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Railway applications - Wheelsets and bogies - Part 1: Design method for axles with external journals

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 06/18

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English Version

Railway applications - Wheelsets and bogies - Part 1: Design method for axles with external journals

Applications ferroviaires - Essieux montés et bogies - Partie 1: Méthode de conception des essieux-axes avec fusées extérieures

Bahnanwendungen - Radsätze und Drehgestelle - Teil 1: Konstruktionsleitfaden für außengelagerte Radsatzwellen

This European Standard was approved by CEN on 11 September 2017.

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

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Foreword

This document (EN 13103-1:2017) 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of an identical text or by endorsement, at the latest by June 2018, and conflicting national standards shall be withdrawn at the latest by June 2018.

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 13103:2009+A2:2012 and EN 13104:2009+A2:2012.

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

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

Railway axles were among the first train components to give rise to fatigue problems.

Many years ago, specific dimensioning methods were developed in order to design these axles. They were based on a feedback process from the service behaviour of axles combined with the examination of failures and on fatigue tests conducted in the laboratory, so as to characterise and optimise the design and materials used for axles.

A European working group under the aegis of UIC[1] started to harmonise these methods at the beginning of the 1970s. This led to an ORE[2] document applicable to the design of trailer stock axles, subsequently incorporated into national standards (French, German, Italian). It was consequently converted into a UIC leaflet.

The method in this standard is based upon nominal stresses calculated using the beam theory. It was developed when the finite element method was not yet developed. Fatigue limits were obtained using tests, and the stress level in the test pieces was calculated using the beam theory. Also fatigue correction factors were determined by the same way, using test results on test pieces with various diameters and radii.

These three values:

— Method of calculation;

— Correction factor values;

— Fatigue limit values;

are closely linked, with the values of the two latter values being dependent on the calculation method.

The bibliography lists the relevant documents used for reference purposes. The method described therein is largely based on conventional loadings (now based on mass definitions from EN15663) and the outcome is validated by many years of operations on the various railway systems.

This standard is based largely on this method which has been improved and its scope enlarged.

In order to simplify the updating of the axle design standard, it was decided to merge the two previous documents EN 13103 and EN 13104 in one standard which is this one.

Also this standard refers to the mass standard EN 15663 to define the loads for calculations.

[1] UIC : Union Internationale des Chemins de fer (International Union of Railways)

[2] ORE: Office de Recherches et d'Essais de l'UIC.

1 Scope

This European Standard:

— defines the forces and moments to be taken into account with reference to masses, traction and braking conditions;

— gives the stress calculation method for axles with outside axle journals;

— specifies the maximum permissible stresses to be assumed in calculations for steel grade EA1N, EA1T and EA4T defined in EN 13261;

— describes the method for determination of the maximum permissible stresses for other steel grades;

— determines the diameters for the various sections of the axle and recommends the preferred shapes and transitions to ensure adequate service performance.

This European Standard is applicable for:

— axles defined in EN 13261

— powered and non-powered axles and

— all track gauges[3].

The powered axle design method of this European Standard applies to:

— solid and hollow powered axles for railway rolling stock;

— solid and hollow non-powered axles of motor bogies;

— solid and hollow non-powered axles of locomotives.

The non-powered axle design method of this standard applies to solid and hollow axles of railway rolling stock used for the transportation of passengers and freight that are not considered in the list above.

This European Standard is applicable to axles fitted to rolling stock intended to run under normal European conditions. Before using this European Standard, if there is any doubt as to whether the railway operating conditions are normal, it is necessary to determine whether an additional design factor has to be applied to the maximum permissible stresses. The calculation of wheelset axles for special applications (e.g. tamping/lining/levelling machines) may be made according to this European Standard only for the load cases of free-rolling and rolling in train formation. This European Standard does not apply to the loads induced by the vehicles in their working mode. They are calculated separately.

This method can be used for light rail and tramway applications.

[3] If the track gauge is not standard, certain formulae need to be adapted

2 Normative references

The following documents are referred to in a normative manner so that some or all of their content is indispensable for the application 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 13260, *Railway applications — Wheelsets and bogies — Wheelsets — Product requirements*

EN 13261:2009+A1:2010, *Railway applications — Wheelsets and bogies — Axles — Product requirements*

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

EN 15663, *Railway applications - Vehicle reference masses*