

STN	Skúšanie požiarneho nebezpečenstva. Časť 1-11: Návod na posudzovanie požiarneho nebezpečenstva elektrotechnických výrobkov. Hodnotenie požiarneho nebezpečenstva.	STN EN 60695-1-11
		34 5630

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

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola označená vo Vestníku ÚNMS SR č. 06/16

Obsahuje: EN 60695-1-11:2015, IEC 60695-1-11:2014

Oznámením tejto normy sa od 12.11.2017 ruší
STN EN 60695-1-11 (34 5630) z júla 2011

122779

Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, 2016
Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy
rozmnožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60695-1-11

October 2015

ICS 29.020; 13.220.40

Supersedes EN 60695-1-11:2010

English Version

**Fire hazard testing - Part 1-11: Guidance for assessing the fire hazard of electrotechnical products - Fire hazard assessment
(IEC 60695-1-11:2014)**

Essais relatifs aux risques du feu - Partie 1-11: Lignes directrices pour l'évaluation du danger du feu des produits électrotechniques - Evaluation du danger du feu
(IEC 60695-1-11:2014)

Prüfungen zur Beurteilung der Brandgefahr - Teil 1-11: Anleitung zur Beurteilung der Brandgefahr von elektrotechnischen Erzeugnissen - Beurteilung der Brandgefahr
(IEC 60695-1-11:2014)

This European Standard was approved by CENELEC on 2014-11-12. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 89/1220/FDIS, future edition 2 of IEC 60695-1-11, prepared by IEC/TC 89 "Fire hazard testing" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60695-1-11:2015.

The following dates are fixed:

- latest date by which the document has to be implemented at (dop) 2016-05-13 national level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with (dow) 2017-11-12 the document have to be withdrawn

This document supersedes EN 60695-1-11:2010.

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

Endorsement notice

The text of the International Standard IEC 60695-1-11:2014 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 60695-6-2	NOTE	Harmonized as EN 60695-6-2.
IEC 60695-7-1:2010	NOTE	Harmonized as EN 60695-7-1:2010 (not modified).
IEC 60695-7-2	NOTE	Harmonized as EN 60695-7-2.
IEC 60695-7-3:2011	NOTE	Harmonized as EN 60695-7-3:2011 (not modified).
IEC 60695-9-2	NOTE	Harmonized as EN 60695-9-2.
IEC 61386-21:2002	NOTE	Harmonized as EN 61386-21:2004 (not modified).

Annex ZA
(normative)

**Normative references to international publications
with their corresponding European publications**

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<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 60695-1-12	-	Fire hazard testing - Part 1-12: Guidance for assessing the fire hazard of electrotechnical products - Fire safety engineering	-	-
IEC 60695-4	2012	Fire hazard testing - Part 4: Terminology concerning fire tests for electrotechnical products	EN 60695-4	2012
IEC Guide 104	2010	The preparation of safety publications and the use of basic safety publications and group safety publications	-	-
ISO 13943	2008	Fire safety - Vocabulary	EN ISO 13943	2010



INTERNATIONAL STANDARD

NORME INTERNATIONALE

BASIC SAFETY PUBLICATION

PUBLICATION FONDAMENTALE DE SÉCURITÉ

Fire hazard testing –

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

Essais relatifs aux risques du feu –

**Partie 1-11: Lignes directrices pour l'évaluation du danger du feu des produits
électrotechniques – Evaluation du danger du feu**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 14 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 55 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.



INTERNATIONAL STANDARD

NORME INTERNATIONALE

BASIC SAFETY PUBLICATION
PUBLICATION FONDAMENTALE DE SÉCURITÉ

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

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

X

ICS 13.220.40, 29.020

ISBN 978-2-8322-1862-4

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

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	15
5 Fire hazard tests	15
6 The fire hazard assessment process	16
6.1 General	16
6.2 Definition of the product range and the circumstances of use	17
6.3 Identification and analysis of fire scenarios	17
6.3.1 General	17
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	20
6.5 Performance requirements	20
6.6 Interpretation of test results	20
6.7 Consequential testing	21
7 Extent and limitations of the fire hazard assessment	21
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	28
A.1 Definition of the fire scenario	28
A.2 Irritant fire effluent	28
A.2.1 F values	28
A.2.2 Equation for irritants	28
A.2.3 Calculation of the X_i values	29
A.3 Asphyxiant fire effluent	29
A.3.1 Exposure dose	29
A.3.2 Equation for asphyxiants	29
A.3.3 Calculation of X_{CO}	30
A.3.4 Calculation of XHCN	31
A.4 Carbon dioxide	32
A.5 Conclusions	32
Annex B (informative) Use of rigid plastic conduit – A fire hazard assessment	33
B.1 General	33
B.2 Terms and definitions	33
B.3 Products covered by this fire hazard assessment	33
B.4 Circumstances of use	33
B.4.1 Conduit and wiring	33

B.4.2	Building construction	34
B.5	Fire scenarios	34
B.6	Relevant fire behaviour	35
B.6.1	General	35
B.6.2	Modelling the exposure fire.....	35
B.6.3	Predicting mass loss of the conduit.....	36
B.7	Results	36
B.7.1	Comparative of fires with and without RPC	36
B.7.2	Assessment of the contribution of RPC to temperature rise.....	36
B.7.3	Assessment of the contribution of RPC to smoke production.....	36
B.7.4	Assessment of the contribution of RPC to the production of toxic effluent	37
B.8	Interpretation of results – Significance and precision	38
B.9	Conclusions	39
	Bibliography.....	45
	 Figure 1 – Flowchart 1 for description of the fire scenario	23
	Figure 2 – Flowchart 1A for evaluation of ignitability/flammability.....	24
	Figure 3 – Flowchart 1B for evaluation of flame propagation and heat release	25
	Figure 4 – Flowchart 1C for evaluation of fire effluent	26
	Figure 5 – Flowchart for description of the range of products and circumstances of use.....	27
	Figure B.1 – Schematic of conduit installation	40
	Figure B.2 – Corridor upper layer temperature (concrete wall)	40
	Figure B.3 – Corridor upper layer temperature (gypsum wall board).....	41
	Figure B.4 – Flux measured at the conduit 2 m away (concrete wall)	41
	Figure B.5 – Flux measured at the conduit 2 m away (gypsum wall).....	42
	Figure B.6 – Comparative mass loss rates of furniture and conduit (concrete wall)	42
	Figure B.7 – Comparative mass loss rates of furniture and conduit (gypsum wall board).....	43
	Figure B.8 – Relative increase of toxicity due to exposed conduit (concrete wall)	43
	Figure B.9 – Relative increase of toxicity due to exposed conduit (gypsum wall board)	44
	 Table A.1 – Irritant <i>F</i> values and calculated <i>X</i> values for the defined fire scenario	29
	Table A.2 – Asphyxiant <i>X</i> values calculated for the defined fire scenario.....	30
	Table A.3 – Incapacitation times for hydrogen cyanide.....	31
	Table A.4 – Multiplication factors for carbon dioxide	32
	Table B.1 – Summary of fire scenario information	35
	Table B.2 – Time of occurrence of highly hazardous conditions in building corridors	38

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 second edition cancels and replaces the first edition of IEC 60695-1-11 published in 2010, and constitutes a technical revision.

The main changes with respect to the previous edition are:

- a) Updated references;
- b) Updated terms and definitions; and
- c) Added Figure 5 – Description of range of products and circumstances of use; and
- d) Updated Bibliography.

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

FDIS	Report on voting
89/1220/FDIS	89/1239/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 [10]¹.

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

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 1-12: Guidance for assessing the fire hazard of electrotechnical products – Fire safety engineering²
- 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 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.

¹ Figures in square brackets refer to the Bibliography.

² To be published.

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 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.

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.

It is intended as guidance to IEC committees, to be used with respect to their individual applications. The actual implementation of this document 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.

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 [10].

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

IEC 60695-1-12, *Fire hazard testing – Part 1-12 Guidance for assessing the fire hazard of electrotechnical products – Fire safety engineering³*

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

³ To be published.

IEC Guide 104:2010, *The preparation of safety publications and the use of basic safety publications and group safety publications*

ISO 13943:2008, *Fire safety – Vocabulary*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN