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Railway applications — Braking — Brake pad holder

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee RAE/4/-/1, Railway applications - Braking.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Contents

Page

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of an identical text or by endorsement, at the latest by December 2015, and conflicting national standards shall be withdrawn at the latest by December 2015.

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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.

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)*

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)
F	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.

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

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/m^3 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/m^2 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.

5.7 Vibrations and shocks

5.7.1 New designs

Dynamic stresses imposed during service operations vibrations and shocks have a big influence on the life cycle of brake pad holder.

Two classes of vibration severity for tests are prescribed in this standard:

— the “low” class called VL and corresponding to EN 61373;

— the “high” class called VH and corresponding to a level of maximum acceleration of 15 g.

This requirement shall be tested in accordance with 6.3.6.

5.7.2 Existing designs

Should existing designs of brake pad holders be subject to the requirements of this standard, compliance with the shock and vibration requirements of this clause can be demonstrated by the documentary evidence of 10 years satisfactory service experience for a minimum of 500 brake pad holders in service spread on minimum 3 trains types.

6 Type test methods

6.1 Sampling for type test

A sample of nine (9) brake pad holders shall be provided for the type tests (see Table 2 below). The specimens shall be produced under serial production conditions. The production data shall be confirmed by certificates.

Table 2 — Operation to carry out for conformity assessment

Tests	Corresponding standard sub-clause	Tested brake pad holder number								
		1	2	3	4	5	6	7	8	9
Interchangeability	5.2 and 6.3.1 Annex A and B	X	X	X	X	X	X	X	X	X
Material	5.3 and 6.3.2	X								
Salt spray test	5.4 and 6.3.3		X	X						
Loading in the direction of force application	5.5 and 6.3.4				X	X				
Loading in the direction of the braking moment (tangential force)	5.6 and 6.3.5						X	X		
Vibrations and shocks	5.7 and 6.3.6								X	X

6.2 Test requirements

Tests consist of material and component testing. The components to be tested shall fulfil the requirements for the brake pad holder as described in the technical documentation for series production.

All the type tests shall be performed at (20 ± 10) °C.

6.3 Test procedure

6.3.1 Interchangeability by applying same main dimensions and geometry

The requirement shall be checked using appropriate measuring instruments, in accordance with the specification and the manufacturer's drawings. If requested the conformity with the requirements of Annex A or Annex B should be checked.

Pass / fail criteria:

Conformity with referenced technical drawings of the product and/or Annex A or Annex B.

6.3.2 Material

The conformity of material shall be proven by presentation of material certificates (e.g. inspection certificate 3.1, EN 10204) and with the following laboratory tests and analyses.

The specifics tests and analyses defined below shall be applied.

Chemical analysis on the products: The sampling and the preparation of the samples shall be carried out according to the regulations of EN ISO 14284. The determination of the content of the various components shall be carried out in accordance with the standards or manufacturing regulations.

Charpy impact test: Verify the KV or KU at + 20 °C and – 20 °C, procedure in accordance with EN ISO 148-1.

Tensile test and resistance: Verify the percentage elongation A % after fracture and the mechanical resistance R_{m} and elastic resistance R_{e}, procedure in accordance with EN ISO 6892-1.

Hardness: Verify the hardness Brinell, Vickers or Rockwell, procedure in accordance with EN ISO 6506-1, EN ISO 6507-1 or EN ISO 6508-1.

Examination by non-destructive testing: The nature of the examination shall characterize the internal soundness of the products in delivery condition. The nature of the examinations to carry out such: ultra sound, magnetic particles inspection, penetrant testing and radiography shall be adapted according to the material and manufacturing process.

Pass / fail criteria:

Conformance with referenced product technical documents and applicable EN standards.

6.3.3 Salt spray test

The application of the salt spray shall be in accordance with the requirements of EN ISO 9227 for neutral salt spray test (NSS test). However, the test shall not be carried out on test specimens as stipulated in EN ISO 9227 but on the brake pad holder and rigging equipped with their connecting device. The brake pad holder shall be equipped with a brake pad.

The brake pad holders placed in the test chamber shall be mounted in accordance with their operational mounting conditions, in particular concerning the connection of the brake pad holder to the rigging.

Duration of tests: Exposure time at salt spray test shall be 48 h.

After this duration the parts shall be removed from the test chamber for examination of the essential functions.

Pass / fail criteria:

— the locking mechanism shall be able to be unlocked and locked again;

— the brake pad shall be able to be disassembled;

— the relative movement of the brake pad holder and the rigging shall be possible (no wedging of connection pins).

6.3.4 Loading in the direction of force application

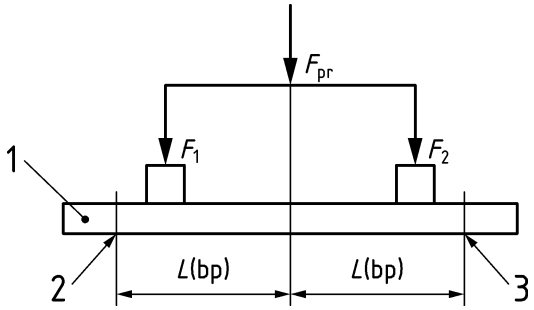
6.3.4.1 General

The principle of a test bench is defined in the figures below. The test consists of tests SL-A and SL-B applied consecutively on the same brake pad holder.

6.3.4.2 Test SL-A

The brake pad holder shall be submitted to a force "F_{pr}" of 50 kN for brake pad holder class SL1 and 35 kN for brake pad holder class SL2 (see Figure 1 below).

The force "F_{pr}" is distributed using the assembly of test on the two points of connection of the brake pad holder to the rigging (F_1 and F_2).



Key

1 brake pad holder

2 – 3 support lines

F_{pr} force

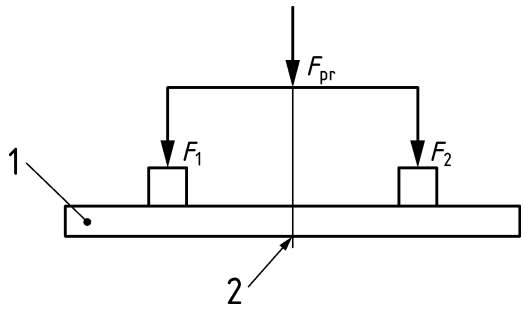
$L_{(bp)}$ maximum 1/2 brake pad length (value defined in Annex D)

Figure 1 — Principle of test bench for test SL-A - Loading in the direction of force application

6.3.4.3 Test SL-B

The brake pad holder shall be submitted to a force "F_{pr}" of 50 kN for brake pad holder class SL1 and 35 kN for brake pad holder class SL2 (see Figure 2 below).

The force "F_{pr}" is distributed using the assembly of test on the two points of connection of the brake pad holder to the rigging (F_1 and F_2).



Key

1 brake pad holder

2 support line

F_{pr} force

Figure 2 — Principle of test bench for test SL-B - Loading in the direction of force application

For every test the force is applied with a gradient of 10 kN ± 1 kN per second until the maximum effort of 50 kN ± 0,5 kN for brake pad holder class SL1 and 35 kN ± 0,5 kN for brake pad holder class SL2. The maximum effort shall be maintained during 30 s ± 3 s. Then the effort is removed with a gradient of 10 kN ± 1 kN per second until 0 kN.

6.3.4.4 Measurement and controls after tests SL-A and SL-B

Consecutively at tests SL-B, dimensions shall be checked with appropriate gauges and the brake pad holder shall be inspected for incipient cracks with an appropriate testing procedure (e.g. ultra sound, Magnetic particle Testing or X-ray examination):

— the geometrical dimensions shall be in conformity with referenced technical drawings and Annex A or Annex B;

— no incipient cracks shall be detected.

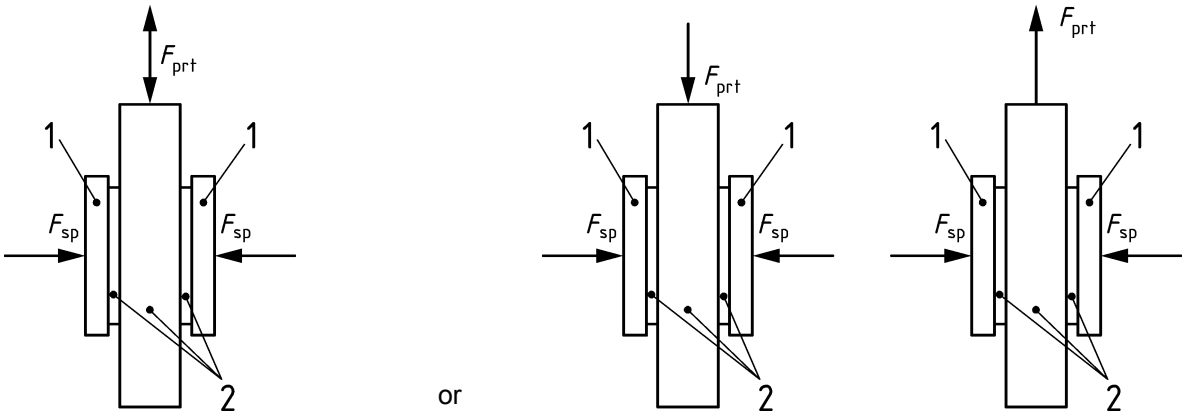
6.3.5 Loading in the direction of the braking moment (tangential force)

6.3.5.1 Test method

The principle of a test bench is defined in Figure 3.

The brake pad holders equipped on a brake disc unit shall be clamped in pairs with a clamping force "F_{sp}" of 100 kN for brake pad holder class SL1 and 70 kN for brake pad holder class SL2. To take up the tangential force, a component simulating the brake pads and the brake disc shall be fitted in the dovetailed guides of the brake pad holders. The tangential test force "F_{prt}" of 35 kN ± 1 kN for brake pad holder class SL1 and 25 kN ± 1 kN for brake pad holder class SL2 shall be applied in both directions with a cycle of 0,25 Hz.

Under these conditions, the brake pad holder shall withstand the quantity of 1×10^6 cycles in every direction.



Key

1 brake pad holder

2 component(s) simulating the brake pads and the brake disc

F_{prt} tangential test force

F_{sp} clamping force

Figure 3 — Principle of test bench - Loading in the direction of the braking moment (tangential force)

After the test, dimensions shall be checked with appropriate gauges and the brake pad holder shall be inspected for incipient cracks with an appropriate testing procedure (e.g. US, MP or X-ray examination).

The results of this test shall be reported in detail.

6.3.5.2 Measurement and controls after loading tests

Pass / fail criteria:

— the geometrical dimensions shall be in conformity with referenced technical drawings and Annex A or Annex B except for the connection of the brake pad holder to the rigging;

— for the connection of the brake pad holder to the rigging, the wear shall permit the further use of the brake pad holder and dimensions shall not exceed the limit values defined in the product manual;

— no incipient cracks shall be detected.

6.3.6 Vibrations and shocks

6.3.6.1 General

The test consists of one of the applied laboratory tests as defined below for evaluating the resistance of the brake pad holder to vibrations and shocks for class VL and vibrations only for class VH.

6.3.6.2 Test VL

The brake pad holders shall be mounted in an appliance in accordance with their operational mounting conditions, in particular concerning the connection of the brake pad holder to the rigging. However, the vertical length of stroke (J) of the brake pad in the brake pad holder shall be 1,0 mm ± 0,1 mm except in case of self-adjustment. The brake pad dummy to be used shall be a steel-dummy of 35 mm thickness. The weight of brake pad per brake pad holder shall be 4,50 kg ± 0,10 kg.

The brake pad holders mounted in the appliance shall be tested in accordance with EN 61373 without the functional and performance tests. They shall be mounted without any load imposed in the brake pad holder.

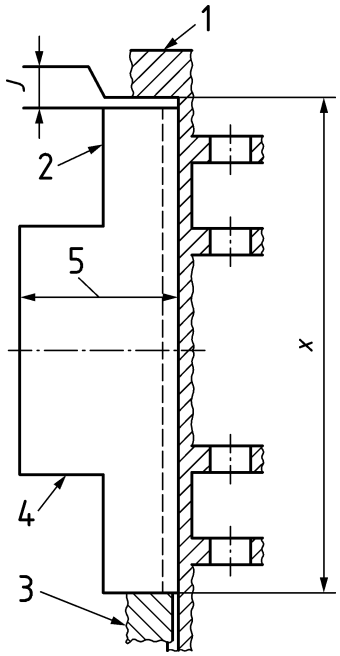
6.3.6.3 Test VH

The mounting of the specimen shall be in compliance with the requirements of EN 60068-2-47.

The implementation of the test shall be in compliance with the requirements of EN 60068-2-6.

The brake pad holders shall be mounted on the test bench in accordance with their operational mounting conditions. However, the vertical clearance (J) of the brake pad dummy in the brake block holder shall be 1,0 mm ± 0,1 mm at the beginning of the test (see Figure 4) except in the case of self-adjustment.

The brake pad holder and test machine shall be rigidly connected.



Key

1 brake pad holder

2 brake pad dummy

3 locking mechanism

4 shape can be adjusted to reduce the weight

5 thickness of 35 mm

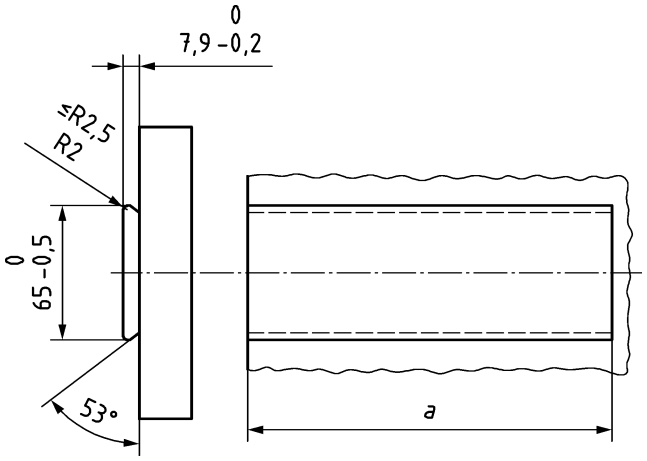
J vertical clearance

X length of dovetail

Figure 4 — Principle of assembly of brake pad dummy in brake pad holder – Vibrations test VH

The brake pad dummy to be used shall be a steel-dummy with a thickness of 35 mm. The weight of brake pad per brake pad holder shall be to 4,50 kg ± 0,10 kg. The dovetail shall be according to Figure 5; the length shall be adjusted for respecting the (J) value. The hardness of wings and end-face of dovetail shall be 200 ± 10 HV in accordance with EN 10328.

Dimensions in mm



Key

a length of dovetail

Figure 5 — Dovetail requirements – Vibrations test VH

The brake pad holders mounted in the appliance shall be tested with stress cycles at test frequencies and accelerations of:

1) 5×10^6 stress cycles at 5 g and 25 Hz;

2) 5×10^6 stress cycles at 5 g and 60 Hz;

3) 5×10^6 stress cycles at 15 g and 25 Hz;

4) 5×10^6 stress cycles at 15 g and 60 Hz.

During this test, there shall not be any clamping force acting on the brake pad; it shall be mounted without any load imposed in the brake pad holder. The stress cycles shall be realized in according to the order defined.

6.3.6.4 Measurements and controls after tests VL or VH

Consecutively at test VL or VH, the geometrical dimensions of the brake block holder and its locking mechanism shall be checked according to the product manual with appropriate gauges and the brake pad holder shall be inspected for incipient cracks with an appropriate testing procedure (e.g. US, MP or X-ray examination).

The results of this control shall be reported in detail.

Pass / fail criteria:

— the wear shall permit the further use of the brake pad holder and its locking mechanism without exceeding the limits values defined by the product manual;

— the variation of value X (see Figure 4 and Annex A, Figure A.2 or Annex B, Figure B.2) shall not exceed 1,6 mm;

— no incipient cracks shall be detected;

— no damage which can induce the loss of brake pad shall be detected.

7 In-service assessment

An in-service assessment may be required. Annex E contains typical requirements of an in-service assessment that may be used to assess a brake pad holder.

8 Designation

Brake pad holders complying with this European Standard shall be designated as follows:

— the designation (type) and the part number;

— the standard number, class of loading, class of vibration and shock shall be indicated in the documentation.

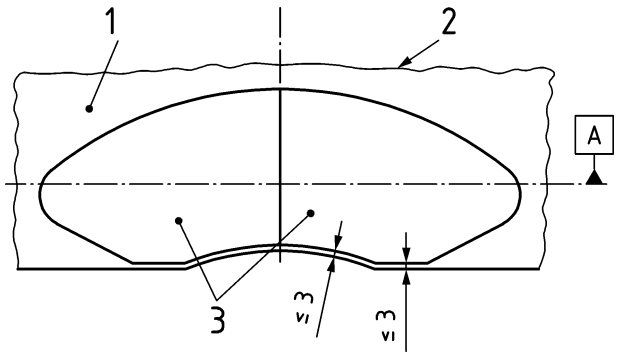
9 Identification and marking

Each brake pad holder shall be indelibly marked to identify the manufacturer.

Annex A
(informative)

Interchangeability for “conventional” brake unit

Dimensions in mm



Key

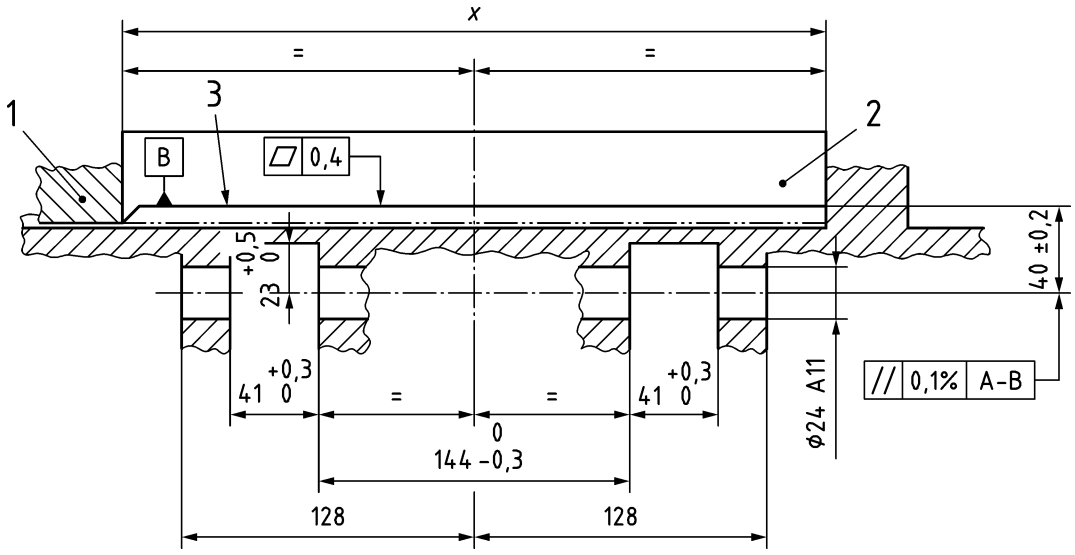
1 brake pad holder

2 form not imposed

3 brake pad

Figure A.1 — Space envelope

Dimensions in mm



Key

1 locking mechanism

2 brake pad

3 no convex

X length of dovetail:

— $X = 320{,}7^{+0{,}4}_{0}$ mm for using with standard brake pad of 200 cm^2;

— $X = 304{,}7^{+0{,}4}_{0}$ mm for using with standard brake pad of 175 cm^2

Figure A.2 — Interface geometry

Dimensions in mm

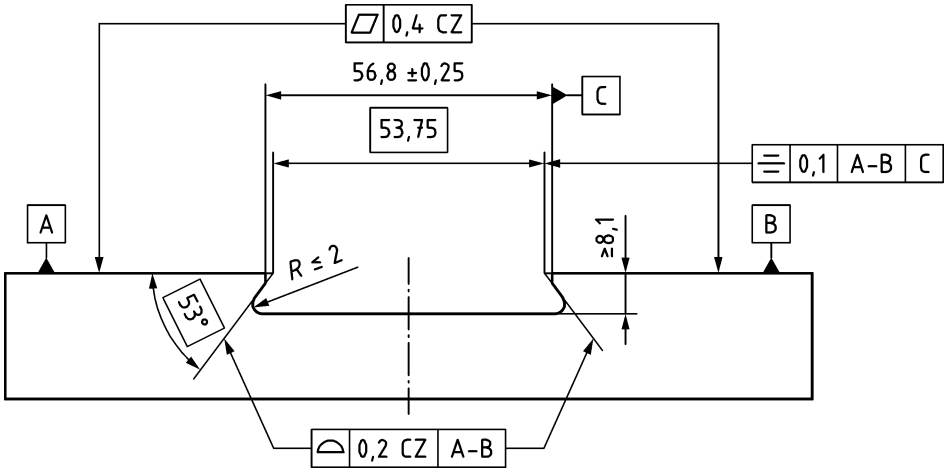
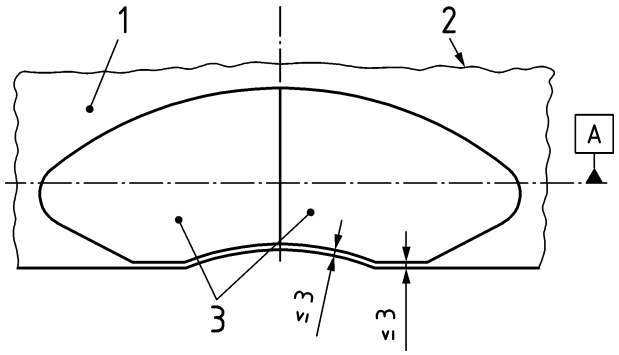


Figure A.3 — Dovetail dimensions

Annex B
(informative)

Interchangeability for “compact” brake unit

Dimensions in mm



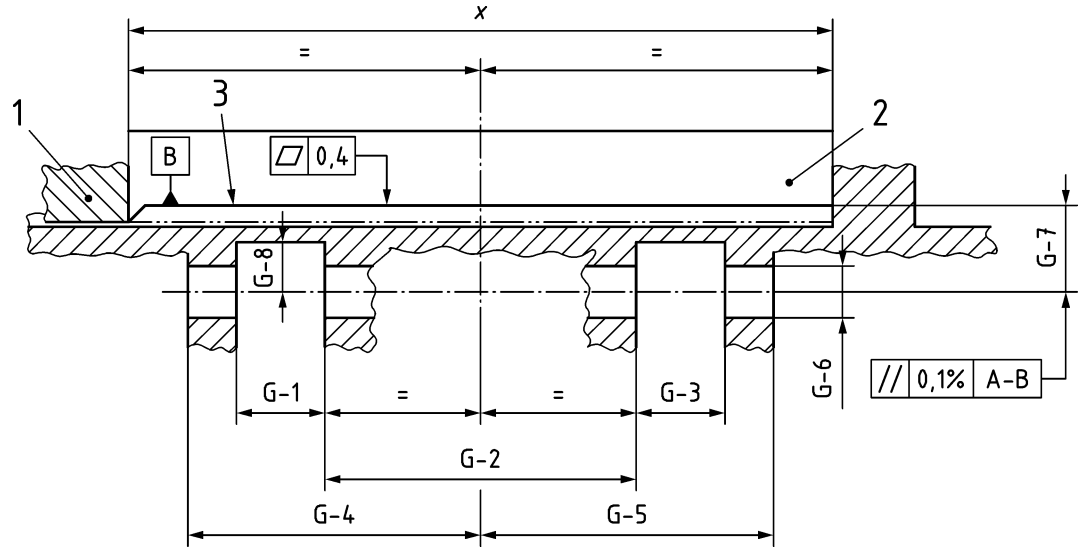
Key

1 brake pad holder

2 form not imposed

3 brake pad

Figure B.1 — Space envelope



Key

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X length of dovetail:

— $X = 320{,}7^{+0{,}4}_{0}$ mm for using with standard brake pad of 200 cm^2;

— $X = 304{,}7^{+0{,}4}_{0}$ mm for using with standard brake pad of 175 cm^2

Figure B.2 — Interface geometry

Table B.1 — Interface geometry

	Type B-1	Type B-2	Type B-3	
G-1	31,5	43,1 ± 0,1	46,3 ± 0,1	If no other indication, general tolerances for G are as defined in EN 22768-1 class m (Part 1) and class H (Part 2)
G-2	157,5	133,9 ± 0,3	133,2 ± 0,4	
G-3	31,5	43,1 ± 0,1	43,1 ± 0,1	
G-4	Open	Open	Open	
G-5	Open	Open	Open	
G-6	20,0	22,2	22,2	
G-7	35,0	35,0	35,0	
G-8	$23{,}0\ ^{+5}_{0}$	$23{,}0\ ^{+5}_{0}$	$21{,}0\ ^{+7}_{0}$	

Dimensions in mm

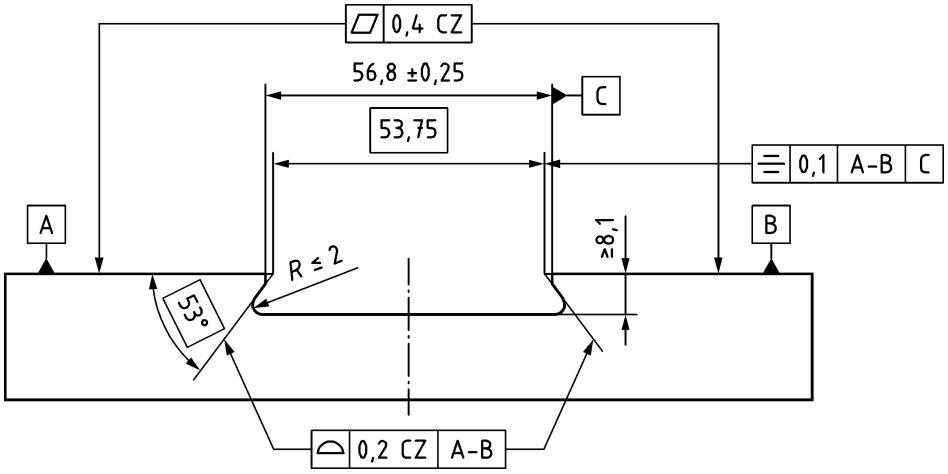


Figure B.3

Annex C
(informative)

Device with mechanical coding

If required, a device with mechanical coding should be used. Figure C.1 indicates an example for application in a brake pad holder.

Dimensions in mm

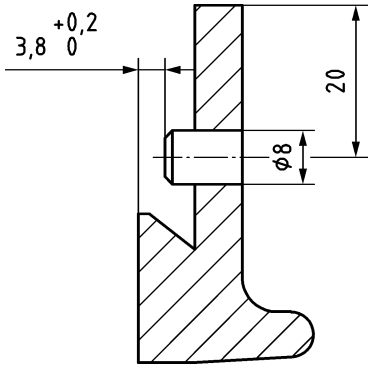


Figure C.1 — Example for device with mechanical coding

Annex D
(informative)

Geometry of standard brake pads

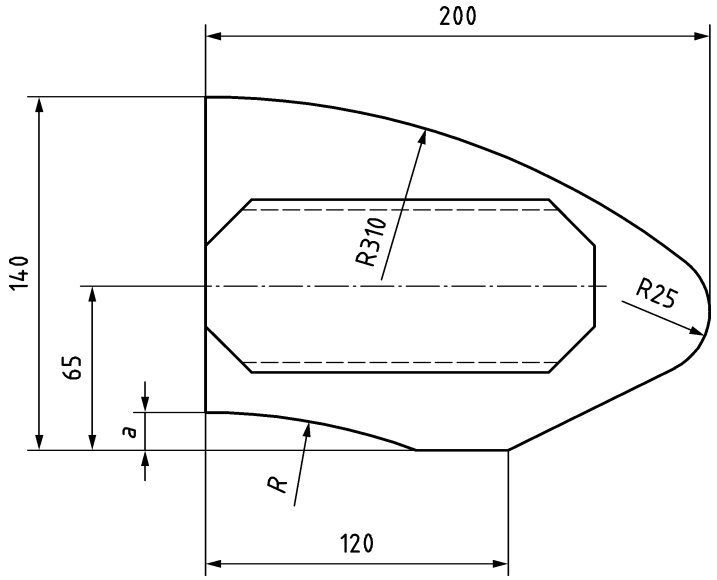
D.1 General

The main dimensions of standard brake pads, in interaction with a brake pad holder, are indicated below.

The definition of standard brake pads should be transferred to EN 15328 at the time of its revision.

D.2 Space envelope for 1/2 brake pad of 200 cm^2 "standard form A"

Dimensions in mm



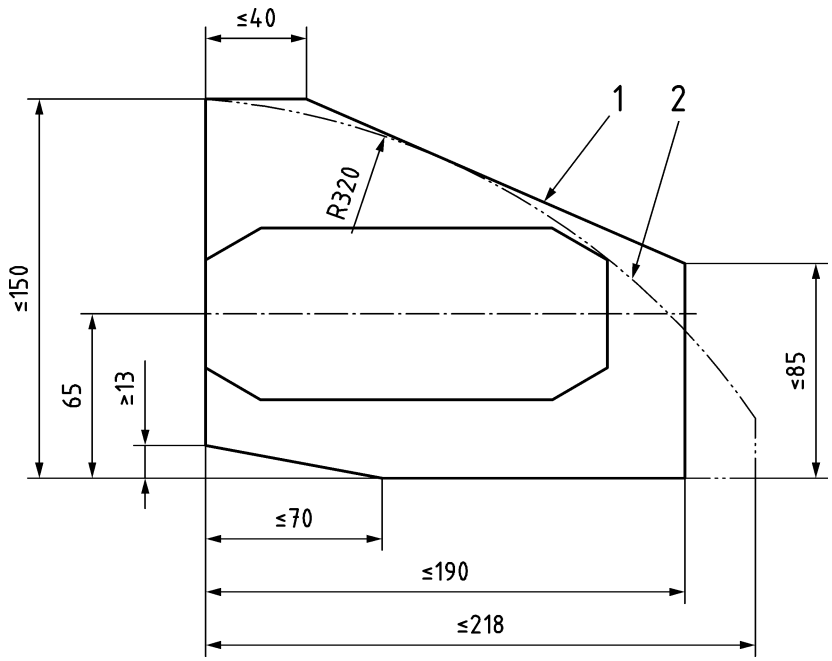
Key

	a	R
Standard form A1	7,5	232,5
Standard form A2	15,0	240,0

Figure D.1 — Brake pad of 200 cm^2 "standard form A"

D.3 Space envelope for 1/2 brake pad of 200 cm^2 “standard form B”

Dimensions in mm



Key

1 standard form B1

2 standard form B2

Figure D.2 — Brake pad of 200 cm^2 “standard form B”

D.4 Space envelope for 1/2 brake pad of 175 cm^2 “standard form”

Dimensions in mm

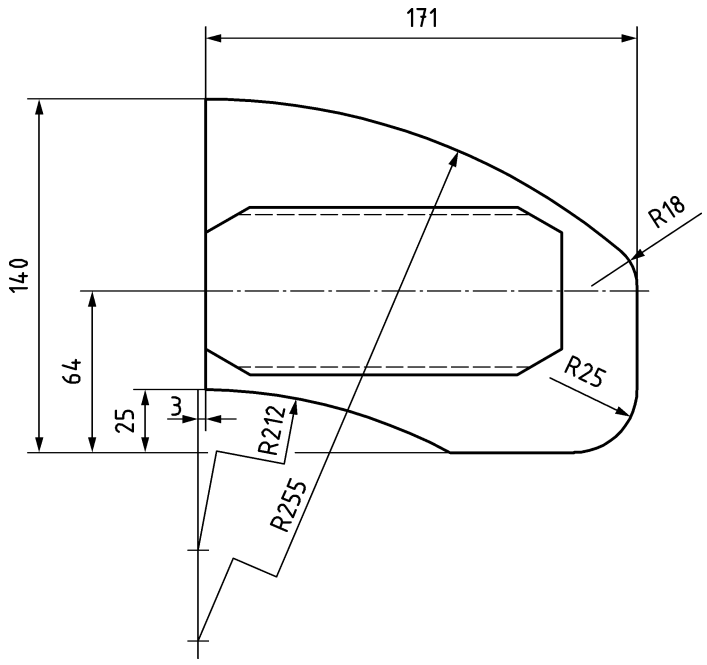
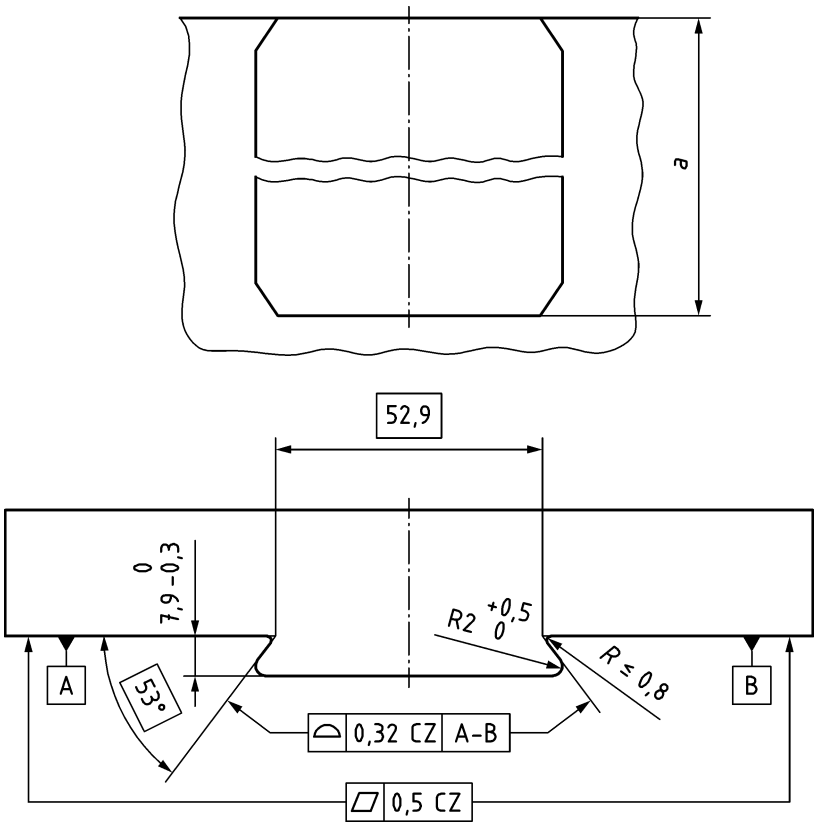


Figure D.3 — Brake pad of 175 cm^2 “standard form”

D.5 Interchangeability of dovetail for 1/2 brake pad of 175 cm^2 and 200 cm^2

Dimensions in mm



Key

a = (152 ± 0,3) mm for 1/2 brake pad of 175 cm^2 and = (160 ± 0,3) mm for 1/2 brake pad of 200 cm^2

Figure D.4 — Dovetail for brake pad

Annex E
(informative)

In-service assessment

E.1 General

An in-service assessment may be conducted on brake pad holders which are defined as a new product or a modified version of an existing product which has changed the design in such a way that it requires a new type designation.

E.2 Test set-up and sampling

The in-service assessment should be conducted using a number of brake pad holders of the same type, with a minimum number of 32, fitted to vehicles running in agreed train formations running in defined service duties.

The brake pad holders should be taken from a representative production process and subject to the type testing requirements of this standard prior to the in-service assessment.

E.3 Procedure

The in-service assessment should be conducted for a minimum period of 12 months. During this time the functional performance of the brake pad holders should be monitored at agreed times on not less than at 3 occasions. This monitoring should be carried out by performing static functional testing on all the vehicles fitted with brake pad holders, and by physical examination of the brake pad holders.

E.4 Pass/fail criteria

All functional requirements should be met and no physical damages should occur at the end of the 12 month assessment.

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