



**SLOVENSKI STANDARD**  
**SIST EN 12082:2001**  
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**Železniške naprave - Ohišja ležajev kolesnih dvojic - Preskus delovanja**

Railway applications - Axleboxes - Performance testing

Bahnanwendungen - Radsatzlager - Prüfung des Leistungsvermögens

Applications ferroviaires - Boîtes d'essieux - Essais de performance

**iTeh STANDARD PREVIEW**

**Ta slovenski standard je istoveten z: EN 12082:1998**

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EUROPEAN STANDARD

EN 12082

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ICS

Descriptors: railway equipment, railway rolling stock, axlebox, rolling bearing, performance test, testing conditions, acceptance criteria

English version

## Railway applications - Axleboxes - Performance testing

Applications ferroviaires - Boîtes d'essieux - Essais de performance

Bahnanwendungen - Radsatzlager - Prüfung des Leistungsvermögens

This European Standard was approved by CEN on 22 February 1998.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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## Foreword

This European Standard 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of an identical text or by endorsement, at the latest by September 1998, and conflicting national standards shall be withdrawn at the latest by September 1998.

This European Standard 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(s).

- Council Directive 96/48/EEC of 23 July 1996 on the interoperability of the European high-speed train network <sup>1)</sup>
- Council Directive 93/38/EEC of 14 June 1993 coordinating the procurement procedures of entities operating in the water, energy, transport and telecommunications sectors <sup>2)</sup>
- Council Directive 91/440/EEC of 29 July 1991 on the development of the Community's railways <sup>3)</sup>

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

This European Standard has been drawn up with the purpose of standardizing the performance testing of axleboxes for all types of rolling stock to ensure suitability for the required service, i.e. that the assembly of box housing, bearing, sealing and grease is well suited for the service requirements.

This testing is made up of two stages, a "Rig performance test", described in detail in this European Standard, and a "Field test". When rig performance testing is specified, it is to be carried out in accordance with this European Standard. The extent of testing to be applied depends on the novelty of bearing design, seal design, grease formulation or box housing, as well as the application (see EN 12080 and EN 12081).

The rig performance test will check the satisfactory function of the assembly during a simulated journey. It is to be applied only if the axlebox is composed of elements delivered by suppliers, which operate a quality system conforming to EN ISO 9001 or EN ISO 9002.

The field test comprises monitoring on vehicles in service of a sufficiently large sample of axleboxes during a high mileage.

## 1 Scope

This European Standard describes the principles and methods for a rig performance test of assembled axleboxes with rolling bearings according to EN 12080 and with lubricating greases according to EN 12081. Test parameters and minimum performance requirements for vehicles in operation on main lines are specified in clause 6 and Annex A (normative). Different test parameters and performance requirements may be selected for vehicles in operation on other networks.

Basic principles for a field test are also determined.

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1) Official Journal of the European Communities No L 235 of 17.9.96  
2) Official Journal of the European Communities No L 199 of 9.8.93  
3) Official Journal of the European Communities No L 237 of 24.8.91

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

EN 12080	Railway applications – Axleboxes – Rolling bearings
EN 12081	Railway applications – Axleboxes – Lubricating greases
EN ISO 9001	Quality systems – Model for quality assurance in design/development, production, installation and servicing (ISO 9001 : 1994)
EN ISO 9002	Quality systems – Model for quality assurance in production, installation and servicing (ISO 9002 : 1994)
ISO 2137	Petroleum products – Lubricating grease and petrolatum – Determination of cone penetration
ISO 2176	Petroleum products – Lubricating grease – Determination of dropping point
ISO 3733	Petroleum products and bituminous materials – Determination of water – Distillation method
UIC 515–4	Passenger rolling stock – Trailer bogies – Running gear – Bogie frame structure strength tests
UIC 515–5	Passenger rolling stock – Trailer bogies – Running gear – Tests for axleboxes
NF F 19–503	Matériel roulant ferroviaire – Méthode d'essais des graisses pour boîtes d'essieux à roulements – Essai dynamique de la stabilité à l'oxydation des graisses

## 3 Definitions

For the purpose of this standard, the following definitions apply:

- 3.1 customer:** railway company, manufacturer or buyer of railway rolling stock or subassemblies, or their representative.
- 3.2 railway company:** organisation or its representative, whatever status it has, which is responsible for the registration of rolling stock.
- 3.3 supplier:** supplier of rolling bearings, sealing, grease or box housings for axleboxes, manufactured under his responsibility.
- 3.4 axlebox:** assembly of box housing, rolling bearings, sealing and grease.
- 3.5 box housing:** structural component which contains rolling bearings, sealing and grease.
- 3.6 rolling bearing:** bearing operating with rolling motion between the parts, supporting load and moving in relation to each other.
- 3.7 grease:** semi-solid lubricant, which consists of a thickener and additives dispersed in a lubricating oil.
- 3.8 sealing:** component that protects the rolling bearings against ingress of water and dust and retains grease in the rolling bearings.
- 3.9 nominal test speed:** the vehicle speed limit increased with 10 %.
- 3.10 main line:** a railway network open to different types of rolling stock.
- 3.11 network:** the infrastructure, on which any railway company can operate rolling stock.

## 4 Information and conditions to be agreed and documented

The approval procedures for the rolling bearings are defined in EN 12080 and for the lubricating greases in EN 12081. The rig performance test is stipulated in both of these European Standards.

For the rig performance test, the following is to be agreed between the customer and the supplier and shall be fully documented by the supplier:

- designation and characteristics of the rolling bearing according to EN 12080;
- designation and characteristics of the lubricating grease according to EN 12081;
- designation and characteristics of the sealing;
- designation and characteristics of the box housing;
- basic load and speed data for the application vehicle (see 6.2.2);
- the extent of testing for rolling bearings for vehicles not in operation on main lines;
- the extent of testing for rolling bearing, grease, sealing or box housing similar to service proven designs (see A.4);
- the conditions intended for the field test (see clause 7).

## 5 Sealing test

The customer shall specify whether a sealing test shall be made. A water spray test is described in UIC 515–5.

## 6 Rig performance test

### 6.1 General

The test consists in putting two axleboxes on a test rig and subjecting them to repeated loading cycles determined from the operating conditions of the vehicles to be equipped with these axleboxes.

Two identical axleboxes, with rolling bearings, sealing, grease and box housing, assembled as for operating conditions shall be mounted on the test rig axle journals. After mounting, the clearance shall be as close as possible to the maximum of the tolerance for one axlebox, and minimum for the other.

During rig operation, the axleboxes are subjected to constant vertical loads and varying transversal loads which will produce radial and axial forces on the rolling bearings.

Before the real performance test, a pre-test shall be carried out. This does not constitute part of the official approval test for the bearings or grease being tested, but is intended to observe the thermal behaviour of the bearings while the grease is redistributed.

The performance test consists in repeating identical cycles up to an agreed cumulative distance. The number of cycles and the test distance reflect the service conditions of the intended application. Throughout the test, the performance of the bearings will be monitored by measurement of temperatures, the values of which, both absolute and relative, shall remain within limits. Finally, on completion of the test, the bearings and the grease will be inspected and shall not show any changes beyond limits imposed.

### 6.2 Execution

#### 6.2.1 Test rig

The test rig shall simulate the operating conditions and ensure accurate monitoring of the axleboxes under test and at the same time minimize influence from the rig. Especially, it shall be avoided that disturbances on one axlebox are transferred to the other axlebox.

An example of a test rig is schematically shown in A.1 and includes principally:

- an axle or two synchronized axles, on which the axle boxes are mounted on the journals;
- a rotation mechanism; [SIST EN 12082:2001](https://standards.iteh.ai/catalog/standards/sist/en-12082-2001)
- a device for measuring the rotational speed of the axle; <https://standards.iteh.ai/catalog/standards/sist/cdf1d34a-3bfa-4752-a360-04672d3a0147/sist-en-12082-2001>
- a device arranged to subject each axlebox to a constant radial force  $F_r$ ;
- a measuring device to monitor this radial force  $F_r$ ;
- a device arranged to subject each axlebox to an alternating axial force  $F_a$ ;
- a measuring device to monitor this alternating axial force  $F_a$ ;
- a ventilation equipment to simulate the cooling in operation;

- sensors permitting temperature measurement:
  - of the loaded zone of each bearing in the axle boxes, by a sensor in contact with the outer ring (see A.2);
  - in the scanning zone of the hot box detectors (HBD), by a sensor glued to the axle box body (see A.2);
  - of the ambient air near the axle boxes in the air stream (see A.1).

## 6.2.2 Test parameters

The test parameters will be defined on the basis of the operating conditions of the vehicles to be equipped with these axle boxes and documented in accordance with clause 4. The following test parameters are required, agreed and documented before the test and presented in the test report:

- maximum mass of the vehicle in running order  $m_{\max}$  in kg;
- number of wheelsets  $j$ ;
- mass of one wheelset  $m_0$  in kg;
- wheel diameter at the limit of wear  $d_{\min}$  in metres;
- vehicle speed limit  $v_{\max}$  in kilometres per hour;
- pretest procedure;
- test cycle and cumulative test distance in kilometres;
- original grease quantity and, if required, re-lubrication interval and grease quantity.

If deviations from the test parameters in A.3 and A.5 are agreed in order to simulate special operating conditions, this shall be indicated in the test report.

### 6.2.2.1 Rotational speed

The maximum rotational speed, maintained most of the time during the test, is that of a wheelset on which the wheels are at their limit of wear and where the rotational speed is derived from the vehicle speed limit, increased with a safety margin of 10 %. The resulting rotational speed is the nominal test speed,  $n$ , in revolutions per minute.

$$n = \frac{110 \cdot v_{\max}}{6 \cdot \pi \cdot d_{\min}}$$

### 6.2.2.2 Radial and axial forces

The external forces are applied to each axlebox inducing forces on the rolling bearings, simulating as closely as possible the distribution of forces from the primary suspension. There shall be a constant radial force and an alternating axial force.

Based on the load data specified in accordance with clause 4, the values of radial and axial forces shall be calculated as defined in A.3, and the frequency of application of the axial load as defined in A.5. The axial force shall not be applied when the test speed is less than 20 % of the nominal test speed.

### 6.2.2.3 Air cooling

An air cooling system shall provide an air speed, measured close to the test axleboxes of 8 – 10 m/s. This cooling is maintained constant when the test is running, however not during the stops. An air temperature of 20 °C is recommended; if it deviates from this value, the temperatures recorded on the test axlebox shall be expressed relative to the 20 °C.

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## 6.3 Carrying out the test

Unless otherwise agreed and documented in accordance with clause 4, the test parameters, speeds and forces shall be those in 6.2.2, A.3 and A.5.

### 6.3.1 Pre-test

Before running the performance test, a pre-test shall be run. This test has as objective to observe the thermal behaviour of the bearings and to redistribute the grease. The pre-test is illustrated in A.5. It consists of four cycles, each made up of two elementary trips, one in each rotational direction. The speeds are 25, 50, 75 and 100 % of the nominal test speed, respectively. The radial force shall be maintained during the test; the axial force is applied as agreed. Each elementary trip is made up of a speed increase, a constant speed, a slowing down and a stop.



The distance of each elementary trip is not predetermined; when the temperatures have stabilized – at least two hours within a 5 degree range – the trip is completed.

### 6.3.2 Performance testing

The test consists in repeating identical cycles at the nominal test speed to a specified cumulative distance. A cycle consists of two elementary trips, one for each direction of rotation, separated by a short stop and composed of a starting period, a period of constant maximum speed and a slowing down period to stop. The stop period may be prolonged if required.

The cumulative test distance (in kilometres), as well as the time at the nominal test speed during each cycle (in minutes), depends on the operating conditions in line traffic of the vehicles to be equipped with these axleboxes. The conditions defined in A.4 and A.5 are intended for main line vehicles. For other applications, the test parameters shall be in accordance with clause 4.

## 6.4 Acceptance criteria

### 6.4.1 Results to be obtained during the test

Throughout the test, no defect in lubrication shall occur as evidenced by unsatisfactory temperature. Likewise, there shall be no bearing defects (spalling, breakage, etc.) or seal failures.

Throughout the test, temperatures shall be measured during each elementary test trip and expressed relative to an ambient temperature of 20 °C. For each sensor position, the maximum temperature as well as the simultaneous differences between axleboxes shall be registered. For consecutive elementary trips, the change of maximum temperatures shall be noted for each bearing.

The limits to be observed and the tolerable number of violations are given in A.6. If these limits are exceeded by too many violations, the rig performance testing shall be stopped. These limits are based on rig testing of tapered roller bearings. For other bearing types, there is currently not enough rig testing experience to fix appropriate criteria. Therefore, the limits to apply shall be based on knowledge of reference cases in comparable applications.

### 6.4.2 Results to be obtained after the test

On completion of the cumulative distance, the bearings shall be dismounted for examination; likewise grease samples from the zones 1, 2 and 3 (see A.2) shall be analysed. The mechanical criteria to be fulfilled by the bearings and the physico-chemical criteria to be fulfilled by the grease are defined in A.7.

## 6.5 Report

Upon completion of the test, a report shall be established with at least this content:

- designation and supplier of the products tested;
- the testing organisation, site, personnel responsible and description of the test rig;
- the test parameters applied during the pre-test and the performance test, in accordance with clause 4, 6.2.2, A.3 and A.4;
- the results obtained during and after the test, enabling evaluation of the products to the criteria in 6.4, (A.6 and A.7).

This report shall be available to the customer and the supplier of the components tested.

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## 7 Field test

### 7.1 General

[SIST EN 12082:2001](#)

The axleboxes to be tested shall be composed of box housings, bearings, seals and grease strictly identical to those which have satisfactorily passed the rig performance test. [EN 12082-2001](#)

### 7.2 Carrying out the test

The axleboxes to be tested shall, as far as possible, be mounted on vehicles covering high annual mileage at the maximum operating speeds authorized for that category of vehicle, and with the highest possible axle loads. For main line vehicles with a speed limit up to 200 km/h, the test should last at least two years or 600 000 km; if the speed limit is over 200 km/h, at least 1 000 000 km.