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Railway applications — Braking — Generic vocabulary

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Contents

Foreword

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This document was prepared by Technical Committee ISO/TC 269, *Railway applications*, Subcommittee SC 2, *Rolling stock*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides unambiguous definitions of generic terminology used in the field of railway braking. The terms and definitions reflect those used in numerous published International Standards.

The braking includes all factors that have a bearing on the stopping, slowing or immobilization performance of the train (e.g. train resistance, gradient) and may involve the conversion and dissipation of braking energy.

Railway applications — Braking — Generic vocabulary

1 Scope

This document defines terms for brakes and braking in rolling stock.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Basic definitions

3.1.1
braking
process generating controlled forces which results in the deceleration of the train, or maintaining a constant speed on a falling gradient, or preventing a stationary train from moving

3.1.2
brake
brake system
combination of *brake unit(s)* (3.1.3) with their trainwide/local control device(s) ensuring one or more braking function(s)

Note 1 to entry: Brakes and brake systems can also be used for other functions e.g. shunting, de-icing.

3.1.3
brake unit
device or assembly of components, that generates a braking force

Note 1 to entry: See Annex E.

Note 2 to entry: For tread brake and disc brake, it consists of the brake actuator, the friction material (pads or block) and the disc (for disc brake units).

Note 3 to entry: The MTB unit includes two magnet assemblies (one per rail).

Note 4 to entry: The primary purpose of the brake unit might not be to generate a braking force, for example elements of the traction system can also function as a brake unit.

3.2 Brake system compatibility

ability of the brake systems of coupled rail vehicles/trains to achieve the specified levels of braking performance, functionality and safety

3.3 Performance

3.3.1
braking performance
parameters and their values used to quantify braking as described in applicable braking standards

3.3.2
deceleration
result of a force acting contrary to the direction of movement

3.4 Purposes of braking

3.4.1
stopping
braking from an initial speed to a standstill

3.4.2
slowing
braking from an initial speed to a final speed, but not standstill

3.4.3
drag braking
continuous brake application
braking on a falling gradient to maintain a substantially constant speed value

3.4.4
stationary braking
braking used to prevent a stationary train from moving, using the holding, immobilizing or parking functions

3.4.5
holding
braking which is used to prevent a stationary train from moving, under the specified conditions and for a specified time, when the brake system energy used is being replenished

Note 1 to entry: Holding is usually achieved by the application of the service brake.

3.4.6
immobilizing
braking which is used to prevent a stationary train from moving, under the specified conditions and for a specified time, using just the brake system energy stored on the train

Note 1 to entry: Immobilizing is usually achieved by the application of the service brake or parking brake equipment.

3.4.7
parking

braking which is used to prevent a stationary train from moving, under the specified conditions and for an unlimited period of time, without the need for any brake system energy replenishment following application

Note 1 to entry: Parking is usually achieved by the application of the parking brake equipment.

3.5 Mechanics of braking

3.5.1
braking force
force generated by the brake system to stop, slow or hold the rail vehicle/unit/train stationary, or when drag braking the train

Note 1 to entry: It does not include external forces which contribute to the overall deceleration of the rail vehicle, unit or train (e.g. train resistance, gradient).

3.5.2
retarding force
force transmitted between the rail vehicle/unit/train and the external environment in reaction to an applied braking force

Note 1 to entry: For wheel/rail adhesion dependent brakes the retarding force can be lower than or equal to the braking force depending on the available wheel/rail adhesion.

Note 2 to entry: The retarding force can be calculated for a single brake equipment type.

3.5.3
decelerating force
sum of longitudinal forces acting on a moving train during braking (combination of retarding forces with all other external and internal forces acting on a moving train)

Note 1 to entry: External forces can be caused by, for example, aerodynamic resistance, rising gradient or head wind.

Note 2 to entry: Internal forces can be caused by, for example, rolling resistance.

Note 3 to entry: External forces can also provide an accelerating effect (negative deceleration) in certain circumstances (e.g. falling gradient, tail wind).

Note 4 to entry: The general assessment is usually done on level track to reduce the number of variables.

3.5.4
retention force
force transmitted between the rail vehicle/unit/train and the external environment in reaction to an applied braking force, used to hold the rail vehicle/unit/train stationary against the external forces (e.g. due to gradient or wind loads)

Note 1 to entry: For wheel/rail adhesion dependent brakes the retention force can be lower than or equal to the braking force depending on the available wheel/rail adhesion.

3.5.5
static mass
mass of the rail vehicle/unit/train in a stationary condition

Note 1 to entry: Static mass is usually determined at the wheel-rail interface.

3.5.6
equivalent rotating mass
equivalent mass resulting from the moment of inertia of the wheels including coupled rotating parts

3.5.7
dynamic mass
sum of the static mass and the equivalent rotating mass

3.5.8
wheel/rail adhesion
physical phenomenon at the wheel-rail interface used to generate a retarding force

3.5.9
coefficient of wheel/rail adhesion
ratio of the tangential force at the wheel-rail interface and the force at this interface acting perpendicular to the surface of the rail

Note 1 to entry: Usually the term “required adhesion” or “demanded adhesion” defines the minimum level of adhesion to transmit the applied braking force (retarding force equal to braking force).

Note 2 to entry: Usually the term “available adhesion” defines the maximum effort that can be transmitted from the wheel to the rail according to the actual conditions.

3.6 Kinematics and dynamics of braking

3.6.1
fully-established brake
state in which all relevant brake units are assumed to be generating their braking force corresponding to the brake demand

Note 1 to entry: The brake demand will be determined by the driver or the train control system.

Note 2 to entry: The term “fully-established brake” is not to be confused with the term “full service brake application”.

3.6.2
free running distance
s_a
distance travelled during the *delay time* (3.6.12)

3.6.3
build-up distance
s_{ab}
distance travelled during the *build-up time* (3.6.14)

3.6.4
braking distance with a fully-established brake
s_f
distance travelled with a fully-established brake to a point when achieving standstill or the final speed

3.6.5
braking distance
s_g

distance travelled from the commencement of the brake application until achieving standstill or the final speed

3.6.6
distance during release time
s_{cd}
distance travelled during the *release time* (3.6.15)

3.6.7
slowing distance
s_{sl}
distance travelled from the initiation of brake demand until achieving the final speed

3.6.8
stopping distance
s
distance travelled from the initiation of brake demand until standstill

3.6.9
equivalent free running distance
$s_{a,e}$
distance travelled during *equivalent response time* (3.6.22)

Note 1 to entry: During the equivalent response time it is assumed that there is no braking force applied.

3.6.10
equivalent braking distance
$s_{f,e}$
distance travelled during the *equivalent braking time* (3.6.23)

Note 1 to entry: During the equivalent braking time it is assumed that the fully established braking force is applied.

3.6.11
reaction time
t_r
time taken by the driver, or any train control system able to trigger a brake demand (e.g. automatic signalling equipment, passenger alarm system, driver vigilance system), to receive the information that a brake demand is required and to initiate that demand

3.6.12
delay time
t_a
period of time commencing when a change in brake demand is initiated and ending when achieving a % of the fully-established braking parameter

Note 1 to entry: See Annex A.

Note 2 to entry: Braking parameter can be taken as braking force, deceleration or brake cylinder pressure.

Note 3 to entry: The delay time includes the propagation time of the trainwide brake control signal to the local brake control device.

3.6.13

