
Fire hazard testing -- Part 2: Test methods -- Section 1/sheet 1: Glow-wire end-product test and guidance - General (IEC 60695-2-1/1:1994+corrigenum May 1995)

Fire hazard testing -- Part 2: Test methods -- Section 1/sheet 1: Glow-wire end-product test and guidance

Prüfungen zur Beurteilung der Brandgefahr -- Teil 2: Prüfverfahren -- Hauptabschnitt 1/Blatt 1: Prüfung mit dem Glühdraht am Enderzeugnis und Anleitung

Essais relatifs aux risques du feu -- Partie 2: Méthodes d'essai -- Section 1/feuille 1: Essai au fil incandescent sur produits finis et guide

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Fire hazard testing
Part 2: Test methods
Section 1/sheet 1: Glow-wire end-product test and guidance
(IEC 695-2-1/1:1994 + corrigendum 1995)

Essais relatifs aux risques du feu
Partie 2: Méthodes d'essai
Section 1/feuille 1: Essai au fil
incandescent sur produits finis et guide
(CEI 695-2-1/1:1994 + corrigendum 1995)

Prüfungen zur Beurteilung der
Brandgefahr
Teil 2: Prüfverfahren
Hauptabschnitt 1/Blatt 1: Prüfung fertiger
Erzeugnisse mit dem Glühdraht und Anleitung
(IEC 695-2-1/1:1994 + Corrigendum 1995)

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This European Standard was approved by CENELEC on 1996-12-09. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

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

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CENELEC

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

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Foreword

The text of the International Standard IEC 695-2-1/1:1994 and its corrigendum May 1995, prepared by IEC TC 89, Fire hazard testing, was submitted to the formal vote and was approved by CENELEC as EN 60695-2-1/1 on 1996-12-09 without any modification.

This sheet 1 is to be used in conjunction with sheet 0 of EN 60695-2-1.

Section 1 of EN 60695-2 supersedes HD 444.2.1 S1:1983 (IEC 695-2-1:1980), clause 7 of HD 441 S1:1983 (IEC 707:1981) and clause 6 of HD 541 S1:1991 (IEC 829:1988, modified).

The following dates were fixed:

—latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement

(dop) 1997-12-01

—latest date by which the national standards conflicting with the EN have to be withdrawn

(dow) 1997-12-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex ZA is normative and Annex A is informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 695-2-1/1:1994 and its corrigendum May 1995 was approved by CENELEC as a European Standard without any modification.

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1 Scope

This sheet of IEC 695-2-1 specifies the details of the glow-wire test when applied to end products for fire hazard testing.

For the purpose of this standard end product means electrotechnical equipment, its sub-assemblies, and components.

2 Normative references

For details see IEC 695-2-1/0.

3 Description of the test

If possible, the specimen should be a complete equipment, sub-assembly or component. The 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, possibly, of flames occurring in, or of burning or glowing particles falling in the vicinity of, the specimen.

If the test cannot be made on the complete equipment, sub-assembly or component, it is acceptable to:

- cut a piece containing the part under examination from it, or
- cut an aperture in the complete specimen, sub-assembly or component to allow access of the glow-wire, or
- remove the part under examination in its entirety and test it separately.

Technical committees should define in their relevant specifications what may be removed to achieve access. A small aperture may affect the results by leading to the ignition of the surroundings, by reducing the temperature of the glow-wire or by restricting the availability of oxygen whereas too large an aperture may permit more oxygen than would normally be available.

If, during the test, any part of the equipment containing the specimen is ignited by extraneous heat from the glow-wire and so influences the thermal conditions at the specimen, the test shall be invalid.

The test is carried out to ensure:

- that a specified loop of resistance wire, which is electrically heated to the temperature specified for the relevant equipment, does not, under defined conditions, cause ignition of parts, or
- that a part, ignited by the electrically heated test wire under defined conditions, has a limited duration of burning, without spreading fire by flames or burning or glowing particles falling from the specimen.

If the specimen emits flames during the application of the glow-wire, the fire hazard created may necessitate further tests using other ignition sources such as:

- a heating element simulating a bad connection as an alternative to the glow-wire, or
- the needle-flame applied to those parts which are reached by the emitted flames.

The glow-wire test may not be appropriate for small components with a linear surface dimension less than 20 mm for which reference may need to be made to other test methods (for example, the needle-flame test).

4 Description of the test apparatus

The description of the test apparatus is given in IEC 695-2-1/0.

If the specimen is a sub-assembly or a component of the equipment and is tested separately, a layer as described in IEC 695-2-1/0 shall be used.

To evaluate the possibility of spread of fire, for example, by burning or glowing particles falling from the specimen, a layer of the material or components normally surrounding or situated underneath the specimen is placed underneath the specimen. The distances between the specimen and the layer representing the surrounding material or components shall be equal to those when the specimen is mounted in the electrotechnical product.

If the specimen is a complete free-standing equipment, it is placed in its normal position of use on the layer as described in IEC 695-2-1/0 extending for at least 100 mm outside the base of the equipment in all directions.

If the specimen is a complete wall-mounted equipment, it is fixed in its normal position of use (200 ± 5) mm above the layer as described in IEC 695-2-1/0.

5 Severities

The temperature of the tip of the glow-wire and the duration of its application to the specimen are as follows:

Preferred test temperatures °C	Tolerances K
550	± 10
650	± 10
750	± 10
850	± 15
960	± 15
Preferred duration of application: $t_a = (30 \pm 1) \text{ s}$	

If required by the relevant specification, other severities may be used.

6 Calibration and verification of the temperature measuring system

The calibration and verification of the temperature measuring system is specified in IEC 695-2-1/0.

7 Conditioning

If not otherwise specified in the relevant specification, the specimen and the layer to be used is conditioned for 24 h in an atmosphere having a temperature between 15 °C and 35 °C and a relative humidity between 45 % and 75 %.

8 Initial measurements

The specimen shall be examined visually and, when specified in the relevant specification, the physical/electrical parameters measured.

9 Test procedure

See IEC 695-2-1/0 for the *Warning note*.

The test procedure shall follow subclauses 9.1 to 9.4 in IEC 695-2-1/0 with the following exceptions:

9.1 In addition to subclause 9.1 in IEC 695-2-1/0:

The specimen shall be so arranged that:

- the tip of the glow-wire is applied to the part of the surface of the specimen which is likely to be subjected to thermal stresses in normal use.

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 preferably not less than 15 mm from the upper edge of the specimen.

9.4 In addition to subclause 9.4 in IEC 695-2-1/0:

The tip of the glow-wire is brought into contact with the specimen for (30 ± 1) s.

9.5 If not otherwise specified by the relevant specification, the test is made on one specimen. In case of doubt with regard to the results of the test, the test is repeated on two further specimens.

10 Observations and measurements

During application of the glow-wire, and during a further period of 30 s, the specimen, the parts surrounding the specimen and the layer placed below it shall be observed and the following shall be reported:

- a) the duration (t_i) from the beginning of tip application up to the time at which the specimen or the layer placed below it ignites;

- b) the duration (t_e) from the beginning of tip application up to the time when flames extinguish during or after the period of application;

- c) the maximum height of any flame rounded up to the next 5 mm but disregarding the start of the ignition, which may produce a high flame for a period of approximately 1 s;

NOTE The height of the flame is the vertical distance measured between the upper edge of the glow-wire, when applied to the specimen, and the visible tip of the flame, when viewed in subdued light.

- d) the degree of tip penetration or test item distortion;

- e) any scorching of the pinewood board, if used.

The mechanical/electrical parameters shall be measured when specified in the relevant specification.

11 Evaluation of test results

Unless otherwise specified in the relevant specification, the specimen is considered to have satisfactorily withstood the glow-wire test if one of the following two situations applies:

- a) if there is no flame or glowing;
- b) if flames or glowing of the specimen, of the surroundings and of the layer below extinguish within 30 s after removal of the glow-wire, i.e. $t_e \leq t_a + 30$ s, and the surrounding parts and the layer below have not burned away completely.

When a layer of wrapping tissue is used, there shall be no ignition of the wrapping tissue.

12 Information to be given in the relevant specification

- a) any conditioning required (clause 7);
- b) the number of specimens (subclause 9.5);
- c) the surface to be tested and the point of application of the glow-wire (subclause 9.1);
- d) the underlying layer to be used to evaluate the effect of flaming drops (clause 4);
- e) the level of severities (clause 5):
 - the test temperature,
 - the duration of application (t_a);
- f) whether the tests must be made at more than one point on the same specimen, in which case care must be taken to ensure that any deterioration caused by previous tests will not affect the result of the test to be made (subclause 9.1);

- g) whether the criteria specified are sufficient to check compliance with the safety requirements, or whether other criteria — for example on t_i , t_e , the height of flame — should be introduced (clause 10);
- h) whether any deterioration of mechanical/electrical properties is allowed (clause 10).

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Annex A (informative)

Guidance for glow-wire test

The appropriate test temperature should be chosen by estimating the risk of failure due to inadequate response to abnormal heat, to ignition and to spread of fire, and the consequences to be expected as a result of such a failure.

To assist the technical committees in describing adequately the application of the glow-wire test associated with the temperature shown in the table of clause 5, the following suggestions are made:

Temperature	Parts of insulation material	
	in contact with, or retaining in position, current-carrying parts	for enclosures and covers not retaining current-carrying parts in position
550 °C	To ensure a minimum level of resistance to ignition of, and/or spread of fire by parts liable to contribute to a fire hazard, and which are not subjected to other tests in this respect (in order to eliminate highly combustible material)	
650 °C	Equipment for attended use	
		Fixed accessories in installations
750 °C	Equipment for attended use but under more stringent conditions	
	Fixed accessories in installations	Equipment intended to be used near the central supply point of a building
	Equipment for attended use but under less stringent conditions	
850 °C	Equipment for unattended use continuously loaded	
960 °C	Equipment for unattended use, continuously loaded but under more stringent conditions	
	Equipment intended to be used near the central supply point of a building	

NOTE This test may not be appropriate for small components with linear surface dimensions of less than 20 mm, for which reference may need to be made to other test methods (for example, needle-flame). The test may also be inappropriate for small items of insulating material which, if they do not contribute appreciably to a fire hazard, normally need not be tested at all.