



**SLOVENSKI STANDARD**  
**SIST EN 12080:2017**

**01-november-2017**

**Nadomešča:**

**SIST EN 12080:2008+A1:2010**

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**Železniške naprave - Ohišja ležajev kolesnih dvojic - Kotalni ležaji**

Railway applications - Axleboxes - Rolling bearings

Bahnanwendungen - Radsatzlager - Wälzlager

Applications ferroviaires - Boîtes d'essieux - Roulements  
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**ICS:**

|           |   |  |
|-----------|---|--|
| 21.100.20 | Kotalni ležaji                          | Rolling bearings                                 |
| 45.040    | Materiali in deli za železniško tehniko | Materials and components for railway engineering |

**SIST EN 12080:2017**

**en,fr,de**

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EUROPEAN STANDARD

EN 12080

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2017

ICS 21.100.20; 45.040

Supersedes EN 12080:2007+A1:2010

English Version

## Railway applications - Axleboxes - Rolling bearings

Applications ferroviaires - Boîtes d'essieux -  
Roulements

Bahnanwendungen - Radsatzlager - Wälzlager

This European Standard was approved by CEN on 19 June 2017.

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COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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**EN 12080:2017 (E)****European foreword**

This document (EN 12080:2017) 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of an identical text or by endorsement, at the latest by March 2018, and conflicting national standards shall be withdrawn at the latest by March 2018.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 12080:2007+A1:2010.

The main changes with respect to the previous edition are listed below:

- The list of normative references has been changed. Some references have been added;
- The list of “Terms and definitions” has been changed and new items added, e.g. “Supplier” has been replaced by “Manufacturer”;
- Clause 4 that regulates “Information and requirements to be agreed and documented” has changed significantly, and 4.3 and 4.4 have been removed;
- The definition of “Dimensional stability” in Clause 6.2 is new and a new requirement for retained austenite for through hardened rings has been added;
- Clause 6.3 about “Traceability” is re-written with new requirements;
- Clause 6.4 about “Coatings” is new;
- Clause 7 about “Material properties” has new requirements on “Chemical composition” and “Inclusion content”;
- Clause 10 “Physical properties” has several changes, e.g. the definition of “Soundness class” as well as that “Steel riveted brass cages” are no longer allowed;
- Clause 11 “Marking” is now more detailed and specifies marking of different “bearing types” – country of origin is no longer compulsory;
- The inspection plan in Clause 12 has been extended;
- A requirement for archiving of documents relating to quality records has been added in Clause 13;
- In Clause 14 a requirement for informing about changes relating to product approval has been added;
- Clause 15 has changes relating to grease batch approval, corrosion protection and packaging;
- In Annex A there are changes to the specification of “Preparation of rings”;
- In Annex B there are changes to the specification of “Equipment”;

- Annex D is now normative and has significant changes;
- Annex F is now normative and more specific on some criteria;
- Annex G is a new informative annex giving an example of an axlebox assembly.

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 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.

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**EN 12080:2017 (E)****Introduction**

This standard is part of a set of standards: EN 12080, EN 12081 and EN 12082.

This European Standard has been drawn up with the purpose of aiming at optimum performance in rail transportation. Performance implies a certain quality level of the vehicle running gear, which every railway undertaking may require, notably by imposing procedures in approval and requesting the existence of a quality assurance system for the supply of rolling bearings intended for rolling stock operating on its network or other networks in Europe.

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## 1 Scope

This European Standard specifies the quality parameters of axlebox rolling bearings supporting the load of the vehicle, required for reliable operation of trains on European networks. It covers metallurgical and material properties as well as geometric and dimensional characteristics. It also defines methods for quality assurance and conditions for approval of the products.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10204:2004, *Metallic products - Types of inspection documents*

EN 12081:2017, *Railway applications - Axleboxes - Lubricating greases*

EN 12082:2017, *Railway applications - Axleboxes - Performance testing*

EN 13018:2016, *Non-destructive testing - Visual testing - General principles*

EN 15663:2017, *Railway applications - Definition of vehicle reference masses*

EN ISO 178:2010, *Plastics - Determination of flexural properties (ISO 178:2010)*

EN ISO 179-1:2010, *Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test (ISO 179-1:2010)*

EN ISO 307:2007, *Plastics - Polyamides - Determination of viscosity number (ISO 307:2007)*

EN ISO 683-17:2014, *Heat-treated steels, alloy steels and free-cutting steels - Part 17: Ball and roller bearing steels (ISO 683-17:2014)*

EN ISO 1172:2003, *Textile-glass-reinforced plastics - Prepregs, moulding compounds and laminates - Determination of the textile-glass and mineral-filler content - Calcination methods (ISO 1172:1996)*

EN ISO 1183-1:2012, *Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2012)*

EN ISO 1183-2:2004, *Plastics - Methods for determining the density of non-cellular plastics - Part 2: Density gradient column method (ISO 1183-2:2004)*

EN ISO 2639:2002, *Steels - Determination and verification of the depth of carburized and hardened cases (ISO 2639:2002)*

EN ISO 3059:2012, *Non-destructive testing - Penetrant testing and magnetic particle testing - Viewing conditions (ISO 3059:2012)*

EN ISO 3451-1:2008, *Plastics - Determination of ash - Part 1: General methods (ISO 3451-1:2008)*

EN ISO 6507-1:2005, *Metallic materials - Vickers hardness test - Part 1: Test method (ISO 6507-1:2005)*

EN ISO 6508-1:2016, *Metallic materials - Rockwell hardness test - Part 1: Test method (ISO 6508-1:2016)*

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EN ISO 6508-2:2015, *Metallic materials - Rockwell hardness test - Part 2: Verification and calibration of testing machines and indenters (ISO 6508-2:2015)*

EN ISO 6508-3:2015, *Metallic materials - Rockwell hardness test - Part 3: Calibration of reference blocks (ISO 6508-3:2015)*

EN ISO 9934-1:2016, *Non-destructive testing - Magnetic particle testing - Part 1: General principles (ISO 9934-1:2016)*

EN ISO 9934-2:2015, *Non-destructive testing - Magnetic particle testing - Part 2: Detection media (ISO 9934-2:2015)*

EN ISO 9934-3:2014, *Non-destructive testing - Magnetic particle testing - Part 3: Equipment (ISO 9934-3:2015)*

EN ISO 11357-3:2013, *Plastics - Differential scanning calorimetry (DSC) - Part 3: Determination of temperature and enthalpy of melting and crystallization (ISO 11357-3:2011)*

ISO 281:2007, *Rolling bearings — Dynamic load ratings and rating life*

ISO 492:2014, *Rolling bearings — Radial bearings — Geometrical product specifications (GPS) and tolerance values*

ISO 4967:2013, *Steel - Determination of content of non-metallic inclusions - Micrographic method using standard diagrams*

ASTM E45:2014, *Standard Test Methods for Determining the Inclusion Content of Steel*

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**3 Terms and definitions**

For the purposes of this document, the following terms and definitions apply (see also Annex G for more information).

**3.1 customer**  
railway undertaking, rolling stock manufacturer, Entity in Charge of Maintenance (ECM) or buyer of railway rolling stock or subassemblies, or their representative

**3.2 railway undertaking**  
organization or its representative, whatever status it has, which is responsible for the registration of rolling stock

**3.3 manufacturer**  
manufacturer of axlebox rolling bearings produced under their responsibility

**3.4 network**  
infrastructure, on which any railway undertaking can operate rolling stock

**3.5 axlebox (assembly)**  
assembly consisting of the following major components: rolling bearing(s)/cartridge bearing, rolling bearing grease, seal(s) and box housing

Note 1 to entry: Further components, e.g. bearing sleeve, housing cover(s), axle end cap components and fasteners may also be part of the assembly. This depends on axlebox type and design (see Annex G).

### 3.6

#### **bearing sleeve**

component of box housing which contains rolling bearing(s), grease and sealing

### 3.7

#### **housing cover**

component which retains the bearing in the housing or bearing sleeve

### 3.8

#### **axle end cap components**

components which secure the rolling bearing axially on the journal

### 3.9

#### **rolling bearing**

bearing, operating with rolling motion between the parts supporting load and moving in relation to each other

### 3.10

#### **cartridge bearing**

rolling bearing with two or more rows of rolling elements within a self-contained unit, greased and equipped with integral seals

### 3.11

#### **ring**

annular part of a rolling bearing incorporating one or more raceways with rolling element contact

### 3.12

#### **rolling elements**

cylindrical, tapered or convex rollers or balls

### 3.13

#### **cage**

component, which partly surrounds the rolling elements and moves with them

### 3.14

#### **grease**

semi-solid lubricant, which consists of a thickener and additives dispersed in a lubricating oil

### 3.15

#### **seal**

component that protects the bearing(s) against ingress of water and dust and retains the grease in the rolling bearing(s)

### 3.16

#### **box housing**

structural component which contains rolling bearing(s), seal(s) and grease

### 3.17

#### **rolling bearing type**

designation of the rolling bearing or cartridge bearing according to the shape of the rolling elements (e.g. tapered roller bearing, cylindrical roller bearing, and spherical roller bearing)

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**EN 12080:2017 (E)****3.18****rolling bearing design**

designation of a specific rolling bearing or cartridge bearing design within a rolling bearing type (e. g. WJ/WJP 130x240x80 P.C3), bearing design is a subset of a bearing type

**3.19****ribs and thrust collars**

annular component of a rolling bearing transmitting axial forces (separate from the bearing inner or outer rings) in contact with the rolling element end face in cylindrical roller bearings

**4 Technical specification****4.1 General requirements**

The supply of a component or a service (rig tests, field test, calculations, etc.) shall be based on a comprehensive specification. This specification shall consist of all the information relevant for design and manufacture of the bearing describing the functional requirements over its complete life cycle and the interfaces with associated components and assemblies.

The design and validation process requires the integration of different disciplines and areas of expertise and the knowledge associated with them. Therefore, the specification shall include information defining the intended operating conditions, calculation and test parameters.

The following information shall be part of the approval process and be fully documented in the technical specification by either of the contracting parties. Both the requirements specified throughout this European Standard and the following documented requirements shall be satisfied before a claim of compliance with this European Standard can be made and verified.

**4.2 Technical specification content**

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The technical specification shall contain at least the following information and requirements:

NOTE Usually the customer is responsible for items 1) to 6). Items 7) to 21) are usually subject to agreement between contracting parties.

- 1) interface drawing showing mounting conditions; all dimensions of the space available for the rolling bearings; dimensions, tolerances and materials of shaft and box housing;
- 2) load specification at least according to EN 12082;
- 3) ambient temperatures in operation;
- 4) if required, special steel composition, cleanliness and soundness class (see 7.1 and 10.2);
- 5) approval procedure type and conditions to be applied (see Clause 14 and Annex E);
- 6) special conditions for quality records and traceability (see 6.3 and Clause 13);
- 7) boundary dimensions and interface tolerances of the rolling bearing (see Clause 8);
- 8) type of coating and influence on boundary dimensions (see 6.4);
- 9) internal clearance measurement process and clearance values before and after mounting (see Clause 8);
- 10) references to standards and special requirements (see Clause 7 and 10.2);

- 11) use of steel of special composition, manufacture or metallurgical quality (see 7.1);
- 12) soundness Class, 1 or 2, and the test methods to be used (see 10.2 and A.4.2);
- 13) type of heat treatment to be applied and methods of testing (see 6.2, 10.3, 10.4 and 12.2);
- 14) marking (see Clause 11);
- 15) inspection plan (see 12.1);
- 16) for cartridge bearings grease designation, quantity and distribution (see 15.1);
- 17) for non-sealed bearings, grease designation and compatibility with preservatives (see 15.2);
- 18) selection of mechanical testing method for cages of polymeric material (see D.4.1);
- 19) material data sheet for polymer cage material;
- 20) proof of batch release according to EN 12081 for traceability;
- 21) method for determining steel cleanliness.

## 5 Quality systems

The quality of workmanship and manufacturing shall be demonstrated to ensure the requirements of the technical specification are met.

NOTE 1 The manufacturer is responsible for this.

NOTE 2 Quality management system according to EN ISO 9001 is usually used.

NOTE 3 The system used for non-destructive testing staff is usually according to EN ISO 9712.

## 6 Manufacture

### 6.1 Steel manufacturing

The process of steel manufacture in mass production shall be such that the metallurgical characteristics are the same as those of the rolling bearings submitted for the approval procedure.

### 6.2 Heat treatment

The heat treatment processes for the rolling bearing components shall be such that the hardness values specified in 10.3 and/or 10.4 are respected. The heat treatment processes shall be such that all the rolling bearings produced in a production batch are treated uniformly.

The bearings shall be heat-treated to retain dimensional stability for one of the two following temperature categories:

- 150 °C
- 200 °C

The temperature category shall be given and documented in the Technical specification (Clause 4).

The bearings (inner and outer rings) shall be heat-treated to retain dimensional stability at least for operating temperatures up to 150 °C.

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Inner rings of cylindrical roller bearings that are heated during mounting or dismounting shall be dimensionally stable up to 200 °C.

The retained austenite content for inner rings made of through-hardened rolling bearing steel must be:

- 150 °C:  $\leq 3.0$  % with a measuring accuracy of  $\pm 1$  %;
- 200 °C:  $\leq 2.0$  % with a measuring accuracy of  $\pm 1$  %.

For other steels, the retained austenite content must be defined in the course of the (type) approval procedure.

The inspection frequency of the retained austenite content is specified in Table 3 — Inspection plan, 12.1. The method of measurement of retained austenite is to be defined in the technical specification (Clause 4).

**6.3 Traceability**

For the manufacturing process a system of identification and traceability of finished products shall be set up and maintained. This system shall allow identification, of the following elements:

- Raw material for rings and rollers;
- Inspection certificate 3.1 in accordance with EN 10204 or equivalent. Minimum content:
  - Chemical analysis (all elements);
  - Steel production method;
  - Microstructure (CN, CG, CZ);
  - Inclusion content (see 7.2.2);
- Polymeric cages:
  - Raw material (granulate material) + raw material manufacturer;
  - Inspection results; inspections at least in accordance with EN 12080, Annex D;
  - Manufacturer, manufacturer's mark, date of manufacture;
- Rolling bearing grease:
  - Name, manufacturer ;
  - Inspection certificate 3.1 in accordance with EN 10204 or equivalent. The content of the certificate is according to EN 12081.
- Production locations of rings and rollers;

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- Traceability of heat treatment:
  - Method;
  - Temperature variations including nominal and actual values per heat treatment batch;
  - Microstructural examination per heat treatment batch;
  - Hardness values/case-hardening depth of rings and rollers in accordance with EN 12080, Table 3;
  - Retained austenite content, inspection frequency in accordance with 6.2;
  - If there are several heat treatment batches per production batch they must be assignable to the production batch;
- Significant changes in the finishing process after heat treatment that could lead to defects, e.g. so called “grinding burns”;
- Traceability of the inspection results in accordance with the inspection plan, (see 12.1);
- Quality records in accordance with Clause 13 and records of inspection plans, inspection instructions and calibrations.

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## 6.4 Coatings

### 6.4.1 General

The type of coating used for the bearing boundary surfaces shall be agreed and documented in accordance with Clause 4. Distinction shall be made between permanent coatings (e.g. for electrical insulation) and non-permanent coatings (e.g. phosphate coating for corrosion protection).

### 6.4.2 Permanent coating

The dimensions in the finished state (including the coating) shall apply for approval and use of the bearing.

### 6.4.3 Non-permanent coating

The dimensions before coating shall apply for approval and use of the bearing and the thickness of the non-permanent coating shall be considered separately. Boundary dimensions shall be documented both for the coated and the uncoated state.

## 7 Material properties

### 7.1 General

The grades and qualities of materials used shall conform to the requirements in 7.2 and 7.3.

### 7.2 Steel for rings and rolling elements

#### 7.2.1 Grades

Steels should be selected from the grades specified in EN ISO 683-17. Alternative steel grades may be used if specified in the technical specification. For particular applications (high rotational speed,