DIN EN 16602-70-21

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ICS 49.140; 49.025.01; 13.220.40

Entwurf

Einsprüche bis 2014-05-28
Vorgesehen als Ersatz für
DIN EN 14090:2002-10

Raumfahrtproduktsicherung – Brennverhaltenstest für die Auswahl von Raumfahrtmaterialien; Englische Fassung FprEN 16602-70-21:2013

Space product assurance –
Flammability testing for the screening of space materials;
English version FprEN 16602-70-21:2013

Assurance produit des projets spatiaux –
Essai de flammabilité pour la sélection des matériaux d'un projet spatial;
Version anglaise FprEN 16602-70-21:2013

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2014-03-28 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

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- oder in Papierform an den Normenausschuss Luft- und Raumfahrt (NL) im DIN, 10772 Berlin (Hausanschrift: Burggrafenstr. 6, 10787 Berlin).

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 51 Seiten

Normenausschuss Luft- und Raumfahrt (NL) im DIN

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Nationales Vorwort

Dieses Dokument (FprEN 16602-70-21:2013) wurde vom Technischen Komitee CEN/CLC/TC 5 „Raumfahrt“ erarbeitet, dessen Sekretariat vom DIN (Deutschland) gehalten wird.

Dieses Dokument ist derzeit zum einstufigen Annahmeverfahren vorgelegt.

Dieses Dokument wird DIN EN 14090:2002-10 ersetzen.

Dieses Dokument wurde speziell zur Behandlung von Raumfahrtsystemen erarbeitet und hat daher Vorrang vor jeglicher Europäischer Norm, da es denselben Anwendungsbereich hat, jedoch über einen größeren Geltungsbereich (z. B. Luft- und Raumfahrt) verfügt.

Das zuständige deutsche Normungsgremium ist der Arbeitsausschuss NA 131-10-01 AA „Interoperabilität von Informations-, Kommunikations- und Navigationssystemen“ im DIN-Normenausschuss Luft- und Raumfahrt (NL).

Änderungen

Gegenüber wird DIN EN 14090:2002-10 wurden folgende Änderungen vorgenommen:

a) Norm-Nummer geändert;

b) keinerlei Änderungen des Textes.

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Nationaler Anhang NA
(informativ)

Begriffe

3 Begriffe und Abkürzungen

3.1 Begriffe aus anderen Normen

Für die Anwendung dieses Dokuments gelten die Begriffe nach ECSS-S-ST-00-01, insbesondere der folgende Begriff:

Entflammbarkeit

Für die Anwendung dieses Dokuments gelten die Begriffe nach ECSS-Q-ST-70.

3.2 Für diese Norm spezifische Begriffe

3.2.1
Sauerstoffkonzentrationsgrenze bei der Verbrennung polymerer Materialien
Mindest-Volumenkonzentration an Sauerstoff in einem Stickstoff-Sauerstoff-Gemisch, bei der es nach Zündung von unten noch zur Verbrennung des Materials kommen kann

ANMERKUNG 1 Sie wird als Prozentsatz angegeben und nach folgender Gleichung bestimmt:

$$C_{\text{lim}} = \frac{\sum_{i=1}^{n} C_{\text{lim},i}}{n} \qquad (3.1)$$

ANMERKUNG 2 D. h., das arithmetische Mittel der Konzentrationsgrenze, berechnet als Funktion der Ergebnisse von Messungen von ($C_{\text{lim},i}$) an der Einheit.

3.3 Abkürzungen

Für die Anwendung dieses Dokuments gelten die Abkürzungen nach ECSS-S-ST-00-01 und die folgenden Abkürzungen:

Abkürzung	Bedeutung
C_{lim}	Mindest-Volumenkonzentration an Sauerstoff in einem Stickstoff-Sauerstoff-Gemisch, bei der es nach Zündung von unten noch zur Verbrennung des Materials kommen kann (en: minimum volumetric concentration of oxygen contained in an oxygen-nitrogen mixture, in the presence of which a material can still combust after ignition from the bottom)
HMT	Hexamethylentetramin (en: hexamethylenetetramine)

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EUROPEAN STANDARD — *Entwurf* — **FINAL DRAFT**
NORME EUROPÉENNE **FprEN 16602-70-21**
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Will supersede EN 14090:2002

English version

Space product assurance - Flammability testing for the screening of space materials

Assurance produit des projets spatiaux - Essai de flammabilité pour la sélection des matériaux d'un projet spatial

Raumfahrtproduktsicherung - Brennverhaltenstest für die Auswahl von Raumfahrtmaterialien

This draft European Standard is submitted to CEN members for unique acceptance procedure. It has been drawn up by the Technical Committee CEN/CLC/TC 5.

If this draft becomes a European Standard, CEN and 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.

This draft European Standard was established by CEN and CENELEC in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN and CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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Foreword

This document (FprEN 16602-70-21:2013) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN (Germany).

This document (FprEN 16602-70-21:2013) originates from ECSS-Q-ST-70-21C.

This document is currently submitted to the Unique Acceptance Procedure.

This document will supersede EN 14090:2002.

This document has been developed to cover specifically space systems and will the-refore have precedence over any EN covering the same scope but with a wider do-main of applicability (e.g. : aerospace).

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1 Scope

This Standard defines a multi-test procedure for the determination of the flammability characteristics of non-metallic materials under a set of closely controlled conditions. The test procedure covers both individual materials and materials used in configuration. This Standard describes a series of tests to provide data for aid in the evaluation of the suitability of materials for use in a space vehicle crew compartment. The data obtained are in respect to the ease of ignition and the flame propagation characteristics of materials.

All non-metallic materials are inherently flammable, the degree to which this is true is dependant on the chemical nature of the material itself and the environment to which the material is exposed. In the closed environment of a manned spacecraft this can lead to a potentially dangerous situation and close control is therefore required.

This standard may be tailored for the specific characteristics and constrains of a space project in conformance with ECSS-S-ST-00.

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2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revision of any of these publications do not apply. However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the more recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS system - Glossary of terms
EN 16602-10-09	ECSS-Q-ST-10-09	Space product assurance - Nonconformance control system
EN 16602-70	ECSS-Q-ST-70	Space product assurance - Materials, mechanical parts and processes
	DIN 50050-1:1986	Testing of materials; burning behaviour of materials; small burning cabinet
	ISO 6941:1984	Textile fabrics - Burning behaviour - Measurement of flame spread properties of vertically oriented specimens

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3 Terms, definitions and abbreviated terms

3.1 Terms from other standards

For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 apply, in particular for the following terms:

flammability

For the purpose of this Standard, the terms and definitions from ECSS-Q-ST-70 apply.

3.2 Terms specific to the present standard

3.2.1 oxygen concentration limit during the combustion of polymeric materials

minimum volumetric amount of oxygen contained in the nitrogen-oxygen mixture, in the presence of which the material can still combust after ignition from the bottom

NOTE 1 It is expressed as a percentage and determined using the equation:

$$C_{\lim} = \frac{\sum_{i=1}^{n} C_{\lim,i}}{n} \qquad [3\text{-}1]$$

NOTE 2 i.e. the arithmetic average of the concentration limit calculated as a function of the results of unit measurements of (C_{lim},i).

3.3 Abbreviated terms

For the purpose of this Standard, the abbreviated terms from ECSS-S-ST-00-01 and the following apply:

Abbreviation	Meaning
C_{lim}	minimum volumetric concentration of oxygen contained in an oxygen-nitrogen mixture, in the presence of which a material can still combust after ignition from the bottom.
HMT	hexamethylenetetramine

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4 Principles

4.1 Test methods

Four test methods are included within this Standard. They can be divided into two different categories:

- Screening tests (see clause 4.2), and
- Configuration tests (see clause 4.3).

4.2 Screening tests

4.2.1 Overview

These are the prime tests to be performed on a material to assess its basic acceptability or otherwise with respect to flammability. They are designed to test the material under worst case test conditions, with respect to, for instance, environment, use, or thickness.

The following two tests form the basis for acceptance or otherwise of most non-metallic materials but are very different in the data generated:

a. Test 1: Upward propagation test

b. Test 2: Standard test method for the determination of the oxygen concentration limit during the combustion of polymer materials

The choice of which test method is used is dependant on the project concerned and is specified within the business agreement.

Test 3 "Electrical wire insulation flammability test method" is related specifically to wire insulation materials.

Materials which meet the requirements of these tests can be considered for general application, within the constraints of the test conditions used.

4.2.2 Screening Test 1: Upward propagation test

The purpose of this test is to determine the flammability characteristics of candidate materials supplied to a standard format when exposed to an ignition source applied at the bottom edge. This test in general is applicable to NASA payloads (e.g. Space Station, STS). See also NASA STD 6001 Test 1.

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4.2.3 Screening Test 2: Standard test method for the determination of the oxygen concentration limit during the combustion of polymer materials

The oxygen concentration limit provides a comparative evaluation of the tendency of polymeric materials to burn and to assess the fire resistance of these materials.

The oxygen concentration limit during the combustion of polymer materials is considered as one of the main indices characterizing the risk of fire which materials present before being considered for use in environments containing various oxygen levels.

4.2.4 Screening Test 3: Electrical wire insulation flammability test method

This test is designed to screen wire insulation for flammability characteristics.

4.3 Configuration test

This test is designed to determine the flammability characteristics of materials configured in the same manner as that in qualification and subsequent spacecraft models. It is intended to determine whether a flammability hazard exists when a material, which fails the basic screening test, is desired to be used.

Materials which are shown to be acceptable in this manner can be accepted for restricted application, within the constraints of the test conditions used. Materials which fail this test are subject to a deviation request. Examples are:

a. flammable adhesives where the use is to bond two non-flammable substrates together, or

b. flammable conformal coatings applied thinly to a non-flammable printed circuit board.

4.4 Additional tests

These tests can be proposed related to the determination of such properties as flash and fire point, or heat of combustion.

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5 Requirements

5.1 Test procedure

5.1.1 Preparatory conditions

5.1.1.1 Hazards, health and safety precautions

a. The supplier shall isolate hazardous substances, items and operations from other activities.

b. The supplier shall locate items and controls so that personnel are not exposed to hazards.

NOTE Hazards can be chemical burns, electric shock, cutting edges, sharp points or toxic atmospheres.

c. The supplier shall provide warning and caution notes in operations, storage, transport, testing, assembly, maintenance and repair instructions.

d. The supplier shall place distinctive markings on hazardous items, equipment or facilities.

NOTE This marking is for personnel protection.

5.1.1.2 Preparation of samples

5.1.1.2.1 Cleaning

a. The supplier shall perform on the samples the same cleaning and other treatment as those performed on the materials to be incorporated into the spacecraft.

b. The supplier should not carry out further cleaning or treatment.

5.1.1.2.2 Handling, storage and environmental conditions

a. The supplier shall avoid contamination of the sample during handling.

NOTE This can be achieved by the use of, for instance, suitable protective gloves.

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b. In addition, the supplier shall store and handle samples in a cleanliness-controlled area with an ambient temperature of (22 ± 3) °C and relative humidity of (55 ± 10) %.

NOTE 1 This can be achieved either in a conditioning room, or by the use of desiccators filled with silica gel or a saturated salt solution.

NOTE 2 A saturated salt solution of calcium nitrate gives approximately 51 % humidity at the testing temperature.

c. The supplier shall shield coated surfaces from contact by using polyethylene or polypropylene bags or sheets.

d. The supplier shall avoid mechanical damage in the standard way by packing the polyethylene- or polypropylene-wrapped test pieces in clean, dust- and lint-free material.

e. The supplier shall label limited-life material with its relative shelf-life and date of manufacture, or date of delivery if date of manufacture is not known.

5.1.1.2.3 Identification

a. For materials submitted for testing, the supplier shall provide a description of at least the name and nature of the material or processing.

5.1.1.3 Facilities

5.1.1.3.1 Cleanliness

a. The work area shall be clean and free of dust.

b. The supplier shall filter the air used for ventilation to prevent contamination of the workpieces by moisture, oil or dust.

5.1.1.3.2 Special utilities

a. The supplier shall use oxygen and nitrogen supplies with minimum purity of 99,9 %.

5.1.2 Test methods

5.1.2.1 Categories

a. The customer shall specify the choice of the screening test method within the business agreement.

b. Materials failing to meet the requirements of the applicable screening test shall be subject to testing in configuration.

c. Materials which fail the testing in configuration shall be subject to a deviation request.

d. The supplier shall obtain customer approval on a case by case basis where additional tests are identified.

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5.1.2.2 Screening Test 1: Upward propagation test

5.1.2.2.1 General

a. The supplier shall follow the test described in clause 5.1.2.5 if the materials are unavailable in the standard format.

5.1.2.2.2 Preparation of specimen

a. The specimen shall be free of cuts, abrasions and other flaws as determined by close visual inspection.

b. The supplier shall test films, fabrics, sheets and composites in the "as received" condition with samples in the form of rectangles 300 mm x 64 mm minimum.

c. The supplier shall test foams and high-bulk materials in the "as applied" thickness with samples in the form of rectangles 300 mm x 64 mm minimum.

d. The supplier shall apply primers, coating materials, paints and pressure-sensitive tapes on the substrate materials intended for use, if known:

e. The coatings shall be applied in a thickness equivalent to normal use and post-cured in accordance with prescribed manufacturing processes.

f. If the spacecraft substrate is not available, the coatings shall be applied to 300 mm x 60 mm x 0,075 mm aluminium panels.

g. The supplier shall condition the test specimens at (22 ± 3) °C and (55 ± 10) % relative humidity for 24 hours before testing.

5.1.2.2.3 Test conditions: pressures and atmosphere

a. The test pressure and atmosphere to represent the most hazardous atmosphere anticipated in the spacecraft shall be specified.

5.1.2.2.4 Test equipment and apparatus - chamber

a. The test chamber shall have a minimum volume of 250 l.

b. A window or viewing port for visual observation and recording shall be included.

c. Internal lighting shall be installed.

d. Feed-throughs shall be available for gas inlets, evacuation, venting to air, and electricity for ignition.

e. The supplier shall confirm that the outgassing rates of the organic materials used in the construction of the chamber are acceptable.

5.1.2.2.5 Test equipment and apparatus - pressure gauge

a. Apparatus shall include a pressure gauge capable of measuring pressures to an accuracy of 10 hPa.

5.1.2.2.6 Test equipment and apparatus – sample holder

a. Samples shall be supported in a frame which holds them taut.

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