SLOVENSKI STANDARD
SIST EN ISO 10093:2000

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Nadomešča:
SIST ISO 10093:1996

Polimerni materiali - Preskusi z ognjem - Standardni viri vžiga (ISO 10093:1998)

Plastics - Fire tests - Standard ignition sources (ISO 10093:1998)

Kunststoffe - Brandprüfungen - Standard-Zündquellen (ISO 10093:1998)

Plastiques - Essais au feu - Catégories de sources d'allumage (ISO 10093:1998)

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83.080.01	Polimerni materiali na splošno	Plastics in general

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English version

Plastics - Fire tests - Standard ignition sources (ISO 10093:1998)

Plastiques - Essais au feu - Catégories de sources d'allumage (ISO 10093:1998)

Kunststoffe - Brandprüfungen - Standard-Zündquellen (ISO 10093:1998)

This European Standard was approved by CEN on 1 November 1998.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Foreword

The text of the International Standard ISO 10093:1998 has been prepared by Technical Committee ISO/TC 61 "Plastics" in collaboration with Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by IBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 1999, and conflicting national standards shall be withdrawn at the latest by May 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 10093:1998 was approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 10093

Second edition
1998-11-15

Plastics — Fire tests — Standard ignition sources

Plastiques — Essais au feu — Sources d'allumage normalisées

Reference number
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Contents

Page

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10093 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 4, *Burning behaviour*.

This second edition cancels and replaces the first edition (ISO 10093:1994), which has been technically revised.

This edition differs from the 1994 edition in that all methods that had not been standardized internationally were eliminated. The sources which were eliminated were S/DF4, which was based on the ASTM E 84 burner, and the sources S/C1, S/C2 and S/C3, which were small cribs used in British Standard tests. Two extra burners, S/DF5 and S/DF6, have been introduced in this revision. These are based on the IEC 60332-3:1992 and the ISO 9705:1993 ignition sources. Sources P/PF2 and P/PF3 in the 1994 edition have been integrated into a single source, P/PF2, with two definitions of fuel supply for the same burner.

Annexes A and B of this International Standard are for information only.

Introduction

Fires are caused by a wide range of possible ignition sources. Statistical analysis of fires has identified the main primary and secondary sources, especially for fires in buildings. The most frequent sources of fires have been found to be as follows:

a) cooking appliances;

b) space-heating appliances;

c) electric wiring, connectors and terminations;

d) other electrical appliances (such as washing machines, bedwarmers, televisions, water heaters);

e) cigarettes;

f) matches and smokers' gas lighters;

g) blow-lamps, blow-torches and welding torches;

h) rubbish burning;

i) candles.

The above list covers the major primary ignition sources for accidental fires. Other sources may be involved in fires raised maliciously. Research into causes of fires has shown that primary ignition sources (e.g. glowing cigarettes or dropped flaming matches) can set fire to waste paper, which then acts as a secondary ignition source of greater intensity.

When analysing and evaluating the various ignition sources for applications involving plastics materials, the following questions need to be answered on the basis of detailed fire statistics:

a) What is the significance of the individual ignition sources in various fire risk situations?

b) What proportion is attributable to secondary ignition sources?

c) Where does particular attention have to be paid to secondary ignition sources?

d) To what extent are different ignition sources responsible for fatal fire accidents?

The following laboratory ignition sources are intended to simulate actual ignition sources that have been shown to be the cause of real fires involving plastics. Laboratory ignition sources are preferred over actual ignition sources due to their consistency which results in greater data repeatability within a laboratory and greater reproducibility between laboratories.

These laboratory ignition sources may be used to develop new test procedures.

Plastics — Fire tests — Standard ignition sources

1 Scope

This International Standard describes and classifies a range of laboratory ignition sources for use in fire tests on plastics and products consisting substantially of plastics. These sources vary in intensity and area of impingement. They may be used to simulate the initial thermal abuse to which plastics may be exposed in certain actual fire risk scenarios.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1337:1980, *Wrought coppers (having minimum copper contents of 99,85 %) — Chemical composition and forms of wrought products.*

ISO 5657:1997, *Reaction to fire tests — Ignitability of building products using a radiant heat source.*

ISO 8191-1:1987, *Furniture — Assessment of the ignitability of upholstered furniture — Part 1: Ignition source: smouldering cigarette.*

ISO 8191-2:1988, *Furniture — Assessment of the ignitability of upholstered furniture — Part 2: Ignition source: match-flame equivalent.*

ISO 9705:1993, *Fire tests — Full-scale room test for surface products.*

ISO 11925-2:1997, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 2: Single flame source test.*

IEC 60332-3:1992, *Tests on electric cables under fire conditions — Part 3: Tests on bunched wires or cables.*

IEC 60695-2-1/0:1994, *Fire hazard testing — Part 2: Test methods — Section 1/sheet 0: Glow-wire test methods — General.*

IEC 60695-2-2:1991, *Fire hazard testing — Part 2: Test methods — Section 2: Needle-flame test.*

IEC 60695-2-4/1:1991, *Fire hazard testing — Part 2: Test methods — Section 4/sheet 1: 1 kW nominal pre-mixed test flame and guidance.*

IEC 60695-2-4/2:1994[1)], *Fire hazard testing — Part 2: Test methods — Section 4/sheet 2: 500 W nominal test flames and guidance.*

IEC 60695-2-20:1995, *Fire hazard testing — Part 2: Glowing/Hot wire based test methods — Section 20: Hot-wire coil ignitability test on materials.*

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1) Future editions of this standard are expected to be published under the designation IEC 60695-11-3.

IEC 60695-11-4:—[2], *Fire hazard testing — Part 11: Test flame — Section 4: 50 W apparatus and confirmational test methods.*

ASTM D 5025:1994, *Standard specification for a laboratory burner used for small-scale burning tests on plastic materials.*

DIN 50051:1977, *Testing of materials; Burning behaviour of materials; Burner.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1
afterflame
persistence of flaming of a material after the ignition source has been removed

3.2
afterflame time
length of time for which a material continues to flame, under specified test conditions, after the ignition source has been removed [also called duration of flame(s)]

3.3
afterglow
persistence of glowing of a material after cessation of flaming or, if no flaming occurs, after the ignition source has been removed

3.4
afterglow time
length of time for which a material continues to glow, under specified test conditions, after the ignition source has been removed and/or cessation of flaming

3.5
combustion
exothermic reaction of a substance with an oxidizer, generally accompanied by flames and/or glowing and/or emission of smoke

3.6
ease of ignition
ease with which a material can be ignited under specified test conditions

3.7
exposed surface
that surface subjected to the heating conditions of the test

3.8
flame (verb)
to undergo combustion in the gaseous phase with emission of light

3.9
flaming debris
material separating from the specimen during the test procedure and falling below the initial lower edge of the specimen and continuing to flame as it falls

3.10
glowing combustion
combustion of a material in the solid phase without flame but with emission of light from the combustion zone

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2) To be published.

3.11
ignitability
measure of the ease with which a specimen can be ignited due to the influence of an external heat source under specified test conditions

3.12
ignite (transitive verb)
to initiate combustion

3.13
ignite (intransitive verb)
to catch fire with or without the application of an external heat source

3.14
ignition
initiation of combustion

3.15
ignition source
applied source of heat which is used to ignite combustible materials or products

3.16
ignition temperature
minimum temperature of a material at which sustained combustion can be initiated under specified test conditions

3.17
irradiance
⟨at a point of a surface⟩ radiant flux incident on an infinitesimal element of the surface containing the point divided by the area of that element

3.18
minimum ignition time
minimum time of exposure of a material to an ignition source to obtain sustained combustion under specified test conditions

3.19
primary ignition source
the first applied ignition source

3.20
punking
propagation of a smouldering combustion front after removal of the ignition source

3.21
secondary ignition source
heat source which is activated following ignition from a primary source

3.22
sustained flaming
after withdrawal of the ignition source, the inception of a flame on the surface of a material that persists for at least 10 s

3.23
transitory flaming
after withdrawal of the ignition source, the appearance of flashes or flames which are not sustained for a continuous 10 s

4 Ignition processes

4.1 When plastics are exposed to thermal energy, flammable vapours may be generated from their surface. Under suitable conditions (especially high temperatures), a critical concentration of flammable vapour may form and spontaneous ignition will result. If a flame is present as the sole energy source, or as a supplementary source, the ignition process will be assisted; this mechanism is sometimes known as pilot ignition.

4.2 A specimen of plastic is regarded as ignited when flames appear on the surface of the plastic or when glowing combustion is evident.

4.3 After ignition has occurred, some burning plastics create additional fire hazards by forming flaming debris or drips. If this flaming debris falls on to combustible material, secondary ignition may occur and the fire will spread more rapidly.

4.4 The localized application of a heat source to some plastics results in glowing combustion. With some thermoplastic foams and foams from thermosetting materials the localized application of a heat source results in punking which produces a carbonaceous char.

5 Characteristics of ignition sources

5.1 The main characteristics of ignition sources and their relation to the test specimen may be defined by the following factors:

a) The intensity of the ignition source. This is a measure of the thermal load on the specimen resulting from the combined conduction, convection and radiation effects caused by the ignition source.

b) The area of impingement of the ignition source on the specimen.

c) The duration of exposure of the specimen and whether it is continuous or intermittent.

d) The presentation of the ignition source to the specimen and whether or not it impinges.

e) The orientation of the specimen in relation to the ignition source.

f) The ventilation conditions in the vicinity of the ignition source and exposed surface of the specimen.

5.2 The ignition sources described in clause 7 provide a range of intensities and areas of impingement to be considered for use in fire tests of plastics.

NOTE Factors c) to f) may be determined when the specific fire test conditions have been decided.

6 Experimental principles

6.1 Flame ignition sources of two types have been selected.

6.1.1 Diffusion flame source

To form a diffusion flame source, gas (usually propane, methane or butane) flows through stainless-steel tubes without ingress of air prior to the base of the flame.

NOTE These flames simulate natural flames well but they often fluctuate and are not convenient to direct if any angular presentation is required toward the specimen.

6.1.2 Premixed flame source

To form a premixed flame source, a gas burner (usually using propane, methane or butane) fitted with air inlet ports or an air intake manifold is used.