SLOVENSKI STANDARD
SIST EN 16602-70-71:2016

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Zagotavljanje varnih proizvodov v vesoljski tehniki - Materiali, procesi in podatki za njihovo izbiro

Space product assurance - Materials, processs and their data selection

Raumfahrtproduktsicherung - Werkstoffe, Prozesse und Angaben zu ihrer Auswahl

Assurance produit des projets spatiaux - Matériaux, procédés et les données pour leur sélection

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Space product assurance - Materials, processes and their data selection

Assurance produit des projets spatiaux - Matériaux, procédés et les données pour leur sélection

Raumfahrtproduktsicherung - Werkstoffe, Prozesse und Angaben zu ihrer Auswahl

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European Foreword

This document (EN 16602-70-71:2016) has been prepared by Technical Committee CEN-CENELEC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16602-70-71:2016) originates from ECSS-Q-ST-70-71C.

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of an identical text or by endorsement, at the latest by February 2017, and conflicting national standards shall be withdrawn at the latest by February 2017.

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.

1
Scope

This Standard specifies the requirements applicable to materials, processes and their data selection to satisfy the mission performance requirements.

This Standard covers the following:

- selection criteria and rules;
- utilization criteria and rules.

The provisions of this Standard apply to all actors involved at all levels in the production of space systems. These can include manned and unmanned spacecraft, launchers, satellites, payloads, experiments, electrical ground support equipment, mechanical ground support equipment, and their corresponding organizations.

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

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 revisions 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 most 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 16603-20-06	ECSS-E-ST-20-06	Space engineering - Spacecraft charging
EN 16603-32-08	ECSS-E-ST-32-08	Space engineering - Materials
EN 16602-20	ECSS-Q-ST-20	Space product assurance - Quality assurance
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 16602-70-04	ECSS-Q-ST-70-04	Space product assurance - Thermal testing for the evaluation of space materials, processes, mechanical parts and assemblies
EN 16602-70-07	ECSS-Q-ST-70-07	Space product assurance - Verification and approval of automatic machine wave soldering
EN 16602-70-08	ECSS-Q-ST-70-08	Space product assurance - Manual soldering of high-reliability electrical connections
EN 16602-70-10	ECSS-Q-ST-70-10	Space product assurance - Qualification of printed circuit boards
EN 16602-70-11	ECSS-Q-ST-70-11	Space product assurance - Procurement of printed circuit boards
EN 16602-70-12	ECSS-Q-ST-70-12	Space product assurance - Design rules for printed circuit boards
EN 16602-70-18	ECSS-Q-ST-70-18	Space product assurance - Preparation, assembly and mounting of RF coaxial cables
EN 16602-70-26	ECSS-Q-ST-70-26	Space product assurance - Crimping of high-reliability electrical connections

EN 16602-70-28	ECSS-Q-ST-70-28	Space product assurance - Repair and modification of printed circuits board assemblies for space use
EN 16602-70-30	ECSS-Q-ST-70-30	Space product assurance - Wire wrapping of high-reliability electrical connections
EN 16602-70-31	ECSS-Q-ST-70-31	Space product assurance - Application of paints on flight hardware
EN 16602-70-38	ECSS-Q-ST-70-38	Space product assurance - High-reliability soldering for surface-mount and mixed technology
EN 16602-70-39	ECSS-Q-ST-70-39	Space product assurance - Processing and quality assurance requirements for welding of metallic materials for flight hardware
	ESCC 3901	Generic specification - Wires and cables, electrical, 600V, low frequency
	ESCC 3902	Generic specification - Cables, coaxial, radio frequency, flexible
	ESCC 3903	Generic specification - Solid wires, electrical 350 V, for wire wrapping

3
Terms, definitions and abbreviated terms

3.1 Terms from other standards

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

1. assembly
2. component
3. corrosion
4. lot
5. material
6. part
7. process
8. relifing
9. repair

b. For the purpose of this Standard, the terms and definitions from ECSS-E-ST-32 apply, in particular for the following terms:

1. A-basis design allowable (A-value)
2. B-basis design allowable (B-value)

3.2 Terms specific to the present standard

3.2.1. plate

form of material having a thickness of >6 mm

3.2.2. sheet

form of material having a thickness >0,2 mm and <6 mm

3.2.3. foil

form of material having a thickness <0,2 mm

3.2.4. thick coatings

coating with such a thickness that the properties of the substrate do not significantly influence the coating properties

NOTE A thick homogeneous coating can be as such treated as if it were effectively a bulk material. The thickness is generally above approximately 125 μm.

3.2.5. debubbling

removal of bubbles performed by low pressure process between the coating line and the coating stand

NOTE The pressure can be high enough not to cause boiling. The low-pressure causes the bubbles to expand and thus rise faster.

3.2.6. unstabilized stainless steel

steels from the 300 series which do not contain Titanium or Niobium as a stabilizing element against the formation of iron-carbides

NOTE The iron-carbide formation is also called sensitization and occurs during prolonged heating at temperatures above 370 °C. Iron-carbide formation can also be avoided using lower carbon grades.

3.2.7. exfoliation

corrosion that proceeds along planes parallel to the surface, generally at grain boundaries, forming corrosion products that create a wedging stress, giving rise to a layered appearance

NOTE This form of corrosion is associated with a marked directionality of the grain structure. Applied stresses are not necessary for exfoliation to occur. However, in alloys susceptible to stress corrosion cracking, the corrosion product wedging action undoubtedly contributes to the propagation of the exfoliation attack. It is important to note that some alloys not susceptible to stress corrosion cracking can suffer exfoliation corrosion. However, if the grain structure is equiaxed, exfoliation corrosion does not usually occur .

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
ATOX	atomic oxygen
EDM	electro discharge machining

Abbreviation	Meaning
ESMDB	European Space Materials Database
DPL	declared parts list
GOX	gaseous oxygen
KIc	fracture toughness
KIscc	stress-corrosion cracking threshold stress intensity factor
LOX	liquid oxygen
MMPDS	metallic materials properties development and standardization
MPCB	materials and processes control board
NDI	non-destructive inspection
PTFE	polytetrafluroethylene
SCC	stress-corrosion cracking
UTS	ultimate tensile strength

3.4 Nomenclature

The following nomenclature applies throughout this document:

a. The word “shall” is used in this Standard to express requirements. All the requirements are expressed with the word “shall”.

b. The word “should” is used in this Standard to express recommendations. All the recommendations are expressed with the word “should”.

NOTE It is expected that, during tailoring, recommendations in this document are either converted into requirements or tailored out.

c. The words “may” and “need not” are used in this Standard to express positive and negative permissions, respectively. All the positive permissions are expressed with the word “may”. All the negative permissions are expressed with the words “need not”.

d. The word “can” is used in this Standard to express capabilities or possibilities, and therefore, if not accompanied by one of the previous words, it implies descriptive text.

NOTE In ECSS “may” and “can” have completely different meanings: “may” is normative (permission), and “can” is descriptive.

e. The present and past tenses are used in this Standard to express statements of fact, and therefore they imply descriptive text.

4
Specific requirements

4.1 Overview

This Standard applies together with the ECSS-Q-ST-70.

NOTE Annex A provides information about the European Space Materials Database (ESMDB).

4.2 Material requirements

4.2.1 General requirements

a. Design stresses shall include all residual stresses including those coming from manufacturing and assembly processes.

b. Alloys, heat treatments and coatings which minimize susceptibility to general corrosion, pitting, intergranular and stress corrosion cracking shall be used.

4.2.2 Aluminium and aluminium alloys

a. Wrought heat-treatable products shall be mechanically stress relieved.

NOTE For example in TX5X or TX5XX tempers.

b. Wrought alloys 5456, 5083 and 5086 shall be used only in controlled tempers for resistance to SCC and exfoliation.

NOTE Examples of controlled tempers are H111, H112, H116, H117, H323, H343.

c. Long-term manned structures, shall not use aluminium alloys 2024-T6, 7079-T6 and 7178-T6 in structural applications.

d. Black anodising shall not be used on 2000 and 7000 series of Aluminium Alloys.

NOTE The black anodizing of metals is covered by ECSS-Q-ST-70-03.

e. Long-term manned structures, shall not use aluminium alloys 5083-H32, 5083-H38, 5086-H34, 5086-H38, 5456-H32 and 5456-H38 in applications where the temperature exceeds 66 °C.