SLOVENSKI STANDARD
SIST EN 16207:2024

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Železniške naprave - Zavore - Funkcionalna merila in merila za zmogljivost elektromagnetnih zavornih sistemov za železniška vozila

Railway applications - Braking - Functional and performance criteria of Magnetic Track Brake systems for use in railway rolling stock

Bahnanwendungen - Bremse - Anforderungen an Funktion und Leistungsfähigkeit von Magnetschienenbremssystemen für Schienenfahrzeuge

Applications ferroviaires - Freinage - Critères pour la fonction et la performance des systèmes de freinage magnétiques pour véhicules ferroviaires

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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

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English Version

Railway applications - Braking - Functional and performance criteria of Magnetic Track Brake systems for use in railway rolling stock

Applications ferroviaires - Freinage - Critères pour la fonction et la performance des systèmes de freinage magnétiques pour véhicules ferroviaires

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This European Standard was approved by CEN on 15 October 2023.

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European foreword

This document (EN 16207:2024) 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of an identical text or by endorsement, at the latest by September 2024, and conflicting national standards shall be withdrawn at the latest by September 2024.

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 supersedes EN 16207:2014+A1:2019.

In comparison with the previous edition, the following technical modifications have been made:

a) normative references have been updated;

b) requirements for end pieces of magnet elements (see 5.5) have been modified;

c) requirements for control of the MTB (5.10) have been modified;

d) content of Table C.1 “List of end pieces and main dimensions” has been updated;

e) new normative Annex D “Validation process for new end pieces of MTB” has been added;

f) Annex ZA has been updated in accordance with Directive (EU) 2016/797.

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This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

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Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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1 Scope

This document specifies the functionality, position, constraints and control of a magnetic track brake system (MTB system) installed in bogies for use in emergency braking and in low adhesion conditions on Mainline Trains with speeds up to 280 km/h. It covers high suspension types of MTB only and not high/low and low suspension type of MTB.

This document also specifies test methods and acceptance criteria for an MTB system. It identifies interfaces with electrical equipment, bogie, track and other brake systems.

This document specifies additional requirements for:

— conditions of application for the MTB system;

— retardation and brake forces;

— functional and design features;

— strength requirements;

— type, series and vehicle implementation tests.

For design and calculation a “reference surface” is established.

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.

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EN 10025-2:2019, *Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels*

EN 13674-1:2011+A1:2017, *Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above*

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EN 14198:2016+A2:2021, *Railway applications - Braking - Requirements for the brake system of trains hauled by locomotives*

EN 14478:2017, *Railway applications - Braking - Generic vocabulary*

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

EN 15734-1:2010+A1:2021, *Railway applications - Braking systems of high speed trains - Part 1: Requirements and definitions*

EN 15734-2:2010+A1:2021, *Railway applications - Braking systems of high speed trains - Part 2: Test methods*

EN 16185-1:2014+A1:2020, *Railway applications - Braking systems of multiple unit trains - Part 1: Requirements and definitions*

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EN 16185-2:2014+A1:2019, *Railway applications - Braking systems of multiple unit trains - Part 2: Test methods*

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

EN 17065:2018, *Railway applications - Braking - Passenger coach test procedure*

EN 45545-2:2020+A1:2023, *Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components*

EN 50124-1:2017, *Railway applications - Insulation coordination - Part 1: Basic requirements - Clearances and creepage distances for all electrical and electronic equipment*

EN 50126-1:2017, *Railway Applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Generic RAMS Process*

EN 50129:2018,[1] *Railway applications — Communication, signalling and processing systems — Safety related electronic systems for signalling*

EN 50155:2021, *Railway applications - Rolling stock - Electronic equipment*

EN 50657:2017, *Railways Applications - Rolling stock applications - Software on Board Rolling Stock*

EN 60077-1:2017, *Railway applications - Electric equipment for rolling stock - Part 1: General service conditions and general rules*

EN 60529:1991,[2] *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61373:2010, *Railway applications - Rolling stock equipment - Shock and vibration tests*

EN ISO 2409:2020, *Paints and varnishes - Cross-cut test (ISO 2409:2020)*

EN ISO 4628-3:2016, *Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 3: Assessment of degree of rusting (ISO 4628-3:2016)*

EN ISO 9227:2022, *Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227:2022)*

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[1] As impacted by EN 50129:2018/AC:2019-04.

[2] As impacted by EN 60529:1991/A1:2000 and EN 60529:1991/A2:2013.

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3 Terms, definitions symbols and abbreviated terms

3.1 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 terminology databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.iso.org/obp/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
actuator
device to lower the MTB to the rail head, commonly a pneumatic cylinder with a return spring

3.1.2
end piece
guide the magnets on the rails

Note 1 to entry: It also contributes to the braking force.

Note 2 to entry: It is subject to wear.

3.1.3
high suspension
variation of the MTB in which the magnets are connected with each other by means of tie bars and, in their rest position, are fastened to centring elements situated at a rest position in the running gear where they are held by spring action, and in which, so as to apply the magnets, an energy source is used for lowering them onto the rails

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3.1.4
high/low suspension
variation of the MTB in which the magnets are likewise connected with each other by means of tie bars and, in their rest position, are fastened to centring elements situated at a rest position in the running gear where they are displaced to their low position by using an external energy source, whereas, in their low position, however they are situated at a height which, when the magnets are energized, causes the magnets to get self-attracted by the rails, against a spring force

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3.1.5
low suspension
variation of the MTB in which the magnets are suspended above the rail surface, by the action of a spring, at a level that allows the magnets, when they are energized, to become self-attracted by the rail

3.1.6
pole shoe
friction element of the magnet that produce the braking force

Note 1 to entry: It is subject to wear and therefore replaceable.

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3.1.7
rest position
position of the MTB in which the magnets suspended at a significant distance from the rail surface, unless a brake application command has been issued and in which position the magnet is guided and positioned by the bogie

Note 1 to entry: This position corresponds to the geometrical defined rest position in case of high suspension and high/low suspension.

3.1.8
weld-on
accumulation of metallic wear debris that attaches to the underside of the MTB pole pieces

Note 1 to entry: The presence of this material reduces the braking performance of the MTB and thus needs to be removed during maintenance activities.

3.1.9
working position
position of the MTB in which the magnets are in contact with the rail where it centres itself, due to the action of the magnetic field and in which, when the magnet is energized, the brake force is produced by friction

3.2 Symbols and abbreviated terms

For the purposes of this document, the following abbreviations apply.

a	adequate lateral clearance
g	acceleration by gravitation (9,81 m/s²)
q	clearance in mm between wheel set and lower part of the bogie frame in accordance with EN 15273-2:2013+A1:2016, Table 1
U_N	nominal battery voltage
x	lateral freedom
BP	brake pipe
CCS	control command and signalling
DC	direct current
EMC	electromagnetic compatibility
FME(C)A	failure mode effect (criticality) analysis
IP67	IP-Code: a coding system to indicate the degrees of protection by an enclosure against access to hazardous parts, ingress of solid foreign objects, ingress of water and to give additional information in connection with such protection, according to EN 60529[2]
MTB	Magnetic track brake, equipment for one bogie/running gear
PD2	degrees of pollution for the purpose of evaluating creepage distances and clearances, according to EN 50124-1:2017
R+Mg	brake mode with the MTB function active in accordance with EN 14198:2016+A2:2021
TSI	Technical Specification for Interoperability
WSP	wheel slide protection

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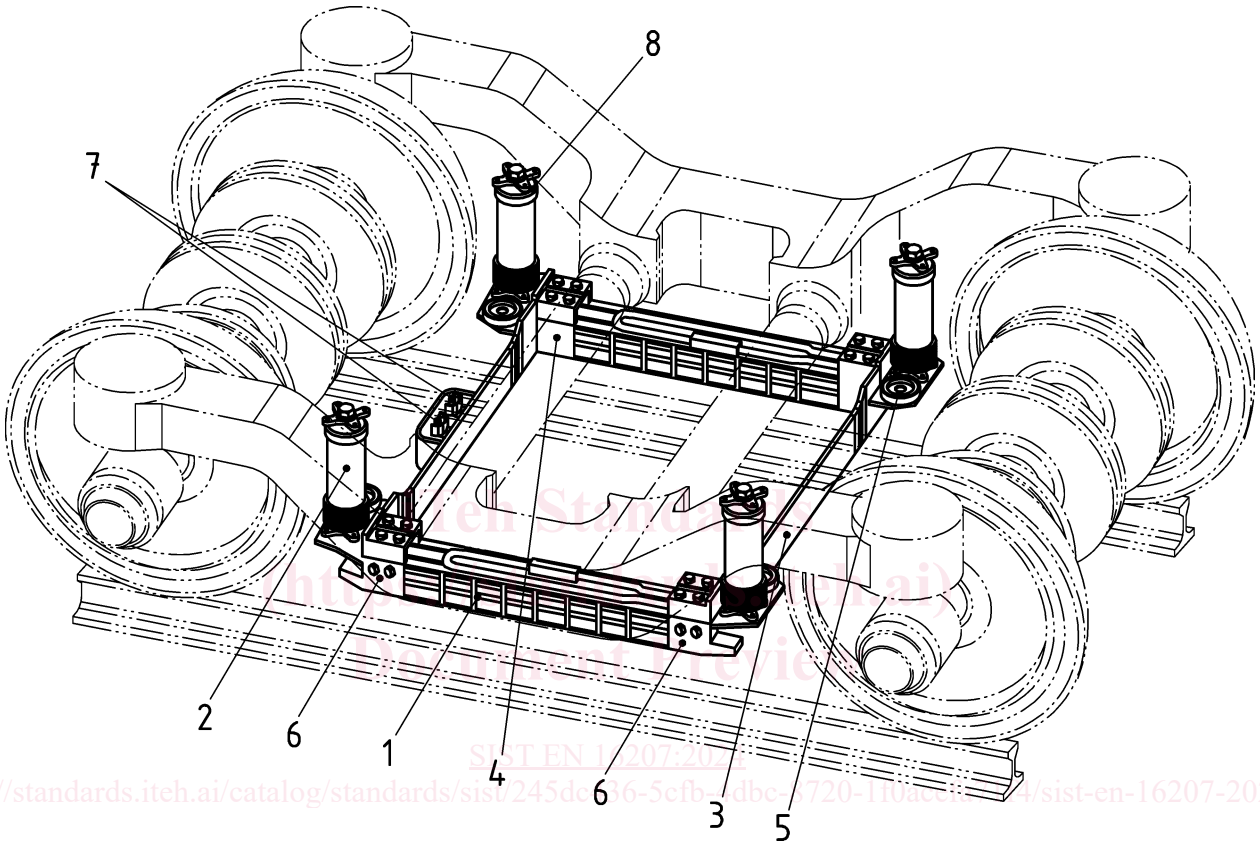
4 Task and purpose of the MTB

The MTB is an additional braking device that directly acts on the rails and is therefore independent of wheel/rail adhesion. Its action is obtained by friction due to the magnetic attractive force. The magnetic attractive force can be generated electrically or by permanent magnets. The MTB is installed into the bogie or running gear, if required, to complement the brake depending on the wheel/rail adhesion. In the bogie the magnets are installed between the wheels.

Figure 1 shows an example of an MTB with high suspension fitted to a bogie, which is represented in a simplified version.



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Key

1 magnet with segmented or rigid pole shoes
2 actuator
3 tie bar
4 brake reaction bracket, non-magnetic
5 centring device to restrict lateral movement in the rest position
6 special end pieces for negotiating point work
7 electrical interface
8 pneumatical interface

Figure 1 — Installation of an MTB into a bogie (example)

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The MTB is generally used in the following cases:

a) Emergency brake applications:

   The MTB is activated automatically in case of an emergency brake application. If the MTB is part of the emergency braking performance then it is subject to specific safety and reliability requirements with respect to its availability to be applied. In this situation the retardation rate can be included in the braked weight value/overall retardation of the vehicle.

b) Brake application under low adhesion conditions or steep slopes:

   The MTB may be actuated at the driver's discretion independently of the wheel/rail adhesion dependent brake.

If MTB is on vehicles that shall be run through areas with shunting facilities such as rail brakes and other shunting and retarding devices, the system shall allow the inhibition of MTB and the clearance restrictions in accordance with EN 15273-2:2013+A1:2016, Figure A.6 shall be observed.

NOTE 1 There is a risk that roll down humps, rail brakes and other shunting and retarding devices may contact MTBs particularly on track curves having a radius of $R < 150$ m.

NOTE 2 Vehicles which by reason of their design are liable to sustain damage when crossing shunting humps will be marked with EN 15877-2:2013, Figure 76. Vehicles which are not designed for passing rail brakes will be marked with EN 15877-2:2013, Figure 58.

5 Design requirements

5.1 Space envelope to be observed by the MTB

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The position of the brake magnets above rail shall ensure a clearance which is sufficient under all operating configurations/conditions to prevent the magnets making contact with the rail if not activated (due to vibrations or suspension movements, independent of speed, even under extreme conditions with wheel wear and new brake magnets.

The clearances shall take into account the lateral excursion and the vertical height position of the MTB when the vehicle is in the operating condition. The clearances of the vehicles to be observed are guided by the following provisions:

a) The permissible clearances in accordance with EN 15273-2:2013+A1:2016, Figure A.6, including space "*e*", for the lower limitation of the vehicles shall not be exceeded by any parts of the MTB, neither in its rest nor in its working position. When the brake is in its working position, the magnets are centred on the rail, due to their magnetic force, as a consequence of which their gauge clearance only needs to be provided for the rest position of the brake.

b) For the short time during the transition from its rest to its working position and vice versa gauge clearance shall be equated with its working position.

c) In case space "*e*" should be used in working position and the magnets should contact with the track, e.g. when passing over switches, track or road crossings, their safe return to space "*d*" shall be ensured, without any functional impediment.