

<b>STN</b>	<b>Železnice Dvojkolesia a podvozky Časť 1: Návod na konštrukciu náprav s vonkajšími čapmi</b>	<b>STN EN 13103-1+A1</b>  28 2301
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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. 04/23

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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 and includes Amendment 1 approved by CEN on 29 August 2022.

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

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

## EN 13103-1:2017+A1:2022 (F)

<b>Contents</b>	<b>Page</b>
<b>Foreword</b> .....	<b>4</b>
<b>Introduction</b> .....	<b>5</b>
<b>1 European scope</b> .....	<b>6</b>
<b>2 Normative references</b> .....	<b>7</b>
<b>3 Terms and definitions</b> .....	<b>7</b>
<b>4 Symbols and abbreviations</b> .....	<b>8</b>
<b>5 tab General</b> .....	<b>10</b>
<b>6 Forces and moments to be taken into consideration</b> .....	<b>10</b>
6.1 <b>Types of forces</b> .....	<b>10</b>
6.2 <b>Effects due to masses in motion</b> .....	<b>10</b>
6.3 <b>Effects due to braking</b> .....	<b>16</b>
6.4 <b>Effects due to curving and wheel geometry</b> .....	<b>20</b>
6.5 <b>Influence of traction</b> .....	<b>20</b>
6.6 <b>Calculation of the resultant moment</b> .....	<b>21</b>
<b>7 Determination of geometric characteristics of the various parts of the axle</b> .....	<b>22</b>
7.1 <b>Stresses in the various sections of the axle</b> .....	<b>22</b>
7.2 <b>Determination of the diameter of journals and axle bodies</b> .....	<b>25</b>
7.3 <b>Determination of the diameter of the various seats from the diameter of the axle body or from the journals</b> .....	<b>25</b>
7.3.1 <b>tab General</b> .....	<b>25</b>
7.3.2 <b>Transition between collar bearing surface and wheel seat</b> .....	<b>28</b>
7.3.3 <b>Wheel seat in the absence of an adjacent seat</b> .....	<b>28</b>
7.3.4 <b>Case of two adjacent wheel seats</b> .....	<b>29</b>
7.3.5 <b>Case of two non-adjacent wheel seats</b> .....	<b>30</b>
<b>8 Maximum permissible stresses</b> .....	<b>30</b>
8.1 <b>tab General</b> .....	<b>30</b>
8.2 <b>tab Steel grade EA1N and EA1T</b> .....	<b>31</b>
8.3 <b>tab Steel grades other than EA1N and EA1T</b> .....	<b>32</b>
8.3.1 <b>tab General</b> .....	<b>32</b>
8.3.2 <b>Steel grade EA4T</b> .....	<b>33</b>
8.3.3 <b>Other steel grades</b> .....	<b>35</b>
<b>Annex A (informative) Model of axle calculation sheet</b> .....	<b>36</b>
<b>Annex B (informative) Procedure for calculating the load coefficient for tilting vehicles</b> .....	<b>38</b>
<b>Annex C (informative) Values of forces to take into consideration for wheelsets for reduced gauge track (metric or close to a metre)</b> .....	<b>40</b>
<b>Annex D (normative) Method for determination of full-scale fatigue limits for new materials</b> ....	<b>41</b>
D.1 <b>Scope</b> .....	<b>41</b>
D.2 <b>General requirements for test pieces</b> .....	<b>41</b>
D.3 <b>General requirements for test apparatus</b> .....	<b>41</b>
D.4 <b>Axle body fatigue limit ("F1")</b> .....	<b>41</b>
D.4.1 <b>Geometry</b> .....	<b>41</b>

<b>D.4.2</b>	<b>Verification of the applied stress</b> .....	<b>42</b>
<b>D.4.3</b>	<b>End of test criterion</b> .....	<b>43</b>
<b>D.4.4</b>	<b>Determination of the fatigue limit</b> .....	<b>43</b>
<b>D.5</b>	<b>Axle bore fatigue limit ("F2")</b> .....	<b>43</b>
<b>D.5.1</b>	<b>Geometry</b> .....	<b>43</b>
<b>D.5.2</b>	<b>Verification of the applied stress</b> .....	<b>44</b>
<b>D.5.3</b>	<b>End of test criterion</b> .....	<b>44</b>
<b>D.5.4</b>	<b>Determination of the fatigue limit</b> .....	<b>44</b>
<b>D.6</b>	<b>Wheel seat fatigue limit ("F3 and F4")</b> .....	<b>44</b>
<b>D.6.1</b>	<b>Geometry</b> .....	<b>44</b>
<b>D.6.2</b>	<b>Verification of the applied stress</b> .....	<b>46</b>
<b>D.6.3</b>	<b>End of test criterion</b> .....	<b>46</b>
<b>D.6.4</b>	<b>Determination of the fatigue limit</b> .....	<b>46</b>
<b>D.7</b>	<b>Content of the test report</b> .....	<b>47</b>
	<b>Bibliography</b> .....	<b>48</b>

**EN 13103-1:2017+A1:2022 (F)****Foreword**

This document (EN 13103-1:2017+A1:2022) 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, by June 2023 at the latest, and all conflicting national standards shall be withdrawn no later than June 2023.

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

This document includes Amendment 1 approved by the CEN on 29 August 2022.

This document will supersede "EN 13103-1:2017".

The start and end of the text added or modified by the amendment are indicated in the text with ! and " respectively.

This document has been prepared in the context of a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of Directive 2008/57/EC.

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

The user should address any feedback or questions regarding this document to their country's national standards organisation. A comprehensive list of these organisations can be found on the CEN website.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are required to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, the Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, the Republic of Serbia, Romania, 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 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 characterize and optimize the design and materials used for axles.

A European working group under the aegis of UIC<sup>1</sup> started to harmonize these methods at the beginning of the 1970s. This led to an ORE<sup>2</sup> 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 for this standard is based on the calculation of nominal stresses using beam theory. It was developed at a time when the calculation method per finished item had yet to be established. Fatigue limit values were obtained from tests, and the level of stress on the test pieces was calculated using beam theory. In addition, fatigue correlation coefficients were determined in the same way, using the experimental results from test pieces of different diameters and transition radii.

The following three elements:

- calculation method;
- correction coefficient values;
- fatigue limit values;

are closely linked, with the values of the two latter parameters 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 deduced from the definition of the masses declined in EN 15663). 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 maintenance of axle design standardization, it was decided to merge two previous documents EN 13103 and EN 13104 into a single standard, in the form of this document.

Furthermore, this standard makes reference to mass standard EN 15663 to define the loads used in the calculations.

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<sup>1</sup> UIC: Union Internationale des Chemins de fer.

<sup>2</sup> ORE: Office de Recherches et d'Essais de l'UIC.

## EN 13103-1:2017+A1:2022 (F)

### 1 European 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 grades EA1N, EA1T and EA4T defined in EN 13261:2020<sup>3</sup>;
- 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 applies to:

- axles defined in EN 13261:2020<sup>3</sup>;
- powered and non-powered axles;
- all track gauges<sup>3</sup>.

The design method for powered axles described in this European Standard applies to:

- solid or hollow powered axles for railway vehicles;
- solid or hollow non-powered axles for motor bogies;
- solid or hollow non-powered axles for locomotives.

The design method for non-powered axles described in this European Standard applies to solid or hollow axles for railway vehicles intended for the transportation of passengers or freight and which do not appear in the preceding list.

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 wheelsets for special applications (e.g. tamping/lining/levelling machines) may be made according to this European Standard only for the load cases of free-running and running in train formation. This European Standard does not apply to workload cases. They are calculated separately.

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

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<sup>3</sup> If the gauge is not standard, certain formulae need to be adapted.



## **2 Normative references**

The following documents are referenced in a normative manner, in part or in full, in this document, and are indispensable for its application. For dated references, only the cited edition applies. For undated references, the last edition of the reference document applies (including any amendments).

!EN 13260:2020", *Railway applications — Wheelsets and bogies — Wheelsets — Product requirements*

!EN 13261:2020", *Railway applications- Wheelsets and bogies - Axles - Product requirements*

!EN 15313:2016", *Railway applications - In-service wheelset operation requirements - In-service and off-vehicle wheelset maintenance*

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

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**