

Space engineering - Testing

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EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

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Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 20.08.2014.	Date of Availability of the European standard is 20.08.2014.
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ICS 49.140

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English version

Space engineering - Testing

Ingénierie spatiale - Tests

Raumfahrttechnik - Tests

This European Standard was approved by CEN on 28 December 2013.

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Foreword

This document (EN 16603-10-03:2014) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN.

This standard (EN 16603-10-03:2014) originates from ECSS-E-ST-10-03C.

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of an identical text or by endorsement, at the latest by February 2015, and conflicting national standards shall be withdrawn at the latest by February 2015.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 will supersede EN 14824:2003.

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 requirements on the systems engineering process are gathered in ECSS-E-ST-10; while specific aspects are further elaborated in dedicated standards, in particular: ECSS-E-ST-10-06, ECSS-E-ST-10-02 and the present standard (ECSS-E-ST-10-03)

In the System Engineering branch (ECSS-E-10) this standard aims at a consistent application of on ground testing requirements to allow proper qualification and acceptance of space products

Experience has demonstrated that incomplete or improper on ground testing approach significantly increase project risks leading to late discovery of design or workmanship problem(s) or in-orbit failure(s).

Testing is part of the system engineering process as defined in ECSS-E-ST-10. This starts at the early phase of the mission when defining verification process in terms of the model philosophy and test sequence and ends at the last testing phase prior launch.

In the level of decomposition of a space system, this standard addresses the requirements for space segment element and space segment equipment.

The document is organised such that:

- clause 4 provides requirements for overall test programme, test management and test conditions, tolerances and accuracy;
- clause 5 provides requirements for Space segment equipment;
- clause 6 provides requirements for Space segment element;
- clause 7 provides requirements for Pre-launch testing.

Clauses 5 and 6 are organised as follows:

- general requirements for the products under test applicable to all models (clause 5.1 or 6.1);
- requirements applicable to qualification model (clause 5.2 or 6.2);
- requirements applicable to acceptance model (clause 5.3 or 6.3);
- requirements applicable to protoflight model (clause 5.4 or 6.4);
- detailed implementation requirements (clause 5.5 or 6.5);

In the clause providing requirements for each model (i.e. clauses 5.2, 5.3, 5.4, 6.2, 6.3 and 6.4), the first table of the clause:

- lists all types of test and defines their applicability and conditions;
- links to the second table of the clause that defines tests level and duration;
- provides reference to the clause defining the detailed implementation requirements for the given test (clause 5.5 or 6.5).

For space segment equipment, the required sequence of test, for each model, is defined after the two tables in clause 5.2, 5.3 or 5.4.

Since testing activities are part of the overall verification activities, test documentation to be produced (DRD's) are either specified in the ECSS-E-ST-10-02 (case of the test report) or in this document.

Annex D gives guidelines for performing the tailoring of this standard as well as the generation of the compliance and verification matrices.

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Scope

This standard addresses the requirements for performing verification by testing of space segment elements and space segment equipment on ground prior to launch. The document is applicable for tests performed on qualification models, flight models (tested at acceptance level) and protoflight models.

The standard provides:

- Requirements for test programme and test management,
- Requirements for retesting,
- Requirements for redundancy testing,
- Requirements for environmental tests,
- General requirements for functional and performance tests,

NOTE Specific requirements for functional and performance tests are not part of this standard since they are defined in the specific project documentation.

- Requirements for qualification, acceptance, and protoflight testing including qualification, acceptance, and proto-flight models' test margins and duration,
- Requirements for test factors, test condition, test tolerances, and test accuracies,
- General requirements for development tests pertinent to the start of the qualification test programme,

NOTE Development tests are specific and are addressed in various engineering discipline standards.

- Content of the necessary documentation for testing activities (e.g. DRD).

Due to the specific aspects of the following types of test, this Standard does not address:

- Space system testing (i.e. testing above space segment element), in particular the system validation test,
- In-orbit testing,
- Testing of space segment subsystems,

NOTE Tests of space segment subsystems are often limited to functional tests that, in some case, are run on dedicated models. If relevant, qualification tests for space segment subsystems are assumed to be covered in the relevant discipline standards.

- Testing of hardware below space segment equipment levels (including assembly, parts, and components),
- Testing of stand-alone software,

NOTE For verification of flight or ground software, ECSS-E-ST-40 and ECSS-Q-ST-80 apply.

- Qualification testing of two-phase heat transport equipment,

NOTE For qualification testing of two-phase heat transport equipment, ECSS-E-ST-31-02 applies.

- Tests of launcher segment, subsystem and equipment, and launch facilities,
- Tests of facilities and ground support equipment,
- Tests of ground segment.

This standard may be tailored for the specific characteristic and constraints of a space project in conformance with ECSS-S-ST-00. Annex D gives guidelines for performing this tailoring.

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 16603-10-02	ECSS-E-ST-10-02	Space engineering - Verification
EN 16603-20	ECSS-E-ST-20	Space engineering - Electrical and electronic
EN 16003-20-01	ECSS-E-20-01	Space engineering - Multipaction design and test
EN 16603-20-06	ECSS-E-ST-20-06	Space engineering - Spacecraft charging
EN 16603-20-07	ECSS-E-ST-20-07	Space engineering - Electromagnetic compatibility
EN 16603-20-08	ECSS-E-ST-20-08	Space engineering - Photovoltaic assemblies and components
EN 16603-31	ECSS-E-ST-31	Space engineering - Thermal control general requirements
EN 16603-32	ECSS-E-ST-32	Space engineering - Structural general requirements
EN 16603-32-02	ECSS-E-ST-32-02	Space engineering - Structural design and verification of pressurized hardware
EN 16603-32-10	ECSS-E-ST-32-10	Space engineering - Structural factors of safety for spaceflight hardware
EN 16603-32-11	ECSS-E-ST-32-11	Space engineering - Modal survey assessment
EN 16603-33-01	ECSS-E-ST-33-01	Space engineering - Mechanisms
EN 16601-40	ECSS-M-ST-40	Space project management - Configuration and information management
EN 16602-10-09	ECSS-Q-ST-10-09	Space product assurance - Nonconformance control system
EN 16602-20-07	ECSS-Q-ST-20-07	Space product assurance - Quality assurance for test centres
EN 16602-40	ECSS-Q-ST-40	Space product assurance - Safety
EN 16602-70-01	ECSS-Q-ST-70-01	Space product assurance - Cleanliness and

		contamination control
	ISO 3740:2000	Acoustics - Determination of sound power levels of noise sources - Guidelines for the use of basic standards

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