SLOVENSKI STANDARD
SIST EN 14535-3:2016

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Železniške naprave - Kolutne zavore za železniška vozila - 3. del: Kolutne zavore, zmogljivost zavornega koluta in trenje kolutnega para, klasifikacija

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

Bahnanwendungen - Bremsscheiben für Schienenfahrzeuge - Teil 3: Bremsscheiben, Leistung Bremsscheibe und der Reibpaarung, Klassifikation

Applications ferroviaires - Disques de frein pour matériel roulant ferroviaire - Partie 3: Disques de frein, performances du disque et du couple de friction, classification

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ICS:

45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering

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

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This European Standard was approved by CEN on 10 July 2015.

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European foreword

This document (EN 14535-3:2015) 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of an identical text or by endorsement, at the latest by June 2016 and conflicting national standards shall be withdrawn at the latest by June 2016.

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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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

EN 14535, *Railway applications — Brake discs for railway rolling stock*, is currently composed of the following parts:

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

— *Part 2: Brake discs mounted onto the wheel, dimensions and quality requirements*;

— *Part 3: Brake discs, performance of the disc and the friction couple, classification*.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard gives the requirements and classification to be met for the design, dimensions, performance, and testing of the brake disc and "pad and brake disc friction couple". These requirements need to be proven in sufficient detail by dynamometer tests. Quality of design, workmanship and construction need to ensure accordance with good engineering practice and manufacture.

The classification according to this standard is the subject of a brake disc classification certificate (Annex A).

1 Scope

This European Standard applies to brake discs designed to be fitted to railway vehicles.

This European Standard comprises a type test of brake disc performance. The brake disc is tested for energy conversion and dissipation, ventilation characteristics as well as mechanical integrity.

The classification qualifies a brake disc in conjunction with the defined brake pad by dynamometer tests which simulates up to one year in service when operating in the defined application class. It does not define the application and the brake performance in specific trains.

NOTE For this purpose, additional tests may be necessary.

For the application of brake discs on railway vehicles it is not mandatory to use classified brake discs.

Classified brake discs can be validated for the use on railway vehicles for higher performance applications with additional tests.

This standard describes the type test procedure for brake disc classification as specified in EN 14535-1 and EN 14535-2.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 14535-1, *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, *Railway applications - Brake discs for railway rolling stock - Part 2: Brake discs mounted onto the wheel, dimensions and quality requirements*

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

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14478 and the following apply.

3.1
axle mounted brake disc
component attached to the axle shaft, drive shaft or any shaft directly coupled to the wheel, and rotating with the wheel

Note 1 to entry: See EN 14535-1.

3.2
wheel mounted brake disc
component attached to the wheel rim, wheel web or wheel hub, and rotating with the wheel

Note 1 to entry: See EN 14535-2.

3.3
friction face
radially and circumferentially extending planar surface of the brake disc available for frictional engagement of the brake pad(s)

3.4
brake ring
portion of the brake disc having the friction face(s)

3.5
brake disc temperature
arithmetic average of the temperature values measured by the six temperature sensors installed on the brake disc

3.6
brake disc classification certificate
document which declares the class fulfilled by the tested product by the classification table

Note 1 to entry: See Clause 5.

Note 2 to entry: It includes the references of the tested specimen and of all the documents produced to obtain the classification.

Note 3 to entry: See Annex A.

3.7
technical datasheet of the product
document in which are described the technical characteristics of the product and the maintenance criteria

4 Symbols and units

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

Table 1 — Symbols and units

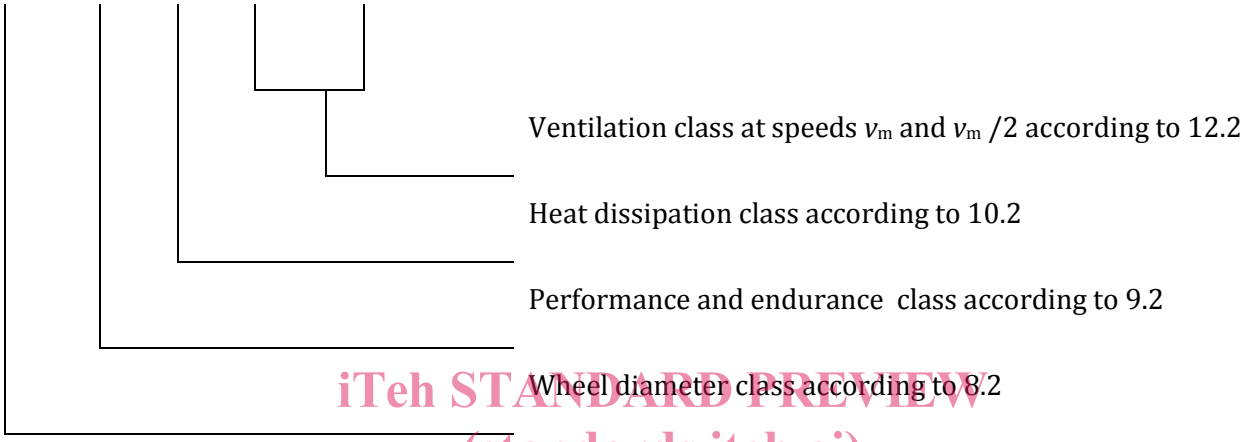
Symbol	Description	Unit
P_C	Nominal power per brake disc in a dragging brake	kW
v	Speed	km/h
U	Imbalance	g·m
a_m	Deceleration	m/s^2
m	Braked mass per brake disc	t
v_m	Class speed	km/h
t	Application duration	min
P_m	Maximum power of the class	kW
W_b	Maximum energy of the class	MJ
P_{vmin}	Minimum ventilation power of the class	kW
P_{vmax}	Maximum ventilation power of the class	kW
Θ_0	Initial temperature	°C

5 Classification

The classification of the brake disc is described by use of a performance class, which is a set of the values of brake energy, brake power and brake torque, related to the major diameter, width and type of the brake disc, at which it is type tested to demonstrate its capability to withstand these conditions without exceeding the defined limits of structural degradation.

The classification of the brake disc is summarized in as follows and recorded in the classification certificate (see Annex A):

W3- C1- H3- V03/ V01



NOTE The designation and marking are in accordance with EN 14535-1 and EN 14535-2.

6 Information to be supplied

The following information shall be fully documented. For compliance with the standard both the common requirements specified throughout the standard and the following documented items shall be satisfied:

— definition and identification of the brake pads (7.2);

— drawing of the wheel (In case of wheel mounted brake disc);

— wheel class (8.2) and wheel diameter if the wheel class is W0;

— method for preliminary and final verifications (8.3);

— performance and endurance target class (9.2);

— heat dissipation target class (10.2);

— ventilation target class (12.2);

— method for the verification of pass and fail criteria (9.4, 10.4, 11.4, 12.4);

— imbalance class according to EN 14535-1 and EN 14535-2 and value of imbalance if it isn't defined;

— maximum values for corrugation, swashing and buckling (9.4, 10.4).

NOTE Usually these items of information are supplied by the manufacturer.

7 Tested properties for brake disc classification

7.1 General requirements

Brake disc and pad materials used for the performance tests shall be in accordance with the specifications of this standard.

The brake disc and pad interaction couple, which is used as a reference, shall be defined.

Should the classification be required with more than one reference pad, then only the performance, endurance and heat dissipation tests, are required to be repeated with the further pad type.

If brake disc dimensions are changed by no more than ± 1 % from existing models, this brake disc shall be included in the same performance class of the existing brake disc without re-testing.

In case of wheel mounted brake discs, all the tests shall be performed with the brake disc assembled on a wheel.

Details for the execution of the tests are described in the following clauses.

The operators shall monitor the product installed during the trial test according to their specific evaluation criteria.

7.2 Test specimens

Three specimens shall be provided for a classification. The specimens shall be produced under serial conditions and the raw materials shall come from the same casting or forging batch. The production data shall be confirmed by certificates.

Dimensional and material controls: Specimen 1.

The classification tests shall be carried out in the following order using the reference specimens:

— performance and endurance test: Specimen 2;

— centrifugal test: Specimen 2;

— ventilation test: Specimen 3;

— heat dissipation test: Specimen 3.

The pad type shall be defined and used for all the classification test. The pads used for each test shall be identified.

7.3 Preliminary and final verification sequences

Before starting the tests and after any test that may influence or change the physical integrity of the tested brake disc the verifications that are listed in Table 3 shall be executed.

7.4 Pass and fail criteria

The pass and fail criteria for every test are mentioned after each test to which they apply.