



SLOVENSKI STANDARD
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Železniške naprave - Metode za izračun zavornih poti pri ustavljanju in upočasnjevanju ter zavarovanje stojećih vozil - 2. del: Izračun za vlakovne kompozicije ali posamezna vozila s postopkom "korak za korakom"

Railway applications - Methods for calculation of stopping and slowing distances and immobilisation braking - Part 2: Step by step calculations for train sets or single vehicles

Bahnanwendungen - Verfahren zur Berechnung der Anhalte- und Verzögerungsbremswege und der Feststellbremsung - Teil 2: Schrittweise Berechnungen für Zugverbände oder Einzelfahrzeuge

Applications ferroviaires - Méthodes de calcul des distances d'arrêt, de ralentissement et d'immobilisation - Partie 2: Calcul pas à pas pour des compositions de trains ou véhicules isolés

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45.060.01 Železniška vozila na splošno Railway rolling stock in general

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Railway applications - Methods for calculation of stopping and slowing distances and immobilisation braking - Part 2: Step by step calculations for train sets or single vehicles

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This draft European Standard is submitted to CEN members for formal vote. It has been drawn up by the Technical Committee CEN/TC 256.

If this draft becomes a European Standard, CEN 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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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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FprEN 14531-2:2015 (E)**Foreword**

This document (FprEN 14531-2:2015) has been prepared by Technical Committee CEN/TC 256 "Railway applications", the secretariat of which is held by DIN.

This document is currently submitted to the Formal Vote.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA which is an integral part of this document.

This series of European standards EN 14531, *Railway applications — Methods for calculation of stopping and slowing distances and immobilization braking* consists of:

- *Part 1: General algorithms utilizing mean value calculation for train sets or single vehicles;*
- *Part 2: Step-by-step calculations for train sets or single vehicles.*

The two parts are interrelated and should be considered together when conducting the step-by-step calculation of stopping and slowing distances.

Introduction

This European Standard describes a common calculation method for railway applications. It describes the general algorithms utilizing step by step calculation for use in the design and validation of brake equipment and braking performance for all types of train sets and single vehicles. In addition, the algorithms provide a means of comparing the results of other braking performance calculation methods.

The EN 14531 series was originally planned to have six parts covering the calculation methodology to be used when conducting calculations relating to the braking performance of various types of railway vehicles under the heading 'EN 14531, *Railway applications – Methods for calculation of stopping, slowing distances and immobilization braking*'. The six parts were as follows:

- Part 1: General algorithms
- Part 2: Application to single freight wagon
- Part 3: Application to mass transit (LRVs and D- and E- MUs)
- Part 4: Application to single passengers coach
- Part 5: Application to locomotive
- Part 6: Application to high speed trains

EN 14531-1 was originally published in 2005 followed by EN 14531-6 which was published in 2009.

Following the publication of these parts, it was decided that a common methodology could be used for parts 2 to 5 and this should be contained under a revised version of Part 1 and Part 6 with a title of '*Railway applications — Methods for calculation of stopping and slowing distances and immobilisation braking — Part 2: Step by step calculations for train sets or single vehicles*' .

EN 14531-1:2005 and EN 14531-6:2009 are referenced in the current TSIs (Freight wagons and Locomotive and passenger RST). The tables of the Annex ZA give the equivalence of the TSI referenced clauses of the original EN 14531 series to the clauses of this issue of FprEN 14531-1 and FprEN 14531-2.

FprEN 14531-2:2015 (E)

1 Scope

This European Standard describes the step-by-step method for the calculation of brake performance utilizing time step integration which may be used for all types of train sets, units or single vehicles, including high-speed, locomotive and passenger coaches, conventional vehicles and wagons.

This European Standard does not specify the performance requirements. It enables the calculation of the various aspects of the performance: stopping or slowing distances, adhesion requirements, force calculations, etc.

This European Standard enables the verification by calculation of the stopping and slowing performance for high-speed and conventional trains operating on high-speed and conventional infrastructure. It may also be used for the detailed investigation of stopping or slowing performance at any design/verification stage.

The proposed method of this standard is based on a numerical time integration algorithm. The standard explains a simple numerical integration scheme in order to provide a useful straightforward example of the proposed method. Other numerical time integration algorithms exist, especially more accurate ones, but they are not in the scope of this Standard.

NOTE When such methods are used the order of accuracy that they achieve has to be in accordance with this European Standard.

This European Standard also includes examples of distance and other dynamic calculations, see Annex B.

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 14478, *Railway applications –Braking – Generic vocabulary*

EN 14067-4, *Railway applications – Aerodynamics – Part 4: Requirements and test procedures for aerodynamics on open track*

FprEN 14531-1, *Railway applications – Methods for calculation of stopping and slowing distances and immobilisation braking – Part 1: General algorithms utilizing mean value calculation for train sets or single vehicles*

3 Terms, definitions, and symbols

3.1 Terms and definitions

For the purposes of this standard, the definitions given in EN 14478 and EN 14531-1 and the following apply.

3.1.1

step-by-step calculation

numerical method with finite time steps

3.2 Symbols and indices

For the purposes of this document, the general symbols given in Table 1 and indices given in Table 2 apply.