



**NSAI**  
Standards

Irish Standard  
I.S. EN 15551:2017

# Railway applications - Railway rolling stock - Buffers

**I.S. EN 15551:2017**

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

*This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):*

*NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.*

*This document is based on:*

EN 15551:2017

*Published:*

2017-01-11

*This document was published under the authority of the NSAI and comes into effect on:*

2017-01-30

ICS number:

45.060.01

NOTE: If blank see CEN/CENELEC cover page

NSAI  
1 Swift Square,  
Northwood, Santry  
Dublin 9

T +353 1 807 3800  
F +353 1 807 3838  
E standards@nsai.ie  
W NSAI.ie

Sales:  
T +353 1 857 6730  
F +353 1 857 6729  
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

## National Foreword

I.S. EN 15551:2017 is the adopted Irish version of the European Document EN 15551:2017, Railway applications - Railway rolling stock - Buffers

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with this document does not of itself confer immunity from legal obligations.**

*In line with international standards practice the decimal point is shown as a comma (,) throughout this document.*

This page is intentionally left blank

EUROPEAN STANDARD

EN 15551

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2017

ICS 45.060.01

Supersedes EN 15551:2009+A1:2010

English Version

## Railway applications - Railway rolling stock - Buffers

Applications ferroviaires - Matériel roulant ferroviaire  
- Tampons

Bahnanwendungen - Schienenfahrzeuge - Puffer

This European Standard was approved by CEN on 24 September 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

<b>Contents</b>	<b>Page</b>
European foreword.....	7
Introduction .....	9
1 Scope.....	10
2 Normative references.....	10
3 Terms and definitions .....	11
4 Classification and designation.....	14
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
5 Requirements .....	15
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
6 Housing.....	24
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
7 Crashworthy buffers .....	28
7.1 On wagons.....	28
7.2 On other vehicles.....	28
Annex A (normative) Maximum space envelope of buffer .....	29
A.1 Requirements for space envelope of buffer .....	29
A.1.1 Buffers for freight wagons .....	29
A.1.2 Buffers for coaches .....	32
A.2 Notes on the definition of envelopes for overall dimensions of Buffers for freight wagons .....	33
A.2.1 General.....	33
A.2.2 Study relating to definition of the envelope.....	34
Annex B (normative) Mechanical characteristics of buffers – Test methods .....	36
B.1 General.....	36

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

## EN 15551:2017 (E)

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
Annex G (normative)	Endurance testing under buffing load for life-cycle simulation.....	59
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
Annex H (informative)	Guidelines for buffer head materials .....	64
H.1	Example of test program requirements for verification of buffer head materials .....	64
H.2	Buffer head materials.....	65
Annex I (normative)	Calculation of the width of buffer heads.....	67
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
Annex J (normative)	Crashworthy buffers for tank wagons.....	72
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
Annex K (normative)	Maximum space envelope of crashworthy buffers.....	74
Annex ZA (informative)	Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC .....	77
Bibliography	.....	80
Figures		
Figure 1	— Force-stroke diagram for stored and absorbed energy .....	13
Figure 2	— Mounting of buffers with non-metallic insert or head (top view for freight wagons).....	17
Figure 3	— Fixing dimensions of 105 mm and 150 mm stroke buffers for interchangeability .....	18
Figure 4	— Points of application of forces.....	20
Figure 5	— Location of the mark.....	22
Figure 6	— Marking .....	23



<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</b>	
<b>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>

## EN 15551:2017 (E)

<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>

## European foreword

This document (EN 15551:2017) 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 July 2017 and conflicting national standards shall be withdrawn at the latest by July 2017.

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

This document supersedes EN 15551:2009+A1:2010.

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.

NOTE After the publication of EN 16839, *Railway applications — Rolling stock — Head stock layout*, as a European Standard, the overlapping content and all items not pertinent to the product "Buffer" will be removed from this document.

Compared with EN 15551:2009+A1:2010, the following main changes have been done:

- a) the "Introduction" was checked upon and revised;
- b) Clause 1 "Scope" was revised;
- c) Clause 2 "Normative references" as well the final "Bibliography" were checked upon and revised;
- d) Clause 3 was modified:
  - 1) damping (3.11) was deleted and the calculation of damping in 3.8;
  - 2) definitions of stored energy and absorbed energy for static and dynamic condition were added as 3.12 to 3.15;
  - 3) the term "technical specification" was added as 3.16;
- e) the term "elastic device" was replaced by "elastic system";
- f) the classification of crashworthy buffers was added as new Subclause 4.5;
- g) tests for type tests and series tests were defined in the new Table 2 and modified in Table 7;
- h) the static requirements in Table 5 have been changed;
- i) Table C.2 "Nature of inspection and tests" was revised;

**EN 15551:2017 (E)**

- j) for friction and ring springs the two Subclauses C.2.4 "Static characteristics" and C.2.5 "Dynamic characteristics" were added;
- k) Annex E was revised with the specification of the high sided test wagons;
- l) Table H.1 was revised and new materials were added;
- m) Annex I was modified to be analogous to prEN 16839 (this annex will be deleted after EN 16839 is published);
- n) in Annex J, the test for crashworthy buffers was modified;
- o) the following figures were modified:
  - 1) Figure 1 — Force-stroke diagram for stored and absorbed energy;
  - 2) Figure 2 — Mounting of buffers with non metallic inserts or heads;
  - 3) Figure 6 — Marking;
  - 4) Figure 7 — Boundary dimensions and minimum surface of buffer heads;
  - 5) Figure A.1 — Dimension of the maximum space envelope of buffer – Side view;
  - 6) Figure B.1 — Location of measurement;
  - 7) Figure K.1 — Dimension of the maximum space of the buffer;
- p) editorial modifications were carried out.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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**

This European Standard is based on UIC 526-1, UIC 526-3, UIC 527-1, UIC 528, UIC 573, UIC 827-1 and UIC 827-2.

## EN 15551:2017 (E)

### 1 Scope

This European Standard defines the requirements for buffers with 105 mm, 110 mm and 150 mm stroke for vehicles or units which use buffers and screw coupling. It covers the functionality, interfaces and testing procedures, including pass fail criteria, for buffers.

NOTE 1 Typically, buffers with a stroke of 105 mm are used on freight wagons and locomotives, buffers with a stroke of 110 mm are used on coaches and locomotives and buffers with a stroke of 150 mm are used on freight wagons.

It defines the different categories of buffers, the space envelope, static and dynamic characteristics and energy absorption.

It includes a calculation method to determine the minimum size of the buffer head to avoid override between buffers.

It defines the static and dynamic characteristics of the elastic systems.

It also defines the requirements for buffers with integrated crash elements (crashworthy buffers) for tank wagons for dangerous goods.

The requirements of this European Standard also apply to buffers of locomotives and passenger coaches which need to meet the crashworthiness requirements of EN 15227 for normal service only. The properties for the energy absorbing function are defined in EN 15227 and the requirements specified in Clause 7 for tank wagons for dangerous goods are not applicable to the buffers of these locomotives and passenger coaches.

Diagonal buffers are excluded from this European Standard.

For the crashworthy buffers of locomotives, cab cars or passenger coaches according to EN 15227, and tank wagons for dangerous goods or buffers which form part of a combined system consisting of a special buffer and a deformation element, interchangeability with freight wagon buffers is not required, and therefore the requirements of 5.2 (Fixing on vehicle and interchangeability), 5.3 (Buffer dimensions) do not apply, those of 5.4 (Mechanical characteristics of buffers) and 5.6 (Marking) apply with restrictions.

NOTE 2 For tank wagon subjected to dangerous goods regulation, see [35].

### 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 1370, *Founding — Examination of surface condition*

EN 10025-2, *Hot rolled products of structural steels — Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10168, *Steel products — Inspection documents — List of information and description*

EN 10204, *Metallic products — Types of inspection documents*

EN 10243-1, *Steel die forgings — Tolerances on dimensions — Part 1: Drop and vertical press forgings*

EN 12663 (all parts), *Railway applications — Structural requirements of railway vehicle bodies*

EN 15227, *Railway applications — Crashworthiness requirements for railway vehicle bodies*

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-