SRI LANKA STANDARD 1007 : PART 2.2 : 2008
IEC 60332 : PART 2-2 : 2004

METHODS OF TEST ON ELECTRIC AND OPTICAL FIBRE CABLES UNDER FIRE CONDITIONS

PART 2.2 : TEST FOR VERTICAL FLAME PROPAGATION FOR A SINGLE SMALL INSULATED WIRE OR CABLE – PROCEDURE FOR DIFUSION FLAME

SRI LANKA STANDARDS INSTITUTION

Sri Lanka Standard

METHODS OF TEST ON ELECTRIC AND OPTICAL FIBRE CABLES UNDER FIRE CONDITIONS
PART 2.2 : TEST FOR VERTICAL FLAME PROPAGATION FOR A SINGLE SMALL INSULATED WIRE OR CABLE – PROCEDURE FOR DIFUSION FLAME

SLS 1007 Part 2.2 : 2008
IEC 60332 Part 2-2 : 2004

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This standard does not purport to include all the necessary provisions of a contract.

Sri Lanka Standard
METHODS OF TEST ON ELECTRIC AND OPTICAL FIBRE CABLES UNDER FIRE CONDITIONS
PART 2.2 TEST FOR VERTICAL FLAME PROPAGATION FOR A SINGLE SMALL INSULATED WIRE OR CABLE – PROCEDURE FOR DIFFUSION FLAME

NATIONAL FOREWORD

This standard was approved by the Sectoral Committee on Electric Cables and Conductors and was authorized for adoption and publication as a Sri Lanka Standard by the Council of Sri Lanka Standards Institution on 2008-08-28.

SLS 1007 Part 2.1 and **SLS 1007 Part 2.2** supersede **SLS 1007 Part 2 : 1993**.

SLS 1007 Methods of test for electric and optical cables under fire conditions is published in five parts as follows:

Part 1.1	Tests for vertical flame propagation for a single insulated wire or cable - Apparatus
Part 1.2	Tests for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame
Part 1.3	Tests for vertical flame propagation for a single insulated wire or cable - Procedure for determination of flaming droplets / particles.
Part 2.1	Tests for vertical flame propagation for a single small insulated wire or cable - Apparatus
Part 2.2	Tests for vertical flame propagation for a single small insulated wire or cable - Procedure for diffusion flame.

This part of the standard is identical with **IEC 60332-2-2 : 2004** Tests on electric and optical fibre cables under fire conditions – Part 2-2 : Test for vertical flame propagation for a single small insulated wire or cable – Procedure for diffusion flame, published by the International Electrotechnical Commission (IEC).

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the results of a test or an analysis shall be rounded off in accordance with **CS 102**. The number of significant places to be retained in the rounded off value shall be the same as that of the specified value in the standard.

Terminology and conventions

The text of the International Standard has been accepted as suitable for publication without deviation, as a Sri Lanka Standard. However, certain terminology and conventions are not identical with those used in Sri Lanka Standards; attention is therefore drawn to the following:

a) Wherever the words "International Standard" appear referring to this standard they should be interpreted as "Sri Lanka Standard".

b) Wherever the page numbers are quoted they are page number of IEC standard.

c) The Comma has been used throughout the standard as a decimal marker. In Sri Lanka Standards it is the current practice to use full point on the base line as the decimal marker.

CROSS REFERENCES

International Standards	**Corresponding Sri Lanka Standards**
IEC 60332 : Tests on electric and optical fibre cables under fire conditions Part 2.1 : Test for vertical flame propagation for a single small insulated wire or cable – Apparatus	SLS 1007 : Tests on electric and optical fibre cables under fire conditions Part 2.1 : Test for vertical flame propagation for a single small insulated wire or cable – Apparatus

NOTE : *Corresponding Sri Lanka Standards for other international standards listed under references in IEC 60322-2-2, are not available.*

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
60332-2-2

Première édition
First edition
2004-07

PUBLICATION GROUPÉE DE SÉCURITÉ
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Essais des câbles électriques et à fibres optiques soumis au feu –

Partie 2-2: Essai de propagation verticale de la flamme sur conducteur ou câble isolé de petite section – Procédure pour une flamme de type à diffusion

Tests on electric and optical fibre cables under fire conditions –

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TESTS ON ELECTRIC AND OPTICAL FIBRE CABLES UNDER FIRE CONDITIONS –

Part 2-2: Test for vertical flame propagation for a single small insulated wire or cable – Procedure for diffusion flame

FOREWORD

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International Standard IEC 60332-2-2 has been prepared by IEC technical committee 20: Electric cables.

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

This first edition of International Standard IEC 60332-2-2, together with IEC 60332-2-1, cancel and replace the third edition of IEC 60332-2, published in 1989, and constitute a technical revision, calling for the re-structurization of the standard into two separate parts.

The text of this standard is based on the following documents:

FDIS	Report on voting
20/700/FDIS	20/714/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 60332 consists of the following parts, under the general title *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

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

Part 1-3: Test for vertical flame propagation for a single insulated wire or cable – Procedure for determination of flaming droplets/particles

Part 2-1: Test for vertical flame propagation for a single small insulated wire or cable – Apparatus

Part 2-2: Test for vertical flame propagation for a single small insulated wire or cable - Procedure for diffusion flame

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

TESTS ON ELECTRIC AND OPTICAL FIBRE CABLES UNDER FIRE CONDITIONS –

Part 2-2: Test for vertical flame propagation for a single small insulated wire or cable – Procedure for diffusion flame

1 Scope

This part of IEC 60332 specifies the procedure for testing the resistance to vertical flame propagation for a single small vertical electrical insulated conductor or cable, or optical cable, under fire conditions. The apparatus is given in IEC 60332-2-1.

This standard gives the procedure for testing small optical fibre cables or a small insulated conductor or cable when the method specified in IEC 60332-1-2 is not suitable because some small optical fibre cables may break or small conductors may melt during the application of the flame. The recommended range of application is for the testing of small single insulated conductors or cables of less than 0,5 mm² cross-section.

NOTE 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.)

Recommended requirements for performance are given in Annex A.

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 60332-2-1, *Tests on electric and optical cables under fire conditions – Part 2-1: Test for vertical flame propagation for a single small 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 terms and 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 60332-2-1 shall be used.

5 Procedure

5.1 Sample

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

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 an 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

5.3.1 Cables with metallic conductors

The test piece shall be straightened and fixed by means of a suitable size of metallic wire in a vertical position in the centre of the metal screen, as described in 4.2 of IEC 60332-2-1. A load of 5 N/mm² of conductor area shall be attached 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 (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).

5.3.2 Optical fibre cables

The test piece shall be secured to two horizontal supports by means of a suitable size of metallic wire 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 screen (see Figure 2).

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

5.4.1.1 Cables with metallic conductors

The burner shall be arranged as shown in Figure 3. The centre-line of the burner shall be at an angle of 45° ± 2° to the centre line of the test piece. The horizontal distance between the centre line of the burner orifice and the surface of the test piece shall be (10 ± 1) mm. The distance between the point at which the burner centre line and test piece centre line intersect and the point where the load of 5 N/mm² is applied shall be (100 ± 10) mm. The distance between the point at which the burner and the test piece centre lines intersect and the lower edge of the top support shall not exceed 465 mm.

The flame shall be applied so that it envelops the test piece.

5.4.1.2 Optical fibre cables

The burner shall be arranged as shown in Figure 4. The centre-line of the burner shall be at an angle of 45° ± 2° to the centre-line of the test piece. The horizontal distance between the centre line of the burner orifice and the surface of the test piece shall be (10 ± 1) mm. The distance between the point at which the burner centre-line and the test-piece centre-line intersect and the top edge of the lower support shall be (100 ± 10) mm. The distance between the point at which the burner and test piece centre-lines intersect and the lower edge of the upper horizontal support shall not exceed 465 mm.

The flame shall be applied so that it envelops the test piece.

5.4.2 Test duration

5.4.2.1 Cables with metallic conductors

The flame shall be applied to the test piece for a duration of (20 ± 1) s. If the test piece is intact, i.e. no melting of conductor, the test shall be evaluated in accordance with Clause 6. Should the metallic conductor prematurely melt, at a time T less than the test duration, the test shall be repeated on a further test piece for a duration of (T – 2) s. The assessment shall then be based only on the further test piece.

5.4.2.2 Optical fibre cables

The flame shall be applied to the test piece for a duration of (20 ± 1) s.

6 Evaluation of test results

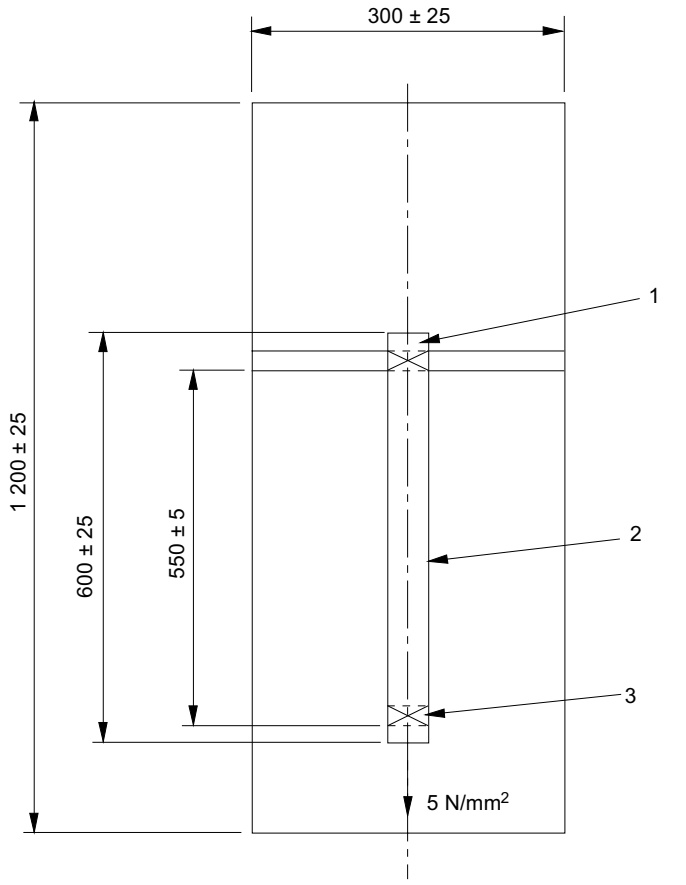
After all burning has ceased, the test piece shall be wiped clean.

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

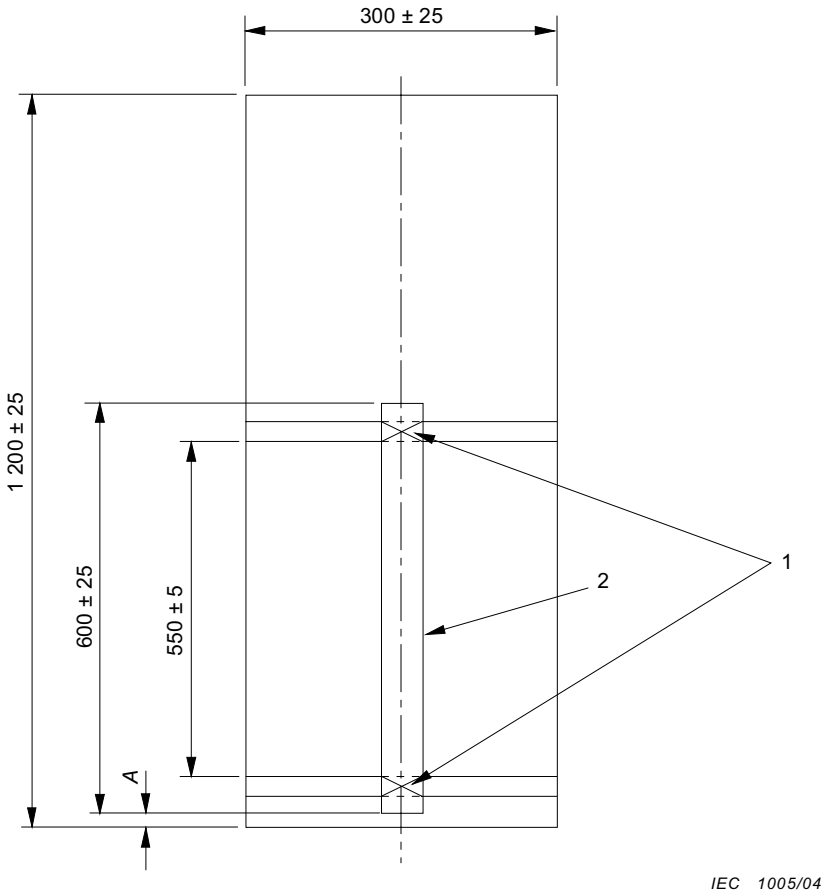
1 support and cable fixing

2 test piece

3 fixing for load

Figure 1 – Arrangement of test piece (metallic conductor)

Dimensions in millimetres



Key

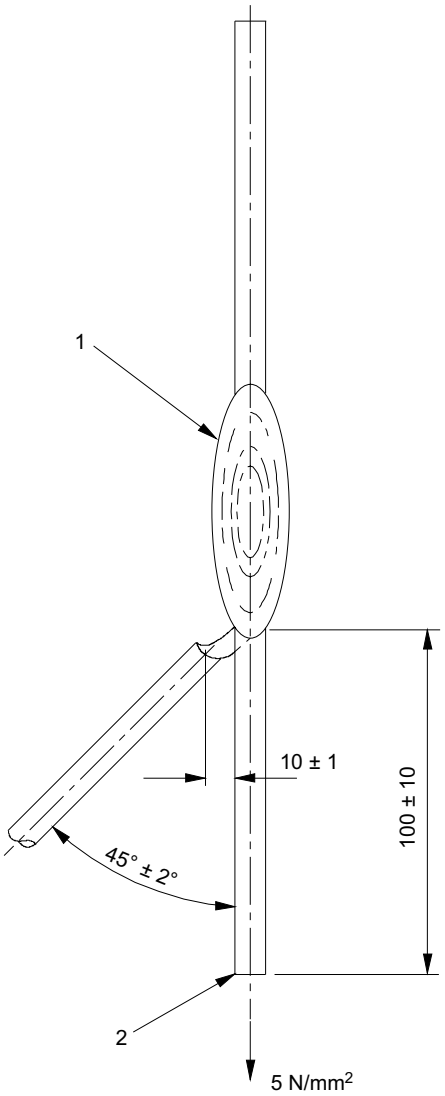
1 support arm and metallic wire fixing

2 test piece

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

Figure 2 – Arrangement of test piece (optical fibre cable)

Dimensions in millimetres



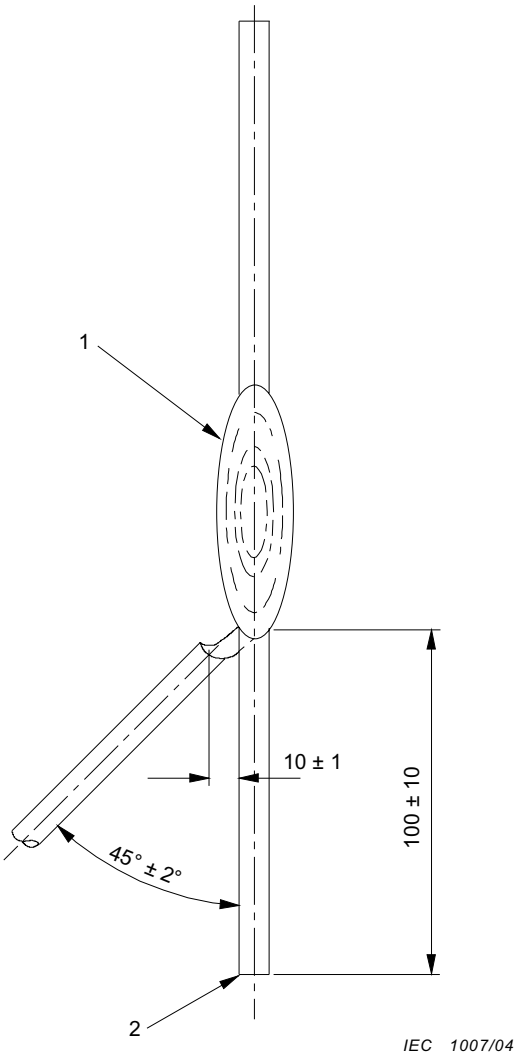
Key

1 flame to envelop test piece

2 point of attachment of load

Figure 3 – Application of burner to test piece (metallic conductor)

Dimensions in millimetres



Key

1 flame to envelop test piece

2 top edge of lower support

Figure 4 – Application of burner to test piece (optical fibre cable)

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 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 insulated conductor or cable shall be deemed to have passed the test.

Bibliography

IEC 60332-1-2, *Tests on electric and optical 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 60332-3 (all part), *Tests on electric cables under fire conditions – Part 3: Test for vertical flame spread of vertically mounted bunched wires or cables*

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