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**Železniške naprave – Komunikacijski, signalni in procesni sistemi – 1. del:  
Varnostna komunikacija v zaprtih prenosnih sistemih**

Railway applications – Communication, signalling and processing systems – Part 1:  
Safety-related communication in closed transmission systems

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EUROPEAN STANDARD

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**Railway applications -  
Communication, signalling and processing systems  
Part 1: Safety-related communication in closed transmission systems**

Applications ferroviaires -  
Systèmes de signalisation, de  
télécommunication et de traitement  
Partie 1: Communication de sécurité sur  
des systèmes de transmission fermés

Bahnanwendungen -  
Telekommunikationstechnik, Signal-  
technik und Datenverarbeitungssysteme  
Teil 1: Sicherheitsrelevante  
Kommunikation in geschlossenen  
Übertragungssystemen

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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 CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

This European Standard was prepared by SC 9XA, Communication, signalling and processing systems, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50159-1 on 1999-09-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2001-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-10-01

This standard is in close relation to EN 50128:2001, ENV 50129:1998 and EN 50159-2:2001.

The applicability of the standard was also extended from a vehicle bus to all closed transmission systems with a known maximum number of connectable participants and known topographical structure.

Annexes designated “informative” are given for information only.  
In this standard, annex A is informative.

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## Introduction

This European Standard deals with safety-related communication between safety-related equipment using a closed transmission system. For those transmission systems which cannot be considered as closed, EN 50159-2 shall be applied.

Both, safety-related and non safety-related equipment can be connected to the transmission system.

In the case of errors affecting safety-related communication it is necessary:

- to detect errors
- to initiate a safety reaction

This standard does not impose safety requirements on the non-trusted transmission system itself, but its properties and its physical characteristics shall be defined.

For safety purposes as considered here, one physical transmission path is sufficient. Safety aspects are covered by applying safety procedures and a safety code which are implemented inside safety-related equipment – on top of a non-trusted communication protocol in a transmission system.

Although reliability is not considered in this standard it is recommended to keep in mind that reliability is a major aspect of the global safety.

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## 1 Scope

This European Standard is applicable to safety-related electronic systems using a closed transmission system for communication purposes. It gives the basic requirements needed in order to achieve safety-related communication between safety-related equipment connected to the transmission system.

This standard is applicable to the safety requirement specification and design of the communication system in order to obtain the assigned safety integrity level (SIL).

The safety requirement specification is a precondition of the safety case of a safety-related electronic system for which the required evidence is defined in EN 50129. Evidence of safety management and quality management has to be taken from EN 50129. Evidence of functional and technical safety is the subject of this standard.

This standard is not applicable to existing systems which had already been accepted prior to the release of this standard. However, as far as is reasonably practicable, this standard shall be applied to modifications and extensions to existing systems, subsystems and equipment.

This standard applies to a closed transmission system with the following preconditions, for which evidence shall be provided:

- 1 Only approved access is permitted.
- 2 There is a known maximum number of connectable participants.
- 3 The transmission media is known and fixed.

Closed transmission systems are not necessarily data buses. They can also include for instance balise links or simple serial links between two safety-related computers.

In particular this standard does not define:

- The transmission system.
- The equipment connected to the transmission system.
- Specific solutions (e.g. for interoperability).
- Which kinds of data are safety-related and which aren't.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 50126	Railway applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)
EN 50128	Railway applications – Software for railway control and protection systems
EN 50129 (*)	Railway applications – Safety related electronic systems for signalling

(\*) In preparation, use ENV 50129:1998.

### 3 Definitions

For the purpose of this standard, the following definitions apply:

#### 3.1

##### **authenticity**

the state in which information is valid and known to have originated from the stated source

#### 3.2

##### **closed transmission system**

a fixed number or fixed maximum number of participants linked by a transmission system with well known and fixed properties, and where the risk of unauthorised access is considered negligible

#### 3.3

##### **CRC**

cyclic redundancy check: procedure to calculate redundant data to be added to the message in order to detect errors which may arise during the transmission from the influence of physical data corruptions

#### 3.4

##### **EMI**

electromagnetic interference

#### 3.5

##### **integrity**

the state in which information is complete and correct and not altered or corrupted

#### 3.6

##### **message**

information, which is transmitted from a sender (data source) to one or more receivers (data sink)

#### 3.7

##### **non-trusted**

no specific precautions towards safety

#### 3.8

##### **safe fall back state**

safe state of a safety-related equipment or system as a deviation from the fault-free state and as a result of a safety reaction leading to a reduced functionality of safety-related functions, possibly also of non safety-related functions

#### 3.9

##### **safety code**

redundant data included in a message to permit data corruptions to be detected by redundancy checks

#### 3.10

##### **safety reaction**

an action which may be taken by safety process in response to an event (such as a failure of the communication system) which leads to a safe fall back state of the equipment

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### 3.11

#### transmission code

redundant information, added to the safety and non safety message of the non trusted transmission system in order to ensure the integrity of the message during the transmission

### 3.12

#### transmission system

a service used by the application to communicate message streams between a number of participants, who may be sources or sinks of information

### 3.13

#### user data

data which represents the states or events of a user process, without any additional data. In the case of communication between safety-related equipment, the user data contains safety-related data

## 4 Reference architecture

This standard defines the safety requirements for a special class of communication systems. The characteristics of this class are defined as preconditions (Pr1, Pr2, Pr3).

In general safety-related and non safety-related equipment may be connected to a transmission system, which is from a safety point of view non-trusted (see Figure 1).

The safety-related transmission system is defined as:

- The non-trusted transmission system (including the transmission functions implemented in highly integrated circuits). [SIST EN 50159-1:2002](https://standards.iteh.ai/catalog/standards/sist/b932dbec-3963-4f25-8ea4-177171010000/sist-en-50159-1-2002)
- The safety-related transmission functions. [SIST EN 50159-1:2002](https://standards.iteh.ai/catalog/standards/sist/b932dbec-3963-4f25-8ea4-177171010000/sist-en-50159-1-2002)

The safety case for the safety process shall be prepared in accordance with EN 50129. The evidence of functional and technical safety of the safety-related transmission functions shall comply with this standard.

No safety requirements are placed upon the non-trusted transmission system. Safety aspects are covered by applying safety procedures and safety code which are running inside safety-related equipment (see Figure 2).