Space product assurance - Commercial electrical, electronic and electromechanical (EEE) components

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 16602-60-13:2023 sisaldab Euroopa standardi EN 16602-60-13:2023 ingliskeelset teksti.	This Estonian standard EVS-EN 16602-60-13:2023 consists of the English text of the European standard EN 16602-60-13:2023.
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 and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 28.06.2023.	Date of Availability of the European standard is 28.06.2023.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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Space product assurance - Commercial electrical, electronic and electromechanical (EEE) components

Assurance produit des projets spatiaux - Composants électriques, électroniques et électromécaniques (EEE) commerciaux

Raumfahrtproduktsicherung - Kommerzielle Elektrische, elektronische und elektromechanische (EEE) Bauteile

This European Standard was approved by CEN on 30 January 2023.

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European Foreword

This document (EN 16602-60-13:2023) has been prepared by Technical Committee CEN-CENELEC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16602-60-13:2023) originates from ECSS-Q-ST-60-13C Rev.1.

This document will supersede EN 16602-60-13:2015.

The main changes with respect to EN 16602-60-13:2015 are listed below:

- Implementation of Change Requests
- Definition of “traceability information (trace code)” updated”
- Alignment with updated version of ECSS-Q-ST-60

This document has been prepared under a standardization request 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).

Introduction

This standard is based on and complementary to ECSS-Q-ST-60C. It defines the applicability and tailoring of the requirements of ECSS-Q-ST-60C for COTS EEE. 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.

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".

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

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.

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 parts from the following families:

- Ceramic capacitors chips
- Solid electrolyte tantalum capacitors chips
- Discrete parts (transistors, diodes, optocouplers)
- Fuses
- Magnetic parts
- Microcircuits
- Resistors chips
- Thermistors

In addition for families of EEE components not addressed by the present ECSS standard, it can be used as guideline on case by case basis.

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.

This standard may be tailored for the specific characteristics and constrains 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 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 20600	Preservation packaging and despatch of SCC components
	ESCC 21004	Guidelines for incoming inspection of EEE components (ESCC Basic Specification No. 21004)
	ESCC 21300	Terms, definitions, abbreviations, symbols and units
	ESCC 22500	Guidelines for displacement damage irradiation testing
	ESCC 24900	Minimum requirements for controlling environmental contamination of components
	ESCC 25100	Single Event Effects Test Method and Guidelines
	ESCC 25500	Methodology for the detection of pure tin in the external surface finish of case and leads of EEE components
	GEIA-STD-005-2	Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High Performance Electronic Systems.
	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

EN reference	Reference in text	Title
	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
	MIL-STD-750	Test methods for semiconductor devices
	MIL-STD-883	Test method standard microcircuits
	AEC-Q100	Failure mechanism based stress test qualification for integrated circuits
	AEC_Q101	Stress test qualification for automotive grade discrete semiconductors
	AEC-Q200	Stress test qualification for passive components