



SLOVENSKI STANDARD

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Železniške naprave - Zavore - Zavorni sistemi za mestno železnico - 1. del: Zahteve in definicije

Railway applications - Braking - Urban rail brake systems - Part 1: Requirements and definitions

Bahnanwendungen - Bremsen - Bremssysteme städtischer Schienenbahnen - Teil 1: Anforderungen und Definitionen

Applications ferroviaires - Freinage - Systèmes de freinage des transports publics urbains et suburbains - Partie 1: Exigences de performances

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Applications ferroviaires - Freinage - Systèmes de
freinage des transports publics urbains et suburbains -
Partie 1: Exigences de performances

Bahnwendungen - Bremsen - Bremssysteme des
öffentlichen Nahverkehrs - Teil 1: Anforderungen an
das Leistungsvermögen

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

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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prEN 13452-1:2023 (E)**European foreword**

This document (prEN 13452-1:2023) 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 CEN Enquiry.

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association.

This document will supersede EN 13452-1:2003.

prEN 13452-1:2023 includes the following significant technical changes with respect to EN 13452-1:2003:

- normative references have been updated;
- requirements on design and specific vehicle type requirements have been revised;
- wheel slide protection recommendations have been added.

This series EN 13452, *Railway applications — Braking – Urban rail brake systems* consists of two parts:

- *Part 1: Requirements and definitions*
- *Part 2: Test methods*

[oSIST prEN 13452-1:2023](https://standards.iteh.ai/catalog/standards/sist/709cfd24-d393-4c48-aea2-0c160a401ed3/osist-pren-13452-1-2023)

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Introduction

Regarding the Europe-wide competition required, this European Standard will allow all prospective bidders to propose or offer rolling stock meeting specified minimum requirements for braking performances.

In case of railway vehicles operating on more than one system (e.g. tram-trains), the technical specification (technical agreement between stakeholders) defines which requirements are valid in the different portions of the systems.

If mentioned in this document, the technical specification defines particular parameters and specifies any additional braking requirements.

Regarding Clause 9, which mainly concerns other urban rail vehicles, there might be borderline cases which can also fall within the scope of EN 16185-1.

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prEN 13452-1:2023 (E)**1 Scope**

This document specifies basic requirements and definitions for a brake system for use in urban rail vehicles.

NOTE Urban rail vehicles are defined in EN 17343.

This document is applicable to:

- tram vehicles and light rail vehicles;
- metro vehicles with steel wheels;
- metro vehicles with rubber tyred wheels;
- other urban rail vehicles.

This document does not apply to special transport systems, e.g. suspended monorail, rack and pinion lines, isolated operations such as scenic railways, special duty vehicles, etc.

Compliance with the functional and performance requirements defined in this document is verified by testing in accordance with prEN 13452-2:2023.

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 14478, *Railway applications - Braking - Generic vocabulary*

EN 14531-1:2015+A1:2018, *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*

EN 14531-2, *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 15663, *Railway applications — Vehicle reference masses*

EN 17343, *Railway applications - General terms and definitions*

EN 50125-1, *Railway applications - Environmental conditions for equipment - Part 1: Rolling stock and on-board equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14478, EN 14531-1, EN 14531-2, EN 17343 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

driver

human being in manual control of train motion, or automatic train control system

3.2

technical specification

project related document describing specific parameter and/or brake system requirements between a customer and a supplier, as an addition to requirements of this standard

3.3

design specification

supplier's project related document describing in detail the different functions of the brake system in accordance with the requirements from the technical specification

Note 1 to entry: The design specification can be used as base for the test procedure document.

3.4

load compensation

adjustment of the braking force on a brake system in accordance with the load, with the objective of maintaining the deceleration constant irrespective of load

3.5

maximum (average) jerk

change of deceleration measured and averaged within the time period t_{ab} (build-up time) in accordance with EN 14531-1

3.6

maximum braking load

maximum load required for the specific braking function for which the brake is designed

Note 1 to entry: The technical specification can specify different value for the maximum braking load.

Note 2 to entry: Load condition can be lower than or equal to "design mass under exceptional payload" (MXD) as defined in EN 15663.

3.7

brake equipment type

brake contributors with different characteristics (e.g. response time, way of operation...)

prEN 13452-1:2023 (E)**4 Symbols**

For the purposes of this document, the following symbols apply:

a	deceleration, expressed in m/s^2
s	stopping distance, expressed in m, as defined in EN 14531
t	time, expressed in s, as defined in EN 14531
t_{ab}	build-up time, from achieving a % to achieving b % of the established deceleration, expressed in s, as defined in EN 14478
v	speed, expressed in m/s, as defined in EN 14531

5 Design principles**5.1 Brake system****5.1.1 General**

If not specified otherwise in this document, the brake system is understood with all brake functions active.

A brake system shall achieve the following objectives:

- to decelerate or stop a moving train;
- to maintain a train stationary;
- to control a train's speed on a downhill gradient.

The brake system shall be designed and built so that

- it is continuous, automatic and inexhaustible,
- it comprises an energize-to-release brake command line, as a minimum for the emergency braking or the safety braking,
- the man machine interface shall provide at least two separate means for demanding an emergency braking or safety braking application,

NOTE 1 If safety braking is implemented on the train, it is acceptable to have only one emergency braking control mean and only one safety braking control mean.

- trains or train sets can be stopped without risk to passengers and third parties and with acceptable levels of jerk at service braking,
- traction effort shall be cut off on the whole train while braking is requested,

NOTE 2 Some operating conditions can require to superpose traction and service braking, e.g. roll-back.

- the adhesion limit specified in 5.4.1 is only to be considered as a design criteria for the brake calculation according to EN 14531-1, in order to ensure that the brake system can fulfil the requirements of Clause 6 to Clause 9,
- thermal load conditions shall not exceed the thermal capacity of the involved brake equipment types.

In achieving the above objectives, a number of functions shall be required, which are described below. The means of achieving these functions shall be in accordance with the requirements defined in the appropriate clause for the type of rolling stock.

5.1.2 Service braking

Service braking shall be provided and shall consistently achieve specified levels of performance. It shall be designed for permanent use by the driver in controlling the train. Braking parameters shall be set to take account of passenger's comfort.

During blending the instantaneous deceleration shall not vary by more than $\pm 10\%$ from that demanded.

Service braking shall be overridden by both any emergency braking mode and a safety braking.

5.1.3 Emergency braking

The traction function (not the ED brake function) shall be cut off automatically and the process to achieve this shall be initiated immediately. It cannot be reactivated before the brake demand is released completely and without a deliberate action by the driver as defined in 3.1.

Emergency braking shall be provided and shall achieve a specified level of performance. Whenever the term "emergency" is used, the type of emergency brake required shall be defined in the technical specification.

The various emergency braking modes are defined with regard to initiation, see Table 1. The braking performance achieved for each of these emergency braking modes does not necessarily need to be different. It is acceptable to group two or more modes together when specifying the emergency brake system for a particular train:

Table 1 — Emergency braking modes

Mode	Usual means of initiation
Emergency braking 1	Driver vigilance, or ATO, or ATP system
Emergency braking 2	Passenger alarm
Emergency braking 3	Driver, via dedicated position on brake controller, or ATP system
Emergency braking 4	Authorized person via control separate from brake controller

When an ATP system is applied, the respective involved braking function shall be specified by the technical specification.

NOTE It is possible for the different levels of emergency braking to be initiated by means other than those indicated above, e.g. driver assistance systems.

5.1.4 Safety braking

Safety braking may be specified as a particular form of braking. It provides not necessarily a high level of performance.

5.1.5 Holding brake

Holding brake may be provided as a separate function if this is specified by the technical specification. The load (see Table 3), gradient and time for which it shall be effective, should be defined by the technical specification.

As an option, a rollback function can be implemented with the aim, when the traction is required, to automatically apply the brake in case of displacement of the train in a direction opposite to the travel

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direction selected by the driver. The maximum rollback distance until the train is stopped may be given in the technical specification.

5.1.6 Parking brake

The purpose of a parking brake is to be applied automatically when all driver controls are deactivated or by loss of all energy. Manual control of the parking brake may be provided in addition, to keep the train stationary in shut down configuration permanently without energy supply. It can be validated by an analysis of the design.

5.1.7 Wheelslide protection systems

The objectives of fitting WSP systems to trains are to assist in achieving the following:

- optimize braking performance in degraded adhesion conditions to achieve the minimum practical stopping distance;
- minimum level of wheel damage due to wheel slide or wheel lock;
- minimum level of track damage;
- minimize the consumption of the stored energy for brake actuation during operation.

If the accordance with EN 15595 is not specified in the technical specification or is not applicable for the concerned vehicle, Annex A can be used as recommendation reference list.

5.1.8 Sanding systems

Sanding systems should be used to optimize braking performance by increasing the adhesion in degraded adhesion conditions. Application of sand shall not disturb signalling systems and should not interrupt power supply.

5.2 Environmental condition

The rolling stock and the equipment on board shall perform under the conditions as specified in the technical specification in accordance with EN 50125-1. They shall work properly in those climatic zones, for which they have been designed and where they will be operated.

For certain applications, further requirements may be required, e.g. for the Nordic countries. Especially using hydraulic brakes, the response time is directly influenced by the temperature-dependency of the hydraulic fluid viscosity. This shall be taken into consideration and shall be part of the technical specification.

5.3 Loading criteria

In specifying the performance of the brake system, one of the key parameters is the payload at which the performance is to be attained. The particular levels shall be defined by the technical specification, based upon the characteristics of its particular system.

When not defined otherwise, the load definitions of EN 15663 for vehicle category M-II shall apply, e.g. MVD, MND, MXD.

The maximum braking load is given as the maximum mentioned in 6.6, 7.4, 8.4 and 9.5.