BS EN 13260:2020

BSI Standards Publication

Railway applications — Wheelsets and bogies — Wheelsets — Product requirements

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National foreword

This British Standard is the UK implementation of EN 13260:2020. It supersedes BS EN 13260:2009+A1:2010, which is withdrawn.

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

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European foreword

This document (EN 13260:2020) was prepared by the CEN/TC 256 “Railway Applications” Technical Committee, the secretariat of which is held by the DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, by March 2021 at the latest, and all conflicting national standards shall be withdrawn no later than March 2021.

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 supersedes EN 13260:2009+A1:2010.

This document has been prepared within the framework of a mandate given to CEN by the European Commission and the European Free Trade Association and supports the essential requirements of Directive 2016/797/EC.

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

For a description of the technical changes made in this new edition, see the Introduction.

The informative annexes to this document provide additional guidance that is not mandatory but that helps to understand or use the document.

NOTE The informative annexes may contain optional requirements. For example, a test method that is optional, or presented as an example, may contain requirements, but it is not necessary to meet these requirements to be in compliance with the document.

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, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, the Republic of North Macedonia, the Republic of Serbia, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

After several years of use of the first editions of this document (EN 13260:2003, EN 13260:2009 and EN 13260:2009+A1:2010), this new edition includes improvements and additional data.

The product requirements have been harmonised across all three standards for wheelsets, wheels and axles.

In addition, the annexes concerning the qualification of the product and the conditions of supply of the product, which were previously informative, have been modified taking the feedback into account and have become normative.

Due to significant in-service feedback on wheelsets in accordance with European Product Design and Qualification Standards, the fatigue test for the assembly is now limited in this revision to specific assembly designs and processes.

Annex A, with the press-fitting curves, contains much more detail than the previous version.

Annex C contains information for identifying wheelset components on the basis of standard EN 15313. Also, the “freight wagon” and “locomotive and passenger vehicle” TSIs require the existence of a production verification process.

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1 Scope

This document specifies the characteristics of wheelsets for all track gauges.

This document applies to heavy railway vehicles but may also apply to other vehicles such as light railway vehicles, trams or undergrounds.

This document applies to wheelsets made from elements defined by the following European Standards:

— EN 13262 for wheels;

— EN 13261 for axles.

The requirements defined in this standard apply to cylindrical wheel seats. Most of the requirements also apply to wheelsets with conical wheel seats. Specific requirements for conical wheel seats (e.g. press-fitting curves, geometric dimensions...) are defined in the technical specification.

Some characteristics are given according to category 1 or category 2.

2 Normative references

The following documents referred to in the text constitute, for all or part of their content, requirements of this document. For dated references, only the cited edition applies. For undated references, the last edition of the reference document applies (including any amendments).

EN 13103-1, *Railway applications – Wheelsets and bogies – Part 1: Design method for axles with external journals*

EN 13261, *Railway applications — Wheelsets and bogies — Axles — Product requirements*

EN 13262, *Railway applications — Wheelsets and bogies — Wheels — Product requirements*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for standardisation, which can be accessed 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
Technical specification
A document describing specific parameters and/or product requirements in addition to the requirements of this document

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3.2
Axle categories
Classification of the component, based on operational aspects, which determines the list of requirements to be applied

Note 1 to clause: Category 1 is generally selected when the traffic speed is greater than 200 km/h. The wheelset is then composed of wheels and a category 1 axle, according to EN 13262 for wheels and EN 13261 for axles.

Note 2 to clause: Category 2 is divided into sub-categories (2a and 2b) to specify certain characteristics:

— 2a) max. speed ≤ 120 km/h;

— 2b) 120 < max. speed ≤ 200 km/h.

Note 3 to clause: These categories can also be defined in accordance with the technical specification.

4 Product definition

4.1 Assembly of components

4.1.1 General

Before assembly, the various components of the wheelset must fulfil the geometric requirements of the specific documents that define them. In particular, the axle and wheels must be in the "ready to assemble" state defined in EN 13262 for wheels and EN 13261 for axles.

The components of the wheelset can be shrink-fitted or press-fitted to the axle.

The wheels should be fitted with an oil injection hole.

The interference fits to be used must be defined by the technical specification, depending on the characteristics of the material used for this element and the forces and moments to be transmitted through the fit. This interference must be defined according to the geometric tolerances of the wheel seats whose interference values are given in 4.1.2.

In the case of shrink-fitting, the whole wheel should be heated and its temperature should not exceed 250°C. If a different heating method is used, proof must be provided that it has had no influence on the characteristics of the wheel, as defined in EN 13262.

If another fitting method is used, it must be defined in the technical specification. It must at least demonstrate that the characteristics of the axle and wheel as defined in EN 13261 and EN 13262 are not affected by the fitting. Then the mechanical resistance of the assembly (see 4.2.1) must be demonstrated and the traceability documents for each fitting must be defined to give the same type of information as that defined in E.6.

The static imbalance of the two wheels on each wheelset must be within the same diametric plane and on the same side of the axle. The static imbalance of the brake discs must be in the same plane as the wheels but on the opposite side of the axle.

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4.1.2 Interference between wheel seat and wheel hub bore

If no other requirement is given in the technical specification, the interference values "*j*" to be adhered to are, in millimetres:

— for shrink-fitting: $0.0009\ dm \leq j \leq 0.0015\ dm$;

— for press-fitting: $0.0010\ dm \leq j \leq 0.0015\ dm + 0.06$;

where *dm* is the wheel seat mean diameter in millimetres.

4.1.3 Press-fitting curve

4.1.3.1 Results to be achieved

For press-fitting, the force-displacement curve ensures that the fitting has not damaged the contact surfaces and that the specified interference is effective.

The shape of the curve to be achieved is defined in Annex A.

The final fitting force F_f is a function of the force F defined in 4.2.1 and must be within the range:

$$0.85\ F < F_f < 1.45\ F$$

This range applies to:

— press-fitting of one-piece wheels;

— with L_f/dm 0.8 to 1.1, where dm is the mean diameter of the wheel seat, and L_f is the fitting length (in mm);

— molybdenum-based pastes (MoS_2) and tallow.

If other lubricants are used, they must be defined in the technical specification and verified with the product qualification in accordance with Annex D, including the dismantling test in accordance with subclause 4.2.1.

4.1.3.2 Measurement method

The press used for assembling must have a calibrated system to plot the diagram representing the force value at each position of the element to be fitted, obtained during the displacement of the element on the axle. The x-axis scale of the displacement must be at least 0.5 times the actual displacement of the element to be fitted. The y-axis scale of force must allow the force to be read at each point of the curve at an accuracy of 25 KN. The accuracy of the force sensor must be 10 KN. The x-axis and y-axis can be inverted.

In the case of point recording, at least one point must be plotted per millimetre of relative displacement of the parts to be fitted and per 25 KN variation in force.

4.2 Wheelset characteristics

4.2.1 Mechanical resistance of assemblies

4.2.1.1 General requirements

Annexes A and E define the need for this test.

4.2.1.2 Results to be achieved

In order to transmit moments and forces between the axle and the wheel, the assembly must be able to withstand an axial force *F* for 30 s, without displacement between one element and another.

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This force F must be defined in the technical specification.

For wheels, if no specific requirement is given in the technical specification, the value of F is as follows:

$$F = 4\ dm$$

when

$$0.8\ dm < L_f < 1.1\ dm$$

where

dm is the mean diameter of the wheel seat in mm, L_f is the length of the fitting in millimetres and F is the force in KN.

4.2.1.3 Test method

The test must be performed on a press equipped with a device to record forces.

The force is applied gradually up to the value F, between one of the hub faces of the fitted element and the axle.

For press-fitted wheels, the dismantling test should be performed at least 48 hours after the fitting.

For shrink-fitted wheels, the test is to be done when the wheel and axle have returned to the same temperature after the fitting.

4.2.2 Fatigue characteristics

4.2.2.1 General

This subclause defines the fatigue limit values for rotational bending for 10^7 cycles. These values are used to calculate the maximum permissible axle seat stresses that are necessary for the application of EN 13103-1. These values are valid for "conventional" axle designs, wheels and the assembly process and do not need to be verified for product qualification.

NOTE 1 A design is considered "conventional" when the parameters defining the assembled parts fulfil the requirements of European Product and Design Standards for internal and external journals (e.g. roughness, geometry, interference adjustment, overflow, diameter ratios, steel grades, etc.).

For other types of design or assembly process (e.g. cooling a wheelset, specific diameter ratio, new materials, specific surface coating of the wheel seat, etc.), the following characteristics must be verified and tested at least once in the event of a new or modified set of parameters affecting the assembly.

These fatigue characteristics are not the same for a solid axle and a hollow axle. This is the result of the axle bore effect on stress distribution.

For a solid axis, only one fatigue limit (F_3) must be determined under the fitting surfaces.

For a hollow axle, given that the fitting effect is greater on journals than on other fitting surfaces due to the difference in metal thickness, two fatigue limits must be considered:

— under the wheel seat, excluding journals, limit F_4,

— under journal wheel seat, limit F_5.

If necessary, the fatigue limit F_3 or F_4 must be verified by testing during qualification (see Annex D). The fatigue limit F_5 can be calculated using the ratios $F_4/F_5 = 1.17$ and $F_3/F_5 = 1.28$.

NOTE 2 Fatigue characteristics F_1 and F_2 of the axle are defined in EN 13261.

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4.2.2.2 Fatigue limits

The minimum fatigue limits for wheelset axles are given in Table 1.

Table 1 — Minimum fatigue limits for wheelset axles in MPa

Steel grade	F_3	F_4	F_5
EA1N/EA1T	120	110	94
EA4T	145	132	113

4.2.2.3 Fatigue test pieces

For fatigue testing of wheelsets, a wheel or test wheel with similar dimensions (especially the hub) must be press-fitted or shrink-fitted on the wheel seat. The interference must fulfil the requirements of 4.1.2.

The area of the test piece where the crack should initiate must have geometry, environment and surface characteristics representative of the axle.

Examples of test pieces are given in Annex B.

4.2.2.4 Test method

Tests must be carried out on machines that can create rotating bending stresses in the area where cracks initiate.

For each limit F_3 and F_4, it must be verified on three test pieces that no cracks spread after 10^7 cycles of a load creating a surface stress equal to F_3 or F_4. Indications with a depth of less than 0.5 mm should not be considered as crack propagations.

These stress levels must be calculated on the wheel seat according to the beam theory, without taking into account the interference stresses.

4.2.3 Electrical resistance

The electrical resistance of each wheelset, measured between the treads of the two wheels must not exceed 0.01 Ω.

The device and method used for this measurement must be defined in the technical specification.

4.2.4 Dynamic imbalance

4.2.4.1 Maximum permissible values

For the wheelset of a vehicle that can travel at speeds greater than 120 km/h, the maximum dynamic imbalance values are shown in Table 2. They are measured in the wheel plane.

For category 1 wheelsets, the dynamic imbalance must be measured individually.

For category 2 wheelsets (speed greater than 120 km/h), the dynamic imbalance must be measured individually, unless otherwise specified in the technical specification.

Table 2 — Maximum dynamic imbalance values

Speed km/h	**Imbalance** g·m
$120 < S \leq 200$	75
$S > 200$	50

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For a powered wheelset, balancing is achieved after the proper placement and balancing of each component (wheels, brake discs and other components such as couplings and gears). Therefore, dynamic imbalance measurement is not necessary.

4.2.4.2 Test piece

The imbalance is measured on a fully assembled and machined wheelset.

4.2.4.3 Test method

The device and method used for this measurement must be defined in the technical specification.

4.2.5 Dimensions and tolerances

4.2.5.1 General

The dimensions of the wheelset must correspond to the design drawings, and the dimensional and geometrical tolerances to be applied when assembling the different parts of the wheelset are given in the following subclauses.

They depend on the category of the wheelset.

The values are given for measurements made without any load on the wheelset.

4.2.5.2 Wheels

Unless otherwise specified in the technical specification, the parameter tolerances defined in Figure 1 must be those given in Table 3.

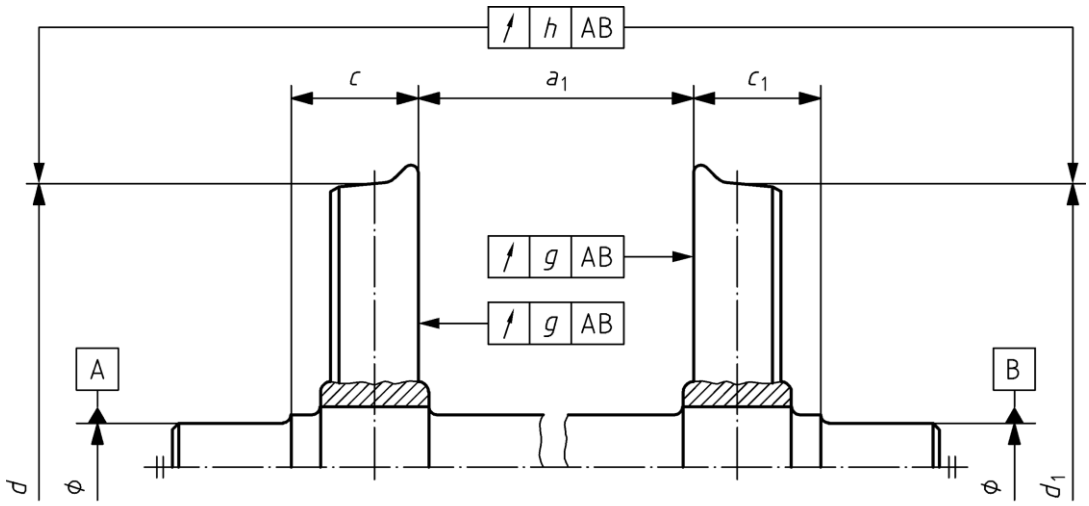

Figure 1 — Parameters for wheelsets

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