Bæredygtighed inden for rumfart – Krav til begrænsning af affald i rummet

Space sustainability – Space debris mitigation requirements (ISO 24113:2019, modified)

DANSK STANDARD
Danish Standards Association

Göteborg Plads 1
DK-2150 Nordhavn

Tel: +45 39 96 61 01
dansk.standard@ds.dk
www.ds.dk

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Nachhaltigkeit im Weltraum - Anforderungen zur Eindämmung des Weltraummülls (ISO 24113:2023, modifiziert)

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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN 16604-10:2023) has been prepared by the Joint Technical Committee CEN-CENELEC/JTC 5 "Space", the secretariat of which is held by DIN.

This standard (EN 16604-10:2023) originates from ECSS-U-AS-10C Rev.2.

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of an identical text or by endorsement, at the latest by June 2024, and conflicting national standards shall be withdrawn at the latest by June 2024.

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

This document supersedes EN 16604-10:2019.

The main changes with respect to EN 16604-10:2019 are listed below:

— adoption of ISO 24113, Space systems — Space debris mitigation requirements, 4th edition 2023 (referred to as ISO 24113:2023) with following additional changes from ECSS:
  — addition of "Context information" w.r.t. ECSS
  — update of "Scope" with ECSS related information
  — replacement of "operation" by "normal operations" in definition 3.13 "launch vehicle orbital stage"
  — addition of Note 4 to definition 3.20 "probability of successful disposal"
  — modification of requirements 7.1.1.3, 7.1.2.2, 7.2.2.6, 7.2.3.1, 7.3.1.2, 7.3.2.3 and 8.2.2
  — addition of Note to requirement 7.2.1 and 7.3.3.2
  — addition of requirements 7.2.3.5, 7.2.3.6 and 7.3.3.3

This document has been prepared under a standardization request addressed to CEN-CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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).

Any feedback and questions on this document should be directed to the users' national standards body/ national committee. A complete listing of these bodies can be found on the CEN and CENELEC websites.

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

Context information

This document outlines the clauses and the requirements of the standard ISO 24113, Space systems — Space debris mitigation requirements, 4th edition 2023 (referred to as ISO 24113:2023) with modifications, additions, notes and clarifications implemented for application in ECSS.

The standard ISO 24113, Space systems — Space debris mitigation requirements has been developed by ISO TC20/SC14. The key space debris mitigation requirements have been thoroughly discussed at international level, agreed by the ISO members and published as standard ISO 24113.

Aiming at the development of worldwide implementation standards dealing with space debris mitigation, ECSS has proactively contributed to the preparation of ISO 24113.

ECSS decided to adopt and apply ISO 24133 with a few modifications, identified in the present document, to account for the reference and applicable space debris mitigation documents existing in Europe and for the needs of the ECSS members, with the addition of a set of delta-requirements.

In 2012, ECSS adopted ISO 24113:2011 with a minimum set of modifications (as per ECSS-U-AS-10C), which have been mostly incorporated in ISO 24113:2019. Therefore, in 2019, ECSS decided to adopt and apply ISO 24113:2019 as it was, without any modifications of the requirements. ISO 24113:2023 has recently been published and is adopted with this document. However, in the present document a few modifications and delta-requirements with respect to ISO 24113:2023 are included.

Introduction

Space debris comprises all objects of human origin in Earth orbit or re-entering the atmosphere, including fragments and elements thereof, that no longer serve a useful purpose. The growing population of these objects poses an increasing hazard to mankind's use of space. In response to this problem, there is international consensus that space activities need to be managed to minimize collision risks among space objects and casualty risks associated with atmospheric re-entry of such objects. This consensus is embodied in space debris mitigation guidelines published by organizations such as the International Telecommunication Union (ITU),[1] the Inter-Agency Space Debris Coordination Committee (IADC)[2] [3] and the United Nations (UN).[4] The transformation of debris mitigation guidelines into engineering practice is a key purpose of this document.

The importance of this document can be seen within the context of four UN treaties[5] that were established under the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) to govern the involvement of nations in space activities. These are the *Outer Space Treaty*, the *Liability Convention*, the *Registration Convention* and the *Rescue Agreement*. Through some of these treaties, a launching State has total liability for damage caused by its spacecraft or launch vehicle orbital stages (or any parts thereof) on the surface of the Earth or to aircraft in flight, as well as in outer space where fault can be proven.

All countries are encouraged to abide by these international agreements in order not to endanger or constrain existing and future activities in space. A launching State can choose to appoint licensing or regulatory authorities to administer its approach for complying with the above-mentioned UN treaties. In several launching States, these authorities have implemented national legislation to enforce the UN treaties. Such legislation can include the mitigation of space debris. Some launching States meet their obligations by appointing non-regulatory government bodies, such as national space agencies, to provide the necessary guidelines or requirements, including those for space debris mitigation.

The general aim of space debris mitigation is to reduce the growth of space debris by ensuring that spacecraft and launch vehicle orbital stages are designed, operated and disposed of in a manner that prevents them from generating debris throughout their orbit lifetime. Another aim of space debris mitigation is to ensure that space objects re-entering the Earth's atmosphere cause no harm. These aims are achieved by the following actions:

a) avoiding the intentional release of space debris into Earth orbit during normal operations;

b) avoiding break-ups in Earth orbit;

c) removing spacecraft and launch vehicle orbital stages from protected orbital regions after the end of mission;

d) performing the necessary actions to minimize the risk of collision with other space objects;

e) reducing the risks associated with re-entry, e.g. to people, property and the Earth's environment.

Such actions are especially important for a spacecraft or launch vehicle orbital stage that has one or more of the following characteristics:

— has a large collision cross-section;

— remains in orbit for many years;

— operates near manned mission orbital regions;

— operates in highly utilized regions, such as protected regions;

— operates in regions of high debris population.

This document transforms these objectives into a set of high-level debris mitigation requirements. Methods and processes to enable conformance with these requirements are provided in a series of lower-level implementation standards.

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1 Scope

This document defines the primary space debris mitigation requirements applicable to all elements of unmanned systems launched into, or passing through, near-Earth space, including launch vehicle orbital stages, operating spacecraft and any objects released as part of normal operations.

2 Normative references

There are no normative references in this document.