SLOVENSKI STANDARD
oSIST prEN 16602-70-17:2018

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Zagotavljanje kakovosti proizvodov v vesoljski tehniki - Preskušanje trajnosti prevlek in površinske apreture

Space product assurance - Durability testing of coatings and surface finishes

Raumfahrtproduktsicherung - Dauerhaftigkeitsprüfung von Beschichtungen und Oberflächenbehandlungen

Ta slovenski standard je istoveten z: **prEN 16602-70-17**

ICS:

03.120.99	Drugi standardi v zvezi s kakovostjo	Other standards related to quality
49.040	Prevleke in z njimi povezani postopki, ki se uporabljajo v letalski in vesoljski industriji	Coatings and related processes used in aerospace industry
49.140	Vesoljski sistemi in operacije	Space systems and operations

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EUROPEAN STANDARD

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English version

Space product assurance - Durability testing of coatings and surface finishes

Raumfahrtproduktsicherung - Dauerhaftigkeitsprüfung von Beschichtungen und Oberflächenbehandlungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/CLC/JTC 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.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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European Foreword

This document (prEN 16602-70-17:2018) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN (Germany).

This document (prEN 16602-70-17:2018) originates from ECSS-Q-ST-70-17C DIR1.

This document is currently submitted to the CEN ENQUIRY.

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).

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

Introduction

Many different environmental factors can have an effect on coating durability for space applications. This includes in-orbit effects such as thermal cycling and particle radiation, as well as ground based effects such as cleaning, contamination and humidity. Space projects have typically been free to choose their own test requirements, based on a combination of existing standards and specific requirements for a given project. This approach can lead to ambiguous definitions about when a coating is “space qualified”. The supplier and customer often re-negotiate very general aspects of coating qualification for each new project. The intention of the present standard is to capture the best practice across the large range of existing national and international standards, in order to specify a minimum set of durability requirements for coating use in space applications. Information is also provided about some mission specific tests (including the atomic oxygen test, thermal ageing test, air-vacuum test and solar illumination test).

1 Scope

This standard specifies requirements for the durability testing of coatings most commonly used for space applications, i.e.:

- Thin film optical coatings
- Thermo-optical and thermal control coatings (the majority are paints, metallic deposits and coatings for stray light reduction)
- Metallic coatings for other applications (RF, electrical, corrosion protection)

This standard covers testing for both ground and in-orbit phases of a space mission, mainly for satellite applications.

This standard applies to coatings within off the shelf items

This standard specifies the types of test to be performed for each class of coating, covering the different phases of a space project (evaluation, qualification and acceptance)

This standard does not cover:

- The particular qualification requirements for a specific mission
- Specific applications of coatings for launchers (e.g. high temperature coatings)
- Specific functional testing requirements for the different coating classes
- Test requirements for long term storage
- Solar cell cover glass coatings
- Surface treatments and conformal coatings applied on EEE parts

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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 16603-10-13	ECSS-E-ST-10-12	Space engineering – Method for the calculation of radiation received and its effects, and a policy for design margins
EN 16602-70-03	ECSS-Q-ST-70-03	Space product assurance- Black anodizing of metals with inorganic dyes
EN 16602-70-31	ECSS-Q-ST-70-31	Space product assurance- Application of paints and coatings on space hardware
EN 16602-70-71	ECSS-Q-ST-70-71	Space product assurance –Materials, Processes and their data selection
	ISO 9211-4:2012	Optics and photonics – optical coatings. Part 4: Specific test methods
	ISO 2409:2013	Paints and varnishes: Cross cut test
	ISO 4524-5:1985	Metallic coatings – test methods for electrodeposited gold and gold alloy coatings – part 5: adhesion tests first edition
	ISO 3696:1987	Water for analytical laboratory use— Specification and test methods
	ASTM B571-97(2013)	Standard practice for qualitative adhesion testing of metallic coatings
	ASTM D1193-06(2011)	Standard specification for reagent water

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 term:

   1. **qualification**

b. For the purpose of this Standard, the terms and definitions from ECSS-E-ST-10-12 apply, in particular for the following terms:

   1. **total ionising dose (TID)**
   2. **total non-ionising dose (TNID)**

3.2 Terms specific to the present standard

3.2.1 coating lot

set of substrates to which a coating is applied at the same time in the same machine

NOTE Can also be called “coating run” or “coating batch”.

3.2.2 sample repair

localised re-application of a coating using a brush

NOTE For example on paints.

3.2.3 sample de-treat or re-treat

complete removal and re-application of a coating onto an existing substrate

3.3 Abbreviated terms

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

Abbreviation	Meaning
ESD	electrostatic discharge

Abbreviation	Meaning
ID	identification
IPA	isopropylalcohol
ITO	indium tin oxide
LID	laser induced damage
LIC	laser induced contamination
MEK	methyl ethyl ketone
NC	nonconformance
QA	quality assurance
RF	radio frequency
TCC	thermal control coatings
TID	total ionising dose
TNID	total non-ionising dose
TRL	technology readiness level
UV	ultraviolet
VUV	vacuum ultraviolet

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
Principles

4.1 General test approach

This standard gives a minimum set of tests to validate the coating process and also to give some meaningful results about exposure of the coating in its operating environment. However, full qualification of the coating for a specific space mission depends on the mission parameters, and can be also necessary to define additional tests which are beyond the scope of the standard.

The practical severity of any test listed can be limited by the substrate.

The tests are subdivided into degrees of severity, where appropriate. The standard gives condensed specification about the test method only. The full test procedure can be taken from appropriate international standards, or can be specified by mutual agreement between customer and supplier.

An individual test performed on a one-test-on-one-sample basis can give information about that single property of a coating reflected by that test and can be particularly useful for the supplier. In reality, coatings face a variety and range of severity of environmental exposures, and this is simulated by certain test sequences. Inevitably, such test sequences represent accumulative requirements.

4.2 Categories of use

For the space applications covered by this standard, the on-ground environment for all coatings is generally the same. The coatings are exposed only to a controlled environment (e.g. inside a cleanroom) and the coatings can be subjected to mild abrasion such as occurs with carefully controlled cleaning.

In-orbit, the following categories of use are specified in order to determine the severity of testing:

- Category A: Coating is within a sealed, pressurised unit
- Category B: Coating is exposed to vacuum but shielded inside spacecraft
- Category C: Coating is exposed to vacuum with view to space