SLOVENSKI STANDARD
kSIST FprEN 16603-33-11:2018

01-september-2018

Vesoljska tehnika - Eksplozivni sistemi in naprave

Space engineering - Explosive systems and devices

Raumfahrttechnik - Explosive Systeme und Geräte

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Ta slovenski standard je istoveten z: **FprEN 16603-33-11**

SIST-EN 16603-33-11:2019
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ICS:

29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres
49.140	Vesoljski sistemi in operacije	Space systems and operations

kSIST FprEN 16603-33-11:2018 **en,fr,de**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

FINAL DRAFT
FprEN 16603-33-11

June 2018

ICS 49.140

Will supersede EN 14607-6:2004

English version

Space engineering - Explosive systems and devices

Raumfahrttechnik - Explosive Systeme und Geräte

This draft European Standard is submitted to CEN members for unique acceptance procedure. 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.

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European Foreword

This document (FprEN 16603-33-11:2018) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN (Germany).

This document (FprEN 16603-33-11:2018) originates from ECSS-E-ST-33-11C Rev.1.

This document is currently submitted to the Unique Acceptance Procedure.

This document will supersede EN 14607-6:2004.

Changes to EN 14607-6:2004 that was based on ECSS-E-30 Part 6A (25 April 2000) are:

- Complete edit to conform to the ECSS Drafting Rules for "ECSS Issue C standards"
- Implementation of ECSS Change Requests and harmonization the standard with ISO in ECSS Revision 1 (2017)
- Change of the title from "Space engineering - Mechanical - Part 6: Pryotechnics" to "Space engineering – Explosive subsystems and devices"
- Use of the more accurate term "explosive" rather than "pyrotechnics" in relation to the subject components and systems
- Emphasis on reliability coupled with confidence level for performance properties
- Inclusion of detailed requirements for the different types of explosive device
- Emphasis on the requirement for properties of components to be agreed with the end user before commitment to purchase.

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 domain of applicability (e.g.: aerospace).

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association

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Introduction

As any explosive item used for flight can function only once, it can never be fully tested before its crucial mission operation. The required confidence can only be established indirectly by the testing of identical items. Test results and theoretical justification are essential for demonstration of fulfilment of the requirements. The requirement for repeatability shows that product assurance plays a crucial role in support of technical aspects.

The need for statistics requires that the explosive components used in the explosive subsystem be tested and characterized extensively. The variability in components requires that manufacturers prove to customers that delivered items are identical to those qualified.

The failure or unintentional operation of an explosive item can be catastrophic for the whole mission and life threatening. Specific requirements can exist for the items associated with it. As all explosives where ever used are treated similarly, the same requirements, regulations, practices and standards need to be applied to help avoiding human error.

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1
Scope

This Standard defines the requirements for the use of explosives on all spacecraft and other space products including launch vehicles. It addresses the aspects of design, analysis, verification, manufacturing, operations and safety.

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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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.

ECSS-S-ST-00-01	ECSS system - Glossary of terms
ECSS-E-ST-10-02	Space engineering - Verification
ECSS-E-ST-10-03	Space engineering - Testing
ECSS-E-ST-20	Space engineering - Electrical and electronic
ECSS-E-ST-20-07	Space engineering – Electromagnetic compatibility
ECSS-E-ST-32-10	Space engineering - Reliability based mechanical factors of safety
ECSS-E-ST-33-01	Space engineering - Mechanisms
ECSS-Q-ST-20	Space product assurance - Quality assurance
ECSS-Q-ST-30	Space product assurance - Dependability
ECSS-Q-ST-40	Space product assurance - Safety
ECSS-Q-ST-70-01	Space product assurance - Contamination and cleanliness control
ECSS-M-ST-40	Space management - Configuration and information management
ST/SG/AC.10/1 latest version (UNECE publication)	Recommendations on the Transport of Dangerous Goods – Model Regulations
Commission Directive 2012/4/EU (22 February 2012)	Commission Directive 2012/4/EU of 22 February 2012 amending Directive 2008/43/EC setting up, pursuant to Council Directive 93/15/EEC, a system for the identification and traceability of explosives for civil uses
Commission Directive 2008/43/EC (4 April 2008)	Commission Directive 2008/43/EC of 4 April 2008 setting up, pursuant to Council Directive 93/15/EEC, a system for the identification and traceability of explosives for civil uses

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Council Directive 93/15/EEC (5 April 1993)	Council Directive 93/15/EEC of 5 April 1993 on the harmonization of the provisions relating to the placing on the market and supervision of explosives for civil uses
Dictionary of explosive related terms, 7th Edition, 2016	Groupe de Travail de Pyrotechnie, Dictionnaire de pyrotechnie

NOTE For launcher subsystems and Transfer Vehicle programmes, the specific General Specification (SG) or Design Rules (DR) documents are applicable for designing, dimensioning and testing.

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3
Terms, definitions and abbreviated terms

3.1 Terms defined in other standards

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

1. lifetime

3.2 Terms specific to the present standard

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3.2.1 all fire

stimulus with a probability of functioning equal to or better than 0,999 at 95 % confidence level

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3.2.2 arm plug receptacle

connector mounted on the skin of a spacecraft that can be connected to a Safe or Test or Arm plug

3.2.3 armed

status of an explosive subsystem when all the safety devices have been disabled and which can be triggered

[Adapted from Dictionary of explosive related terms]

3.2.4 cartridge

explosive device designed to produce pressure for performing a mechanical function

NOTE A cartridge is called an initiator if it is the first or only explosive element in an **explosive train** (see definition 3.2.14).

3.2.5 charge

explosive loaded in a cartridge, detonator, or separate container for use in an explosive device

3.2.6 component

smallest functional item in an explosive subsystem

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3.2.7 deflagration

self-sustaining, exothermic decomposition reaction of an explosive substance, whose apparent velocity is less than the velocity of sound in the substance and greater than the speed of sound in air

NOTE It is generally accepted that the energy transmission takes place via a mechanical compression wave. This type of reaction is intermediary between combustion and detonation. It differs from combustion through the presence of a significant compression wave in the surrounding environment.

[Dictionary of explosive related terms]

3.2.8 detonation

exothermic decomposition reaction of an explosive substance self-sustained by a shock wave, whose velocity of propagation is greater than the velocity of sound in the substance

NOTE The velocity of propagation is of the order of several thousands of m/s.

[Dictionary of explosive related terms]

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3.2.9 detonator

initiator whose function is to transform external energy directly into a shock wave strong enough to detonate a secondary high explosive

NOTE External energy can be, for example, mechanical, electrical and thermal.

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[Dictionary of explosive related terms]

3.2.10 electro-explosive device

device containing some reaction mixture that is electrically initiated

NOTE 1 The output of the initiation is heat, shock or mechanical action.

NOTE 2 The reaction mixture can be explosive or pyrotechnic.

[Dictionary of explosive related terms]

3.2.11 end-user

person who or organization that actually uses a product

NOTE 1 The end-user need not to be the owner or buyer.

NOTE 2 In the context of this standard the end user is generally the first level customer.

3.2.12 energetic material

material consisting of, or containing, an explosive, oxidizer, fuel, or combination of them, that can undergo, contribute to, or cause rapid exothermic decomposition, combustion, deflagration, or detonation

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3.2.13 explosively actuated device

device that converts the products of explosion into useful mechanical work

NOTE 1 The explosion can be combustion, deflagration or detonation.

NOTE 2 Pyromechanisms and linear detonating separation devices are explosively actuated devices.

3.2.14 explosive train

series of explosive components including the initiator, explosive transfer assembly and explosively actuated device

3.2.15 explosive component

discrete item containing an explosive substance

3.2.16 explosive function

function that uses energy released from explosive substances for its operation

3.2.17 explosive subsystem

collection of all the explosive trains on the spacecraft or launcher system, and the interface aspects of any on-board computers, launch operation equipment, ground support and test equipment and all software associated with explosive functions

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3.2.18 fail operational

mission capable after one failure

NOTE Maintaining operational conditions after one failure and safety conditions after a second independent failure is referred to as "Fail operational – Fail safe".

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3.2.19 fail safe

design property of a subsystem, or part of it, which remains safe after one failure

NOTE Maintaining safety following two independent failures is referred to as "Fail safe – Fail safe".

3.2.20 gas generators

explosive devices that produce a volume of gas or exothermic output or both

NOTE E.g. pyrotechnic igniters for solid propulsion applications, gas generator for inflatable structures.

3.2.21 initiator

basic component located upstream of an explosive train, from which originates a transformation of mechanical, electrical or optical energy, the effect produced being a combustion, deflagration or detonation.

NOTE 1 It contains a small quantity of an energetic material.

NOTE 2 Examples: hot bridge wire initiator, exploding bridge wire initiator