

INTERNATIONAL STANDARD

IEC 60840

Third edition
2004-04

**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**

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*



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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

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

This third edition cancels and replaces the second edition published in 1999 and constitutes a technical revision.

The significant technical changes with respect to the previous edition are described in the introduction of this edition.

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

FDIS	Report on voting
20/684/FDIS	20/692/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 content of this publication will remain unchanged until 2008. At this date, the publication will be

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- withdrawn;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

Withdrawn

INTRODUCTION

This document is a major revision of IEC 60840, second edition, published in February 1999.

During the preparation of the second edition, a number of comments of principle were made on the CD and CDV and, at its meeting in February 1998, the former SC20A of TC20 agreed that these comments should be the basis of a major revision of IEC 60840 under the maintenance cycle. In addition, during the preparation of the new IEC 62067 covering cable systems above 150 kV up to 500 kV, it appeared that a number of comments were also applicable to IEC 60840. Therefore, all these comments were considered in the preparation of this third edition.

In addition, the following other aspects have been considered.

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 have 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 has been taken into account 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.

During the meeting of TC20 held in Stockholm in September 2000, it was agreed that WG16 consider the guidelines made by CIGRE for cables having a longitudinally applied metal foil, published in Electra n°141 in April 1992. WG16 carried out this task and, further to a survey on the experience with such cables, have concluded that only a part of these guidelines should be introduced in this standard as a normative annex.

Consideration has also been given to the recent work carried out by CIGRE on tests after installation on high voltage extruded insulation cables, the recommendations of which were published in Electra n°173 in August 1997. These recommendations state, among others, that d.c. tests should be avoided on the main insulation, as they are both ineffective and dangerous. On the other hand, d.c. tests are recommended on the oversheath.

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

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

1 Scope

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

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.

IEC 60060-1:1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60183:1984, *Guide to the selection of high-voltage cables*

IEC 60228:1978, *Conductors of insulated cables*

IEC 60229:1982, *Tests on cable oversheaths which have a special protective function and are applied by extrusion*

IEC 60230:1966, *Impulse tests on cables and their accessories*

IEC 60287-1-1:1994, *Electric cables – Calculation of the current rating – Part 1: Current rating equations (100 % load factor) and calculation of losses – Section 1: General*

IEC 60332-1:1993, *Tests on electric cables under fire conditions – Part 1: Test on a single vertical insulated wire or cable*

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*

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*

IEC 60811-1-3:1993, *Insulating and sheathing materials of electric cables – Common test methods – Part 1: General application – Section 3: Methods for determining the density – Water absorption tests – Shrinkage test*

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*

IEC 60811-2-1:1998, *Insulating and sheathing materials of electric and optical cables – Common test methods – Part 2-1: Methods specific to elastomeric compounds – Ozone resistance, hot set and mineral oil immersion tests*

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*

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*

IEC 60811-4-1:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 4: Methods specific to polyethylene and polypropylene compounds – Section One: Resistance to environmental stress cracking – Wrapping test after thermal ageing in air – Measurement of the melt flow index – Carbon black and/or mineral content measurement in PE*

IEC 60885-3:1988, *Electrical test methods for electric cables – Part 3: Test methods for partial discharge measurements on lengths of extruded power cables*

ISO 48:1994, *Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD)*