

# DIN EN 15551:2017-05 (E)

## Railway applications - Railway rolling stock - Buffers

---

<b>Contents</b>		<b>Page</b>
European foreword .....		7
Introduction .....		9
<b>1</b>	<b>Scope .....</b>	<b>10</b>
<b>2</b>	<b>Normative references .....</b>	<b>10</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>11</b>
<b>4</b>	<b>Classification and designation .....</b>	<b>14</b>
4.1	General .....	14
4.2	Buffers with buffer stroke 105 mm (Categories A, B and C) .....	14
4.3	Buffers with buffer stroke 110 mm .....	14
4.4	Long stroke buffer 150 mm .....	14
4.5	Crashworthy Buffers .....	15
4.6	Interaction coupling/buffer .....	15
<b>5</b>	<b>Requirements .....</b>	<b>15</b>
5.1	General .....	15
5.2	Fixing on vehicle and interchangeability .....	17
5.3	Buffer dimensions .....	18
5.4	Mechanical characteristics of buffers .....	19
5.5	Elastic systems .....	20
5.5.1	Types of elastic systems .....	20
5.5.2	Static characteristics .....	21
5.5.3	Dynamic characteristics .....	22
5.5.4	Type testing .....	22
5.6	Marking .....	22
<b>6</b>	<b>Housing .....</b>	<b>24</b>
6.1	Plunger and base .....	24
6.2	Buffer head .....	24
6.2.1	Materials .....	24
6.2.2	Boundary dimensions .....	24
6.2.3	Standard dimensions of buffer head .....	25
6.3	Type and series tests .....	26
<b>7</b>	<b>Crashworthy buffers .....</b>	<b>28</b>
7.1	On wagons .....	28
7.2	On other vehicles .....	28
<b>Annex A (normative)</b>	<b>Maximum space envelope of buffer .....</b>	<b>29</b>
<b>A.1</b>	<b>Requirements for space envelope of buffer .....</b>	<b>29</b>
A.1.1	Buffers for freight wagons .....	29
A.1.2	Buffers for coaches .....	32
<b>A.2</b>	<b>Notes on the definition of envelopes for overall dimensions of Buffers for freight wagons .....</b>	<b>33</b>
A.2.1	General .....	33
A.2.2	Study relating to definition of the envelope .....	34

<b>Annex B (normative) Mechanical characteristics of buffers - Test methods</b> .....	<b>36</b>
<b>B.1 General</b> .....	<b>36</b>
<b>B.2 Test methodology</b> .....	<b>36</b>
<b>B.2.1 General</b> .....	<b>36</b>
<b>B.2.2 Force F1</b> .....	<b>37</b>
<b>B.2.3 Force F2</b> .....	<b>37</b>
<b>B.2.4 Force F3</b> .....	<b>37</b>
<b>B.2.5 Force F4</b> .....	<b>37</b>
<b>B.2.6 Force F5</b> .....	<b>37</b>
<b>B.2.7 Force F6</b> .....	<b>38</b>
<b>B.3 Test documentation</b> .....	<b>38</b>
<b>Annex C (normative) Requirements for elastic systems</b> .....	<b>40</b>
<b>C.1 Rubber elastomer or other elastomer elastic systems</b> .....	<b>40</b>
<b>C.1.1 General</b> .....	<b>40</b>
<b>C.1.2 Metal inserts</b> .....	<b>40</b>
<b>C.1.3 Constituents of rubber elastomer and/or other elastomer systems</b> .....	<b>40</b>
<b>C.1.4 Static characteristics of the sets</b> .....	<b>42</b>
<b>C.1.5 Dynamic characteristics of the sets</b> .....	<b>42</b>
<b>C.1.6 Bonding</b> .....	<b>42</b>
<b>C.1.7 Marking</b> .....	<b>42</b>
<b>C.1.8 Inspection and tests</b> .....	<b>42</b>
<b>C.2 Friction spring/ring spring</b> .....	<b>44</b>
<b>C.2.1 Manufacturer's marks</b> .....	<b>44</b>
<b>C.2.2 Flexibility test</b> .....	<b>44</b>
<b>C.2.3 Endurance test</b> .....	<b>45</b>
<b>C.2.4 Static characteristics for friction spring/ring spring</b> .....	<b>45</b>
<b>C.2.5 Dynamic characteristics for friction spring/ring spring</b> .....	<b>45</b>
<b>C.3 Hydrodynamic or hydrostatic systems</b> .....	<b>45</b>
<b>C.3.1 General</b> .....	<b>45</b>
<b>C.3.2 Absorbing energy medium</b> .....	<b>46</b>
<b>C.3.3 Static tests of capsules</b> .....	<b>46</b>
<b>C.4 Combined elastic systems</b> .....	<b>46</b>
<b>Annex D (normative) Testing of static characteristics of buffers</b> .....	<b>47</b>
<b>D.1 Test principle</b> .....	<b>47</b>
<b>D.2 Test procedure</b> .....	<b>47</b>
<b>D.3 Measurements</b> .....	<b>47</b>
<b>Annex E (normative) Dynamic testing</b> .....	<b>48</b>
<b>E.1 Dynamic testing of buffer</b> .....	<b>48</b>
<b>E.1.1 General</b> .....	<b>48</b>
<b>E.1.2 Temperature effects</b> .....	<b>50</b>
<b>E.2 Dynamic characteristics of 105 mm stroke buffer</b> .....	<b>50</b>
<b>E.2.1 Test programme</b> .....	<b>50</b>
<b>E.2.2 Category A</b> .....	<b>52</b>
<b>E.2.3 Category B</b> .....	<b>52</b>
<b>E.2.4 Category C</b> .....	<b>53</b>
<b>E.2.5 Comments on the test conditions</b> .....	<b>53</b>
<b>E.3 Dynamic characteristics of 150 mm stroke buffer</b> .....	<b>53</b>
<b>E.3.1 General</b> .....	<b>53</b>
<b>E.3.2 Comments on test conditions</b> .....	<b>54</b>
<b>E.4 Dynamic characteristics of 110 mm stroke buffer</b> .....	<b>55</b>
<b>Annex F (normative) Endurance testing under service load for elastic system</b> .....	<b>56</b>
<b>F.1 Aim of the test</b> .....	<b>56</b>
<b>F.2 Test principle</b> .....	<b>56</b>

F.3	Test results to be obtained .....	56
F.4	Test procedure .....	57
F.4.1	Endurance test assembly .....	57
F.4.2	Preliminary static test .....	57
F.4.3	Endurance test .....	58
F.4.4	Final static test .....	58
<b>Annex G (normative) Endurance testing under buffing load for life-cycle simulation .....</b>		<b>59</b>
G.1	Endurance tests for elastic systems for wagons .....	59
G.1.1	Aim of the test .....	59
G.1.2	Test principle .....	59
G.1.3	Test results to be obtained .....	59
G.1.4	Test procedure .....	59
G.1.5	Delivery of elastic systems .....	61
G.2	Endurance tests for elastic systems for coaches .....	62
G.2.1	General .....	62
G.2.2	Tests under alternating loads .....	62
G.2.3	Repeated buffing tests .....	63
G.2.4	Conditions to be observed .....	63
<b>Annex H (informative) Guidelines for buffer head materials .....</b>		<b>64</b>
H.1	Example of test program requirements for verification of buffer head materials .....	64
H.2	Buffer head materials .....	65
<b>Annex I (normative) Calculation of the width of buffer heads .....</b>		<b>67</b>
I.1	General .....	67
I.1.1	Introduction .....	67
I.1.2	Comments on the preparation of the formulae in this annex .....	67
I.1.3	Track .....	67
I.1.4	Vehicle .....	67
I.2	Data used in the calculation .....	68
I.3	Calculation .....	68
<b>Annex J (normative) Crashworthy buffers for tank wagons .....</b>		<b>72</b>
J.1	Requirements on crashworthy buffers .....	72
J.1.1	Objectives .....	72
J.1.2	Additional requirements .....	72
J.2	Test procedure for crashworthy buffers .....	72
<b>Annex K (normative) Maximum space envelope of crashworthy buffers .....</b>		<b>74</b>
<b>Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC .....</b>		<b>77</b>
<b>Bibliography .....</b>		<b>80</b>
<b>Figures Figure 1 -- Force-stroke diagram for stored and absorbed energy .....</b>		<b>13</b>
<b>Figure 2 -- Mounting of buffers with non-metallic insert or head (top view for freight wagons) .....</b>		<b>17</b>
<b>Figure 3 -- Fixing dimensions of 105 mm and 150 mm stroke buffers for interchangeability .....</b>		<b>18</b>
<b>Figure 4 -- Points of application of forces .....</b>		<b>20</b>
<b>Figure 5 -- Location of the mark .....</b>		<b>22</b>
<b>Figure 6 -- Marking .....</b>		<b>23</b>

<b>Figure 7 -- Boundary dimensions and minimum surface of buffer heads .....</b>	<b>25</b>
<b>Figure A.1 -- Dimension of the maximum space envelope of buffer - Side view .....</b>	<b>29</b>
<b>Figure A.2 -- Cross section A - A .....</b>	<b>30</b>
<b>Figure A.3 -- Cross section B - B .....</b>	<b>30</b>
<b>Figure A.4 -- Cross section C - C .....</b>	<b>30</b>
<b>Figure A.5 -- Cross section D - D .....</b>	<b>31</b>
<b>Figure A.6 -- Cross section E - E .....</b>	<b>31</b>
<b>Figure A.7 -- Cross section F - F .....</b>	<b>32</b>
<b>Figure A.8 -- Dimension of the buffer: Cross sections G - G, H - H, K - K and L - L .....</b>	<b>32</b>
<b>Figure A.9 -- Dimension of the maximum space envelope of buffer for coaches - Side view .....</b>	<b>33</b>
<b>Figure B.1 -- Location of measurement .....</b>	<b>36</b>
<b>Figure B.2 -- Tool for application of force F3 .....</b>	<b>37</b>
<b>Figure F.1 -- Definition of heights .....</b>	<b>56</b>
<b>Figure F.2 -- Representation of the stored energy .....</b>	<b>57</b>
<b>Figure F.3 -- Endurance test under service load .....</b>	<b>58</b>
<b>Figure G.1 -- Determination of the buffer strokes for endurance test .....</b>	<b>60</b>
<b>Figure I.1 -- The position of the bogie vehicles in the track .....</b>	<b>70</b>
<b>Figure I.2 -- The position of the other vehicles (non bogie vehicles) in the track .....</b>	<b>71</b>
<b>Figure K.1 -- Dimension of the maximum space of the buffer .....</b>	<b>74</b>
<b>Figure K.2 -- Cross section A - A .....</b>	<b>75</b>
<b>Figure K.3 -- Cross section B - B .....</b>	<b>75</b>
<b>Figure K.4 -- Cross section C - C .....</b>	<b>75</b>
<b>Figure K.5 -- Cross section D - D .....</b>	<b>76</b>
<b>Figure K.6 -- Dimension of the buffer: Cross section E - E, F - F, G - G and H - H .....</b>	<b>76</b>
<b>Tables Table 1 -- Buffer stroke 105 mm .....</b>	<b>14</b>
<b>Table 2 -- Testing on buffers or their components .....</b>	<b>16</b>
<b>Table 3 -- Buffer dimensional characteristics .....</b>	<b>18</b>
<b>Table 4 -- Proof loads for buffers .....</b>	<b>19</b>
<b>Table 5 -- Static characteristics .....</b>	<b>21</b>
<b>Table 6 -- Standard widths of buffer heads .....</b>	<b>26</b>
<b>Table 7 -- Type and series tests .....</b>	<b>27</b>

<b>Table B.1 -- Measurement protocol (example)</b> .....	<b>39</b>
<b>Table C.1 -- Characteristics of the constituents</b> .....	<b>40</b>
<b>Table C.2 -- Nature of inspections and tests</b> .....	<b>43</b>
<b>Table C.3 -- Number of flexibility tests per batch of springs</b> .....	<b>45</b>
<b>Table C.4 -- Characteristics of absorbing energy medium</b> .....	<b>46</b>
<b>Table E.1 -- Standard high-sided open wagon</b> .....	<b>48</b>
<b>Table E.2 -- Characteristics and requirements with regard to both the test set-up and measuring and technical assessment</b> .....	<b>49</b>
<b>Table E.3 -- Wagons - Buffers with a stroke of 105 mm, Definition of dynamic tests</b> .....	<b>51</b>
<b>Table E.4 -- Definition of dynamic tests</b> .....	<b>54</b>
<b>Table E.5 -- Dynamic characteristics of 110 mm stroke buffers</b> .....	<b>55</b>
<b>Table G.1 -- Hydrodynamic buffers</b> .....	<b>62</b>
<b>Table G.2 -- Hydrostatic buffers</b> .....	<b>62</b>
<b>Table H.1 -- Verification of buffer head materials</b> .....	<b>64</b>
<b>Table H.2 -- List of selection of existing buffer head materials</b> .....	<b>66</b>
<b>Table I.1 -- Vehicle specification and valid methodology</b> .....	<b>69</b>
<b>Table ZA.1 -- Correspondence between this European Standard, the Commission Regulation concerning the technical specification for interoperability relating to the subsystem 'rolling stock - freight wagons' of the rail system in the European Union and repealing Commission Decision 2006/861/EC, as amended by Commission Regulation (EU) 2015/924 (published in the Official Journal L 150, 17.06.2015, p.10); and Directive 2008/57/EC</b> .....	<b>78</b>
<b>Table ZA.2 -- Correspondence between this European Standard, the Commission regulation (EU) No 1302/2014 of 18 November 2014 concerning the technical specification for interoperability relating to the 'rolling stock locomotives and passenger rolling stock' of the rail system in the European Union (published in the Official Journal L 356, 12.12.2014, p.228) and Directive 2008/57/EC</b> .....	<b>79</b>