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Railway applications - Methods for calculation of
stopping and slowing distances and immobilization
braking - Part 1: General algorithms utilizing mean
value calculation for train sets or single vehicles

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 14531-1:2015+A1:2018 sisaldab Euroopa standardi EN 14531-1:2015+A1:2018 ingliskeelset teksti.	This Estonian standard EVS-EN 14531-1:2015+A1:2018 consists of the English text of the European standard EN 14531-1:2015+A1:2018.
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English Version

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

Applications ferroviaires - Méthodes de calcul des
distances d'arrêt, de ralentissement et
d'immobilisation - Partie 1 : Algorithmes généraux
utilisant le calcul par la valeur moyenne pour des
rames ou des véhicules isolés

Bahnanwendungen - Verfahren zur Berechnung der
Anhalte- und Verzögerungsbremswege und der
Feststellbremsung - Teil 1: Allgemeine Algorithmen für
Einzelfahrzeuge und Fahrzeugverbände unter
Berücksichtigung von Durchschnittswerten

This European Standard was approved by CEN on 27 June 2015 and includes Amendment 1 approved by CEN on 5 August 2018.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR 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, symbols and indices	6
3.1 Terms and definitions	6
3.2 Symbols and indices.....	8
4 Stopping and slowing distances calculation.....	11
4.1 General.....	11
4.2 Accuracy of input values.....	11
4.3 General characteristics	12
4.3.1 Train formation	12
4.3.2 Characteristics of a train	12
4.4 Brake equipment type characteristics	14
4.4.1 General.....	14
4.4.2 Tread braking.....	16
4.4.3 Disc braking	16
4.4.4 Forces of friction brake (tread brake) equipment.....	16
4.4.5 Forces of friction brake (disc brake) equipment.....	22
4.4.6 Mean dynamic coefficient of friction (μ_m) tread and disc brakes	26
4.4.7 Brake forces of other brake equipment types.....	26
4.4.8 Time characteristics.....	35
4.4.9 Blending concept.....	38
4.4.10 Sharing, proportioning of the brake forces - achieved forces.....	39
4.5 Initial and operating characteristics.....	39
4.5.1 Gradient of the track.....	39
4.5.2 Initial speed.....	40
4.5.3 Coefficient of adhesion.....	40
4.5.4 Level of the brake demand	41
4.5.5 Quantity of each brake equipment type available	41
4.5.6 Calculation in degraded conditions.....	41
4.6 Total decelerating force at train level	42
4.7 External forces	42
4.7.1 Gradient.....	42
4.7.2 Wind force on the train	42
4.7.3 Train resistance.....	42
4.8 Stopping and slowing distance calculation based on mean values.....	43
4.8.1 General.....	43
4.8.2 Mean braking force with respect to the distance	43
4.8.3 Equivalent deceleration (a_e) based on mean forces	43
4.8.4 Mean decelerations supplied by each braking force ($\overline{a_i}$)	44
4.8.5 Equivalent free run distance (s_0).....	44
4.8.6 Stopping and slowing distance on level track (s)	45
4.8.7 Stopping and slowing distance on a gradient (s_{grad}).....	45
4.8.8 Other specific formulae for the calculation of stopping distance.....	46

4.9	Supplementary dynamic calculations	46
4.9.1	General	46
4.9.2	Mass to be braked (m_B).....	47
4.9.3	Braking energy	47
4.9.4	Maximum braking power of each brake equipment type.....	49
4.9.5	Maximum specific power flux for each type of friction brake.....	49
4.10	Specific expressions of braking performance	50
4.10.1	General	50
4.10.2	Braked weight percentage (λ).....	50
4.10.3	Braked weight.....	50
4.10.4	Braking ratio	50
4.10.5	Equivalent brake force	50
5	Immobilization brake calculation	50
5.1	General	50
5.2	General characteristics.....	50
5.3	Static coefficient of friction	51
5.4	Train and operating characteristics	51
5.5	Immobilization force provided by equipment type	51
5.5.1	General	51
5.5.2	Force of a screw hand brake (Tread brake).....	52
5.5.3	Force of a screw hand brake (Disc brake)	52
5.5.4	Force of a tread brake unit.....	52
5.5.5	Force of a disc brake unit arrangement	53
5.5.6	Force of a permanent magnetic track brake.....	53
5.6	Immobilization force for each axle.....	54
5.7	Total immobilization force per train.....	54
5.8	Immobilization safety factor	55
5.9	Coefficient of adhesion required by each braked axle.....	55
5.10	Maximum achievable gradient	56
Annex A (informative)	Workflow of stopping and slowing distance calculation method.....	57
Annex B (informative)	Workflow of immobilization calculations.....	59
Annex C (informative)	Brake equipment type example calculations	60
Annex D (informative)	Train stopping distance and immobilization brake calculation example	72
D.1	General	72
D.2	Train stopping calculations	73
D.3	Train stopping calculations on a gradient.....	75
D.4	Train immobilization (parking) brake calculations.....	75
Annex E (informative)	Development of the formula for the mean brake force with respect to the braking distance	77
Annex F (informative)	Slowing or stopping distance calculation using alternative method of equivalent response time calculation as French Railway requirements in particular for trains operating in 'G' position	78
Annex ZA (informative)	Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC.....	80
Bibliography		83

European foreword

This document (EN 14531-1:2015+A1:2018) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2019, and conflicting national standards shall be withdrawn at the latest by May 2019.

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

This document includes Amendment 1 approved by CEN on 2018-08-05.

This document supersedes A1 EN 14531-1:2015 A1.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

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.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard describes a common calculation method for railway applications. It describes the general algorithms utilizing mean value 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.

EN 14531 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 (LRV's and D- and E- MU's)
- 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 above 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 with a title of *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* while revising Part 6 to be Part 2 with the title of *Railway applications - Methods for calculation of stopping and slowing distances and immobilization 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 technical specifications for interoperability (TSIs) (Freight wagons and locomotive and passenger rolling stock (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 EN 14531-1 and EN 14531-2.

1 Scope

This European Standard describes general algorithms for the brake performance calculations to 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 estimation and/or comparison by calculation of the various aspects of the performance: stopping or slowing distances, dissipated energy, power, force calculations and immobilization braking.

If it is required to validate, verify or assess braking performance it is recommended that a more detailed calculation is performed in accordance with EN 14531-2, i.e. a step by step calculation.

This European Standard contains generic examples of the calculation of brake forces for individual brake equipment types and calculation of stopping distance and immobilization braking relevant to a train (see Annexes C and D).

2 Normative references

The following referenced 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 14067-4, *Railway applications — Aerodynamics — Part 4: Requirements and test procedures for aerodynamics on open track*

EN 14478, *Railway applications — Braking — Generic vocabulary*

EN 14531-2, *Railway applications — Methods for calculation of stopping and slowing distances and immobilisation braking — Part 2: Step by step calculations for trains or single vehicles*

A1 deleted text A1

EN 16452, *Railway applications — Braking — Brake blocks*

EN 15663, *Railway applications — Definition of vehicle reference masses*

3 Terms, definitions, symbols and indices

3.1 Terms and definitions

For the purpose of this document, the terms and definitions given in EN 14478 and EN 14531-2 and the following apply.

3.1.1

static mass per axle

mass measured by weighing at the wheel-rail interface, or estimated from design evaluation, of each axle in a stationary condition for each operating condition required

3.1.2

static mass of the train

summation of all the static mass values per entity

Note 1 to entry: E.g. per axle, for each operating condition.