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## Vesoljska tehnika - Komunikacije

Space engineering - Communications

Raumfahrttechnik - Kommunikation

Ingénierie spatiale - Communications

Ta slovenski standard je istoveten z: **EN 16603-50:2022**

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## Space engineering - Communications

Ingénierie spatiale - Communications

Raumfahrttechnik - Kommunikation

This European Standard was approved by CEN on 13 March 2022.

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## European Foreword

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This document (EN 16603-50:2022) has been prepared by Technical Committee CEN-CENELEC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16603-50:2022) originates from ECSS-E-ST-50C Rev.1 DIR1.

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of an identical text or by endorsement, at the latest by January 2023, and conflicting national standards shall be withdrawn at the latest by January 2023.

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 16603-50:2014.

The main changes with respect to EN 16603-50:2014 are:

- Implementation of Change Requests
- Update w.r.t. of replacement of EN 16603-50-01:2014, EN 16603-50-03:2014 and EN 16603-50-04:2014 by EN 16603-50-21 to EN 16603-50-26
- Update of Terms, definitions and abbreviated terms in clause 3
- Term “space network” replaced by “on-board network”
- Update of Purpose and objective of Annex F “Communication system details design document (CSDDD) – DRD”
- Update of Purpose and objective of Annex F “Communication system profile document (CSPD) – DRD”
- Update of Annex I “Documentation summary”

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

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This standard specifies requirements for the development of the end-to-end data communication system for spacecraft. Implementation aspects are defined in ECSS-E-ST-50 Level 3 standards, ECSS Adoption Notices, and CCSDS standards.

The complete set of standards to define a complete communication link is project dependent and cannot be specified here. ECSS-E-HB-50 provides some guidance on this aspect, and gives some practical examples.

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# 1

## Scope

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This Standard specifies the requirements for the development of the end-to-end data communications system for spacecraft.

Specifically, this standard specifies:

- The terminology to be used for space communication systems engineering.
- The activities to be performed as part of the space communication system engineering process, in accordance with the ECSS-E-ST-10 standard.
- Specific requirements on space communication systems in respect of functionality and performance.

The communications links covered by this Standard are the space-ground (i.e. space-to-ground and ground-to-space) and space-to-space links used during spacecraft operations, and the communications links to the spacecraft used during the assembly, integration and test, and operational phases.

Spacecraft end-to-end communication systems comprise components in three distinct domains, namely the ground network, the space link, and the space network. This Standard covers the components of the space link and space network in detail. However, this Standard only covers those aspects of the ground network that are necessary for the provision of the end-to-end communication services.

NOTE Other aspects of the ground network are covered in ECSS-E-ST-70.

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 revisions 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 most 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

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## Terms, definitions and abbreviated terms

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### 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. function
  2. interface
- b. For the purpose of this Standard, the terms and definitions from ECSS-E-ST-20 apply, in particular for the following term:
  1. essential function

NOTE Synonym to the term “vital function” from ECSS-E-ST-70-11
- c. For the purpose of this Standard, the terms and definitions from ECSS-E-ST-70-11 apply, in particular for the following terms:
  1. commandable vital function
  2. high priority command
  3. high priority telemetry
  4. vital function

NOTE Synonym to the term “essential function” from ECSS-E-ST-20.

  5. vital telecommand

### 3.2 Terms specific to the present standard

#### 3.2.1 channel

combination of protocol and medium that provides a physical layer service from end-to-end

NOTE This is the transfer of the unstructured bitstream from point-to-point.

#### 3.2.2 communication service

service that provides the capability of moving data between users.

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NOTE At least two users are involved when a communication service is used, one sending data and the other(s) receiving data.

### 3.2.3 cross support

use by one party of part of another party's data system resources to complement its own system

### 3.2.4 downlink

see "telemetry link"

### 3.2.5 duplex service

point-to-point system composed of two or more connected parties or devices that can communicate with one another in both directions

### 3.2.6 entity

active element within a system

### 3.2.7 essential telecommand

telecommand that controls essential or vital functions

NOTE This corresponds to "high priority telecommand" in ECSS-E-ST-70-11).

### 3.2.8 essential telemetry

telemetry that enables a reliable determination of the current status of vital on-board equipment available under all circumstances

NOTE This correspond to "high priority telemetry" in ECSS-E-ST-70-11.

### 3.2.9 frame

service data unit passed, at the sending end, from the protocol sublayer to the coding and synchronization sublayer

NOTE For definition of layers see Figure 4-2.

### 3.2.10 isochronous service

service providing for the transfer of data with a defined maximum deviation from a nominal delay from end to end

### 3.2.11 protocol

set of rules and formats (semantic and syntactic) that determine the communication behaviour of layer entities in the performance of communication functions

### 3.2.12 service

capability of a layer, and the layers beneath it (a service-provider), that is provided to service-users at the boundary between the service-provider and the service-users

**NOTE** The service defines the external behaviour of the service-provider, independent of the mechanisms used to provide that behaviour. Layers, layer entities, and application-service-elements are examples of components of a service-provider.

### **3.2.13 service data unit**

amount of information whose identity is preserved when transferred between peer (N+1) entities and which is not interpreted by the supporting (N) entities

**NOTE** Also known as: (N) service data unit.

### **3.2.14 service-provider**

abstract representation of the totality of those entities which provide a service to service-users

**NOTE** A service provider includes entities in the layer at which the service is provided, and in the layers beneath it.

### **3.2.15 service-user**

entity in a single system that makes use of a service

**NOTE** The service-user makes use of the service through a collection of service primitives defined for the service.

### **3.2.16 simplex**

communicating in one direction from data source to data sink

### **3.2.17 source**

entity that sends service-data-units, using a service provider

### **3.2.18 sink**

entity that receives service-data-units from a service provider

### **3.2.19 telecommand**

command data transmitted to a spacecraft through a telecommand link

### **3.2.20 telecommand link**

communication link from ground to space by which a spacecraft is commanded

**NOTE** The term “uplink” is synonymous.

### **3.2.21 telemetry**

housekeeping data and payload data generated on-board the spacecraft and transmitted through a telemetry link

### **3.2.22 telemetry link**

communication link from spacecraft to ground over which data generated on the spacecraft is provided to ground

NOTE The term “downlink” is synonymous.

### 3.2.23 uplink

see “telecommand link”

### 3.2.24 user

service-user

### 3.2.25 user application

application that makes use of data handling system services

NOTE An application can be a software entity or a non-software entity which is controlling an onboard system.

## 3.3 Abbreviated terms

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

Abbreviation	Meaning
AIT	assembly, integration, and test
AR	acceptance review
ARQ	automatic repeat request
BER	bit error rate
CCITT	Consultative Committee for International Telegraph and Telephone
CCSDS	Consultative Committee for Space Data Systems
CDMU	central data management unit
CDR	critical design review
CSAD	communication system analysis document
CSADD	communication system architectural design document
CSBD	communication system baseline definition
CSDDD	communication system detailed design document
CSOM	communication system operations manual
CSPD	communication system profile document
CSRD	communication system requirements document
CSVP	communication system verification plan
DRD	document requirements definitions
EIRP	equivalent isotropically radiated power
EMC	electromagnetic compatibility
ISO	International Organization for Standardization
ITU	International Telecommunication Union
ITU/RR	ITU / Radio Regulations