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Railway applications — Braking — Brake block holder and brake shoe key for railway vehicles

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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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Bahnanwendungen - Bremsen - Bremsklotzschuh und Federriegel für Schienenfahrzeuge

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

Page

European foreword

This document (EN 15329:2015) 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of an identical text or by endorsement, at the latest by January 2016 and conflicting national standards shall be withdrawn at the latest by January 2016.

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Introduction

The requirements of this European Standard cannot be laid down in such detail as to ensure defect-free design and production without obstructing further development. It is therefore essential for each manufacturer himself to take all requisite steps to ensure on his part that the quality of design and production are state of the art.

1 Scope

This European Standard applies to brake block holders and brake shoe keys installed on railway vehicles.

Brake block holders and brake shoe keys made of non-ferrous materials are not subject to this European Standard.

This European Standard contains requirements for design, evaluation testing of conformity and serial production monitoring.

The requirements contained in this European Standard apply to the brake block holders and brake shoe keys with which the railway vehicles of main-line railways, private railways (regional railways, company railways) are fitted.

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 14478:2005: *Railway applications - Braking - Generic vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14478:2005 and the following apply.

3.1
brake block
friction element which transfers the brake block application force onto the tread of the wheel or the friction surface of brake drum in the radial direction

3.2
brake block force
force with which the brake block is applied to contact with the friction surface

3.3
brake block holder
component for the secure mounting and positioning of the brake block and transmitting the brake block force

3.4
brake block key
securing element for the brake block in the brake block holder

3.5
brake block with low friction factor
brake blocks with a low friction factor of 0,10 to 0,15

Note 1 to entry: This definition generally corresponds to cast iron brake blocks and composite material type L or LL brake blocks.

3.6
brake block with high friction factor
brake block with a high friction factor of 0,25 to 0,30

Note 1 to entry: This definition generally corresponds to composite material type K brake blocks.

3.7
single brake block holders
brake block holders apt to receive one brake block length of 320 mm; corresponds to “Bg” configuration

3.8
double brake block holders
brake block holders apt to receive two brake blocks length of 250 mm; corresponds to “Bgu” configuration

4 Symbols and abbreviations

4.1 Symbols

For the purposes of this document, the following symbols and abbreviations apply:

Table 1 — Symbols and units

Symbol	Description	Unit
D	diameter	mm
F_{Pr}	test force	kN
F_{Prdyn}	dynamic test force	kN
F_{Prm}	dynamic mean force	kN
h	pitch before deflection test	mm
L_s	span during deflection test	mm

4.2 Abbreviations

MP magnetic particle testing

US ultrasound

5 Materials

5.1 General

The ferrous materials used for the manufacturing of brake block holders and their components shall comply with applicable European Standards.

5.2 Material for brake block holder

The brake block holders shall be produced from one of the following:

— steel (cast, forged or rolled),

— grey cast iron.

Welded designs are permitted subject to agreement between manufacturer and customer. Welding shall only be used for rectification of manufacturing defects, when subject to a formal procedure.

5.3 Material for brake shoe key and brake block key

The selection of the material and the manufacturing process are left to the discretion of the manufacturer but they shall comply with the technical specifications and/or the drawings approved by the operator.

5.4 Corrosion protection

If corrosion protection is required, it shall be agreed between manufacturer and customer. It shall not contain any components constituting a hazard for the staff coming into contact with them. Should paint colouring be applied, care shall be taken to ensure that bearing points for bolts, bushes and moving parts are free from paint.

6 Design

6.1 Brake block holders

6.1.1 General

The purpose of the brake block holders shall provide secure mounting and positioning of the brake block made of grey cast iron, sintered material or composite material. Sprues, suction heads and sharp edges caused by manufacturing shall be removed. Cast brake block holders shall be normalized.

Brake block holders should be designed to accommodate:

— one brake block (see Figure A.10 and Figure B.11);

— two brake blocks securely mounted separately in the brake block holder (see Figure A.9 and Figure B.10);

— two brake blocks mounted separately but with movable supports (see Figure C.1).

The curvature of the contact surface of the brake block holder with the brake blocks shall be smooth and have the same radius as shown on the figures. The entire length of the contact surface shall be perpendicular to the longitudinal centre plane of the brake block holder so as to ensure large surface contact with the brake block. The same applies to the clearance of the key-hole eyes for guiding the brake shoe key and to the recesses for accommodating the brake block mounting cams. The brake block holder shall not become permanently deformed at the maximum brake force. The suitability of the brake block holder shall be demonstrated by determining its fatigue limit by means of the test forces and number of cycles stipulated in Clause 8. Repair welding is not permitted.

6.1.2 Dimensional accuracy

In order to ensure the interchangeability of the brake block holders and the brake blocks – nationally and internationally – the main dimensions of the brake block holders shall be as per the circled areas in the figures given in Annexes A and B.

6.2 Brake shoe key/Brake block key

6.2.1 General

Some examples of brake shoe keys and brake block keys are given in the figures in Annex C and Annex D. The customer approves the types used. The surfaces shall be smooth and free from corrosion. Burrs and sharp edges shall be removed before treatment, the required hardness shall be indicated in the technical documentation.

6.2.2 Dimensional requirements

The dimensional characteristics shall ensure the interchangeability and shall be agreed between the manufacturer and the customer, and indicated in the drawings.

Distortions of the brake block key due to manufacture shall not exceed 2 mm.

7 Markings

7.1 General

Brake block holders, brake shoe keys/insert springs covered by this document shall be provided with permanent markings, as described in 7.2 and 7.3. The marking on the brake block holder shall also be legible when the brake block is fitted.

7.2 Brake block holder

The brake block holders shall be marked permanently.

The markings shall be applied raised or recessed.

The area in which the markings are to be applied shall be shown in the drawing.

The following details are to be provided:

— size of the brake blocks employed, e.g. (2 × 250 mm);

— outside radius of the brake block, e.g. (560 mm);

— ownership sign of the railway and year of manufacturing;

— dimension of the bore-hole for the bushing of the bearing pin, e.g. ø 60 mm;

— interchangeability sign and dimensions of the markings according to Annex G.

7.3 Brake shoe key and brake block key

The brake shoe key shall be marked in raised letters in a recessed panel with the markings of the manufacturer and the year of manufacturing. The markings shall not protrude above the surface of the key. For keys manufactured by rolling, the markings may also be recessed, but care shall be taken to ensure that the tool used for this purpose does not have any sharp edges which might lead to the creation of fatigue fractures.

8 Type testing

8.1 General

8.1.1 Elements of type testing

Type testing consists of material and component testing. The components presented for acceptance shall comply with the technical documentation for series production (dimensional accuracy, surface conditions – but without painting treatment of the surface, material).

8.1.2 Material testing

Within the framework of material testing, the manufacturer shall submit all test certificates concerning structural composition and physical/mechanical properties to the customer/user for inspection and approval. The materials used shall exhibit toughness, stipulated by a material standard, down to –30 °C. The manufacturer shall also ensure that the material used exhibits sufficient toughness down to –50 °C to exclude any brittle fracture behaviour.

8.1.3 Component testing

The test shall be performed on the complete component at (+20 ± 5) °C and under laboratory conditions according to 8.2.

If required by the user/customer, component testing may also be performed at sub-zero temperatures or under other operating conditions which shall be agreed upon between the manufacturer and the customer.

8.2 Type testing for brake block holders

8.2.1 Static loading

8.2.1.1 Static loading with the specified test force

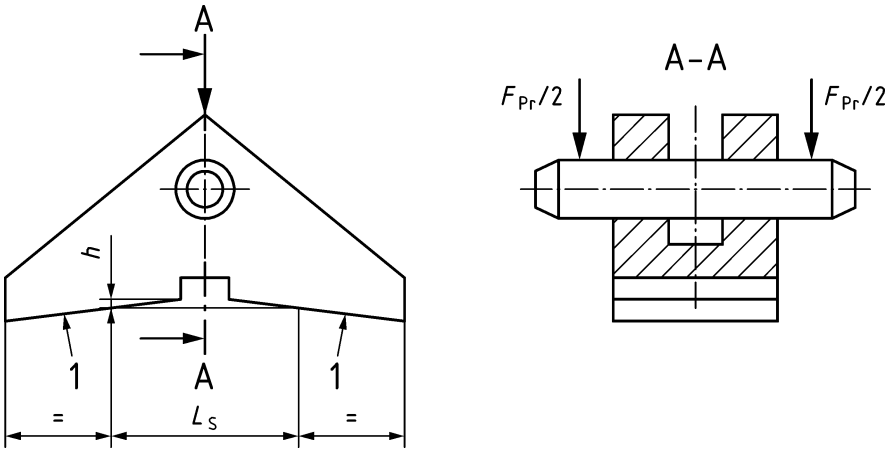
The brake block holders shall be mounted according to Figure 1 in a testing appliance and loaded with a steadily increasing test force F_{Pr} in kN up to the maximum value F_{Prmax}. The span L_s is determined by the spacing of the outer brake block mounting cams or by the dimension L_s pursuant to the approved drawing. For testing, a suitably dimensioned pin shall be inserted into the non-bushed brake block holder. After removal of the test force, the brake block holder shall not show any permanent deformations. The test force shall be specified as approved by the customer/user.

8.2.1.2 Static loading with the specified deflection

In accordance with 8.2.1.1, the brake block holder shall be mounted with the span L_s and loaded until the contact surface of the brake block is pressed through to the half-pitch h. A force/distance diagram shall be recorded during this loading test in order to be able to identify the beginning of plastic deformation.

During this loading test, no cracks shall occur.

At the end of the test, the brake block holders shall be inspected for incipient cracks by means of an appropriate testing procedure (e.g. US, MP or X-ray examination).



Key

1 contact surface
F_{Pr} test force
L_s span
h pitch

Figure 1 — Test arrangement for static load test

8.2.2 Dynamic loading

8.2.2.1 Fatigue test in the direction of the application force

In order to be able to provide evidence of the fatigue limit, the brake block holder shall be mounted in an appliance in the configuration complying with the conditions as shown in Figure 1. The test force shall be applied as a pulsating load sinusoidal between F_{Prmin} = 5 kN and F_{Prmax} = 50 kN with a mean load of 27,5 kN.

The number of cycles shall be greater than 2×10^7. The test frequency shall be set according to the stability of the test configuration, but it should be between 2 Hz and 16 Hz.

At the end of the test, the brake block holders shall be inspected for incipient cracks by means of an appropriate testing procedure (e g. US, MP or X-ray examination).

The result is satisfactory if the examination does not reveal any damage or defects that affect either the performance or service life of the brake block holder, in consideration of the precision of the applied testing procedure.

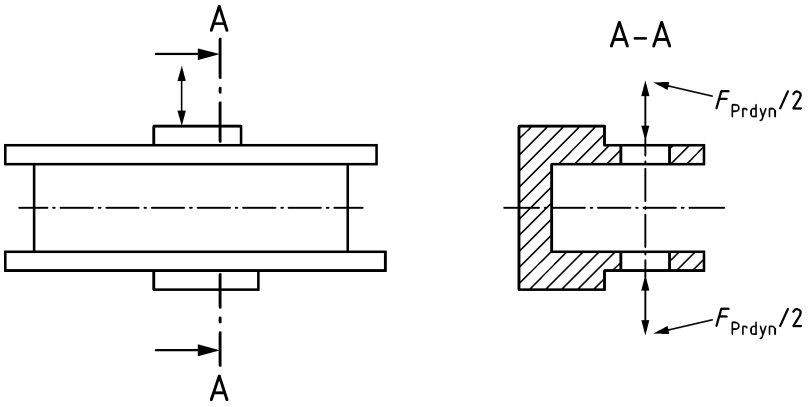
8.2.2.2 Fatigue test at a right angle to the direction of the application force

For this fatigue test, the brake block holder shall be mounted as shown in Figure 2 so that it is lying horizontally and, starting from a mean load of 4,5 kN, be loaded dynamically with plus/minus 1,5 kN (see Figure 2).

NOTE The fatigue test at a right angle to the direction of the application force is necessary since lateral forces arising in operations impose an enormous load both on the side webs and the mid-section. This is particularly the case with brake block holders welded together from two halves.

The test frequency should be approximately 10 Hz. The number of cycles which the brake block holder shall withstand shall be greater than 10^7 load cycles.

The result is satisfactory if the examination does not reveal any damage or defects that affect either the performance or service life of the brake block holder, in consideration of the precision of the applied testing procedure.



Key

F_{Prdyn} = ± 1,5 kN at F_{Pm} = 4,5 kN

Section A-A, Test force F_{Prdyn}, illustration offset by 90°

Figure 2 — Test arrangement for fatigue test

8.2.3 Testing of brake shoe key and brake block key

Within the framework of testing, tests shall be carried out on 10 specimens each of the brake shoe key and the brake block key:

— dimensional accuracy.

The requirements for dimensional accuracy contained in 6.2.2 of this document shall apply:

— the manufacturer is responsible for sufficient toughness of the material used.

For inspection of the structural composition, 5 specimens shall be notched 80 mm from the tip and broken. Inspection of the fracture surface shall show a uniform, fine-grained microstructure in accordance with the requirements contained in the order:

— hardness testing.

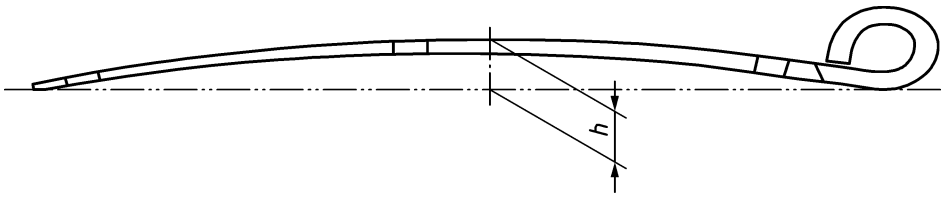
The hardness of the specimens (6 off) shall be determined on 3 pieces from the inspection of the structural composition and on 3 pieces of the brake shoe keys intended for the loading test, before the loading test.

In the case of the brake block key, this shall be performed on all specimens. The results obtained shall not deviate by more than ± 10 % from the required target value:

— loading test;

— brake shoe keys.

The brake shoe keys (5 off) shall be pressed once into their extended position for a short period. After removing the pressure, the pitch h in the longitudinal centre shall be measured (see Figure 3).



Key
h pitch

Figure 3 — Brake shoe key

Subsequently, the brake shoe key shall be kept pressed in its extended position for 1 min. After removing the pressure, the loss of pitch shall not be more than 5 % of the original value.

9 Series testings

The series testings to be achieved for the supply of brake block holders, brake shoe keys, and springs are to be defined by agreement between the customer and the manufacturer.

NOTE 1 For minimum details provided in the invitation to tender and in the order, see Annex E.

NOTE 2 For requirements regarding supply, see Annex F.

Annex A
(normative)

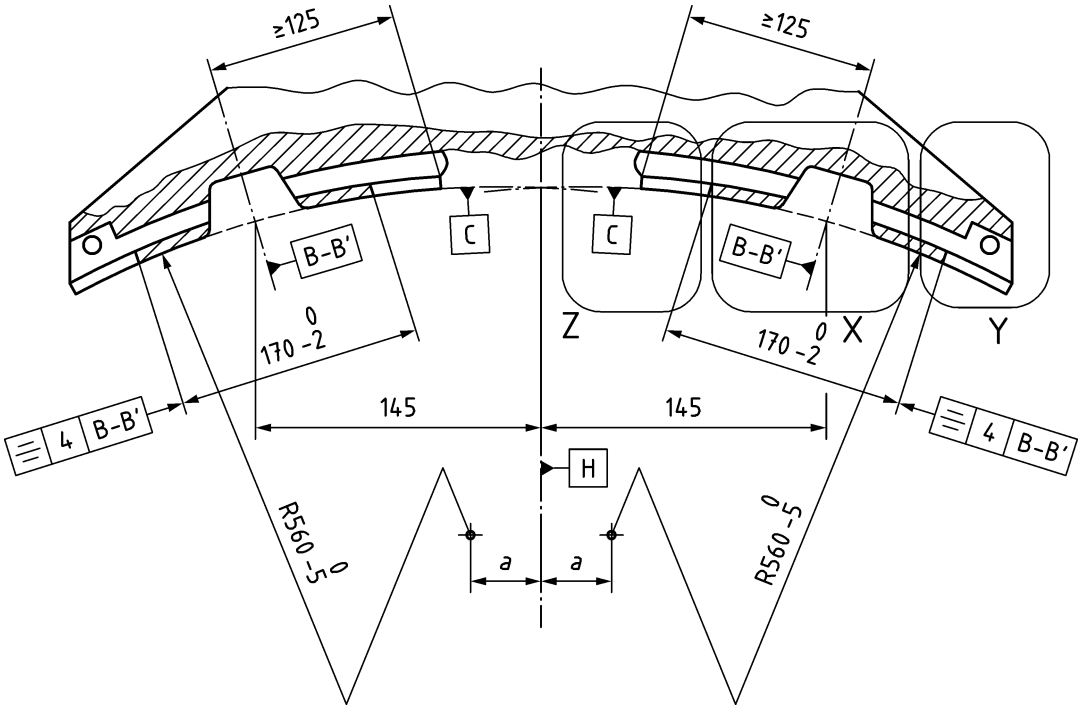
Simple and double brake block holder for brake shoes with a low friction factor

A.1 Geometric characteristics

A.1.1 Double brake block holder

Figure A.1 gives some functional dimensions of a double brake block holder, these dimensions should be completed by dimensions required by the figures showing the detail of the boxed parts.

Dimensions in millimetres



Key

X see Figures A.4 and A.5

Y see Figure A.6

Z see Figure A.7

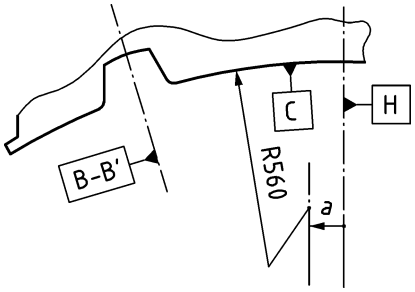
Figure A.1

Dimension *a* shall be calculated with regard to the nominal diameter *D* of the tread of the wheel, by applying the following formula, when *D* ≥ 800 mm

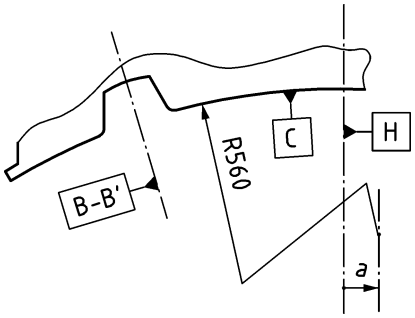
$$a = \frac{145\,(0{,}5\,D - 515)}{0{,}5\,D + 45} \qquad \text{(A.1)}$$

Dimension *a* is positive when the centers of the radius circles 560 mm are on the same side of the plan H as the contact face that they are defining. Dimension *a* is negative in the contrary situation (see Figure A.2).

Dimensions in millimetres



a) With positive *a*



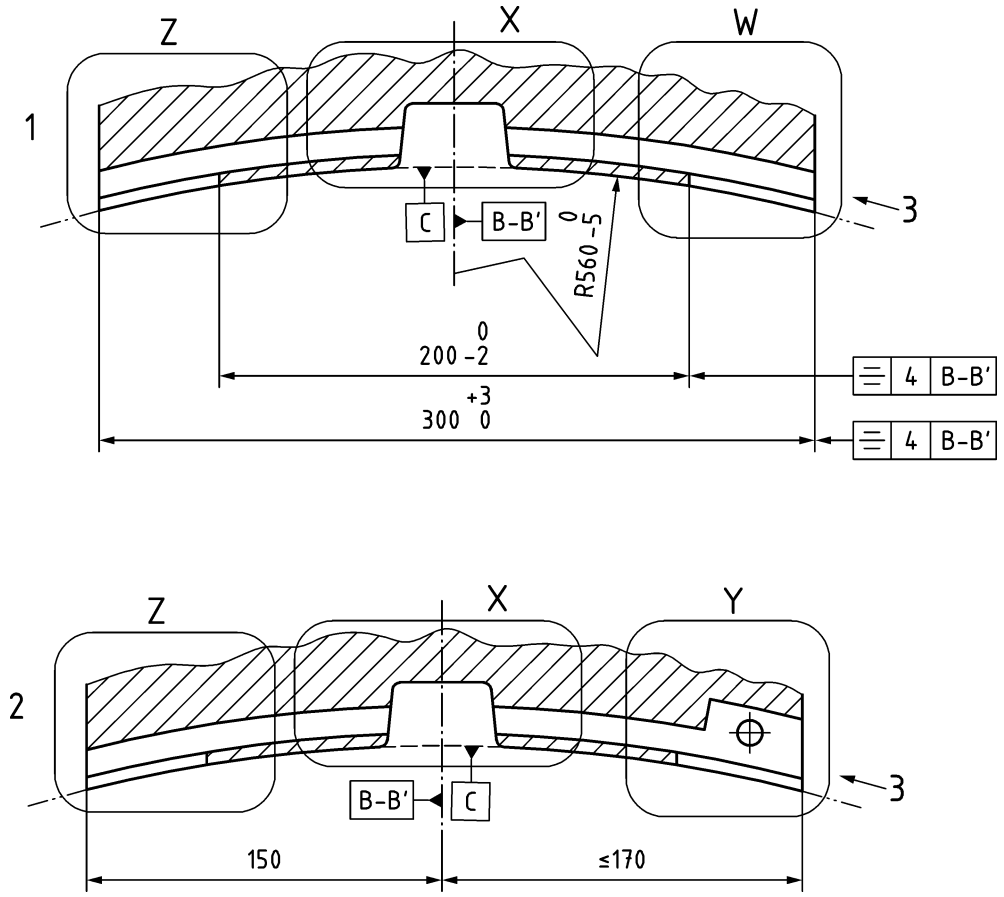
b) With negative *a*

Figure A.2

A.1.2 Simple brake block holder

Figure A.3 gives some functional dimensions of a simple brake block holder, these dimensions should be completed by dimensions required by the figures showing the detail of the boxed parts.

Dimensions in millimetres



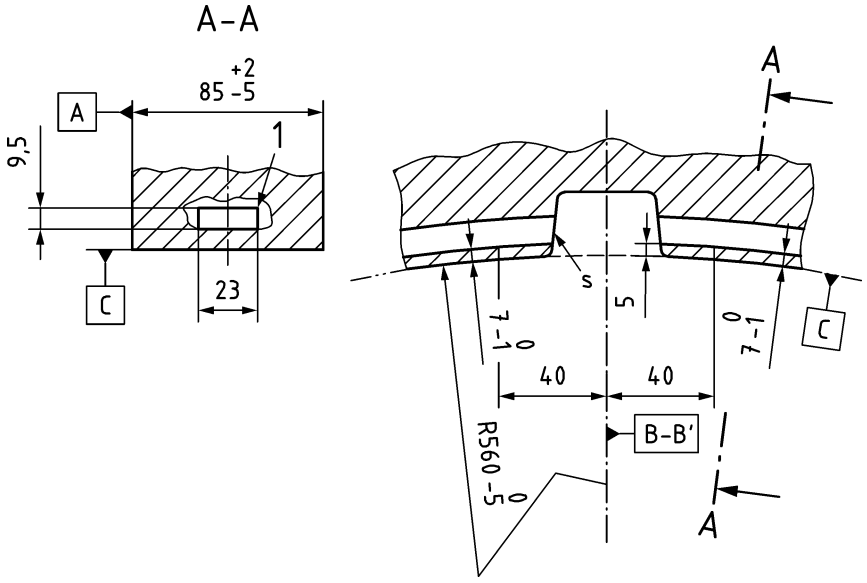
Key

1	arrangement for a gib-headed key	Y	see Figure A.6
2	arrangement for a eye-headed key	Z	see Figure A.7
3	direction of keying	W	see Figure A.8
X	see Figures A.4 and A.5		

Figure A.3

A.1.3 Common details of double and simple brake block holders

Dimensions in millimetres



Key

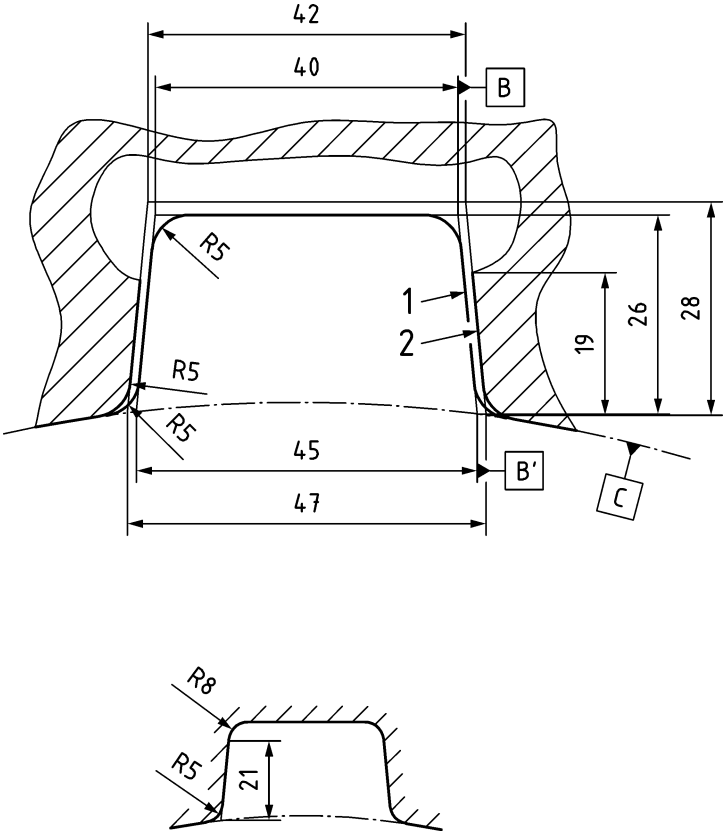
1 corresponds to the minimal passage section

s see Figure A.5

Figure A.4 — Detail X of Figures A.1 and A.3

The contour *s* of the cell connector housing of the brake shoe shall be between the shape for maximum material and the shape for minimum material as defined below by the lines in bold.

Dimensions in millimetres



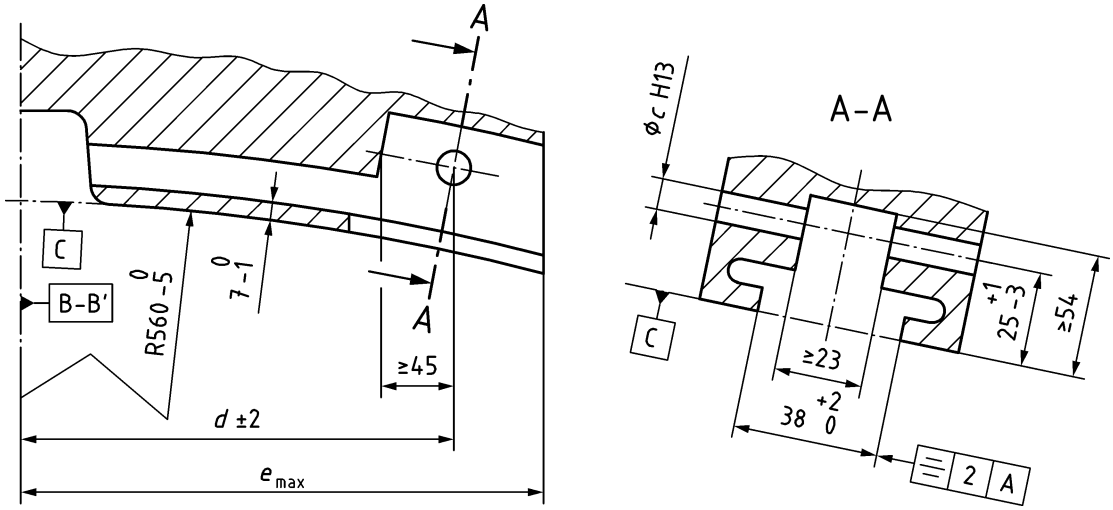
Key

1 contour *s* of the housing for maximum material shape

2 contour *s* of the housing for minimum material shape

Figure A.5 — Detail *s* from Figure A.4

Dimensions in millimetres



Key

c, d, e see Table A.1 for separate brake block holder

Figure A.6 — Detail Y of Figures A.1 and A.3

Table A.1

Dimensions in millimetres

	Brake block holders				Double brake block holders mounted on rigging with clipped holding device
	mounted on tread brake unit		mounted on rigging		
	Double brake block	Simple brake block	Double brake block	Simple brake block	
c	10	10	13	13	13
d	113	150	90	150	95
e	135	170	135	170	135

Dimensions in millimetres

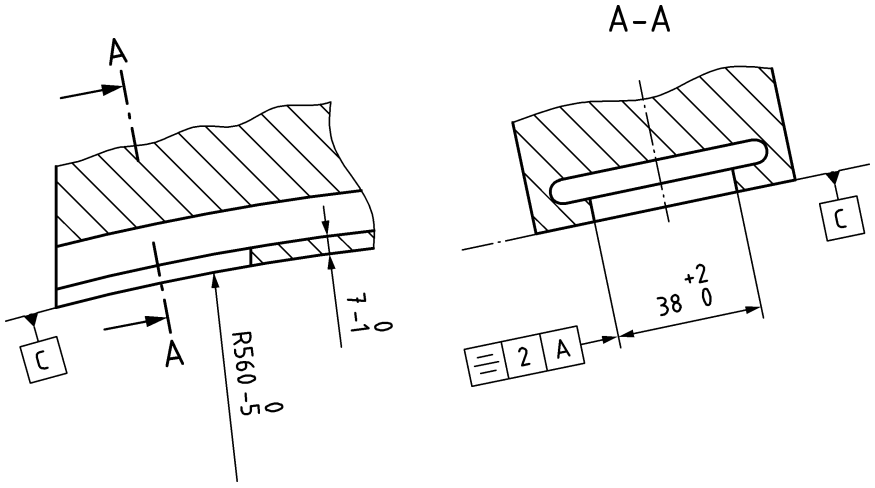


Figure A.7 — Detail Z of Figures A.1 and A.3

Dimensions in millimetres

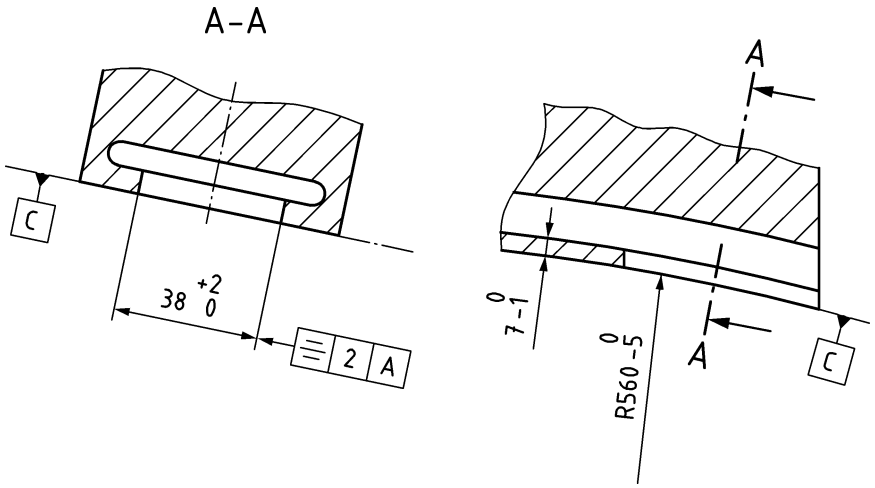


Figure A.8 — Detail W of Figure A.3

A.2 Interchangeability requirements for brake block holders intended to be mounted on the rigging

A.2.1 Double brake block holder

Figure A.9 gives the interchangeability dimensions conditioning the mounting of a double brake block holder on rigging, for a vehicle with a 920 mm wheel diameter.

Dimensions in millimetres

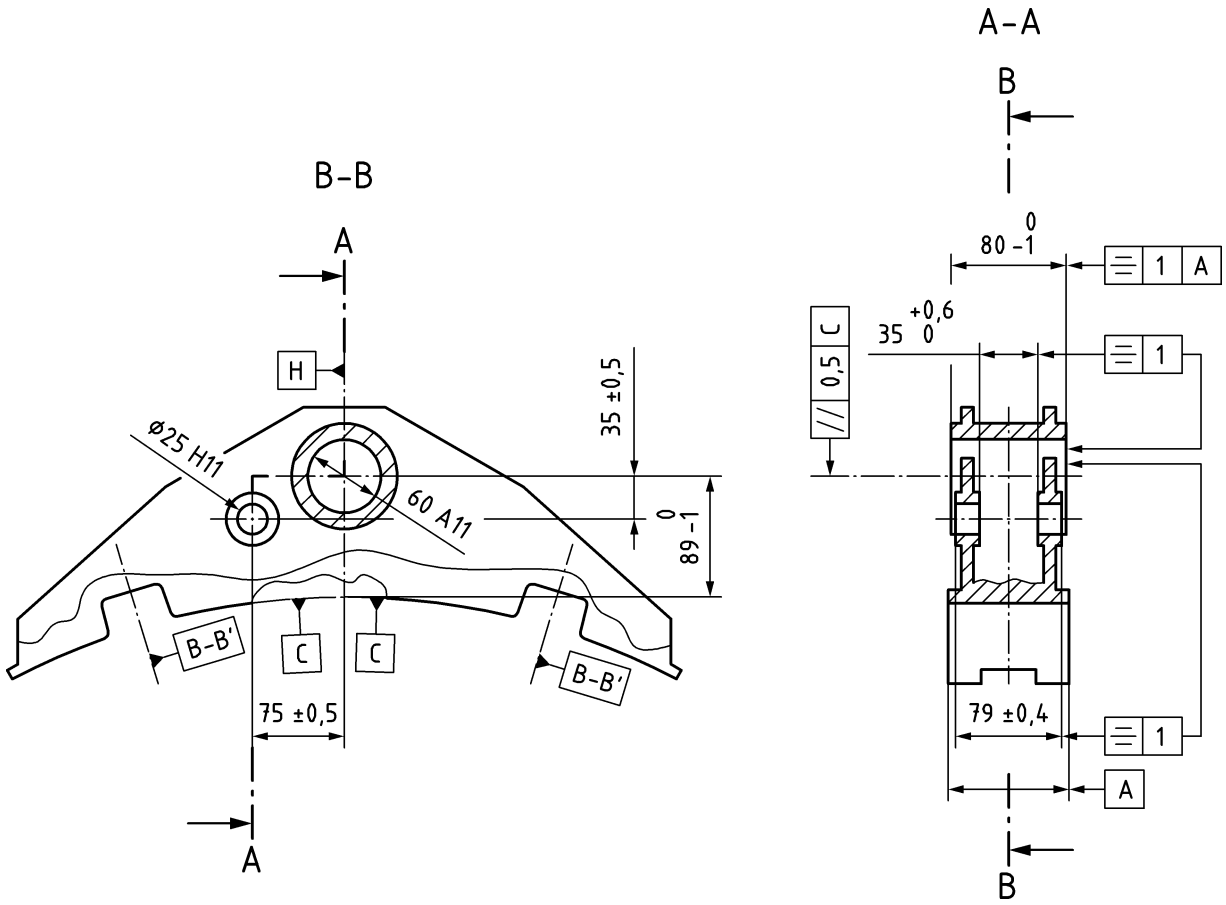


Figure A.9

A.2.2 Simple brake block holder

Figure A.10 gives the interchangeability dimensions conditioning the mounting of a simple brake block holder on rigging.

Dimensions in millimetres

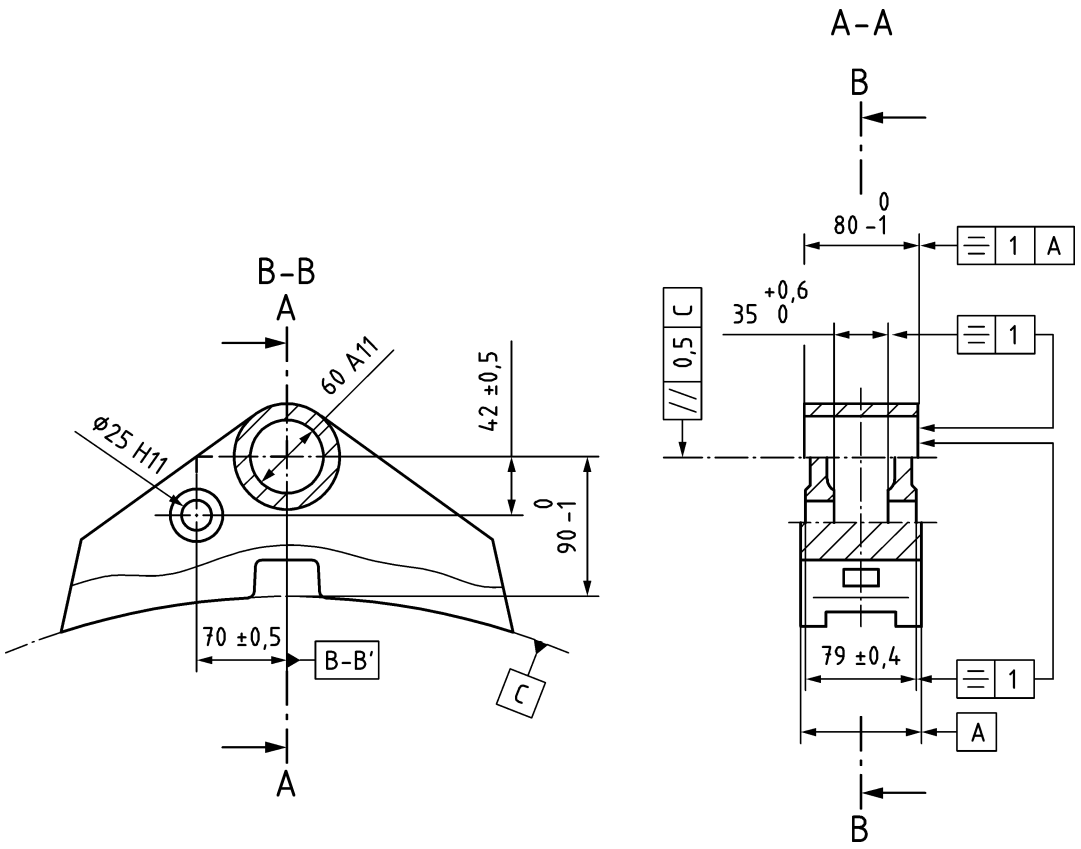


Figure A.10

Annex B
(normative)

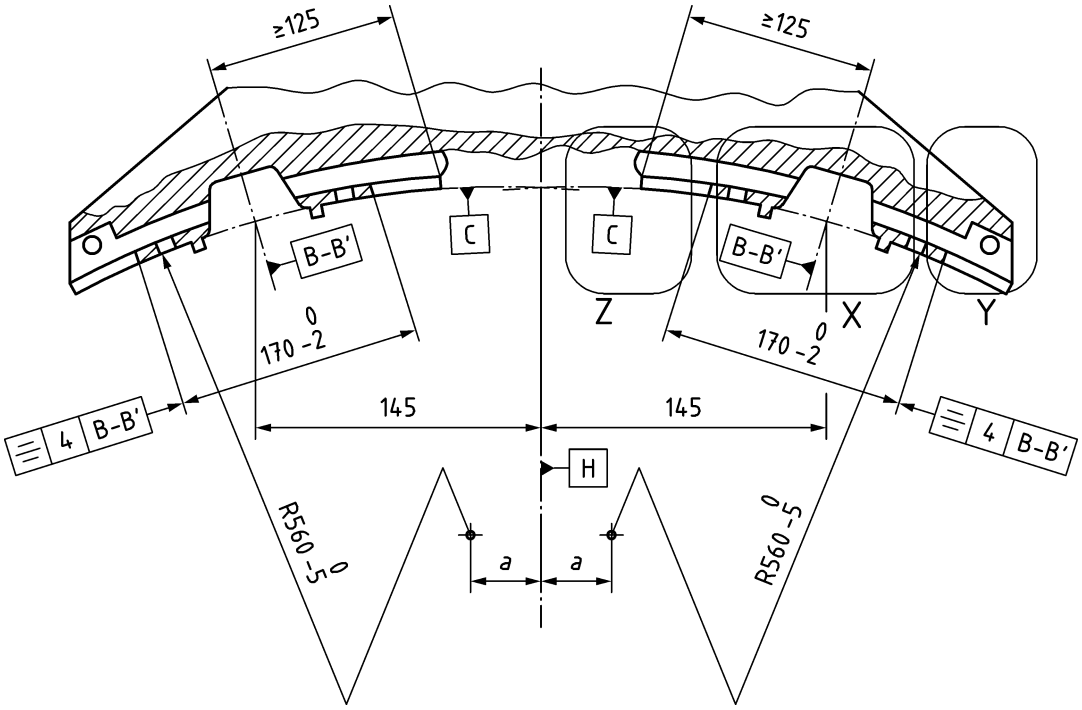
Simple and double brake block holder for brake shoes with a high friction factor

B.1 Geometric characteristics

B.1.1 Double brake block holder

Figure B.1 gives some functional dimensions of a double brake block holder, these dimensions should be completed by dimensions required by the figures showing the detail of the boxed parts.

Dimensions in millimetres



Key

X see Figures B.4, B.5 and B.6

Y see Figure B.7

Z see Figure B.8

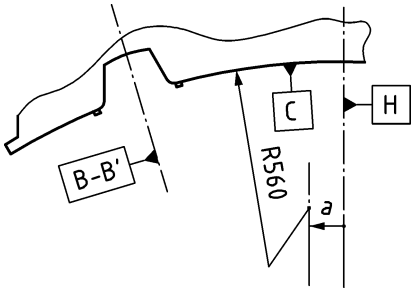
Figure B.1

Dimension *a* shall be calculated with regard to the nominal diameter *D* of the tread of the wheel, by applying the following formula, when *D* ≥ 800 mm

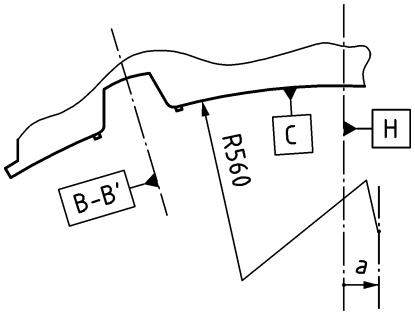
$$a = \frac{145\,(0{,}5\,D - 515)}{0{,}5\,D + 45} \qquad \text{(B.1)}$$

Dimension *a* is positive when the centers of the radius circles 560 mm are on the same side of the plan H as the contact face that they are defining. Dimension *a* is negative in the contrary situation (see Figure B.2).

Dimensions in millimetres



a) With positive *a*



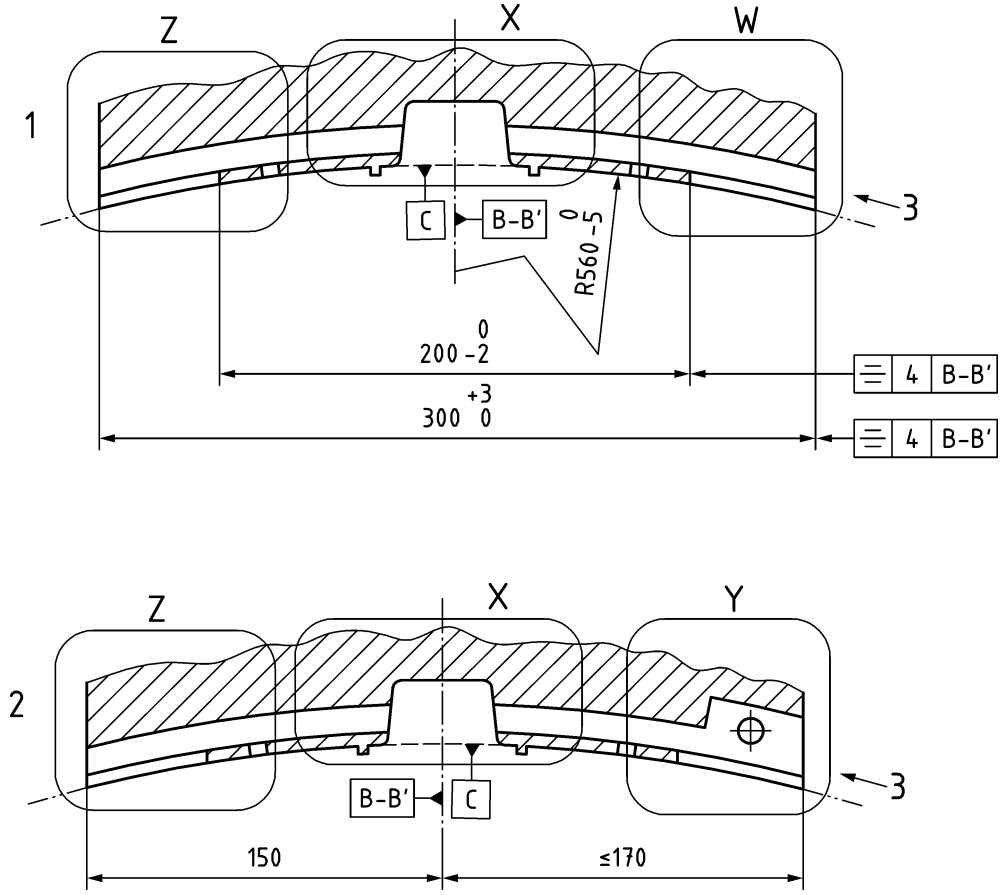
b) With negative *a*

Figure B.2

B.1.2 Simple brake block holder

Figure B.3 gives some functional dimensions of a simple brake block holder, these dimensions should be completed by dimensions required by the figures showing the detail of the boxed parts.

Dimensions in millimetres



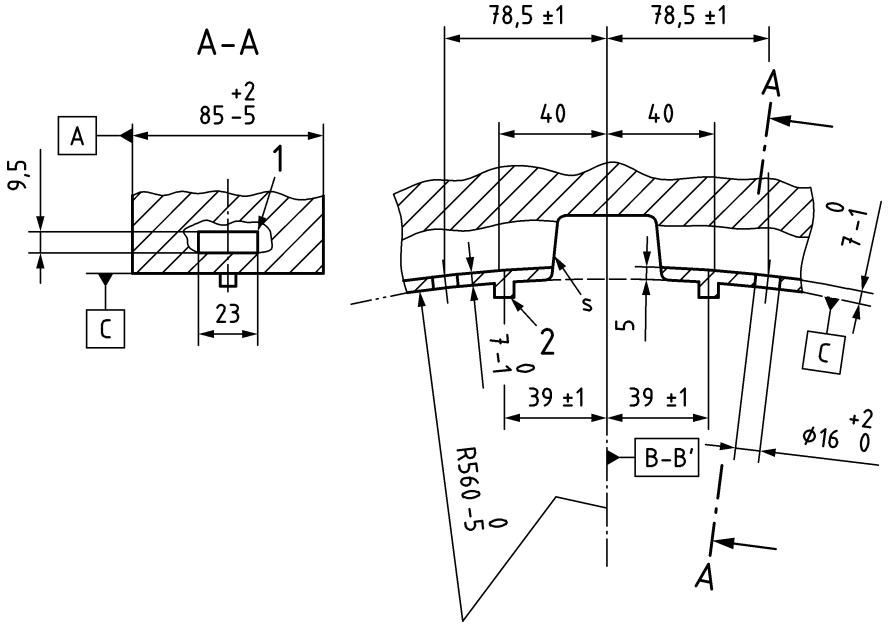
Key

1 arrangement for a gib-headed key
2 arrangement for an eye-headed key
3 direction of keying
X see Figures B.4, B.5 and B.6
Y see Figure B.7
Z see Figure B.8
W see Figure B.9

Figure B.3

B.1.3 Common details of double and simple brake block holders

Dimensions in millimetres



Key

1 corresponds to the minimal passage section

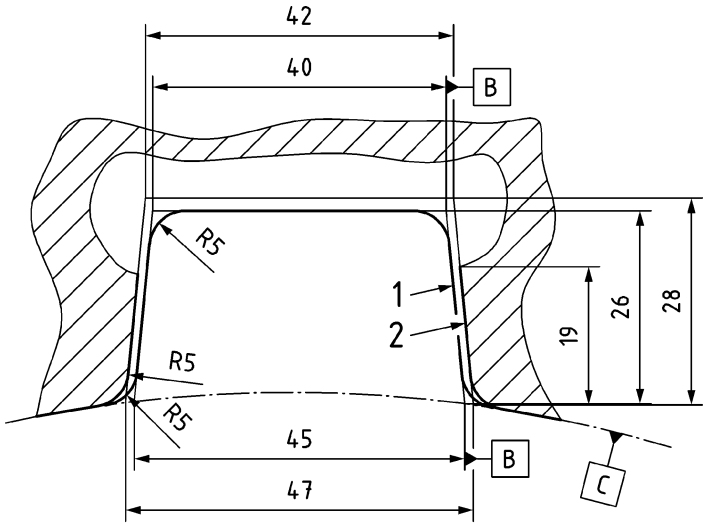
2 the detail of locating is given by the Figure B.6.

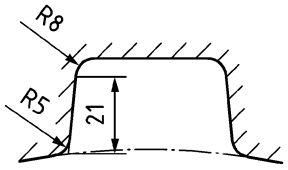
s see Figure B.5

Figure B.4 — Detail X of Figures B.1 and B.3

The contour of the cell connector housing of the brake shoe shall be between the shape for maximum material and the shape for minimum material as defined below by the lines in bold.

Dimensions in millimetres





Key

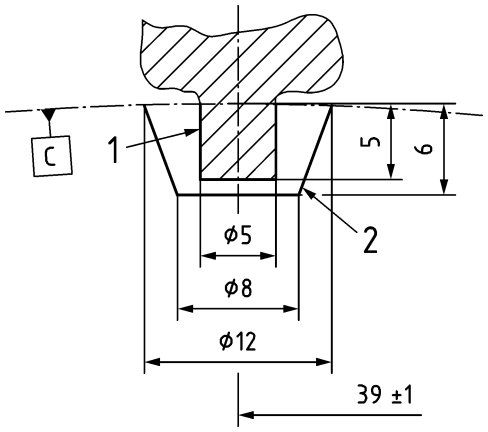
1 contour *s* of the housing for maximum material shape

2 contour *s* of the housing for minimum material shape

Figure B.5 — Details of Figure B.4

The shape and the dimensions of the locating pin are not required, but the contour of this one shall be between the both envelopes (maximum and minimum shapes) defined by the Figure B.6.

Dimensions in millimetres



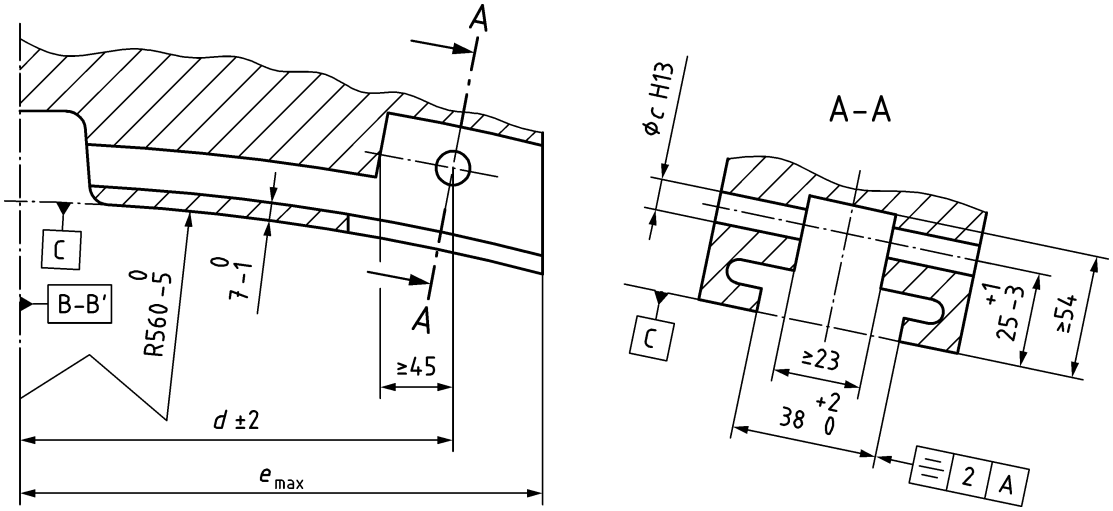
Key

1 minimum allowed shape

2 maximum allowed shape

Figure B.6

Dimensions in millimetres



Key

c, d, e See Table B.1 for separate brake block holder

Figure B.7 — Detail Y of Figures B.1 and B.3 (holding of the eye-headed key with a pin)

Table B.1

Dimensions in millimetres

	Brake block holders			
	mounted on tread brake unit		mounted on rigging	
	Double brake block	Simple brake block	Double brake block	Simple brake block
c	10	10	13	13
d	113	150	90	150
e	135	170	135	170

Dimensions in millimetres

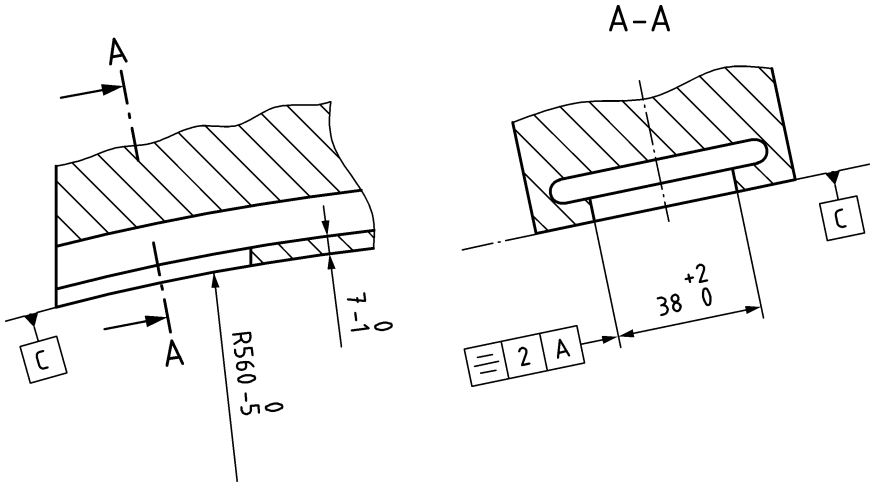


Figure B.8 — Detail Z of Figures B.1 and B.3

Dimensions in millimetres

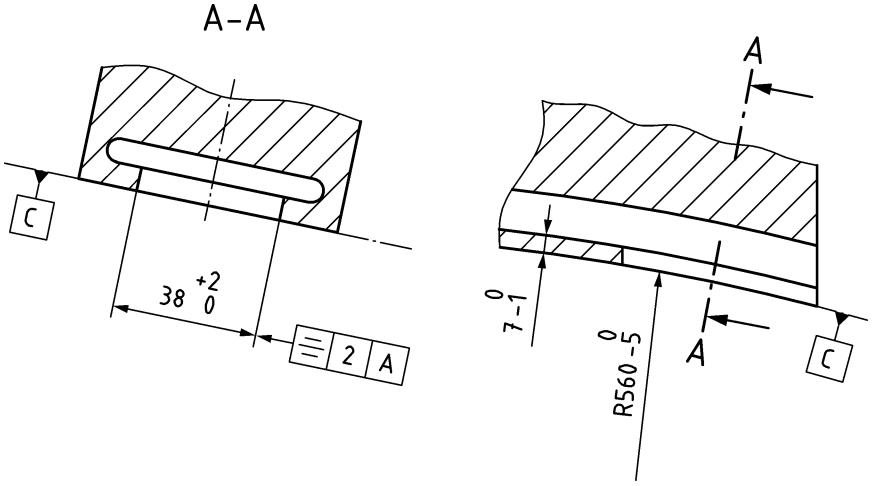


Figure B.9 — Detail W of Figure B.3

B.2 Interchangeability requirements for brake block holders intended to be mounted on the rigging

B.2.1 Double brake block holder

Figure B.10 gives the interchangeability dimensions conditioning the mounting of a double brake block holder on rigging, for a vehicle with a 920 mm wheel diameter.

Dimensions in millimetres

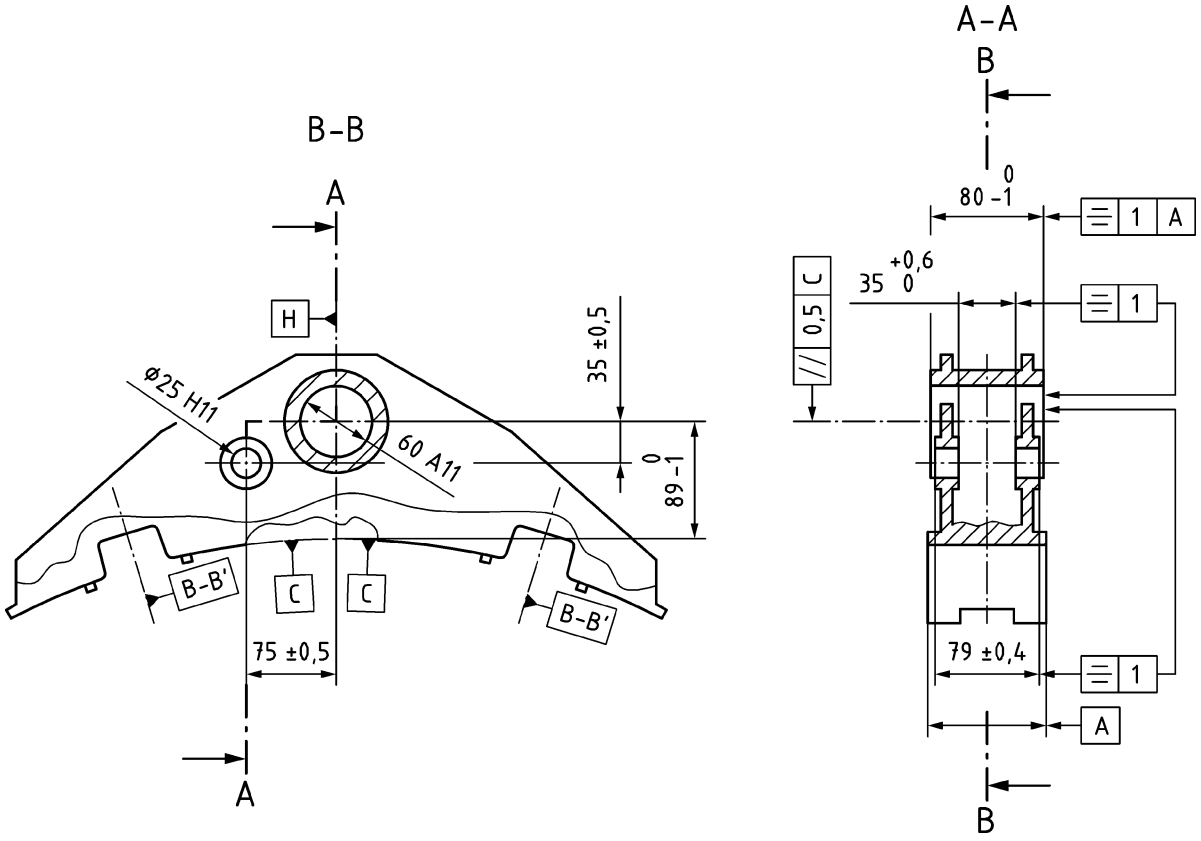


Figure B.10

B.2.2 Simple brake block holder

Figure B.11 gives the interchangeability dimensions conditioning the mounting of a simple brake block holder on rigging.

Dimensions in millimetres

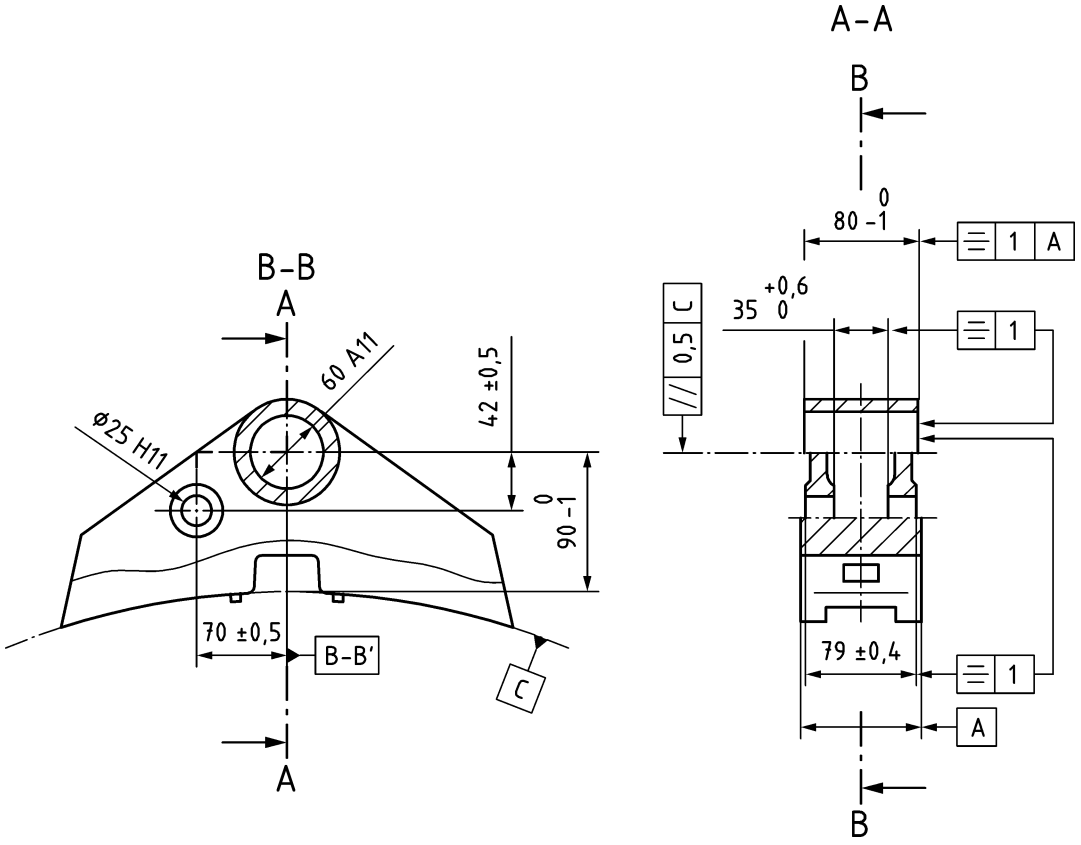
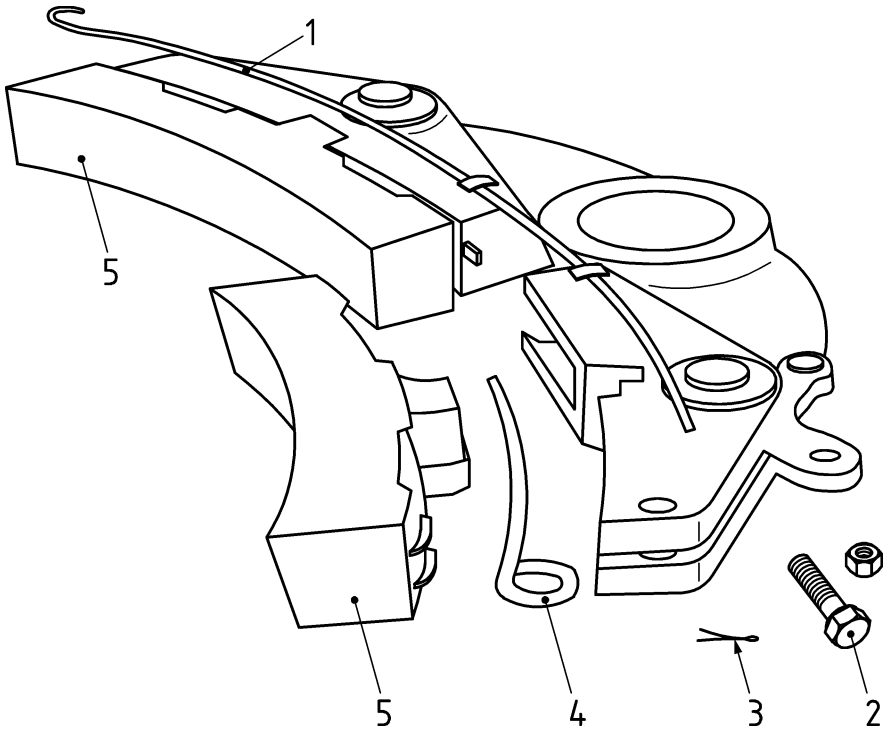


Figure B.11

Annex C
(informative)

Brake block holder – Type Bdg, brake block, brake shoe key

Figure C.1 shows a brake block holder, type Bdg, brake block, brake shoe key.



Key

1 brake block key
2 securing pin / screw
3 splint
4 brake shoe key
5 brake block

Figure C.1 — Brake block holder – Type Bdg

Annex D
(informative)

Brake shoe keys

Figure D.1 shows brake shoe keys.

Dimensions in millimetres

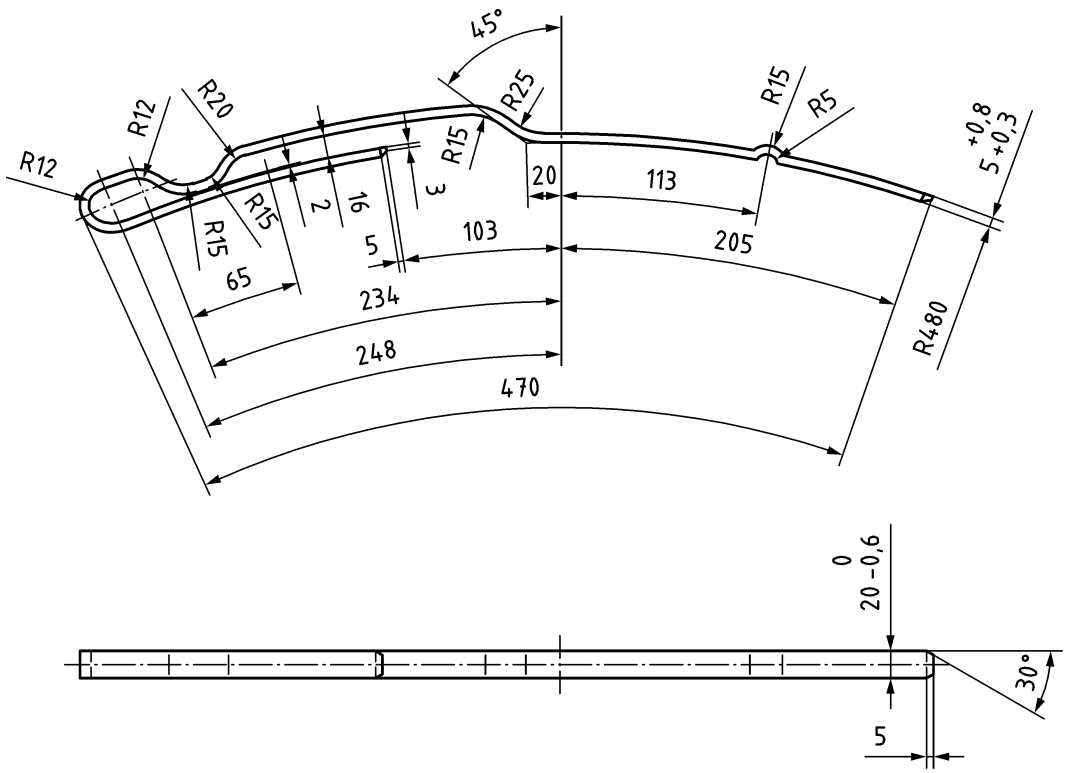


Figure D.1 — Special-shaped brake shoe key for improved securing of the brake block

Figure D.2 shows a simple brake shoe key.

Dimensions in millimetres

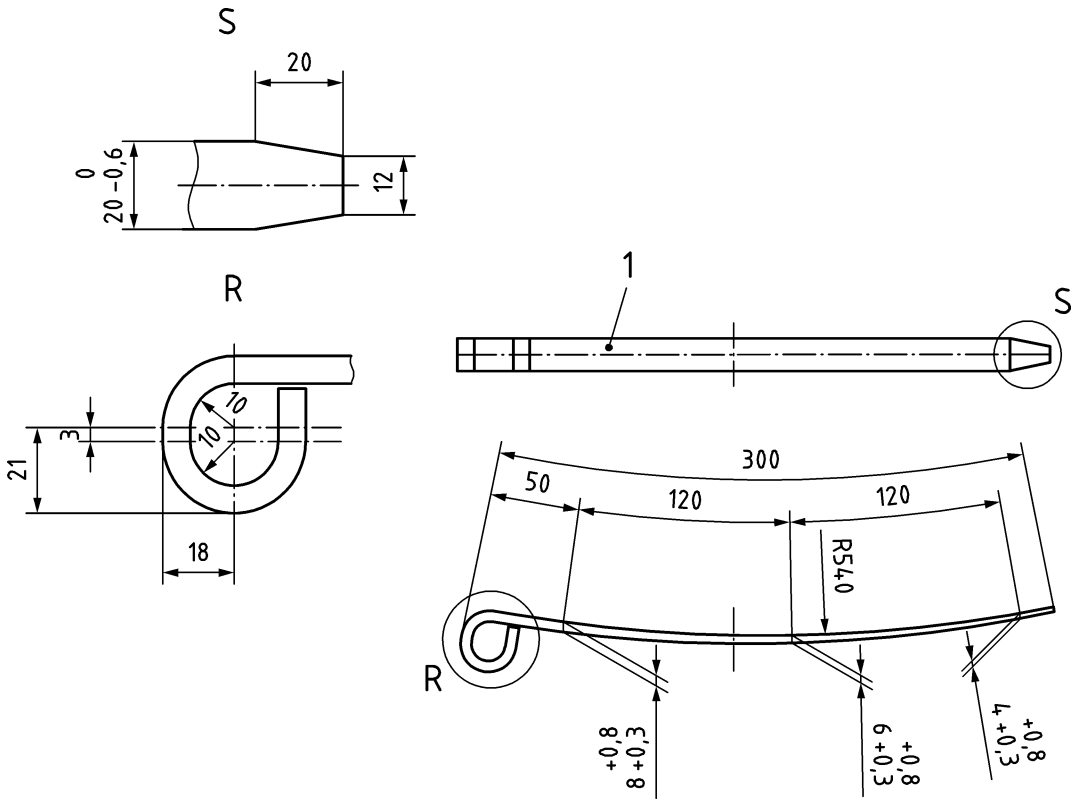


Figure D.2 — Simple brake shoe key

Annex E
(informative)

Minimum details provided in the invitation to tender and in the order

The following details are to be provided in the order so as to ensure clarity in the enquiry/order.

a) Drawings signed off and approved by the customer/user.

b) Reference to this European Standard, i.e. EN 15329.

c) Details concerning the material: material number and special properties), if these are stipulated.

d) Details concerning corrosion protection, if these are stipulated.

e) Details concerning the area of application, if this deviates significantly from the generally known operating conditions.

f) Details concerning the conditions for fitting, if these are not readily determinable from the drawing/ documentation.

Annex F
(informative)

Supply

F.1 Brake shoe key and brake block key

In accordance with the agreements between manufacturer and customer, the brake shoe keys and brake block keys may be supplied in open containers, but protected against climatic influences (moisture).

F.2 Brake block holders

Owing to the bearing positions/bushes, the brake block holders shall be supplied in containers that ensure protection against mechanical damage. With regard to corrosion protection, the bearing positions/bushes shall be provided with an adequate film with grease or other protection that will ensure corrosion protection for at least 3 months.

If other means of corrosion protection with at least the same corrosion protection effect are used, it shall be possible to remove these with simple treatment without forming residues that may lead to problems when treated with lubricants.

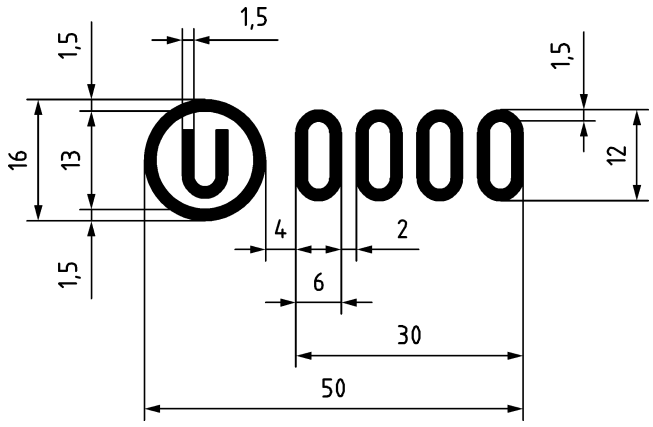
Annex G
(normative)

Marking

G.1 The interchangeability sign U

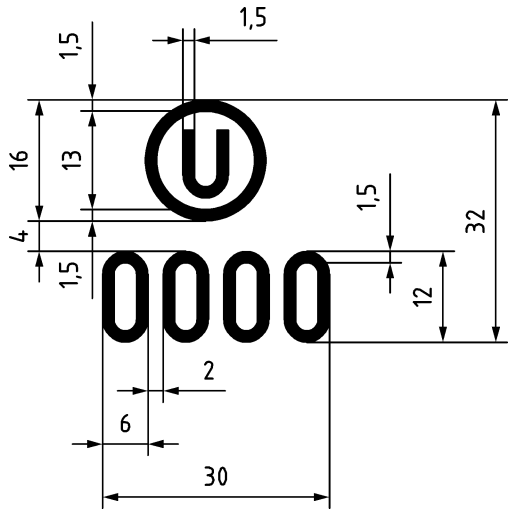
Replaceable parts have to be marked by an interchangeability sign according to Figure G.1.

Dimensions in millimetres



a) Horizontal arrangement

Dimensions in millimetres



b) Vertical arrangement

Figure G.1 — Interchangeability sign

Bibliography

[1] UIC 583:1995, *Wagons - Application of a special mark on interchangeable parts*

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