

BS EN 16602-60-13:2015



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Space product assurance — Requirements for the use of COTS components

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National foreword

This British Standard is the UK implementation of EN 16602-60-13:2015.

The UK participation in its preparation was entrusted to Technical Committee ACE/68, Space systems and operations.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Date	Text affected
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English version

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

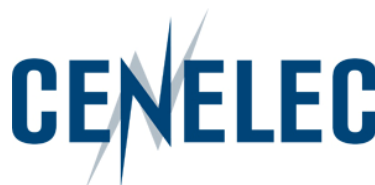
Raumfahrtproduktsicherung - Anforderungen für die
Nutzung von COTS-Komponenten

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

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Table of contents

European foreword.....	4
Introduction.....	4
1 Scope.....	7
2 Normative references	9
3 Terms, definitions and abbreviated terms.....	11
3.1 Terms from other standards.....	11
3.2 Terms specific to the present standard	11
3.3 Abbreviated terms.....	12
3.4 Conventions.....	13
3.5 Nomenclature	14
4 Requirements for class 1 components.....	15
5 Requirements for class 2 components.....	36
6 Requirements for class 3 components.....	59
7 Quality levels	74
8 Evaluation and lot acceptance for retinned parts.....	75
9 Pure tin lead finish – risk analysis	83
Annex A (normative) Component control plan (CCP) - DRD	84
Annex B (normative) Declared components list (DCL) - DRD	85
Annex C (normative) Internal Supplier's specification - DRD	86
Annex D (normative) Parts approval document - DRD	88
Annex E (informative) EEE documents delivery per review	89
Annex F (normative) Justification document - DRD	90
Annex G (informative) Difference between the three classes	93
Annex H (informative) Flow chart for construction analysis and destructive physical analysis.....	94

Bibliography.....	98
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Figures

Figure 4-1: Evaluation tests flow chart for Class 1 components.....	21
Figure 4-2: Lot acceptance tests flow chart for Class 1 components	28
Figure 5-1: Evaluation Tests flow charts for Class 2 components.....	42
Figure 5-2: Lot acceptance tests flow chart for Class 2 components	51
Figure 6-1: Lot acceptance test flow chart for Class 3 components	67
Figure 8-1: Evaluation flow chart for retinned parts – class 1 programmes	76
Figure 8-2: Lot acceptance flow chart for retinned parts – class 1 programmes	77
Figure 8-3: Evaluation flow chart for retinned parts – class 2 programmes	79
Figure 8-4: Lot acceptance flow chart for retinned parts – class 2 programmes	80
Figure 8-5: Evaluation flow chart for retinned parts – class 3 programmes	81
Figure 8-6: Lot acceptance flow chart for retinned parts – class 3 programmes	82

Tables

Table 4-1: Evaluation Tests for Class 1 components.....	21
Table 4-2: Screening tests for Class 1 components.....	25
Table 4-3: Lot acceptance tests for Class 1 components.....	29
Table 4-4: Documentation for Class 1 components	35
Table 5-1: Evaluation Tests for Class 2 components.....	43
Table 5-2: Screening tests for the Class 2 components.....	48
Table 5-3: Lot acceptance tests for Class 2 components.....	52
Table 5-4: Documentation for Class 2 components	58
Table 6-1: Evaluation tests for Class 3 components	63
Table 6-2: Screening tests for Class 3 components.....	65
Table 6-3: Lot acceptance tests for Class 3 components.....	68
Table 6-4: Documentation for Class 3 components	73
Table H-1 : Construction analysis and DPA.....	94
Table H-2 : Construction analysis sequence.....	95
Table H-3 : Destructive physical analysis sequence	97

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.

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.

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.

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 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

3

Terms, definitions and abbreviated terms

3.1 Terms from other standards

For the purpose of this standard, the terms and definitions from ECSS-S-ST-00-01 apply.

For the purpose of this standard, the following terms and definitions from ECSS-Q-ST-60 apply:

agent
characterization
commercial component
concurrent engineering
franchised distributor
parts engineer
parts procurer
qualified parts
screening
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 a common manufacturing history and thereby common characteristics.

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

NOTE 2 Several trace codes can be part of a same delivery from the manufacturer or the distributor.

NOTE 3 It is possible to have several diffusion lots (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
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
QCI	quality conformance inspection
RFD	request for deviation

Abbreviation	Meaning
RH	relative humidity
RoHs	restriction of the use of certain hazardous substances
RVT	radiation verification testing
SCSB	Space Components Steering Board
SAM	scanning acoustic microscopy
SEM	scanning electron microscope
SMD	surface mount device
TCI	technology conformance inspection
T _g	glassivation temperature
THB	temperature humidity bias
T _j	junction temperature
T/C	thermal cycling

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.

4

Requirements for class 1 components

Identifier	Requirement	Applicability
4.1 Component programme management		
4.1.1 General		
4.1.1a		Applicable
4.1.2 Components control programme		
4.1.2.1 Organization		
4.1.2.1a		Applicable
4.1.2.1b		Applicable
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	After equipment CDR, all modifications affecting the JD information shall be implemented, in the "as design" DCL, through the CN / CR process and submitted to the customer for approval. NOTE For JD generation, see 4.2.4.d.	Modified
4.1.4e		Applicable
4.1.4f		Applicable
4.1.4g		Applicable
4.1.4h		Applicable

4.1.5 Electrical and mechanical GSE		
4.1.5a		Applicable
4.1.5b		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		Applicable
4.2.2.1d		Applicable
4.2.2.1e		Applicable
4.2.2.1f		Applicable
4.2.2.1g	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. NOTE It is important to check the exhaustiveness of the manufacturer documentation & data sheet with respect to e.g. the following items: • component marking, • mechanical description, • electrical and thermal description.	New
4.2.2.1h	For Deep Sub-Micron Technologies (<90nm), the detailed test definition shall identify the technology through the construction analysis and the application. NOTE 1 It is important to ensure that the test conditions remain as close as possible to application. NOTE 2 This requirement is important due to the specificities of Deep Sub-Micron Technologies (<90nm).	New
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	For limited life duration, known instability, safety hazards or reliability risk reasons, EEE components listed below shall not be used:	Modified

	1. EEE components with pure tin (less than 3% Pb in case of SnPb alloy) used as a finish on the leads, terminations and external surfaces of components and packages. NOTE For EEE components with pure tin, see also requirements 4.2.2.2h and 4.2.2.2i. 2. Hollow core resistors 3. Potentiometers (except for mechanism position monitoring) 4. Non-metallurgically bonded diodes 5. Semiconductor dice with unglassivated active area 6. Wet slug tantalum capacitors other than capacitor construction using double seals and a tantalum case 7. Any component whose internal construction uses metallurgic bonding with a melting temperature not compatible with the end-application mounting conditions 8. Wire link fuses < 5A 9. TO5 relays without double welding of the mechanism to the header or with any type of integrated diodes inside	
4.2.2.2e		Applicable
4.2.2.2f		Applicable
4.2.2.2g		Applicable
4.2.2.2h	The use of pure tin (inside or outside the part) shall be declared in the JD.	Modified
4.2.2.2i	To assess Pb free with tin finish whisker risk, the following actions shall be performed by the supplier: 1. In order to verify information from manufacturer (included in the JD), as part of the incoming inspection, check the lead finish of all procured lots as per ESCC 25500 basic specification. 2. When confirmed during incoming, assess individually each use of pure tin termination through a RFD. 3. Submit each lot confirmed with pure tin terminations to solder dip with an SnPb solder. NOTE Solder dip for tin whisker mitigation differs from solder dip for solderability in that for tin whisker mitigation it is required that the termination is coated over its entire length, right up to the package surface (no stand off). 4. Perform the reflowing operation before screening and before the lot acceptance test. 5. Before reflowing of flight parts, document the hot solder	New

	dip process by a procedure to be submitted to customer for approval. 6. Perform the evaluation of retinned components in conformance with Figure 8-1 from the requirement 8.1a. 7. Perform the lot acceptance of retinned components in conformance with Figure 8-2 from the requirement 8.1a.	
4.2.2.3 Preferred sources		
4.2.2.3a		Not applicable
4.2.2.3b		Not applicable
4.2.2.3c		Applicable
4.2.2.4 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		Applicable
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	In case $(manufacturer\ max\ temperature\ range - used\ max\ temp) < 10\ ^\circ C$, an electrical characterisation shall be performed at used temperature with an additional margin of 10 °C during the evaluation step. NOTE 1 Example: for a manufacturer -40°C/+85°C temperature range with an application up to +80°C, then an electrical characterisation is performed at +90°C. NOTE 2 Example for a manufacturer -40°C/+85°C temperature range with an application down to -35°C, then an electrical characterisation is performed at -45°C.	New

4.2.3 Component evaluation		
4.2.3.1 General		
4.2.3.1a		Applicable
4.2.3.1b		Applicable
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.	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 sent to the customer for approval. NOTE Annex H provides guidelines for such procedure.	Modified
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	Evaluation tests shall be performed as specified in Figure 4-1 and Table 4-1.	New
4.2.3.4d	Omission of any of the elements of tests specified in Figure 4-1 and Table 4-1, or the introduction of alternative activities, shall be justified in the JD. NOTE For mounting process (including baking for PED), see ECSS-Q-ST-70-38 and ECSS-Q-ST-70-08.	New
4.2.3.4e	Evaluation of retinned components shall be performed as specified in Figure 8-1 from the requirement 8.1a.	New

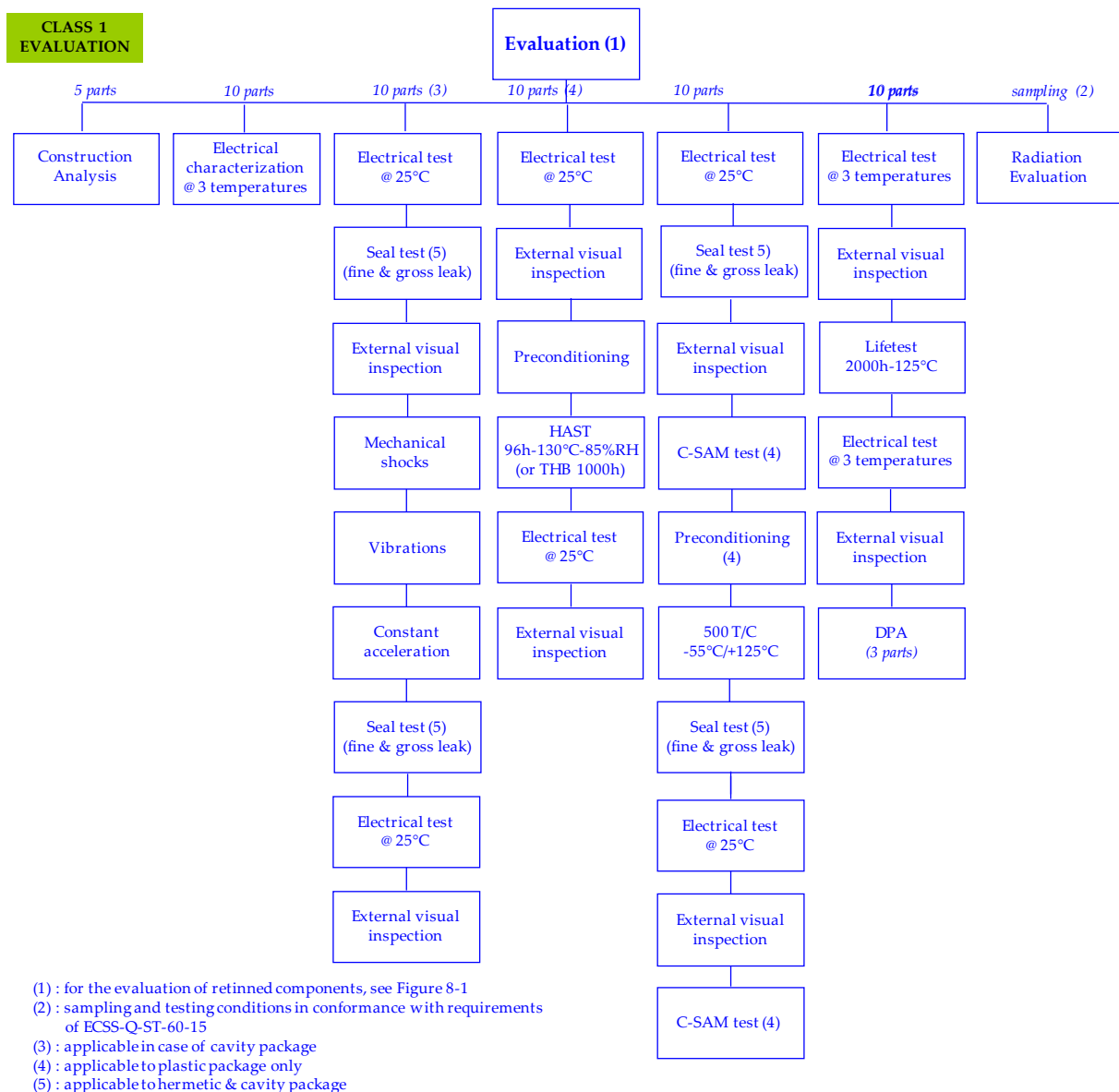


Figure 4-1: Evaluation tests flow chart for Class 1 components

Table 4-1: Evaluation Tests for Class 1 components

	TEST	SAMPLING	METHOD / CRITERIA	COMMENTS
1	Construction analysis	5 parts	As per clause 4.2.2.3 See Annex H	-
2	Electrical characterization	10 parts min	Electrical test under 3 T° (min, typ, max) or at using range +10 °C (whichever is higher as per 4.2.2.6).	Read & record for electrical test as per the preliminary issue of the internal supplier's specification (see 4.2.3.1.k).

	TEST	SAMPLING	METHOD / CRITERIA	COMMENTS
3	External visual inspection	10 parts min	ESCC 2055000 ESCC 2059000	
4	Mechanical shocks	10 parts min	MIL STD 883 TM 2002 condition B - 50 pulses (per orientation) instead of 5 pulses (per orientation). MIL-STD-750 TM 2016, 1500g, 0,5ms duration - 50 shocks instead of 5 shocks, planes X1, Y1 and Z1.	Applicable to cavity package. Read & record for electrical test as per the preliminary issue of the internal supplier's specification (see 4.2.3.1.k).
	Vibrations		MIL-STD-883, TM 2007 condition A - 120 times (total) instead of 12 times (total) MIL-STD-750, TM 2056, 20g, 10-2000Hz, cross over at 50Hz - 120 times (total) instead of 12 times (total).	
	Constant acceleration		MIL-STD-883, TM 2001 condition E (resultant centrifugal acceleration to be in the Y1 axis only). For components which have a package weight of 5 grammes or more, or whose inner seal or cavity perimeter is more than 5 cm, Condition D shall be used MIL-STD-750, TM 2006, 20000g, planes X1, Y1 and Y2.	
5	Preconditioning + 96h HAST (or 1000h THB 85/85)	10 parts min	HAST 96h-130°C-85% RH (JESD22-A110 with continuous bias) or THB (JESD22-A101) Initial and final electrical test at 25°C (parameter & functional) Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole.	Applicable to plastic package. Read & record for electrical test as per the preliminary issue of the internal supplier's specification (see 4.2.3.1.k).
6	C-SAM	10 parts min	JEDEC J-STD-020	To be done on the 10 parts of step 7 after the electrical test at 25°C and before preconditioning. C-SAM test only applicable to plastic package.

	TEST	SAMPLING	METHOD / CRITERIA	COMMENTS
7	Preconditioning + Thermal Cycling	10 parts min	500 T/C -55°/+125°C (or to the manufacturer storage temp., whichever is less) MIL-STD-750. method 1051 cond.B MIL-STD-883 method 1010 cond.B Initial, intermediate (100 T/C) and final electrical tests at 25°C (parameter & functional). Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole.	Preconditioning applicable to plastic package only. Read & record for electrical tests as per the preliminary issue of the internal supplier's specification (see 4.2.3.1.k).
8	Seal test	10 parts min	MIL-STD-883 TM 1014 condition A or B (fine leak) and condition C (gross leak). MIL-STD-750 TM 1071 condition H1 or H2 (fine leak) and condition C or K (gross leak with cavity) or condition E (gross leak without cavity).	Applicable to hermetic & cavity package.
9	Lifetest 2000h-125°C minimum	10 parts min	MIL-STD-750 method 1026 & 1042 MIL-STD-883 method 1005 cond.D Initial, intermediate (1000h) and final electrical tests at 3 T° (min, typ, max) (parameter & functional).	The lifetest duration shall be 2000h at minimum 125°C. In case of a temperature lower than 125°C, the lifetest duration is extended i.a.w. MIL-STD-883 method 1005. Read & record for electrical tests. as per the preliminary issue of the internal supplier's specification (see 4.2.3.1.k).
10	DPA	3 parts	As per clause 4.3.9 see Annex H.	To be done on 3 parts after lifetest (as per above step 4).
11	Radiation evaluation	i.a.w. ECSS-Q-ST-60-15	See ECSS-Q-ST-60-15	-

4.2.4 Parts approval		
4.2.4a		Applicable
4.2.4b		Applicable
4.2.4c		Applicable
4.2.4d	Prior to procurement of components (or before equipment CDR, at the latest), the approval process by the customer shall be organized as follows:	Modified
	1.	Not applicable
	2.	Not applicable
	3. A Justification Document is required in accordance with Annex F.	Modified
	4.	Applicable
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
4.3 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 The procurement of a single trace code per delivery lot should be preferred and encouraged.	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 traceability information usually included on the original manufacturer packaging.	New

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 Table 4-2.	Modified
4.3.3e		Applicable
4.3.3f		Applicable
4.3.3g		Applicable
4.3.3h		Applicable

Table 4-2: Screening tests for Class 1 components

	TEST	SAMPLING	METHOD	COMMENTS
1	X-rays	100%	MIL-STD-750 method 2076 MIL-STD-883 method 2012.	Deposited total dose shall be < 1/10 of product acceptable dose.
2	Serialization	100%	Defined by the supplier.	-
3	Temperature cycling	100%	10 T/C -55°/+125°C (or to the manufacturer storage temp., whichever is less). MIL-STD-750 method 1051	-

	TEST	SAMPLING	METHOD	COMMENTS
			MIL-STD-883 method 1010	
4	PIND test	100%	MIL-STD-750 method 2052 cond.A MIL-STD-883 method 2020 cond.A	Applicable to cavity package only.
5	Initial electrical test	100%	Electrical test (para-metrical and functional) at 25°C as per the internal supplier's specification.	Read & record on selected parameters as per the internal supplier's specification (see 4.2.3.1.k).
6	Burn-in	100%	MIL-STD-750 method 1038 & 1039 MIL-STD-883 method 1015 cond.B 240h – 125°C or 445h – 105°C or 885h – 85°C	Temperature shall be < T _{jmax} -10°C and T _g -10°C whichever is lower. In absence of T _j or T _g knowledge, 105°C max is required. E _a = 0,4eV for equivalence calculation unless a different value has been demonstrated for the product. Termination oxidation risk shall be controlled after burn-in. For discrete, HTRB and power burn-in depend on product family.
7	Final electrical test	100%	Electrical test (para-metrical and functional) at 3 temp. as per the internal supplier's specification.	Read & record on selected parameters as per the internal supplier's specification (see 4.2.3.1k).
8	PDA	-	On steps 5 and 7. Max acceptable PDA: 5%	PDA calculation applies to room temperature measurement only.
9	Seal test	100%	MIL-STD-750 method 1071 cond H1 or H2 and C or K. MIL-STD-883 method 1014 cond A or B and C.	Applicable to hermetic & cavity package only.

	TEST	SAMPLING	METHOD	COMMENTS
10	External visual inspection	100%	MIL-STD-750 method 2071 MIL-STD-883 method 2009	The MIL specs are not adapted to visual inspection of plastic encapsulated components, but can be used as reference (mainly for connection corrosion and marking acceptance). In addition, for plastic packages, inspect for the following defects: Package deformation/ Foreign inclusions in the package, voids and cracks in the plastic/ deformed leads.

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 each trace code of EEE parts is submitted to a lot acceptance procedure specified in Figure 4-2 and Table 4-3 according to the following rules:	Modified
	1.	Not applicable
	2.	Not applicable
	3. Commercial components: (a) Each trace code is submitted to lot acceptance as specified in Table 4-3. (b) The proposed lot acceptance is approved through the approval process in accordance with the clause 4.2.4. (c) Omission of any of these elements, or the introduction of alternative tests, is justified in the JD. (d) If evaluation test is performed directly on flight lot (and if in conformance with lot acceptance and screening requirements), evaluation data can be used	Modified

	as lot acceptance. (e) The lot acceptance report is sent to the customer, on request, for information.	
4.3.5b		Not applicable
4.3.5c	Lot acceptance of retinned components shall be performed as specified in Figure 8-2, from the requirement 8.1a.	New

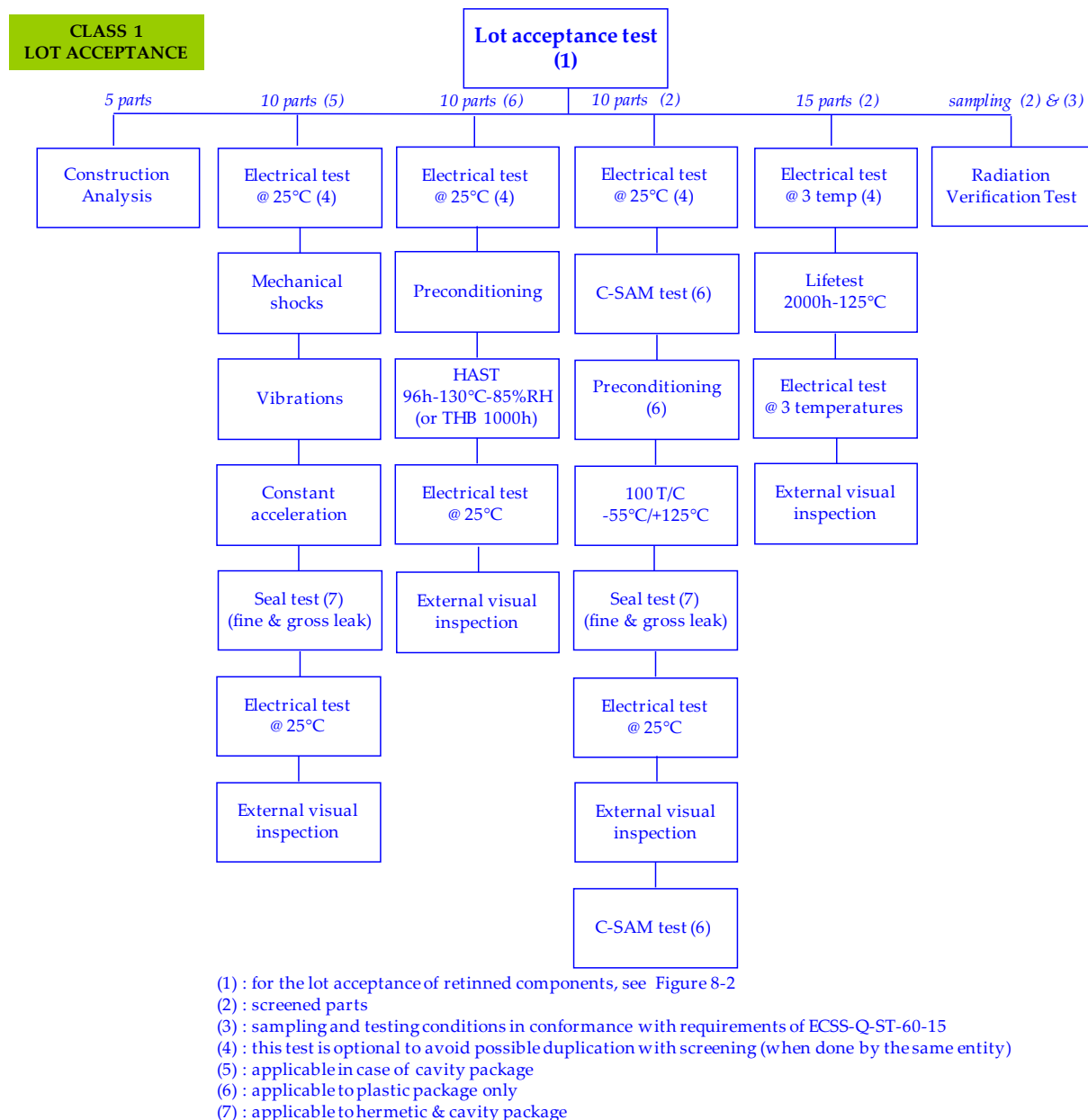


Figure 4-2: Lot acceptance tests flow chart for Class 1 components

Table 4-3: Lot acceptance tests for Class 1 components

	TEST	SAMPLING / CRITERIA	METHOD	COMMENTS
1	Construction analysis	5 parts	As per clause 4.2.3.3 see Annex H.	-
2	Mechanical shocks	10 parts min	MIL STD 883 TM 2002 condition B - 50 pulses (per orientation) instead of 5 pulses (per orientation). MIL-STD-750 TM 2016, 1500g, 0,5ms duration - 50 shocks instead of 5 shocks, planes X1, Y1 and Z1.	Applicable to cavity package. Read & record for electrical test as per the preliminary issue of the internal supplier's specification (see 4.2.3.1.k).
	Vibrations		MIL-STD-883, TM 2007 condition A - 120 times (total) instead of 12 times (total). MIL-STD-750, TM 2056, 20g, 10-2000Hz, cross over at 50Hz - 120 times (total) instead of 12 times (total).	
	Constant acceleration		MIL-STD-883, TM 2001 condition E (resultant centrifugal acceleration to be in the Y1 axis only). For components which have a package weight of 5 grammes or more, or whose inner seal or cavity perimeter is more than 5 cm, Condition D shall be used. MIL-STD-750, TM 2006, 20000g, planes X1, Y1 and Y2.	
3	Preconditioning + 96h HAST (or 1000h THB 85/85)	10 parts 0 defect accepted	HAST 96h-130°C-85%RH (JESD22-A110 with continuous bias) or THB (JESD22-A101). Electrical test (para-metrical and functional) at 25°C as per the internal supplier's specification. Preconditioning: i.a.w. JESD-22-A113 for SMD JESD-22-B106 for through hole.	Applicable to plastic package. Internal supplier's specification (see 4.2.3.1k)
4	C-SAM	10 parts	JEDEC J-STD-020	To be done on the 10