

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

BASIC SAFETY PUBLICATION

PUBLICATION FONDAMENTALE DE SÉCURITÉ

**Fire hazard testing –**

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

**Essais relatifs aux risques du feu –**

**Partie 1-30: Lignes directrices pour l'évaluation des risques du feu des produits  
électrotechniques – Processus d'essai de présélection – Lignes directrices  
générales**

<https://standards.iec.ch/standards/iec/d03/314e9-ca1c-4524-85da-b3f7e8bbe64e/iec-60695-1-30-2008>



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INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX

**M**

ICS 13.220.40; 29.020

ISBN 2-8318-9855-2

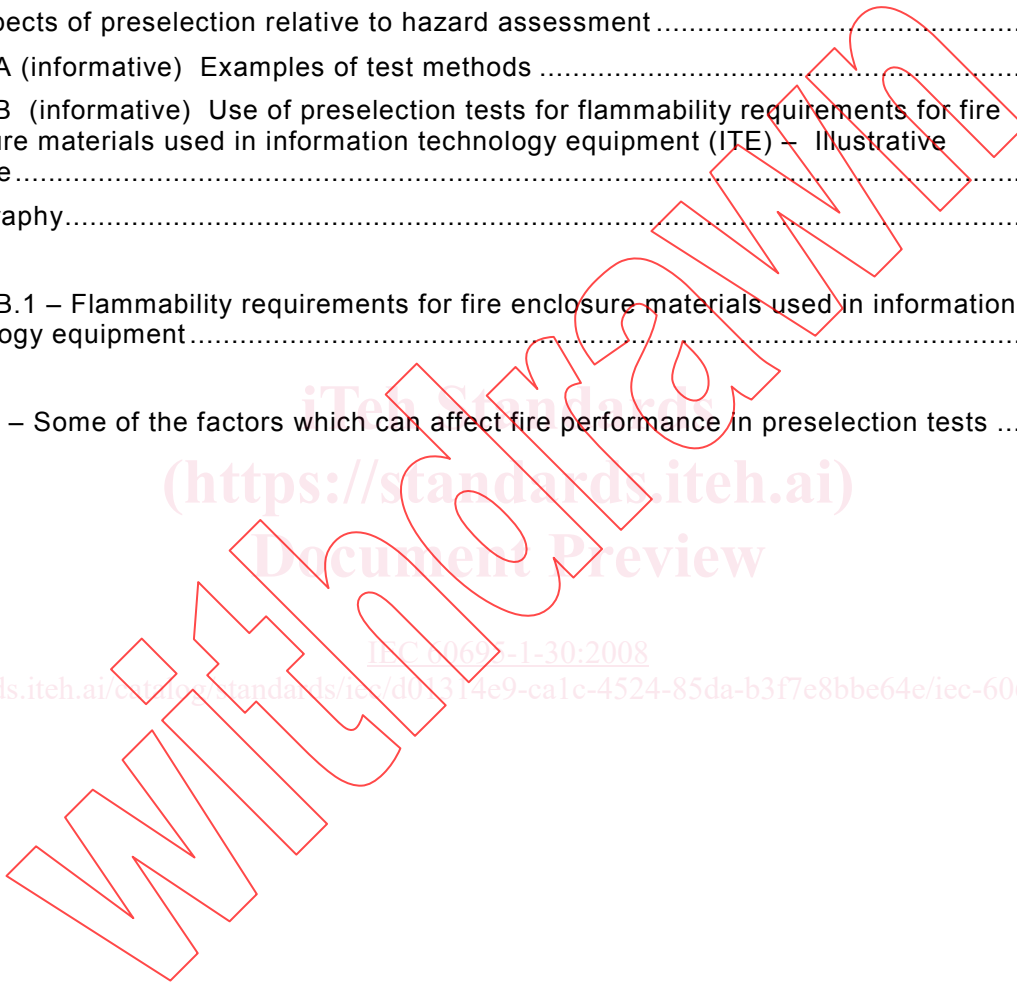
## CONTENTS

|   |    |
|---|----|
| FOREWORD.....   | 3  |
| INTRODUCTION.....   | 5  |
| 1 Scope.....  | 6  |
| 2 Normative references.....   | 6  |
| 3 Terms and definitions.....  | 6  |
| 4 Principles of product design considering preselection.....  | 7  |
| 5 Advantages and limitations of preselection.....   | 8  |
| 6 Aspects of preselection relative to hazard assessment.....  | 8  |
| Annex A (informative) Examples of test methods.....   | 9  |
| Annex B (informative) Use of preselection tests for flammability requirements for fire enclosure materials used in information technology equipment (ITE) – Illustrative example..... | 11 |
| Bibliography.....   | 13 |
| Figure B.1 – Flammability requirements for fire enclosure materials used in information technology equipment.....   | 12 |
| Table 1 – Some of the factors which can affect fire performance in preselection tests.....  | 7  |

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## FIRE HAZARD TESTING –

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

## FOREWORD

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International Standard IEC 60695-1-30 has been prepared by IEC technical committee 89: Fire hazard testing.

This second edition cancels and replaces the first edition of IEC 60695-1-30, published in 2002, and constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

- Further explanation given in the introduction and scope.
- Clause 3: changes to the definitions.
- Clause 4: clarifications of the principles of product design considering preselection.
- Clause 5: clarifications of the advantages and limitations of preselection.
- Clause 6: clarifications of the aspects of preselection relative to hazard assessment.

- Annex A: changes in the references for examples of test methods which may be relevant to preselection.
- Annex B: changes in the illustrative example of the flowchart of the use of preselection tests for resistance to fire hazards of a specific product type.

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

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

| FDIS        | Report on voting |
|-------------|------------------|
| 89/865/FDIS | 89/869/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 publication is to be used in conjunction with the future IEC 60695-1-10<sup>1</sup> and IEC 60695-1-11<sup>1</sup>.

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

Part 1 consists of the following sub-parts:

Part 1-10<sup>1</sup>: *Guidance for assessing the fire hazard of electrotechnical products – General guidelines*

Part 1-11<sup>1</sup>: *Guidance for assessing the fire hazard of electrotechnical products – Fire hazard assessment*

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 process – 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 maintenance result 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.

<sup>1</sup> Under consideration.

## INTRODUCTION

In the design of any 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 to acceptable levels the potential risks of fire even in the event of foreseeable abnormal use, malfunction or failure. The future IEC 60695-1-10<sup>2</sup> and IEC 60695-1-11<sup>2</sup> provide guidance on how this is to be accomplished using quantitative and qualitative fire tests.

The information gained from properly designed small-scale tests can be used as an aid for the preselection of proper materials, parts, components or sub-assemblies with regard to the fire hazard evaluation of the final end-product. The best method for testing electrotechnical products with regard to fire hazard is to duplicate exactly the conditions occurring in practice by conducting real-scale fire tests. Where this is not practicable, fire hazard testing should be conducted by simulating as closely as possible, the actual conditions of use and of the situation to which a sub-assembly, component, part or material may be exposed in such use. As an outcome of conducting a fire hazard assessment, an appropriate series of preselection flammability and ignition tests may enable reduced end-product testing.

Preselection is the procedure for assessing and choosing materials, components or sub-assemblies for parts of end-products. Preselection has been used for many years to assist the designer in the selection of candidate materials in the design stage of the end-product.

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<sup>2</sup> Under consideration.

## FIRE HAZARD TESTING –

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

#### 1 Scope

This part of IEC 60695 provides guidance for assessing and choosing candidate materials, components or sub-assemblies for making an end-product based upon preselection testing.

It describes how preselection provides comparative fire hazard test methods to evaluate the performance of a test specimen and how preselection can be used in the selection of materials, parts, components and sub-assemblies during the design stage of an end-product. It further describes how standardized test methods may be used as one part in the decision making processes directed to minimize the fire hazards from electrotechnical equipment. It states that one should take into account the desired reaction to fire properties of the end-product, and that one should consider the possible effects of environmental conditions on the behaviour of the end-product.

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. The requirements, test methods or test conditions of this basic safety publication will not apply unless specifically referred to or included in the relevant publications.

#### 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 60695-4:2005, *Fire hazard testing – Part 4: Terminology concerning fire tests for electrotechnical products*

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

ISO/IEC Guide 51:1999, *Safety aspects – Guidelines for their inclusion in standards*

ISO/IEC 13943:2000, *Fire safety – Vocabulary*

#### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

##### 3.1

##### **end-product fire test**

fire test that is described in a relevant product specification and that is carried out on an assembled product which is ready for use

NOTE End-product fire tests may be small-scale, intermediate-scale, large-scale or real-scale.



### 3.2 preselection

process of assessing and choosing candidate materials, components or sub-assemblies for making an end-product

## 4 Principles of product design considering preselection

One objective of equipment design is to choose individual materials, parts, components and sub-assemblies that reduce the likelihood of fire. The preselection procedure, as well as end-product testing, should take into account all possible ignition sources, even those that may have an influence in the event of foreseeable abnormal use, malfunction or failure.

The properties required by individual materials, parts, components and sub-assemblies are determined by their function and related requirements as part of the final end-product. The selection and magnitude of these properties will be dependent upon the details of reasonable foreseeable use, abuse and environmental exposure.

An integral element of preselection is the acquisition of relevant information regarding a material's characteristics. This knowledge can be acquired from an analysis of data obtained from standardized test methods conducted on specified test specimens. Examples of tests which may be relevant to preselection are contained in Annex A.

The preselection process should describe how standardized test methods may be used in decision-making processes to minimize the fire hazards from electrotechnical equipment. The preselection process should take into account the relevant features of the end-product, since the actual performance of the material may be affected by various factors and constructional characteristics.

The fire performance of materials, parts, components and sub-assemblies is affected by a number of factors, some of which are listed in Table 1.

Consequently, a preselection procedure to assess the adequate performance of a final end-product requires test data on materials, parts, components and sub-assemblies and should take into account all of the relevant features (for example, the environmental conditions, association with other items, and possible ignition sources).

A decision analysis flow chart (see Figure B.1) is shown in Annex B for an illustrative example of the use of preselection.

**Table 1 – Some of the factors which can affect fire performance in preselection tests**

| Item | Factor  |
|------|---|
| a)   | Thickness and size of the test specimen   |
| b)   | Shape, homogeneity and volume of the test specimen  |
| c)   | Combination and interaction of materials, parts, components and sub-assemblies                            |
| d)   | Position and orientation of the test specimen   |
| e)   | Composition of materials  |
| f)   | Presence of fire-retardant covers, barriers and/or coatings   |
| g)   | Effects of environmental influence and contamination, e.g. effects of temperature, ageing and ventilation |
| h)   | Effects of manufacturing processes  |
| i)   | Type and power of the ignition source   |
| j)   | Location of application of the ignition source  |
| k)   | Time of application of the ignition source  |
| l)   | Presence of any heat sinks, and heat transfer effects   |

## 5 Advantages and limitations of preselection

A preselection process that can meet the principles described in Clause 4 may present certain advantages and limitations:

- a) Preselection provides a comparative method to evaluate the performance of a test specimen and can be of assistance in the selection of materials, parts, components and sub-assemblies during the design stage.
- b) The grading and classification obtained from a comprehensive preselection process may be used to specify a basic minimum performance of materials and parts used in product specifications.
- c) In general, it cannot be assumed that any direct relationship exists between the results of a preselection test and the results of a test made on the final end-product. However, a material, part, component or sub-assembly that reacts more favourably than another when subjected to a standardized preselection test and has a history of safe use in similar applications, could also react more favourably when used in the design of an end-product.

Priority is given to fire hazard assessment tests made on the final end-product. However, in certain cases preselection may be agreed upon for practical reasons as a way to reduce the amount of end-product testing. It should be noted that in this case, it is advisable to establish an increased margin of safety in an attempt to ensure satisfactory performance, based on the relevant features of the end-product.

- d) Preselection may lead to a reduction in the number of end-product tests with a consequent reduction, for the purpose of fire hazard assessment, in the total amount of testing required.
- e) Preselection tests may result in an increased margin of safety due to the use of specified test samples and consistency in test methods and test data. Preselection tests tend to use relatively small, discrete samples, consequently reducing the costs of testing and also enabling a variety of ignition sources to be used, which may not be easily applied in a test on the end-product.
- f) Preselection data are readily available from multiple international sources. Preselection data can be used to examine the variation of a material's properties with respect to a range of parameters. Typical examples of such parameters are: source of data (test laboratory), source of material, test orientation, colour and thickness.

Examples of test methods which contain combustion characteristics tests, specified in the publications of IEC/TC 89 and ISO/TC 61, are listed in Annex A.

## 6 Aspects of preselection relative to hazard assessment

Preselection of materials based on the results obtained by tests for reaction to abnormal heat and reaction to fire, may be used in the decision-making process related to fire hazard assessment, when the relevant aspects discussed in Clause 4 have been considered, or if there is a history of safe use of the material in similar applications.

Some of these factors listed in Table 1 may be reasonably covered by the preselection test itself, others may require careful interpretation of a result with regard to evaluation of fire hazard.

In some cases, the fire hazard analysis can include either relevant preselection tests or a combination of relevant preselection tests and end-product tests to reduce the likelihood of fire from electrotechnical products.

## Annex A (informative)

### Examples of test methods

The following TC 89 and ISO/TC 61 publications contain information on fire hazard assessment tests which may be applicable during the preselection procedure for the acquisition of pertinent information regarding a material's characteristics.

#### A.1 Ignitability

IEC/TR 60695-1-21: *Fire hazard testing – Part 1-21: Guidance for assessing the fire hazard of electrotechnical products – Ignitability – Summary and relevance of test methods*

IEC 60695-2-13: *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignitability test method for materials*

IEC/TS 60695-11-11: *Fire hazard testing – Part 11-11: Test flames – Determination of the ignition characteristic heat flux from a non-contacting flame source*<sup>3</sup>

#### A.2 Flammability

IEC 60695-2-12: *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability test method for materials*

IEC/TS 60695-9-2: *Fire hazard testing – Part 9-2: Surface spread of flames – Summary and relevance of test methods*

IEC 60695-11-5: *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

IEC 60695-11-10: *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

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

IEC/TS 60695-11-21: *Fire hazard testing – Part 11-21: Test flames – 500 W vertical flame test method for tubular polymeric materials*

ISO 9772: *Cellular plastics – Determination of horizontal burning characteristics of small specimens subjected to a small flame*

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

#### A.3 Heat

IEC/TS 60695-8-2: *Fire hazard testing – Part 8-2: Heat release – Summary and relevance of test methods*

#### A.4 Smoke

IEC/TS 60695-6-2: *Fire hazard testing – Part 6-2: Smoke obscuration – Summary and relevance of test methods*

IEC/TS 60695-6-30: *Fire hazard testing – Part 6-30: Guidance and test methods on the assessment of obscuration hazard of vision caused by smoke opacity from electrotechnical products involved in fires – Small scale static method – Determination of smoke opacity – Description of the apparatus*

<sup>3</sup> Under consideration.