



SLOVENSKI STANDARD
SIST EN 16602-70-18:2015
01-januar-2015

Zagotavljanje varnih proizvodov v vesoljski tehniki - Pripravljanje, sestavljanje in pritrjevanje RF-koaksialnih kablov

Space product assurance - Preparation, assembly and mounting of RF coaxial cables

Raumfahrtproduktsicherung - Vorbereitung, Zusammenbau und Befestigung von RF-Koaxial-Kabeln

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Assurance produit des projets spatiaux - Préparation, assemblage et montage des câbles radiofréquence coaxiaux

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49.060	Letalska in vesoljska električna oprema in sistemi	Aerospace electric equipment and systems
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EUROPEAN STANDARD

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Space product assurance - Preparation, assembly and mounting of RF coaxial cables

Assurance produit des projets spatiaux - Préparation,
assemblage et montage des câbles radiofréquence
coaxiaux

Raumfahrtproduktsicherung - Vorbereitung, Zusammenbau
und Befestigung von RF-Koaxial-Kabeln

This European Standard was approved by CEN on 11 April 2014.

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Foreword

This document (EN 16602-70-18:2014) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN.

This standard (EN 16602-70-18:2014) originates from ECSS-Q-ST-70-18C.

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of an identical text or by endorsement, at the latest by April 2015, and conflicting national standards shall be withdrawn at the latest by April 2015.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.

Introduction

The main part of this Standard is based on industrial experience and recommendations from European soldering technology experts. Modifications are incorporated into the text to provide for the specific requirement of low-outgassing electrical systems which are required by scientific and application satellites. Other additions were made in the light of recent technological advances and results of metallurgical test programmes. The use of processes other than solder assembly is recognized, but only certain general requirements are given in this Standard.

These requirements apply to assemblies designed to operate within the temperature limits from -45 °C to +85 °C. More extreme temperatures or other unusual environmental applications require special design measures or processing steps to provide environmental survival capability.

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Scope

This Standard defines the technical requirements and quality assurance provisions for the assembly and mounting of high-reliability, radio-frequency (RF) coaxial-cable interconnections for use as transmission lines in spacecraft and associated equipment.

In general, these assemblies are designed for low-loss, stable operation from the relatively low frequencies through the higher frequencies in the microwave regions.

These transmission-line cables should not be confused with low-frequency cables with conductive sheaths (usually copper braid), which are used in applications where shielding of the centre conductors from the surrounding electrical ambient is required. The interconnection of those shielded cables, not covered by the present standard, is covered in ECSS-Q-ST-70-08.

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

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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 16602-10-09	ECSS-Q-ST-10-09	Space product assurance – Nonconformance control system
EN 16602-20	ECSS-Q-ST-20	Space product assurance – Quality assurance
EN 16602-60	ECSS-Q-ST-60	Space product assurance – Electrical, electronic and electromechanical (EEE) components
EN 16602-70-02	ECSS-Q-ST-70-02	Space product assurance – Thermal vacuum outgassing test for the screening of space materials
EN 16602-70-08	ECSS-Q-ST-70-08	Space product assurance – Manual soldering of high-reliability electrical connections
EN 16602-70-26	ECSS-Q-ST-70-26	Space product assurance – Crimping of high-reliability electrical connections
EN 16602-70-28	ECSS-Q-ST-70-28	Space product assurance – Repair and modification of printed circuit board assemblies
	MIL-C-17G(3) SUP1	General specification for cables, radio frequency, flexible and semi-rigid. (8 Jan 1996)

Terms, definitions and abbreviated terms

3.1 Terms from other standards

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

requirement

3.2 Terms specific to the present standard

3.2.1 minimum bend radius

inside radius of the bend measured on the outer surface of the cable

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3.3 Abbreviated terms

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

Abbreviation	Meaning
FEP	fluorinated ethylene propylene
PTFE	polytetrafluoroethylene
SMA	sub miniature version A
VSWR	voltage standing wave ratio

Principles and prerequisites of reliable soldered or crimped cable connections

4.1 Principles of reliable soldered or crimped semi-rigid cable connections

Reliable soldered or crimped connections result from proper design, control of tools, materials and work environments and careful workmanship.

The basic design concepts, adherence to which ensures reliable connections and prevents joint failure, are:

- a. Avoidance of dimensional mismatch between the coaxial-cable assembly and the units being connected; i.e. not forcing the semi-rigid cable assembly into position and thereby cracking or pre-stressing one of the joints.
- b. Use of cable end connectors with retractable (non-captive) coupling nuts; after completion of mounting, the coaxial-cable assembly is not in a state of tension resulting from axial movement when the connectors are threaded together.
- c. Minimizing the internal stresses on the soldered or crimped connections resulting from exposure to thermal cycling.

NOTE The thermal coefficient of expansion of the dielectric is about ten (10) times that of copper and in service this can introduce a tensile stress on the joint.

- d. The various assembly and mounting processes are covered by quality-control inspection steps.

4.2 Prerequisites for assembly and mounting of semi-rigid coaxial cables

Each supplier maintains documented soldering or crimping programmes which meet the requirements of this Standard for the types of connections employed and the articles involved. The programmes include procedures for training, certification, maintenance of certified status, recertification and revocation of certified status for soldering, crimping and inspection personnel. The supplier also prepares and has readily available workmanship standards consisting of

satisfactory work samples or visual aids which clearly illustrate the quality characteristics for all connections involved, including the applicable illustrations in Annex B of this Standard.

Records are kept to provide identification between the finished product and the operator. Records are also maintained of the training, testing and certification status of assembly operators. Records are retained for at least one year, or longer if this is a specific requirement of the customer's project.

Equipment and tools are verified and calibrated periodically for proper operation, and records of tool calibration and verification are maintained (see clause 5.8).

For soldering or crimping requirements not covered in this Standard, the supplier submits a process procedure including all pertinent quality requirements to the customer's relevant project office for approval in accordance with ECSS-Q-ST-70.

4.3 Alternative coaxial cable technologies

Alternative coaxial cable technologies are accepted for application in individual customer programmes following the completion of qualification and batch acceptance test programmes in accordance with clause 5.7. The precise test programme and results are subject to review and acceptance by the relevant customer programme. For materials used in the alternative technology see ECSS-Q-ST-70-71.

Some mounting requirements for alternative technologies are given in clause 5.6.3 of this Standard.

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