IEC 60695-2-11

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REDLINE VERSION

INTERNATIONAL STANDARD

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HORIZONTAL PUBLICATION

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

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

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

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

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INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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)

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60695-2-11:2014. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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.

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,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

~~The purpose of this Introduction is to provide background regarding the basic guidance that prompted the preparation of this International Standard and how it relates to the Scope.~~

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 ~~should be~~ 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 ~~poor electrical~~ 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 ~~may~~ 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.

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 ~~standards~~ 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. ~~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 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*

~~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 13943:2017, *Fire safety – Vocabulary*

3 Terms and definitions

For the purpose of this document, the ~~following~~ 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

[SOURCE: ~~ISO/IEC 13943:2008, definition 4.28~~ ISO 13943:2017, 3.34]

3.2
combustible, adjective
capable of being ignited and burned

[SOURCE: ~~ISO/IEC 13943:2008, definition 4.43~~ ISO 13943:2017, 3.52]

3.3
combustion
exothermic reaction of a ~~substation~~ substance with an oxidizing agent

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

[SOURCE: ~~ISO/IEC 13943:2008, definition 4.46~~ 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/IEC 13943:2008, definition 4.78~~ 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 /IEC 13943:2008, definition 4.112~~ 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
~~probability of a fire combined with a quantified measure of its consequence~~

~~Note 1 to entry: It is often calculated as the product of probability and consequence.~~

~~[SOURCE: ISO/IEC 13943:2008, definition 4.124]~~

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]

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

[SOURCE: ~~ISO/IEC 13943:2008, definition 4.133~~ ISO 13943:2017, 3.159]

3.10
flame spread
propagation of a flame front

[SOURCE: ~~ISO/IEC 13943:2008, definition 4.142~~ ISO 13943:2017, 3.168]

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

[SOURCE: ~~ISO/IEC 13943:2008, definition 4.151~~ 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/IEC 13943:2008, definition 4.187~~ 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

~~It is preferred that~~ 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, 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 ~~supply~~ allow an adequate supply of air for **combustion**.

If, during the test, any part of the ~~equipment~~ 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 ~~shall be~~ 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.

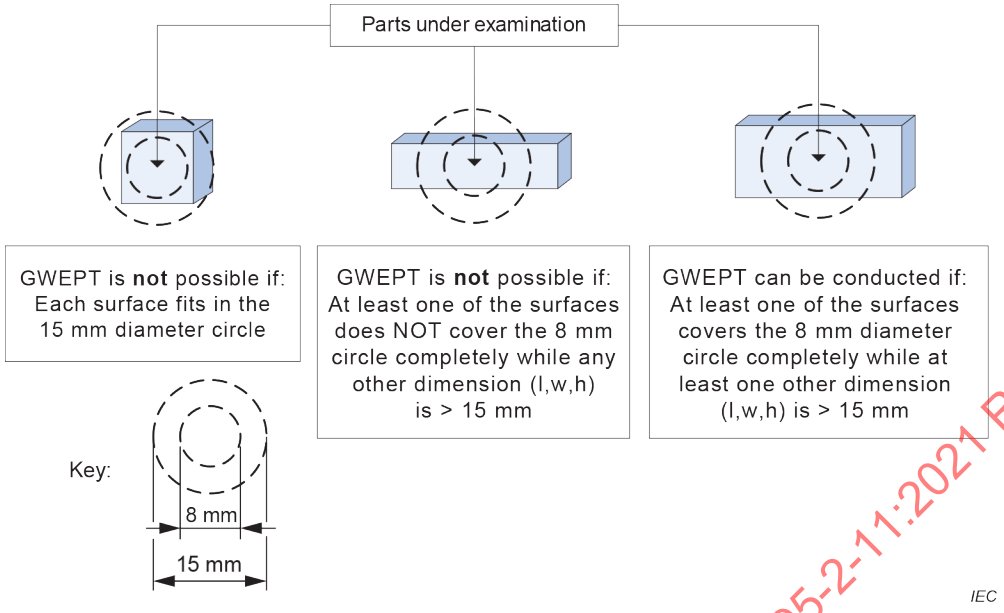


Figure 1 – Small parts

5 Test apparatus

The test apparatus ~~is specified in~~ of IEC 60695-2-10 shall be used except that the reference to a specified layer may not apply.

To evaluate the possibility of the spread of fire, for example by burning or **glowing** particles falling from the test specimen, a specified layer as described in IEC 60695-2-10, or the material or components normally surrounding or situated underneath the test specimen, are placed underneath the test specimen. The distance between the test specimen and the specified layer representing the surrounding material or components shall be equal to that which occurs in end use. If the test specimen is a component such that surrounding materials and distances are unknown, then the ~~wrapping tissue / wooden board~~ specified layer described in IEC 60695-2-10 shall be placed 200 mm ± 5 mm below the glow-wire point of contact.

If the test specimen is a complete free-standing equipment, it is placed in its normal position of use on the specified layer as described in IEC 60695-2-10 extending for at least 100 mm outside the base of the equipment in all directions.

If the test specimen is a complete wall-mounted equipment, it is fixed in its normal position of use 200 mm ± 5 mm above the specified layer as described in IEC 60695-2-10.

6 Verification of the temperature measuring system

~~The method of verification of~~ The temperature measuring system ~~is~~ shall be verified as specified in IEC 60695-2-10.

7 Conditioning

7.1 Conditioning of test specimens

Unless otherwise specified in the relevant product standard, the test specimens shall be conditioned for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 45 % and 75 %.

7.2 Conditioning of specified layers

If the wrapping tissue ~~/~~ or wooden board is used as specified layer ~~is used~~, the conditioning shall be carried out according to IEC 60695-2-10. If the material or components normally surrounding or situated underneath the test specimen is used, the material or components shall be conditioned in the same way as the test specimen (see 7.1).

7.3 Testing conditions

The test specimens shall be tested in a laboratory atmosphere having a temperature between 15 °C and 35 °C and a relative humidity less than or equal to 75 %. Testing shall be completed within 30 minutes after the specimens and the specified layers (if any) ~~is~~ are removed from the conditions specified in 7.1 and 7.2, respectively.

8 Test procedure

8.1 General

In addition to the common test procedure specified in IEC 60695-2-10, if not otherwise specified, the test specimen shall be so arranged that the tip of the glow-wire is applied to the part of the surface of the test specimen which is likely to be subjected to thermal stresses in normal use. The glow-wire shall be maintained as close to the horizontal as is practicable.

~~In cases where the test shall be made at more than one point on the same test specimen, care shall be taken that any deterioration caused by previous tests will not affect the result of the test to be made.~~

In cases where the test shall be made at more than one point on the same test specimen, ensure that any deterioration caused by previous tests does not affect the result. In this case, the test shall be made at a minimum distance from the edges of the previous burnt area of 30 mm (two times the size of **small parts**).

In cases where the areas subjected to thermal stresses during normal use of the equipment are not specified in detail, the tip of the glow-wire is applied at a place where the section is thinnest, but if possible not less than 15 mm from the upper edge of the test specimen.

Clamping the test specimen onto the test apparatus shall not introduce excessive internal mechanical stresses in the test specimen during the test.

8.2 Test temperatures

The glow-wire is heated to the test temperature specified in the relevant product standard. This temperature should preferably be one of the temperatures shown in Table 1.

Table 1 – Test temperatures

Test temperatures °C	Tolerances °C
550	±10
600	±10
650	±10
700	±10
750	±10
800	±15
850	±15
900	±15
960	±15

When selecting test temperatures, product committees should consider Annex A and its Figure A.1, which gives suggested glow-wire **end product** test (GWEPT) temperatures.

8.3 Number of test specimens

If not otherwise specified by the relevant product standard, the test is made on one test specimen.

NOTE More test specimens can be required.

9 Observations and measurements

During the time of application of the glow-wire, ~~t_A~~ t_{APP} (30 s ± 1 s), and during a further period of 30 s, time of observation t_{OBS}, the test specimen, the parts surrounding the test specimen ~~and~~ or the specified layer placed below it shall be observed and the following shall be ~~reported~~ recorded:

~~a) whether there is no ignition; or, if there is ignition, the duration, t_i (to the nearest 0,5 s), from the beginning of tip application up to the time at which the test specimen or the specified layer placed below it ignites;~~

~~b) the duration, t_E, (to the nearest 0,5 s) from the beginning of tip application up to the time when all flames extinguish, during or after the period of application;~~

~~c) whether the test specimen extinguishes by virtue of most of the flaming material being withdrawn with the glow-wire;~~

~~d) whether the test specimen is totally burned; and~~

~~e) whether there is any ignition of the specified layer placed underneath the test specimen.~~

a) whether there is no **ignition**; or, if there is **ignition**, the time of **ignition**, t_I for the test specimen;

b) the time of extinguishment t_E; and

c) whether there is any **ignition** of the specified layer placed underneath the test specimen.

10 Evaluation of test results

The test specimen is considered to have ~~a GWEPT of T if at a test temperature of T °C~~ passed the GWEPT test if the following criteria have been met:

a) there is no **ignition**, or

b) all of the following situations apply when **ignition** has occurred:

i) ~~if~~ **flames** or **glowing combustion** of the test specimen extinguish within 30 s after removal of the glow-wire, i.e. ~~$t_E \leq t_A + 30$ s~~ $t_R \leq 30$ s; and

ii) the specified layer placed underneath the test specimen does not ignite.

11 Test report

The test report shall include the following information:

a) a reference to IEC 60695-2-11;
b) a description of the test specimen including type and manufacturer (see Clause 4);
c) a description of the method for preparation of the test specimen (see Clause 4);
d) the conditioning of the test specimens and the specified layers (see Clause 7);
e) the number of test specimens tested (see 8.3);
f) the surface tested and the points of application of the glow-wire (see 8.1);
g) the specified layer used to evaluate the effect of flaming particles and its vertical distance to the glow wire point of application (see Clause 5);
h) the test temperature (see 8.2);
i) all applicable observations and measurements from Clause 9; and
j) the GWEPT as determined in Clause 10 shall be reported in the following manner, for example, for a test specimen tested at 850 °C:

GWEPT: 850

12 Information to be given in the relevant product standard

When referencing this method, technical committees shall indicate the following details:

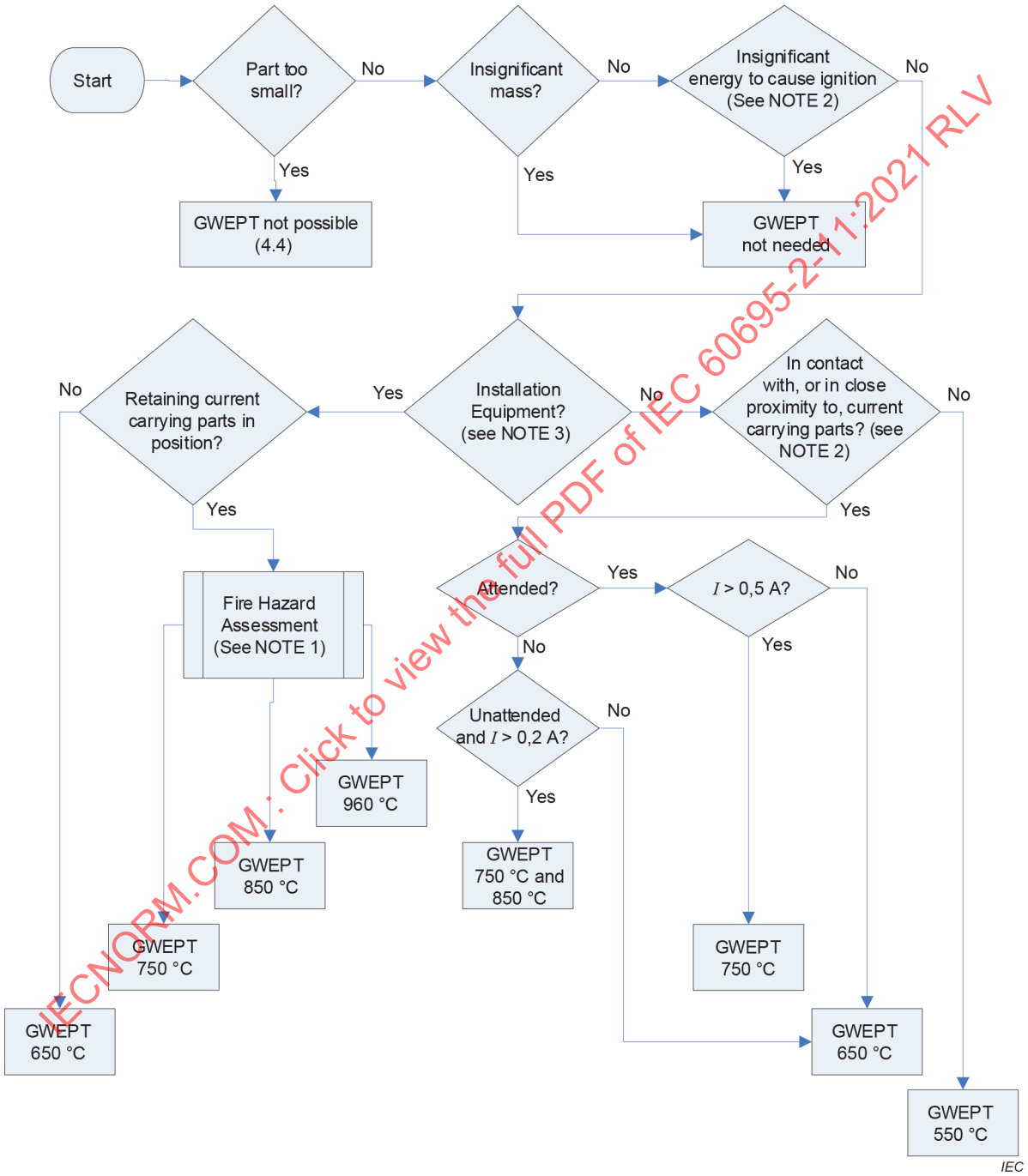
a) the type and description of the test specimen (see Clause 4);
b) the method of preparation (see Clause 4);
c) any conditioning of the test specimens and the specified layers (see Clause 7);
d) the number of test specimens (see 8.3);
e) the surface to be tested and the points of application of the glow-wire (see 8.1);
f) the specified layer to be used to evaluate the effect of flaming particles (see Clause 5);
g) the GWEPT (see Clause 10) and test temperature (see 8.2), for example, "GWEPT of 850 °C in accordance with IEC 60695-2-11";
h) the relevant part(s) or zone(s) of the end product subjected to the test on the same test specimen (see 8.1);
i) whether the criteria specified are sufficient to check compliance with the safety requirements, or whether other criteria should be used (see Clause 9); and
j) whether consequential testing needs to be considered to cover residual risks and, if so, which test method and what requirements should be specified.

NOTE See IEC 60695-1-11 [2] for additional guidance on consequential testing.

Annex A
(informative)

Suggested GWEPT temperatures

Figure A.1 demonstrates suggested GWEPT temperatures.



Key

I	rated current
A	ampere
GWEPT	~~Glow Wire End Product Test~~ glow-wire flammability test method for end products

NOTE 1 A separate fire hazard assessment (FHA) as determined by the relevant product standard will dictate the appropriate GWEPT temperature.

NOTE 2 The phrases "insufficient energy" and "close proximity" ~~should be~~ are defined by the relevant product committee. It is dependent upon a number of factors (for example, the severity of the hazard).

NOTE 3 Examples of installation equipment include socket outlets, circuit protection devices, and LV switchgear.

NOTE 4 The right side of the flow chart (Installation equipment = no) is intended to partially represent the limited application of the GWEPT as currently used by IEC 60335-1 [5]. Refer to IEC 60335-1 for other considerations.

Figure A.1 – Suggested GWEPT temperatures

Bibliography

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

[2] IEC 60695-1-11, *Fire hazard testing – Part 1-11: Guidance for assessing the fire hazard of electrotechnical products – Fire hazard assessment*

[3] IEC 60695-2-12, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability index (GWFI) test method for materials*

[4] IEC 60695-2-13, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignition temperature (GWIT) test method for materials*

[5] IEC 60335-1, *Household and similar electrical appliances – Safety – Part 1: General requirements*

~~IEC 60695-4:2012, *Fire hazard testing – Part 4: Terminology*~~

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

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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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)

FOREWORD

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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.
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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.

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.

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,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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.

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

[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]

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,

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.

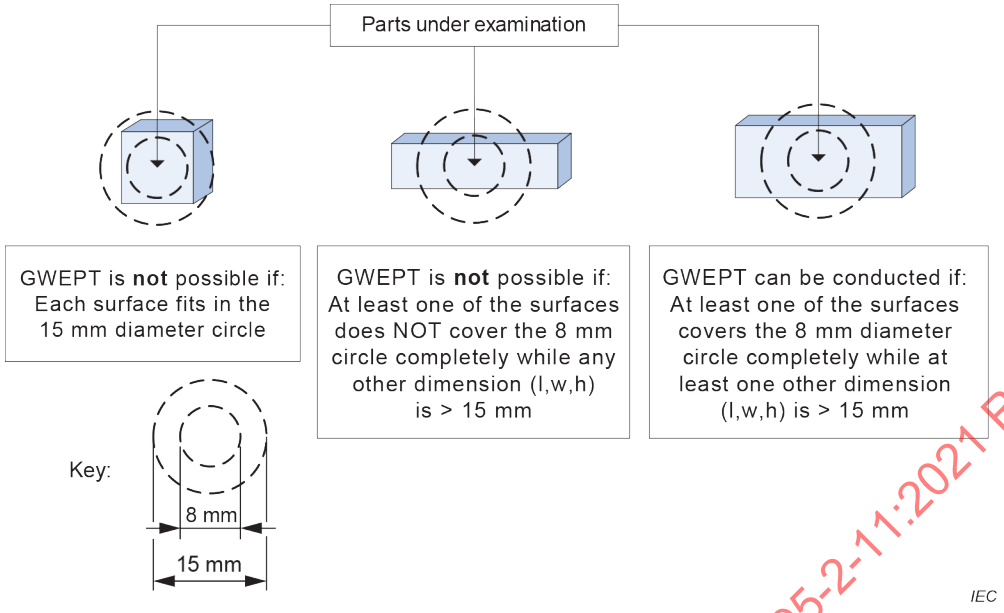


Figure 1 – Small parts

5 Test apparatus

The test apparatus of IEC 60695-2-10 shall be used except that the reference to a specified layer may not apply.

To evaluate the possibility of the spread of fire, for example by burning or **glowing** particles falling from the test specimen, a specified layer as described in IEC 60695-2-10, or the material or components normally surrounding or situated underneath the test specimen, are placed underneath the test specimen. The distance between the test specimen and the specified layer representing the surrounding material or components shall be equal to that which occurs in end use. If the test specimen is a component such that surrounding materials and distances are unknown, then the specified layer described in IEC 60695-2-10 shall be placed 200 mm ± 5 mm below the glow-wire point of contact.

If the test specimen is a complete free-standing equipment, it is placed in its normal position of use on the specified layer as described in IEC 60695-2-10 extending for at least 100 mm outside the base of the equipment in all directions.

If the test specimen is a complete wall-mounted equipment, it is fixed in its normal position of use 200 mm ± 5 mm above the specified layer as described in IEC 60695-2-10.

6 Verification of the temperature measuring system

The temperature measuring system shall be verified as specified in IEC 60695-2-10.

7 Conditioning

7.1 Conditioning of test specimens

Unless otherwise specified in the relevant product standard, the test specimens shall be conditioned for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 45 % and 75 %.

7.2 Conditioning of specified layers

If the wrapping tissue or wooden board is used as specified layer, the conditioning shall be carried out according to IEC 60695-2-10. If the material or components normally surrounding or situated underneath the test specimen is used, the material or components shall be conditioned in the same way as the test specimen (see 7.1).

7.3 Testing conditions

The test specimens shall be tested in a laboratory atmosphere having a temperature between 15 °C and 35 °C and a relative humidity less than or equal to 75 %. Testing shall be completed within 30 minutes after the specimens and the specified layers (if any) are removed from the conditions specified in 7.1 and 7.2, respectively.

8 Test procedure

8.1 General

In addition to the common test procedure specified in IEC 60695-2-10, if not otherwise specified, the test specimen shall be so arranged that the tip of the glow-wire is applied to the part of the surface of the test specimen which is likely to be subjected to thermal stresses in normal use. The glow-wire shall be maintained as close to the horizontal as is practicable.

In cases where the test shall be made at more than one point on the same test specimen, ensure that any deterioration caused by previous tests does not affect the result. In this case, the test shall be made at a minimum distance from the edges of the previous burnt area of 30 mm (two times the size of **small parts**).

In cases where the areas subjected to thermal stresses during normal use of the equipment are not specified in detail, the tip of the glow-wire is applied at a place where the section is thinnest, but if possible not less than 15 mm from the upper edge of the test specimen.

Clamping the test specimen onto the test apparatus shall not introduce excessive internal mechanical stresses in the test specimen during the test.

8.2 Test temperatures

The glow-wire is heated to the test temperature specified in the relevant product standard. This temperature should preferably be one of the temperatures shown in Table 1.

Table 1 – Test temperatures

Test temperatures °C	Tolerances °C
550	±10
600	±10
650	±10
700	±10
750	±10
800	±15
850	±15
900	±15
960	±15

When selecting test temperatures, product committees should consider Annex A and its Figure A.1, which gives suggested glow-wire **end product** test (GWEPT) temperatures.

8.3 Number of test specimens

If not otherwise specified by the relevant product standard, the test is made on one test specimen.

NOTE More test specimens can be required.

9 Observations and measurements

During the time of application of the glow-wire, t_{APP} (30 s ± 1 s), and during a further period of 30 s, time of observation t_{OBS}, the test specimen, the parts surrounding the test specimen or the specified layer placed below it shall be observed and the following shall be recorded:

a) whether there is no **ignition**; or, if there is **ignition**, the time of **ignition**, t_I for the test specimen;

b) the time of extinguishment t_E; and

c) whether there is any **ignition** of the specified layer placed underneath the test specimen.

10 Evaluation of test results

The test specimen is considered to have passed the GWEPT test if the following criteria have been met:

a) there is no **ignition**, or

b) all of the following situations apply when **ignition** has occurred:

   i) **flames** or **glowing combustion** of the test specimen extinguish within 30 s after removal of the glow-wire, i.e. $t_R \leq 30$ s; and

   ii) the specified layer placed underneath the test specimen does not ignite.

11 Test report

The test report shall include the following information:

a) a reference to IEC 60695-2-11;

b) a description of the test specimen including type and manufacturer (see Clause 4);

c) a description of the method for preparation of the test specimen (see Clause 4);

d) the conditioning of the test specimens and the specified layers (see Clause 7);

e) the number of test specimens tested (see 8.3);

f) the surface tested and the points of application of the glow-wire (see 8.1);

g) the specified layer used to evaluate the effect of flaming particles and its vertical distance to the glow wire point of application (see Clause 5);

h) the test temperature (see 8.2);

i) all applicable observations and measurements from Clause 9; and

j) the GWEPT as determined in Clause 10 shall be reported in the following manner, for example, for a test specimen tested at 850 °C:

GWEPT: 850

12 Information to be given in the relevant product standard

When referencing this method, technical committees shall indicate the following details:

a) the type and description of the test specimen (see Clause 4);

b) the method of preparation (see Clause 4);

c) any conditioning of the test specimens and the specified layers (see Clause 7);

d) the number of test specimens (see 8.3);

e) the surface to be tested and the points of application of the glow-wire (see 8.1);

f) the specified layer to be used to evaluate the effect of flaming particles (see Clause 5);

g) the GWEPT (see Clause 10) and test temperature (see 8.2), for example, "GWEPT of 850 °C in accordance with IEC 60695-2-11";

h) the relevant part(s) or zone(s) of the end product subjected to the test on the same test specimen (see 8.1);

i) whether the criteria specified are sufficient to check compliance with the safety requirements, or whether other criteria should be used (see Clause 9); and

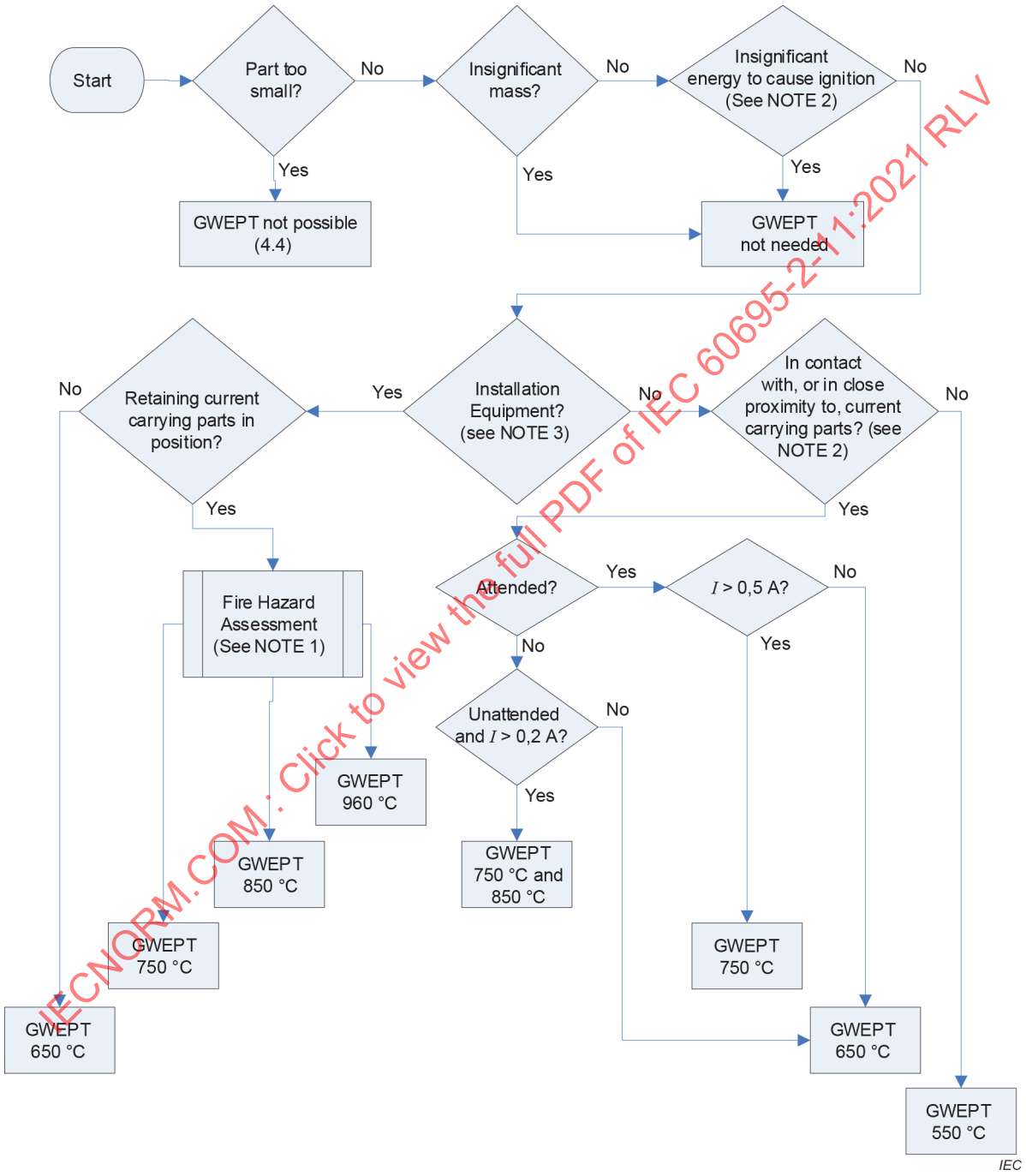
j) whether consequential testing needs to be considered to cover residual risks and, if so, which test method and what requirements should be specified.

NOTE See IEC 60695-1-11 [2] for additional guidance on consequential testing.

Annex A
(informative)

Suggested GWEPT temperatures

Figure A.1 demonstrates suggested GWEPT temperatures.



Key

I	rated current
A	ampere
GWEPT	glow-wire flammability test method for end products

NOTE 1 A separate fire hazard assessment (FHA) as determined by the relevant product standard will dictate the appropriate GWEPT temperature.

NOTE 2 The phrases "insufficient energy" and "close proximity" are defined by the relevant product committee. It is dependent upon a number of factors (for example, the severity of the hazard).

NOTE 3 Examples of installation equipment include socket outlets, circuit protection devices, and LV switchgear.

NOTE 4 The right side of the flow chart (Installation equipment = no) is intended to partially represent the limited application of the GWEPT as currently used by IEC 60335-1 [5]. Refer to IEC 60335-1 for other considerations.

Figure A.1 – Suggested GWEPT temperatures

Bibliography

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

[2] IEC 60695-1-11, *Fire hazard testing – Part 1-11: Guidance for assessing the fire hazard of electrotechnical products – Fire hazard assessment*

[3] IEC 60695-2-12, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability index (GWFI) test method for materials*

[4] IEC 60695-2-13, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignition temperature (GWIT) test method for materials*

[5] IEC 60335-1, *Household and similar electrical appliances – Safety – Part 1: General requirements*

SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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ESSAIS RELATIFS AUX RISQUES DU FEU –

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

AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
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L'IEC 60695-2-11 a été établie par le comité d'études 89 de l'IEC: Essais relatifs aux risques du feu. Il s'agit d'une Norme internationale.

Cette troisième édition annule et remplace la deuxième édition parue en 2014. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) ajout à l'Article 3 de nombreux termes et définitions applicables au présent document.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
89/1536/FDIS	89/1544/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Le présent document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

Il a le statut d'une publication fondamentale de sécurité conformément au Guide IEC 104.

Cette norme doit être utilisée conjointement avec l'IEC 60695-2-10.

Une liste de toutes les parties de la série IEC 60695, publiées sous le titre général *Essais relatifs aux risques du feu,* peut être consultée sur le site web de l'IEC.

Dans la présente norme, les caractères d'imprimerie suivants sont utilisés:

- les termes définis à l'Article 3: caractères **gras**

Le comité a décidé que le contenu du présent document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

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- amendé.

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INTRODUCTION

Lors de la conception d'un quelconque produit électrotechnique, il est nécessaire de prendre en considération le danger d'incendie et les dangers potentiels associés au feu. À cet égard, la conception des composants, circuits et produits ainsi que le choix des matériaux ont pour objectif de réduire à des niveaux acceptables les risques potentiels d'incendie dans les conditions de fonctionnement normal, d'utilisation anormale raisonnablement prévisible, de dysfonctionnement et/ou de défaillance. L'IEC 60695-1-10 [1][1] a été élaborée, avec sa norme associée, IEC 60695-1-11 [2], afin de fournir des recommandations sur les méthodes de réalisation correspondantes.

L'IEC 60695-1-10 et l'IEC 60695-1-11 ont pour principaux objectifs de fournir des recommandations relatives aux éléments suivants:

a) éviter l'allumage provoqué par un composant sous tension électrique; et

b) confiner le feu résultant dans les limites de l'enceinte du produit électrotechnique en cas d'allumage.

Les objectifs secondaires de l'IEC 60695-1-10 et de l'IEC 60695-1-11 comprennent la réduction à un niveau minimal de toute propagation de la flamme au-delà de l'enceinte du produit et la réduction à un niveau minimal des effets nuisibles des effluents du feu tels que la chaleur, la fumée, la toxicité et/ou la corrosivité.

Les feux impliquant des produits électrotechniques peuvent également être déclenchés par des sources externes non électriques. Ces éléments sont pris en considération lors de l'évaluation globale du danger d'incendie.

Dans l'appareillage électrotechnique, les parties métalliques surchauffées peuvent agir comme sources d'allumage. Pour les essais au fil incandescent, un fil incandescent est utilisé pour simuler ce type de source d'allumage.

L'IEC 60695-2-10 décrit un appareillage d'essai au fil incandescent et la méthode commune d'essai, l'IEC 60695-2-12 [3] décrit une méthode d'essai d'indice d'inflammabilité au fil incandescent (GWFI, *glow-wire flammability index*) et l'IEC 60695-2-13 [4] décrit une méthode d'essai de température d'allumage au fil incandescent (GWIT, *glow-wire ignition temperature*) pour matériaux.

Le présent document permet d'évaluer la réaction des produits finis à la chaleur engendrée par le contact avec un fil chauffé électriquement dans des conditions contrôlées en laboratoire. Il peut être utile pour l'évaluation de produits finis susceptibles d'être exposés à des contraintes thermiques excessives telles qu'un courant de défaut passant dans un fil, une surcharge de composants et/ou de mauvaises connexions. Il convient de ne pas l'utiliser pour uniquement décrire ou évaluer le danger d'incendie ou le danger d'incendie de produits ou d'assemblages dans des conditions réelles de feu. Cependant, les résultats de cet essai peuvent servir d'éléments pour une évaluation du danger d'incendie qui prend en compte tous les facteurs appropriés à une utilisation finale particulière.

Le présent document peut concerner des matériaux, opérations et matériels dangereux. Il n'a pas pour objet de traiter tous les problèmes de sécurité associés à son utilisation. Il incombe à l'utilisateur du présent document d'établir les bonnes pratiques appropriées en termes de sécurité et de santé et de déterminer l'applicabilité des limites réglementaires avant usage.

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1 Les chiffres entre crochets se réfèrent à la Bibliographie.

ESSAIS RELATIFS AUX RISQUES DU FEU –

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

1 Domaine d'application

La présente partie de l'IEC 60695 spécifie une méthode d'essai applicable au produit fini. Elle est destinée à simuler les effets des contraintes thermiques produites par une source chauffée électriquement afin de représenter un danger d'incendie.

La présente méthode d'essai permet de vérifier que, dans des conditions d'essai définies, un produit fini exposé à une source chauffée électriquement présente une aptitude limitée à s'enflammer ou, s'il s'enflamme, une aptitude limitée à propager la flamme. Cependant, le présent document ne traite pas de l'analyse du danger d'incendie, des aspects d'inflammabilité et de propagation de flammes à d'autres produits.

La présente publication fondamentale de sécurité, fondée sur la ou les méthodes d'essai de sécurité, est essentiellement destinée à être utilisée par les comités d'études dans le cadre de l'élaboration de publications de sécurité conformément aux principes établis dans le Guide IEC 104 et le Guide ISO/IEC 51.

L'une des responsabilités d'un comité d'études consiste, le cas échéant, à utiliser les publications fondamentales de sécurité dans le cadre de l'élaboration de ses publications.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60695-2-10, *Essais relatifs aux risques du feu – Partie 2-10: Essais au fil incandescent/chauffant – Appareillage et méthode commune d'essai*

IEC 60695-4:2012, *Essais relatifs aux risques du feu – Partie 4: Terminologie relative aux essais au feu pour les produits électrotechniques*

ISO 13943:2017, *Sécurité au feu – Vocabulaire*

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions de l'ISO 13943:2017 et de l'IEC 60695-4:2012, certains étant repris ci-dessous pour des raisons de commodité de l'utilisateur, puis ceux de l'IEC 60695-2-10 relatifs aux moments et aux durées, s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

3.1
brûler, verbe intransitif
être en état de combustion

[SOURCE: ISO 13943:2017, 3.34]

3.2
combustible, adjectif
susceptible d'être allumé et de brûler

[SOURCE: ISO 13943:2017, 3.52]

3.3
combustion
réaction exothermique d'une substance avec un comburant

Note 1 à l'article: Cette combustion émet généralement des effluents du feu accompagnés de flammes et/ou d'incandescence.

[SOURCE: ISO 13943:2017, 3.55]

3.4
enceinte
<électrotechnique> enveloppe qui protège les parties mécaniques et électriques d'un appareillage

Note 1 à l'article: Ce terme exclut les câbles.

[SOURCE: ISO 13943:2017, 3.93]

3.5
produit final
produit prêt à être utilisé

Note 1 à l'article: Un produit final peut être un composant d'un autre produit final.

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

3.6
danger d'incendie
dommage potentiel associé à un feu

Note 1 à l'article: Un danger d'incendie peut également être un objet physique ou une condition susceptible d'entraîner des conséquences non souhaitables causées par un incendie.

[SOURCE: ISO 13943:2017, 3.131]

3.7
évaluation du danger d'incendie
évaluation des causes possibles d'incendie, de la possibilité et de la nature de la croissance ultérieure du feu, et des conséquences éventuelles de l'incendie

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