SLOVENSKI STANDARD
SIST EN 13260:2009+A1:2010

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Železniške naprave - Kolesne dvojice in podstavni vozički - Kolesne dvojice - Zahtevane lastnosti proizvoda

Railway applications - Wheelsets and bogies - Wheelsets - Product requirements

Bahnanwendungen - Radsätze und Drehgestelle - Radsätze - Produktanforderungen

Applications ferroviaires - Essieux montés et bogies - Essieux montés - Prescriptions pour le produit

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ICS:

45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering

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EUROPEAN STANDARD

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English Version

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

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Foreword

This document (EN 13260:2009+A1:2010) 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of an identical text or by endorsement, at the latest by April 2011, and conflicting national standards shall be withdrawn at the latest by April 2011.

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 comprises amendment 1 adopted by CEN on 2010-09-14.

This document supersedes EN 13260:2009.

The start and end of the text added or modified by the amendment is indicated in the text by the !" marks.

[A1] 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 2008/57/EC. [A1]

[A1] For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document. [A1]

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The main purpose of normative documents used until now for the delivery of wheelsets (UIC leaflets, national standards) was a complete definition of the acceptance procedures and of the wheelset characteristics which were to be verified.

Product qualification was sometimes mentioned but the procedures used and the product characteristics to be verified during qualification were not given.

This standard addresses these points by:

a) definition of all the wheelset characteristics that are assembly characteristics and finished product characteristics and do not arise from a choice of design parameters such as diameters, interferences, materials etc. They are verified during either qualification or delivery of the product (see clause 3);

b) definition of qualification procedures (see Annex E);

c) definition of delivery conditions (see Annex F). They are based on quality assurance concepts.

1 Scope

This European Standard specifies the characteristics of new wheelsets for use on European networks:

This standard is applicable to wheelsets comprising elements that conform to the following European Standards:

— EN 13262 for wheels;

— EN 13261 for axles;

This standard is not fully applicable to wheelsets undergoing maintenance.

Some characteristics are given as a function of a category 1 or of a category 2. Category 2 can be divided into sub-categories (2a and 2b) to specify certain characteristics. Category 1 is generally chosen when the operating speed exceeds 200 km/h. The wheelset then comprises wheels and axle of category 1 as specified in EN 13262 for the wheels and EN 13261 for the axles.

2 Normative references

The following referenced documents are 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 13103, *Railway applications — Wheelsets and bogies — Non-powered axles — Design method*

EN 13104, *Railway applications — Wheelsets and bogies — Powered axles — Design method*

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

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

3 Product definition

3.1 Assembly of components

3.1.1 General

Before being assembled, all elements which comprise the wheelset shall meet the geometric requirements of the documents which define them. In particular, the wheels and the axle shall be in the "ready for assembly" state defined in EN 13262 for the wheels and EN 13261 for the axles.

The elements comprising the wheelset may be shrink-fitted or press-fitted.

The interferences to be used for fitting shall be defined by the designer of the element to be fitted and are a function of the characteristics of the element material and the forces and torque to be transmitted by the fitting. This interference shall be defined according to the geometric tolerances of the axle seats specified in EN 13261.

For the wheel fittings, unless otherwise specified by the wheel designer, the interference values to be used are given in 3.1.2.

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

If a different fitting method is used, this shall be the subject of an agreement between the customer and the supplier. In this agreement, the supplier shall demonstrate at least that the axle and wheel characteristics as defined in EN 13261 and EN 13262 are not modified by the fitting. Then, the mechanical resistance of the assembly (see 3.2.1) shall be demonstrated and the traceability documents for each fitting shall be defined so as to give the same type of information as specified in F.5.

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

3.1.2 Interference between axle wheel seat and wheel hub bore

Unless otherwise specified by the wheel designer, the interference values "*j*" to be adhered to are, in mm:

— 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 mean diameter in mm.

3.1.3 Press-fitting diagram

3.1.3.1 Results to be achieved

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

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

The final fitting force, in MN, is a function of the force *F* defined in 3.2.1 and shall be within the range:

$$0{,}85\ F < \text{final fitting force} < 1{,}45\ F$$

3.1.3.2 Measurement method

The press used for the assemblies shall have a calibrated system to plot the diagram of the force value at each position of the element to be fitted, obtained during the displacement of the latter on the axle. The abscissa scale of displacement shall be at least equal to 0,5 times the actual displacement of the element to be fitted. The ordinate scale of force shall allow the force to be read at each point of the curve with an accuracy of 0,025 MN. The accuracy of the force sensor shall be 0,01 MN. The abscissae and ordinates may be reversed.

In the case of point recording, at least one point shall be plotted per millimetre of relative displacement of the elements to be fitted and per 0,025 MN variation in force.

3.2 Wheelset characteristics

3.2.1 Mechanical resistance of the assemblies

3.2.1.1 Results to be achieved

In order to be able to transmit forces and torques between the fitted elements, the assemblies shall be capable of withstanding an axial force *F* for 30 s without there being any displacement between one element and another.

This force *F* shall be defined by the designer of the element to be fitted.

For wheels, unless otherwise specified by the designer, the value of the force *F* in MN is:

$$F = 4 .10^{-3} dm$$

when 0,8 *dm* < *L*< 1,1 *dm*

where *dm* is the mean diameter of the seat in mm and *L* is the length of the fitting in mm.

3.2.1.2 Test method

The test shall be carried out on a press equipped with a device to record forces.

The force is applied gradually up to *F* between one of the faces of the fitted component hub and the axle.

For press-fitted wheels, the test shall be carried out at least 48 h after fitting.

For shrink-fitted wheels, the test shall be carried out when the wheels and axle have returned to the same temperature after the fitting.

3.2.2 Fatigue characteristics

3.2.2.1 General

The rotational bending fatigue limit values for 10^7 cycles are defined here. These values are used to calculate the maximum permissible axle seat stresses and are required for application of EN 13103 and EN 13104.

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

For a solid axle, only one fatigue limit (F_3) shall be determined under the fitting areas.

For a hollow axle, given that the fitting effect is greater on the journals than on the other fitted areas because of the different metal thicknesses, two fatigue limits shall be considered:

— under the fitted parts , except for journals, limit F_4,

— under the fitted parts of the journal, limit F_5

NOTE 1 The fatigue limit F_4 is verified by testing during qualification. The fatigue limit F_5 can be calculated using the ratios $F_4/F_5 = 1{,}17$ and $F_3/F_5 = 1{,}276$

NOTE 2 The fatigue characteristic F_1 and F_2 of the axle are defined in EN 13261.

3.2.2.2 Values defined for EA1N

The minimum values for wheelsets using an axle of EA1N grade steel are given in Table 1.

Table 1 — Minimum values for wheelsets with an axle made of EA1N steel

Fatigue limit	F_3	F_4	F_5
N/mm^2	120	110	94

For other steel grades, the values are given in Annex B.

3.2.2.3 Fatigue test pieces

The area of the test piece where the crack initiates shall have geometry, environment and surface condition representative of the axle under consideration.

For the fatigue testing of the wheelsets, one wheel or test piece with similar dimensions (particularly the hub) shall be press-fitted or shrink-fitted on the wheel seat. The interference shall meet the requirements of 3.1.2.

It is not mandatory to use a wheelset as the test piece. An example of a test piece is given in Annex C.

3.2.2.4 Test method

The tests shall be carried out on machines capable of creating rotating bending stresses in the area where it is required to initiate a crack.

For each limit F_3, and F_4, it shall be verified on three test pieces that no crack has appeared after 10^7 cycles of a load creating a surface stress equal to F_3 or F_4.

These stress levels shall be calculated on the seat, in accordance with the beam theory, disregarding the interference stresses.

3.2.3 Electrical resistance

The electrical resistance of each wheelset measured between the treads of the two wheels shall not exceed 0,01 Ω.

The means and method used for this measurement shall be defined in agreement between the customer and the supplier.

The test voltage shall be in the range 1,8 V – 2,0 V DC.

3.2.4 Imbalance

3.2.4.1 Values to be achieved

For a non-powered wheelset capable of running at a speed of greater than 120 km/h, a maximum dynamic imbalance shall be specified.

The maximum values are given in Table 2. They are measured in the plane of the wheels.

Table 2 — Maximum imbalance values

Speed (km/h)	Maximum imbalance x measuring plane (g.m)
120 < *V* ≤ 200	75
V > 200	50

3.2.4.2 Test piece

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

3.2.4.3 Test method

The customer and the supplier shall agree the means of measurement.

3.2.5 Dimensions and tolerances

3.2.5.1 General

The dimensions of the wheelset shall be in accordance with the design drawings and the dimensional and geometric tolerances to be applied when assembling the different parts of the wheelset are given in the following subclauses.

They are dependent on the category of the wheelset.

The values are given for measurements taken with no load on the wheelset.

3.2.5.2 Wheels

The tolerances of the parameters defined in Figure 1 shall be those given in Table 3.

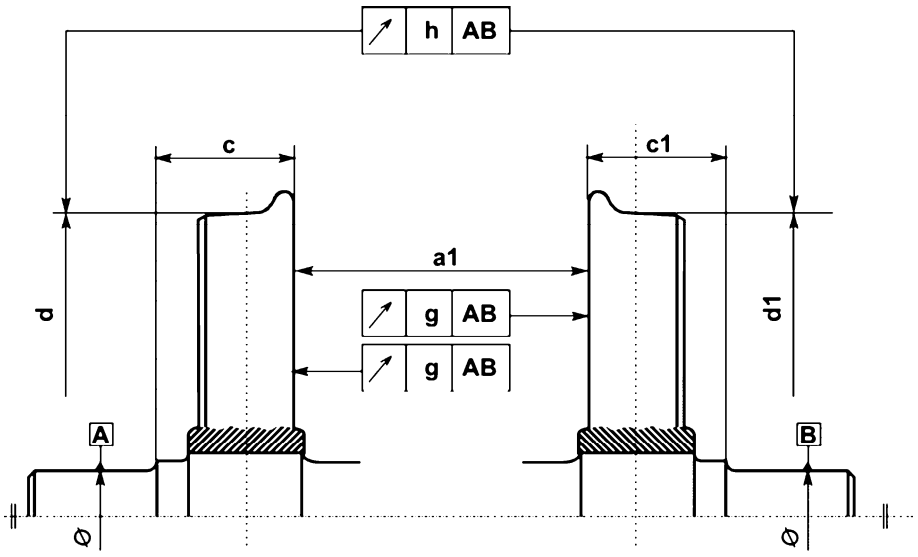

Figure 1 — Wheel parameters