

EUROPEAN STANDARD

**EN 60332-1-2**

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Supersedes EN 50265-2-1:1998

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.

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.

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**

**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

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**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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## **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 mm<sup>2</sup> 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*

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

[IEC 60695-4:1993, definition 2.76]

#### **3.2**

##### **char**

carbonaceous residue resulting from pyrolysis or incomplete combustion

[IEC 60695-4:1993, definition 2.12]

### **4 Test apparatus**

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

### **5 Procedure**

#### **5.1 Sample**

The test sample shall be a piece of single insulated conductor or cable  $(600 \pm 25)$  mm long.

#### **5.2 Conditioning**

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

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  $(60 \pm 2)$  °C for 4 h.

#### **5.3 Positioning of test piece**

The test piece shall be straightened and be secured to two horizontal supports by means of a suitable size of copper wire, in a vertical position in the centre of the metal screen, as described in 4.2 of IEC 60332-1-1, so that the distance between the bottom of the upper support and the top of the lower support is  $(550 \pm 5)$  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 screen (see Figure 1).

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



## 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

One burner, as described in 4.3 of IEC 60332-1-1, shall be ignited and the recommended flow rates of gas and air adjusted. The burner shall be positioned so that the tip of the inner blue cone impinges on the surface of the test piece at a distance of  $(475 \pm 5)$  mm from the lower edge of the upper horizontal support, whilst the burner is at an angle of  $45^\circ \pm 2^\circ$  to the vertical axis of the test piece (see Figure 2).

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

### 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 <sup>a</sup> mm	Time for flame application <sup>b</sup> s
$D \leq 25$	$60 \pm 2$
$25 < D \leq 50$	$120 \pm 2$
$50 < D \leq 75$	$240 \pm 2$
$D > 75$	$480 \pm 2$
<sup>a</sup> Where non-circular cables (for example, flat-form constructions) are to be tested, the circumference shall be measured and used to calculate an equivalent diameter, as if the cable were circular. <sup>b</sup> For flat cables having a ratio of major to minor axis greater than 17:1, the flame application time remains under consideration.	

At the end of the specified test duration, the burner shall be removed and the flame of the burner extinguished.

## 6 Evaluation of test results

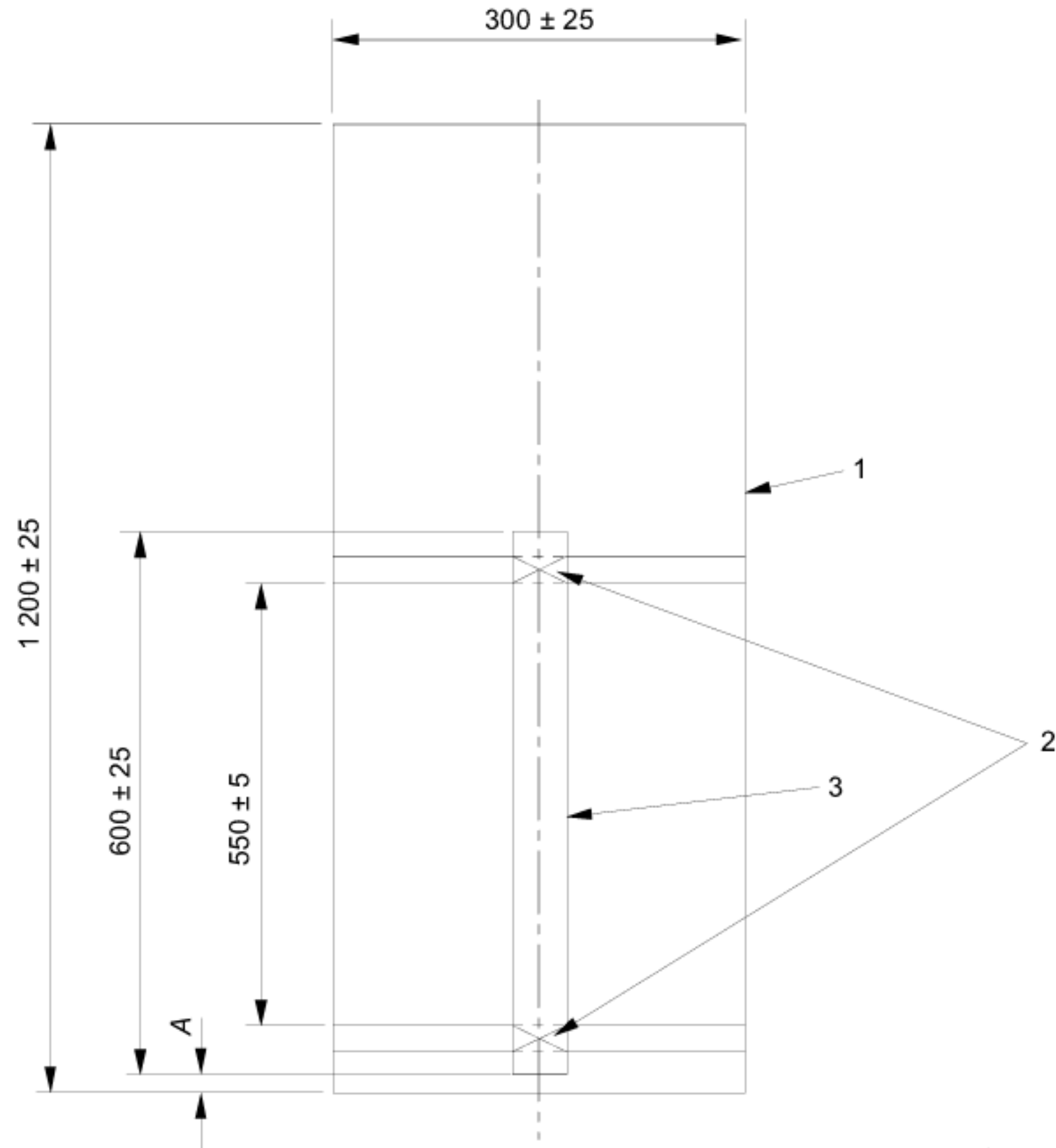
After all burning has ceased, the test piece shall be wiped clean.

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*



IEC 1000/04

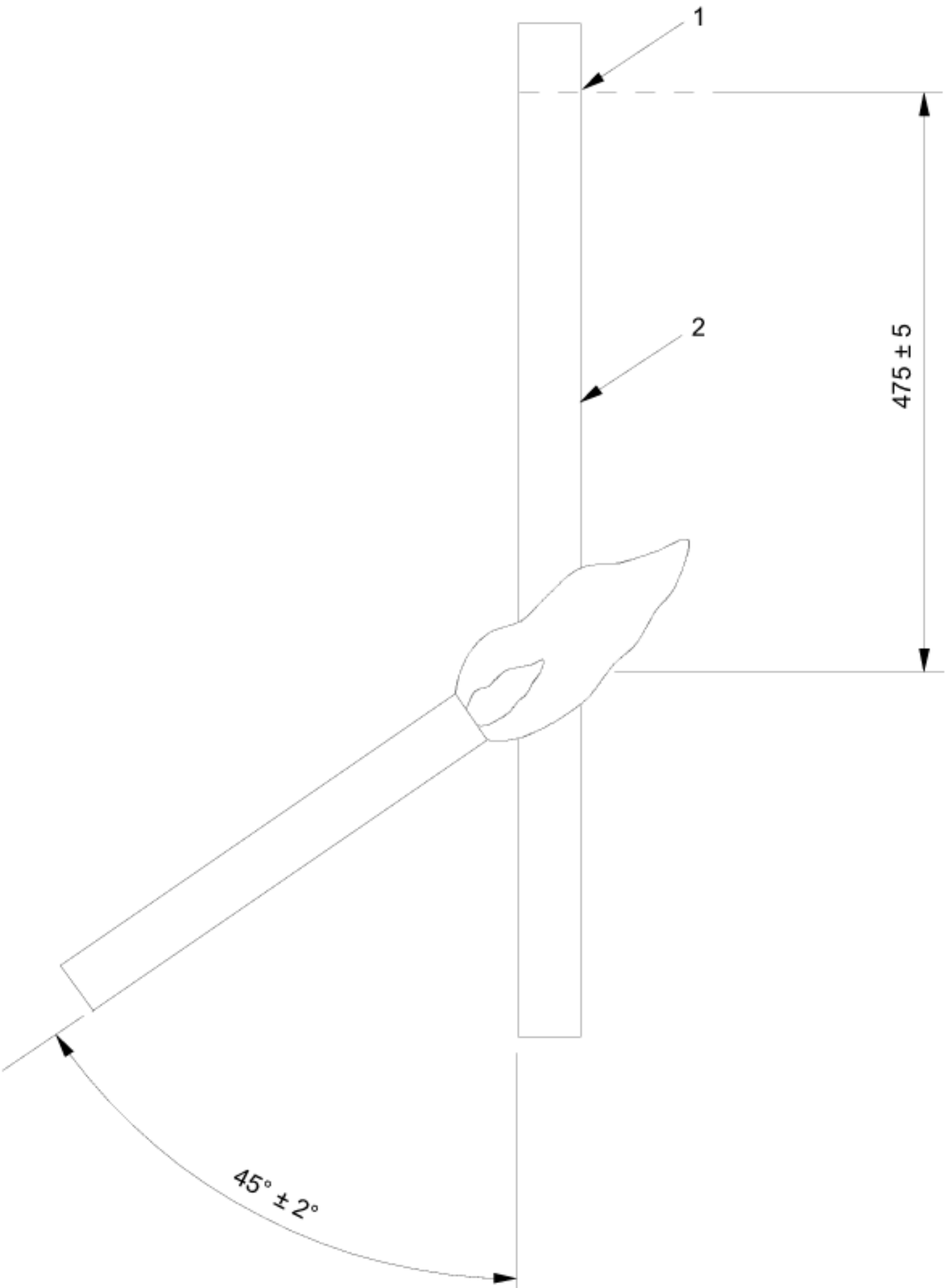
**Key**

- 1 metallic screen
- 2 support arm and copper wire fixing
- 3 test piece

Distance A: Length from base of screen to bottom of test piece = 50 mm (approximately)

**Figure 1 – Arrangement of test piece in test apparatus**

*Dimensions in millimetres*



- Key
- 1 lower edge of top support
  - 2 test piece

IEC 1001/04

**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*

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**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 Where an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60332-1-1	- <sup>1)</sup>	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 <sup>2)</sup>
IEC 60695-4	- <sup>1)</sup>	Fire hazard testing Part 4: Terminology concerning fire tests	EN 60695-4	1995 <sup>2)</sup>
IEC Guide 104	- <sup>1)</sup>	The preparation of safety publications and the use of basic safety publications and group safety publications	-	-

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<sup>1)</sup> Undated reference.  
<sup>2)</sup> Valid edition at date of issue.