SLOVENSKI STANDARD

SIST EN 14535-1:2006+A1:2011

01-september-2011

Železniške naprave - Kolutne zavore za železniška vozila - 1. del: Kolutne zavore (diski), nameščene na osi s hladnim ali vročim postopkom, mere in zahteve za kakovost

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

Bahnanwendungen - Bremsscheiben für Schienenfahrzeuge - Teil 1: Wellenbremsscheiben, aufgepresst oder geschrumpft, Abmessungen und Qualitätsanforderungen

Applications ferroviaires - Disques de frein pour matériel roulant ferroviaire - Partie 1: Disques de frein calés ou frettés sur essieu ou sur arbre moteur, dimensions et exigences de qualité

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This European Standard was approved by CEN on 28 October 2005 and includes Amendment 1 approved by CEN on 3 April 2011.

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Foreword

This European Standard (EN 14535-1:2005+A1:2011) 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of an identical text or by endorsement, at the latest by November 2011 and conflicting national standards shall be withdrawn at the latest by November 2011.

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

This document includes Amendment 1, approved by CEN on 2011-04-03.

This document supersedes EN 14535-1:2005.

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

⟨A1⟩ This document has been prepared under a mandate given to CEN/CENELEC/ETSI 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. ⟨A1⟩

This EN 14535 consists of the following parts:

— Part 1: Brake discs pressed or shrunk onto the axle or drive-shaft, dimensions and quality requirements;

— Part 2[1)]: Brake discs mounted onto the wheel rim, wheel web or wheel hub, dimensions and quality requirements;

— Part 3[1)]: Brake discs, performance of the disc and of the pad and disc friction couple, classification.

Until Part 3 is made publicly available, the existing relevant national standards or other suitable regulations should be used as an interim solution where prEN 14535-3 is referenced in this document.

NOTE On publication of Part 3, Part 1 may be reviewed to take into account any necessary changes.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

[1)] To be published.

Introduction

The requirements given in this European Standard cannot be written in sufficient detail to ensure good workmanship or proper construction. Each manufacturer is therefore responsible for taking every necessary step to make sure that the quality of design, workmanship and construction is such as to ensure accordance with good engineering practice.

1 Scope

This European Standard specifies requirements for the design, dimensions, performance, and testing of the brake disc, hereafter called “disc”. This European Standard applies to discs secured at the axle or drive-shaft of railway rolling stock by a cylindrical or conic tapered interference fit.

For each discrete unit so fitted, one or more disc brake rings, each having two axially separated friction faces, may be deployed.

This European Standard applies to discs designed to be fitted to rail vehicles used on the main national networks, urban networks, underground railways, trams and private networks (regional railways, company railways etc.).

NOTE This European Standard should be used in association with the standards prEN 15328 and CEN/TC 256 N 185 covering disc brake linings.

2 Normative references

Not applicable.

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1
brake disc
rotor having one or more co-planar annular friction faces for the engagement of brake pads and means of transmitting rotation between itself and the associated axle or drive shaft element

NOTE 1 It may absorb and dissipate at least part of the brake energy.

NOTE 2 This definition is identical to 4.9.7.10 in EN 14478:2005.

3.2
friction face
radially and circumferentially extending planar surface of the disc available for frictional engagement of the brake pad(s)

3.3
brake ring
portion of the disc having friction faces

NOTE 1 Brake rings constructed from homogenous material between the friction faces are ”homogenous” or otherwise ”non-homogenous”.

NOTE 2 Brake rings can consist of one or more sectors and can have continuous or non-continuous friction faces.

3.4
hub
portion of the disc having an internal cylindrical or conical surface, the hub bore, for interference fit engagement with the axle or drive shaft

NOTE The hub can be constructed integrally with the brake ring (monobloc disc) or connected to it by a separate linking arrangement.

3.5
non-ventilated disc
disc having a continuity of material or materials allowing in that volume no flow of air between the friction faces

3.6
ventilated disc
disc in which passages to conduct a flow of cooling air are located between the friction faces of the brake ring

NOTE 1 The air flow is usually occasioned by the rotation of the disc.

3.7
single disc
disc in which one brake ring is associated with one hub

3.8
double disc
disc in which one hub supports two axially spaced brake rings

3.9
brake disc temperature
arithmetic average value of the measured temperatures of the disc friction face

NOTE The temperatures are measured by six sensors as shown in Annex A.

3.10
maximum permissible disc temperature
highest operation temperature related to the application

NOTE This may be expressed as an absolute peak value or as a nominal value over a defined period of time.

3.11
maximum permissible rotational speed
highest rotational speed related to the application

3.12
direct actuation brake
brake in which the brake pad normal force is applied directly

3.13
indirect actuation
brake in which the brake pad normal force is applied via a lever system

3.14
part
assembly or component uniquely identified

3.15
part number
number given to the part by the supplier to designate its characteristics and design

3.16
purchaser
vehicle and/or bogie builder, owner, operator or his nominated representative

3.17
performance class
set of the values of brake energy, braking power and brake torque, related to the outer diameter, width and type of the disc, at which it is type tested to demonstrate its capability to withstand these conditions without exceeding the defined limits of structural degradation

NOTE Discs are categorized into performance classes according to the tests stated in Part 3 of this European Standard: brake discs, performance of the disc and of the pad and disc friction couple, classification.

3.18
braking energy
energy dissipated per disc

3.19
braking torque
torque per disc generated by the brake calliper and pad friction value

3.20
braking power
braking energy per unit time

4 Symbols and units

For the purposes of this European Standard, the symbols and units given in Table 1 apply.

Table 1 — Symbols and units

Symbol	Description	Unit
d	Diametrical dimension	mm
R_a	Surface roughness (arithmetical mean deviation of the assessed profile)	µm
R_z	Surface roughness (maximum height of profile	µm
R, r	Radial dimension	mm
U	Imbalance	g · m
x	Axial dimension	mm
θ	Angular dimension	° or rad

5 Requirements

5.1 Purpose

The discs are intended to be used as part of a friction brake and shall fulfil the following purposes:

— permit a braking moment or torque to be generated, supported and transmitted to the rail vehicle axle or drive shaft element;

— permit, by frictional engagement of a brake pad or pads, the conversion into heat of the kinetic and potential energy involved in retarding the vehicle or vehicles which is attributed to the use of the disc brake;

— absorb part or all of the kinetic and potential energy arising from the process described previously;

— dissipate the absorbed energy by radiation, convection and conduction.

In achieving these requirements the disc shall not suffer damage or degradation other than normal wear of the friction face beyond permissible limits.

5.2 Materials, design and manufacture

a) The materials, design and manufacture of the disc shall, for all intended operating conditions, take into account the following:

— in the case of discs mounted on the axle, the vehicle gauge when the rail wheels are at their minimum permitted diameter;

— rotational speed;

— magnitude of the brake moment or torque;

— quantity of brake energy to be converted and dissipated and its rate of conversion and dissipation;

— frictional working conditions, especially of the brake pad;

— self ventilating fan driving losses;

— noise;

— mass of disc;

— imbalance of disc;

— environmental influence, e.g. storage, transport, climatic, shock and vibration conditions;

— integrity, life and maintenance requirements of the disc, associated brake components, and brake and vehicle systems.

Where a disc consists of more than one constructional element designed for in-service replacement of the brake ring or part of it, the associated parts of that disc shall be interchangeable while the hub or carrier remains installed on the axle or shaft within the vehicle.

Where the purchaser specifies that during maintenance procedures the hub bore is to be enlarged, the design shall accommodate such enlargement.

The design shall be such as to prevent the detachment of any part of the disc at any braking conditions and at any rotational speed up to the maximum permissible rotational speed in all degraded conditions (e.g. wear, cracking) up to the limits specified by the supplier.

NOTE 1 The purchaser may specify special conditions for manufacture.

NOTE 2 The purchaser may specify special characteristics for the materials used, etc.

5.3 Dimensions

5.3.1 Brake disc

The disc major dimensioning notation shall be as shown in Figure 1 and the preferred ranges of major interface dimensions as specified in Table 2.