SLOVENSKI STANDARD
SIST EN 14100:2004

01-maj-2004

Space product assurance - The determination of offgassing products from materials and assembled articles to be used in a manned space vehicle crew compartment

Space product assurance - The determination of offgassing products from materials and assembled articles to be used in a manned space vehicle crew compartment

Raumfahrtproduktsicherung - Bestimmung der Abgabe von Fremdstoffen durch Werkstoffe und Bauteile im Mannschaftsraum von Raumfahrzeugen

Assurance produit des projets spatiaux - Détermination des produits de dégazage sous atmosphere pour les matériaux et éléments assemblés utilisés dans le poste d'équipage du satellite habité

Ta slovenski standard je istoveten z: **EN 14100:2001**

ICS:

49.140	Vesoljski sistemi in operacije	Space systems and operations

SIST EN 14100:2004 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14100

October 2001

ICS 49.140

English version

Space product assurance - The determination of offgassing products from materials and assembled articles to be used in a manned space vehicle crew compartment

This European Standard was approved by CEN on 28 September 2001.

CEN 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 Management Centre or to any CEN 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 CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 14100:2001 E

Contents

Foreword

This European Standard has been prepared by CMC.

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 April 2002, and conflicting national standards shall be withdrawn at the latest by April 2002.

It is based on a previous version[1)] prepared by the ECSS Product Assurance Standards Working Group, reviewed by the ECSS Technical Panel and approved by the ECSS Steering Board. The European Cooperation for Space Standardization (ECSS) is a cooperative effort of the European Space Agency, National Space Agencies and European industry associations for the purpose of developing and maintaining common standards.

Requirements in this Standard are defined in terms of what shall be accomplished, rather than in terms of how to organize and perform the necessary work. This allows existing organizational structures and methods to be applied where they are effective, and for the structures and methods to evolve as necessary without rewriting the standards.

The formulation of this Standard takes into account the existing ISO 9000 family of documents.

Annexes A and B are informative.

This standard includes a Bibliography.

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.

Introduction

All non-metallic materials release trace contaminants into the surrounding environment; the extent to which this occurs is dependent on the nature of the material concerned. In the closed environment of a manned spacecraft, contaminants within the atmosphere are potentially dangerous with respect to toxicity and its consequences for the safety of the crew.

[1)] ECSS-Q-70-29A.

1 Scope

This European Standard defines a test procedure for the determination of the release of trace contaminants by non-metallic materials under a set of closely controlled conditions. The test procedure covers both individual materials and assembled articles.

This Standard describes a test to provide data for aid in the evaluation of the suitability of assembled articles and materials for use in a space vehicle crew compartment. The data obtained are in respect of the nature and quantity of organic and inorganic volatile contaminants evolved when subjected to the crew compartment environment.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13701, *Space systems - Glossary of terms.*

ECSS-Q-20A, *Space product assurance — Quality assurance.*

ECSS-Q-70A, *Space product assurance — Materials, mechanical parts and processes.*

EN 14097, —[2)], *Space product assurance — Nonconformance control system.*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13701, ECSS-Q-70 and the following terms and definitions apply.

3.1.1
assembled article
any component "black box" or assembly of components which represents the article to be used in a spacecraft

3.1.2
experiment
item designed and built to accomplish a specific purpose which can be disassembled and retain its capabilities after re-assembly

3.1.3
rack
structure where different experiments will take place during a manned mission

3.1.4
offgassing
evolution of gaseous products from an assembled article subjected to slight radiant heat in the specified test atmosphere

[2)] To be published.

3.1.5
offgassed product
organic or inorganic gaseous compound evolved from a material or assembled article or experiment or rack

3.1.6
SMAC (Spacecraft Maximum Allowable Concentration)
maximum concentration of a volatile offgassed product that is allowed in the spacecraft atmosphere for a specified flight duration

3.1.7
toxic hazard index (T)
T value is determined by calculating the ratio of the projected concentration of each offgassed product to its SMAC value and summing the ratios for all offgassed products without separation into toxicological categories

3.2 Abbreviated terms

The following abbreviated terms are defined and used within this European Standard.

Abbreviation	Meaning
C	Concentration expressed in $\mu g/m^3$
C_1	Concentration expressed in parts per million
$CI^{\pm}$	Chemical Ionization
EI	Electron Ionization
eV	Electron volt
GC	Gas-Chromatograph
MS	Mass-Spectrometer
MWt	Molecular weight
m/z	Ratio Mass to electron
SMAC	Spacecraft Maximum Allowable Concentration
T	Toxic hazard index

NOTE For $\mu g/m^3$, the conversion to parts per million is done, using the formula given in annex A.

4 Test procedure

4.1 Preparatory conditions

4.1.1 Test specimen preparation

4.1.1.1 Materials

All the materials to be tested shall be classified into one of three categories: surface, volume or weight.

a) Samples based on surface

1) This category is defined as all those materials that are essentially two dimensional. This shall include films, fabrics, coatings, finishes, inks, primers, adhesives, thin film lubricants, tapes and electrical insulating materials.

2) The sample tested shall have a surface of (300 ± 10) cm^2/l of test chamber. For instance coatings and finishes shall be coated on a clean aluminium substrate. Material thickness, curing process and method of application shall be in accordance with the manufacturer's recommendations. Material may be coated on both sides of the aluminium panel. In all cases, only the outer surfaces of a material on the aluminium panel is counted in the surface area determinations. Films, fabrics and similar materials shall be cut to give (300 ± 10) cm^2 surface. Because these materials are two surfaced in use, both the top and bottom surface shall be counted in determining total surface area. Heat shrinkable tubing or boots shall be applied and shrunk to simulate actual use configuration.

b) Samples based on volume

1) This category is defined as all those materials having a definite volume but having a large real surface area due to surface convolutions or matting. These shall include foams and other blown or foamed materials and insulating padding.

2) Samples of these materials shall be cut to a thickness of (1,25 ± 0,2) cm unless the existing thickness is less than 1,25 cm. In this case, the existing thickness shall be used. The material shall be cut to such a size as to give (50 ± 5) cm^2 of total apparent surface per litre of test container volume. All surfaces, tops, bottoms and sides shall be used to compute total surface area. In case where the natural thickness is such that the material cut would be too large to be placed into the container, two or more pieces may be cut as long as the total surface area requirement is met.

c) Samples based on weight

1) This category is defined as all those materials having a definite bulk and not falling into the volume classification. This shall include potting compounds, moulding compounds, cast of formed objects, solid wires and thick plastics.

2) The samples shall be used as much as possible in the supplied configuration and cut to give (5,0 ± 0,25) g/l of test chamber volume. Potted or moulded materials shall be prepared and cut to weight.

4.1.1.2 Assembled articles

Articles shall be tested in the "as received" condition. A full description of material identification and location shall be provided with each article.

The offgassing test shall be performed in a passive mode (without power).

4.1.1.3 Racks

Racks shall be tested in the context of their specific requirements, in relation to e.g. safety, non-degradation of equipments or vacuum resistance.

The offgassing test shall be performed in a passive mode (without power).

4.1.2 Cleaning

The cleaning and other treatment of the test article shall be the same as that to which the sample is submitted before integration into the spacecraft.

4.1.3 Identification

Materials submitted for testing shall be accompanied by a completed materials identification, with technical specifications, expected degradation during the test, cure and post-cure noted. For assembled articles and racks see 4.1.1.2 and 4.1.1.3 above.

4.2 Test facility

4.2.1 General

The basic equipment for the performance of this test shall consist of a sealed test chamber, a sampling capability and the analytical equipment.

4.2.2 Test chamber

The test chamber shall be of the hermetically sealable type and shall be of a sufficient size so that the material or assembled article can be adequately contained, by using the volume of the specimen equivalent to 1/3 of the test chamber. It should not be considerably larger than the article under test in order to avoid over-dilution of the offgassed products in the test chamber. It shall be constructed of materials that do not offgass under the most severe conditions.

The test chamber shall be easily accessible for any required cleaning operation and shall allow full visibility of the sample under test. In order to facilitate the process of chamber cleaning, the chamber should have the capability to be evacuated to a pressure of 1,3 Pa or less, otherwise a facility shall be included whereby the chamber can be purged with a suitable chamber heater, either internal or external, with an upper temperature limit of not less than 80 °C. Suitable feed-through connections shall be fitted to the chamber so that the temperature at various points on the article or rack may be measured. Heatable gas line connections shall be included for sampling of the test atmosphere.

The temperature control system shall be capable of maintaining the temperature in the test chamber uniformly within ± 2 °C of the designated test temperature. The test chamber instrumentation shall have the capability to continuously record the temperature.

The test chamber shall be equipped with an internal fan for the correct mixing of the test atmosphere.

A pressure gauge such as a Bourdon manometer shall be incorporated such that the test pressure can be measured to an accuracy of ± 1 300 Pa.

4.2.3 Sampling equipment

The sampling equipment shall consist of two basic types. The first of these is direct atmosphere sampling using suitable containers of accurately known volume (such as chromatograph gas sampling loops and evacuated glass chamber) for subsequent direct gas analysis. The second is dynamic atmosphere sampling performed by passing a known volume of the test atmosphere through an enrichment device (such as a pre-concentration absorption trap and a cool empty loop). Additional sampling devices may be included such as specific gas monitoring equipment.

The sampling volume extracted should not exceed 25 % of the total volume of the facility.