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BSI Standards Publication

Railway applications — Crashworthiness requirements for rail vehicles

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National foreword

This British Standard is the UK implementation of EN 15227:2020. It supersedes BS EN 15227:2008+A1:2010, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RAE/3/-/11, Railway Applications - Structural requirements and Welding.

A list of organizations represented on this committee can be obtained on request to its secretary.

The UK committee draws users' attention to the distinction between normative and informative elements, as defined in Clause 3 of the CEN/CENELEC Internal Regulations, Part 3.

Normative: Requirements conveying criteria to be fulfilled if compliance with the document is to be claimed and from which no deviation is permitted.

Informative: Information intended to assist the understanding or use of the document. Informative annexes do not contain requirements, except as optional requirements, and are not mandatory. For example, a test method may contain requirements, but there is no need to comply with these requirements to claim compliance with the standard.

When speeds in km/h require unit conversion for use in the UK, users are advised to use equivalent values rounded to the nearest whole number. The use of absolute values for converted units should be avoided in these cases. Please refer to the table below for agreed conversion figures:

INS, RST and ENE speed conversions	
km/h	mph
5	3
10	5
20	10
30	20
80	50
160	100
190	120

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Published by BSI Standards Limited 2020

ISBN 978 0 580 85438 5

ICS 45.060.01

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 April 2020.

Amendments/corrigenda issued since publication

Date

Text affected

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EUROPÄISCHE NORM

April 2020

ICS 45.060.01

Supersedes EN 15227:2008+A1:2010

English Version

Railway applications - Crashworthiness requirements for rail vehicles

Applications ferroviaires - Exigences de sécurité contre collision pour véhicules ferroviaires

Bahnanwendungen - Anforderungen für die Kollisionssicherheit von Schienenfahrzeugen

This European Standard was approved by CEN on 10 February 2020.

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.

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 15227:2020) 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 October 2020, and conflicting national standards shall be withdrawn at the latest by October 2020.

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 supersedes EN 15227:2008+A1:2010.

This document has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2016/797/EU.

For relationship with EU Directive 2016/797/EU, see informative Annex ZA, which is an integral part of this document.

Additionally to a general editorial reordering of clauses and text the technical changes with respect to the previous edition are listed below:

- a) applicable vehicle types (1);
- b) modified definitions and examples for crashworthiness design categories (5.1);
- c) definition of train sets to be assessed (5.2);
- d) assessment of train set which is only operated in one direction (5.2);
- e) mandatory requirement of initial vertical offset for design collision scenario 1 for all crashworthiness design categories (5.4.1);
- f) new definition of collision mass in accordance with EN 15663 mass definitions (5.4.1);
- g) new requirements for locomotives with heavy duty couplers (5.4.2 and C.2);
- h) mandatory requirement for locomotives with centre cabs to fulfil design collision scenario 3 (5.4);
- i) additional design collision scenario for crashworthiness design category C-IV (5.4.5 and C.6);
- j) new requirement for support condition of side windows at vehicle ends (6.3.1);
- k) exclusion of gangways from survival space (6.3.2);
- l) mandatory requirement that the survival space for the driver shall be inside the cab (6.3.1);
- m) modified definition for driver's seat survival space envelopes (6.3.5);
- n) elimination of deceleration limits for design collision scenario 3 (6.4.1);

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- o) modified deceleration limits and modified deceleration assessment method for design collision scenarios 1 and 2 (6.4.1);
- p) modified requirement for obstacle deflectors with respect to gauge limits (6.5.1);
- q) new requirements for lifeguards (6.6);
- r) new requirement for tests of structures or components mounted at intermediate ends (B.1.1)
- s) modified obstacle geometry for design collision scenario 3 for crashworthiness design category C-III (C.3);
- t) modified reference train for coach design (D.4);
- u) new train definition for coach design limited to specific leading vehicles (D.5).
- v) alignment of terms and definitions to prEN 17343:2019.

If a vehicle has been successfully assessed using the previous edition of this standard, and the technical changes of the new edition of EN 15227 do not affect this assessment, the vehicle can be regarded to conform to the new standard. Otherwise, if the vehicle needs to be reassessed, it is sufficient to assess only the modified technical requirements and new requirements.

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.

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Introduction

The objective of the passive safety requirements described in this European Standard is to reduce the consequences of collision accidents. The measures considered in this European Standard provide the means of protection when all possibilities of preventing an accident have failed. It provides a framework for determining the crash conditions that rail vehicle bodies can be designed to withstand, based on the most common collisions and associated risks.

This European Standard adds to the basic strength requirement defined in EN 12663-1:2010+A1:2014 by setting additional requirements for structural passive safety in order to increase occupant safety in case of collisions.

In the event of a collision, application of this European standard provides protection for the occupants of new designs of crashworthy vehicles through the preservation of structural integrity, reducing the risk of overriding and limiting decelerations. This protection does not extend to interactions between the occupants and the vehicle interior or to occupants of other rail vehicles, to other railway employees and customers who are not in vehicles, or to third parties.

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1 Scope

This document specifies crashworthiness requirements applicable to new designs of:

- locomotives,
- driving vehicles operating in passenger and freight trains;
- passenger rail vehicles operating in passenger trains (such as trams, metros, mainline trains).

This document identifies common methods of providing passive safety that can be adapted to suit individual vehicle requirements.

This document specifies the characteristics of reference obstacle models for use with the design collision scenarios.

This document also specifies the requirements and methods for demonstrating that the passive safety objectives have been achieved by comparison with existing proven designs, numerical simulation, component or full-size tests, or a combination of all these methods.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12663-1:2010+A1:2014, *Railway applications - Structural requirements of railway vehicle bodies - Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons)*

EN 15663:2017+A1:2018, *Railway applications - Vehicle reference masses*

prEN 17343:2019, *Railway applications — General terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 17343:2019 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

active safety

systems and measures which take actions that aim to prevent a collision occurring

3.2

collision mass

effective vehicle mass used for collision simulations

3.3

collision speed

v_c

velocity difference between trains or train and obstacle at the start of the collision