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Railway applications - Braking - Brake pad holder

Bahnanwendungen - Bremse - Bremsbelaghalter

Applications ferroviaires - Freinage - Porte-garnitures de frein

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Railway applications - Braking - Brake pad holder

Applications ferroviaires - Freinage - Porte-garnitures

Bahnanwendungen - Bremse - Bremsbelaghalter

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EN 16451:2015 (E)

Foreword

This document (EN 16451:2015) 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of an identical text or by endorsement, at the latest by December 2015, and conflicting national standards shall be withdrawn at the latest by December 2015.

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.

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Introduction

This European Standard gives the requirements to be met for the design, dimensioning, testing and quality assessment of brake pad holders. These requirements 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 workmanship and construction is such as to ensure accordance with good engineering practice.

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EN 16451:2015 (E)**1 Scope**

The requirements contained in this European Standard apply to the brake pad holders with which the rail vehicles of main-line railways, regional and suburban railways are fitted. Brake pad holders pursuant to this standard are to be made from ferrous materials e.g. cast iron, cast steel or forged steel. Brake pad holders made of non-ferrous materials are not subject of this standard.

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 10204, *Metallic products - Types of inspection documents*

EN 10328, *Iron and steel - Determination of the conventional depth of hardening after surface heating*

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

EN 22768-1, *General tolerances - Part 1: Tolerances for linear and angular dimensions without individual tolerance indications (ISO 2768-1)*

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

EN 60068-2-6, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal) (IEC 60068-2-6)*

EN 60068-2-47, *Environmental testing - Part 2-47: Tests - Mounting of specimens for vibration, impact and similar dynamic tests (IEC 60068-2-47)*

EN 60721-3-5:1997, *Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 5: Ground vehicle installations (IEC 60721-3-5:1997)*

EN 61373, *Railway applications — Rolling stock equipment — Shock and vibration tests (IEC 61373)*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1)*

EN ISO 6507-1, *Metallic materials - Vickers hardness test - Part 1: Test method (ISO 6507-1)*

EN ISO 6508-1, *Metallic materials - Rockwell hardness test - Part 1: Test method (ISO 6508-1)*

EN ISO 6892-1, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1)*

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

EN ISO 14284, *Steel and iron - Sampling and preparation of samples for the determination of chemical composition (ISO 14284)*

EN ISO 148-1, *Metallic materials - Charpy pendulum impact test - Part 1: Test method (ISO 148-1)*

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3 Terms and definitions

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

3.1

compact disc brake unit

disc brake unit, generally with reduced envelope and weight with a single interface to the bogie

3.2

operational mounting condition

normal and nominal conditions of assembly on a vehicle

3.3

referenced technical drawings

drawings used for definition of brake pad holder

4 Symbols and abbreviations

A%	Percentage elongation after fracture (as specified by EN ISO 6892-1)
<i>F</i>	Force
g	Gravity acceleration 9,81 m/s ²
KV	Absorbed energy for a V-notch test piece (as specified by EN ISO 148-1)
KU	Absorbed energy for a U-notch test piece (as specified by EN ISO 148-1)
SL1 and SL2	Classes of loading
T1 and TX	Classes of temperature as specified by EN 50125-1
VL and VH	Classes of vibration

5 Design and manufacture

5.1 Latch mechanism

The design of the latch mechanism to retain the brake pads shall satisfy the following principle:

- there shall be a positive retention (generation of strain to obtain unlocking) of the latch when in the closed position;
- no single point failure of the latch mechanism and its attachment to the pad holder shall result in a loss of brake pads;
- ease of operation – no special tools to open and close the latch mechanism. Preferably designed to allow use of simple flat bladed screw driver;
- during pad renewal the latch mechanism should remain attached to the brake pad holder;
- renewal of a defective latch mechanism should not require the dismantling of the brake pad holder from the brake unit.

5.2 Interchangeability by applying same main dimensions and geometry

5.2.1 General

Brake pad holders can be designed based on different concepts. The requirements specially for interchangeability are defined below.

EN 16451:2015 (E)**5.2.2 Interchangeability for “conventional” brake unit**

The requirements for the dimensions for geometric interchangeability for “conventional” brake unit are given in Annex A. These dimensions are compatible with brake pads defined in Annex D. If required a device with mechanical coding should be used. Annex C indicates an example for application.

5.2.3 Interchangeability for “compact” brake unit

The requirements for the dimensions for geometric interchangeability for “compact” brake unit are given in Annex B. These dimensions are compatible with brake pads defined in Annex D. If required a device with mechanical coding should be used. Annex C indicates an example for application.

5.2.4 Dimensional conformity

The dimensional requirements are defined in referenced technical drawings. The conformity assessment of the dimensions of the brake pad holder is verified in accordance with 6.3.1.

5.3 Material

As specified in the scope, this standard applies only to the brake pad holders in “ferrous material” e.g. cast iron or steel, manufactured by a forging or casting process. The material used for the design of the brake pad holder shall conform to the technical requirements defined in this document.

The conformity assessment of the brake pad holder material, with referenced technical drawings, shall be verified in accordance with 6.3.2.

5.4 Environmental conditions (standards.iteh.ai)**5.4.1 Ambient temperature**

The brake pad holder shall be able to operate within the temperature classes T1 and TX as specified by EN 50125-1, where the upper limit for TX is +70 °C external air temperature.

5.4.2 Other environmental conditions**5.4.2.1 General**

The following environmental conditions shall be considered in the design of the brake pad holder.

If not specifically required to be tested as part of the type testing requirements in this standard, suitable tests and/or design assessments considering the effect of the following environmental conditions on the brake pad holder shall be used in the development/design proving of the device, prior to type testing.

5.4.2.2 Humidity

The following external humidity levels shall be considered:

- yearly average: ≤ 75 % relative humidity;
- on 30 days in the year continuously: between 75 % and 95 % relative humidity;
- on the other days occasionally: between 95 % and 100 % relative humidity;
- maximum absolute humidity: 30 g/m³ occurring in tunnels.

5.4.2.3 Rain

Rain rate of 6 mm/min shall be taken into account. The effect of rain shall be considered depending on the possible equipment installation together with wind and vehicle movement.

5.4.2.4 Snow, ice and hail

Consideration shall be given to the effect of all kinds of snow, ice and hail. The maximum diameter of hailstones shall be taken as 15 mm, larger diameter can occur exceptionally. The effect of snow, ice and hail shall be considered depending on the equipment installation together with wind and vehicle movement.

5.4.2.5 Solar radiation

Equipment design shall allow for direct exposure to solar radiation at the rate of 1 120 W/m² for a maximum duration of 8 h.

5.4.2.6 Resistance to pollution

The effects of pollution shall be considered in the design of equipment and components. Means may be provided to reduce pollution by the effective use of protection of the device. The severity of pollution can depend upon the location of the equipment therefore the effects of the kinds of pollution indicated in Table 1 shall be considered as a minimum.

Table 1 — Pollution

Pollution	Class to be considered
Chemically active substances	Class 5C2 of EN 60721–3-5:1997
Contaminating fluids	Class 5F2 (electrical engine) of EN 60721–3-5:1997 Class 5F3 (thermal engine) of EN 60721–3-5:1997
Biologically active substances	Class 5B2 of EN 60721–3-5:1997
Dust	Class 5S2 of EN 60721–3-5:1997
Stones and other objects	Ballast and other objects of maximum 15 mm diameter
Sand	Class 5S2 of EN 60721–3-5:1997
Sea spray	Class 5C2 of EN 60721–3-5:1997 See specific test and requirements in 6.3.3

5.5 Loading in the direction of force application

As a consequence of uneven wear of the brake pad and/or the brake disc, load cases can occur in which there is no longer contact over the entire surface of the pad. In order to rule out crack or plastic deformation of the pad holder in such load cases the brake pad holder shall transfer an application force (F_{pr}) of 50 kN for brake pad holder class SL1 and 35 kN for brake pad holder class SL2 without crack or plastic deformation (see Figures 1 and 2). This requirement shall be tested in accordance with 6.3.4.

5.6 Loading in the direction of the braking moment (tangential force)

With regard to stability of shape and safety against the tangential forces acting, the brake pad holder shall endure a tangential test force F_{prt} of 35 kN for brake pad holder class SL1 and 25 kN for brake pad holder class SL2 without crack or plastic deformation. This requirement shall be tested in accordance with 6.3.5.