SLOVENSKI STANDARD
SIST EN 16603-20-21:2020

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Vesoljska tehnika - Zahteve vmesnika za električne pogone

Space engineering - Interface requirements for electrical actuators

Raumfahrttechnik - Anforderungen an Schnittstellen für elektrische Aktuatoren

Ingénierie spatiale - Exigences d'interface pour les actuateurs électriques

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Space engineering - Interface requirements for electrical actuators

Ingénierie spatiale - Exigences d'interface pour les actionneurs électriques

Raumfahrttechnik - Anforderungen an Schnittstellen für elektrische Aktuatoren

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European Foreword

This document (EN 16603-20-21:2020) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16603-20-21:2020) originates from ECSS-E-ST-20-21C.

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of an identical text or by endorsement, at the latest by December 2020, and conflicting national standards shall be withdrawn at the latest by December 2020.

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 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.

Introduction

This standard identifies the requirements needed to specify, procure or develop the electronics needed for driving release actuators (bot explosive like pyrotechnic devices or non-explosive like thermal knives) and gives the relevant electrical interface specification, both from source and load perspective.

The present standard covers explosive or non-explosive actuators electronics required to comply with single fault tolerance with respect to actuation success.

For a reference architecture description, it is possible to refer to ECSS-E-HB-20-21.

ECSS-E-HB-20-21 includes a clarification of the principles of operation of the actuator electronics, identifies important issues related to actuators and explains the requirements of the present standard.

1
Scope

In general terms, the scope of the consolidation of the electrical interface requirements for electrical (hold down and release or deployment) actuators in the present ECSS-E-ST-20-21 and the relevant explanation in the handbook ECSS-E-HB-20-21 is to allow a more recurrent approach both for actuator electronics (power source) and electrical actuators (power load) offered by the relevant manufacturers, at the benefit of the system integrators and of the Agency, thus ensuring:

- better quality,
- stability of performances, and
- independence of the products from specific mission targets.

A recurrent approach enables manufacturing companies to concentrate on products and a small step improvement approach that is the basis of a high quality industrial output.

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 16602-30-02	ECSS-Q-ST-30-02	Space product assurance - Failure modes, effects (and criticality) analysis (FMEA/FMECA)
EN 16603-33-11	ECSS-E-ST-33-11	Space engineering - Explosive subsystems and devices

3
Terms, definitions and abbreviated terms

3.1 Terms from other standards

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

1. redundancy
2. active redundancy
3. hot redundancy
4. cold redundancy
5. fault
6. fault tolerance

b. For the purpose of this document, the terms and definitions ECSS-Q-ST-30-02 apply, in particular for the following terms:

1. failure propagation

c. For the purpose of this document, the terms and definitions from ECSS-E-ST-33-11 apply, in particular for the following terms:

1. no fire
2. all fire

3.2 Terms specific to the present standard

3.2.1 actuator

<CONTEXT: electrical actuator> component of a machine that is responsible for triggering the movement of a mechanism or a system

3.2.2 actuator electronics

electronics supplying an actuator

3.2.3 actuators group

set of actuators sharing the same ARM and the same FIRE block

NOTE The term “actuators group” is synonymous to the term “group” in this standard

3.2.4 all-fire current

current giving a probability of actuation higher than a specified limit, at a confidence level higher of a specified limit

3.2.5 no-fire current

current giving a probability of actuation lower than a specified limit, at a confidence level higher than a specified limit

3.2.6 maximum fire current

maximum current allowed in an actuator in nominal conditions

3.2.7 minimum actuation current

all-fire current plus a margin defined by the system integrator

NOTE The current margin is calculated to guarantee in worst case the required reliability with a given confidence level when the actuation time is above the minimum actuation time.

3.2.8 minimum actuation time

actuation time in the all-fire current reference conditions, plus a margin established by the manufacturer or by the system integrator

NOTE The margin is calculated to guarantee in worst case the required reliability with a given confidence level when the actuation current is above the minimum actuation current.

3.2.9 inhibition strap

hardware feature that does not allow firing of the actuator

NOTE The inhibition strap typically contains a connector and one of more wires to ensure continuity until strap is opened.

3.2.10 current-driven actuator

actuator that is commanded by a current pulse within a certain range of values and duration

3.2.11 voltage-driven actuator

actuator that is commanded by a voltage pulse within a certain range of values and duration

3.2.12 short duration actuator

actuator with actuation duration lasting less than or equal to 1 s

3.2.13 long duration actuator

actuator with actuation duration lasting more than 1 s

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
DC	direct current
EEE	electrical, electronic and electromechanical
FMEA	failure modes and effects analysis
FMECA	failure modes, effects and criticality analysis
RoD	review of design
SSE	space segment element
SSS	space segment subsystem

3.4 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.