

DIN EN 16602-60-13

ICS 49.140

Ersatz für
DIN EN 16602-60-13:2015-11**Raumfahrtproduktsicherung –
Kommerzielle, elektrische, elektronische und elektromechanische (EEE)
Bauteile;
Englische Fassung EN 16602-60-13:2023**

Space product assurance –
Commercial, electrical, electronic and electromechanical (EEE) components;
English version EN 16602-60-13:2023

Assurance produit des projets spatiaux –
Composants électriques, électroniques et électromécaniques (EEE) commerciaux;
Version anglaise EN 16602-60-13:2023

Gesamtumfang 114 Seiten

DIN-Normenausschuss Luft- und Raumfahrt (NL)

Nationales Vorwort

Dieses Dokument (EN 16602-60-13:2023) wurde vom Technischen Komitee CEN/CENELEC/TC 5 „Raumfahrt“ erarbeitet, dessen Sekretariat von DIN (Deutschland) gehalten wird.

Das zuständige deutsche Normungsgremium ist der Arbeitsausschuss NA 131-06-01 AA „Raumfahrt“ im DIN-Normenausschuss Luft- und Raumfahrt (NL).

Dieses Dokument (EN 16602-60-13:2023) basiert auf ECSS-Q-ST-60-13C Rev.1.

Dieses Dokument enthält unter Berücksichtigung des Präsidialbeschlusses 1/2004 nur die englische Originalfassung von EN 16602-60-13:2023.

Aktuelle Informationen zu diesem Dokument können über die Internetseiten von DIN (www.din.de) durch eine Suche nach der Dokumentennummer aufgerufen werden.

Änderungen

Gegenüber DIN EN 16602-60-13:2015-11 wurden folgende Änderungen vorgenommen:

- a) Umsetzung von Änderungsanträgen;
- b) Definition von „Rückverfolgbarkeitsinformationen (Rückverfolgungscode)“ aktualisiert;
- c) Angleichung an die aktualisierte Fassung von ECSS Q ST 60.

Frühere Ausgaben

DIN EN 16602-60-13: 2015-11

Nationaler Anhang NA (informativ)

Begriffe

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

ISO und IEC stellen terminologische Datenbanken für die Verwendung in der Normung unter den folgenden Adressen bereit:

- ISO Online Browsing Platform: verfügbar unter <https://www.iso.org/obp>
- IEC Electropedia: verfügbar unter <http://www.electropedia.org/>

NA.1 Begriffe aus anderen Normen

- a) Für die Anwendung dieser Norm gelten die Begriffe nach ECSS-S-ST-00-01.
- b) Für die Anwendung dieser Norm gelten die folgenden Begriffe nach ECSS-Q-ST-60:
 - 1) Agent
 - 2) Charakterisierung
 - 3) handelsübliche Komponente
 - 4) simultane Entwicklung
 - 5) Franchiseverteiler
 - 6) Teileentwickler
 - 7) Teilebeschaffer
 - 8) qualifizierte Teile
 - 9) Kontrolle
 - 10) für die Raumfahrt qualifizierte Teile

NA.2 Für diese Norm spezifische Begriffe

3.2.1

Rückverfolgbarkeitsinformationen

Rückverfolgungscode

unverwechselbarer Kennzeichner, der von Herstellern dazu verwendet wird, eine Menge von Komponenten mit mindestens einer gemeinsamen zu kennzeichnen und zurückzuverfolgen

ANMERKUNG 1 Der Begriff „Lot von EEE-Teilen“, der für die Lotannahme verwendet wird, außer für die Strahlung, wird durch den gleichen Rückverfolgungscode definiert.

ANMERKUNG 2 Der Begriff „Lot von EEE-Teilen“, der für die Strahlung verwendet wird, wird durch das gleiche Diffusionslot definiert.

ANMERKUNG 3 Es können mehrere Rückverfolgungscodes Teil derselben Lieferung des Herstellers oder Vertreibers sein.

ANMERKUNG 4 Es ist möglich, verschiedene Diffusionslote (nach ESCC 21300) unter demselben Rückverfolgungscode zusammenzufassen.

Nationaler Anhang NB (informativ)

Abkürzungen

NB.1 Abkürzungen

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

Abkürzung	Bedeutung
AOQ	durchschnittliche Ausgangsqualität (en: average outgoing quality)
ASIC	anwendungsspezifischer integrierter Schaltkreis (en: application specific integrated circuit)
BGA	Kugelanordnung (en: ball grid array)
CA	Konstruktionsanalyse (en: construction analysis)
CCD	ladungsgekoppeltes Bauelement (en: charge coupled device)
CCP	Bauteilkontrollplan (en: component control plan)
CN	Änderungsbenachrichtigung (en: change notice)
CoC	Konformitätszertifikat (en: certificate of conformance)
CDR	kritische Entwurfsprüfung (en: critical design review)
CR	Änderungsanforderung (en: change request)
DCL	deklarierte Komponentenliste (en: declared components list)
DPA	destruktive physische Analyse (en: destructive physical analysis)
DRD	Definition der Anforderungen an Dokumente (en: document requirement definition)
DSM	tiefe Submikron (en: deep Sub-Micron)
Ea	Auslösungsenergie (en: activation energy)
ECSS	Europäische Kooperation für Raumfahrtnormung (en: European Coordination for Space Standardization)
EEE	elektrisch, elektronisch, elektromechanisch (en: electrical, electronic, electromechanical)
EFR	frühe Misserfolgsrate (en: early failure rate)
ESCC	Europäische Raumfahrtkomponentenkoordination (en: European space components coordination)
GSE	Bodendienstgeräte (en: ground support equipment)
HAST	Hochbeschleunigter Belastungstest (en: highly accelerated stress test)
HTOL	Hochtemperatur-Nutzungsdauer (en: high temperature operating life)
HTRB	Hochtemperatur-Sperrvorspannung (en: high temperature reverse bias)
JD	Rechtfertigungsdokument (en: justification document)
LAT	Losannahmetest (en: lot acceptance test)
LED	Leuchtdiode (en: light emitting diode)
LVT	Losvalidierungsprüfung (en: lot validation testing)
MMIC	monolithisch integrierte Mikrowellenschaltung (en: microwave monolithic integrated circuit)
PAD	Teilezulassungsdokument (en: parts approval document)
PCB	Teileschalttafel (en: parts control board)

PCN	Prozessänderungsbenachrichtigung (en: process change notice)
PDA	zulässiger Fehleranteil (en: percent defective allowable)
PED	kunststoffummanteltes Bauteil (en: plastic encapsulated device)
PIND	Partikel-Auswirkungs-Geräusch-Abfragung (en: particle impact noise detection)
QBSD	Vollquadrant-Detektor von zurückgestreuten Elektronen (en: full quadrant back scatter electron detector)
QCI	Qualitätsentsprechungsinspektion (en: quality conformance inspection)
RFD	Antrag auf Abweichung (en: Request For Deviation)
RH	relative Luftfeuchte (en: relative humidity)
RoHs	Einschränkung des Gebrauchs bestimmter gefährlicher Substanzen (en: restriction of the use of certain hazardous substances)
RVT	Strahlungsverifikationsprüfung (en: radiation verification testing)
SCSB	Raumfahrtkomponenten-Lenkungsausschuss (en: Space Components Steering Board)
SAM	Ultraschallmikroskopie (en: scanning acoustic microscopy)
SEM	Rasterelektronenmikroskopie (en: scanning electron microscope)
SMD	oberflächenmontierbares Bauteil (en: surface mount device)
TCI	Technikkonformitätsinspektion (en: technology conformance inspection)
Tg	Glassivationstemperatur (en: glassivation temperature)
THB	Temperatur-Feuchtigkeits-Einfluss (en: temperature humidity bias)
Tj	Verbindungstemperatur (en: junction temperature)
T/C	Temperaturwechselbeanspruchung (en: thermal cycling)
TM	Testmethode (en: Test Method)

NB.2 Vereinbarungen

- a) Der Begriff „EEE-Komponente“ ist mit den Begriffen „EEE-Teil“, „Komponente“ oder einfach „Teil“ synonym.
- b) Der Begriff „zur Zulassung“ bedeutet, dass zur Fortsetzung des Prozesses eine Entscheidung der Zulassungsbehörde erforderlich ist.
- c) Der Begriff „zur Überprüfung“ bedeutet, dass Kommentare von Gutachtern berücksichtigt und zur Verfügung gestellt werden.
- d) Der Begriff „zur Information“ bedeutet, dass keine Kommentare zum gelieferten Gegenstand erwartet werden.
- e) Zum besseren Verständnis dieses Dokuments ist nachfolgend eine Liste von Komponentenkategorien aufgeführt, die unabhängig von der Qualitätsstufe unter den Begriff EEE-Komponente, ummantelt oder nicht ummantelt, fallen:
 - 1) Kondensatoren;
 - 2) Steckverbinder;
 - 3) Kristalle;
 - 4) einzelne Halbleiter (einschließlich Dioden, Transistoren);
 - 5) Filter;

- 6) Sicherungen;
- 7) magnetische Komponenten (z. B. Induktoren, Transformatoren, einschließlich eigener Produkte);
- 8) monolithische Mikroschaltungen (einschließlich MMIC);
- 9) Hybridschaltungen;
- 10) Relais;
- 11) Widerstände, Wärmeerzeuger;
- 12) akustische Oberflächenwellenbauelemente;
- 13) Schalter (einschließlich mechanischer Schalter, Wärmeschalter);
- 14) Thermistoren;
- 15) Drähte und Leitungen;
- 16) optoelektronische Bauelemente (einschließlich Optokoppler, LED, ladungsgekoppelte Bauteile, Displays, Sensoren);
- 17) passive Mikrowellengeräte (einschließlich z. B. Mischer, Koppler, Isolatoren und Schalter).

ANMERKUNG Mikrowellenschalter, die aus mehreren EEE-Komponenten bestehen, werden als Gerät angesehen. Die Anforderungen dieser Norm gelten in Mikrowellenschaltern enthaltene EEE-Teile und für Mikrowellenschalter in einfacher Ausführung (einzelnes EEE-Teil).

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EUROPEAN STANDARD

EN 16602-60-13

NORME EUROPÉENNE

EUROPÄISCHE NORM

June 2023

ICS 49.140

Supersedes EN 16602-60-13:2015

English version

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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This European Standard exists 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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CEN-CENELEC Management Centre:
Rue de la Science 23, B-1040 Brussels

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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 constraints of a space project in conformance with ECSS-S-ST-00.

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

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.
- b. For the purpose of this standard, the following terms and definitions from ECSS-Q-ST-60 apply:
 - 1. agent
 - 2. characterization
 - 3. commercial component
 - 4. concurrent engineering
 - 5. franchised distributor
 - 6. parts engineer
 - 7. parts procurer
 - 8. qualified parts
 - 9. screening
 - 10. space qualified parts

3.2 Terms specific to the present standard

3.2.1 traceability information (trace code)

unique identifier used by manufacturers to label and trace a quantity of components with at least a common assembly history

NOTE 1 The notion of "lot of EEE parts" used for lot acceptance tests, except for radiation, is defined by the same trace code.

NOTE 2 The notion of "lot of EEE parts" used for the radiation is defined by the same diffusion lot.

NOTE 3 Several trace codes can be part of a same delivery from the manufacturer or the distributor.

NOTE 4 It is possible to have several diffusion lots and wafer fabs (as per ESCC 21300) in the same trace code.

3.3 Abbreviated terms

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

Abbreviation	Meaning
AOQ	average outgoing quality
ASIC	application specific integrated circuit
BGA	ball grid array
CA	construction analysis
CCD	charge coupled device
CCP	component control plan
CN	change notice
CoC	certificate of conformance
CDR	critical design review
CR	change request
DCL	declared components list
DPA	destructive physical analysis
DRD	document requirement definition
DSM	deep Sub-Micron
Ea	activation energy
ECSS	European Coordination for Space Standardization
EEE	electrical, electronic, electromechanical
EFR	early failure rate
ESCC	European space components coordination
GSE	ground support equipment
HAST	highly accelerated stress test
HTOL	high temperature operating life
HTRB	high temperature reverse bias
JD	justification document
LAT	lot acceptance test
LED	light emitting diode
LVT	lot validation testing
MMIC	microwave monolithic integrated circuit
PAD	parts approval document
PCB	parts control board
PCN	process change notice
PDA	percent defective allowable
PED	plastic encapsulated device
PIND	particle impact noise detection
QBSD	full quadrant back scatter electron detector

Abbreviation	Meaning
QCI	quality conformance inspection
RFD	request for deviation
RH	relative humidity
RoHs	restriction of the use of certain hazardous substances
RVT	radiation verification testing
SCSB	Space Components Steering Board
SAM	scanning accoustic microscopy
SEM	scanning electron microscope
SMD	surface mount device
TCI	technology conformance inspection
Tg	Glass Transition Temperature
THB	temperature humidity bias
Tj	junction temperature
T/C	thermal cycling
TM	Test Method

3.4 Conventions

- a. The term “EEE component” is synonymous with the terms “EEE Part”, “Component” or just “Part”.
- b. The term “for approval” means that a decision of the approval authority is necessary for continuing the process.
- c. The term “for review” means that raised reviewers comments are considered and dispositioned.
- d. The term “for information” means that no comments are expected about the delivered item.
- e. For the purpose of clear understanding of this document, hereunder is a listing of component categories which are covered by the term EEE component, encapsulated or non-encapsulated, irrespective of the quality level:
 1. Capacitors
 2. Connectors
 3. Crystals
 4. Discrete semiconductors (including diodes, transistors)
 5. Filters
 6. Fuses
 7. Magnetic components (e.g. inductors, transformers, including in-house products)

8. Monolithic Microcircuits (including MMICs)
9. Hybrid circuits
10. Relays
11. Resistors, heaters
12. Surface acoustic wave devices
13. Switches (including mechanical, thermal)
14. Thermistors
15. Wires and Cables
16. Optoelectronic Devices (including opto-couplers, LED, CCDs, displays, sensors)
17. Passive Microwave Devices (including, for instance, mixers, couplers, isolators and switches)

NOTE Microwave switches consisting of multiple EEE components are considered as equipment. The requirements of this standard are applicable to the EEE parts they incorporate and to microwave switches having a simple design (single EEE part).

3.5 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.

3.6 Convention for the Applicability Matrix

The following terminology applies for the column “Applicability” of the applicability matrix:

Applicability	Explanation
Applicable	Requirement of ECSS-Q-ST-60 applies
Not applicable	Requirement from ECSS-Q-ST-60 does not apply
Modified	Requirement of ECSS-Q-ST-60 applies with modified text
New	Requirement added in ECSS-Q-ST-60-13 and not present in ECSS-Q-ST-60
Deleted	Requirement is deleted in the applicable version of ECSS-Q-ST-60 or ECSS-Q-ST-60-13 NOTE: In case of the deletion of a requirement that existed only in ECSS-Q-ST-60-13 the former text is replaced by the word <<deleted>>

Requirements for class 1 components

Identifier	Requirement	Applicability
4.1 Component programme management		
4.1.1 General		
4.1.1a		Deleted
4.1.2 Components control programme		
4.1.2.1 Organization		
4.1.2.1a		Applicable
4.1.2.1b		Deleted
4.1.2.2 Component control plan		
4.1.2.2a		Applicable
4.1.2.2b		Applicable
4.1.2.2c		Applicable
4.1.3 Parts control board		
4.1.3a		Applicable
4.1.3b		Applicable
4.1.3c		Applicable
4.1.3d		Applicable
4.1.4 Declared component list		
4.1.4a		Applicable
4.1.4b		Applicable
4.1.4c		Applicable
4.1.4d		Applicable
4.1.4e		Applicable
4.1.4f		Applicable
4.1.4g		Applicable
4.1.4h		Applicable
4.1.4i		Applicable
4.1.5 Electrical and mechanical GSE		
4.1.5a		Applicable

4.1.5b		Applicable
4.1.6 EQM components		
4.1.6a		Applicable
4.1.6b		Applicable
4.2 Component selection, evaluation and approval		
4.2.1 General		
4.2.1a		Applicable
4.2.1b		Applicable
4.2.2 Manufacturer and component selection		
4.2.2.1 General rules		
4.2.2.1a		Applicable
4.2.2.1b		Applicable
4.2.2.1c	<<deleted and moved to 4.2.2.3d>>	Deleted
4.2.2.1d	<<deleted, modified and moved to 4.2.2.3e>>	Deleted
4.2.2.1e	<<deleted and moved to 4.2.2.3f>>	Deleted
4.2.2.1f	<<deleted and moved to 4.2.2.3g>>	Deleted
4.2.2.1g	<p>For the assessment of commercial components, the supplier shall collect the available data on the manufacturer and the component in the JD specified in the requirement 4.2.4d.</p> <p>NOTE It is important to check the exhaustiveness of the manufacturer documentation & data sheet with respect to e.g. the following items:</p> <ul style="list-style-type: none"> • component marking, • mechanical description, • electrical and thermal description. 	New
4.2.2.1h	<<deleted>>	Deleted
4.2.2.2 Parts and material restriction		
4.2.2.2a		Applicable
4.2.2.2b		Applicable
4.2.2.2c		Applicable
4.2.2.2d		Applicable
4.2.2.2e		Applicable
4.2.2.2f		Applicable
4.2.2.2g		Applicable
4.2.2.2h		Applicable

4.2.2.2i		Applicable
4.2.2.2.j		Applicable
4.2.2.2k		Applicable
4.2.2.2l		Applicable
4.2.2.3 Preferred sources		
4.2.2.3a		Not applicable
4.2.2.3b		Not applicable
4.2.2.3c		Applicable
4.2.2.3d		Not applicable
4.2.2.3e		Applicable
4.2.2.3f		Applicable
4.2.2.3g		Applicable
4.2.2.4 Radiation hardness		
4.2.2.4a		Applicable
4.2.2.4b		Applicable
4.2.2.4c		Applicable
4.2.2.4d		Applicable
4.2.2.4e		Applicable
4.2.2.4f		Applicable
4.2.2.4g		Applicable
4.2.2.4h		Applicable
4.2.2.4i		Applicable
4.2.2.5 Derating		
4.2.2.5a		Applicable
4.2.2.5b		Deleted
4.2.2.6 Temperature range		
4.2.2.6a	Commercial parts shall be selected in the highest available temperature range.	New
4.2.2.6b	A minimum 10 °C margin shall be used between the maximum manufacturer temperature range and the application temperature range (including worst cases).	New
4.2.2.6c	<<deleted>>	Deleted
4.2.2.6d	Operating temperature range of all commercial parts shall be greater or equal to (-40 / 85) °C.	New
4.2.2.6e	Temperature range of commercial ceramic capacitors shall be greater or equal to (-40 / 125) °C	New

4.2.3 Component evaluation		
4.2.3.1 General		
4.2.3.1a		Applicable
4.2.3.1b		Deleted
4.2.3.1c		Applicable
4.2.3.1d		Applicable
4.2.3.1e		Applicable
4.2.3.1f		Applicable
4.2.3.1g		Applicable
4.2.3.1h		Applicable
4.2.3.1i	The supplier shall review the evaluation results to determine their impact on the content of the screening and lot acceptance tests.	Modified
4.2.3.1j		Applicable
4.2.3.1k	The supplier shall prepare a preliminary internal supplier's specification for electrical testing during evaluation tests. NOTE This specification can be part of the Justification document.	New
4.2.3.1l	The supplier specification specified in 4.2.3.1k shall as minimum include tested parameters, test conditions, acceptance criteria, drift limits.	New
4.2.3.1m	The supplier shall update the internal supplier's specification used for screening and lot acceptance in accordance with the results of evaluation testing.	New
4.2.3.1n	The preliminary and the final internal supplier's specification as specified in Annex C shall be submitted to the customer for approval.	New
4.2.3.2 Component manufacturer assessment		
4.2.3.2.1		Not applicable See 4.2.2.1.g
4.2.3.2.2a		Not applicable See 4.2.2.1.g
4.2.3.2.2b		Not applicable See 4.2.2.1.g
4.2.3.3. Construction analysis		
4.2.3.3a		Applicable
4.2.3.3b	The Construction analysis shall be documented by a procedure to be submitted on request to the customer for information.	Modified

	NOTE Annex H provides guidelines for microcircuits, diodes, transistors and optocouplers.	
4.2.3.3c		Applicable
4.2.3.4 Evaluation testing		
4.2.3.4a		Applicable
4.2.3.4b		Applicable
4.2.3.4c	<p>Evaluation tests shall be performed as specified in:</p> <ol style="list-style-type: none"> 1. Table 8–1 for ceramic capacitors chips 2. Table 8–2 for solid electrolyte tantalum capacitors chips 3. Table 8–3 for discrete parts (diodes, transistors, optocouplers) 4 Table 8–4 for fuses 5. Table 8–5 for magnetic parts 6. Table 8–6 for microcircuits 7. Table 8–7 for resistors 8. Table 8–8 for thermistors 	New
4.2.3.4d	Omission of any of the elements of tests specified in Table 8–1, Table 8–2, Table 8–3, Table 8–4, Table 8–5, Table 8–6, Table 8–7 and Table 8–8, or the introduction of alternative activities, shall be justified in the JD.	New
4.2.3.4e	<<deleted>>	Deleted

Figure 4-1: <<deleted>>

Table 4–1: <<deleted and moved as legacy test files as Table 8–9>>

4.2.4 Parts approval		
4.2.4a		Applicable
4.2.4b		Deleted
4.2.4c		Applicable
4.2.4d	The approval process by the customer depends on the part qualification status and shall be organized as follows:	Modified
	1.	Not applicable
	2.	Not applicable
	3.	Applicable
	4. <<deleted>>	Deleted
4.2.4e	In case the evaluation results are changing the testing conditions documented in the JD, a new revision of JD shall be submitted to the customer for approval.	Modified
4.2.4f		Applicable
4.3 Component procurement		
4.3.1 General		
4.3.1a		Applicable
4.3.1b		Not applicable
4.3.1c		Not applicable
4.3.1d		Applicable
4.3.1e		Applicable
4.3.1f		Applicable
4.3.1g		Applicable
4.3.1h		Applicable
4.3.1i	Each procured EEE part shall be traceable to a manufacturer assigned trace code. NOTE 1 The procurement of a single trace code per delivery lot should be preferred and encouraged. NOTE 2 Some passive components can be traceable with datecode only.	New
4.3.1j	Each trace code shall be maintained as is through the entire supply chain including distributor. NOTE As far as possible, commercial parts should be ordered in the manufacturer's standard packing quantities or multiples thereof to avoid distributor re-packing and handling and to preserve the	New

	traceability information usually included on the original manufacturer packaging.	
4.3.1k	The supplier shall ensure that the elements of the JD in accordance with Annex F, including any action plan, are applicable to flight parts.	New
4.3.2 Procurement specification		
4.3.2a	The supplier shall procure EEE components according to controlled specifications. NOTE It can be procurer's in-house specification, a manufacturer's drawing or a datasheet as a minimum.	Modified
4.3.2b		Not applicable
4.3.2c		Not applicable
4.3.2d		Not applicable
4.3.2e		Applicable
4.3.2f		Applicable
4.3.2g		Applicable
4.3.2h	If additional requirements to the manufacturer are identified by the supplier, they shall be specified in the procurement specification, in conformance with DRD from Annex C.	New
4.3.3. Screening requirements		
4.3.3a		Applicable
4.3.3b		Applicable
4.3.3c		Applicable
4.3.3d	For commercial parts, screening tests shall be performed in accordance with: 1. Table 8-1 for ceramic capacitors chips, 2. Table 8-2 for solid electrolyte tantalum capacitors chips 3. Table 8-3 for discrete parts (diodes, transistors, optocouplers) 4. Table 8-4 for fuses 5. Table 8-5 for magnetic parts 6. Table 8-6 for microcircuits 7. Table 8-7 for resistors 8. Table 8-8 for thermistors	Modified
4.3.3e		Deleted
4.3.3f		Applicable
4.3.3g		Deleted
4.3.3h		Applicable

Table 4–2: <<deleted and moved as legacy test files as Table 8–10>>

4.3.4 Initial customer source inspection (precap)		
4.3.4a		Not applicable
4.3.4b		Not applicable
4.3.4c		Not applicable
4.3.5 Lot acceptance		
4.3.5a	The supplier shall ensure that any lot/date code of EEE parts is submitted to a lot acceptance procedure, in line with applied normative systems, according to the following rules:	Modified
	1.	Not applicable
	2.	Not applicable
	3.	Applicable
4.3.5b		Not applicable
4.3.5c	Lot acceptance tests shall be performed as specified in: <ol style="list-style-type: none"> 1. Table 8–1 for ceramic capacitors chips 2. Table 8–2 for solid electrolyte tantalum capacitors chips 3. Table 8–3 for discrete parts (diodes, transistors, optocouplers) 4. Table 8–4 for fuses 5. Table 8–5 for magnetic parts 6. Table 8–6 for microcircuits 7. Table 8–7 for resistors 8. Table 8–8 for thermistors 	New

Figure 4-2: <<deleted>>

Table 4–3: <<deleted and moved as legacy test files as Table 8–11>>

4.3.6 Final customer source inspection (buy-off)		
4.3.6a		Not applicable
4.3.6b		Not applicable
4.3.6c	For commercial parts, the buy off shall be replaced by an incoming inspection at the procurement entity's facility reported in the JD in accordance with clause 4.3.7.	Modified

4.3.6d		Not applicable
4.3.7 Incoming inspection		
4.3.7a		Applicable
4.3.7b		Applicable
4.3.7c		Applicable
4.3.7d		Not applicable
4.3.7e		Applicable
4.3.8 Radiation verification testing		
4.3.8a		Applicable
4.3.8b		Applicable
4.3.8c		Not applicable
4.3.8d		Applicable
4.3.8e		Applicable
4.3.8f	Parts submitted to total dose test shall be first screened as specified in the clause 4.3.3 to be fully representative of flight parts.	New
4.3.9 Destructive physical analysis		
4.3.9a	The DPA shall be performed according to the procurement Tables Table 8-1, Table 8-2, Table 8-3, Table 8-4, Table 8-5, Table 8-6, Table 8-7, Table 8-8 of Clause 8.	Modified
4.3.9b		Not applicable
4.3.9c		Not applicable
4.3.9d		Not applicable
4.3.9e	The DPA process shall be documented by a procedure to be submitted, on request, to the customer for information. NOTE For guidance refer to the basic specification ESSC 20600 and for active parts ECSS-Q-ST-60-13 Annex H.	Modified
4.3.9f		Applicable
4.3.9g		Deleted
4.3.9h		Not applicable
4.3.9i		Applicable
4.3.9j		Applicable
4.3.9k	<<deleted>>	Deleted
4.3.10 Relifing		
4.3.10a		Applicable
4.3.10b		Applicable
4.3.10c	<<deleted>>	Deleted

4.3.10d	<<deleted>>	Deleted
4.3.11 Manufacturer's data documentation deliveries		
4.3.11a	The manufacturer's or the franchised distributor's CoC shall be delivered to the parts procurer.	Modified
4.3.11b	Any other data, defined in the procurement documents, shall be delivered to the parts' procurer in line with the purchase order.	Modified
4.3.11c		Applicable
4.4 Handling and storage		
4.4a	The supplier shall establish and implement procedures for handling and storage of components in order to prevent possible degradation. NOTE For guidance, refer to the basic specification ESCC 20600.	Applicable
4.4b		Applicable
4.4c		Applicable
4.4d		Applicable
4.4e	Plastic encapsulated devices shall be stored in one of the following conditions: 1. Dry Nitrogen 2. Dry and ionised air, with RH in a range of 15% to 20% 3. Dry packs as specified in J-STD-033 for dry pack inspection and control	New
4.5 Components quality assurance		
4.5.1 General		
4.5.1a		Applicable
4.5.2 Nonconformances or failures		
4.5.2a		Applicable
4.5.2b		Applicable
4.5.2c		Applicable
4.5.2d		Applicable
4.5.3 Alerts		
4.5.3a		Applicable
4.5.3b		Applicable
4.5.3c		Applicable
4.5.4 Traceability		
4.5.4a		Deleted
4.5.4b		Applicable

4.5.4c		Applicable
4.5.4d	The traceability of EEE parts during installation in equipment, shall be ensured by the supplier through maintaining the traceability to the manufacturer's trace code number of the EEE parts actually mounted.	Modified
4.5.4e	If the as built DCL has not yet been delivered, the supplier shall be able to provide this information (part type actually installed with its relevant trace code number) within one week.	Modified
4.5.5 Lot homogeneity for sampling test		
4.5.5a	If tests are performed by sampling, the sampled parts shall be selected so that they are representative of the trace code distribution.	Modified
4.5.5b		Applicable
4.6 Specific components		
4.6.1 General		
4.6.1a	<<deleted>>	Deleted
4.6.2 ASICs		
4.6.2a		Applicable
4.6.3 Hybrids		
4.6.3a		Not applicable
4.6.3b		Not applicable
4.6.3c		Not applicable
4.6.4 One time programmable devices		
4.6.4a		Applicable
4.6.4b	The JD shall allow traceability to the information related to the procurement of blank parts, the programming process and the acceptance of the programmed parts. NOTE The programming process and the acceptance of the programmed parts may be part of PCB, for customer approval, if not indicated in the JD.	Modified
4.6.4c	<<deleted>>	Deleted
4.6.4d		Applicable
4.6.4e		Applicable
4.6.4f		Applicable
4.6.4g		Applicable
4.6.4h		Applicable
4.6.5 Microwave monolithic integrated circuits		
4.6.5a		Not applicable

4.6.6 Connectors		
4.6.6a		Not applicable
4.7 Documentation		
4.7a	Any result from inspection or control shall be documented (including lot acceptance, incoming, reliving and complementary tests).	Modified

Table 4-4: Documentation for Class 1 components

Document	Clause	Customer	Comments
New : Procedure for hot solder dip process	4.2.2.2j.	Approval	For retinning operation
New : Internal supplier's specification	4.2.3.1k.	Approval	Applicable to the preliminary and final internal supplier's specification
<i>PAD : not applicable</i>	4.2.4	-	-
New : Justification Document	4.2.4	Approval	-
<i>Procedure for customer precap : not applicable</i>	4.3.4	-	-
New : Procedure for construction analysis	4.2.3.3	Information (on request)	-
New :-Evaluation and LAT report	4.2.4d.	Information (on request)	-