



# SLOVENSKI STANDARD

## SIST EN 50239:2001

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### Železniške naprave – Sistem radijskega daljinskega vodenja vlečnih vozil za tovorni promet

Railway applications - Radio remote control system of traction vehicle for freight traffic

Bahnanwendungen - Funkfernsteuerung von Triebfahrzeugen für Güterbahnen

Applications ferroviaires - Système de radiocommande à distance des locomotives et locotracteurs affectés au trafic fret

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
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**EN 50239**

December 1999

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English version

**Railway applications**  
**Radio remote control system of traction vehicle for freight traffic**

Applications ferroviaires  
Système de radiocommande à distance  
des locomotives et locotracteurs  
affectés au trafic fret

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**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 SC9 XA, 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 50239 on 1999-10-01.

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) 2000-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2002-10-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only. In this standard, annex A is normative and annexes B and C are informative.

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## Contents

Introduction .....		4
1 Scope .....		5
2 Normative references .....		5
3 Definitions .....		6
4 The radio remote control system and its components .....		8
5 General operational requirements.....		8
6 Radio remote command signals .....		8
7 Stop functions .....		9
8 Prevention of inadvertent movement whilst traction vehicle at standstill .....		10
9 Requirements for the transmitter, receiver, traction vehicle control unit and associated interface.....		10
10 Radio transmission procedure.....		12
11 Safety process of the system components.....		12
12 Safety acceptance and approval.....		14
13 Maintenance, modification, extensions.....		14
 Annex A (normative) Some examples of basic railway operational applications and the correlation to safety integrity level.....		15
 Annex B (informative) Typical schematic system diagram.....		27
 Annex C (informative) Bibliography .....		28

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## Introduction

This is a European Product Standard dedicated to the design and application of a radio remote control system on traction vehicles for freight traffic to provide remote control by an operator of the traction vehicle. Control functions are usually provided by manual control on the traction vehicle e.g. acceleration, brakes etc.

The European Product Standard considers the minimum requirements with regard to the following aspects:

- operational requirements for the use of the radio remote control system;
- technical and safety requirements for the overall system;
- safety acceptance and approval.

The radio remote control system is a safety related associated system. This European Product Standard uses the following European Standards for guidance:

- 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
- ENV 50129; Railway applications - Safety related electronic systems for signalling
- EN 50155; Railway applications - Electronic equipment used on rolling stock

These named European Standards require for the design of the radio remote control system that a systematic approach should be taken to:

- implement hazard analysis, risk assessment and defining of risk criteria;
- identify the risk, quantifying and reducing the risk by safety related functions to reach a level as low as reasonably practicable as defined in clause 11 and Annex A;
- define the overall system safety requirement specification for the radio remote control system including its operational application necessary to achieve the required risk reduction as defined in clause 11 and Annex A;
- select a suitable system architecture;
- plan, monitor and control of technical and operational activities necessary to transform the system safety requirement specification into the safety related radio remote control system.

## 1 Scope

This European Product Standard specifies the characteristics of operational and technical requirements for the overall system design as well as safety acceptance and approval, maintenance, modifications and extensions of the radio remote control system for the use in railway network in relationship with other European Standards.

This European Product Standard applies only for the use of radio remote control systems for freight traffic.

If the radio remote control system is modified in such a way that the system safety may be compromised it is necessary that safety reviews are carried out throughout the system lifecycle.

This European Product Standard is not applicable to existing systems (i.e. those which had already been accepted prior to the creation of this standard). However as far as reasonably practicable this European Product Standard applies to modifications and extensions to existing systems.

## 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 1037	Safety of machinery - prevention of unexpected start-up
EN 50126	Railway applications - The specification and demonstration of dependability, reliability, availability, maintainability and safety (RAMS)
EN 50128 <sup>(*)</sup>	Railway applications - Software for railway control and protection systems
ENV 50129	Railway applications - Safety related electronic systems for signalling
EN 50155	Railway applications - Electronic equipment used on rolling stock
EN 50159-1	Railway applications - Communication, signalling and processing systems -- Part 1: Safety related communication in closed transmission systems
EN 50159-2 <sup>(*)</sup>	Part 2: Safety-related communication in open transmission systems
EN 60870-5-1	Telecontrol equipment and systems -- Part 5: Transmission protocols Section 1: Transmission frame formats

### 3 Definitions

For the purposes of this European Product Standard, the following definitions together with others given in EN 50126, EN 50128, ENV 50129 apply. The terms may have broader meanings in other International Standards.

- 3.1 addressing:** A set of rules that allows only the designated transmitter to address the corresponding receiver.
- 3.2 anti-skid device of vehicle:** Device which limits skidding/blocking of any wheels during braking.
- 3.3 anti-slip device of vehicle:** Device which limits slipping of driving wheels during traction.
- 3.4 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.
- 3.5 command signal:** A signal from the transmitter or from the manual control device to the traction vehicle to perform the specified task.
- 3.6 design:** The pre-build exercise of defining elements and their interconnection such that the system will meet its specified requirements.
- 3.7 direct acting brake:** The braking system of the traction vehicle.
- 3.8 dynamic brake:** The braking system that operates on the traction vehicle independently of the direct or indirect acting brake in an electrical or hydrokinetical mode.
- 3.9 equipment under control:** Equipment/machinery/apparatus for which designated safety-related systems could be used to:
- prevent hazardous events associated with the equipment under control from taking place; or,
  - mitigate the effects of the hazardous events.
- 3.10 freight traffic:** Transportation of goods excluding passengers from one place to another.
- 3.11 indirect acting brake:** The braking system of the train.
- 3.12 manual control mode:** Operation of the traction vehicle by using local controls from within the vehicle cabin by the operator.
- 3.13 multiple use of radio frequency carrier system:** System which allows with one radio frequency carrier, multiple transmission of messages in a network of several transmitters and receivers.
- 3.14 open transmission system:** A transmission system with an unknown number of participants, having unknown, variable and non-trusted properties, used for unknown telecommunication services, and having a non-negligible risk of unauthorised access.



**3.15 operational condition:** A situation under which a system will satisfy a set of operational requirements.

**3.16 operator:** The person who drives the radio remote controlled traction vehicle.

**3.17 operator vigilance device in manual control mode:** A device on the traction vehicle which monitors the vigilance of the operator and initiates a stop signal if no command is given by vigilance switch within or longer than a preset time.

**3.18 operator vigilance device in remote control mode:** A device usually in the transmitter which monitors the vigilance of the operator in the radio control mode and initiates a stop signal if no command is given within a preset time. An early warning that the vigilance time is about to expire can be given.

**3.19 radio signal:** Information transmitted on a radio-frequency carrier.

**3.20 radio transmission path:** Path followed by radio signals between a transmitter and a receiver.

**3.21 receiver:** The part of the radio remote control system that converts transmitted radio signals into a desired form of outputsignals.

**3.22 remote control mode:** The mode in which the traction vehicle is operated by the radio remote control system.

**3.23 safety integrity level:** A number which indicates the required degree of confidence that a system will meet its specified safety features. The safety integrity level is specified as one of four discrete levels. Level 4 has the highest level of safety integrity; level 1 has the lowest. Level 0 is used to indicate that there are no safety requirements.

**3.24 safety related system:** A system that

- implements the required safety functions necessary to achieve a safe state for the equipment under control or to maintain a safe state for the equipment under control; and
- is intended to achieve, on its own or with other elements or with other safety related systems, the necessary level of safety integrity for the implementation of the required safety functions.

**3.25 standstill monitoring:** A device to detect that the speed is less than a preset value during a preset time.

**3.26 start up:** Change from rest to motion of traction vehicle.

**3.27 tilt switch device:** A safety device in the transmitter to initiate a stop signal to the receiver if the transmitter is inadvertently tilted for longer than a preset time.

**3.28 traction vehicle:** A rail guided motorized vehicle.

**3.29 traction vehicle control unit:** A device located on the traction vehicle to transform the output signals from the radio control receiver or from the manual controls located on the traction vehicle into commands and control signals for valves and monitoring functions etc.

**3.30 transmitter:** The part of the radio remote control system that is used for converting operator given commands into radio transmission signals.

#### 4 The radio remote control system and its components(see also annex B)

A radio remote control system has to comprise as a minimum:

- transmitter;
- receiver;
- traction vehicle control unit with the associated interface, which can be shared with the manual control mode.

#### 5 General operational requirements

5.1 The use of the radio remote control shall not limit the safe and normal operational use of the traction vehicle.

5.2 If the traction vehicle operates in the radio remote control mode, all the command signals in the manual control mode shall be ineffective except the emergency stop and if required the warning signal, sanding, application of brakes, decrease of power and motor stop.

5.3 The traction vehicle shall be equipped with an interlock feature to prevent simultaneous activation of the manual control and radio remote control mode. Switching from manual control mode and vice versa shall be done only when the traction vehicle is at standstill. Otherwise the brakes are automatically applied and power is decreased to minimum. The switching device shall be located on the traction device.

5.4 The control system shall prevent an inadvertent initiation of the function - release of automatic shunting coupling. This shall be prevented by design and manufacture e.g. two switches or a switch with a releasable lock etc.

5.5 Before putting the radio remote control system into operation the operator shall ensure that the correctly assigned transmitter for the traction vehicle is being used. The operator shall check that the safety related control functions operate precisely as defined by operational instructions.

5.6 As long as the traction vehicle is operating in the radio remote control mode the operator shall be in charge of the transmitter at all times.

#### 6 Radio remote command signals

##### 6.1 Basic command signals

The radio remote control system shall be capable of giving the following command signals:

- manual stop;
- automatic stop caused by tilt switch;
- forward direction;
- reverse direction;
- increase of power;
- decrease of power;

- application of direct acting brake;
- release of direct acting brake;
- tilt switch override;
- warning signal;
- sanding.

If an indirect acting brake is installed:

- application of indirect acting brake;
- release of indirect acting brake.

## 6.2 Additional command signals

If necessary the radio remote control system shall be required to perform additional command signals dependent on the traction vehicle type, equipment and operational conditions such as the following:

- release of the automatic shunting coupling;
- bell signal;
- operator vigilance function in the radio remote control mode;
- uphill start;
- connection of pantograph to overhead line;
- release of pantograph from overhead line;
- application of dynamic brake;
- release of dynamic brake;
- filling stroke;
- engage transmission;
- disengage transmission;
- preset speed;
- radio remote reset;
- release of authority to command (Annex A, example 14);
- demand of authority to command (Annex A, example 14).

## 7 Stop functions

**7.1** The radio remote controlled traction vehicle includes safety related functions and they shall be capable of automatically and immediately braking the traction vehicle to avoid potentially hazardous situations.

The stop function of the radio remote control system shall operate as follows:

- a) manual stop:** The transmitter shall include a separate and clearly identifiable means of initiating the manual stop function of the traction vehicle and also for all motions that can cause a hazardous condition.
- b) automatic stop:** The following minimum conditions for initiating the automatic stop are required:
  - 1) if a fault is detected in the system;
  - 2) when the tilt switch device is operated for longer than a preset time;

NOTE: A contact bypass override switch can be fitted to prolong the preset time of operation of the device. This allows the operator to bend over in order to couple/decouple waggons.

When the contact bypass override switch is set, then an interlock should be provided to avoid increase of power and release of the brakes and consequential movement of the traction vehicle.

- 3) when a valid signal on the radio transmission path has not been detected within the preset time e.g. loss of communication or interference. (valid signals also include command signals and signals which confirm that communication is established and maintained)
- 4) if fitted, an operator vigilance device in remote control mode (see 3.18) has not operated within a preset time.

## 7.2 The transmitter shall be fitted with a tilt switch device.

The tiltswitch shall be omni-directional.

## 7.3 After initiation of the manual stop the minimum effect shall be to:

- apply rapid braking in the shortest possible time;
- decrease traction power to minimum.

In the case of automatic stop (7.1.b1/b2/b3/b4) rapid braking shall be applied. Dependent on national and local operation conditions (e.g. operator aboard the train) in the event of 7.1.b1 and 7.1.b3 controlled braking shall be applied or a warning signal shall be given before rapid braking is applied.

## 7.4 The manual stop function initiated by a switch on the transmitter shall be cancelled from the same transmitter. However the cancellation shall require a sequence of steps which shall be precisely defined by operational instruction.

NOTE: Independent of the radio remote control system the traction vehicle can have emergency stop devices fitted in visible and easily accessible positions on the vehicle.

## 8 Prevention of inadvertent movement whilst traction vehicle at standstill

Measures shall be provided to prevent accidental start commands in accordance with EN 1037:1995 item 3.2 resulting in an unexpected start up.

## 9 Requirements for the transmitter, receiver, traction vehicle control unit and associated interface

### 9.1 General requirements

**9.1.1** The transmitter shall be of ergonomic design with regard to size, weight and positioning of control elements. The control elements shall be clearly identified and shall be capable of being used under all operational conditions even when the operator is wearing gloves.