

Space engineering - Cleanliness requirements for  
spacecraft propulsion hardware

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 16603-35-06:2022 sisaldab Euroopa standardi EN 16603-35-06:2022 ingliskeelset teksti.	This Estonian standard EVS-EN 16603-35-06:2022 consists of the English text of the European standard EN 16603-35-06:2022.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
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English version

## Space engineering - Cleanliness requirements for spacecraft propulsion hardware

Ingénierie spatiale - Exigences de propreté du matériel  
de propulsion des engins spatiaux

Raumfahrttechnik - Sauberkeitsanforderungen für die  
Antriebstechnik von Raumfahrzeugen

This European Standard was approved by CEN on 20 April 2022.

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Rue de la Science 23, B-1040 Brussels

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## European Foreword

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This document (EN 16602-20-07:2016) has been prepared by Technical Committee CEN-CENELEC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16602-20-07:2016) originates from ECSS-Q-ST-20-07C.

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of an identical text or by endorsement, at the latest by January 2023, and conflicting national standards shall be withdrawn at the latest by January 2023.

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

This document supersedes EN 16603-35-06:2014.

The main changes with respect to EN 16603-35-06:2014 are listed below:

- Implementation of Change Requests received to the ECSS equivalent standard
- Addition of the Nomenclature in clause 3.5
- Definition of “accuracy” deleted in 3.2 and reference to ECSS-S-ST-00-01 made in 3.1
- Definition “condensable hydrocarbon” and “dewar” deleted in clause 3.2 as they were not used in the standard
- Added requirements 6.4.3d.
- Modified requirements: 4.1h Note 2 (reference to Figure of other ECSS Standard corrected); 6.2.6.2a; 6.4.3a; 6.4.3c; 12.1a; 12.2c Note to item 10 moved to the end of the requirement.
- Interleaved Notes in requirement 12.1a move to the end of the requirement
- Cross-reference in Annex B.1.1 to added requirement 6.4.3d created
- Caption of Table in Annex D corrected from “Table A-1” to “Table D-1”.

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).

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



# 1

## Scope

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ECSS-E-ST-35-06 belongs to the Propulsion field of the mechanical discipline, and concerns itself with the cleanliness of propulsion components, sub-systems and systems

The standard

- defines design requirements which allow for cleaning of propulsion components sub-systems and systems and which avoid generation or unwanted collection of contamination,
- identifies cleanliness requirements (e.g. which particle / impurity / wetness level can be tolerated),
- defines requirements on cleaning to comply with the cleanliness level requirements, and the requirements on verification,
- identifies the cleanliness approach, cleaning requirements, (e.g. what needs to be done to ensure the tolerable level is not exceeded, compatibility requirements),
- identifies, specifies and defines the requirements regarding conditions under which cleaning or cleanliness verification takes place (e.g. compatibility, check after environmental test).

The standard is applicable to the most commonly used propulsion systems and their related storable propellant combinations: Hydrazine ( $\text{N}_2\text{H}_4$ ), Mono Methyl Hydrazine ( $\text{CH}_3\text{N}_2\text{H}_3$ ), MON (Mixed Oxides of Nitrogen), Nitrogen ( $\text{N}_2$ ), Helium (He), Propane ( $\text{C}_3\text{H}_8$ ), Butane ( $\text{C}_4\text{H}_{10}$ ) and Xenon (Xe).

This standard is the basis for the European spacecraft and spacecraft propulsion industry to define, achieve and verify the required cleanliness levels in spacecraft propulsion systems.

This standard is particularly applicable to spacecraft propulsion as used for satellites and (manned) spacecraft and any of such projects including its ground support equipment.

External cleanliness requirements, e.g. outside of tanks, piping and aspects such as fungus and outgassing are covered by ECSS-Q-ST-70-01.

This standard may be tailored for the specific characteristic 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 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	ECSS-S-ST-00-01	ECSS system — Glossary of terms
EN 16603-35	ECSS-E-ST-35	Space engineering — Propulsion general requirements
EN 16602-40	ECSS-Q-ST-40	Space product assurance — Safety
EN 16602-70-01	ECSS-Q-ST-70-01	Space product assurance — Cleanliness and contamination control.
EN 16602-70	ECSS-Q-ST-70	Space product assurance — Materials, mechanical parts and processes
	ISO 2210:1972	Liquid halogenated hydrocarbons for industrial use- Determination of residue on evaporation
	ISO 5789:1979	Fluorinated hydrocarbons for industrial use — Determination of non-volatile residue
	ISO 5884:1987	Aerospace — Fluid systems and components — Methods for system sampling and measuring the solid particle contamination of hydraulic fluids
	ISO 14951-3:2000	Space systems — Fluid characteristics — Part 3: Nitrogen
	ISO 14951-4:2000	Space systems — Fluid characteristics — Part 4: Helium
	ISO 14951-10:2000	Space systems — Fluid characteristics — Part 10: Water
	ISO 14952-3:2003	Space systems — Surface cleanliness of fluid systems — Part 3: Analytical procedures for the determination of non-volatile residues and particulate contamination
	ASTM D257(99) 2005	Standard Test Method for DC Resistance or Conductance of Insulating Materials
	ASTM D329 10 Dec 2002	Standard specification for Acetone

EN reference	Reference in text	Title
	ASTM D740 15 May 2005	Standard specification for Methyl Ethyl Ketone
	ASTM D770-05 15 May 2005	Standard specification for Isopropyl Alcohol
	ASTM D1152 1 Apr 2006	Standard specification for Methanol (Methyl Alcohol)
	ASTM D1293 10 Dec 1999	Standard test methods for pH of water
	ASTM D4376	Standard specification for vapor-degreasing grade Perchloroethylene
	MIL-PRF-27415B 8 Feb 2007	Performance specification, propellant pressurizing agent, Argon
	O-E-760D 28 May 1987	Federal specification
	SEMI C47-0699 May 1999	Guideline for Trans 1,2 Dichloroethylene