

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

ICS 33.200; 45.060.10

National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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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

Bahnanwendungen - Funkfernsteuerung
von Triebfahrzeugen für Güterbahnen

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CENELEC

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

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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conflicting with the EN have to be withdrawn (dow) 2002-10-01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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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 the 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 ^(*)	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 ^(*)	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 and 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 unauthorized 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 unauthorized 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 output signals

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;