IEC 60811-412

Edition 1.0 2012-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electric and optical fibre cables – Test methods for non-metallic materials – Part 412: Miscellaneous tests – Thermal ageing methods – Ageing in an air bomb

Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux non-métalliques –
Partie 412: Essais divers – Méthodes de vieillissement thermique – Vieillissement dans une bombe à air

IEC 60811-412:2012

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 412: Miscellaneous tests – Thermal ageing methods – Ageing in an air bomb

FOREWORD

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International Standard IEC 60811-412 has been prepared by IEC technical committee 20: Electric cables.

This Part 412 of IEC 60811 cancels and replaces 8.2 of IEC 60811-1-2:1985, which is withdrawn.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
20/1296/FDIS	20/1345/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- withdrawn,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.

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.

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

Part 412: Miscellaneous tests – Thermal ageing methods – Ageing in an air bomb

1 Scope

This Part 412 of IEC 60811 gives the procedure for ageing in an air bomb, which typically applies to crosslinked and thermoplastic 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 60811-501, *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 with IEC 60811-100.

Unless otherwise specified, tests shall be carried out at room temperature.

4.2 Apparatus

The ageing is realized in an air bomb which can be filled with air, which shall be free from oil and moisture, to a pressure of (0,55 ± 0,02) MPa.

4.3 Sample and test pieces preparation

A sample of cable or 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 are taken, in accordance with IEC 60811-501.

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

4.4 Ageing procedure

This test shall be carried out not less than 16 h after the extrusion or cross-linking, if any, of the insulating or sheathing compounds.

Compounds of obviously different compositions shall not be tested at the same time in the same air bomb.

Five test pieces shall be placed in the air bomb at ambient temperature without touching each other and shall be kept in the bomb at the temperature and for the time specified for the material in the relevant standard for the type of cable.

The test pieces shall not occupy more than one-tenth of the effective capacity of the bomb.

The bomb shall be filled with air, which shall be free from oil and moisture, to a pressure of (0,55 ±0,02) MPa.

As soon as the ageing period is completed, the pressure shall be released gradually so as to reach atmospheric pressure in not less than 5 min, in order to avoid formation porosity in the test pieces.

The test pieces shall then be removed from the bomb and left at ambient temperature, avoiding direct sunlight, for at least 16 h.

4.5 Measurements

Determination of the mechanical properties on aged dumb-bell and/or tubular test pieces obtained directly after ageing shall then be carried out in accordance of IEC 60811-501.

4.6 Expression of the result

Calculate the tensile strength and the elongation at break, according to the definitions given in IEC 60811-501.

If required by the standard for the material in the relevant standard for the type of cable, the values found for the aged test pieces shall be calculated, as variation compared to the untreated test pieces according to the following formulae:

$$V_T = \frac{T_E - T_U}{T_U} \times 100 \quad (1)$$

$$V_E = \frac{E_E - E_U}{E_U} \times 100 \quad (2)$$

where

V_T is the variation of the tensile strength in per cent;

T_E is the tensile strength of aged test piece;

T_U is the tensile strength of untreated test piece;

V_E is the variation of the elongation at break in per cent;

E_E is the elongation at break of aged test piece in per cent;

E_U is the elongation at break of untreated test piece in per cent.

The untreated test piece shall be kept at ambient temperature.

The value and the variation between the median value obtained for the aged test pieces and the median value of the values obtained for the untreated test pieces (see IEC 60811-501), expressed as a percentage of the latter shall not exceed the percentage specified in the standard for the material in the relevant standard for the type of cable.

5 Test report

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

Bibliography

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* (withdrawn)