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Entwurf

**Raumfahrtproduktsicherung –
Dauerhaftigkeitsprüfung von Beschichtungen und
Oberflächenbehandlungen;
Englische Fassung prEN 16602-70-17:2017**

Space product assurance –
Durability testing of coatings and surface finishes;
English version prEN 16602-70-17:2017

Assurance produit des projets spatiaux –
Test de résistance pour les traitements et les finitions de surfaces,
Version anglaise prEN 16602-70-17:2017

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2018-04-27 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

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

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal von DIN unter www.din.de/go/entwuerfe bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter www.entwuerfe.normenbibliothek.de, sofern dort wiedergegeben;
- oder als Datei per E-Mail an nl@din.de möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter www.din.de/go/stellungnahmen-norm-entwuerfe oder für Stellungnahmen zu Norm-Entwürfen der DKE unter www.dke.de/stellungnahme abgerufen werden;
- oder in Papierform an den DIN-Normenausschuss Luft- und Raumfahrt (NL), 10772 Berlin, 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 45 Seiten

DIN-Normenausschuss Luft- und Raumfahrt (NL)

Nationales Vorwort

Dieses Dokument (prEN 16602-70-17:2017) wurde vom Technischen Komitee CEN/CLC/TC 5 „Raumfahrt“ erarbeitet, dessen Sekretariat vom DIN (Deutschland) gehalten wird.

Das zuständige deutsche Normungsgremium ist der Arbeitsausschuss NA 131-06-02 AA „Interoperabilität von Informations-, Kommunikations- und Navigationssystemen“ im DIN-Normenausschuss Luft- und Raumfahrt (NL).

Dieses Dokument (prEN 16602-70-17:2017) basiert auf ECSS-Q-ST-70-17C DIR1.

Dieses Dokument enthält unter Berücksichtigung des DIN-Präsidialbeschlusses 1/2004 nur die englische Originalfassung von pr EN 16602-70-17:2017.

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

Nationaler Anhang NA (informativ)

Begriffe und Abkürzungen

Die Benummerung der folgenden Begriffe und Abkürzungen ist identisch mit der Benummerung in der englischen Fassung.

3.1 Begriffe aus anderen Normen

- a) Für die Anwendung dieser Norm gelten die Begriffe nach ECSS-S-ST-00-01, besonders die folgenden Begriffe:
 - 1) Qualifizierung
- b) Für die Anwendung dieser Norm gelten die Begriffe nach ECSS-E-ST-10-12, besonders die folgenden Begriffe:
 - 1) Gesamtionisationsdosis (TID, en: Total Ionising Dose)
 - 2) nicht-ionisierende Gesamt-Dosis (TNID, en: Total Non-Ionising Dose)

3.2 Für diese Norm spezifische Begriffe

3.2.1

Beschichtungslos

Satz von Substraten, auf die zur gleichen Zeit in der gleichen Maschine eine Beschichtung aufgetragen wird

Anmerkung 1 zum Begriff: Kann auch als „Beschichtungsserie“ oder „Beschichtungscharge“ bezeichnet werden.

3.2.2

Probennachbesserung

lokaler Neuauftrag einer Beschichtung mithilfe eines Pinsels

Anmerkung 1 zum Begriff: Beispielsweise im Fall von Anstrichen.

3.2.3

Probenabtragung oder -neuauftragung

vollständige Entfernung und Neuauftrag einer Beschichtung auf ein bestehendes Substrat

3.3 Abkürzungen

Für die Anwendung dieser Norm gelten die Abkürzungen und Symbole nach ECSS-S-ST-00-01 und die folgenden:

Abkürzung	Bedeutung	
ESD	elektrostatische Entladung	(en: Electrostatic Discharge)
ID	Identifizierung	(en: Identification)
IPA	Isopropylalkohol	(en: Isopropylalcohol)
ITO	Indiumzinnoxid	(en: Indium Tin Oxide)
LID	laserinduzierte Zerstörung	(en: Laser Induced Damage)
LIC	laserinduzierte Kontamination	(en: Laser Induced Contamination)
MEK	Methylethylketon	(en: Methyl Ethyl Ketone)
NC	Nichtkonformität	(en: Non-Conformance)
QA	Qualitätssicherung	(en: Quality Assurance)
HF	Hochfrequenz	(en: Radio Frequency)
TCC	thermische Schutzbeschichtung	(en: Thermal Control Coatings)
TID	Gesamtionisationsdosis	(en: Total Ionising Dose)
TNID	nicht-ionisierende Gesamt-Dosis	(en: Total Non-Ionising Dose)
TRL	Technologie-Reifegrad	(en: Technology Readiness Level)
UV	ultraviolett	(en: ultraviolet)
VUV	vakuumultraviolett	(en: vacuum ultraviolet)

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"Space product assurance - Durability testing of coatings and surface finishes

Raumfahrtproduktsicherung - Haltbarkeitstests/Beständigkeitstests für Beschichtungen und Oberflächenbearbeitung

Assurance produit des projets spatiaux - Test de résistance pour les traitements et les finitions de surfaces

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European Foreword

This document (prEN 16602-70-17:2017) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN (Germany).

This document (prEN 16602-70-17:2017) 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 therefore have precedence over any EN covering the same scope but with a wider domain of applicability (e.g.: aerospace).

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

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

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.