

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Power cables with extruded insulation and their accessories for rated voltages above 30 kV ( $U_m = 36$  kV) up to 150 kV ( $U_m = 170$  kV) – Test methods and requirements**

**Câbles d'énergie à isolation extrudée et leurs accessoires pour des tensions assignées supérieures à 30 kV ( $U_m = 36$  kV) et jusqu'à 150 kV ( $U_m = 170$  kV) – Méthodes et exigences d'essai**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**POWER CABLES WITH EXTRUDED INSULATION AND  
THEIR ACCESSORIES FOR RATED VOLTAGES ABOVE 30 kV  
( $U_m = 36$  kV) UP TO 150 kV ( $U_m = 170$  kV) –  
TEST METHODS AND REQUIREMENTS**

## 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.
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International Standard IEC 60840 has been prepared by IEC technical committee 20: Electric cables.

This fourth edition cancels and replaces the third edition, published in 2004, and constitutes a major technical revision.

The significant technical change with respect to the previous edition is as follows:

- introduction of a prequalification test procedure for cables with high electrical stresses and tested as a cable system including accessories.

NOTE For a more detailed history of events leading up to this fourth edition, see the Introduction.

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

FDIS	Report on voting
20/1267/FDIS	20/1277A/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

## INTRODUCTION

The first edition of IEC 60840, published in 1988, dealt only with cables. Accessories were added to the second edition, published in February 1999, which separately covered test methods and test requirements for

- a) cables alone,
- b) cables together with accessories (a cable system).

Some countries then suggested that a better discrimination be made between systems, cables and accessories, particularly for the lower voltages of the scope, e.g. 45 kV. This was taken into account in the third edition and is retained in this revision, which gives the type approval requirements and the range of approvals for

- a) cable systems,
- b) cables alone,
- c) accessories alone.

Manufacturers and users may choose the most appropriate option for type approval.

At its meeting in November 2004, TC 20 decided to prepare a further major revision of IEC 60840 and concluded that this edition should incorporate the recommendations for testing HV and EHV extruded cables that were under preparation by CIGRE study committee B1 WG B1.06. This work was made available as CIGRE technical brochure No. 303, before the meeting of TC 20 in October 2006. The brochure, entitled "Revision of qualification procedures for extruded (extra) high voltage a.c. underground cables", has therefore been considered by TC 20, and considerable parts implemented in this standard. Cables with high electrical stresses at the conductor screen and/or insulation screen are now required to undergo a prequalification test procedure (simplified compared to that in IEC 62067) as a cable system inclusive of accessories.

Additionally the following other significant changes to this standard have been introduced:

- a) The clause numbering of this standard and IEC 62067 (which has been revised at the same time as this standard) has been coordinated to achieve as much commonality as possible to assist users who use both standards.
- b) In the case of the sample test, the lightning impulse voltage test is no longer followed by a power frequency voltage test.

A list of relevant CIGRE references is given in the bibliography.

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THEIR ACCESSORIES FOR RATED VOLTAGES ABOVE 30 kV  
( $U_m = 36$  kV) UP TO 150 kV ( $U_m = 170$  kV) –  
TEST METHODS AND REQUIREMENTS**

## 1 Scope

This International Standard specifies test methods and requirements for power cable systems, cables alone and accessories alone, for fixed installations and for rated voltages above 30 kV ( $U_m = 36$  kV) up to and including 150 kV ( $U_m = 170$  kV).

The requirements apply to single-core cables and to individually screened three-core cables and to their accessories for usual conditions of installation and operation, but not to special cables and their accessories, such as submarine cables, for which modifications to the standard tests may be necessary or special test conditions may need to be devised.

This standard does not cover transition joints between cables with extruded insulation and paper insulated cables.

## 2 Normative references

The following referenced documents are indispensable for the application 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 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60183, *Guide to the selection of high-voltage cables*

IEC 60228, *Conductors of insulated cables*

IEC 60229:2007, *Electric cables – Tests on extruded oversheaths with a special protective function*

IEC 60230, *Impulse tests on cables and their accessories*

IEC 60287-1-1:2006, *Electric cables – Calculation of the current rating – Part 1-1: Current rating equations (100 % load factor) and calculation of losses – General*

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 60811-1-1:1993, *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)