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Železniške naprave - Osnovni parametri sistemov za detekcijo vlaka - 2. del: Števci osi

Railways applications - Basic parameters of train detection systems - Part 2: Axle counters

Bahnanwendungen - Basic Parameters der Gleisfreimeldesystemen - Teil 2: Achszähler

Applications ferroviaires - Paramètres de base des systèmes de détection des trains - Partie 2 : Compteurs d'essieux

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This draft European Standard is submitted to CENELEC members for CENELEC enquiry. Deadline for CENELEC: 2013-12-13.

It has been drawn up by CLC/SC 9XA.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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CENELEC

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Foreword

This document [prEN 50617-2:2013] has been prepared by CLC/SC 9XA "Communication, signalling and processing systems", of CLC/TC 9X "Electrical and electronic applications for railways".

This document is currently submitted to the Enquiry.

EN 50617, *Railway applications – Basic parameters of train detection systems*, will consist of

- Part 1: Track circuits;
- Part 2: Axle counters.

Introduction

The working group SC9XA WGA4-2 has developed the limits for electromagnetic compatibility between rolling stock and train detection systems, specifically track circuits and axle counter systems and correspondingly published two technical specifications CLC TS50238-2 and CLC TS50238-3. These limits and associated measurement methods are based on preferred existing systems which are well established and still put forward for signalling renewals by infrastructure managers. To meet the requirements for compatibility with rolling stock in the future (ref. ERA/ERTMS/033281) defined in the form of Frequency Management and to benefit true interoperability and free movement within the Community, it is considered necessary to develop a new harmonised standard to define the complete set of requirements for the target train detection system. Although the demand for FM is driven by Interoperability requirements, it is independent from the drive to introduce systems like ERTMS level 3 or level 2.

This European Standard is based on the current understanding of the Railway Industry experts represented at WGA4-2 that track circuits and axle counter systems will continue to be the essential two train detection systems for the foreseen future. The train detection systems are also seen as an integral part of CCS trackside subsystem, in the context of the Rail Interoperability Directive.

This European Standard is a counter part to the TS 50238-3 which specifies – in combination with the frequency management, defined in the TSI CCS Interface Document – the requirements for compatibility of rolling stock. Both sides – rolling stock and axle counter systems –fulfil their requirements on the magnetic field interface in relation to the TSI CCS and the corresponding standards to obtain a safe and reliable operation.

In this European Standard, the defined parameters are structured and allocated according to their basic references as follows:

- Axle counter system parameters
- Train based parameters
- Track based parameters
- Environmental and other parameters

Where possible, the parameters are defined as consistent with other European Standards.

Each parameter is defined by a short general description, the definition of the requirement, the relation to other standards and a procedure to show the fulfilment of the requirement as far as necessary. An overview on the safety relevance of each parameter is given – in the context of this European Standard – in a separate table.

A table in the TSI CCS Interface document [ERA/ERTMS 033281] gives an overview on the magnetic field emission levels established for individual axle counter detectors which fulfil the following two requirements:

1) Currently supported by an European Infrastructure Manager for signalling installations;
2) Immunity limits established following the test specification outlined in TS50238-3.

1 Scope

This European Standard is intended to specify the design and usage of Axle counter systems. It will be primarily used by Manufacturers of axle counter systems and other forms of Wheel Sensors used for train detection as well as by Infrastructure Managers/Infrastructure Companies and National Safety Authorities, who are responsible for introducing and certifying new train detection systems.

This European Standard specifies the basic parameters of Axle Counter systems associated with the magnetic field limits for RST in the context of interoperability defined in the form of Frequency Management. The bands and limits currently defined in the Frequency Management are controlled by the European Railway Agency.

2 Normative reference

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

2006/679/EC	COMMISSION DECISION of 28 March 2006 concerning the technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European conventional rail system.
2006/860/EC	COMMISSION DECISION of 7 November 2006 concerning a technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European high speed rail system and modifying Annex A to Decision 2006/679/EC concerning the technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European conventional rail system
2006/964/EC	European Union, COMMISSION DECISION of 28 March 2006 concerning the technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European conventional rail system (notified under document number C(2006) 964)
CLC/TS 50238-3	Railway applications - Compatibility between rolling stock and train detection systems – Part 3: Compatibility with axle counters
EN 13848 – 5	Railway applications - Track - Track geometry quality - Part 5: Geometric quality levels - Plain line
EN 50121-4	Railway applications - Electromagnetic compatibility - Part 4: Emission and immunity of the signalling and telecommunications apparatus
EN 50124-2	Railway applications - Insulation coordination - Part : Overvoltages and related protection
EN 50125-3	Railway applications – Environmental conditions for equipment Part 3: Equipment for signaling and telecommunications
EN 50126-1	Railway applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Basic requirements and generic process
EN 50128	Communication, signalling and processing systems – Software for railway control and protection systems;

EN 50129	Railway applications – Communications, signalling and processing systems – Safety related electronic systems for signalling;
EN 50238	Railway applications – Compatibility between rolling stock and train detection systems
EN 50388	Railway applications - Power supply and rolling stock - Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability
EN 60068-2-1	Environmental testing – Part 2-1: Tests – Tests A: Cold
EN 60068-2-2	Basic environmental testing procedures - Part 2: Tests - Tests B: Dry heat
EN 60529	Degrees of protection provided by enclosures (IP Code)
ETSI EN 300 330	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 1: Technical characteristics and test methods
ETSI EN 302 608	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment for Eurobalise railway systems; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive
TSI CCS interface document	ERTMS/ETCS UNIT – Interfaces between control-command and signalling trackside and other subsystems; ERA/ERTMS 033281
UIC510-2	Trailing stock: wheels and wheelsets. Conditions concerning the use of wheels of various diameters
UNISIG SUBSET-023	Glossary of UNISIG Terms and Abbreviations
UNISIG SUBSET-036	FFFIS for Eurobalise
UNISIG SUBSET-085	Test Specification for Eurobalise FFFIS

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
antenna for generating magnetic fields
square loop antenna to generate the magnetic fields for testing of the immunity

3.1.2
axle counter detector
the axle counter detector consists of the axle counter sensor and the detection circuit which includes in general filters and rectifiers.

3.1.3
axle counter sensor
sensor head mounted in the track

3.1.4
axle counter system
whole system including axle counter sensor, axle counter detector and the evaluation unit

3.1.5
bandwidth
the bandwidth is the difference between the upper and lower frequencies in a contiguous set of frequencies and is typically measuered in Hz.

3.1.6
basic frequency range
the basic frequency range is defined by the tolerance range of the centre frequency of the axle counter detector including half the 20 dB bandwidth on either side.

3.1.7
direct safety relevant
failure results in a wrong side failure

3.1.8
equipment under test
the test object is the set of axle counter detector connected to a rail.

3.1.9
in band
working frequency area of an axle counter detector

3.1.10
indirect safety relevant
every not autocorrected fault count will lead to a reset of the system, the resets are safety issues. So this will be an indirect safety effect. The design has to make sure, that this will not result in a safety issue. The requirement is availability relevant.

3.1.11
inflection point
the inflection point defines the transition between the static (continuous wave) and dynamic immunity (short duration) behaviour of the axle counter detector. On the left side of the inflection point the interference duration is less then the integration time. The transition is 105 % of the steady state threshold concluded from sinusoidal bursts by lab tests. The corresponding burst duration is equivalent to the integration time used for evaluation.

3.1.12
integration time
the “Integration Time” is the time constant of an axle counter detector indicating the range of time in which the immunity of the regarded axle counter detector to sinusoidal in band disturbances rises with shorter time duration of these disturbances (short term interference). It is one parameter for evaluation of the measurement results of compatibility tests of vehicles (TSI CCS Interface Document). It is defined as the window size over which the root mean square (RMS) of the output of the band-pass filter is calculated.

3.1.13
measurement antenna
magnetic field antenna, mounted on the rail to capture magnetic field. The measurement covers the axes X, Y and Z

3.1.14
out band
frequency bands out of the working frequency area of an axle counter detector

3.1.15
right side failure
failure of a signalling system which results in a more restrictive condition for the movement of traffic than is appropriate

3.1.16
sinusoidal sway
the sinusoidal sway is defined as the maximum movement of a wheel in y-direction with the running of a train in relation to the inner flange of the rail head.

3.1.17
working frequency range
the working frequency range is a range over which it is considered to provide a useful level of signal with acceptable distortion characteristics. Therefore the frequency range is defined as the area or field where the sensors are operating.

3.1.18
wrong side failure
failure of a signalling system which results in a less restrictive condition for the movement of traffic than is appropriate

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

AC	alternating current
AM	amplitude modulation
CCS	command control signalling
DC	direct current
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
EUT	equipment under test
FFFIS	form fit functional interface specification
FGA	field generating antenna
FM	frequency fanagement
FSK	frequency shift key
HF	higher frequency
HR	hazard rate
IP(xx)	ingress protection (rating)
LC	inductor/capacitor resonant circuit
LF	lower frequency
MA	measurement antenna
MIZ	metallic influencing zone

283	MTBF	mean time between failure
284	MTTR	mean time to repair
285	PS	power supply
286	RMS	root mean square
287	RSF	right side failure
288	TEU	trackside electronic unit
289	THR	tolerable hazard rate
290	TSI	technical specification for interoperability
291	WSF	wrong side failure

292 4 Description of track vacancy detection system

293 Track vacancy detection systems for route proving as a fully automatic track vacancy detection system are
294 integrated into railway signalling and safety systems. The Track vacancy detection is part of the route proving
295 procedure and contribution of trouble-free railway operation.
296 The track vacancy detection equipment provides information about whether track sections are clear or
297 occupied.
298
299 Axle counting systems operate on the principle of difference calculation. The evaluation unit evaluates the
300 signals received from the counting head belonging to the same section, compares the number of axles which
301 have entered a track vacancy detection section with the number of axles which have left this section and
302 generates a "track clear" or "track occupied" indication.
303
304 The figure below defines the system boundaries of a track vacancy detection system using axle counter
305 systems:
306

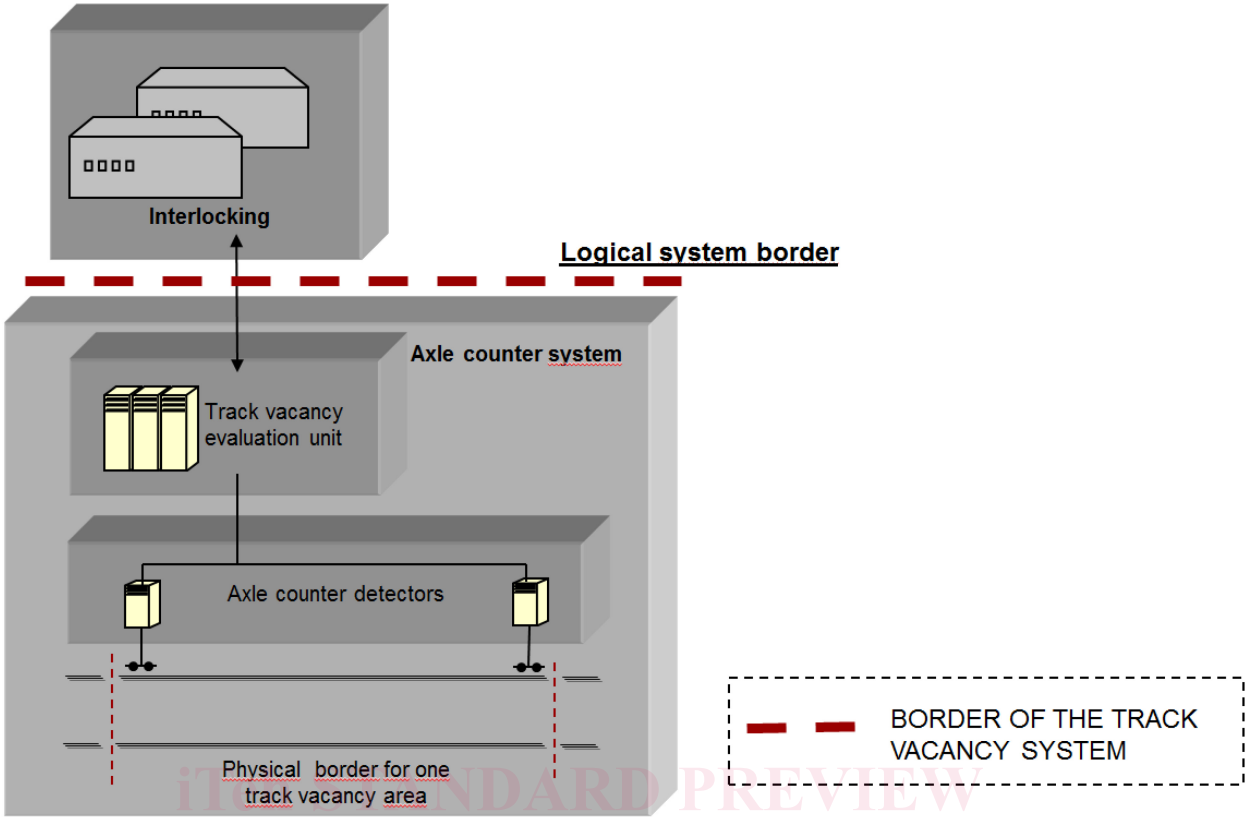

Figure 1 – System boundary of an axle counter system

5 Safety relevance per parameter

There are two levels of safety relevance defined for the basic parameters of axle counter systems:

NOTE The issue safety relevance is defined in EN50126 and EN50129 (see also subclause 6.1.4). The information below is given only with respect to the parameters defined in this document.

- indirect safety relevant parameters. For indirect safety relevant parameters the following sentence is applicable in general:

  "If the parameter is defined as indirectly relevant to safety, it means it is availability related.

  The following example is provided:

  Every not autocorrected wrong count will lead to a reset of the affected track section. The resets themselves lead to safety issues in the whole railway system context, while wrong count alone will have an indirect safety effect. The system design and operational rules have to ensure that such effects will not result in a safety issue"

- direct safety relevant parameters :

  A failure to meet the direct safety relevant requirement results in a wrong side failure.