

SLOVENSKI STANDARD
SIST EN 60695-1-11:2010**01-december-2010****Nadomešča:****SIST EN 60695-1-1:2000**

Preskušanje požarne ogroženosti - 1-11. del: Vodilo za ocenjevanje požarne varnosti elektrotehniških izdelkov - Ocena požarne varnosti (IEC 60695-1-11:2010)

Fire hazard testing - Part 1-11: Guidance for assessing the fire hazard of electrotechnical products - Fire hazard assessment (IEC 60695-1-11:2010)

Prüfungen zur Beurteilung der Brandgefahr - Teil 1-11: Anleitung zur Beurteilung der Brandgefahr von elektrotechnischen Erzeugnissen - Beurteilung der Brandgefahr (IEC 60695-1-11:2010)

[SIST EN 60695-1-11:2010](#)

Essais relatifs aux risques du feu - Partie 1-11: Lignes directrices pour l'évaluation des risques du feu des produits électrotechniques - Evaluation des risques du feu (CEI 60695-1-11:2010)

Ta slovenski standard je istoveten z: EN 60695-1-11:2010**ICS:**

13.220.40	Sposobnost vžiga in obnašanje materialov in proizvodov pri gorenju	Ignitability and burning behaviour of materials and products
29.020	Elektrotehnika na splošno	Electrical engineering in general

SIST EN 60695-1-11:2010**en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60695-1-11:2010

<https://standards.iteh.ai/catalog/standards/sist/4ae4eab9-6a70-45c9-8eb4-a92a5f2141c4/sist-en-60695-1-11-2010>

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60695-1-11

October 2010

ICS 13.220.40; 29.020

Supersedes EN 60695-1-1:2000 (partially)

English version

**Fire hazard testing -
Part 1-11: Guidance for assessing the fire hazard of electrotechnical
products -
Fire hazard assessment
(IEC 60695-1-11:2010)**

Essais relatifs aux risques du feu -
Partie 1-11: Lignes directrices
pour l'évaluation des risques du feu
des produits électrotechniques -
Evaluation des risques du feu
(CEI 60695-1-11:2010)

Prüfungen zur Beurteilung
der Brandgefahr -
Teil 1-11: Anleitung zur Beurteilung
der Brandgefahr von elektrotechnischen
Erzeugnissen -
Beurteilung der Brandgefahr
(IEC 60695-1-11:2010)

iteh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 60695-1-11:2010](https://standards.iteh.ai/catalog/standards/sist/4ae4eab9-6a70-45c9-8eb4-390100000000/EN-60695-1-11-2010)

[https://standards.iteh.ai/catalog/standards/sist/4ae4eab9-6a70-45c9-8eb4-](https://standards.iteh.ai/catalog/standards/sist/4ae4eab9-6a70-45c9-8eb4-390100000000/EN-60695-1-11-2010)

This European Standard was approved by CENELEC on 2010-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 89/991A/FDIS, future edition 1 of IEC 60695-1-11, prepared by IEC TC 89, Fire hazard testing, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60695-1-11 on 2010-10-01.

This European Standard partially supersedes EN 60695-1-1:2000.

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

This standard is to be used in conjunction with EN 60695-1-10.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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) 2011-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2013-10-01

Annex ZA has been added by CENELEC.

ITEH STANDARD PREVIEW
(standards.iteh.ai)

Endorsement notice

SIST EN 60695-1-11:2010

The text of the International Standard IEC 60695-1-11:2010 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 61386-21:2002 | NOTE | Harmonized as EN 61386-21:2004 (not modified). |
| IEC/TS 60695-7-3 | NOTE | Harmonized as EN 60695-7-3. |
| IEC 60695-4:2005 | NOTE | Harmonized as EN 60695-4:2006 (not modified). |

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60695-1-10	2009	Fire hazard testing - Part 1-10: Guidance for assessing the fire hazard of electrotechnical products - General guidelines	EN 60695-1-10	2010
IEC 60695-1-21	2008	Fire hazard testing - Part 1-21: Guidance for assessing the fire hazard of electrotechnical products - Ignitability - Summary and relevance of test methods	-	-
IEC/TS 60695-5-2	2002	Fire hazard testing - Part 5-2: Corrosion damage effects of fire effluent - Summary and relevance of test methods	-	-
IEC/TS 60695-6-2	2005	Fire hazard testing - Part 6-2: Smoke obscuration - Summary and relevance of test methods	-	-
IEC/TR 60695-7-2	2002	Fire hazard testing - Part 7-2: Toxicity of fire effluent - Summary and relevance of test methods	-	-
IEC/TR 60695-8-2	2008	Fire hazard testing - Part 8-2: Heat release - Summary and relevance of test methods	-	-
IEC/TS 60695-9-2	2005	Fire hazard testing - Part 9-2: Surface spread of flame - Summary and relevance of 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	1999	Safety aspects - Guidelines for their inclusion in standards	-	-
ISO 13943	2008	Fire safety - Vocabulary	-	-
ISO/TR 13387	Series	Fire safety engineering	-	-

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60695-1-11:2010

<https://standards.iteh.ai/catalog/standards/sist/4ae4eab9-6a70-45c9-8eb4-a92a5f2141c4/sist-en-60695-1-11-2010>



IEC 60695-1-11

Edition 1.0 2010-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

BASIC SAFETY PUBLICATION

PUBLICATION FONDAMENTALE DE SÉCURITÉ

Fire hazard testing – **STANDARD PREVIEW**
Part 1-11: Guidance for assessing the fire hazard of electrotechnical products –
Fire hazard assessment (standards.iten.ai)

Essais relatifs aux risques du feu –
Partie 1-11: Lignes directrices pour l'évaluation des risques du feu des produits
électrotechniques – Evaluation des risques du feu

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX



ICS 13.220.40; 29.020

ISBN 978-2-88912-027-7

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions.....	8
4 Elements of fire hazard assessment.....	14
4.1 Ignition sources.....	14
4.2 Fire hazard.....	14
4.3 Fire risk.....	14
4.4 Fire hazard assessment.....	14
5 Fire hazard tests.....	15
6 The fire hazard assessment process.....	15
6.1 General.....	15
6.2 Definition of the product range and the circumstances of use.....	16
6.3 Identification and analysis of fire scenarios.....	16
6.3.1 General.....	16
6.3.2 Qualitative description of the fire scenario.....	17
6.3.3 Quantitative analysis of the fire scenario.....	18
6.3.4 Simple hypothetical fire scenarios.....	19
6.4 Selection of criteria for acceptable fire scenario outcomes.....	19
6.5 Performance requirements.....	20
6.6 Interpretation of test results.....	20
6.7 Consequential testing.....	20
7 Scope and limitations of the fire hazard assessment.....	20
8 Fire test requirements and specifications.....	21
Annex A (informative) Calculation of acceptable toxic yield values for an electrical insulation material, based on a simple hypothetical fire scenario.....	26
Annex B (informative) Use of rigid plastic conduit – A fire hazard assessment.....	31
Bibliography.....	43
Figure B.1 – Schematic of conduit installation.....	38
Figure B.2 – Corridor upper layer temperature (concrete wall).....	38
Figure B.3 – Corridor upper layer temperature (gypsum wall board).....	39
Figure B.4 – Flux measured at the conduit 2 m away (concrete wall).....	39
Figure B.5 – Flux measured at the conduit 2 m away (gypsum wall).....	40
Figure B.6 – Comparative mass loss rates of furniture and conduit (concrete wall).....	40
Figure B.7 – Comparative mass loss rates of furniture and conduit (gypsum wall board).....	41
Figure B.8 – Relative increase of toxicity due to exposed conduit (concrete wall).....	41
Figure B.9 – Relative increase of toxicity due to exposed conduit (gypsum wall board).....	42
Table A.1 – Irritant F values and calculated X values for the defined fire scenario.....	27
Table A.2 – Asphyxiant X values calculated for the defined fire scenario.....	28
Table A.3 – Incapacitation times for hydrogen cyanide.....	29

Table A.4 – Multiplication factors for carbon dioxide	30
Table B.1 – Summary of fire scenario information	33
Table B.2 – Time of occurrence of highly-hazardous conditions in building corridors.....	36

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60695-1-11:2010

<https://standards.iteh.ai/catalog/standards/sist/4ae4eab9-6a70-45c9-8eb4-a92a5f2141c4/sist-en-60695-1-11-2010>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIRE HAZARD TESTING –

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

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60695-1-11 has been prepared by IEC technical committee 89: Fire hazard testing.

This first edition of this standard, together with IEC 60695-1-10, cancels and replaces the third edition of IEC 60695-1-1 published in 1999, and corrigenda 1 and 2 (2000). It also constitutes a technical revision.

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

This standard is to be used in conjunction with IEC 60695-1-10.

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

FDIS	Report on voting
89/991A/FDIS	89/1005/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.

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.

Part 1 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 1-20 *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* [https://standards.iteh.ai/catalog/standards/sist/4ae4eab9-6a70-45c9-8eb4-](https://standards.iteh.ai/catalog/standards/sist/4ae4eab9-6a70-45c9-8eb4-a92a5f2141c4/sist-en-60695-1-11-2010)

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

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. This standard, together with its companion, IEC 60695-1-10, provides guidance on how this is to be accomplished.

The primary aims are 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.

Secondary aims include the minimisation of any flame spread beyond the product's enclosure and the minimisation of harmful effects of fire effluents including heat, smoke, and toxic or corrosive combustion products.

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

Fire hazard assessment is used to identify the kinds of fire events (fire scenarios) which will be associated with the product, to establish how the measurable fire properties of the product are related to the outcome of those events, and to establish test methods and performance requirements for those properties which will either result in a tolerable fire outcome or eliminate the event altogether.

Annex A demonstrates a relatively simple fire hazard assessment process as applied to the toxic hazard from a burning material.

Annex B demonstrates a more complex fire hazard assessment process as applied to an electrotechnical product: rigid plastic conduit.

Attention is drawn to the principles in IEC Guide 104, and to the role of committees with horizontal safety functions and group safety functions.

FIRE HAZARD TESTING –

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

1 Scope

This part of IEC 60695-1 provides guidance for assessing the fire hazard of electrotechnical products and for the resulting development of fire hazard testing as related directly to harm to people, animals or property. For the purposes of this standard, product means complete electrotechnical equipments, their parts (including components) and electrical insulating materials.

It outlines a hazard-based process to identify appropriate fire test methods and performance criteria for products. The principles of the methodology are to identify fire events (fire scenarios) which will be associated with the product, to establish how the measurable fire properties of the product are related to the possible occurrence and outcome of those events, and to establish test methods and performance requirements for those properties which will either result in a tolerable fire outcome or eliminate the event altogether.

This standard is intended as guidance to IEC committees, and should be used with respect to their individual applications. The actual implementation of this standard remains the responsibility of each product committee, according to the minimum acceptable fire safety in its application field and taking into account the feedback from experience.

<https://standards.iteh.ai/catalog/standards/sist/4ae4eab9-6a70-45c9-8eb4->

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 60695-1-10:2009, *Fire hazard testing – Part 1-10: Guidance for assessing the fire hazard of electrotechnical products – General guidelines*

IEC 60695-1-21:2008, *Fire hazard testing – Part 1-21: Guidance for assessing the fire hazard of electrotechnical products – Ignitability – Summary and relevance of test methods*

IEC/TS 60695-5-2:2002, *Fire hazard testing – Part 5-2: Corrosion damage effects of fire effluents – Summary and relevance of test methods*

IEC/TS 60695-6-2:2005, *Fire hazard testing – Part 6-2: Smoke obscuration – Summary and relevance of test methods*

IEC/TR 60695-7-2:2002, *Fire hazard testing – Part 7-2: Toxicity of fire effluent – Summary and relevance of test methods*

IEC/TR 60695-8-2:2008, *Fire hazard testing – Part 8-2: Heat release – Summary and relevance of test methods*

IEC/TS 60695-9-2:2005, *Fire hazard testing – Part 9-2: Surface spread of flame – Summary and relevance of 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 51:1999, *Safety aspects – Guidelines for their inclusion in standards*

ISO/IEC 13943:2008, *Fire safety – Vocabulary*

ISO/TR 13387:1999 (all parts), *Fire safety engineering*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 13943, some of which are reproduced below for the use' convenience, as well as the followings apply.

3.1 asphyxiant

toxicant that causes hypoxia, (which can result in central nervous system depression or cardiovascular effects)

NOTE Loss of consciousness and ultimately death may occur.
[ISO/IEC 13943, definition 4.17]

3.2 available safe escape time ASET

time available for escape for an individual occupant, the calculated time interval between the time of ignition (3.27) and the time at which conditions become such that the occupant is estimated to be incapacitated, i.e. unable to take effective action to escape (3.8) to a safe refuge or place of safety

NOTE 1 The time of ignition can be known, e.g. in the case of a fire model or a fire test, or it may be assumed, e.g. it may be based upon an estimate working back from the time of detection. The basis on which the time of ignition is determined is always stated.

NOTE 2 This definition equates incapacitation with failure to escape. Other criteria for ASET are possible. If an alternate criterion is selected, it is necessary that it be stated.

NOTE 3 Each occupant can have a different value of ASET, depending on that occupant's personal characteristics.

[ISO/IEC 13943, definition 4.20]

3.3 built environment building or other structure

EXAMPLES off-shore platforms, civil engineering works such as tunnels, bridges and mines; and means of transportation such as motor vehicles and marine vessels.

NOTE ISO 6707-1 contains a number of terms and definitions for concepts related to the built environment.

[ISO/IEC 13943, definition 4.26]

3.4**combustion**

exothermic reaction of a substance with an oxidizing agent

NOTE Combustion generally emits fire effluent accompanied by flames and/or glowing.

[ISO/IEC 13943, definition 4.46]

3.5**combustion product****product of combustion**

solid, liquid and gaseous material resulting from combustion (3.4)

NOTE Combustion products can include fire effluent, ash, char, clinker and/or soot.

[ISO/IEC 13943, definition 4.48]

3.6**effective heat of combustion**

heat released (3.25) from a burning test specimen in a given time interval divided by the mass lost from the test specimen in the same time period

NOTE 1 It is the same as the net heat of combustion if all the test specimen is converted to volatile combustion (3.4) products and if all the combustion products (3.5) are fully oxidized.

NOTE 2 The typical units are $\text{kJ}\cdot\text{g}^{-1}$.

[ISO/IEC 13943, definition 4.74]

3.7**environment**

conditions and surroundings that may influence the behaviour of an item or persons when exposed to fire (3.13)

[ISO/IEC 13943, definition 4.80]

3.8**escape**

effective action taken to reach a safe refuge or place of safety

[ISO/IEC 13943, definition 4.82]

3.9**exposure dose**

measure of the maximum amount of a toxic gas or fire effluent (3.14) which is available for inhalation, calculated by integration of the area under a concentration-time curve

NOTE 1 For fire effluent, typical units are grams times minutes per cubic metre ($\text{g}\cdot\text{min}\cdot\text{m}^{-3}$).

NOTE 2 For a toxic gas, typical units are microlitres times minutes per litre ($\mu\text{L}\cdot\text{min}\cdot\text{L}^{-1}$) (at $T = 298\text{ K}$ and $P = 1\text{ atm}$).

[ISO/IEC 13943, definition 4.89]

3.10**extinction area of smoke**

product of the volume occupied by smoke (3.35) and the extinction coefficient of the smoke

NOTE It is a measure of the amount of smoke, and the typical units are square metres (m^2).

[ISO/IEC 13943, definition 4.92]