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Space engineering - Star sensor terminology and performance specification

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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English version

Space engineering - Star sensor terminology and performance specification

Ingénierie spatiale - Terminologie et spécification des performances des capteurs stellaires

Raumfahrttechnik - Terminologie und Leistungsspezifikation für Sternensensoren

This European Standard was approved by CEN on 20 May 2020.

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This European Standard exists 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.

CEN and CENELEC members are the national standards bodies and national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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Table of contents

Figures

Tables

European Foreword

This document (EN 16603-60-20:2020) has been prepared by Technical Committee CEN-CENELEC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16603-60-20:2020) originates from ECSS-E-ST-60-20C Rev. 2.

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of an identical text or by endorsement, at the latest by February 2021, and conflicting national standards shall be withdrawn at the latest by February 2021.

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 supersedes EN 16603-60-20:2014.

The main changes with respect to EN 16603-60-20:2014 are:

- Update of several definitions in clause 3.2 including update of some of the Figures.
- Update of list of Abbreviated term in clause 3.3.
- Addition of the Nomenclature in clause 3.4
- Addition of a standard set of core commands and telemetry (or functional interfaces) prepared in the context of SAVOIR initiative in clauses 4.1.5, 4.1.6, 4.1.7 and Annex I.
- Clause 5.1.1 rewritten.
- Addition of new clause 5.13 “Robustness to solar events” addressing robustness and performance in presence of solar events.
- Heading of clauses 5.2, 5.2.3, 5.4 updated.
- Addition of new clauses
- 5.2.4 “Provision for tests”;
- 5.9.4.1 “Probability of correct attitude determination”;
- 5.9.4.2 “Probability of false attitude determination”;
- 5.9.4.3 “Probability of invalid attitude solution”
- Update of Clause 5 and Annex B and Annex G to be fully consistent with the Control Performance Standard ECSS-E-ST-60-10 and to remove irrelevant duplications.

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

In recent years there have been rapid developments in star sensor technology, in particular with a great increase in sensor autonomy and capabilities. This Standard is intended to support the variety of star sensors either available or under development.

This Standard defines the terminology and specification definitions for the performance of star sensors (in particular, star trackers and autonomous star trackers). It focuses on the specific issues involved in the specification of performances of star sensors and is intended to be used as a structured set of systematic provisions.

This Standard is not intended to replace textbook material on star sensor technology, and such material is intentionally avoided. The readers and users of this Standard are assumed to possess general knowledge of star sensor technology and its application to space missions.

This document defines and normalizes terms used in star sensor performance specifications, as well as some performance assessment conditions:

- sensor components
- sensor capabilities
- sensor types
- sensor reference frames
- general performance conditions including temperature, radiation, dynamic and stray light
- sensor performance metrics

This document also defines a standard core of functional interfaces which help to harmonize the majority of commands and telemetry necessary to operate star sensors.

1 Scope

This Standard specifies star sensor performances as part of a space project. The Standard covers all aspects of performances, including nomenclature, definitions, and performance requirements for the performance specification of star sensors.

The Standard focuses on:

- performance specifications (including the impact of temperature, radiation and straylight environments);
- robustness (ability to maintain functionalities under non nominal environmental conditions).

Other specification types, for example mass and power, housekeeping data and data structures, are outside the scope of this Standard.

This Standard also proposes a standard core of functional interfaces defined by unit suppliers and avionics primes in the context of Space AVionics Open Interface aRchitecture (SAVOIR) initiative.

When viewed from the perspective of a specific project context, the requirements defined in this Standard should be tailored to match the genuine requirements of a particular profile and circumstances of a project.

This standard may be tailored for the specific characteristics 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 16603-60-10	ECSS-E-ST-60-10	Space engineering – Control performance
EN 16603-60-30	ECSS-E-ST-60-30	Space engineering – Satellite attitude and orbit control system (AOCS) requirements