IEC 60695-2-11

Edition 3.0 2021-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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HORIZONTAL PUBLICATION
PUBLICATION HORIZONTALE

Fire hazard testing –
Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end products (GWEPT)

Essais relatifs aux risques du feu –
Partie 2-11: Essais au fil incandescent/chauffant – Méthode d'essai d'inflammabilité pour produits finis (GWEPT)

IEC 60695-2-11:2021-10(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIRE HAZARD TESTING –

Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end products (GWEPT)

FOREWORD

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IEC 60695-2-11 has been prepared by IEC technical committee 89: Fire hazard testing. It is an International Standard.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

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

a) Numerous terms and definitions relevant to this document have been added to Clause 3.

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The text of this International Standard is based on the following documents:

FDIS	Report on voting
89/1536/FDIS	89/1544/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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

This standard is to be used in conjunction with IEC 60695-2-10.

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

In this standard, the following print types are used:

- terms defined in Clause 3: in **bold** type

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
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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 within the design of component, circuit, and product design, as well as the choice of the materials, is to reduce to acceptable levels the potential risks of fire during normal operating conditions, reasonable foreseeable abnormal use, malfunction, and/or failure. IEC 60695-1-10 [1][1], together with its companion IEC 60695-1-11 [2], has been developed to provide guidance on how this is to be accomplished.

The primary aims of IEC 60695-1-10 and IEC 60695-1-11 are to provide guidance on how to:

a) prevent ignition caused by an electrically energized component part, and

b) confine any resulting fire within the bounds of the enclosure of the electrotechnical product in the event of ignition.

Secondary aims of IEC 60695-1-10 and IEC 60695-1-11 include the minimization of any flame spread beyond the product's enclosure and the minimization of harmful effects of fire effluents such as heat, smoke, toxicity and/or corrosivity.

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

In electrotechnical equipment, overheated metal parts can act as ignition sources. In glow-wire tests, a glowing wire is used to simulate such an ignition source.

IEC 60695-2-10 describes a glow-wire test apparatus and common test procedure, IEC 60695-2-12 [3] describes a glow-wire flammability index (GWFI) test method for materials, and IEC 60695-2-13 [4] describes a glow-wire ignition temperature (GWIT) test method for materials.

This document is used to assess the reaction of end products to heat caused by contact with an electrically heated wire under controlled laboratory conditions. This may be useful for the evaluation of end products that may be exposed to excess thermal stress such as a fault current flowing through a wire, overloading of components, and/or bad connections. It should not be used to solely describe or appraise the fire hazard or fire risk of products, or assemblies under actual fire conditions. However, results of this test can be used as elements of a fire hazard assessment which takes into account all of the factors which are pertinent to a particular end use.

This document may involve hazardous materials, operations, and equipment. It does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

[1] Numbers in square brackets refer to the bibliography.

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FIRE HAZARD TESTING –

Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end products (GWEPT)

1 Scope

This part of IEC 60695 specifies a test method on an end product. It is intended to simulate the effects of thermal stresses produced by an electrically heated source to represent a fire hazard.

This test method is used to check that, under defined test conditions, an end product exposed to an electrically heated source has either a limited ability to ignite or, if it ignites, a limited ability to propagate flame. However, the fire hazard analysis, the flammability aspects and the flame spreading to other products are not covered by this document.

This basic safety publication focusing on safety test method(s) is primarily intended for use by technical committees in the preparation of safety publications 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 60695-2-10, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

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

ISO 13943:2017, *Fire safety – Vocabulary*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 13943:2017 and IEC 60695-4:2012, some of which are reproduced below for the user's convenience, and in IEC 60695-2-10 regarding times and durations, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
burn, intransitive verb
undergo combustion

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[SOURCE: ISO 13943:2017, 3.34]

3.2
combustible, adjective
capable of being ignited and burned

[SOURCE: ISO 13943:2017, 3.52]

3.3
combustion
exothermic reaction of a substance with an oxidizing agent

Note 1 to entry: Combustion generally emits fire effluent accompanied by flames and/or glowing.

[SOURCE: ISO 13943:2017, 3.55]

3.4
enclosure
<electrotechnical> external casing protecting the electrical and mechanical parts of apparatus

Note 1 to entry: The term excludes cables.

[SOURCE: ISO 13943:2017, 3.93]

3.5
end product
product that is ready for use without modification

Note 1 to entry: An end product can be a component of another end product.

[SOURCE: IEC 60695-4:2012, 3.2.7]

3.6
fire hazard
potential for harm associated with fire

Note 1 to entry: Alternatively, fire hazard can be a physical object or condition with a potential for an undesirable consequence from fire.

[SOURCE: ISO 13943:2017, 3.131]

3.7
fire hazard assessment
evaluation of the possible causes of fire, the possibility and nature of subsequent fire growth, and the possible consequences of fire

[SOURCE: IEC 60695-4:2012, 3.2.10]

3.8
fire risk
estimation of expected fire loss that combines the potential for harm in various fire scenarios that can occur with the probabilities of occurrence of those scenarios

Note 1 to entry: An alternative definition of fire risk is, "combination of the probability of a fire and a quantified measure of its consequence".

Note 2 to entry: Fire risk is often calculated as the product of probability and consequence.

[SOURCE: ISO 13943:2017, 3.145]

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3.9
flame
rapid, self-sustaining, sub-sonic propagation of combustion in a gaseous medium, usually with emission of light

[SOURCE: ISO 13943:2017, 3.159]

3.10
flame spread
propagation of a flame front

[SOURCE: ISO 13943:2017, 3.168]

3.11
flammability
ability of a material or product to burn with a flame under specified conditions

[SOURCE: ISO 13943:2017, 3.178]

3.12
glowing, adjective
emitting light without flame from the combustion of a material in the solid phase

3.13
ignition
DEPRECATED: sustained ignition
<general> initiation of combustion

[SOURCE: ISO 13943:2017, 3.217]

3.14
insignificant mass
insufficient combustible material to constitute a fire hazard

Note 1 to entry: A default value is 2 g, but product TCs may assign a different value appropriate to the product type and scale.

[SOURCE: IEC 60695-4:2012, 3.2.16]

3.15
small part
part with a dimension less than the minimum specified for the relevant test method

[SOURCE: IEC 60695-4:2012, 3.2.25]

4 Test specimens

4.1 General

It is not necessary to test **end products** or parts of **end products** which have **insignificant mass**. Additionally, this test method is not suitable for testing **small parts** (see 4.4).

4.2 Complete end product

Whenever possible, the test specimen should be a complete **end product** as opposed to a partial **end product** (see 4.3). The test specimen shall be chosen so that the conditions of the test will not be significantly different from those occurring in normal use with regard to shape

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ventilation, effect of thermal stresses, and eventually, the effects of burning or **glowing** particles falling from the test specimen.

4.3 Partial end product (alternative)

If the test cannot be made on a complete **end product** then, unless otherwise specified by the relevant product standard, it is acceptable to

a) cut a piece containing the part under examination from a complete and assembled **end product**, or

b) cut an aperture in the complete **end product** to allow the glow-wire access, or

c) remove the part under examination in its entirety and test it separately.

Technical committees should define in their relevant product standards what may be removed to achieve access. So far as possible, these product standards should strive to replicate actual service locations and conditions.

4.4 Test considerations and limitations associated with the specimen configuration

When cutting an opening for access purposes, a small aperture may affect the results by leading to the **ignition** of the surroundings and/or reducing the temperature of the tip of the glow-wire. The opening should be large enough to allow an adequate supply of air for **combustion**.

If, during the test, any part of the end product containing the test specimen is ignited by extraneous heat from the glow-wire which in turn influences the thermal conditions at the test specimen, the test is invalid.

The glow-wire **flammability** test method for **end products** shall not be used for testing **small parts**. This is because such parts cannot be effectively supported to avoid heat losses (see IEC 60695-2-10), and they are not able to accommodate the penetration of the glow-wire.

The following are considered to be **small parts**:

a) where each surface lies completely within a circle of 15 mm in diameter; or

b) where it is not possible to fit a circle of 8 mm in diameter completely on at least one of the surfaces while, at least one part dimension is > 15 mm.

See Figure 1.

When checking a surface,

1) projections on the surface are disregarded, and

2) holes or recesses which are not greater than 2 mm in any dimension are disregarded.

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