

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electric and optical fibre cables – Test methods for non-metallic materials –
Part 507: Mechanical tests – Hot set test for cross-linked materials

Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux
non-métalliques –
Partie 507: Essais mécaniques – Essai d'allongement à chaud pour les
matériaux réticulés



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRIC AND OPTICAL FIBRE CABLES –
TEST METHODS FOR NON-METALLIC MATERIALS –****Part 507: Mechanical tests –
Hot set test for cross-linked materials**

FOREWORD

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International Standard IEC 60811-507 has been prepared by IEC technical committee 20: Electric cables.

This Part 507 of IEC 60811 cancels and replaces Clause 9 of IEC 60811-2-1:1998, which is withdrawn. Full details of the replacements are shown in Annex A of IEC 60811-100:2012.

There are no specific technical changes with respect to the previous edition, but see the Foreword to IEC 60811-100: 2012.

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

FDIS	Report on voting
20/1303/FDIS	20/1352/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.

This part of IEC 60811 shall be used in conjunction with IEC 60811-100.

A list of all the parts in the IEC 60811 series, published under the general title *Electric and optical fibre cables – Test methods for non-metallic materials*, can be found on the IEC website.

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- withdrawn,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.

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INTRODUCTION

The IEC 60811 series specifies the test methods to be used for testing non-metallic materials of all types of cables. These test methods are intended to be referenced in standards for cable construction and for cable materials.

NOTE 1 Non-metallic materials are typically used for insulating, sheathing, bedding, filling or taping within cables.

NOTE 2 These test methods are accepted as basic and fundamental and have been developed and used over many years principally for the materials in all energy cables. They have also been widely accepted and used for other cables, in particular optical fibre cables, communication and control cables and cables for ships and offshore applications.

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ELECTRIC AND OPTICAL FIBRE CABLES – TEST METHODS FOR NON-METALLIC MATERIALS –

Part 507: Mechanical tests – Hot set test for cross-linked materials

1 Scope

This Part 507 of IEC 60811 gives the procedure for the hot set test, which typically applies to cross-linkable compounds used for insulating and sheathing materials.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60811-100:2012, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 100: General*

IEC 60811-201, *Electric and optical fibre cables – Test methods for non-metallic materials Part 201: General tests – Measurement of insulation thickness*

IEC 60811-202, *Electric and optical fibre cables – Test methods for non-metallic materials Part 202: General tests – Measurement of thickness of non-metallic sheaths*

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 60811-501, *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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60811-100 apply.

4 Test method

4.1 General

This part of IEC 60811 shall be used in conjunction IEC 60811-100.

This standard gives the method for the hot set test, which applies to crosslinked compounds.

All the tests shall be carried out not less than 16 h after the extrusion or crosslinking of the insulating or sheathing compounds.

4.2 Apparatus

The apparatus consists of the following parts:

- a) An oven capable of maintaining the temperature and tolerance specified.
- b) Grips shall be provided, such that each test piece can be suspended from an upper grip in the oven and weights attached to a lower grip attached to the test piece.

NOTE When testing tubular test pieces, the fixing of the grips should not cause air-tight sealing. This can be achieved by inserting at least on one end a short piece of metal pin, having slightly smaller dimensions than those of the inner side of the test piece.

4.3 Sample and test piece preparation

A sample of the cable or cord, or of the sheath removed from the cable, or samples of core, cut into pieces of sufficient length, shall be taken, preferably from positions close to that from which the samples for the tensile tests without ageing were taken, in accordance with IEC 60811-501.

Test pieces, dumb-bell or tubular, shall be prepared according to IEC 60811-501.

Two test pieces of sheath and of insulation from each core, after they have been prepared and their cross-sectional areas measured, as specified in the test method of IEC 60811-201 and/or IEC 60811-202. Dumb-bell test pieces shall be prepared from the inner part of the sheath and of the insulation after any ridges and/or semi-conducting layers have been removed.

The thickness shall be not less than 0,8 mm and not more than 2,0 mm. If a thickness of 0,8 mm cannot be obtained from the original sample, a minimum thickness of less than 0,8 mm is permitted; however, the greatest possible thickness shall be used.

The central 20 mm for the larger dumb-bells, or 10 mm for the smaller dumb-bells, shall be marked on each test piece.

NOTE A thickness of less than 0,8 mm is only permitted where the specified thickness in the applicable cable standard is less than 0,8 mm.

4.4 Procedure

Test conditions are specified in the relevant cable standard.

NOTE 1 In the absence of any requirement in the relevant cable standard, Annex A of this standard gives a recommendation for test temperature and requirements.

The test pieces shall be suspended in the oven and the weights attached to the lower grip to exert a force of the value specified for the material in the relevant cable standard. This process shall be carried out as quickly as possible so that the oven door is open for the minimum time.

After the oven has regained its temperature, the test pieces shall be held in the oven for a further 10 min. The distance between the marker lines shall then be measured so that the elongation can be calculated. If the oven does not have a window and the oven door has to be opened to make the measurement, the measurement shall be made not more than 30 s after opening the door.

In case of dispute, the test shall be carried out in an oven with a window and the measurement made without opening the door.

The tensile force shall then be removed from the test pieces (by cutting the test pieces at the lower grip), and the test pieces left to recover in the oven. The test pieces shall be held in the oven for 5 min or until the specified temperature is regained, whichever is the longer.

The test pieces shall then be removed from the oven and allowed to cool slowly to ambient temperature, after which the distance between the marker lines shall be measured again.

NOTE 2 Adequate precautions should be taken to avoid physical danger from the handling of the heated grips, weights and test pieces.

4.5 Expression of the results

The mean value of the elongation, after 10 min at the specified temperature, with the weight attached, shall not exceed the value specified in the standard for the type of cable.

The mean value of the distance between the marker lines, after removing the test piece from the oven and allowing it to cool, shall not have increased from the value before inserting the test piece in the oven by more than the percentage specified in the relevant cable standard.

If one of the two samples fails the test, then two more samples shall be tested. If both pass the test, the sample is deemed to have passed the test.

5 Test report

The test report shall be in accordance with that given in IEC 60811-100.

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Annex A (informative)

Recommended performance requirement

The performance requirements for a particular type or class of insulated conductor or cable should preferably be given in the individual cable standard.

In the absence of any given requirement, it is recommended that the following values are adopted for any cable tested against this standard:

- test temperature: $(200 \pm 3) \text{ }^{\circ}\text{C}$
- tensile force: $(20 \pm 0,5) \text{ N/cm}^2$
- maximum elongation under load: 175 %
- maximum residual elongation: 15 %

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