

**SLOVENSKI STANDARD**  
**SIST HD 606.1 S1:1998****01-februar-1998**

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**Measurement of smoke density of electric cables burning under defined conditions - Part 1: Test apparatus (IEC 1034-1:1990, modified)**

Measurement of smoke density of electric cables burning under defined conditions -- Part 1: Test apparatus

Messung der Rauchdichte elektrischer Kabel beim Brennen unter definierten Bedingungen -- Teil 1: Prüfeinrichtung

Mesure de la densité de fumées dégagées par des câbles électriques brûlant dans des conditions définies -- Partie 1: Appareillage d'essai

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**Ta slovenski standard je istoveten z: HD 606.1 S1:1992****ICS:**

13.220.40	Sposobnost vžiga in obnašanje materialov in proizvodov pri gorenju	Ignitability and burning behaviour of materials and products
29.060.20	Kabli	Cables

**SIST HD 606.1 S1:1998****en**

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HARMONIZATION DOCUMENT

HD 606.1 S1

DOCUMENT D'HARMONISATION



HARMONISIERUNGSDOKUMENT

REPUBLIKA SLOVENIJA  
 MINISTRSTVO ZA ZNANOST IN TEHNOLOGIJO  
 Urad RS za standardizacijo in meroslovje  
 LJUBLJANA

August 1992

UDC 621.315.2/.3:620.1

SIST..... *HD 606.1 S1* .....  
 PREVZET PO METODI RAZGLASITVE

-02- 1998

Descriptors: fire protection, electric cable, test apparatus,  
 calibration, combustion product, test method, flammability  
 test

## ENGLISH VERSION

Measurement of smoke density of electric cables  
 burning under defined conditions  
 Part 1: Test apparatus  
 (IEC 1034-1:1990, modified)

Mesure de la densité de fumées  
 dégagées par les câbles  
 électriques brûlant dans des  
 conditions définies  
 Partie 1: Appareillage d'essai  
 (CEI 1034-1:1990, modifiée)

Messung der Rauchdichte  
 elektrischer Kabel beim Brennen  
 unter definierten Bedingungen  
 Teil 1: Prüfeinrichtung  
 (IEC 1034-1:1990, modifiziert)

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This Harmonization Document was approved by CENELEC on 1992-03-24.  
 CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations  
 which stipulate the conditions for implementation of this Harmonization Document  
 on a national level.  
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Up-to-date lists and bibliographical references concerning national implementation  
 may be obtained on application to the Central Secretariat or to any CENELEC member.

This Harmonization Document exists in three official versions (English, French,  
 German).

CENELEC members are the national electrotechnical committees of Austria, Belgium,  
 Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg,  
 Netherlands, Norway, Portugal, 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

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Ref. No. HD 606.1 S1:1992 E

FOREWORD

Following the decision taken by CENELEC Technical Committee TC 20 at their meeting in Vienna in November in 1990, the International Standard IEC 1034-1:1990 together with a common modification was submitted to the CENELEC Unique Acceptance Procedure (UAP) in June 1990 for acceptance as a Harmonization Document.

The text of the draft was approved by CENELEC as HD 606.1 S1 on 24 March 1992.

The following dates were fixed:

- latest date of announcement  
of the HD at national level (doa) 1992-12-01
- latest date of publication of  
a harmonized national standard (dop) 1993-12-01
- latest date of withdrawal of  
conflicting national standards (dow) 1993-12-01

For products which have complied with the relevant national standard before 1993-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1994-12-01.

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The text of the International Publication 1034-1:1990 was approved by CENELEC as a Harmonization Document with an agreed common modification as given below.

COMMON MODIFICATION

- 5                    **Smoke mixing**
- Clause  
and  
Figure 1        Replace the value of the flow rate of the fan by  
7 m<sup>3</sup>/min to 15 m<sup>3</sup>/min.

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NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD

CEI  
IEC

1034-1

Première édition  
First edition  
1990-11

Mesure de la densité de fumées  
dégagées par des câbles électriques  
brûlant dans des conditions définies

Partie 1:

Appareillage d'essai

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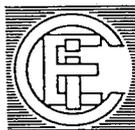
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Measurement of smoke density of  
electric cables burning under defined conditions

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Part 1: 8e/sist-hd-606-1-s1-1998

Test apparatus



Numéro de référence  
Reference number  
CEI/IEC 1034-1: 1990

DESKR: KABL I ELEKTRICNI; GOLLIVOST; SESTOTA DIMA; PRESKUVANJE; FC 6061 DEFINIRANI

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

MEASUREMENT OF SMOKE DENSITY OF ELECTRIC CABLES BURNING  
UNDER DEFINED CONDITIONS

## Part 1: Test apparatus

## FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

This International Standard has been prepared by IEC Technical Committee No. 20: Electric cables.

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

Six Months' Rule	Report on Voting	Two Months' Procedure	Report on Voting
20(CO)178	20(CO)184	20(CO)189	20(CO)193

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

## Introduction

The measurement of smoke density is an important aspect in the evaluation of the burning performance of electric cables as it is related to the evacuation of persons and accessibility for fire-fighting. It is therefore necessary to be careful when specifying test requirements, particularly since they may be affected by the number of samples and the way these are mounted above the test flame.

Whilst these details have yet to be finalized, they will nevertheless be based on the use of the 27 m<sup>3</sup> rig.

Annex A gives guidance on various aspects of the test apparatus which may be useful when first constructing the test cabin.

Part 2 will be issued giving details of the test procedure and requirements for the level of smoke emission.

# MEASUREMENT OF SMOKE DENSITY OF ELECTRIC CABLES BURNING UNDER DEFINED CONDITIONS

## Part 1: Test apparatus

### 1 Scope

This International Standard provides details of the test apparatus to be used for measuring smoke emission when electric cables are burned under defined conditions, for example, a few cables burned horizontally. The light transmittance ( $I_t$ ) for flaming and smouldering conditions can be used as a means of comparing different cables or complying with specific requirements.

### 2 Details of apparatus

The equipment shall comprise a cubic enclosure with inside dimensions of  $3\,000\text{ mm} \pm 30\text{ mm}$  and constructed of a suitable material fixed on to a steel angle frame. One side shall have a door, with a glass inspection window. Transparent sealed windows (minimum size  $100\text{ mm} \times 100\text{ mm}$ ) shall be provided on two opposite sides to permit the transmission of a beam of light from the horizontal photometric system. The distance from the floor to the centre of these windows shall be  $2\,150\text{ mm} \pm 100\text{ mm}$  (see figure 1 for plan view).

The walls of the enclosure will include orifices at ground level for the passage of cables, etc., and to permit the enclosure to be at atmospheric pressure. The total area of the orifices open during the test shall be  $50\text{ cm}^2 \pm 10\text{ cm}^2$ . The ambient temperature outside the enclosure shall be  $20\text{ }^\circ\text{C} \pm 10\text{ }^\circ\text{C}$  and the enclosure shall not be directly exposed to sunlight or extreme climatic conditions.

NOTE — It should normally be possible to extract fumes from the enclosure after each test through a duct complete with valve which should be closed during the test. The duct may include a fan to increase the rate of extraction. It is recommended that the door of the enclosure be opened to assist the extraction process.

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### 3 Photometric system

3.1 The photometric system is illustrated in figure 2. The light source and the receiver shall be placed externally in the centre of both windows in the two opposite walls of the cube without making physical contact. The light beam shall traverse the cube through the glass windows in the side walls.

3.2 The light source shall be a halogen lamp with a tungsten filament with a clear quartz bulb having the following characteristics:

nominal power:	100 W
nominal voltage:	12 V d.c.
nominal luminous flux:	2 000 lm - 3 000 lm
nominal colour temperature:	2 800 K to 3 200 K.

The bulb shall be supplied with a stabilized voltage of  $12,00\text{ V} \pm 0,01\text{ V}$ . The lamp shall be mounted in a housing and the beam adjusted by a lens system to give an evenly illuminated circular area of  $1,5\text{ m} \pm 0,1\text{ m}$  diameter on the interior of the opposite wall.

3.3 The receptor photocell shall be of the selenium or silicon type with a spectral response matching the Commission Internationale de l'Eclairage (CIE) photopic observer (equivalent to the human eye). The

\* International Commission on Illumination.

photocell shall be mounted at the end of  $150 \text{ mm} \pm 10 \text{ mm}$  tube with a dust protection window at the other end. The inside of the tube shall be matt black to prevent reflections. The photocell shall be connected to a potentiometric recorder to produce a linear proportional output. The cell shall be resistance-loaded to operate in its linear range and the input impedance of the recorder shall be at least  $10^4$  times greater than the load resistance of the cell which shall not exceed  $100 \Omega$ .

3.4 The photometric system shall be energized before the blank test. When stability has been attained, the zero and full scale reading of the recorder shall be adjusted for light on the detector corresponding to 0% (absence of light) and 100% luminous transmission.

NOTE – Periodically, for example at the beginning of a test series, the performance of the photocell should be verified by placing standard neutral density filters in the light beam. It is essential that these filters cover the entire optical entry port for the photocell and the values of absorbance (or optical density) measured by the photocell fall within  $\pm 5\%$  of the standard values. The filters should also permit the verification of the linearity of response of the detector which should be proportional to the absorbance of light in the range used.

#### 4 Qualification of test apparatus

The following test shall be undertaken satisfactorily in order that the combination of the test cube and the optical system will produce consistent results with the other test cubes when identical cables are burned under the same conditions.

##### 4.1 Blank test

This is undertaken when the cube is maintained in an external environment where the temperature is  $20 \text{ }^\circ\text{C} \pm 10 \text{ }^\circ\text{C}$ .

##### 4.1.1 Fire source

The fire source shall be 1 litre  $\pm 0,01$  litre of alcohol having the following composition by volume:

ethanol:	$90 \pm 1\%$
methanol:	$4 \pm 1\%$
water:	$6 \pm 1\%$

When a denaturing agent is added to the alcohol, it shall have no effect on the smoke emission of any cable under test.

The alcohol shall be contained in a tray made from galvanized or stainless steel with joined edges, a pyramidal trunk section and the following interior dimensions (see figure 3):

bottom base:	$210 \text{ mm} \times 110 \text{ mm}$
top base:	$240 \text{ mm} \times 140 \text{ mm}$
height:	$80 \text{ mm}$

All dimensions  $\pm 2 \text{ mm}$ .

Thickness of tray:  $1 \text{ mm} \pm 0,1 \text{ mm}$ .

The tray shall be supported at a height of  $100 \text{ mm} \pm 10 \text{ mm}$  from the floor to permit circulation of the air.

4.1.2 Burn 1 litre of alcohol in order to preheat the test enclosure and to ensure that the temperature inside the cube is within the range of  $25 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$  measured at the internal door surface, at a height of 1,5 m to 2,0 m and a minimum of 20 cm from the walls.