



Edition 4.0 2024-02 REDLINE VERSION

INTERNATIONAL STANDARD



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

IEC 60227-5:2024

https://standards.iteh.ai/catalog/standards/iec/5eeaf2aa-2fe2-4b6f-a792-4ae2b1283c67/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 Varembé 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 It also gives information on projects, replaced and withdrawn publications.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.







Edition 4.0 2024-02 REDLINE VERSION

INTERNATIONAL STANDARD



Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords) Standards.iteh.ai) Document Preview

IEC 60227-5:2024

https://standards.iteh.ai/catalog/standards/iec/5eeaf2aa-2fe2-4b6f-a792-4ae2b1283c67/iec-60227-5-2024

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 29.060.20

ISBN 978-2-8322-8370-7

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

CONTENTS

			۰ م
	IRODU	CTION	2
1	Gene	ral	
1	Scop	9	8
2	Norm	ative references	8
3	Term	s and definitions	10
4	Flat t	nsel cord	10
	4.1	Code designation	
	4.2	Rated voltage	10
	4.3	Construction	10
	4.3.1	Conductors	10
	4.3.2	Insulation	10
	4.3.3	Assembly of cores	11
	4.3.4	Overall dimensions	11
	4.4	Tests	11
	4.4.1	General	11
	4.4.2	Bending test	11
	4.4.3	Drop test	11
	4.5	Guidance on use	11
5	(Vaca	int)	12
6	Cord	for indoor decorative lighting chains	12
	6.1	Code designation	12
	6.2	Rated voltage	12
	6.3	Construction	12
	6.3.1	s itel Conductors	
	6.3.2	Insulation	
	6.3.3	Cord identification	13
	6.3.4	Overall diameter	13
	6.4	Tests	13
	6.4.1	General	13
	4.4.2	Long term resistance of insulation to d.c	
	6.4.2	(Vacant)	13
	6.5	Guidance on use	14
7	Light	polyvinyl chloride sheathed cord	15
	7.1	Code designation	15
	7.2	Rated voltage	15
	7.3	Construction	15
	7.3.1	Conductors	15
	7.3.2	Insulation	16
	7.3.3	Assembly of cores	16
	7.3.4	Sheath	16
	7.3.5	Overall dimensions	16
	7.4	Tests	16
	7.4.1	General	16
	7.4.2	Flexing test	16
	75	Guidance on use	16

8	Ordin	nary polyvinyl chloride sheathed cord	18
	8.1	Code designation	18
	8.2	Rated voltage	19
	8.3	Construction	19
	8.3.1	Conductors	19
	8.3.2	Insulation	19
	8.3.3	Assembly of cores and fillers, if any	19
	8.3.4	Sheath	19
	8.3.5	o Verall dimensions	19
	8.4	Tests	20
	8.4.1	General	20
	8.4.2	Personal Flexing test	20
	8.5	Guidance on use	20
9	Heat-	-resistant light PVC-sheathed cord for a maximum conductor temperature of	
•	90 °C	C	23
	9.1	Code designation	23
	9.2	Rated voltage	23
	9.3	Construction	23
	9.3.1	Conductors	23
	9.3.2	Insulation	23
	9.3.3	Assembly of cores	23
	9.3.4	Sheath	23
	9.3.5	Overall dimensions	23
	9.4	Tests	24
	941	General Document Preview	24
	942	P Elexing test	24
	9.5	Guidance on use TEC (0007, 5,0004	<u>2</u> -7 24
10	U.U Heat	-resistant ordinary PVC-sheathed cord for a maximum conductor temperature	 7 5 202
12.14	of 90) $^{\circ}$ C	26
	10 1	Code designation	26
	10.2	Rated voltage	26
	10.3	Construction	26
	10.3	1 Conductors	26
	10.0.	2 Insulation	26
	10.3	3 Assembly of cores and fillers if any	26
	10.0.	4 Sheath	27
	10.3	5 Overall dimensions	27
	10.0.		21
	10.4	1 General	20 28
	10.4.	2 Eleving test	20 28
	10.4.		20 20
.	10.0 hliogram		20 20
Ы	unograp	אוזע	20

Table 1 – General data for type 60227 IEC 41	11
Table 2 – Tests for type 60227 IEC 41	12
Table 3 – General data for type 60227 IEC 43	14
Table 4 – Tests for type 60227 IEC 43	15

– 4 – IEC 60227-5:2024 RLV © IEC 2024

Table 5 – Mass of weight and diameter of pulleys	17
Table 6 – General data for type 60227 IEC 52	17
Table 7 – Tests for type 60227 IEC 52	18
Table 8 – General data for type 60227 IEC 53	20
Table 9 – Mass of weight and diameter of pulleys	21
Table 10 – Tests for type 60227 IEC 53	22
Table 11 – Mass of weight and diameter of pulleys	24
Table 12 – General data for type 60227 IEC 56	25
Table 13 – Tests for type 60227 IEC 56	25
Table 14 – General data for type 60227 IEC 57	27
Table 15 – Mass of weight and diameter of pulleys	28
Table 16 – Tests for type 60227 IEC 57	30

iTeh Standards (https://standards.iteh.ai) Document Preview

IEC 60227-5:2024

https://standards.iteh.ai/catalog/standards/iec/5eeaf2aa-2fe2-4b6f-a792-4ae2b1283c67/iec-60227-5-2024

- 5 -

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.
- 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.
- https 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and 2024 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.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60227-5:2011. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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.

https://standards.iteh.ai/catalog/standards/iec/5eeaf2aa-2fe2-4b6f-a792-4ae2b1283c67/iec-60227-5-2024

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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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).

iTeh Standards (https://standards.iteh.ai) Document Preview

IEC 60227-5:2024

https://standards.iteh.ai/catalog/standards/iec/5eeaf2aa-2fe2-4b6f-a792-4ae2b1283c67/iec-60227-5-2024

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

- 8 -

Part 5: Flexible cables (cords)

1 General

1 Scope

This part of IEC 60227 details the particular specifications or 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.

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 s://standards.iteh.ai)

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.

NOTE The IEC 60811 series is currently undergoing a revision, which will lead to a restructuring of its parts. A description of this, as well as a cross-reference table between the current and planned parts will be given in IEC 60811-100.

IEC 60227-1: $\frac{2007}{-}^2$, Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements

IEC 60227-2:1997, Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2: Test methods Amendment 1 (2003)

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 premixed flame

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 – Amendment 1 (2001)

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

IEC 60227-5:2024 RLV © IEC 2024 - 9 -

IEC 60811-1-2:1985, Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Two: Thermal ageing methods Amendment 1 (1989) – Amendment 2 (2000)

IEC 60811-1-4:1985, Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Four: Tests at low temperature Amendment 1 (1993) – Amendment 2 (2001)

IEC 60811-3-1:1985, Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section One: Pressure test at high temperature – Tests for resistance to cracking – Amendment 1 (1994) – Amendment 2 (2001)

IEC 60811-3-2:1985, Common test methods for insulating and sheathing materials of electric cables - Part 3: Methods specific to PVC compounds - Section Two: Loss of mass test - Thermal stability test - Amendment 1 (1993) - Amendment 2 (2003)

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 – http://www.part.501: Mechanical tests – Tests for determining the mechanical properties of insulating and 2024 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*

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

IEC 60227-5:2024

https://standards.iteh.ai/catalog/standards/iec/5eeaf2aa-2fe2-4b6f-a792-4ae2b1283c67/iec-60227-5-2024 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 shall comply with the specified value 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

i i en Stanuarus

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

4.5 Guidance on use

be maximum conductor temporature in normal use is 70 °C

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

NOTE Other guidelines are under consideration. 60227-5:2024

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.

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	Lower limit	Upper limit	$M\Omega\cdot km$	Ω/km	
mm	mm	mm			
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 1 – General data 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	60227-2 IEC 63294:2021, 5.1
1.2	Voltage test on completed cable at 2 000 V	T, S	60227-2 IEC 63294:2021, 5.2
1.3	Insulation resistance at 70 °C	т	60227-2 IEC 63294:2021, 5.4
			IEC 60227-1:—, Table 3
2	Provisions covering constructional and dimensional characteristics		60227-1 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	60227-2 IEC 63294:2021, 6.2
2.3	Measurement of overall dimensions	T, S	60227-2 IEC 63294:2021, 6.4
3	Mechanical properties of insulation		
3.1	Tensile test before and after ageing	т	<mark>60811-1-1 60811-1-2</mark> IEC 60811-501
3.2	Loss of mass test	т	60811-3-2 IEC 60811-409
4	Pressure test at high temperature	dorda	60811-3-1 IEC 60811-508
5	Elasticity at low temperature	uarus	
5.1	Bending test for insulation at low temperature	rdstitel	60811-1-4 IEC 60811-504
6	Heat shock test	T	60811-3-1 IEC 60811-509
7	Mechanical strength of completed cable	review	7
7.1	Bending test	Т	60227-2 IEC 63294:2021, 6.8 See also 4.4.2 of this document
7.2	Drop test <u>IEC 60227-5:</u> ls.iteh.ai/catalog/standards/iec/5eeaf2aa-21	<u>2024</u> т e2-4b6f-a792-	60227-2 IEC 63294:2021, 6.10 See also 4.4.3 of this document
8	Test of flame retardance	Т	60332-1 IEC 60332-1-2

Table 2 – Tests for type 60227 IEC 41

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.