

Fire hazard testing —

Part 11-10: Test flames — 50 W horizontal and vertical flame test methods

The European Standard EN 60695-11-10:1999, with the incorporation of amendment A1:2003 has the status of a British Standard

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National foreword

This British Standard is the English language version of EN 60695-11-10:1999, including amendment A1:2003. It is identical with IEC 60695-11-10:1999, Edition 1.1:2003, which comprises Edition 1:1999 consolidated by the incorporation of amendment 1:2003.

The UK participation in its preparation was entrusted to Technical Committee GEL/89, Fire Hazard Testing, which has the responsibility to:

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- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 26, an inside back cover and a back cover.

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English version

Fire hazard testing Part 11-10: Test flames — 50 W horizontal and vertical flame test methods

(includes amendment A1:2003)

(IEC 60695-11-10:1999 + A1:2003)

Essais relatifs aux risques du feu
Partie 11-10: Flammes d'essai Méthodes d'essai
horizontale et verticale à la flamme de 50 W
(inclut l'amendement A1:2003)
(CEI 60695-11-10:1999 + A1:2003)

Prüfungen zur Beurteilung der Brandgefahr
Teil 11-10: Prüfflammen Prüfverfahren
mit 50-W Prüf Flamme horizontal und vertikal
(enthält Änderung A1:2003)
(IEC 60695-11-10:1999 + A1:2003)

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Comité Européen de Normalisation Electrotechnique
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Foreword

The text of document 89/315/FDIS, future edition 1 of IEC 60695-11-10, prepared by IEC TC 89, Fire hazard testing, and by SC 4, Burning behaviour, of ISO TC 61, Plastics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60695-11-10 on 1999-04-01.

This European Standard partly supersedes HD 441 S1:1983.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2000-01-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2002-01-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex ZA is normative and Annex A and Annex B are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60695-11-10:1999 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

- IEC 60695-1-1 NOTE Harmonized as EN 60695-1-1:1995 (not modified).
- IEC 60695-4 NOTE Harmonized as EN 60695-4:1995 (not modified).
- IEC 60707 NOTE Harmonized as EN 60707:1999 (not modified).

Foreword to amendment A1

The text of document 89/587/FDIS, future amendment 1 to IEC 60695-11-10:1999, prepared by IEC TC 89, Fire hazard testing, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60695-11-10:1999 on 2003-09-01.

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- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2006-09-01

Endorsement notice

The text of amendment 1:2003 to the International Standard IEC 60695-11-10:1999 was approved by CENELEC as an amendment to the European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

- ISO 307 NOTE Harmonized as EN ISO 307:1997 (not modified), superseded by EN ISO 307:2003.

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INTRODUCTION

When considering the use of the tests in this International Standard it is important to distinguish the term "end-product test", meaning a fire hazard assessment test on a completed product, piece part, component or subassembly, from the term "pre-selection test", meaning a combustion characteristic test made on a material (piece part, component or subassembly).

Pre-selection tests on materials normally use test pieces that have a standardized (simplistic) shapes, such as a rectangular bar or sheet, and are frequently prepared using standardized moulding procedures.

It is emphasized that data using the pre-selection tests given in this standard need careful consideration to ensure their relevance to the intended application, and to avoid misuse and erroneous interpretation. The actual fire performance of a part or product is affected by its surroundings, design variables such as shape and size, fabrication techniques, heat transfer effects, the type of potential ignition source and the length of exposure to it. It is important to bear in mind that these properties may also be affected by foreseeable use, abuse and environmental exposure.

The advantages of a pre-selection procedure are listed below.

- a) A material which reacts more favourably than another, when tested as a standard test specimen, will usually also react more favourably when used as a finished part in the product, provided that possible synergistic effects are avoided.
- b) Data concerning relevant combustion characteristics can aid the selection of materials, components and subassemblies during the design stage.
- c) The precision of pre-selection tests is usually higher, and their sensitivity may be superior when compared with end-product tests.
- d) Pre-selection tests may be used in a decision-making process directed to minimize fire hazard. Where applicable for the purpose of fire hazard assessment, they may lead to a reduction in the number of end-product tests, with a consequent reduction in the total testing effort.
- e) When fire hazard requirements need to be upgraded quickly, it may be possible to do this by upgrading the requirements of a pre-selection test before modifying the end-product test.
- f) The grading and classification obtained from the pre-selection test results may be used to specify a basic minimum performance of materials used in product specifications.

It should be noted that, when pre-selection testing is used to replace some of the end-product testing, it is necessary to fix an increased margin of safety in an attempt to ensure satisfactory performance of the end-product. End-product testing may avoid restrictions in innovative design and in economic material selection imposed by a pre-selection procedure. Consequently, following a pre-selection procedure, it may be necessary to implement a value analysis on the end-product, in order not to overspecify the product beyond what is strictly needed.

For electrotechnical products, IEC 60695-1-1 indicates that the risk of fire is present in any electrical circuit which is energized. With regard to this risk, the objective of component circuit and equipment design, and of the choice of material, is to reduce the likelihood of fire, even in the event of foreseeable abnormal use, malfunction or failure. The practical aim is to prevent ignition due to the electrically energized part but, if ignition and fire occur, to control the fire, preferably within the bounds of the enclosure of the electrotechnical product.

The best method for testing electrotechnical products with regard to fire hazards is to duplicate exactly the conditions occurring in practice. In most instances this is not possible. Accordingly, for practical reasons, the testing of electrotechnical products with regard to fire hazard is best conducted by simulating as closely as possible the actual effects occurring in practice.

IEC 60695-1-3 provides that pre-selection may be made on the basis of specified tests, and by the use of specifications of the necessary resistance to fire and related combustion characteristics. It also outlines guidance that is intended to relate the specific function of the electrotechnical product, its subassemblies and its parts to the tested properties of materials, and to demonstrate the significance and the limitations of such a pre-selection procedure.

ISO/TR 10840 summarizes specific problems associated with the fire testing of plastics, which should be taken into account when assessing and interpreting test results.

FIRE HAZARD TESTING – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods

1 Scope

This part of IEC 60695 specifies a small-scale laboratory screening procedure for comparing the relative burning behaviour of vertically or horizontally oriented specimens made from plastic and other non-metallic materials, exposed to a small-flame ignition source of 50 W nominal power.

These test methods determine the linear burning rate and the afterflame/afterglow times, as well as the damaged length of specimens. They are applicable to solid and cellular materials that have an apparent density of not less than 250 kg/m³, determined in accordance with ISO 845. They do not apply to materials that shrink away from the applied flame without igniting; ISO 9773 should be used for thin flexible materials.

The test methods described provide classification systems (see 8.4 and 9.4), which may be used for quality assurance, or the pre-selection of component materials of products.

The methods may be used for the pre-selection of a material, providing positive results are obtained at a thickness equal to the smallest thickness used in the application.

NOTE Test results are influenced by material components, e.g. pigments, fillers and fire-retardants, and properties such as the direction of anisotropy and the molecular mass.

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 60695-2-2:1991, *Fire hazard testing – Part 2: Test methods – Section 2: Needle-flame test*

IEC 60695-11-4,— *Fire hazard testing – Part 11-4: Test flames – 50 W flames – Apparatus and confirmational test methods* ¹⁾

IEC 60695-11-20:1999, *Fire hazard testing – Part 11-20: Test flames – 500 W flame test methods*

IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*

ISO/IEC Guide 51:1990, *Guidelines for the inclusion of safety aspects in standards*

ISO 291:1997, *Plastics – Standard atmospheres for conditioning and testing*

¹⁾ To be published.

ISO 293:1986, *Plastics – Compression moulding of test specimens of thermoplastic materials*

ISO 294 (all parts), *Plastics – Injection moulding of test specimens of thermoplastic materials*

ISO 295:1991, *Plastics – Compression moulding of test specimens of thermosetting materials*

ISO 845:1988, *Cellular plastics and rubbers – Determination of apparent (bulk) density*

ISO 9773:1998, *Plastics – Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source*

3 Definitions

For the purpose of this part of IEC 60695, the following definitions apply:

3.1

afterflame

persistence of flaming of a material under specified test conditions, after the ignition source has been removed

3.2

afterflame time t_1 , t_2

the length of time during which an afterflame persists

3.3

afterglow

persistence of glowing of a material under specified test conditions, after cessation of flaming or, if no flaming occurs, after the ignition source has been removed

3.4

afterglow time t_3

the length of time during which an afterglow persists

4 Principle

A rectangular bar-shaped test specimen is supported horizontally or vertically by one end and the free end is exposed to a specified test flame. The burning behaviour of the horizontally supported bar is assessed by measuring the linear burning rate. The burning behaviour of the vertically supported bar is assessed by measuring the afterflame and afterglow times, the extent of burning and dripping of flaming particles.

5 Significance of test

5.1 Tests made on a material under the conditions specified can be of considerable value when comparing the relative burning behaviour of different materials, controlling manufacturing processes or assessing any change in burning characteristics. The results obtained from these methods are dependent on the shape, orientation and environment surrounding the specimen, and on the conditions of ignition.

The significant feature of these test methods is the arrangement of the test specimens in either a horizontal or a vertical position. These testing arrangements make it possible to distinguish between the different degrees of flammability of materials.