IEC 60695-1-21

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

BASIC SAFETY PUBLICATION

PUBLICATION FONDAMENTALE DE SÉCURITÉ

Fire hazard testing –
Part 1-21: Guidance for assessing the fire hazard of electrotechnical products – Ignitability – Summary and relevance of test methods

Essais relatifs aux risques du feu –
Partie 1-21: Lignes directrices pour l'évaluation des risques du feu des produits électrotechniques – Allumabilité – Résumé et pertinence des méthodes d'essais

IEC 60695-1-21:2016 (en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FIRE HAZARD TESTING –

Part 1-21: Guidance for assessing the fire hazard of electrotechnical products – Ignitability – Summary and relevance of test methods

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 60695-1-21 has been prepared by IEC technical committee 89: Fire hazard testing.

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

FDIS	Report on voting
89/1336/FDIS	89/1339/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.

It has the status of a basic safety publication in accordance with IEC Guide 104 and ISO/IEC Guide 51.

This first edition of IEC 60695-1-21 cancels and replaces the first edition of IEC TR 60695-1-21 published in 2008. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Change from a TR to an international standard;

b) Modified Introduction;

c) Modified Scope;

d) Updated normative references;

e) Updated terms and definitions;

f) Updates and new text in Clause 4;

g) Addition of text concerning ASTM D 3638;

h) Updates to Annex A;

i) Updates to the bibliography.

A list of all the parts in the IEC 60695 series, under the general title *Fire hazard testing*, can be found on the IEC website.

The IEC 60695-1 series, under the general title *Fire hazard testing*, consists of the following parts:

Part 1-10: Guidance for assessing the fire hazard of electrotechnical products – General guidelines

Part 1-11: Guidance for assessing the fire hazard of electrotechnical products – Fire hazard assessment

Part 1-12: Guidance for assessing the fire hazard of electrotechnical products – Fire safety engineering

Part 1-20: Guidance for assessing the fire hazard of electrotechnical products – Ignitability – General guidance

Part 1-21: Guidance for assessing the fire hazard of electrotechnical products – Ignitability – Summary and relevance of test methods

Part 1-30: Guidance for assessing the fire hazard of electrotechnical products – Preselection testing procedures – General guidelines

Part 1-40: Guidance for assessing the fire hazard of electrotechnical products – Insulating liquids

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

Fires are responsible for creating hazards to life and property as a result of the generation of heat (thermal hazard), and also as a result of the production of toxic effluent, corrosive effluent and smoke (non-thermal hazard). Fires start with ignition and then can grow, leading in some cases to flash-over and a fully developed fire. Ignition resistance is therefore one of the most important parameters of a material to be considered in the assessment of fire hazard. If there is no ignition, there is no fire.

For most materials (other than metals and some other elements), ignition occurs in the gas phase. Ignition occurs when combustible vapour, mixed with air, reaches a high enough temperature for exothermic oxidation reactions to rapidly propagate. The ease of ignition is a function of the chemical nature of the vapour, the fuel/air ratio and the temperature.

In the case of liquids, the combustible vapour is produced by vaporization of the liquid, and the vaporization process is dependent on the temperature and chemical composition of the liquid.

In the case of solids, the combustible vapour is produced by pyrolysis when the temperature of the solid is sufficiently high. The vaporization process is dependent on the temperature and chemical composition of the solid, and also on the thickness, density, specific heat, and thermal conductivity of the solid.

The ease of ignition of a test specimen depends on many variables. Factors that need to be considered for the assessment of ignitability are:

a) the geometry of the test specimen, including thickness and the presence of edges, corners or joints;

b) the surface orientation;

c) the rate and direction of air flow;

d) the nature and position of the ignition source;

e) the magnitude and position of any external heat flux; and

f) whether the combustible material is a solid or a liquid.

In the design of an electrotechnical product the risk of fire and the potential hazards associated with fire need to be considered. In this respect the objective of component, circuit and equipment design, as well as the choice of materials, is to reduce the risk of fire to a tolerable level even in the event of reasonably foreseeable (mis)use, malfunction or failure.

Fires involving electrotechnical products can also be initiated from external non-electrical sources. Considerations of this nature are dealt with in an overall fire hazard assessment.

The aim of the IEC 60695 series of standards is to save lives and property by reducing the number of fires or reducing the consequences of the fire. This can be accomplished by:

- trying to prevent ignition caused by an electrically energised component part and, in the event of ignition, to confine any resulting fire within the bounds of the enclosure of the electrotechnical product.
- trying to minimise flame spread beyond the product's enclosure and to minimise the harmful effects of fire effluents including heat, smoke, and toxic or corrosive combustion products.

For these reasons there are many tests used to evaluate the ignitability of electrotechnical products and of the materials used in their construction. This part of IEC 60695 describes ignitability test methods in common use to assess electrotechnical products, or materials used in electrotechnical products. It also includes test methods in which, by design,

ignitability is a significant quantifiable characteristic. It forms part of the IEC 60695-1 series, which gives guidance to product committees wishing to incorporate fire hazard test methods in product standards.

FIRE HAZARD TESTING –

Part 1-21: Guidance for assessing the fire hazard of electrotechnical products – Ignitability – Summary and relevance of test methods

1 Scope

This part of IEC 60695 provides a summary of test methods that are used to determine the ignitability of electrotechnical products or materials from which they are formed. It also includes test methods in which, by design, ignitability is a significant quantifiable characteristic.

It represents the current state of the art of the test methods and, where available, includes special observations on their relevance and use. The list of test methods is not to be considered exhaustive, and test methods which were not developed by the IEC are not to be considered as endorsed by the IEC unless this is specifically stated.

This basic safety publication is intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications in the preparation of its publications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60695-1-20, *Fire hazard testing – Part 1-20: Guidance for assessing the fire hazard of electrotechnical products – Ignitability – General guidance*

IEC 60695-1-30, *Fire hazard testing – Part 1-30: Guidance for assessing the fire hazard of electrotechnical products – Use of preselection testing procedures*

IEC 60695-4:2012, *Fire hazard testing – Part 4: Terminology concerning fire tests for electrotechnical products*

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

ISO/IEC Guide 51, *Safety aspects – Guidelines for their inclusion in standards*

ISO 13943:2008, *Fire safety – Vocabulary*