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Space product assurance - Requirements for the use of COTS components

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NATIONAL FOREWORD

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Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 12.08.2015.	Date of Availability of the European standard is 12.08.2015.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

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ICS 49.140

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16602-60-13

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English version

Space product assurance - Requirements for the use of COTS components

Assurance produit des projets spatiaux - Exigences pour l'utilisation de composants commerciaux sur étagère

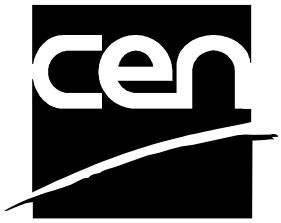
Raumfahrtproduktsicherung - Anforderungen für die Nutzung von COTS-Komponenten

This European Standard was approved by CEN on 16 November 2014.

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European foreword

This document (EN 16602-60-13:2015) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16602-60-13:2015) originates from ECSS-Q-ST-60-13C.

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of an identical text or by endorsement, at the latest by February 2016, and conflicting national standards shall be withdrawn at the latest by February 2016.

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.

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Introduction

This European Standard is based on and complementary to ECSS-Q-ST-60C (with upward revisions). This standard can only be used in conjunction with ECSS-Q-ST-60C in its current revision. This standard applies only to commercial components - as defined in its scope - which meet defined technical parameters that are on the system application level demonstrated to be unachievable with existing space components or only achievable with qualitative and quantitative penalties. The standard requires that qualitative and quantitative penalties are specified, as applicable, as a minimum in terms of quantifiable parameters such as: functional capability, parts count, power dissipation, frequency of operation, data/signal processing efficiency, interconnect complexity, mass, volume, …

For traceability to ECSS-Q-ST-60, the modifications or additions are marked in blue. Text in black colour is unmodified text.

The objective of the EEE component selection, control, procurement and use requirements is to ensure that EEE components used in a space project enables the project to meet its mission requirements.

Important elements of EEE component requirements include:

a. component programme management,
b. component selection, evaluation and approval,
c. procurement,
d. handling and storage,
e. component quality assurance,
f. specific components, and
g. documentation.

The main tools which can be used to reach the objective are:

a. concurrent engineering,
b. standardization of component types,
c. characterization of components,
d. assessment of component manufacturers including declared competencies and processes,
e. testing, screening, lot acceptance and periodic testing,
f. procurement specifications,
g. control and inspection,
h. control of nonconforming materials,
i. assessment and use of existing component data,
j. application of specific control to mitigate risk for components with limited data or confidence, and

k. information management.

The basic approach is as follows:

- The customer of a given space project defines the EEE component requirements within the boundaries of this standard. They appear in the appropriate clauses of the project requirements as defined in ECSS-M-ST-10.
- The supplier defines a component control plan to implement those requirements into a system which enables, for instance, to control the selection, approval, procurement, handling in a schedule compatible with his requirements, and in a cost-efficient way.
- The supplier ensures that the applicable parts requirements are passed down to lower level suppliers and ensure that they are compliant to these parts requirements.

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1 Scope

This standard defines the requirements for selection, control, procurement and usage of EEE commercial components for space projects.

This standard is applicable to commercial encapsulated active monolithic parts (integrated circuits and discrete):

- diodes
- microwave diodes
- integrated circuits
- microwave integrated circuits (MMIC)
- transistors
- microwave transistors

This standard is not applicable to the commercial parts from the following families:

- capacitors
- connectors
- crystals
- filters
- fuses
- heaters
- inductors
- microwave passive parts
- oscillators
- relays
- resistors
- switches
- thermistors
- transformers
- cables & wires
- hybrids
- surface acoustic waves (SAW)
- charge coupled devices (CCD)
- active pixel sensors (APS)

In addition, the following families of EEE components are not addressed by the present ECSS standard but it can be used as guideline and revisited on case/case basis:

- photodiodes
- light emitting diodes (LED)
- phototransistors
- opto-couplers
- laser diodes

In line with ECSS-Q-ST-60, this standard differentiates between three classes of components through three different sets of standardization requirements (clauses) to be met.

The three classes provide for three levels of trade-off between assurance and risk. The highest assurance and lowest risk is provided by class 1 and the lowest assurance and highest risk by class 3. Procurement costs are typically highest for class 1 and lowest for class 3. Mitigation and other engineering measures can decrease the total cost of ownership differences between the three classes. The project objectives, definition and constraints determine which class or classes of components are appropriate to be utilised within the system and subsystems.

a. Class 1 components are described in Clause 4

b. Class 2 components are described in Clause 5

c. Class 3 components are described in Clause 6

Annex G includes a diagram that summarizes the difference between these three classes for evaluation, screening and lot acceptance.

The requirements of this document are applicable to all parties involved at all levels in the integration of EEE commercial components into space segment hardware and launchers.

For easy tailoring and implementation of the requirements into a Requirement Management Tool, and for direct traceability to ECSS-Q-ST-60, requirements in this standards have been written in the way of a ECSS Applicability Requirement Matrix (EARM), as defined in Annex A of ECSS-S-ST-00 “ECSS system – Description, implementation and general requirements”.

This standard may be tailored for the specific characteristics 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 16602-60	ECSS-Q-ST-60	Space product assurance - Electrical, electronic and electromechanical (EEE) components
EN 16602-60-14	ECSS-Q-ST-60-14	Space product assurance - Relifing procedure - EEE components
EN 16602-60-15	ECSS-Q-ST-60-15	Space product assurance – Radiation hardness assurance – EEE components
	ESCC 21300	Terms, definitions, abbreviations, symbols and units
	ESCC 24900	Minimum requirements for controlling environmental contamination of components
	ESCC 25500	Methodology for the detection of pure tin in the external surface finish of case and leads of EEE components
	MIL-STD-750	Test methods for semiconductor devices
	MIL-STD-883	Test method standard microcircuits
	JESD22-A101	Steady state temperature humidity bias life test
	JESD22-A110	Highly accelerated temperature and humidity stress test
	JESD22-A113	Preconditioning of plastic surface mount devices prior to reliability testing
	JESD22-A121	Test Method for Measuring Whisker Growth on Tin and Tin Alloy Surface Finishes
	JESD22-B106	Resistance to soldering temperature for through hole mounted devices
	JESD-201	Environmental Acceptance Requirements for Tin

		Whisker Susceptibility of Tin and Tin Alloy Surface Finishes
	J-STD-020	Moisture/Reflow sensitivity classification for nonhermetic solid state surface mount devices
	J-STD-033	Handling, packing, shipping and use of moisture/ reflow sensitive surface mount devices

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