

# SVENSK STANDARD

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### **Järnvägar – Bromssystem – Bromsblock**

### **Railway applications – Braking – Brake blocks**

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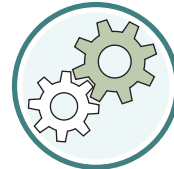
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Denna standard ersätter SS-EN 16452:2015, utgåva 1.

The European Standard EN 16452:2015+A1:2019 has the status of a Swedish Standard. This document contains the official version of EN 16452:2015+A1:2019.

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EUROPEAN STANDARD

**EN 16452:2015+A1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2019

ICS 45.040; 45.060.01

Supersedes EN 16452:2015

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## Railway applications - Braking - Brake blocks

Applications ferroviaires - Freinage - Semelles de frein

Bahnanwendungen - Bremse - Bremsklotzsohlen

This European Standard was approved by CEN on 28 February 2015 and includes Amendment 1 approved by CEN on 21 December 2018.

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**SS-EN 16452:2015+A1:2019 (E)**

<b>Contents</b>	<b>Page</b>
Foreword .....	8
Introduction .....	9
<b>1 Scope .....</b>	<b>10</b>
<b>2 Normative references .....</b>	<b>10</b>
<b>3 Terms and definitions .....</b>	<b>11</b>
<b>4 Abbreviations .....</b>	<b>13</b>
<b>5 Overall requirements .....</b>	<b>13</b>
5.1 Deviations from requirements.....	13
5.2 Functions.....	13
5.3 Operational criteria.....	14
5.3.1 Friction material performance .....	14
5.3.2 Service performance.....	14
5.3.3 Brake block characteristics.....	15
<b>6 Acceptance procedure .....</b>	<b>15</b>
<b>6.1 Brake block performance requirements.....</b>	<b>15</b>
6.1.1 General.....	15
6.1.2 Category A.....	16
6.1.3 Category B.....	16
6.1.4 Category C .....	16
6.2 Approval test requirements.....	16
6.3 Dynamometer specification .....	19
<b>7 Category A requirements .....</b>	<b>19</b>
<b>7.1 Brake block characteristics.....</b>	<b>19</b>
7.1.1 Standard design .....	19
7.1.2 Brake block characterization test.....	19
7.1.3 Brake block mechanical characteristics for service operation .....	20
<b>7.2 Dynamic friction performance .....</b>	<b>20</b>
7.2.1 Generic requirements for assessment process .....	20
7.2.2 Bedded and non bedded performance .....	21
7.2.3 Variation in mean coefficient of friction in dry condition for a brake to rest.....	21
7.2.4 Mean friction coefficient variation under wet conditions.....	21
7.2.5 Mean friction coefficient variation at high initial temperature .....	21
7.2.6 Mean friction coefficient variation after simulation of a downhill brake application.....	21
7.2.7 Instantaneous friction coefficient variation during simulation of a downhill brake application.....	21
7.2.8 Variation in instantaneous friction for a brake to rest .....	23
<b>7.3 Static friction coefficient.....</b>	<b>24</b>
<b>7.4 Extreme winter conditions (freight wagons).....</b>	<b>24</b>
7.4.1 General.....	24
7.4.2 <b>A1</b> Dynamometer test.....	24
7.4.3 Train brake test .....	25
<b>7.5 Locked brake (fusibility) .....</b>	<b>26</b>
7.5.1 Generic prescriptions .....	26
7.5.2 Specific prescriptions for freight wagons.....	26

<b>8</b>	<b>Category B requirements</b> .....	<b>27</b>
<b>8.1</b>	<b>Vehicle brake test</b> .....	<b>27</b>
<b>8.2</b>	<b>Dynamometer wear test (friction couple)</b> .....	<b>27</b>
<b>8.3</b>	<b>Dynamic friction performance</b> .....	<b>27</b>
<b>8.4</b>	<b>In service assessment</b> .....	<b>27</b>
<b>9</b>	<b>Category C requirements</b> .....	<b>28</b>
<b>9.1</b>	<b>Metal pick up</b> .....	<b>28</b>
<b>9.2</b>	<b>Influence on track circuit operation (shuntage)</b> .....	<b>28</b>
<b>10</b>	<b>Environmental issues</b> .....	<b>28</b>
<b>10.1</b>	<b>General</b> .....	<b>28</b>
<b>10.2</b>	<b>Noise</b> .....	<b>28</b>
<b>10.3</b>	<b>Odour</b> .....	<b>29</b>
<b>10.4</b>	<b>Smoke, fumes and sparkling</b> .....	<b>29</b>
<b>10.5</b>	<b>Recycling and disposal</b> .....	<b>29</b>
<b>11</b>	<b>Marking</b> .....	<b>29</b>
<b>Annex A (normative) Summary of Dynamometer test programs and acceptance criteria</b> .....		<b>30</b>
<b>Annex B (normative) General requirements for conducting dynamometer test programmes</b> ....		<b>32</b>
<b>B.1</b>	<b>General</b> .....	<b>32</b>
<b>B.2</b>	<b>Rotation and ventilation conditions</b> .....	<b>32</b>
<b>B.3</b>	<b>Brake application timing <math>t_s</math></b> .....	<b>32</b>
<b>B.4</b>	<b>Bedding</b> .....	<b>32</b>
<b>B.5</b>	<b>Wear</b> .....	<b>32</b>
<b>B.6</b>	<b>Roughness index of the wheel tread</b> .....	<b>33</b>
<b>B.7</b>	<b>Interruption of the tests</b> .....	<b>33</b>
<b>B.8</b>	<b>Temperatures</b> .....	<b>33</b>
<b>B.9</b>	<b>Wet conditions</b> .....	<b>33</b>
<b>B.10</b>	<b>Test of simulation of downhill</b> .....	<b>34</b>
<b>B.11</b>	<b>Test wheels</b> .....	<b>34</b>
<b>Annex C (normative) Composite brake blocks (K) (2Bg – 2Bgu)- Demonstration of friction properties for S and SS (S/SS) – braked freight wagons (<math>v_{max} = 120</math> km/h)</b> .....		<b>35</b>
<b>C.1</b>	<b>Program for performance tests</b> .....	<b>35</b>
<b>C.2</b>	<b>Program for simulation brake assessment</b> .....	<b>41</b>
<b>C.3</b>	<b>Dispersion range of mean friction coefficients</b> .....	<b>42</b>
<b>C.4</b>	<b>Dispersion range of instantaneous friction coefficients</b> .....	<b>46</b>
<b>Annex D (normative) Composite brake blocks (LL) – Demonstration of friction properties for S and SS (S/SS) – braked freight wagons (<math>v_{max} = 120</math> km/h)</b> .....		<b>47</b>
<b>D.1</b>	<b>Program for performance tests</b> .....	<b>47</b>
<b>D.2</b>	<b>Program for simulation brake assessment</b> .....	<b>52</b>
<b>D.3</b>	<b>Dispersion range of mean friction coefficients</b> .....	<b>54</b>
<b>D.4</b>	<b>Dispersion range of instantaneous friction coefficients</b> .....	<b>56</b>

**SS-EN 16452:2015+A1:2019 (E)**

<b>Annex E (normative) Composite brake blocks (K) (1Bg)- Demonstration of friction properties for S and SS (S/SS) - braked freight wagons (<math>v_{max} = 120</math> km/h)</b> .....	<b>57</b>
<b>E.1 Program for performance tests</b> .....	<b>57</b>
<b>E.2 Dispersion range of mean friction coefficients</b> .....	<b>60</b>
<b>E.3 Dispersion range of instantaneous friction coefficients</b> .....	<b>62</b>
<b>Annex F (normative) Composite brake blocks (L) - Demonstration of friction properties for extra tread brake of coach</b> .....	<b>63</b>
<b>F.1 Program for performance tests</b> .....	<b>63</b>
<b>F.2 Program for simulation brake assessment</b> .....	<b>67</b>
<b>F.3 Dispersion range of mean friction coefficients in dry condition</b> .....	<b>68</b>
<b>F.4 Dispersion range of mean friction coefficients in wet condition</b> .....	<b>69</b>
<b>F.5 Dispersion range of instantaneous friction coefficients</b> .....	<b>70</b>
<b>Annex G (normative) Composite brake blocks (K) - Demonstration of friction properties for locomotives</b> .....	<b>72</b>
<b>G.1 Program for performance tests</b> .....	<b>72</b>
<b>G.2 Program for simulation brake assessment</b> .....	<b>76</b>
<b>G.3 Dispersion range of mean friction coefficients in dry condition</b> .....	<b>77</b>
<b>G.4 Dispersion range of mean friction coefficients in wet condition</b> .....	<b>78</b>
<b>G.5 Dispersion range of instantaneous friction coefficients</b> .....	<b>79</b>
<b>Annex H (normative) Composite brake blocks (K) - Demonstration of friction properties for EMU - DMU</b> .....	<b>81</b>
<b>H.1 Program for performance tests</b> .....	<b>81</b>
<b>H.2 Program for simulation brake assessment</b> .....	<b>86</b>
<b>H.3 Dispersion range of mean friction coefficients in dry condition</b> .....	<b>87</b>
<b>H.4 Dispersion range of mean friction coefficients in wet condition</b> .....	<b>88</b>
<b>H.5 Dispersion range of instantaneous friction coefficients</b> .....	<b>89</b>
<b>Annex I (normative) Composite brake blocks (K) - Demonstration of friction properties for High speed train (motor bogie)</b> .....	<b>91</b>
<b>I.1 Program for performance tests</b> .....	<b>91</b>
<b>I.2 Program for simulation brake assessment</b> .....	<b>94</b>
<b>I.3 Dispersion range of mean friction coefficients in dry condition</b> .....	<b>95</b>
<b>I.4 Dispersion range of mean friction coefficients in wet condition</b> .....	<b>97</b>
<b>I.5 Dispersion range of instantaneous friction coefficients</b> .....	<b>98</b>
<b>Annex J (A1) normative (A1) Dynamometer test program - Generic test program</b> .....	<b>100</b>
<b>J.1 General</b> .....	<b>100</b>
<b>J.2 Generic test program</b> .....	<b>100</b>
<b>J.3 Definitions</b> .....	<b>104</b>
<b>J.4 (A1) Values to be determined in order to define the area of use</b> .....	<b>104</b>



J.5	Ⓐ <sub>1</sub> Principle of assessment and pass/fail criteria .....	106
<b>Annex K (normative) Dynamometer Test program to detect the formation of metal pick-up at the brake block.....</b>		
K.1	Test program for freight wagons with brake blocks type K and LL .....	107
K.2	Test program for locomotives with brake blocks type K.....	109
K.3	Test program for EMU – DMU with brake blocks type K.....	112
K.4	Test program for High speed train with brake blocks type K .....	115
<b>Annex L (normative) Dynamometer test program to demonstrate the extreme winter braking properties .....</b>		
L.1	Test program for freight wagons with brake blocks type K.....	118
L.2	Test program for freight wagons with brake blocks type LL.....	120
L.3	Specific requirements for conducting Test Programs L.1 and L.2 .....	121
L.4	Process of assessment and past fail criteria for test programs L.1 and L.2.....	122
L.5	Generic flow chart to perform test program.....	123
L.6	Detailed flow chart to perform test program (example brake block K).....	124
<b>Annex M (normative) Test run to demonstrate the extreme winter braking properties brake blocks K – LL for freight wagons.....</b>		
M.1	Ⓐ <sub>1</sub> Test program to demonstrate the braking properties under severe snowy conditions.....	127
M.2	Values to be determined in order to define the area of use .....	130
M.3	Assessment of measurement data and pass/fail criteria.....	130
<b>Annex N (normative) Dynamometer Test program to simulate “Locked brake” .....</b>		
N.1	Test program for freight wagons with brake blocks type K and LL .....	132
N.2	Test program for locomotives with brake blocks type K.....	133
N.3	Test program for EMU – DMU with brake blocks type K.....	134
N.4	Test program for High speed train with brake blocks type K .....	135
<b>Annex O (normative) Dynamometer test program to demonstrate the compatibility with track circuits.....</b>		
O.1	General .....	136
O.2	Short description of the measuring method used.....	136
O.3	Schematic diagram of test set up.....	136
O.4	Flow chart to perform test program .....	138
O.5	Preparation of the disc and the rollers .....	138
O.6	Preparation of the samples of brake block .....	139
O.7	Contamination of disc .....	139
O.8	Measurements .....	140
O.9	Assessment of the results .....	141
<b>Annex P (informative) Vehicle test to demonstrate the compatibility with track circuits.....</b>		
		143

**SS-EN 16452:2015+A1:2019 (E)**

<b>P.1</b>	<b>General</b> .....	<b>143</b>
<b>P.2</b>	<b>Test conditions</b> .....	<b>143</b>
<b>P.3</b>	<b>Assessment of results</b> .....	<b>144</b>
<b>P.4</b>	<b>Pass/fail criteria</b> .....	<b>145</b>
<b>Annex Q (informative)</b>	<b>Dynamometer test program – Determination of static friction coefficient</b> .....	<b>147</b>
<b>Q.1</b>	<b>Ⓐ Generic test program for freight wagons with brake blocks type K and LL</b> .....	<b>147</b>
<b>Q.2</b>	<b>Ⓐ Specific test program for S and/or SS freight wagons with brake blocks type K and LL</b> Ⓐ.....	<b>147</b>
<b>Q.3</b>	<b>Test program for EMU – DMU and Locomotive with brake blocks type K</b> .....	<b>149</b>
<b>Q.4</b>	<b>Test program for High speed train with brake blocks type K</b> .....	<b>150</b>
<b>Q.5</b>	<b>Ⓐ Specific Requirements for conducting dynamometer test programmes Q.1 to Q.4</b> Ⓐ.....	<b>150</b>
<b>Annex R (informative)</b>	<b>Dynamometer test program – Simulation of service conditions for freight wagons</b> .....	<b>153</b>
<b>R.1</b>	<b>Simulation freight wagon with brake block type K 2Bgu</b> .....	<b>153</b>
<b>R.2</b>	<b>Simulation freight wagon with brake block type LL 2Bgu</b> .....	<b>155</b>
<b>Annex S (normative)</b>	<b>Interchangeability, rejection lugs and critical dimensions</b> .....	<b>158</b>
<b>Annex T (normative)</b>	<b>Brake block shear and flexural strength tests</b> .....	<b>161</b>
<b>T.1</b>	<b>General</b> .....	<b>161</b>
<b>T.2</b>	<b>Shear strength test</b> .....	<b>161</b>
<b>T.3</b>	<b>Flexural strength test</b> .....	<b>162</b>
<b>Annex U (normative)</b>	<b>Limitation of permissible mechanical damage of brake block</b> .....	<b>164</b>
<b>U.1</b>	<b>General</b> .....	<b>164</b>
<b>U.2</b>	<b>Cracked through to back-plate</b> .....	<b>164</b>
<b>U.3</b>	<b>Crumbling of the friction material</b> .....	<b>165</b>
<b>U.4</b>	<b>Metal pick-up</b> .....	<b>165</b>
<b>U.5</b>	<b>Detachment from back-plate</b> .....	<b>166</b>
<b>U.6</b>	<b>Cracks in the direction of wheel circumference</b> .....	<b>166</b>
<b>U.7</b>	<b>Detachment of the friction material</b> .....	<b>166</b>
<b>U.8</b>	<b>Interface with the brake block holder</b> .....	<b>167</b>
<b>Annex V (normative)</b>	<b>In service assessment of brake block</b> .....	<b>168</b>
<b>V.1</b>	<b>General</b> .....	<b>168</b>
<b>V.2</b>	<b>Freight wagon</b> .....	<b>168</b>
<b>V.3</b>	<b>Coach</b> .....	<b>169</b>
<b>V.4</b>	<b>Locomotive</b> .....	<b>169</b>
<b>V.5</b>	<b>EMU-DMU</b> .....	<b>170</b>
<b>V.6</b>	<b>High speed train</b> .....	<b>170</b>

**SS-EN 16452:2015+A1:2019 (E)**

<b>V.7</b>	<b>Description of areas to be monitored and additional measures.....</b>	<b>171</b>
<b>V.8</b>	<b>Pass/fail criteria .....</b>	<b>172</b>
<b>Annex W (informative)</b>	<b>Complementary definitions and abbreviations.....</b>	<b>173</b>
<b>Annex X (informative)</b>	<b>Brake block characterization test.....</b>	<b>175</b>
<b>Annex ZA (informative)</b>	<b>Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC aimed to be covered.....</b>	<b>176</b>
<b>Bibliography</b>	<b>.....</b>	<b>179</b>

## SS-EN 16452:2015+A1:2019 (E)

### Foreword

This document (EN 16452:2015+A1:2019) 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 September 2019, and conflicting national standards shall be withdrawn at the latest by September 2019.

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

This document includes Amendment 1 approved by CEN on 28 October 2018.

This document supersedes A1 EN 16452:2015 A1.

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

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 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

Compared to the previous edition, the following changes have been made:

- a) 7.3 "Static friction coefficient" has been modified;
- b) 7.4.2 "Dynamometer test" has been modified;
- c) 7.5.1 "Generic prescriptions" has been modified;
- d) 7.4.3 "Train brake test" has been modified;
- e) Annex A "Summary of Dynamometer test programs and acceptance criteria" has been modified;
- f) Annex J "Dynamometer test program – Generic test program" has been modified;
- g) Annex M "Test run to demonstrate the extreme winter braking properties brake blocks K – LL for freight wagons" has been modified;
- h) Annex Q "Dynamometer test program – Determination of static friction coefficient" has been modified;
- i) Annex T "Brake block shear and flexural strength tests" has been modified;
- j) Annex ZA has been updated.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **Introduction**

For environmental reasons (reduction of rolling noise), this European Standard does not cover cast iron brake block requirements, although cast iron brake block technology is still widely used in Europe. Cast iron has already been replaced by composite materials for new rolling stock builds and major steps have been taken by EEC (TSI) and UIC in 2004 to accelerate the change from cast iron to composite materials.

When published this European Standard will replace the current UIC requirements for technical approval of brake blocks. The requirements of this EN are based on the state of art form UIC leaflet and a European project "Euro Rolling Silently".

## SS-EN 16452:2015+A1:2019 (E)

### 1 Scope

This European Standard gives the requirements for the design, dimensions, performance, and testing of a brake block (otherwise known as brake shoe insert) that acts on the wheel tread as part of a tread brake system. This European Standard does not cover cast iron brake block requirements.

This European Standard is applicable to brake blocks of either “K”, “L”, or “LL” friction level designed to be fitted to tread braked rail vehicles.

This European Standard contains the requirements for interfacing the brake block with the rail vehicle, the testing procedures in order to confirm that it satisfies the basic safety and technical interchangeability requirements, the material control procedures to ensure product quality, reliability and conformity and considers health and environmental needs.

### 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 13452-1, *Railway applications — Braking — Mass transit brake systems — Part 1: Performance requirements*

EN 13452-2, *Railway applications — Braking — Mass transit brake systems — Part 2: Methods of test*

EN 13715, *Railway applications — Wheelsets and bogies — Wheels — Tread profile*

EN 13979-1:2003+A2:2011, *Railway applications — Wheelsets and bogies — Monobloc wheels — Technical approval procedure — Part 1: Forged and rolled wheels*

EN 14033-1, *Railway applications — Track — Railbound construction and maintenance machines — Part 1: Technical requirements for running*

EN 14033-2:2008+A1:2011, *Railway applications — Track — Railbound construction and maintenance machines — Part 2: Technical requirements for working*

EN 14198, *Railway applications — Braking — Requirements for the brake system of trains hauled by a locomotive*

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

EN 15179, *Railway applications — Braking — Requirements for the brake system of coaches*

EN 15313, *Railway applications — In-service wheelset operation requirements — In-service and off-vehicle wheelset maintenance*

EN 15663, *Railway applications — Definition of vehicle reference masses*

EN 15734-1, *Railway applications — Braking systems of high speed trains — Part 1: Requirements and definitions*

EN 15734-2, *Railway applications — Braking systems of high speed trains — Part 2: Test methods*

EN 16185-1, *Railway applications — Braking systems of multiple unit trains — Part 1: Requirements and definitions*

EN 16185-2, *Railway applications — Braking systems of multiple unit trains — Part 2: Test methods*

EN 50126-1, *Railway applications — The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) — Part 1: Basic requirements and generic process*

EN ISO 4287, *Geometrical product specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters (ISO 4287)*

EN ISO 4288, *Geometrical product specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture (ISO 4288)*

UIC 544-1, *Brakes — Braking power*

### **3 Terms and definitions**

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

#### **3.1**

##### **application parameter**

configuration parameters refer to vehicle mass, operating speed, wheel diameter, braked mass, brake block configuration, brake block force

#### **3.2**

##### **Bg configuration**

one brake block 320 mm per brake block holder

Note 1 to entry: Bg comes from UIC and means “Bremsklotzsohle geteilt”.

#### **3.3**

##### **Bgu configuration**

two brake blocks 250 mm per brake block holder

Note 1 to entry: Bgu comes from UIC and means “Bremse geteilt mit unterteilter Sohle”.

#### **3.4**

##### **brake block**

stator part of a tread brake adapted to generate a friction force when engaged with a wheel tread

#### **3.5**

##### **brake block force**

force with which the brake block is made to come into contact with the wheel tread

#### **3.6**

##### **friction material**

consumable portion of the brake block that acts on the wheel tread in order to provide the specified brake performance

## SS-EN 16452:2015+A1:2019 (E)

### 3.7

#### **coefficient of friction**

#### 3.7.1

##### **mean coefficient of friction**

coefficient of friction of the friction material, integrated over distance, for any one condition of braking

#### 3.7.2

##### **instantaneous coefficient of friction**

value of coefficient of friction of the friction material at any one instant

#### 3.7.3

##### **static coefficient of friction**

coefficient of friction achieved by the friction material at standstill at the point where relative movement between the block friction surface and wheel tread takes place

### 3.8

#### **K material**

friction material with a mean coefficient of friction of 0,25 to 0,30

### 3.9

#### **L material**

friction material with a mean coefficient of friction of 0,15 to 0,25

### 3.10

#### **LL material**

friction material with a mean coefficient of friction of 0,10 to 0,15

### 3.11

#### **EU-D Rolling stock**

rolling stock governed by the requirements of the European Directive 2008/57/EC

### 3.12

#### **metal pick-up**

damage to the brake block surface as a result of the interaction between the brake block and wheel tread

### 3.13

#### **non EU-D Rolling stock**

rolling stock not governed by the requirements of the European Directive 2008/57/EC

### 3.14

#### **brake block back plate**

element onto which the friction material is fixed, acting as the interface between the brake block and brake block holder

### 3.15

#### **track circuit**

integral part of certain signalling systems, the operation of which is essential to ensure the safe operation of the signalling system

### 3.16

#### **brake type**

classification term for air brakes as specified by the UIC in accordance with their action (G = Goods = slow-acting, P = Passenger = quick-acting)



## 4 Abbreviations

$m$	[t]	Mass to be braked per wheel (inclusive of the rotational masses)
$F_B$	[kN]	Nominal application force per wheel
$F_b$	[kN]	Instantaneous application force per wheel
$v$	[km/h]	Theoretical initial speed at the brake application initiation
$v_i$	[km/h]	Instantaneous speed
$v_3$	[km/h]	Final speed at the end of braking
$v_m$	[km/h]	Maximum service speed.
$\mu_a = \frac{F_{tR}}{F_b}$	[-]	Instantaneous friction coefficient (brake block): The instantaneous friction coefficient $\mu_a$ specified at every instance of the braking time by the ratio between the total brake force $F_{tR}$ and the total application force $F_b$
$\mu_m = \frac{1}{s_2} \cdot \int_0^{s_2} \mu_a \cdot ds$	[-]	Mean friction coefficient: the mean friction coefficient $\mu_m$ integrated over the time from where 95 % of the nominal application force $F_B$ is reached over the stopping distance $s_2$
$\theta_0$	[°C]	Mean initial temperature at the beginning of the brake application
$s_2$	[m]	Stopping distance from the moment on when $F_b = 0,95 \cdot F_B$ to rest
$R_z$	[ $\mu\text{m}$ ]	Surface roughness (maximum height of profile)
$d$	[mm]	Diameter of wheel
$e$	[mm]	Flange thickness
$h$	[mm]	Flange height
$qR$	[mm]	Distance between flange angle
$a_1$	[mm]	Back-to-back distance between wheels
$P$	[-]	Brake type – $P$ = passenger

## 5 Overall requirements

### 5.1 Deviations from requirements

If deviating from some points of the requirements of this standard for a particular assessment, these deviations shall be reported and explained. The influence on the assessment of the brake block in terms of the acceptance criteria shall be evaluated and recorded. The outcome of this study shall be considered as an integral part of the requirements of this standard when applied to the assessment process of the brake block.

### 5.2 Functions

The brake block is to be used as part of the friction brake of a vehicle. It shall provide the performance specified, in terms of stopping distance for instance, and in doing so shall fulfil the following requirements:

- create a braking moment or torque;

## **SS-EN 16452:2015+A1:2019 (E)**

- facilitate, by frictional engagement with a wheel tread, the conversion into heat of the kinetic and potential energy involved in retarding the vehicle or vehicles which is/are attributed to the use of the tread brake;
- act as part of a holding or parking brake by frictional engagement with a wheel tread.

In achieving the above requirements, the brake block and the wheel shall not suffer damage or degradation other than normal wear and tear.

The brake block shall be considered along with the wheel tread as a friction pair.

### **5.3 Operational criteria**

#### **5.3.1 Friction material performance**

The design and manufacture of the brake block shall, for all intended operating conditions and vehicle rescue and recovery conditions, take into account the following criteria for friction material performance:

- all levels of stopping and slowing distances and immobilization braking specified;
- all levels of retardation specified;
- the initial speed of braking for the vehicle in question;
- the braked mass, in tare and laden conditions;
- the quantity of brake energy to be converted and its rate of conversion and dissipation;
- the range of specific pressure of the brake block friction surface on the wheel tread;
- the form and condition of the wheel tread;
- the type of material used in the manufacture of the wheel tread;
- the temperature of the wheel tread;
- the deformation of the wheel under thermal load;
- friction property variation as a function of brake block and wheel tread bedding and conditioning thereafter;
- friction property variation as a function of brake block and wheel tread according to various climatic conditions;
- signalling performance from the interaction of brake block, wheel and rail.

#### **5.3.2 Service performance**

The design and manufacture of the brake block shall, for all intended operating conditions and vehicle rescue and recovery conditions, take into account the following criteria for service performance:

- the need to prevent the detachment of any part of the friction material from the brake block back plate throughout its useable thickness;

- unless specifically permitted, the friction material shall be capable of being worn down to a thickness of 10 mm at the thinnest point excluding the back plate, without mechanical degradation of the friction material or the back plate coming into contact with the wheel tread;
- the need to allow interchangeability between brake blocks of the same friction characteristics, and to avoid interchangeability between brake blocks of different friction characteristics;
- the integrity and wear rate of the brake block friction material and wheel tread;
- the need to prevent permanent deformation of the brake block back plate throughout the useable thickness of the friction material;
- the need to comply with environmental and health requirements.

### **5.3.3 Brake block characteristics**

In order to comply with the above requirements the performance of the brake block shall be determined using the test methods described below.

According to proven experience, past certification of the brake block being considered, and function of the application being considered, test obligations and acceptance criteria are provided in Table 1 and Table 2 in 6.2.

The main characteristics to be assessed are as follows:

- brake block design;
- instantaneous and mean dynamic friction coefficients;
- static friction coefficient;
- wet friction behaviour;
- metal pickup formation behaviour;
- behaviour under conditions simulating a locked brake, with an applied braking force;
- brake block and wheel tread wear at different loads and service braking conditions;
- friction behaviour under severe winter conditions;
- influence on signalling systems (shuntage);
- brake block material properties.

## **6 Acceptance procedure**

### **6.1 Brake block performance requirements**

#### **6.1.1 General**

The following tests (categories A, B and C) should be conducted and are intended to provide an evaluation of the capability of the brake block to operate under the duty level applicable to the application being considered, and are designated as follows: