



NSAI
Standards

Irish Standard
I.S. EN 50617-1:2015

Railway applications - Technical parameters
of train detection systems for the
interoperability of the trans-European railway
system - Part 1: Track circuits

I.S. EN 50617-1:2015

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:

EN 50617-1:2015

Published:

2015-04-24

This document was published under the authority of the NSAI and comes into effect on:

2015-05-12

ICS number:

NOTE: If blank see CEN/CENELEC cover page

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

EUROPEAN STANDARD

EN 50617-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2015

ICS 29.280

English Version

Railway applications - Technical parameters of train detection systems for the interoperability of the trans-European railway system - Part 1: Track circuits

Applications ferroviaires - Paramètres techniques des systèmes de détection des trains - Partie 1: Circuits de voie

Bahnanwendungen - Technische Parameter von Gleisfreimeldesystemen - Teil 1: Gleisstromkreisen

This European Standard was approved by CENELEC on 2015-03-09. 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.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	5
Introduction	6
1 Scope	7
2 Normative references	7
3 Terms, definitions and abbreviations	8
3.1 Terms and definitions	8
3.2 Abbreviations	9
4 Description of train detection system	10
5 Safety relevance of parameters	11
6 Technical track circuit parameters	12
6.1 TC non-Detection zone.....	12
6.1.1 General.....	12
6.1.2 Requirements	12
6.2 Track circuit length.....	12
6.2.1 General.....	12
6.2.2 TC Minimum length of detection - Requirement.....	12
6.2.3 TC Maximum length of detection - Requirement.....	12
6.3 Broken rail detection	13
6.3.1 General.....	13
6.3.2 Requirements	13
6.4 IRJ failure detection	14
6.4.1 General.....	14
6.4.2 Requirement.....	14
6.5 Frequency management and relevant parameters of the track circuit	14
6.5.1 Frequencies and immunity limits.....	14
6.5.2 Number of operational channels.....	15
6.5.3 Separation between operational channels / channel bandwidth.....	15
6.6 Coding.....	16
6.6.1 General.....	16
6.6.2 Type of coding	16
6.6.3 Requirements	17
6.7 Response of the receiver to transient disturbances.....	17
6.7.1 General.....	17
6.7.2 Switched sinusoidal signal.....	17
6.7.3 Other signals.....	19
6.7.4 Validation of the response of the receiver to transient disturbances.....	19
6.8 RAMS	20
6.8.1 Reliability	20
6.8.2 Availability	20
6.8.3 Maintainability	20
6.8.4 Safety	21
6.8.5 Validation of all RAMS parameters	21
7 Train based parameter - Shunt impedance.....	21
7.1 General.....	21
7.2 Requirements	22
8 Track based parameters	22
8.1 Total impedance of the track.....	22
8.1.1 General.....	22
8.1.2 Requirements	23
8.2 Rail to Earth impedance.....	24
8.2.1 General.....	24
8.2.2 Limits and requirements	24

8.2.3	Validation	25
8.3	Rail surface resistance / track quality	25
8.4	Insulation value of IRJ	25
8.4.1	General	25
8.4.2	Requirements and validation	25
8.5	Type of sleepers / track structure	26
8.5.1	General	26
8.5.2	Definition of the parameter	26
8.5.3	Requirement and validation	26
8.6	Ballast resistance	27
8.6.1	General	27
8.6.2	Definition of the parameter	27
8.6.3	Requirements for validation	27
8.7	Maximum time between train movements	27
8.7.1	General	27
8.7.2	Definition of the parameter	27
8.7.3	Requirements and validation	27
8.8	Unbalance of the return current	28
8.8.1	General	28
8.8.2	Requirements and validation	28
9	Environmental and other parameters	28
9.1	Signalling power supply quality with respect to availability	28
9.1.1	General	28
9.1.2	Requirements and validation	28
9.2	Traction power supply quality	29
9.2.1	General	29
9.2.2	Definition of the parameter	29
9.2.3	Requirements and validation	29
9.3	Amount of sand	29
9.3.1	General	29
9.3.2	Definition of parameter	30
9.3.3	Requirements and validation	30
9.4	Weather, ice and other environmental conditions	30
9.4.1	Temperature	30
9.4.2	Pressure/Airflow	30
9.4.3	Humidity	31
9.4.4	Precipitation	31
9.4.5	Solar radiation	32
9.4.6	Protection level (IP)	32
9.4.7	Vibrations / shock	33
9.5	EMC	33
9.5.1	General	33
9.5.2	Requirement and validation for EMC with respect to vehicles	33
9.5.3	Requirement and validation for EMC with radio transmitters	33
9.5.4	Requirement and validation for overvoltage protection (including indirect lightning effects)	33
Annex A	(informative) Guidance for usual safety relevance of parameters	34
Annex B	(informative) Scenarios for non-detection zone	36
B.1	Overlap of two detection zones using isolated rail joints (distance x in figure below)	36
B.2	Overlap of a dead zone in S&C area	36
B.3	Equipotential wires in S&C area	38
B.4	Zone without detection in electrical joints	39
Annex C	(informative) Track circuit length	42
C.1	Introduction	42
C.2	Example of TC with S-bond	42
C.2.1	Introduction	42
C.2.2	TC minimum length depending on the S-bond length	42
C.2.3	TC minimum length depending on the speed of the train, drop-away delay, route release delay and tolerances	43

EN 50617-1:2015 (E)

C.2.4	TC Minimum length relating to RST.....	43
Annex D	(informative) Scenarios for broken rail Relation Track circuit – Broken rail detection.....	45
D.1	Basic principle	45
D.2	Fail safe system	46
D.3	Examples where the broken rail detection is not possible.	47
D.3.1	S&C area	47
D.3.2	Single rail isolation.....	47
D.3.3	Parallel paths of other tracks circuits or (and) earthing connections	47
Annex E	(informative) Frequency management.....	48
E.1	Frequencies and immunity limits.....	48
E.1.1	Frequency bands of operation	48
E.1.2	Parameters for evaluation.....	48
E.1.3	TC Compatibility limits.....	48
E.1.4	Immunity to in-band interference.....	49
E.1.5	Immunity to harmonics frequency from traction power supply (1,5 kHz to 2,65 kHz in DC and 50 Hz power systems only)	50
E.1.6	Validation of immunity	51
E.2	Background to development	54
E.2.1	Introduction	54
E.2.2	Approach to Frequency Management	55
E.2.3	Future Track Circuits and Frequency Management.....	55
E.2.4	Future RST and Frequency Management.....	55
E.2.5	Application of FrM to existing generation Track Circuits	55
E.3	Frequency management – Emission limits for rolling stock	56
E.3.1	General.....	56
E.3.2	Emission limits for rolling stock supplied under DC power systems.....	56
E.3.3	Emission limits for rolling stock supplied under 16,7 Hz power systems	57
E.3.4	Emission limits for rolling stock supplied under 50 Hz power systems	57
Annex F	(informative) Vehicle Impedance / guidance for RST design to support the FrM	58
F.1	Definition of the parameter.....	58
F.2	Justification of the parameter	58
F.3	Limits and RST requirements.....	58
F.3.1	For DC traction:	58
F.3.2	For both AC and DC traction:	58
F.4	Validation of the parameter	58
Annex G	(informative) Example of elements of maintenance for existing track circuits	59
Annex H	(informative) Example of management of shunt impedance.....	64
Annex I	(informative).....	66
I.1	Physical factors	66
I.2	Symmetric rail- ground resistance	67
I.3	Values from experience	67
I.4	Asymmetric rail- ground resistance	67
I.5	Touch Potential Effects.....	68
Annex J	(informative) Example of mechanical test for IRJ	70
J.1	General.....	70
J.2	Testing program	71
Annex K	(informative) Example of existing requirement for the type of sleepers / track structure	73
K.1	Typical value for a ballast resistance	73
K.2	Infrabel	73
K.3	DB.....	73
K.3.1	Wooden sleepers	73
K.3.2	Concrete sleepers.....	73
K.3.3	Slab tracks.....	74
Annex L	(informative) Example of application for different safety requirements.....	75
L.1	Lower safety integrity level (less than SIL 4).....	75
L.2	Highest safety integrity level (SIL 4).....	75
Annex ZZ	(informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC	76
Bibliography	80

Foreword

This document (EN 50617-1:2015) 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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

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.

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

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

EN 50617-1:2015 (E)

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/TS 50238-2 and CLC/TS 50238-3. These limits and associated measurement methods are based on preferred existing systems (as defined in CLC/TS 50238-2 and CLC/TS 50238-3) which 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 "Frequency management" including the complete set of interface requirements.

The train detection systems, track circuits and axle counters, are an integral part of the CCS trackside subsystem in the context of the Rail Interoperability Directive. The relevant technical parameters are enumerated in the CCS and LOC&PAS TSI and specified in the mandatory Specification (index 77 of CCS TSI). This standard refers whenever needed to this document. Although the demand for FrM is driven by Interoperability requirements, it is independent from the drive to introduce systems like ERTMS level 3 or level 2.

This standard is based on the current understanding of the railway experts represented at WGA4-2 that track circuits and axle counter systems will continue to be the essential two train detection systems for the foreseeable future.

The published specifications CLC/TS 50238-2 and CLC/TS 50238-3 can be used in the interim period, to ascertain conformity of individual train detection systems to the requirements of the Frequency Management. The 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, that will be in place for the parameters still declared "open points" in index 77 of CCS TSI.

The Frequency Management requirements presented in this standard are informative at this stage until introduced in document Index 77 of CCS TSI.

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

- track circuit system parameters;
- train based parameters;
- track based parameters;
- environmental and other parameters.

Where possible, the parameters as defined are 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 of the safety relevance of each parameter is given – in the context of this European Standard – in a separate table.

1 Scope

This European Standard specifies the technical parameters of track circuits associated with the disturbing current emissions limits for RST in the context of interoperability defined in the form of Frequency Management. The limits for compatibility between rolling stock and track circuits currently proposed in this standard allow provision for known interference phenomena linked to traction power supply and associated protection (over voltage, short-circuit current and basic transient effects like in-rush current and power cut-off). These effects are assessed using modelling tools that have been verified by the past European research project RAILCOM.

This European Standard is intended to be used to assess compliance of track circuits equipment and other forms of train detection systems using the rails as part of their detection principles, 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 European Standard describes technical parameters to consider for achieving the compatibility of the track circuit with the emissions limits defined in the frequency management for rolling stock. These parameters are structured and allocated according to their basic references as follows:

- Technical track circuit parameters;
- Train based parameters;
- Track based parameters;
- Environmental and other parameters including EMC.

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 of the safety relevance of each parameter is given – in the context of this European Standard – in a separate table.

NOTE The allocated bands for track circuits and emission limits for rolling stock defined in the Frequency Management are currently used as input information to define mandatory requirements to be stated in index 77 of CCS TSI. The evaluation is conducted by the European Railway Agency.

The immunity limits of the track circuits installed on non-interoperable lines, or on interoperable lines built before the publication date of this document, are not defined in this European Standard and remain the responsibility of individual infrastructure managers, NSAs and/or suppliers of train detection systems. In this case, the limits for compatibility are usually given in the infrastructure registers and/or the notified national rules.

This European Standard is applicable to track circuits installed on all traction power supply lines, including non-electrified lines. However, for track circuits intended to be installed only on non-electrified lines, some parameters may be not applicable.

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 13146-5, *Railway applications — Track — Test methods for fastening systems — Part 5: Determination of electrical resistance*

EN 50121-4, *Railway applications — Electromagnetic compatibility — Part 4: Emission and immunity of the signalling and telecommunications apparatus*

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-