
Železniške naprave - Osnovni parametri sistemov za detekcijo vlakov - 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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Railway Applications - Technical parameters of train detection systems for the interoperability of the trans-European railway system - Part 2: Axle counters

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Bahnanwendungen - Technische Parameter von Gleisfreimeldesystemen - Teil 2: Achszähler

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Foreword

This document (EN 50617-2:2015) has been prepared by CLC/SC 9XA "Communication, signalling and processing systems" of CLC/TC 9X "Electrical and electronic applications for railways".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-03-09
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2018-03-09

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive 2008/57/EC amended by Commission Directive 2011/18/EU, see informative Annex ZZ, which is an integral part of this document.

This document is Part 2 of the EN 50617 series, which consists of the following parts under the common title "*Railway Applications - Technical parameters of train detection systems*":

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

Introduction

The working group CENELEC/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/TS 50238-2 and CLC/TS 50238-3. These limits and associated measurement methods are based on characteristics of existing systems that are well established and still put forward for signalling renewals by infrastructure managers.

To meet the requirements for compatibility between train detection systems and rolling stock in the future and to achieve interoperability and free movement within the European Union, it is necessary to define a “FrM” and a complete set of interface requirements.

Track circuits and axle counter systems, are an integral part of the CCS trackside subsystem in the context of the Rail Interoperability Directive. The relevant basic parameters are enumerated in the CCS and LOC&PAS TSI and specified in the mandatory Specification CCS TSI Index 77 “Interfaces between Control-Command and Signalling Trackside and other Subsystems”. This standard refers whenever needed to the mandatory specification.

The already published specifications CLC/TS 50238-2 and CLC/TS 50238-3 can be used to ascertain conformity of individual train detection systems to the requirements of the TSIs and to the Notified National Rules, which will be in place for the parameters still declared “open points” in CCS TSI Index 77.

The requirements defined in this standard are either compliant with those of CCS TSI Index 77 or can be used as input information for the closure of open points of the CCS TSI Index 77. Where applicable, the standard should refer to the rolling stock FrM in the TSI CCS and the parameter values defined in the CCS TSI Index 77.

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1 Scope

This European Standard specifies parameters for the design and usage of axle counter systems.

For this, the standard specifies the technical parameters of axle counter systems associated with the magnetic field limits for RST in the context of interoperability. In addition test methods are defined for establishing the conformity and the performance of axle counter products.

The specified 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

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.

This European Standard is intended to be used to assess compliance of axle counter systems and other forms of wheel sensors used for train detection, in the context of the European Directive on the interoperability of the trans-European railway system and the associated technical specification for interoperability relating to the control-command and signalling track-side subsystems.

The frequency bands and rolling stock emission limits are currently defined in the axle counter FrM as specified in the CCS TSI Index 77.

2 Normative references

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.

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 2: Overvoltages and related protection*

EN 50125-3:2003, *Railway applications — Environmental conditions for equipment — Part 3: Equipment for signaling and telecommunications*

EN 50126 (all parts), *Railway applications — The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)*

EN 50128, *Railway applications — 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 50238-1, *Compatibility between rolling stock and train detection systems — Part 1: General*

EN 60068-2-1, *Environmental testing — Part 2-1: Tests — Tests A: Cold (IEC 60068-2-1)*

EN 60068-2-2, *Environmental testing — Part 2-2: Tests — Test B: Dry heat (IEC 60068-2-2)*

EN 60068-2-30, *Environmental testing — Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle) (IEC 60068-2-30)*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

EN 61000 (all parts), *Electromagnetic compatibility (EMC) (IEC 61000, all parts)*

CCS TSI Index 77, *ERTMS/ETCS UNIT — Interfaces between control-command and signalling trackside and other subsystems*

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 (ACD)

detector consisting of the axle counter sensor and of 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 the axle counter detector ACD with its sensor, and the evaluation unit

3.1.5

bandwidth

difference between the upper and lower frequencies in a contiguous set of frequencies and is typically measured in Hz

3.1.6

direct safety relevant

failure results in a wrong side failure

3.1.7

equipment under test

test object is the set of ACD connected to a rail

3.1.8

immunity level

maximum level of interfering signal at which the correct operation of the equipment is granted to be in line with expectations

EN 50617-2:2015**3.1.9****in-band**

working frequency area of an ACD

3.1.10**indirect safety relevant**

every not autocorrected fault count will lead to a reset of the section, which itself is a safety issue

Note 1 to entry: These faults are indirectly safety relevant.

3.1.11**inflection point**

defines the transition between the static (continuous wave) and dynamic immunity (short duration) behaviour of the ACD

3.1.12**integration time**

parameter for evaluation 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**

antenna, mounted on the rail to capture magnetic field

Note 1 to entry: The measurement covers the axes X, Y and Z

3.1.14**out-of-band**

frequency bands out of the working frequency area of an ACD

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**

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**

frequency 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.

ACD	axle counter detector
AM	amplitude modulation
CCS	control-command and signalling
DC	direct current
EMC	electromagnetic compatibility
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
FrM	frequency management
FSK	frequency shift key
HR	hazard rate
IR	Infrared (electromagnetic radiation)
IP(xx)	ingress protection (rating)
LC	inductor/capacitor resonant circuit
MA	measurement antenna
MIZ	metallic influencing zone
MTBF	mean time between failure
MTTR	mean time to repair
PS	power supply
rms	root mean square
RSF	right side failure
RST	rolling stock
TEU	trackside electronic unit
THR	tolerable hazard rate
TSI	technical specification for interoperability
UV	Ultraviolet (electromagnetic radiation)
WSF	wrong side failure

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4 Description of train detection system

Train detection systems for route proving as a fully automatic train detection system are integrated into railway signalling and safety systems. The train detection is part of the route proving procedure contributing to a safe and reliable railway operation.

The train detection equipment provides information about whether track sections are clear of or occupied by rail vehicles.

Axle counting systems operate on the principle of difference calculation. The evaluation unit evaluates the signals received from each counting head associated with a section, compares the number of axles which have entered the train detection section with the number of axles which have left this section and generates a "track clear" or "track occupied" indication.

The figure below defines the system boundaries of a train detection system using axle counter systems:

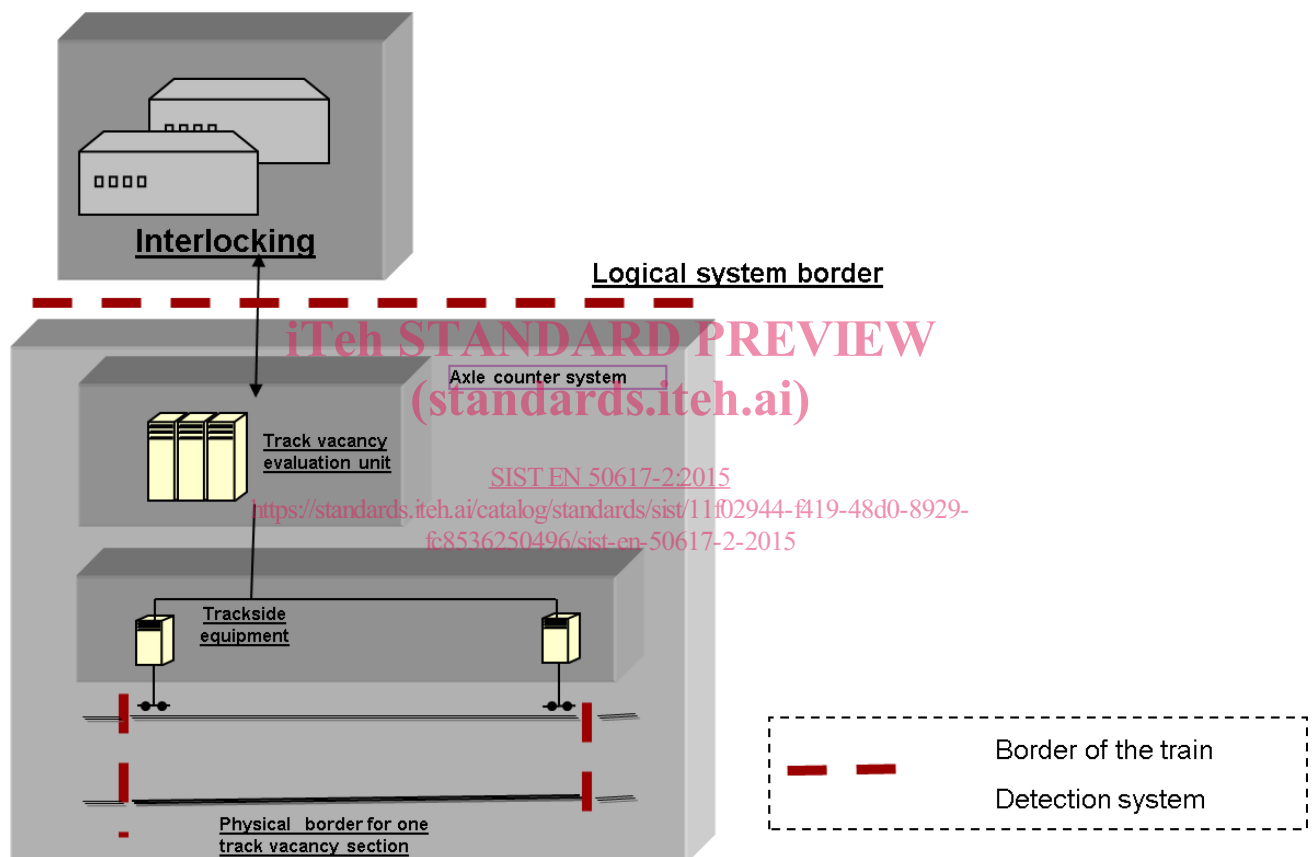


Figure 1 – System boundary of an axle counter system

5 Safety relevance per parameter

There are two degrees of safety relevance which may be assigned to the technical parameters of axle counter systems:

NOTE The issue safety relevance is defined in general in EN 50126 and EN 50129 (see also 6.1.5). The information below is given only with respect to the parameters defined in this document.

- Direct safety relevant parameters:

Failure to meet the direct safety relevant requirement can result directly in a wrong side failure.

- Indirect safety relevant parameters:

Failure to meet the indirect safety relevant requirement may cause a right side failure, but may result in the occurrence of a second failure or human error which could subsequently lead to an accident.

Indirect safety relevant parameters are generally availability related. A deviation may result in a reset being required. Human error may then lead to an accident.

The consequences of right side failures and errors shall therefore be evaluated in the context of risk analysis and appropriately mitigated in the equipment and system design, and in the operational rules.

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