

INTERNATIONAL STANDARD

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 4: Test requirements on accessories for cables with rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2023 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 It also gives information on projects, replaced and withdrawn publications.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. 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 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

INTERNATIONAL STANDARD

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 4: Test requirements on accessories for cables with rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.060.20

ISBN 978-2-8322-7701-0

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

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	7
4 Types of accessories.....	9
5 Voltage designations and maximum conductor temperatures	9
5.1 Rated voltages.....	9
5.2 Maximum conductor temperatures	9
6 Components.....	9
6.1 Connectors	9
6.2 Materials.....	9
7 Assembly of accessories to be tested.....	10
7.1 Identification	10
7.1.1 Cables.....	10
7.1.2 Connectors.....	10
7.1.3 Accessories.....	10
7.2 Installation and connections.....	10
7.2.1 General	10
7.2.2 Non-range-taking terminations, joints and stop ends.....	10
7.2.3 Range-taking terminations, joints and stop ends.....	11
7.2.4 Separable connectors.....	11
7.2.5 Assembly.....	12
7.2.6 Conditioning	12
7.2.7 Terminations.....	12
7.2.8 Terminal boxes.....	12
7.2.9 Joints and stop ends.....	13
7.2.10 Separable connectors.....	13
7.2.11 Set-up	13
7.2.12 Test arrangements and number of samples	13
8 Range of approval.....	13
8.1 General.....	13
8.2 Cable.....	14
8.3 Three-core to single-core accessory	14
8.4 Non-range-taking terminations, joints and stop ends.....	15
8.5 Range-taking terminations, joints and stop ends.....	15
8.6 Terminations in terminal boxes	16
8.7 Separable connectors	16
9 Test sequences	16
9.1 General.....	16
9.2 Dynamic short-circuit performance.....	17
10 Test results	17
10.1 General remarks	17
10.2 Test reports	18
10.3 Failures	18
10.3.1 Accessory failure.....	18
10.3.2 Cable failure	18

10.3.3 Bushing failure.....	18
11 Visual examination	19
Annex A (normative) Identification of test cable	34
Annex B (normative) Identification of connector	35
Annex C (normative) Visual examination.....	36
C.1 Method	36
C.2 Examination sheet	36
Bibliography.....	37
Figure 1 – Test arrangements and number of samples for terminations (see Table 9).....	29
Figure 2 – Test arrangements and number of samples for straight, branch or loop joints (see Table 10)	30
Figure 3 – Test arrangements and number of samples for stop ends (see Table 11)	31
Figure 4 – Test arrangements and number of samples for screened deadbreak separable connectors (see Table 12)	32
Figure 5 – Test arrangements and number of samples for unscreened deadbreak separable connectors (see Table 13)	33
Table 1 – Compliance and qualification scheme for non-range-taking terminations, joints and stop ends.....	11
Table 2 – Compliance and qualification scheme for range-taking terminations, joints, and stop ends	11
Table 3 – Test cable conductor cross-sections for separable connectors	12
Table 4 – Range of approval for cable insulation.....	14
Table 5 – Extension of compliance from a three-core accessory to a single-core accessory of the same design.....	15
Table 6 – Extension of compliance and qualification scheme for non-range-taking terminations, joints and stop ends.....	15
Table 7 – Extension of compliance and qualification scheme for range-taking terminations, joints, and stop ends	16
Table 8 – Test sequences.....	17
Table 9 – Test sequences and requirements for terminations.....	20
Table 10 – Test sequences and requirements for straight, branch or loop joints.....	21
Table 11 – Test sequences and requirements for stop ends.....	22
Table 12 – Test sequences and requirements for screened deadbreak separable connectors.....	23
Table 13 – Test sequences and requirements for unscreened separable connectors (excluding shrouded terminations)	24
Table 14 – Additional tests for smaller conductor cross-sectional areas.....	25
Table 15 – Additional tests for separable connector compliance extension to largest cable cross-section	26
Table 16 – Summary of tests	27
Table 17 – Summary of test voltages (see Clause 9)	28

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**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 4: Test requirements on accessories for cables with
rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)**

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 not misinterpreted 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, accept 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> shall not be held responsible for identifying any or all such patent rights.

IEC 60502-4 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 2010. This edition constitutes a technical revision.

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

- a) Terminations, joints and stop ends are now characterized as either non-range-taking or range-taking and are tested accordingly.

- b) Introduction of the 240 mm² conductor size for testing non-range-taking terminations, joints and stop ends.
- c) Introduction of the 2 500 A separable connector size in Table 3 and the method of testing in Figure 5.
- d) Introduction of dynamic short-circuit classes 0, 1, 2 and 3 in 9.2.
- e) Introduction of specific requirements for test reports in Clause 10 and Clause 11 and specific recording sheets for cables, connectors and examination in Annex A, Annex B and Annex C.
- f) Option to use $2 U_0$ for partial discharge testing and removal of DC testing from Table 9, Table 10, Table 11, Table 12, Table 13 and Table 14.

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

Draft	Report on voting
20/2110/FDIS	20/2133/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 60502 series, published under the general title *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)*, can be found on the IEC website.

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,
- replaced by a revised edition, or
- amended.

**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 4: Test requirements on accessories for cables with
rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)**

1 Scope

This part of IEC 60502 specifies the test requirements for type testing of accessories for power cables with rated voltages from 3,6/6 (7,2) kV up to 18/30 (36) kV, complying with IEC 60502-2 or other relevant cable standards.

Accessories for special applications, such as aerial cables, submarine or ship cables or hazardous situations (explosive environments, fire-resistant cables or seismic conditions), are not included.

It is not necessary to repeat these tests, once successfully completed, unless changes are made in the materials, design or manufacturing process which can affect the performance characteristics.

Test methods are included in IEC 61442.

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 60183, *Guide to the selection of high-voltage AC cable systems*

IEC 60502-2:2014, *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 2: Cables for rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)*

IEC 61230-1-3, *Compression and mechanical connectors for power cables – Part 1-3: Test methods and requirements for compression and mechanical connectors for power cables for rated voltages above 1 kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV) tested on non-insulated conductors*

IEC 61442:2023, *Test methods for accessories for power cables with rated voltages from 6 kV ($U_m = 7,2$ kV) up to 30 kV ($U_m = 36$ kV)*