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Zagotavljanje varnih proizvodov v vesoljski tehniki - Zagotavljanje kakovosti

Space product assurance - Quality assurance

Raumfahrtproduktsicherung - Qualitätssicherung

Assurance produit des projets spatiaux - Assurance qualité

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Space product assurance - Quality assurance

Assurance produit des projets spatiaux - Assurance qualité

Raumfahrtproduktsicherung - Qualitätssicherung

This European Standard was approved by CEN on 6 March 2014.

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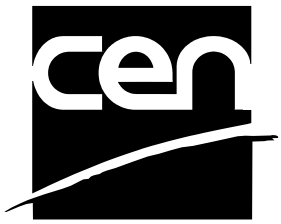

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Foreword

This document (EN 16602-20:2014) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16602-20:2014) originates from ECSS-Q-ST-20C Rev.1.

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of an identical text or by endorsement, at the latest by March 2015, and conflicting national standards shall be withdrawn at the latest by March 2015.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 supersedes EN 13291-2:2003.

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 defines the quality assurance (QA) requirements for the establishment and implementation of a Quality Assurance programme for products of space projects.

Discipline related qualification activities are complemented in standards specific to those disciplines (e.g. ECSS-E-ST-32-01 for fracture control).

For software quality assurance, the software product assurance standard, ECSS-Q-ST-80 is applicable.

This Standard is applicable to all space projects.

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

For the tailoring of this standard the following information is provided:

- A table providing the pre-tailoring per “Product types” in clause 6
- A table providing the pre-tailoring per “Project phase” in Annex J

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 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	ECSS-Q-ST-10	Space product assurance - Product assurance management
EN 16602-10-04	ECSS-Q-ST-10-04	Space product assurance - Critical-item control
EN 16602-10-09	ECSS-Q-ST-10-09	Space product assurance - Nonconformance control system
	EN 61340-5-1 (2007)	Electrostatics - Part 5-1: Protection of electronic devices from electrostatic phenomena - General requirements
	ANSI-ESD S20.20-2007	Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment

3
Terms and definitions

3.1 Terms from other standards

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

nonconformance

process

product assurance

quality assurance

space system

space segment element

space segment sub-system

launch segment element

launch segment sub-system

ground segment element

ground segment sub-system

space segment equipment

launch segment equipment

ground segment equipment

3.2 Terms specific to the present standard

3.2.1 ground support equipment (GSE)

optical, mechanical, fluidic, electrical and software support equipment or systems used for example for calibration, measurements, testing, simulation, transportation, and handling of space segment or of space segment elements

3.2.2 inspectability

ability of an item of being inspected

NOTE Inspectability includes provisions for the followings aspects:

- Definition of inspection including acceptance or rejection criteria, expressed in an unambiguous and quantified manner.
- Part and component accessibility for inspection
- Definition of tolerance methods for dimensional inspection performance (e.g. functional tolerances).

3.2.3 producibility

ability of an item of being producible

NOTE Producibility includes provisions for the following aspects:

- Design simplification and standardization, reduction in part types and part number.
- Guidelines for selection of preferred parts, materials and processes.
- Unambiguous definitions of the requirements and limits to be used.
- Definition of tolerance build-up methods, in order to simplify manufacturing, assembly, inspection.
- Standardization of interfaces.
- Part accessibility for assembly and inspection.
- Definition of design criteria consistent with the capability of manufacturing processes.
- Definition of design methods to ensure that the cleanliness requirements are compatible with the capability of related cleanliness procedures and facilities.

3.2.4 repeatability

ability to reproduce the performance and characteristics of an item

NOTE Repeatability includes provisions for the following aspects:

- Definition of standard tolerances generally applicable.
- Recommended design concepts and solutions to ensure repeatability.
- Recommended manufacturing processes having proven repeatability.
- Design criteria that optimize implementation of automated manufacturing methods, or computer-aided manufacturing

3.2.5 testability

ability of an item of being tested

NOTE Testability includes provisions for the followings aspects:

- Definition of test requirements, including acceptance or rejection criteria, expressed in an unambiguous and quantified manner.
- Part and component accessibility for test.
- Definition of recommended design techniques to facilitate fault detection, identification and location (e.g. test points, modularity, built-in test software, and feedback loops).

3.3 Abbreviated terms and symbols

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

Abbreviation	Meaning
AIV	assembly, integration, verification
BB	breadboard
CI	configuration item
CoC	certificate of conformity
DRB	delivery review board NOTE: DRB is synonymous to "Acceptance Review Board" (ARB) in ECSS-M-ST-10
DRD	document requirements definition
EEE	electrical, electronic, electromechanical
EGSE	electrical ground support equipment
EIDP	end item data package
FGSE	fluidic ground support equipment
FM	flight model
GSE	ground support equipment
MGSE	mechanical ground support equipment
MIP	mandatory inspection point
NCR	nonconformance report
NRB	nonconformance review board
OGSE	optical ground support equipment
PA	product assurance
PM	project manager
QA	quality assurance
QM	qualification model

RFD	request for deviation
RFW	request for waiver
TRB	test review board
TRR	test readiness review
VCB	verification control board
VCD	verification control document

3.4 Nomenclature

The following nomenclature apply 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, all the 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 a complete different meaning: “may” is normative (permission) and “can” is descriptive.

e. The present and past tense are used in this standard to express statement of fact, and therefore they imply descriptive text.

4
Quality assurance principles

4.1 QA management principles

The prime objective of Quality Assurance (QA) management is to ensure that a QA programme for projects covering mission definition, design, development and production of space systems is established, maintained and implemented.

All QA requirements are specified through definition and implementation of adequate methods and procedures.

Personnel whose performance determines or affects product quality are trained and certified in accordance with project needs.

4.2 General principles

The implementation of the following phase-independent activities is ensured by the QA function throughout the lead-time of projects:

- critical-items control
- nonconformance control
- alert management
- stamp control
- traceability
- metrology and calibration
- handling, storage and preservation
- statistical quality control (if required by the business agreement).

4.3 Design and verification principles

The objective of the QA function is to ensure that:

a. a set of design rules and methods has been set up and is consistent with the project techniques and technologies;

b. methods, procedures and tools have been defined and are implemented in order to prove that each applicable requirement is verified through one or more of the following methods: analysis, inspection, test, review of design, audits;

c. the design is producible and repeatable and that the resulting product can be verified and operated within the required operating limits;

d. design and verification activities are planned in a consistent and logical way;

e. the verification process is complete and includes clear test, test model and verification logic;

f. a defined qualification approach is implemented to demonstrate that the item performs satisfactorily in the intended environment.

4.4 Procurement principles

All procurement activities including selection of procurement sources, procurement documents, procurement source surveillance and receiving inspection are controlled to ensure that all procured items and services conform to requirements.

4.5 Manufacturing, assembly and integration principles

All manufacturing, assembly and integration operations are planned and performed in coordination with inspections and tests to ensure that the deliverables are built, assembled and integrated to the approved configuration baseline.

Special processes and new technologies are identified in a timely manner and adequate evaluation or qualification activities should be implemented in line with the overall schedule.

4.6 Testing principles

Test facilities and test equipment are validated prior to their use to ensure conformance to project requirements.

All tests are performed in accordance with documented and released procedures and results are comprehensively recorded.

4.7 Acceptance and delivery principles

The objective is to ensure that an acceptance and delivery process is implemented which allows demonstrating and documenting the conformance of the delivered item.

4.8 GSE principles

Design, production, delivery and maintenance requirements for GSE are defined and implemented allowing for testability, availability, safety, life duration, operability and ability to interface as necessary with space segment in a safe way.