



# SLOVENSKI STANDARD

## oSIST prEN 14198:2023

01-september-2023

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**Železniške naprave - Zavore - Zahteve, ki jih morajo izpolnjevati zavorni sistemi vlakov, vlečeni z lokomotivami**

Railway applications - Braking - Requirements for the brake system of trains hauled by locomotives

Bahnanwendungen - Bremsen - Anforderungen an die Bremsausrüstung lokbespannter Züge

Applications ferroviaires - Freinage - Exigences concernant le système de freinage des trains tractés par locomotive

**Ta slovenski standard je istoveten z: prEN 14198**

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**ICS:**

45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering
45.060.01	Železniška vozila na splošno	Railway rolling stock in general

**oSIST prEN 14198:2023**

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NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 14198**

June 2023

ICS 45.040; 45.060.01

Will supersede EN 14198:2016+A2:2021

English Version

## Railway applications - Braking - Requirements for the brake system of trains hauled by locomotives

Applications ferroviaires - Freinage - Exigences  
concernant le système de freinage des trains tractés  
par locomotive

Bahnanwendungen - Bremsen - Anforderungen an die  
Bremsausrüstung lokbespannter Züge

This draft European Standard is submitted to CEN members for enquiry. 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  
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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**prEN 14198:2023 (E)****European foreword**

This document (prEN 14198:2023) 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 will supersede EN 14198:2016+A2:2021.

This document includes the following significant technical changes with respect to EN 14198:2016+A2:2021:

- normative references have been updated;
- definitions have been modified;
- functional requirements at train level for brake modes and positions, for EP assist and for emergency brake application have been modified;
- requirements for direct brake have been modified;
- requirements for brake management have been modified;
- performance requirements for adhesion have been modified;
- Annex A “Vehicle requirements” has been modified;
- Annexe D “Corresponding standards EN – UIC” has been updated;
- Annex E “Brake pipe pressure control system” has been updated;
- Annex F “Venting performance of emergency valves” has been updated;
- Annex ZA has been updated.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

## 1 Scope

This document specifies basic requirements for the braking of trains hauled by locomotives:

- For trains hauled by locomotives and intended for use in general operation each vehicle is fitted with the traditional brake system with a brake pipe compatible with the UIC brake system.

NOTE This ensures technical compatibility of the brake function between vehicles of various origins in a train (see 5.4).

- For trains hauled by locomotives and intended for use in fixed or predefined formation, the requirements on the vehicle and the train are necessary. In the case of a UIC brake system, this standard applies; if not, the EN 16185 series or the EN 15734 series applies.

If concerned, the UIC brake architecture described in this document (see 5.4) can be used for brakes for multiple unit train and high speed trains and urban rail described in the EN 13452 series, the EN 16185 series and the EN 15734 series.

This document also takes into account electrical and electronic control functions and additional brake systems like dynamic brakes and adhesion independent brakes.

The brake system requirements, which are specific for on-track machines are set out in EN 14033-1.

This document does not apply to urban rail rolling stock brake system, which is specified by EN 13452-1.

## 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 837-1:1996,<sup>1</sup> *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

EN 854:2015, *Rubber hoses and hose assemblies - Textile reinforced hydraulic type - Specification*

EN 10220:2002, *Seamless and welded steel tubes - Dimensions and masses per unit length*

EN 10305-4:2016, *Steel tubes for precision applications - Technical delivery conditions - Part 4: Seamless cold drawn tubes for hydraulic and pneumatic power systems*

EN 10305-6:2016, *Steel tubes for precision applications - Technical delivery conditions - Part 6: Welded cold drawn tubes for hydraulic and pneumatic power systems*

EN 13749:2021, *Railway applications - Wheelsets and bogies - Method of specifying the structural requirements of bogie frames*

EN 14478:2017, *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*

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<sup>1</sup> Document impacted by AC:1998.

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EN 14531-2:2015, *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 14535-1:2019, *Railway applications - Brake discs for railway rolling stock - Part 1: Brake discs pressed or shrunk onto the axle or drive shaft, dimensions and quality requirements*

EN 14535-2:2019, *Railway applications - Brake discs for railway rolling stock - Part 2: Brake discs mounted onto the wheel, dimensions and quality requirements*

EN 14535-3:2015, *Railway applications — Brake discs for railway rolling stock — Part 3: Brake discs, performance of the disc and the friction couple, classification*

EN 14601:2005+A2:2021, *Railway applications - Straight and angled end cocks for brake pipe and main reservoir pipe*

EN 15220:2016, *Railway applications - Brake indicators*

EN 15273-2:2013+A1:2016, *Railway applications - Gauges - Part 2: Rolling stock gauge*

EN 15328:2020, *Railway applications - Braking - Brake pads*

EN 15329:2019, *Railway applications - Braking - Brake block holder and brake block key*

EN 15355:2019+A1:2023, *Railway applications — Braking — Distributor valves and distributor-isolating devices*

EN 15595:2018,<sup>2</sup> *Railway applications — Braking — Wheel slide protection*

EN 15611:2020+A1:2022, *Railway applications - Braking - Relay valves*

EN 15612:2020, *Railway applications - Braking - Brake pipe accelerator*

EN 15663:2017+A1:2018, *Railway applications - Vehicle reference masses*

EN 15807:2021, *Railway applications - Pneumatic half couplings*

EN 16186-2:2017, *Railway applications - Driver's cab - Part 2: Integration of displays, controls and indicators*

EN 16207:2014+A1:2019, *Railway applications - Braking - Functional and performance criteria of Magnetic Track Brake systems for use in railway rolling stock*

EN 16241:2014+A1:2016, *Railway applications - Slack adjuster*

EN 16334-1:2014+A1:2022, *Railway applications - Passenger Alarm System - Part 1: System requirements for mainline rail*

EN 16451:2015, *Railway applications - Braking - Brake pad holder*

EN 16452:2015+A1:2019, *Railway applications - Braking - Brake blocks*

EN 16834:2019, *Railway applications - Braking - Brake performance*

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<sup>2</sup> Document impacted by AC:2021.



EN 45545-1:2013, *Railway applications - Fire protection on railway vehicles - Part 1: General*

EN 45545-2:2020, *Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components*

EN 45545-3:2013, *Railway applications - Fire protection on railway vehicles - Part 3: Fire resistance requirements for fire barriers*

EN 45545-4:2013, *Railway applications - Fire protection on railway vehicles - Part 4: Fire safety requirements for rolling stock design*

EN 45545-5:2013+A1:2015, *Railway applications - Fire protection on railway vehicles - Part 5: Fire safety requirements for electrical equipment including that of trolley buses, track guided buses and magnetic levitation vehicles*

EN 45545-6:2013, *Railway applications - Fire protection on railway vehicles - Part 6: Fire control and management systems*

EN 45545-7:2013, *Railway applications - Fire protection on railway vehicles - Part 7: Fire safety requirements for flammable liquid and flammable gas installations*

EN 50125-1:2014, *Railway applications - Environmental conditions for equipment - Part 1: Rolling stock and on-board equipment*

EN 50163:2004, *Railway applications - Supply voltages of traction systems*

EN 50553:2012,<sup>3</sup> *Railway applications — Requirements for running capability in case of fire on board of rolling stock*

EN ISO 1127:1996, *Stainless steel tubes - Dimensions, tolerances and conventional masses per unit length (ISO 1127:1992)*

ISO 4975:2022, *Railway applications — Braking system — Quality of compressed air for pneumatic apparatus and systems*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14478:2017 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

##### **general operation**

mode of operation of units intended to be coupled with other units in a train formation which is not defined at design stage

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<sup>3</sup> Document impacted by A1:2016, A2:2020 and AC:2013.

**prEN 14198:2023 (E)****3.2****brake mode**

in the “EN-UIC” design, mode that defines the brake force build up and release timings – namely “G” for goods timings, i.e. slow-acting, “P” for passenger timings, i.e. fast timing, typically controlled by the brake distributor in an air brake system

**3.3****brake position**

in the “EN-UIC” design, position that defines the behaviour of the distributor valve in regard of brake application and release timings and brake cylinder forces, combined with additional brake systems

Note 1 to entry: E.g. brake positions G, P, R and others.

**3.4****automatic brake application**

automatic application of the brakes when the brake line is interrupted

**3.5****power brake**

uses compressed air to apply the brake

**3.6****unit**

assessable entity which may be a single vehicle/locomotive or a group of vehicles that operate in a fixed formation

**3.7****train**

operational formation consisting of one or more units

**3.8****rear view position**

position in the front cab, where the driver can observe the rear end of the train and can command the traction and brake system for shunting

**3.9****active driving cab**

only cab enabled to generate trainwide control signal for traction and service braking

**3.10****brake command vehicle**

vehicle where the active cab is located

**3.11****emergency brake performance**

result of an emergency brake application in terms of stopping distances, retardation and brake response time

**3.12****locomotive**

traction vehicle (or combination of several vehicles) that is not intended to carry a payload and has the ability to be uncoupled in normal operation from a train and to operate independently

**3.13****braked weight percentage**

also known as  $\lambda$  (lambda) brake performance in accordance with EN 16834

**3.14****braked weight**

performance value that is obtained by multiplying the braked weight percentage by the total mass of the vehicle/train and dividing the result by 100 and is expressed in tonnes

**3.15****build-up time**

time to create an emergency brake application on a single vehicle starting from the beginning of the pressure rising until 95 % of the maximum brake cylinder pressure is reached

**3.16****release time**

time for reducing the brake cylinder on a single vehicle, starting from the beginning of the pressure drop down to 0,4 bar

**4 Symbols and abbreviated terms**

For the purposes of this document, the following symbols and abbreviated terms apply.

$\lambda$	braked weight percentage
AC	alternating current
BP	brake pipe
CCS	Control Command and Signalling System
CSM	common safety methods
CW	marking for freight wagons depending on compliance with TSI WAG requirements, for application refer to Commission Regulation (EU) No 321/2013, Annex C, Clause 5 "Marking of units"
DC	direct current ("Berlin DC-Network" means network of the S-Bahn Berlin, Germany, which runs on DC)
EMC	electromagnetic compatibility
ETCS	European Train Control System
GE	marking for freight wagons depending on compliance with TSI WAG requirements, for application refer to Commission Regulation (EU) No 321/2013, Annex C, Clause 5 "Marking of units"
MRP	main reservoir pipe
MTB	magnetic track brake
UIC	International Union of Railways ( <i>Union internationale des chemins de fer</i> )
UK	United Kingdom
WSP	wheel slide protection system

## 5 Requirements

### 5.1 General requirements of the train brake system

The purpose of the train brake system is to ensure that the train's speed can be reduced or maintained on a slope, or that the train can be stopped within the maximum allowable braking distance.

Braking also provides the immobilization of a train either for a certain period of time or permanently when it is not in operation or without any energy on board.

Units designed and assessed to be operated in general operation (various formations of vehicles from different origins; train formation not defined at the design stage) shall be fitted with a technically compatible brake system to ensure the brake function in all vehicles of the train.

### 5.2 General safety requirements

#### 5.2.1 Design principles

The design, construction or assembly, maintenance and monitoring of safety-critical components, and more particularly of the components involved in train movements, shall ensure safety at the level corresponding to the aims laid down for the respective railway network. The braking techniques and the stresses exerted shall be compatible with the design of the tracks, engineering structures and signalling systems. Brake systems shall conform to the following:

- the design principles listed in the standards on brake systems referred to in Clause 2;
- the brake performances defined in Clause 6;
- the design principles in accordance with the requirements of this document;
- keeping within the specified effects on the infrastructure, particularly regarding EMC and noise emissions.

In the course of the system design, risks shall be considered and mitigated. As a minimum, the following hazards shall be taken into account:

- a) the brake force applied is greater than the maximum design level:
  - 1) impact on track shifting forces;
  - 2) excessive jerk (impact on standing passengers);
  - 3) significant damage to the contact surface of the wheels or friction partners;
  - 4) impact on load assumptions in the fatigue life of the components generating the brake force;
- b) the brake performance is lower than the level of brake demanded:
  - 1) keeping traction effort on the train while emergency brake is requested;
  - 2) required emergency brake performance not achieved;
  - 3) required parking brake performance not achieved;
  - 4) holding brake performance not achieved;
- c) there is no brake force when demanded:

- 1) no emergency brake on the whole train when requested;
  - 2) automatic (emergency) brake not initiated in the case of an unintended train separation (loss of train integrity);
  - 3) parking brake: loss of performance over the time;
- d) there is a brake force when a brake demand has not been made:
- 1) undue local brake application (pneumatic or parking);
- e) brake component failures that could cause death or injury or damage to the train or infrastructure, e.g. derailment.

The hazards in the previous list shall be assessed in accordance with CSM.

Concluding from the hazards listed above the emergency brake shall have a high level of integrity and shall always be available when the brake system is set up for operation, whereas the service brake, whilst it may share subsystems and components, etc. with the emergency brake, need not achieve the same level of integrity. Nevertheless, the service brake shall be designed to comply with the following requirements:

- it shall be activated on the whole train when requested;
- it shall cut off traction effort on the whole train while service brake is requested;
- it shall provide service brake effort as high as requested.

Independently from the service brake:

- it shall be possible for the driver to immediately initiate the emergency brake by using the same lever which is used for service braking or by using another independent device;
- the train protection systems shall be capable of initiating the emergency brake.

The components shall be of a proven design and withstand any duties expected to occur during their period in service. The safety implication of any failures shall be limited by appropriate means; as described in this standard. For more guidance on proven design see Annex C.

Single point failures shall not cause any relevant malfunctions regarding emergency brake application.

Proper functionality of the brake system is also affected by the design of the piping and component design as specified in 5.4.5.

### 5.2.2 Fire protection

The brake system shall be protected against the effects of fire and shall not emit toxic fumes. This shall be achieved by selecting appropriate materials, by an appropriate system architecture and installation arrangement.

The brake system shall be consistent with the train fire protection requirements as set out in the EN 45545 series.

The running capability shall be in accordance with EN 50553:2012<sup>3</sup>.

### 5.2.3 Environmental condition

The rolling stock and the equipment on board shall perform under the conditions as specified in EN 50125-1:2014. They shall work properly in those climatic zones, for which they have been designed and where they will be operated.

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For certain lines further requirements may be specified, e.g. for the Nordic countries.  
CEN/TR 16251 covers this subject and it may be considered.

**5.3 Requirements of the main brake system****5.3.1 General requirements**

Trains for general operation shall be equipped with a main brake system providing the following functions:

- emergency braking;
- service braking;
- functions to keep the train stationary.

The functions shall incorporate the features listed below:

- trainwide brake control (driver's cab equipment, CCS, etc.);
- command distribution;
- local brake control;
- brake force generation;
- indication of brake status;
- energy supply for brake force generation and command control of the main brake system.

The structure of the document is considering general functions on a train wide level and particular functions for the different vehicles on a local vehicle level. The local vehicle level is considering different functions for locomotives, coaches and wagons.

Figure 1 shows the basic structure of a brake system (with train and vehicle levels) and transmission paths for brake control signals and energy for brake force generation, including their conversion into brake force.

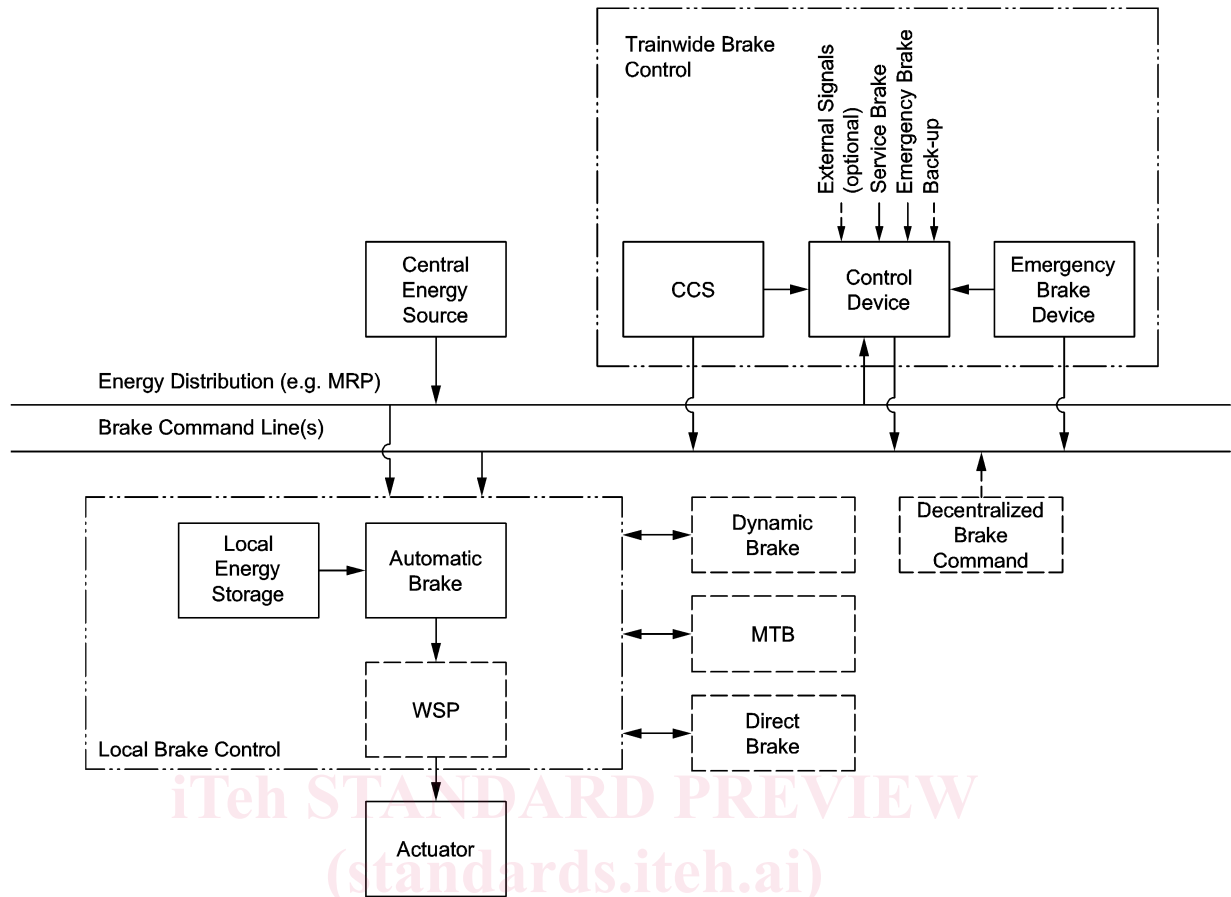


Figure 1 — Basic structure of the main brake system (functions in dotted lines are optional)

### 5.3.2 General functions on train level

#### 5.3.2.1 Brake control functions

- a) Each unit shall be equipped with a brake command line which is intended to transmit the brake command from the active driving cab to all other units in the train in a dedicated manner.
- b) The trainwide brake control, the continuous brake command line and the local control unit in each single vehicle of the train shall cooperate in a compatible way by using appropriate command signals.
- c) The brake command line shall be capable
  - 1) to receive a brake apply/release command from a trainwide brake control initiated from the active cab of the leading vehicle,
  - 2) to receive an emergency brake application command from a trainwide brake control initiated from decentralized brake command devices if fitted.
- d) The brake command line shall be capable of transmitting the brake command information:
  - 1) full release of the brakes;
  - 2) emergency brake application;
  - 3) gradual application or release for service braking.