Inspection and manual test
2.2	Measurement of insulation thickness of inner layer (minimum thickness only)	T, S	IEC 63294:2021, 6.2
2.3	Measurement of insulation thickness of outer layer (minimum thickness only)	T, S	IEC 63294:2021, 6.2
2.4	Measurement of overall thickness	T, S	IEC 63294:2021, 6.2
2.5	Measurement of overall diameter	T, S	IEC 63294:2021, 6.4
3	Mechanical properties of insulation		
3.1	Tensile test before ageing ^a	T	IEC 60811-501
3.2	Tensile test after ageing ^a	T	IEC 60811-501
3.3	Loss of mass test ^a	T	IEC 60811-409
4	Pressure test at high temperature ^a	T	IEC 60811-508
5	Elasticity at low temperature		
5.1	Bend test for insulation ^a	T	IEC 60811-504
6	Heat shock test ^a	T	IEC 60811-509
7	Test of flame retardance	T	IEC 60332-1-2

^a 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.

7 Light polyvinyl chloride sheathed cord

7.1 Code designation

60227 IEC 52.

7.2 Rated voltage

300/300 V.

7.3 Construction

7.3.1 Conductors

Number of conductors: 2 and 3.

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

7.3.2 Insulation

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

The specified value of insulation thickness is given in Table 6, column 2.

The insulation resistance shall be not less than the values given in Table 6, 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/ST5 applied around the cores.

The specified value of sheath thickness is given in Table 6, 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.

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 6, columns 4 and 5.

7.4 Tests

7.4.1 General

Compliance with the requirements of 7.3 shall be checked by inspection and by the sample tests and type tests given in Table 7.

7.4.2 Flexing test

7.4.2.1 General

The requirements are given in IEC 60227-1:—, 6.6.3.2.

7.4.2.2 Sample preparation

The mass of the weight and the diameter of pulleys A and B are given in Table 5.

Table 5 – Mass of weight and diameter of pulleys

Number of cores	Nominal cross-sectional area mm ²	Mass of weight kg	Diameter of pulleys ^a mm
2	0,5	0,5	60
	0,75	1,0	80
3	0,5	0,5	80
	0,75	1,0	80

^a Diameter measured at the lowest point of the groove.

7.4.2.3 Current loading of cores

During the flexing test, the cable sample shall be loaded as follows:

- two- and three-core cables: all cores to be loaded with $1 \text{ A/mm}^2 \text{ }^{+10}_{-0} \%$.

7.5 Guidance on use

Maximum conductor temperature in normal use: 70 °C.

The use of the cable type 60227 IEC 52 shall comply with IEC 62440, which provides guidance on the safe use of electric cables with a rated voltage not exceeding 450/750 V.

Table 6 – 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	Thickness of sheath	Mean overall dimensions ^a		Minimum insulation resistance at 70 °C MΩ · km
	Specified value mm	Specified value mm	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

^a The mean overall dimensions have been calculated in accordance with IEC 60719.

Table 7 – Tests for type 60227 IEC 52

1	2	3	4
Ref. No.	Test	Category of test	Test method described in
1	Electrical tests		
1.1	Resistance of conductors	T, S	IEC 63294:2021, 5.1
1.2	Voltage test on cores at 1 500 V	T, S	IEC 63294:2021, 5.3
1.3	Voltage test on completed cable at 2 000 V	T, S	IEC 63294:2021, 5.2
1.4	Insulation resistance at 70 °C	T	IEC 63294:2021, 5.4 IEC 60227-1:—, Table 3
2	Provisions covering constructional and dimensional characteristics		
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 63294:2021, 6.2
2.3	Measurement of sheath thickness	T, S	IEC 63294:2021, 6.3
2.4	Measurement of overall dimensions:		
2.4.1	• mean value	T, S	IEC 63294:2021, 6.4
2.4.2	• ovality	T, S	IEC 63294:2021, 6.4
3	Mechanical properties of insulation		
3.1	Tensile test before and after ageing	T	IEC 60811-501
3.2	Loss of mass test	T	IEC 60811-409
4	Mechanical properties of sheath		
4.1	Tensile test before and after ageing	T	IEC 60811-501
4.2	Loss of mass test	T	IEC 60811-409
5	Pressure test at high temperature		
5.1	Insulation	T	IEC 60811-508
5.2	Sheath	T	IEC 60811-508
6	Elasticity and impact strength at low temperature		
6.1	Bending test for insulation at low temperature	T	IEC 60811-504
6.2	Bending test for sheath at low temperature	T	IEC 60811-504
6.3	Impact test on completed cable at low temperature	T	IEC 60811-504
7	Heat shock test		
7.1	Insulation	T	IEC 60811-509
7.2	Sheath	T	IEC 60811-509
8	Mechanical strength of completed cable		
8.1	Flexing test	T	IEC 63294:2021, 6.6 See also 7.4.2 of this document
9	Test of flame retardance	T	IEC 60332-1-2

8 Ordinary polyvinyl chloride sheathed cord

8.1 Code designation

60227 IEC 53.

8.2 Rated voltage

300/500 V.

8.3 Construction

8.3.1 Conductors

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/D applied around each conductor.

The specified value of insulation thickness is given in Table 8, column 2.

The insulation resistance shall be not less than the value given in Table 8, column 6.

8.3.3 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 a 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/ST5 applied around the cores.

The specified value of sheath thickness is given in Table 8, 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 8, columns 4 and 5.

Table 8 – General data for type 60227 IEC 53

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 ^a		Minimum insulation resistance at 70 °C MΩ · km
			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 or 3,9 × 6,2	7,5 or 4,7 × 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
2 × 4	0,8	1,1	9,7	12,1	0,007
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
3 × 4	0,8	1,1	10,3	12,8	0,007
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
4 × 4	0,8	1,2	11,5	14,3	0,007
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
5 × 4	0,8	1,3	12,8	15,9	0,007

^a The mean overall dimensions have been calculated in accordance with IEC 60719.

8.4 Tests

8.4.1 General

Compliance with the requirements of 8.3 shall be checked by inspection and by the sample tests and type tests given in Table 10.

8.4.2 Flexing test

8.4.2.1 General

The requirements are given in IEC 60227-1:—, 6.6.3.2.

8.4.2.2 Sample preparation

The mass of the weight and the diameter of pulleys A and B are given in Table 9.

Table 9 – Mass of weight and diameter of pulleys

Number of cores	Nominal cross-sectional area mm ²	Mass of weight kg	Diameter of pulleys ^a mm
2	0,5	0,5	60
	0,75	1,0	80
	1	1,0	80
	1,5	1,0	80
	2,5	1,5	120
3	0,5	0,5	80
	0,75	1,0	80
	1	1,0	80
	1,5	1,0	80
	2,5	1,5	120
4	0,5	0,5	80
	0,75	1,0	80
	1	1,0	80
	1,5	1,5	120
	2,5	1,5	120
5	0,5	1,0	80
	0,75	1,0	80
	1	1,0	120
	1,5	1,5	120
	2,5	2,0	120

^a Diameter measured at the lowest point of the groove.

8.4.2.3 Current loading of cores

During the flexing test, the cable sample shall be loaded as follows:

- two- and three-core cables: all cores to be loaded with $1 \text{ A/mm}^2 \begin{smallmatrix} +10 \\ 0 \end{smallmatrix} \%$;
- four- and five-core cables: three cores to be loaded with $1 \text{ A/mm}^2 \begin{smallmatrix} +10 \\ 0 \end{smallmatrix} \%$ or all cores to be loaded with $\sqrt{3/n} \text{ A/mm}^2 \begin{smallmatrix} +10 \\ 0 \end{smallmatrix} \%$, where n is the number of cores.

8.5 Guidance on use

Maximum conductor temperature in normal use: 70 °C.

The use of the cable type 60227 IEC 53 shall comply with IEC 62440, which provides guidance on the safe use of electric cables with a rated voltage not exceeding 450/750 V.

Table 10 – Tests for type 60227 IEC 53

1	2	3	4
Ref. No.	Test	Category of test	Test method described in
1	Electrical tests		
1.1	Resistance of conductors	T, S	IEC 63294:2021, 5.1
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	IEC 63294:2021, 5.3
1.2.2	• at 2 000 V exceeding 0,6 m	T	IEC 63294:2021, 5.3
1.3	Voltage test on complete cable at 2 000 V	T, S	IEC 63294:2021, 5.2
1.4	Insulation resistance at 70 °C	T	IEC 63294:2021, 5.4 IEC 60227-1:—, Table 3

1	2	3	4
Ref. No.	Test	Category of test	Test method described in
2	Provisions covering constructional and dimensional characteristics		
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 63294:2021, 6.2
2.3	Measurement of sheath thickness	T, S	IEC 63294:2021, 6.3
2.4	Measurement of overall dimensions:		
2.4.1	• mean value	T, S	IEC 63294:2021, 6.4
2.4.2	• ovality	T, S	IEC 63294:2021, 6.4
3	Mechanical properties of insulation		
3.1	Tensile test before and after ageing	T	IEC 60811-501
3.2	Loss of mass test	T	IEC 60811-409
4	Mechanical properties of sheath		
4.1	Tensile test before and after ageing	T	IEC 60811-501
4.2	Loss of mass test	T	IEC 60811-409
5	Compatibility test	T	IEC 60811-501
6	Pressure test at high temperature		
6.1	Insulation	T	IEC 60811-508
6.2	Sheath	T	IEC 60811-508
7	Elasticity and impact strength at low temperature		
7.1	Bending test for insulation at low temperature	T	IEC 60811-504
7.2	Bending test for sheath at low temperature	T	IEC 60811-504
7.3	Impact test on completed cable at low temperature	T	IEC 60811-506
8	Heat shock test		
8.1	Insulation	T	IEC 60811-509
8.2	Sheath	T	IEC 60811-509
9	Mechanical strength of completed cable		
9.1	Flexing test	T	IEC 63294:2021, 6.6 See also 9.4.2 of this document
10	Test of flame retardance	T	IEC 60332-1-2

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

9.1 Code designation

60227 IEC 56.

9.2 Rated voltage

300/300 V.

9.3 Construction

9.3.1 Conductors

Number of conductors: 2 and 3.

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

9.3.2 Insulation

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

The specified value of insulation thickness is given in Table 12, column 2.

The insulation resistance shall be not less than the values given in Table 12, column 6.

9.3.3 Assembly of cores

Circular cord: the cores shall be twisted together.

Flat cord: the cores shall be laid parallel.

9.3.4 Sheath

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

The specified value of sheath thickness is given in Table 12, 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.

9.3.5 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 12, columns 4 and 5.

9.4 Tests

9.4.1 General

Compliance with the requirements of 9.3 shall be checked by inspection and by the sample tests and type tests given in Table 13.

9.4.2 Flexing test

9.4.2.1 General

The requirements are given in IEC 60227-1:—, 6.6.3.2.

9.4.2.2 Sample preparation

The mass of the weight and the diameter of pulleys A and B are given in Table 11.

Table 11 – Mass of weight and diameter of pulleys

Number of cores	Nominal cross-sectional area mm ²	Mass of weight kg	Diameter of pulleys ^a mm
2	0,5	0,5	60
	0,75	1,0	80
3	0,5	0,5	80
	0,75	1,0	80

^a Diameter measured at the lowest point of the groove.

9.4.2.3 Current loading of cores

During the flexing test, the cable sample shall be loaded as follows:

- two- and three-core cables: all cores to be loaded with 1 A/mm² $\pm 10\%$.

9.5 Guidance on use

Maximum conductor temperature in normal use: 90 °C.

The use of the cable type 60227 IEC 56 shall comply with IEC 62440, which provides guidance on the safe use of electric cables with a rated voltage not exceeding 450/750 V.

Table 12 – 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	Sheath thickness	Mean overall dimensions ^a		Minimum insulation resistance at 90 °C MΩ · km
	Specified value mm	Specified value mm	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

^a The mean overall dimensions have been calculated in accordance with IEC 60719.

Table 13 – Tests for type 60227 IEC 56

1	2	3	4
Reference No.	Test	Category of test	Test methods described in
1	Electrical tests		
1.1	Resistance of conductors	T, S	IEC 63294:2021, 5.1
1.2	Voltage test on completed cable at 2 000 V	T, S	IEC 63294:2021, 5.2
1.3	Voltage test on cores at 1 500 V	T	IEC 63294:2021, 5.3
1.4	Insulation resistance at 90 °C	T	IEC 63294:2021, 5.4 IEC 60227-1:—, Table 3
2	Provisions covering constructional and dimensional characteristics		
2.1	Checking of compliance with constructional provisions	T, S	IEC 60227-1 Inspection and manual test
2.2	Measurement of thickness of insulation	T, S	IEC 63294:2021, 6.2
2.3	Measurement of thickness of sheath	T, S	IEC 63294:2021, 6.3
2.4	Measurement of overall dimensions		
2.4.1	Mean value	T, S	IEC 63294:2021, 6.4
2.4.2	Ovality	T, S	IEC 63294:2021, 6.4
3	Mechanical properties of insulation		
3.1	Tensile test before ageing	T	IEC 60811-501
3.2	Tensile test after ageing	T	IEC 60811-401
3.3	Loss of mass test	T	IEC 60811-409
4	Mechanical properties of sheath		
4.1	Tensile test before ageing	T	IEC 60811-501
4.2	Tensile test after ageing	T	IEC 60811-401
4.3	Loss of mass test	T	IEC 60811-409
5	Pressure test at high temperature		
5.1	Insulation	T	IEC 60811-508
5.2	Sheath	T	IEC 60811-508
6	Tests at low temperature		
6.1	Bending test for insulation	T	IEC 60811-504
6.2	Bending test for sheath	T	IEC 60811-504
6.3	Impact test	T	IEC 60811-506
7	Heat shock test		
7.1	Insulation	T	IEC 60811-509
7.2	Sheath	T	IEC 60811-509
8	Thermal stability		
8.1	Insulation	T	IEC 60811-403
8.2	Sheath	T	IEC 60811-405
9	Mechanical strength of complete cable		
9.1	Flexing test	T	IEC 63294:2021, 6.6 See also 9.4.2 of this document
10	Test of flame retardance	T	IEC 60332-1-2