



SLOVENSKI STANDARD
SIST EN 16602-70-01:2015
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Zagotavljanje varnih proizvodov v vesoljski tehniki - Čistoča in kontrola onesnaženosti

Space product assurance - Cleanliness and contamination control

Raumfahrtproduktsicherung - Reinheit und Verunreinigungskontrolle

Assurance produit des projets spatiaux - Contrôle de la propreté et de la contamination

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Space product assurance - Cleanliness and contamination control

Assurance produit des projets spatiaux - Contrôle de la propreté et de la contamination

Raumfahrtproduktsicherung - Reinheit und Verunreinigungskontrolle

This European Standard was approved by CEN on 13 March 2014.

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Foreword

This document (EN 16602-70-01:2014) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN.

This standard (EN 16602-70-01:2014) originates from ECSS-Q-ST-70-01C.

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of an identical text or by endorsement, at the latest by April 2015, and conflicting national standards shall be withdrawn at the latest by April 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document has been developed to cover specifically space systems and has therefore precedence over any EN covering the same scope but with a wider domain of applicability (e.g. aerospace).

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The objective of this Standard is to ensure a successful mission by the definition of acceptable contamination levels for space system elements, their achievement, and maintenance, throughout

- performance assessment versus contamination,
- facilities and tools definition for contamination control and monitoring,
- materials and processes selection, and
- planning of activities.

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1

Scope

The purpose of this standard is to define:

- The selection of critical items, the definition of cleanliness requirements to satisfy the mission performance requirements and control the levels to be met by personnel, items, facilities and operations of space projects.
- The management, including organization, reviews and audits, acceptance status and documentation control.

It covers design, development, production, testing, operation of space products, launch and mission.

In this standard are also guidelines given for identification of possible failures and malfunctions due to contamination and guidelines for achieving and maintaining the required cleanliness levels during ground activities, launch and mission.

This Standard applies to all types and combinations of projects, organizations and products, and during all the project phases, except manned missions.

It also applies to those ground systems that have a hardware interface to space systems, such as MGSE integration stands.

This Standard does not address magnetic, electrical or electrostatic cleanliness.

This Standard does not address completely biocontamination aspects. However, references to relevant ECSS standards are provided.

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

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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 16602-20	ECSS-Q-ST-20	Space product assurance – Quality assurance
EN 16602-20-07	ECSS-Q-ST-20-07	Space product assurance – Quality assurance for test centres
EN 16602-70	ECSS-Q-ST-70	Space product assurance – Materials, mechanical parts and processes
EN 16602-70-02	ECSS-Q-ST-70-02	Space product assurance – Thermal vacuum outgassing test for the screening of space materials
EN 16602-70-29	ECSS-Q-ST-70-29	Space product assurance – Determination of offgassing products from materials and assembled articles to used in manned space vehicle crew compartment
EN 16602-70-50	ECSS-Q-ST-70-50	Space product assurance – Particle contamination monitoring for spacecraft systems and cleanrooms
EN 16602-70-53	ECSS-Q-ST-70-53	Space product assurance – Material and hardware compatibility test for sterilization processes
EN 16602-70-55	ECSS-Q-ST-70-55	Space product assurance – Microbial examination of flight hardware and cleanrooms
EN 16602-70-58	ECSS-Q-ST-70-58	Space product assurance – Bioburden control of cleanrooms
	ISO 14644	Cleanrooms and associated controlled environments
	IEST-STD-CC1246D	Product cleanliness levels and contamination control program

Terms, definitions and abbreviated terms

3.1 Terms from other standards

For the purpose of this Standard, the terms and definitions from ECSS-ST-00-01 and ECSS-Q-ST-70 apply.

3.2 Terms specific to the present standard

3.2.1 airborne particle

particle suspended in air

3.2.2 airborne particle cleanliness class

level of cleanliness specified by the maximum allowable number of particles per cubic metre (or cubic foot) of air

3.2.3 bakeout

activity of increasing the temperature of hardware to accelerate its outgassing rates with the intent of reducing the content of molecular contaminants within the hardware

NOTE Bakeout is usually performed in a vacuum environment, but can be done in a controlled atmosphere.

3.2.4 biocontamination

contamination of materials, devices, individuals, surfaces, liquids, gases or air with viable particles

[ISO 14698-1:2003, 3.1.4] [ISO 14698-2:2003, 3.4]

3.2.5 cleaning

actions to reduce the contamination level

3.2.6 cleanliness (contamination) control

any organized action to control the level of contamination

3.2.7 cleanliness level

quantitative level of contamination

3.2.8 cleanliness verification

activity intended to verify that the actual cleanliness conditions of the space system, the cleanrooms or the vacuum chambers are in conformance with the applicable specifications and other cleanliness requirements

3.2.9 cleanroom

room in which the concentration of airborne particles is controlled, and which is constructed and used in a manner to minimize the introduction, generation and retention of particles inside the room, and in which other relevant parameters, e.g. temperature, humidity and pressure, are controlled as necessary

[ISO 14644-6]

3.2.10 clean zone

dedicated space in which the concentration of airborne particles is controlled, and which is constructed and used in a manner to minimize the introduction, generation and retention of particles inside the room, and in which other relevant parameters, e.g. temperature, humidity and pressure, are controlled as necessary

[ISO 14644-6]

NOTE This zone can be open or enclosed and can or can not be located within a cleanroom.

3.2.11 contaminant

any unwanted molecular or particulate matter (including microbiological matter) on the surface or in the environment of interest, that can affect or degrade the relevant performance or life time

3.2.12 contaminate, to

act of introducing any contaminant

3.2.13 contamination budget

permissible contamination levels defined at different stages of the life of the instrument and satellite

3.2.14 contamination potential

potential amount of contaminant in the source which can produce contamination

3.2.15 controlled area

environmentally controlled area, operated as a cleanroom, with two pre-filter stages but without the final stage of HEPA (or better) filters used in cleanrooms

3.2.16 fibre

particle with a length to diameter ratio of 10 or more

3.2.17 FTIR spectrometer

analyser (chemical identification) of organic and inorganic contamination using infrared wavelengths

3.2.18 HEPA particle filter

throwaway, extended-medium, dry type filter in a rigid frame that has a minimum particle-collection efficiency of 99,97 % (that is a maximum particle penetration of 0,03 %) for 0,3 μm thermally generated DOP or specified alternative aerosol

3.2.19 induced contaminant environment

environment created by the presence of contaminating items

3.2.20 molecular contamination

airborne or surface contamination (vapour, gas, liquid, or solid) without observable dimensions (i.e. with dimensions at molecular level)

3.2.21 monitoring

to perform routine, quantitative measurements of environmental parameters in and around cleanrooms, clean zones, and other clean areas, including contamination parameters

3.2.22 non-volatile residue (NVR)

quantity of residual soluble, suspended, and particulate matter remaining after the controlled evaporation of a volatile liquid at a specified temperature

3.2.23 obscuration factor (OF)

ratio of the projected area of all particles to the total surface area on which they rest

3.2.24 offgassing

evolution of gaseous products from a liquid or solid material into an atmosphere

3.2.25 outgassed quantity

total quantity of outgassed species expressed as a mass (e.g. gram or percent of the initial specimen) or as pressure \times volume (e.g. hPa \times m³)

3.2.26 outgassing

evolution of gaseous species from a material, usually in vacuum

NOTE Outgassing also occurs in a higher-pressure environment.

3.2.27 particle

unit of matter with observable length, width and thickness

3.2.28 particle fallout

accumulated deposit of particulate matter on a surface

3.2.29 particle size

apparent maximum linear dimension of a particle in the plane of observation as observed with an optical microscope, or the equivalent diameter of a particle detected by automatic instrumentation

NOTE The equivalent diameter is the diameter of a reference sphere having known properties and producing the same response in the sensing instrument as the particle being measured.

3.2.30 particulate

of or relating to minute separate particles

3.2.31 particulate contamination (PAC)

airborne or surface contamination due to particles

3.2.32 plume

exhaust (molecules or particles) of thrusters and engines

3.2.33 purging

supply of clean gas to protect the critical hardware from contamination

3.2.34 quartz crystal microbalance (QCM)

device for measuring small quantities of mass deposited on a quartz crystal using the properties of a crystal oscillator

3.2.35 ram direction

in the direction of velocity vector

3.2.36 sensitive item

item whose contamination may affect its performance or life time

3.2.37 ULPA particle filter

throwaway, extended-medium, dry-type filter in a rigid frame that has a minimum particle-collection efficiency of 99,999 % (that is, a maximum particle penetration of 0,001 %) for particles in the size range of 0,1 μm to 0,2 μm

3.2.38 venting

conveying unwanted gaseous products through an aperture

3.2.39 visibly clean

absence of surface contamination when examined with a specific light source, angle of incidence and viewing distance using normal or magnified vision

3.2.40 wake direction

direction opposite to the velocity vector