



BSI Standards Publication

Railway applications — Compatibility between rolling stock and train detection systems

Part 2: Compatibility with track circuits

National foreword

This Published Document is the UK implementation of CLC/TS 50238-2:2020. It supersedes PD CLC/TS 50238-2:2015, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/9/1, Railway Electrotechnical Applications - Signalling and communications.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 539 13096 6

ICS 29.280; 45.060.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 July 2020.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

English Version

**Railway applications - Compatibility between rolling stock and
train detection systems - Part 2: Compatibility with track circuits**

Applications ferroviaires - Compatibilité entre le matériel
roulant et les systèmes de détection des trains - Partie 2 -
Compatibilité avec les circuits de voie

Bahnanwendungen - Kompatibilität zwischen Fahrzeugen
und Gleisfreimeldesystemen - Teil 2: Kompatibilität mit
Gleisstromkreisen

This Technical Specification was approved by CENELEC on 2020-06-15.

CENELEC members are required to announce the existence of this TS in the same way as for an EN and to make the TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, 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: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword.....	4
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms, definitions and abbreviations.....	7
3.1 Terms and definitions.....	7
3.2 Abbreviations	9
4 General aspects of interference current limits for RST	9
4.1 Derivation of interference current limits for RST	9
4.2 Application of Interference current limits to RST design.....	10
4.3 System definition.....	10
Annex A (normative) Interference current limits for RST	13
A.1 Definitions	13
A.2 Preferred track circuits for DC traction.....	13
A.3 Preferred track circuits for RST for 16,7 Hz traction	14
A.4 Preferred track circuits for RST for 50 Hz traction	14
A.5 UGSK3.....	15
A.6 UGSK95.....	15
A.7 FTGS 46 / FTGS 917/TCM100	15
A.8 GRS	16
A.9 Jade	17
A.10 Coded track circuits for DC traction.....	18
A.11 Digicode.....	18
A.12 CoRT0	19
A.13 CBDAC	19
A.14 Preferred track circuit in Czech Republic	20
A.15 All kind of UM71 equipped with RENUM receptor and UC 9500	20
A.16 DC track circuits in UK.....	21
A.17 EBI Track 200 (TI21)	21
A.18 EBI Track 400.....	22
A.19 FS3000	23
A.20 FS2000 / FS 2500 / FS 2550 / FS 5000	23
A.21 Track circuits of 95 Hz and 105 Hz in Norway.....	24
A.22 JRK 10470	24
Annex B (normative) Rolling Stock Interference Evaluation methods.....	25
B.1 General	25
B.2 Selected evaluation method.....	25
B.3 Derivation of the interference current limits for RST	26

B.4	Criteria for compatibility	26
B.5	Defined interference current limits for RST	27
B.6	Test specifications for RST interference measurements	27
B.7	Test equipment requirements (hardware)	30
B.8	Train interference analysis and evaluation methods.....	31
B.8.1	Evaluation method	31
B.9	Requirements for on-train interference monitoring and control.....	33
B.10	Documentation	33
Annex C (informative) Infrastructure data.....		35
C.1	Supply frequency	35
C.2	Infrastructure characterization	35
C.3	Power supply impedance	36
C.4	Approximate calculation of the lowest power supply resonance frequency	36
C.5	Simplified method to handle resonance effects with roof cables	38
C.6	Return current transfer function.....	39
Annex D (informative) Typical voltage resonance graphs.....		40
D.1	General	40
D.2	Interface voltage/current measurement	40
D.3	Voltage resonance graphs for 15 kV 16,7 Hz network	40
D.4	Voltage resonance graphs for 25 kV, 50 Hz network	41
D.5	Voltage resonance graphs for 1 500 V DC network	41
D.6	Voltage resonance graphs for 3 000 V DC network	42
Bibliography		43

European foreword

This document (CLC/TS 50238-2:2020) has been prepared by CLC/SC 9XA “Communication, signalling and processing systems” of Technical Committee CLC/TC 9X, “Electrical and electronic applications for railways”.

This document supersedes CLC/TS 50238-2:2015 and its corrigendum of July 2016.

CLC/TS 50238-2:2020 includes the following significant technical changes with respect to CLC/TS 50238-2:2015:

The interference current limits for RST have been updated in the normative Annex A.

This Technical Specification is Part 2 of the EN 50238 series published under the title *Railway applications — Compatibility between rolling stock and train detection systems*. The series consists of:

- Part 1: General;
- Part 2: Compatibility with track circuits [this document];
- Part 3: Compatibility with axle counters.

Introduction

This Technical Specification defines the interference limits and evaluation criteria for electromagnetic compatibility between rolling stock and track circuits.

The limits have been defined on the basis of national specifications described in NTRs.

This Part 2 of the series defines:

- a set of interference current limits for rolling stock based on defined track circuits,
- measurement and evaluation methods to verify rolling stock interference current emissions and demonstrate compatibility with the track circuits;
- traceability of compatibility requirements (types of track circuit and associated limits).

1 Scope

This document defines, for the purpose of ensuring compatibility between rolling stock and track circuits, the limits for interference current emissions from rolling stock. The measurement and evaluation methods for verifying conformity of rolling stock to these limits are presented in a dedicated annex.

The interference limits are only applicable to rolling stock that is intended to run on lines exclusively equipped with preferred track circuits listed in this document. The rolling stock test methodology (infrastructure conditions, test configurations, operational conditions, etc.) presented in this document is applicable to establish compatibility with any track circuits.

This document gives guidance on the derivation of interference current limits specified for rolling stock and defines measurement methods and evaluation criteria in a dedicated annex.

This document defines:

- a) a set of interference current limits for RST (Rolling Stock) applicable for each of the following types of traction system:
 - 1) DC (750 V, 1,5 kV and 3 kV);
 - 2) 16,7 Hz AC;
 - 3) 50 Hz AC;
- b) methodology for the demonstration of compatibility between rolling stock and track circuits;
- c) measurement method to verify interference current limits and evaluation criteria.

NOTE 1 The basic parameters of track circuits associated with the interference current limits for RST are not in the scope of this document.

NOTE 2 Any phenomena linked to traction power supply and associated protection (over voltage, short-circuit current, under- and over-voltage if regenerative brakes are used) is part of the track circuit design and outside the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 — Communication, signalling and processing systems — Safety related electronic systems for signalling*

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

CLC/TS 50238-3, *Railway applications — Compatibility between rolling stock and train detection systems — Part 3: Compatibility with axle counters*

EN 50388, *Railway Applications - Power supply and rolling stock - Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability*

CLC/TR 50507, *Railway applications - Interference limits of existing track circuits used on European railways*