

# DIN EN 15328:2024-06 (E)

## Railway applications - Braking - Brake pads (includes Amendment :2024)

---

<b>Contents</b>	<b>Page</b>
European foreword.....	5
Introduction .....	7
1 Scope.....	8
2 Normative references.....	8
3 Terms and definitions .....	9
4 Symbols and abbreviations .....	10
5 Characteristics and test method of the brake pads .....	11
5.1 Classification of brake pads.....	11
5.2 Coefficient of friction .....	11
5.3 Environmental impact, health and safety .....	11
5.4 Usage requirements .....	11
5.5 Frictional requirements for brake pads .....	11
5.5.1 General.....	11
5.5.2 Priority levels of brake applications.....	12
5.5.3 Criteria for the nominal line .....	12
5.5.4 Criteria for the mean coefficient of friction.....	12
5.5.5 Criteria for continuous brake applications .....	13
5.5.6 Criteria for bedding brake applications .....	13
5.6 Requirements and optional test programs for brake pads for coaches.....	14
5.6.1 General.....	14
5.6.2 Tolerance ranges.....	14
5.6.3 Criteria for continuous brake applications .....	14
5.6.4 Criteria for bedding brake applications .....	14
5.6.5 Coefficient of friction under high thermal load.....	14
5.6.6 Coefficient of friction under wet conditions.....	14
5.7 Geometrical features of the brake pads.....	15
5.7.1 Brake pad shape .....	15
5.7.2 Brake pad wear .....	15
5.7.3 Brake pad fixing.....	15
5.8 Mechanical, physical and chemical characteristics .....	15
5.9 Thermal and mechanical requirements .....	17
5.10 In-service assessment.....	17
5.11 Marking of brake pads.....	17
5.12 Dynamometer tests .....	17
5.13 Conditions for classification tests .....	18
5.13.1 Classification scheme for locomotives, MUs, high-speed trains, freight wagon and coaches.....	18
5.13.2 Optional classification scheme for coaches .....	20
5.13.3 Validity of assessment.....	20
5.13.4 Scope of classification.....	20
5.14 Interchangeability of brake pads .....	20
Annex A (normative) Generic conditions for the execution of test programs .....	21
A.1 General.....	21
A.2 Response time .....	21

<b>A.3</b>	<b>Weighing</b> .....	<b>21</b>
<b>A.4</b>	<b>Interruption of test sequence</b> .....	<b>21</b>
<b>A.5</b>	<b>Temperatures</b> .....	<b>21</b>
<b>A.6</b>	<b>Brake applications under wet conditions</b> .....	<b>21</b>
<b>A.7</b>	<b>Conditioning of brake discs</b> .....	<b>22</b>
<b>A.7.1</b>	<b>General</b> .....	<b>22</b>
<b>A.7.2</b>	<b>Conditioning program</b> .....	<b>23</b>
<b>A.7.3</b>	<b>Roughness measurement</b> .....	<b>23</b>
<b>A.8</b>	<b>Bedding-in of brake pads</b> .....	<b>23</b>
<b>A.9</b>	<b>Methods of temperature measurements</b> .....	<b>24</b>
<b>A.10</b>	<b>Mean friction radius</b> .....	<b>24</b>
<b>A.11</b>	<b>Rotation and ventilation conditions</b> .....	<b>24</b>
<b>Annex B (normative) Test programs for classes A1 to G1</b> .....		<b>25</b>
<b>B.1</b>	<b>Test program: brake pads of class A1</b> .....	<b>25</b>
<b>B.2</b>	<b>Test program: brake pads of classes B1 and C1</b> .....	<b>27</b>
<b>B.3</b>	<b>Test Program: brake pads of classes B2 and C2</b> .....	<b>32</b>
<b>B.4</b>	<b>Test program: brake pads of class C0</b> .....	<b>37</b>
<b>B.5</b>	<b>Test program: brake pads of class C3</b> .....	<b>39</b>
<b>B.6</b>	<b>Test program: brake pads of class D1</b> .....	<b>42</b>
<b>B.7</b>	<b>Test program: brake pads of class D2</b> .....	<b>45</b>
<b>B.8</b>	<b>Test program: brake pads of class E1</b> .....	<b>49</b>
<b>B.9</b>	<b>Test program: brake pads of class F1</b> .....	<b>51</b>
<b>B.10</b>	<b>Test program: brake pads of classes F2 and G1</b> .....	<b>55</b>
<b>B.11</b>	<b>Test program: brake pads of class F3</b> .....	<b>57</b>
<b>B.12</b>	<b>Assessment of static friction coefficient</b> .....	<b>60</b>
<b>Annex C (normative) Test programs for coaches</b> .....		<b>61</b>
<b>C.1</b>	<b>Test program S1.1 (<math>v_{max} = 200</math> km/h – organic brake pads)</b> .....	<b>61</b>
<b>C.2</b>	<b>Test program S2.1 (wet test)</b> .....	<b>64</b>
<b>C.3</b>	<b>Instantaneous coefficient of friction for test program S1.1, S2.1, T1 and T2</b> .....	<b>64</b>
<b>C.4</b>	<b>Mean coefficient of friction for test programs S1.1, S2.1, T1 and T2</b> .....	<b>65</b>
<b>C.5</b>	<b>Test program T1 (<math>v_{max} = 200</math> km/h – sintered brake pads)</b> .....	<b>66</b>
<b>C.6</b>	<b>Test program T2 wet test (sintered brake pads)</b> .....	<b>69</b>
<b>Annex D (normative) Documentation of brake tests</b> .....		<b>70</b>
<b>Annex E (normative) Generic test programs for locomotives, MUs and high speed trains</b> .....		<b>72</b>
<b>E.1</b>	<b>Use of the generic test programs</b> .....	<b>72</b>
<b>E.2</b>	<b>Locomotives and MUs</b> .....	<b>72</b>

E.2.1	Test parameters.....	72
E.2.2	Brake steps .....	75
E.2.3	Masses .....	76
E.2.4	Continuous brake applications .....	76
E.3	High speed trains .....	76
E.3.1	Test parameters.....	76
E.3.2	Brake steps .....	78
E.3.3	Masses .....	79
E.3.4	Brake forces for high-speed brake applications.....	79
E.3.5	Power for continuous brake applications.....	80
Annex F (normative) Brake pads shapes and envelopes .....		81
F.1	General.....	81
F.2	Preferred space envelope for SBP 200 cm <sup>2</sup> .....	81
F.3	Preferred space envelope for SBP 175 cm <sup>2</sup> .....	82
F.4	Space envelope for SBP 200 cm <sup>2</sup> .....	83
F.5	Maximum Space envelope for SBP 175 cm <sup>2</sup> .....	83
Annex G (normative) Drawings for dove tails.....		84
Annex H (informative) In-service test .....		86
H.1	Test requirements .....	86
H.2	Mechanical requirements .....	86
H.3	Thermal requirements.....	87
Annex I (informative) Example of the declaration of conformity.....		88
Bibliography.....		89