BRITISH STANDARD

BS EN
60332-1-2:2004
+A1:2015

Tests on electric and optical fibre cables under fire conditions —

Part 1-2: Test for vertical flame propagation for a single insulated wire or cable — Procedure for 1 kW pre-mixed flame

ICS 13.220.40; 29.060.20; 33.180.10

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 60332-1-2:2004+A1:2015. It is identical to IEC 60332-1-2:2004, incorporating amendment 1:2015. It supersedes BS EN 60332-1-2:2004, which will be withdrawn on 1 September 2018.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by [A1] ⟨A1⟩.

The UK participation in its preparation was entrusted by Technical Committee GEL/20, Electric cables, to Subcommittee GEL/20/18, Electric Cables - Fire testing.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 10 December 2004

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Amendments/corrigenda issued since publication

Date	Comments
30 November 2015	Implementation of IEC amendment 1:2015 with CENELEC endorsement A1:2015. Annex ZA updated

EUROPEAN STANDARD **EN 60332-1-2:2004+A1**

NORME EUROPÉENNE

EUROPÄISCHE NORM October 2015

ICS 13.220.40; 29.020; 29.060.20

English version

Tests on electric and optical fibre cables under fire conditions Part 1-2: Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame

(IEC 60332-1-2:2004)

Essais des câbles électriques et à fibres optiques soumis au feu Partie 1-2: Essai de propagation verticale de la flamme sur conducteur ou câble isolé - Procédure pour flamme à prémélange de 1kW (CEI 60332-1-2:2004)

Prüfungen an Kabeln, isolierten Leitungen und Glasfaserkabeln im Brandfall Teil 1-2: Prüfung der vertikalen Flammenausbreitung an einer Ader, einer isolierten Leitung oder einem Kabel - Prüfverfahren mit 1 kW-Flamme mit Gas-/Luftgemisch (IEC 60332-1-2:2004)

This European Standard was approved by CENELEC on 2004-09-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

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

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 60332-1-2:2004 E

Foreword

The text of document 20/697/FDIS, future edition 1 of IEC 60332-1-2, prepared by IEC TC 20, Electric cables, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60332-1-2 on 2004-09-01.

This European Standard supersedes EN 50265-2-1:1998.

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)	2005-06-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2007-09-01

Annex ZA has been added by CENELEC

———————

Endorsement notice

The text of the International Standard IEC 60332-1-2:2004 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 60332-1-3	NOTE	Harmonized as EN 60332-1-3:2004 (not modified).
IEC 60332-2-2	NOTE	Harmonized as EN 60332-2-2:2004 (not modified).

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Foreword to amendment A1

The text of document 20/1591/FDIS, future IEC 60332-1-2:2004/A1, prepared by IEC/TC 20 "Electric cables" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60332-1-2:2004/A1:2015.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2016-06-01
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2018-09-01

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.

This standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

Endorsement notice

The text of the International Standard IEC 60332-1-2:2004/A1:2015 was approved by CENELEC as a European Standard without any modification.

In the Bibliography of EN 60332-1-2:2004, the following note has to be **added** for the standard indicated:

ISO 13943	NOTE	Harmonized as EN ISO 13943.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 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.

Publication	Year	Title	EN/HD	Year
IEC 60332-1-1	- [1)]	Tests on electric and optical fibre cables under fire conditions Part 1-1: Test for vertical flame propagation for a single insulated wire or cable – Apparatus	EN 60332-1-1	2004 [2)]
IEC 60695-4	- [1)]	Fire hazard testing Part 4: Terminology concerning fire tests	EN 60695-4	1995 [2)]
IEC Guide 104	- [1)]	The preparation of safety publications and the use of basic safety publications and group safety publications	-	-
IEC 60811-203	-	Electric and optical fibre cables - Test methods for non-metallic materials - Part 203: General tests - Measurement of overall dimensions	EN 60811-203	-

[1)] Undated reference.

[2)] Valid edition at date of issue.

CONTENTS

TESTS ON ELECTRIC AND OPTICAL FIBRE CABLES UNDER FIRE CONDITIONS –

Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame

1 Scope

This part of IEC 60332 specifies the procedure for testing the resistance to vertical flame propagation for a single vertical electrical insulated conductor or cable, or optical fibre cable, under fire conditions. The apparatus is given in IEC 60332-1-1.

NOTE 1 Testing to IEC 60332-1-2 may be performed simultaneously with that to IEC 60332-1-3 if required.

Recommended requirements for performance are given in Annex A.

IEC 60332-1-2 specifies the use of a 1 kW pre-mixed flame and is for general use, except that the procedure specified may not be suitable for the testing of small single insulated conductors or cables of less than 0,5 mm² total cross-section because the conductor melts before the test is completed, or for the testing of small optical fibre cables because the cable is broken before the test is completed. In these cases, the procedure given in IEC 60332-2-2 is recommended.

NOTE 2 Since the use of insulated conductor or cable which retards flame propagation and complies with the recommended requirements of this standard is not sufficient by itself to prevent propagation of fire under all conditions of installation, it is recommended that wherever the risk of propagation is high, for example in long vertical runs of bunches of cables, special installation precautions should also be taken. It cannot be assumed that because the sample of cable complies with the performance requirements recommended in this standard, that a bunch of cables will behave in a similar manner. (See IEC 60332-3 series.)

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60332-1-1, *Tests on electric and optical fibre cables under fire conditions – Part 1-1: Test for vertical flame propagation for a single insulated wire or cable – Apparatus*

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

A1 IEC 60811-203, *Electric and optical fibre cables – Test methods for non-metallic materials – Part 203: General tests – Measurement of overall dimensions* A1

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. The definitions are taken from IEC 60695-4.

3.1
ignition source
source of energy that initiates combustion

[A1] [SOURCE: ISO 13943:2008, 1.489] [A1]

3.2
char
carbonaceous residue resulting from pyrolysis or incomplete combustion

[A1] [SOURCE: ISO 13943:2008, 4.38] [A1]

4 Test apparatus

The apparatus specified in IEC 60332-1-1 shall be used.

5 Procedure

5.1 Sample

[A1] The test sample shall be a piece of single insulated conductor or cable (600 ± 25) mm long.

The test sample diameter shall be measured using the method given in IEC 60811-203. The measurement shall be made at each of three places, separated by at least 100 mm.

The average of the three values obtained shall be rounded to obtain the overall diameter. If the calculation gives 5 or more for the second decimal figure, raise the first to the next number; thus, for example, 5,75 is rounded to 5,8. If the calculation gives 4 or less for the second decimal figure, maintain the first number; thus, for example, 5,74 is rounded to 5,7.

The overall diameter obtained shall be used for the selection of the time for flame application. [A1]

5.2 Conditioning

Before testing, all test pieces shall be conditioned at (23 ± 5) °C for not less than 16 h at a relative humidity of (50 ± 20) %.

In the case of a single insulated conductor or cable with a finish of paint or lacquer, this conditioning shall follow an initial period where the test piece shall be kept at a temperature of (60 ± 2) °C for 4 h.

5.3 Positioning of test piece

[A1] The test piece shall be straightened and secured to two horizontal supports by means of a suitable size of copper wire, in a vertical position in the centre of the metal enclosure, as described in IEC 60332-1-1, so that the distance between the bottom of the upper support and the top of the lower support is (550 ± 5) mm. In addition, the test piece shall be positioned so that the bottom of the specimen is approximately 50 mm from the base of the enclosure (see Figure 1).

The vertical axis of the test piece shall be arranged centrally within the enclosure (i.e. 150 mm from each side and 225 mm from the rear). [A1]

5.4 Flame application

Safety warning

Precautions shall be taken to safeguard personnel against the following when conducting tests:

a) the risk of fire or explosion;

b) the inhalation of smoke and/or noxious products, particularly when halogenated materials are burned;

c) harmful residues.

5.4.1 Positioning of flame

〈A1〉 A burner, as described in IEC 60332-1-1, shall be ignited and the flow rates of gas and air adjusted to the specified values. The burner shall be positioned so that the tip of the blue cone impinges on the surface of the test piece at a distance of (475 ± 5) mm from the lower edge of the upper horizontal support, whilst the burner is at an angle of (45 ± 2)° to the vertical axis of the test piece (see Figure 2). The burner position shall be fixed throughout the flame application time.

For flat-form cables, the flame impingement shall be on the middle of the flat side of the cable.

In case of an electrical insulated conductor or cable, should the test piece move significantly during the test so as to render the result invalid, the test piece shall be held straight by the attachment of a load of approximately 5 N/mm^2 of conductor area to the lower part of the sample so that the distance between the point where the load is attached and the lower edge of the top support measures (550 ± 5) mm. In such cases, the test piece shall not be secured to the lower support. 〈A1〉

5.4.2 Test duration

The flame shall be applied continuously for the period of time corresponding to the diameter shown in Table 1.

Table 1 – Time for flame application

Overall diameter of test piece [a] mm	Time for flame application s
$D \leq 25$	60 ± 2
$25 < D \leq 50$	120 ± 2
$50 < D \leq 75$	240 ± 2
$D > 75$	480 ± 2

[a] 〈A1〉 For non-circular cables in which the major to minor axis ratio is less than 3, the nominal minor axis shall be used as the overall diameter (D). For non-circular cables in which the major to minor axis ratio lies between 3 and 16, the overall diameter (D) shall be taken as the sum of the major and minor axis divided by 3,14 (π). For cables in which the major to minor axis ratio exceeds 16, the test criteria shall be given in the product standard or, if not, agreed between manufacturer and purchaser. 〈A1〉

[b] 〈A1〉 *Text deleted* 〈A1〉

〈A1〉 At the end of the specified flame application time, the burner shall be removed and the flame of the burner extinguished. 〈A1〉

6 Evaluation of test results

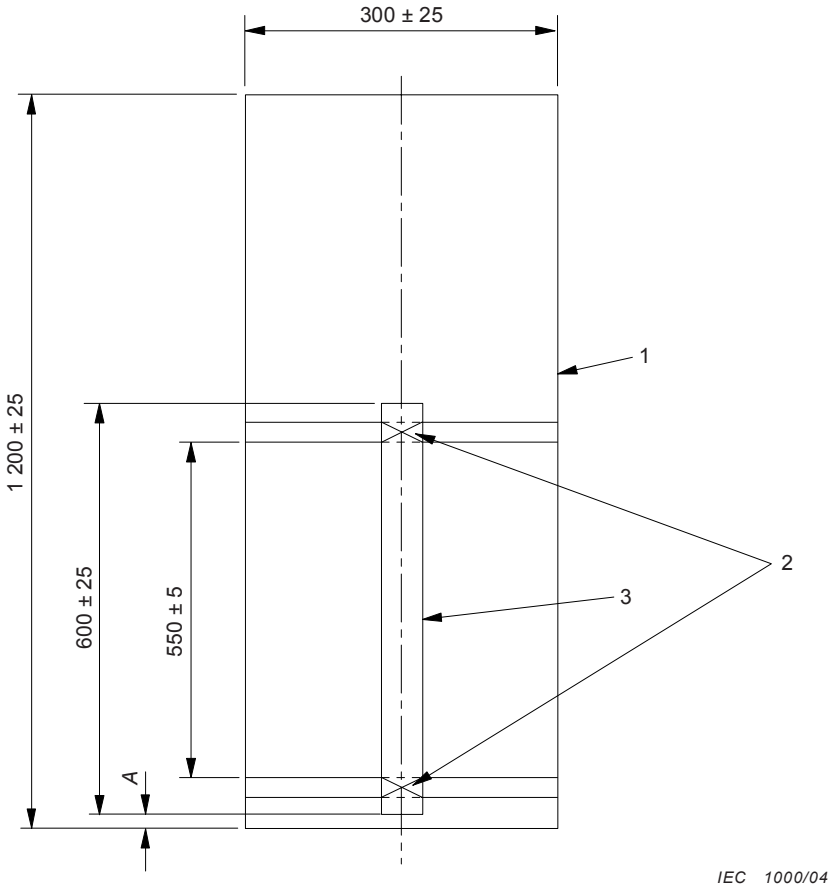
After all burning has ceased, the test piece shall be wiped clean.

All soot shall be ignored if, when wiped off, the original surface is undamaged. Softening or any deformation of the non-metallic materials shall also be ignored. The distance from the lower edge of the top support to the upper onset of charring and the distance from the lower edge of the top support to the lower onset of charring shall be measured to the nearest millimetre.

The onset of char shall be determined as follows.

Press against the cable surface with a sharp object, for example, a knife blade. Where the surface changes from a resilient to a brittle (crumbling) surface indicates the onset of charring.

Dimensions in millimetres



Key

[A1] 1 metal enclosure [A1]

2 support arm and copper wire fixing

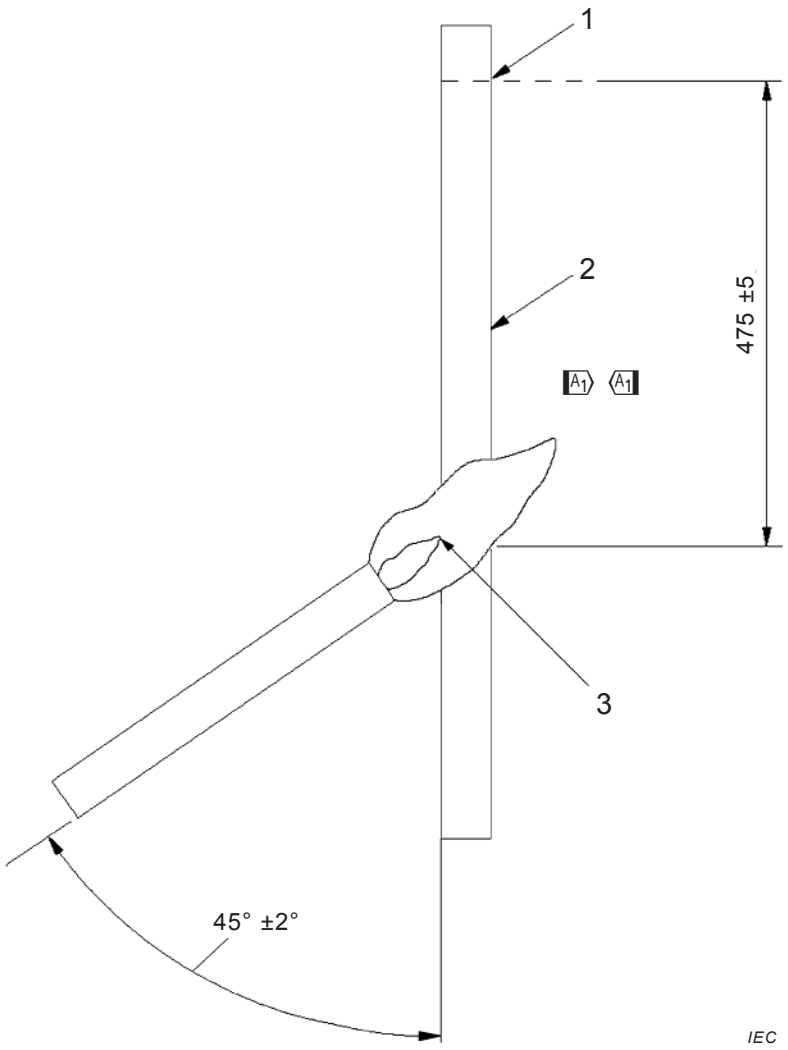
3 test piece

[A1] Distance A: Length from base of enclosure to bottom of test piece = 50 mm (approximately) [A1]

Figure 1 – Arrangement of test piece in test apparatus

A1

Dimensions in millimetres



Key

1 lower edge of top support
2 test piece
3 position of impingement of blue cone A1

Figure 2 – Application of flame to test piece

Annex A
(informative)

Recommended performance requirements

The performance requirements for a particular type or class of insulated conductor or cable should preferably be given in the individual cable standard. In the absence of any given requirement it is recommended that those given below should be taken as a minimum acceptable level.

The single insulated conductor or cable shall pass the test if the distance between the lower edge of the top support and the onset of charring is greater than 50 mm.

In addition, a failure shall be recorded if charring extends downwards to a point greater than 540 mm from the lower edge of the top support.

If a failure is recorded, two more tests shall be carried out. If both tests result in passes, the single insulated conductor or cable shall be deemed to have passed the test.

Bibliography

IEC 60332-1-3, *Tests on electric and optical fibre cables under fire conditions – Part 1-3: Test for vertical flame propagation for a single small insulated conductor or cable – Procedure for determination of flaming droplets/particles*

IEC 60332-2-2, *Tests on electric and optical fibre cables under fire conditions – Part 2-2: Test for vertical flame propagation for a single small insulated conductor or cable – Procedure for diffusion flame*

IEC 60332-3 (all parts), *Tests on electric cables under fire conditions – Test for vertical flame spread of vertically-mounted bunched wires or cables*

〚A1〛 ISO 13943, *Fire safety – Vocabulary* 〚A1〛

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