

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electric and optical fibre cables – Test methods for non-metallic materials –
Part 405: Miscellaneous tests – Thermal stability test for PVC insulations and
PVC sheaths

Câbles électriques et à fibres optiques – Méthodes d'essai pour les matériaux
non-métalliques –
Partie 405: Essais divers – Essai de stabilité thermique pour les enveloppes
isolantes et gaines en PVC



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRIC AND OPTICAL FIBRE CABLES –
TEST METHODS FOR NON-METALLIC MATERIALS –****Part 405: Miscellaneous tests –
Thermal stability test for PVC insulations and PVC sheaths**

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 60811-405 has been prepared by IEC technical committee 20: Electric cables.

This Part 405 of IEC 60811 cancels and replaces Clause 9 of IEC 60811-3-2:1985, which is withdrawn.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
20/1289/FDIS	20/1338/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 405: Miscellaneous tests – Thermal stability test for PVC insulations and PVC sheaths

1 Scope

This Part 405 of IEC 60811 specifies the procedure for the thermal stability test which applies to PVC compounds.

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*

ISO 695:1991, *Glass – Resistance to attack by a boiling aqueous solution of mixed alkali – Method of test and classification*

ISO 719:1985, *Glass – Hydrolytic resistance of glass grains at 98 degrees C – Method of test and classification*

ISO 1776:1985, *Glass – Resistance to attack by hydrochloric acid at 100 degrees C – Flame emission or flame atomic absorption spectrometric method*

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 following apparatus shall be used:

- a) Glass tubes closed at one end (e.g. by melting), 110 mm long with an outer diameter of approximately 5 mm and an inner diameter of $(4,0 \pm 0,5)$ mm.

Tubes made of AR-glass shall be used complying with

- ISO 695:1991; Alkali resistance, Class A2,
- ISO 719:1985; Hydrolytic resistance, Class HGB3,

- ISO 1776:1985; Acid resistance, max. weight loss $150 \mu\text{g Na}_2\text{O}/100 \text{ cm}^2$;
- b) Universal indicating paper with a pH range of 1 to 10.
- c) Thermostatically controlled heating apparatus for a temperature specified in the standard for the type of cable, or, if the temperature is not specified in the cable standard, at $(200 \pm 0,5) ^\circ\text{C}$. An oil bath is preferred and shall be used for type tests and in case of doubt.
- d) Calibrated thermometer with divisions of $0,1 ^\circ\text{C}$.
Depending on the type of thermometer, and the way in which it has been calibrated and is used, a mercury column correction may be necessary.
- e) Stop-watch or a suitable time meter.

4.3 Pre-conditioning

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

4.4 Test procedure

The test procedure shall be as follows:

NOTE The use of a sufficiently accurate thermometer and compliance with the required test temperature limits are absolutely necessary to obtain reliable test results and to restrict scatter in these results.

- a) From the insulation of each core to be tested or from the sheath to be tested, three samples, each of $(50 \pm 5) \text{ mg}$, shall be taken. Each sample shall consist of two or three small strips having a length between 20 mm and 30 mm.
Each sample shall be inserted into a glass tube as specified in item a) of 4.2. The sample shall occupy no more than the bottom 30 mm of the tube.
- b) A strip of dry universal indicating paper, as specified in item b) of 4.2, about 15 mm long and 3 mm wide, shall be inserted into the open end (top) of the glass tube so that the strip protrudes about 5 mm out of the tube and can be bent to keep it in position.
- c) The glass tube shall be placed into the heating apparatus, as specified in item c) of 4.2, which has already attained the test temperature specified. The glass tube shall be inserted into the heating apparatus to a depth of 60 mm.
- d) The time taken for the universal indicating paper to change colour from a pH value of 5 pH to a value between 2 pH and 3 pH shall be measured, or the test continued for the specified duration without the colour change occurring. The colour change point shall be considered to have been reached when the red colouring of the universal indicating paper characteristic of a pH value of 3 is just becoming visible. The universal indicating paper shall be renewed (especially for long duration stabilities) towards the end of the expected test time every 5 min to 10 min, so that the change point is better visible.

4.5 Evaluation of results

The average value of the thermal stability times of the three samples shall not be lower than the value specified in the 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 60811-3-2:1985, *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*
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