# SLOVENSKI STANDARD
# SIST EN 16602-60-05:2014

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**Zagotavljanje varnih proizvodov v vesoljski tehniki - Osnovne zahteve za naročanje hibridnih vezij**

Space product assurance - Generic procurement requirements for hybrids

Raumfahrtproduktsicherung - Allgemeine Beschaffungsanforderungen an Hbyride

Assurance produit des projets spatiaux - exigences génériques d'approvisionement des composants hybrides

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# Space product assurance - Generic procurement requirements for hybrids

Assurance produit des projets spatiaux - exigences génériques d'approvisionement des composants hybrides

Raumfahrtproduktsicherung - Allgemeine Beschaffungsanforderungen an Hybride

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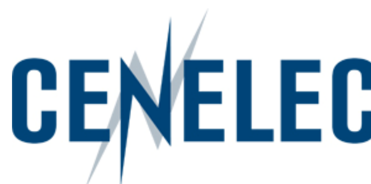


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# Foreword

This document (EN 16602-60-05:2014) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16602-60-05:2014) originates from ECSS-Q-ST-60-05C Rev. 1.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2015, and conflicting national standards shall be withdrawn at the latest by March 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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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).

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# Introduction

The objective of this Standard is to define the requirements for the procurement of hybrid microcircuits for use in space systems.

This Standard covers the following requirement domains:

- Validation procedure for a hybrid microcircuit manufacturer.
- Design of hybrid microcircuits.
- Procurement of active and passive chips.
- Procurement of materials and piece parts.
- Screening of hybrid microcircuit lots.
- Lot acceptance tests for hybrid microcircuits.
- Customer involvement, key inspection points.
- Repair provisions.
- Hybrids and data package delivery.

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# 1 Scope

The procurement requirements for hermetic hybrid microcircuits for use in space projects are defined in this Standard.

This Standard also provides details concerning the documentation requirements and the procedures relevant to obtain approval for the use of hybrid microcircuits in the fabrication of space systems and associated equipment.

The provisions of this Standard apply to all participants in the production of space systems, at all levels and are applicable to manned and unmanned spacecraft, launchers, satellites, payloads, experiments, and their corresponding organizations.

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

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# 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 revisions 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 most 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 16602-60-12 | ECSS-Q-ST-60-12 | Space product assurance - Design, selection, procurement and use of die form monolithic microwave integrated circuits (MMICs) |
| EN 16602-30-11 | ECSS-Q-ST-30-11 | Space product assurance — Derating - EEE components |
| EN 16602-70 | ECSS-Q-ST-70 | Space product assurance — Materials, mechanical parts and processes |
| | MIL-STD-883G | Tests methods and procedures for microelectronics |
| | MIL-STD-750D | Test method standard for semiconductor devices |
| | ESCC 20600 | Preservation, packaging and despatch of ESCC components |
| | ESCC 2043000 | Internal visual inspection of capacitors |
| | ESCC 2044000 | Internal visual inspection of resistors |
| | ESCC 2045010 | Internal visual inspection of microwave devices |
| | ESCC 2049010 | Internal visual inspection of monolithic microwave devices |
| | ESCC 2053000 | External visual inspection of capacitors |
| | ESCC 2054000 | External visual inspection of resistors |
| | ESCC 2093000 | Radiographic inspection of capacitors |
| | ESCC 2094000 | Radiographic inspection of resistors |

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# 3 Terms, definitions and abbreviated terms

## 3.1 Terms from other standards

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

## 3.2 Terms specific to the present standard

### 3.2.1 approving authority

organization supplying approval certificate

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NOTE In Europe the approving authority for space systems components is the ESCC system.

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### 3.2.2 category 1 manufacturer

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manufacturer with a technology domain approved or pending approval by the **approving authority**

### 3.2.3 category 2 manufacturer

manufacturer with a technology domain not approved by the **approving authority**

### 3.2.4 EM quality level hybrid

**hybrid** manufactured with the same parts (types, sources and design), materials, and processes as flight models but with acceptance of a lower quality level for visual inspection or screening during procurement or manufacturing

### 3.2.5 hybrid

see "**hybrid microcircuit**"

### 3.2.6 hybrid circuit

see "**hybrid microcircuit**"

### 3.2.7 hybrid microcircuit

combination of elements (interconnection substrate, added active or passive chips) sealed inside a package in order to perform an electronic function

NOTE 1 Interconnection substrate (e.g. thick film, thin film, co-fired, DBC) can be with or without integrated

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passive components (e.g. resistors, inductors, capacitors).

NOTE 2 Active parts can be monolithic or discrete, chips or packaged components.

NOTE 3 Electronic functions that are performed by hybrids include digital or analog, low frequency or radiofrequency, low power or high power functions. These functions may be mixed according to the application.

NOTE 4 The terms "**hybrid circuits**" and "**hybrids**" are synonymous for "Hybrid microcircuits".

### 3.2.8 process identification document

document that defines the approved technology domain, the reference of approval status, and one that freezes the configuration of the manufacturing line and the approved domain

### 3.2.9 process performance index

the long-term capability of the process which reflects the process centering and the variability with respect to specification requirements

### 3.2.10 production lot

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number of units of a single device type manufactured on the same production line using the same production techniques, in one uninterrupted period, according to the same component or part design and having the same chips lots and the same materials

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### 3.2.11 representative production lot

lot that represents several **production lots** grouping products from the same family, covered by one SEC type, manufactured on the same production line, in one uninterrupted period, using the same materials and processes

### 3.2.12 standard evaluation circuit

device that represents a family of products using the same materials and processes and which is processed on the same production line with the same manufacturing equipment and tools

### 3.2.13 technology review board

formal group at manufacturer level where design, materials and parts procurement, manufacturing, testing, reliability, and quality assurance functions are represented

## 3.3 Abbreviated terms

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

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| Abbreviation | Meaning |
|---|---|
| CECC | CENELEC Electronic Components Committee |
| CTA | circuit type approval |
| COC | certificate of conformance |
| DCL | declared component list |
| DRD | document requirements definition |
| DBC | direct bonded copper |
| DPA | destructive physical analysis |
| EM | engineering model |
| ESA | European Space Agency |
| ESCC | European Space Components Coordination |
| ESD | electrostatic discharge |
| FM | flight model |
| FMECA | failure modes effects and criticality analysis |
| HTIF | hybrid circuit technology identification form |
| LAT | lot acceptance test |
| MMIC | monolithic microwave integrated circuit |
| MIP | mandatory inspection points |
| NCR | nonconformance report |
| PA | product assurance |
| PAD | part approval document |
| PDA | percent defective allowable |
| PDR | preliminary design review |
| PID | process identification document |
| PIND | particle impact noise detection |
| Ppk | process performance index |
| RFD | request for deviation |
| RFW | request for waiver |
| SAM | scanning acoustic microscope |
| SEC | standard evaluation circuit |
| SEM | scanning electronic microscope |
| SPC | statistical process control |
| TCV | technological characterization vehicle |
| TRB | technology review board |

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# 4 Sequence of procurement activities

The sequences of activities involved in the procurement of hybrid microcircuits are illustrated in Figure 4-1. A more detailed illustration is further provided in Figure 4-2.

The initial steps in the process are the selection and validation of the manufacturer and the technology.

The technology of a hybrid circuit is defined as the set of processes and materials used to manufacture the hybrid, i.e.

- the substrate network and material: thick film or thin film;
- integrated components, i.e. resistors, capacitors and inductors used in the network;
- processes and materials for the attachment and connection of the added-on components (active and passive chips);
- packaging type and material.

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