SLOVENSKI STANDARD
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Zagotavljanje varnih proizvodov v vesoljski tehniki - Zahteve za izdelavo in preskrbo vijačnih zvez

Space product assurance - Requirements for manufacturing and procurement of threaded fasteners

Raumfahrtproduktsicherung - Anforderungen für die Herstellung und Beschaffung von eingezogenen Klemmen/Befestigern

Assurance produit des projets spatiaux - Exigences pour la fabrication et l'approvisionnement de fixations filetées

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49.030.01	Vezni elementi na splošno	Fasteners in general

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Foreword

This document (EN 16602-70-46:2014) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16602-70-46:2014) originates from ECSS-Q-ST-70-46C 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of an identical text or by endorsement, at the latest by April 2015, and conflicting national standards shall be withdrawn at the latest by April 2015.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.

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.

1 Scope

This Standard defines the requirements for manufacturing, provision, inspection and quality control of high-quality threaded fastening devices (bolts, nuts, studs and screws) hereafter referred to as threaded fasteners or fasteners, used in space hardware.

This Standard does not include a complete review of the factors relevant to the fabrication of high quality threaded fasteners. It provides the definition of the technical requirements and quality control procedures to be applied in the fabrication and supply of threaded fasteners for spacecraft applications.

Fasteners for spacecraft applications are those aerospace standard fasteners (i.e. in accordance with LN, DIN or other national or international aerospace standards), or those fasteners meeting or exceeding the requirements in ISO 4759-1 for "Product grade A", which also fulfil the requirements for space applications as specified in the present document.

2
Normative references

The following dated normative documents are called by the requirements of this ECSS Standard and therefore constitute requirements to it. Subsequent amendments to, or revisions of any of these publications do not apply.

NOTE 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.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01C	ECSS system – Glossary of terms
EN 16603-30-01	ECSS-E-ST-30-01C	Space engineering — Fracture control
EN 16602-70	ECSS-Q-ST-70C	Space product assurance — Materials, parts and processes
EN 16602-70-02	ECSS-Q-ST-70-02C	Space product assurance — Thermal vacuum outgassing test for the screening of space materials
EN 16602-70-29	ECSS-Q-ST-70-29C	Space product assurance — The determination of offgassing products from materials and assembled articles to be used in a manned space vehicle crew compartment
EN 16602-70-36	ECSS-Q-ST-70-36C	Space product assurance — Material selection for controlling stress-corrosion cracking
EN 16602-70-37	ECSS-Q-ST-70-37C	Space product assurance — Determination of the susceptibility of metals to stress— corrosion cracking
EN 16602-70-71	ECSS-Q-ST-70-71C	Space product assurance — Data for selection of space materials
	ISO 204	Metallic materials — Uninterrupted uniaxial creep testing in tension — Method of test
	ISO 225	Fasteners — Bolts, screws, studs and nuts — Symbols and designations of dimensions
	ISO 1502	ISO general — purpose metric screw threads — Gauges and gauging

EN reference	Reference in text	Title
	ISO 2859-1	Sampling procedures for inspection by attributes, Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection
	ISO 2859-2	Sampling procedures for inspection by attributes, Part 2: Sampling plans indexed by limiting quality (LQ), for isolated lots inspection
	ISO 3353-1:2002	Aerospace — Lead and runout threads — Part 1: Rolled external threads
	ISO 3800	Threaded fasteners – Axial load fatigue testing – Test methods and evaluation of results
	ISO 4759-1	Tolerances for fasteners — Part 1: Bolts, screws, studs and nuts — Product grades A, B and C
	ISO 6157-2	Fasteners — Surface discontinuities – Part 2: Nuts
	ISO 6157-3	Fasteners – Surface discontinuities – Part 3: Bolts, screws and studs for special requirements
	ISO 6506-1	Metallic materials — Brinell hardness test — Part 1: Test method
	ISO 6506-2	Metallic materials — Brinell hardness test — Part 2: Verification and calibration of testing machines
	ISO 6506-3	Metallic materials — Brinell hardness test — Part 3: Calibration of reference blocks
	ISO 6507-1	Metallic materials — Vickers hardness test – Part 1: Test method
	ISO 6507-2	Metallic materials — Vickers hardness test — Part 2: Verification and calibration of testing machines
	ISO 6507-3	Metallic materials — Vickers hardness test — Part 3: Calibration of reference blocks
	ISO 6508-1	Metallic materials — Rockwell hardness test — Part 1: Test method
	ISO 6508-2	Metallic materials — Rockwell hardness test — Part 2: Verification and calibration of testing machines
	ISO 6508-3	Metallic materials — Rockwell hardness test — Part 3: Calibration of reference blocks
	ISO 9140	Aerospace – Nuts, plain or slotted (castellated) – Test methods
	DIN ISO 9152	Aerospace – Bolts, with MJ Threads, in Titanium alloys, strength class 1100 MPa – Procurement specification
	ASTM B 117-07a	Standard practice for operating salt spray (fog) apparatus
	ASTM E 1417-05e1	Standard practice for liquid penetrant testing
	ASTM E 1444-05	Standard practice for magnetic particle testing

3 Terms, definitions and abbreviated terms

3.1 Terms defined in other standards

For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 and ECSS-Q-ST-70 apply.

3.2 Terms specific to the present standard

3.2.1 bolt

cylindrical screwed bar provided with a head, generally not threaded along its entire length

NOTE For example: Shank plus threaded portion.

3.2.2 fail-safe

approach in which the structure is designed with sufficient structural redundancy to ensure that the failure of one structural element does not cause general failure of the entire structure

3.2.3 fastener

device used to hold parts firmly together in an assembly

3.2.4 galling

condition whereby excessive friction between high spots results in localized welding with subsequent splitting and a further roughening of rubbing surfaces of one or both or two mating parts

3.2.5 nut

metal collar, screwed internally, to fit a bolt

NOTE Usually hexagonal in shape and operated by a spanner.

3.2.6 safe-life

approach which requires that the largest undetected defect that can exist in the structure does not grow to failure when subjected to loads and environments encountered in service

3.2.7 sampling plan

combination of sample size to be used with associated batch acceptability criteria

3.2.8 shank

unthreaded portion of the cylindrical screwed bar of a bolt

3.2.9 stud

shank, or endless bolt, externally screwed from one end, both ends or along its entire length

3.2.10 (screw) thread

helical ridge of approximately triangular, square or rounded section, formed on a cylindrical core, the pitch and core diameter being standardised under various systems

3.2.11 threaded fastener

device composed by a cylindrical screwed bar provided with a head and a metal collar, screwed internally, to fit the cylindrical bar that is used to hold parts firmly together in an assembly

3.3 Abbreviated terms

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

Abbreviation	Meaning
AQL	acceptance quality level
ASTM	American Society for Testing and Materials
HB	Brinell hardness
HRC	Rockwell hardness
HV	Vickers hardness
ISO	International Organization for Standardization
LQ	limiting quality
PCR	product conformance report
PVC	polyvinyl chloride
RMC	raw material certificate
UTS	ultimate tensile strength

4
Requirements

4.1 Fabrication

4.1.1 General

a. The customer shall establish a specification document in conformance with the DRD in Annex A.

b. The manufacturer shall have a quality assurance system.

c. The manufacturer shall verify and assure conformance during production to the technical requirements specified in this clause.

4.1.2 Raw material

a. The raw material for threaded fasteners shall be selected in accordance with the metallic materials requirements as per ECSS-Q-ST-70-71C, if not otherwise specified in the customer specification document for threaded fasteners.

b. Nut material shall be more ductile than bolt material.

NOTE The reason is that during tightening nut threads can deflect to seat on the bolt threads.

c. Materials for threaded fasteners shall be selected in order to avoid galling of the mating surfaces.

NOTE Galling in stainless steel fasteners can be prevented by using two different steels on the mating surfaces and by specific surface treatments.

d. Materials for threaded fasteners shall be corrosion resistant

e. Materials shall possess high resistance to stress-corrosion cracking as specified in ECSS-Q-ST-70-36C.

4.1.3 Head forming

a. Fastener heads shall be formed by hot or cold forging before heat treating.

NOTE Driving recesses and lightening holes in double hexagon design can be forged or machined.