

# INTERNATIONAL STANDARD

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

**Part 7: Flexible cables screened and unscreened with two or more conductors  
and of rated voltages up to and including 300/500 V**

IEC 60227-7:2024

<https://standards.iteh.ai/catalog/standards/iec/4873fdd5-3eea-48f7-8ecd-7610f19c6b4d/iec-60227-7-2024>



## 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](mailto:info@iec.ch)  
[www.iec.ch](http://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](http://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 It also gives information on projects, replaced and withdrawn publications.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](http://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](http://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](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://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](http://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.

International Standards  
Document Preview

[IEC 60227-7:2024](https://standards.iteh.ai/catalog/standards/iec/4873fdd5-3eea-48f7-8ecd-7610f19c6b4d/iec-60227-7-2024)

<https://standards.iteh.ai/catalog/standards/iec/4873fdd5-3eea-48f7-8ecd-7610f19c6b4d/iec-60227-7-2024>



IEC 60227-7

Edition 2.0 2024-02

# INTERNATIONAL STANDARD

---

**Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V –  
Part 7: Flexible cables screened and unscreened with two or more conductors  
and of rated voltages up to and including 300/500 V**

[IEC 60227-7:2024](https://standards.iteh.ai/standards/iec/4873fdd5-3eea-48f7-8ecd-7610f19c6b4d/iec-60227-7-2024)

<https://standards.iteh.ai/catalog/standards/iec/4873fdd5-3eea-48f7-8ecd-7610f19c6b4d/iec-60227-7-2024>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 29.060.20

ISBN 978-2-8322-8270-0

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

## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references .....	6
3 Terms and definitions .....	7
4 Oil resistant, polyvinyl chloride sheathed, screened and unscreened flexible cable.....	8
4.1 Code designation .....	8
4.2 Rated voltage .....	8
4.3 Construction .....	8
4.3.1 Conductors .....	8
4.3.2 Insulation.....	8
4.3.3 Assembly of cores and fillers, if any.....	8
4.3.4 Inner sheath for screened cables.....	8
4.3.5 Screen.....	9
4.3.6 Sheath or oversheath .....	9
4.3.7 Core identification.....	10
4.3.8 Overall diameter .....	10
4.4 Tests .....	10
4.4.1 General .....	10
4.4.2 Flexing test.....	10
4.5 Guidance on use.....	11
Bibliography.....	15
Table 1 – Mass of weight and diameter of pulleys.....	10
Table 2 – General data for type 60227 IEC 74 .....	12
Table 3 – General data for type 60227 IEC 75 .....	13
Table 4 – Tests for types 60227 IEC 74 and 60227 IEC 75 .....	14

ITeH Standards  
<https://standards.iteh.ai/>  
 Document Preview

IEC 60227-7:2024  
<https://standards.iteh.ai/catalog/standards/iec/60227-7-2024>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**POLYVINYL CHLORIDE INSULATED CABLES  
OF RATED VOLTAGES UP TO AND INCLUDING 450/750 V –****Part 7: Flexible cables screened and unscreened with two or more  
conductors and of rated voltages up to and including 300/500 V**

## 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 60227-7 has been prepared by IEC technical committee 20: Electric cables. It is an International Standard.

This second edition cancels and replaces the first edition published in 1995, Amendment 1:2003 and Amendment 2:2011. 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
20/2144/FDIS	20/2157/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://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.

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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

(<https://standards.iteh.ai>)  
Document Preview

[IEC 60227-7:2024](#)

<https://standards.iteh.ai/catalog/standards/iec/4873fdd5-3eea-48f7-8ecd-7610f19c6b4d/iec-60227-7-2024>

## 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 screened and unscreened with two or more conductors and of rated voltages up to and including 300/500 V only.

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

[IEC 60227-7:2024](https://standards.iteh.ai/catalog/standards/iec/4873fdd5-3eea-48f7-8ecd-7610f19c6b4d/iec-60227-7-2024)

<https://standards.iteh.ai/catalog/standards/iec/4873fdd5-3eea-48f7-8ecd-7610f19c6b4d/iec-60227-7-2024>

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

## Part 7: Flexible cables screened and unscreened with two or more conductors and of rated voltages up to and including 300/500 V

### 1 Scope

This part of IEC 60227 details the particular specifications for polyvinyl chloride insulated, screened and unscreened control cables of rated voltages up to and including 300/500 V.

This document provides the particular requirements for screened and unscreened control cables of rated voltages up to and including 300/500 V, 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, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60228, *Conductors of insulated cables*

<https://standards.iteh.ai/catalog/standards/iec/4873fdd5-3cea-48f7-8ecd-7610f19c6b4d/iec-60227-7-2024>

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 60811-404, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 404: Miscellaneous tests – Mineral oil immersion tests for 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*

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 60502-1:2021, *Power cables with extruded insulation and their accessories for rated voltages from 1 kV ( $U_m = 1,2$  kV) up to 30 kV ( $U_m = 36$  kV) – Part 1: Cables for rated voltages of 1 kV ( $U_m = 1,2$  kV) and 3 kV ( $U_m = 3,6$  kV)*

IEC 60719, *Calculation of the lower and upper limits for the average outer dimensions of cables with circular copper conductors and of rated voltages up to and including 450/750 V*

IEC 62153-4-3:2013, *Metallic communication cable test methods – Part 4-3: Electromagnetic compatibility (EMC) – Surface transfer impedance – Triaxial method*

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 Oil resistant, polyvinyl chloride sheathed, screened and unscreened flexible cable

### 4.1 Code designation

60227 IEC 74 for screened cables;

60227 IEC 75 for unscreened cables.

### 4.2 Rated voltage

300/500 V.

### 4.3 Construction

#### 4.3.1 Conductors

Number of conductors: 2 to 60.

Preferred number of conductors: 2, 3, 4, 5, 6, 7, 12, 18, 27, 36, 48 and 60.

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

#### 4.3.2 Insulation

The insulation shall be polyvinyl chloride compound of type PVC/D (see IEC 60227-1) applied around each conductor.

The specified value of the insulation thickness is given in Table 2, column 2 and Table 3, column 2. The insulation resistance shall be not less than the value given in Table 2, column 8 or Table 3, column 6.

#### 4.3.3 Assembly of cores and fillers, if any

The cores shall be twisted together, where appropriate in several concentric layers.

A centre core is not permitted but a centre filler of suitable material shall be applied for cables with five or more cores in the first layer. Assemblies with three or more cores shall have one core which is coloured green-and-yellow.

Around each layer a tape may be applied which can cover the cores fully or partially. The tape shall not adhere to the cores.

For two-core cables, the space between the cores shall be filled either by separate fillers or by the sheath filling the interstices.

#### 4.3.4 Inner sheath for screened cables

The inner sheath shall be a polyvinyl chloride compound of type PVC/ST5 (see IEC 60227-1) applied around the core assembly. For all cables, the thickness of the inner sheath shall be determined by the formula:

$$t_{is} = 0,02 D_f + 0,6 \text{ mm},$$

where  $D_f$  is the fictitious diameter over the laid-up core, calculated in accordance with IEC 60502-1:2021, A.3.1, A.3.2 and A.3.3, and where the fictitious diameter ( $d_f$ ) of 0,5 mm<sup>2</sup>, 0,75 mm<sup>2</sup> and 1,0 mm<sup>2</sup> conductors (not given in IEC 60502-1:2021, A.3.1) shall be taken to be 0,8 mm, 1,0 mm and 1,1 mm, respectively.

For cables with the preferred number of cores, the calculated values of the inner sheath thickness are given in Table 2, column 3.