SLOVENSKI STANDARD
oSIST prEN 16602-70-40:2022

01-februar-2022

Zagotavljanje kakovosti proizvodov v vesoljski tehniki - Zahteve za obdelavo in zagotavljanje kakovosti za trdo spajkanje kovinskih materialov za letalsko strojno opremo

Space product assurance - Processing and quality assurance requirements for hard brazing of metallic materials for flight hardware

Raumfahrtproduktsicherung - Metallschweißen in Flug-Hardware

Ta slovenski standard je istoveten z: **prEN 16602-70-40**

ICS:

03.120.99	Drugi standardi v zvezi s kakovostjo	Other standards related to quality
25.160.50	Trdo in mehko lotanje	Brazing and soldering
49.140	Vesoljski sistemi in operacije	Space systems and operations

oSIST prEN 16602-70-40:2022 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

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prEN 16602-70-40

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English version

Space product assurance - Processing and quality assurance requirements for hard brazing of metallic materials for flight hardware

Raumfahrtproduktsicherung - Metallschweißen in Flug-Hardware

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/CLC/JTC 5.

If this draft becomes a European Standard, CEN and CENELEC 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.

This draft European Standard was established by CEN and CENELEC in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN and CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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European Foreword

This document (prEN 16602-70-40:2021) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN (Germany).

This document (prEN 16602-70-40:2021) originates from ECSS-Q-ST-70-40C DIR1.

This document is currently submitted to the ENQUIRY.

This document has been developed to cover specifically space systems and will therefore have precedence over any EN covering the same scope but with a wider do-main of applicability (e.g. : aerospace).

1 Scope

This Standard specifies the processing and quality assurance requirements for brazing processes for space flight application. Brazing is understood as the joining and sealing of materials by means of a solidification of a liquid filler metal.

The term brazing in this standard s is used as equivalent to soldering, in cases that the filler materials have liquidus temperatures below 450 °C.

Brazing and soldering are allied process to welding and this standard is supplementing the standard for welding ECSS-Q-ST-70-39.

This standard does not cover requirements for:

- Joining processes by adhesive bonding (ECSS-Q-ST-70-16),
- Soldering for electronic assembly purposes (ECSS-Q-ST-70-61),
- Soldering used in hybrid manufacturing (ESCC 2566000).

The standard covers but is not limited to the following brazing processes:

- Torch brazing,
- Furnace brazing,
- Dip Brazing and Salt-bath brazing,
- Induction Brazing.

This Standard does not detail the brazing definition phase and brazing pre-verification phase, including the derivation of design allowables.

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

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 revision 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 more 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 16601-40	ECSS-M-ST-40	Space management – Configuration and information management
EN 16603-10-02	ECSS-E-ST-10-02	Space engineering – Verification
EN 16603-32-01	ECSS-E-ST-32-01	Space engineering – Fracture control
EN 16602-10-09	ECSS-Q-ST-10-09	Space product assurance – Nonconformance control system
EN 16602-70	ECSS-Q-ST-70	Space product assurance – Materials, mechanical parts and processes
EN 16602-70-01	ECSS-Q-ST-70-01	Cleanliness and contamination control
	EN ISO 18279:2004	Imperfections in brazed joints

3 Terms, definitions and abbreviated terms

3.1 Terms from other standards

a. For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 apply and in particular the following:

1. **critical**

b. For the purpose of this Standard, the terms and definitions from ECSS-E-ST-32-01 apply.

1. **fail-safe**

3.2 Terms specific to the present standard

3.2.1 alpha sample

sample brazed prior to the start of a production run, used to verify selected aspects of the quality of the brazing joint to be produced during production

3.2.2 beta sample

sample brazed at the end of a production run, used to verify selected aspects of the quality of the brazing joint to be produced during production

3.2.3 braze metal

see "**filler metal**"

3.2.4 brazer

person who performs brazing in a manual operation, guides the heating means, ensures the introduction of the brazing filler material and verifies the braze joint configuration specified by the design

3.2.5 brazing

joining and sealing of parent materials by means of a solidification of a liquid filler metal

NOTE Terms brazing and soldering are synonymous independent from the liquidus temperature or the filler material. For more details see clause 4.

3.2.6 brazing inspector

person with the responsibility and ability to judge the quality of brazed joints in relation to the specification

3.2.7 brazing operator

person who prepares the joint and sets up brazing equipment and thereby has direct influence on the brazed joint quality

3.2.8 brazing responsible

person who is nominated by the company to follow and organise brazing processes, establish the BPS, be responsible for training and realisation of acceptable brazing for production

3.2.9 design and engineering authority

organization that has the responsibility for the structural integrity and maintenance of flightworthiness of the hardware and compliance with all relevant documents related to brazing and soldering

3.2.10 filler metal

material required for soldered/brazed joints

NOTE The term "**braze metal**" is synonymous

3.2.11 flux

material which promotes wetting of the parent material by the filler metal

3.2.12 parent material

material being brazed and soldered

3.2.13 soldering

see "**brazing**"

NOTE Terms soldering and brazing are used synonymously in this standard. For more details see clause 4.

3.3 Abbreviated terms

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

Abbreviation	Meaning
BPS	brazing procedure specification
BVTP	brazing verification test plan
BVTR	brazing verification test report
CTE	coefficient of thermal expansion
ECSS	European Cooperation for Space Standardization
HAZ	heat affected zone
NCR	nonconformance report
NDT	non-destructive test
RfA	request for approval

3.4 Conventions

For the purpose of this Standard, the following conventions apply:

Convention	Meaning
qualification	In this ECSS-Q-ST-70-40 the term is synonymous with the term "verification" used in ECSS documentation.
qualification test plan (QTP)	used in common brazing documentation is synonymous with the term "Brazing verification test plan (BVTP)" from this ECSS-Q-ST-70-40
qualification test report (QTR)	used in common brazing documentation is synonymous with the term "Brazing verification test report (BVTR)" from this ECSS-Q-ST-70-40

3.5 Nomenclature

The following nomenclature applies throughout this document:

a. The word “shall” is used in this Standard to express requirements. All the requirements are expressed with the word “shall”.

b. The word “should” is used in this Standard to express recommendations. All the recommendations are expressed with the word “should”.

NOTE It is expected that, during tailoring, recommendations in this document are either converted into requirements or tailored out.

c. The words “may” and “need not” are used in this Standard to express positive and negative permissions, respectively. All the positive permissions are expressed with the word “may”. All the negative permissions are expressed with the words “need not”.

d. The word “can” is used in this Standard to express capabilities or possibilities, and therefore, if not accompanied by one of the previous words, it implies descriptive text.

NOTE In ECSS “may” and “can” have completely different meanings: “may” is normative (permission), and “can” is descriptive.

e. The present and past tenses are used in this Standard to express statements of fact, and therefore they imply descriptive text.

3.6 Schematic of brazed assembly

Figure 3-1 shows a typical joint made by brazing and soldering.

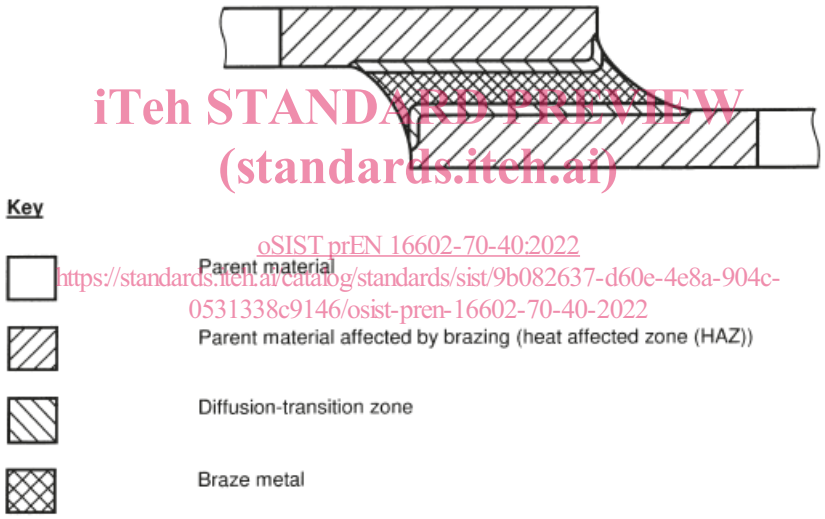

Figure 3-1: Schematic of a brazed and soldered joint (taken from EN ISO 18279:2004)