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Space engineering - Mechnical - Part 7: Mechnical parts

Raumfahrttechnik - Mechanik - Teil 7: Mechanische Teile

Ingénierie spatiale - Mécanique - Partie 7: Pieces mécaniques

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Raumfahrttechnik - Mechanik - Teil 7: Mechanische Teile

This European Standard was approved by CEN on 27 June 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This document (EN 14607-7:2004) has been prepared by CMC.

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of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

It is based on a previous version[1)] originally prepared by the ECSS Mechanical Engineering Standard Working Group, reviewed by the ECSS Technical Panel and approved by the ECSS Steering Board. The European Cooperation for Space Standardization (ECSS) is a cooperative effort of the European Space Agency, National Space Agencies and European industry associations for the purpose of developing and maintaining common standards.

This document is one of the series of space standards intended to be applied together for the management, engineering and product assurance in space projects and applications.

Requirements in this document are defined in terms of what shall be accomplished, rather than in terms of how to organize and perform the necessary work. This allows existing organizational structures and methods to be applied where they are effective, and for the structures and methods to evolve as necessary without rewriting the standards.

EN 14607 Space engineering - Mechanical is published in 8 Parts:

- Part 1: Thermal control
- Part 2: Structural
- Part 3: Mechanisms

- Part 4: ECLS
- Part 5: Propulsion
  - Part 5.1: Liquid and electric propulsion for spacecraft
  - Part 5.2: Solid propulsion for spacecraft, solid and liquid propulsion for launchers
- Part 6: Pyrotechnics
- Part 7: Mechanical parts
- Part 8: Materials

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

[1)] ECSS-E-30 Part 7A

1 Scope

EN 14607 Part 7 of Space engineering - Mechanical defines the mechanical engineering requirements for mechanical parts.

This document defines the requirements applicable to the selection, design, verification and application of mechanical parts to promote the use of high-quality non-critical mechanical parts that achieve robust functionality and satisfy the mission performance requirements.

This document defines a pragmatic approach to the selection of parts by the mechanical and design engineer on the basis of their effect on the integrity of the equipment and to streamline the selection of space-proven rather than non space-proven parts during the design of a new equipment in order to select the least number of different parts to satisfy the mission requirements.

It defines performance, design, test, product assurance and support activity requirements for the use of mechanical parts in space applications.

When viewed from the perspective of a specific project context, the requirements defined in this document should be tailored to match the genuine requirements of a particular profile and circumstances of a project.

NOTE Tailoring is a process by which individual requirements of specifications, standards and related documents are evaluated, and made applicable to a specific project by selection, and in some exceptional cases, modification of existing or addition of new requirements.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13290-4:2001, *Space project management — General requirements — Part 4: Project phasing and planning.*

EN 13291-1:1999, *Space product assurance — General requirements — Part 1: Policy and principles.*

EN 13291-2:2003, *Space product assurance — General requirements — Part 2: Quality assurance.*

EN 13291-3:2003, *Space product assurance — General requirements — Part 3: Materials, mechanical parts and processes.*

EN 13701:2001, *Space systems — Glossary of terms.*

EN 14607-2, *Space engineering — Mechanical — Part 2: Structural.*

EN14607-8, *Space engineering — Mechanical — Part 8: Materials.*

EN 14725:2003, *Space engineering — Verification.*

References to sources of approved lists, procedures and processes can be found in the bibliography.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13701:2001 and the following apply.

3.1.1
bearing part
component whose function is to permit rotation or sliding between load-bearing parts

EXAMPLE Ball-bearing and ball-joint.

3.1.2
certificate of conformity
document related to the part with relevant data certifying that the part fulfils the requirements

3.1.3
connecting part
structural elements to provide a mechanical joint

EXAMPLE Bolts, nuts, rivets, inserts and clips.

3.1.4
control part
component which regulates systems for variable operating and environmental conditions

EXAMPLE Gears.

3.1.5
critical mechanical part
mechanical part featuring risk which can be unacceptable to the project and requires specific attention or control or with which the contractor has had no previous applications experience

EXAMPLE Critical mechanical parts include: single point failure part, limited life part, hazardous part, part without possibility of check out after integration, part with critical technology, part with a known history of failures.

3.1.6
development testing
set of tests performed to prove the validity of the design and the technologies involved and to supplement analytical techniques in the pre-selected part or subassemblies

3.1.7
evaluation
combination of tests, analyses and audit used to pronounce approval, validation or qualification

3.1.8
fluid handling part
component that is used for moving fluids

EXAMPLE Containers, ducts, valves, fittings, couplings, O-rings and diffusers.

3.1.9
heater
device for the conversion of energy or work into heat

3.1.10
magnetic part
device which functions either by the generation of or by the response to magnetic fields

3.1.11
measuring part
component used to measure a physical quantity, with a selected unit, within a given tolerance, and inside a certain range of variation of the physical quantity

EXAMPLE Gauges and thermocouples.

3.1.12
mechanical part
off-the-shelf commercial and military (CAM) item or equipment designed and produced to perform a distinct mechanical function

NOTE 1 CAM equipment has been developed and produced in lots to military or commercial national standards, in-house specifications or manufacturer data sheets are readily available.

NOTE 2 CAM equipment may be acquired without change to satisfy special requirements. However if changes are performed on a space-proven part, the transformed part is considered as equivalent to a "Space-proven part but with deviation in materials, design or use environment".

3.1.13
optical passive equipment
fixed optical elements requiring no external energy supply

EXAMPLE Gratings, beam-splitters, lenses (reflecting, refractive) and mirrors.

3.1.14
spacing part
component whose function it is to provide a separation between adjacent parts

EXAMPLE Washers, spacers and shims.

3.1.15
separating part
component with the function of releasing or separating adjoining components

EXAMPLE Pyrotechnic actuators, springs and cutters.

3.1.16
space-proven part
mechanical item whose properties are known and that is produced by means of stable processes and has been approved for use in previous space applications which are still valid for its intended use

3.2 Abbreviated terms

The following abbreviated terms are defined and used within this document.

Abbreviation	Meaning
CAM	commercial and military (part)
DML	declared materials list
DPL	declared processes list
DMPL	declared mechanical parts list
EMC	electromagnetic compatibility
ESC	electrostatic compatibility
UV	ultraviolet

4 Requirements

4.1 General

4.1.1 Requirements overview

This clause contains the technical requirements for a project or programme requiring high reliability mechanical parts.

a) This document shall be used in the establishment of mechanical and physical properties of materials, including the effects of environmental conditions.

b) This document shall be applicable to destructive and non-destructive test methods required for material selection, procurement, production and verification.

NOTE The use of space-proven parts avoids additional testing and ensures that such parts perform satisfactorily in nominal environment.

4.1.2 Part classification

The mechanical parts requirements are defined according to the following part classifications:

- space-proven mechanical part;
- non-space-proven mechanical part;
- space-proven part, with deviation in materials, design or use environment.

4.1.3 Part types

The mechanical parts classifications are defined according to following part types:

- non-critical mechanical part;
- critical mechanical part.

4.1.4 Application

a) This document applies to mechanical parts used in all space products. It is intended for end-users, design authorities, safety officials, project offices and manufacturers.

b) The requirements shall be applied to mechanical parts for the selection, fabrication or acquisition of the parts to be used and integrated in a structure, assembly or subsystem of

1) manned space vehicles,

2) unmanned space vehicles,

3) expendable or reusable launch vehicles, and

4) ground equipment.

NOTE Practical application can be impaired by the (provisional) absence of a particular standard or by the need to modify a space product targeted standard or by the existence of several standards addressing the same topic.

c) An early programme of parts identification and control shall be implemented by a materials, parts and processes board in accordance with the requirements of this document, EN 13291-2 and by EN 13291-3.