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Železniške naprave - Ohišja ležajev kolesnih dvojic - Preskusni postopki

Railway applications - Axleboxes - Test procedures

Bahnanwendungen - Radsatzlager - Teil 1: Prüfverfahren

Applications ferroviaires - Boîtes d'essieux - Méthodes d'essai

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English Version

Railway applications - Axleboxes - Test procedures

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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prEN 12082-1:2024 (E)**European foreword**

This document (prEN 12082-1:2024) has been prepared by Technical Committee CEN/TC 256 “Railway Applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 12082:2017+A1:2021.

EN 12082-1 includes the following significant technical changes with respect to EN 12082:2017+A1:2021:

- Document split into EN 12082-1 on Test procedures and EN 12082-2 on Deployment procedure
- EN 12082-1 contains requirements for tests which are referred to in EN 12082-2 as part of the axlebox deployment procedure. These test requirements focus on test preparation, test execution and post-test actions including the test report. Main addressees of EN 12082-1 are testing institutes which carry out the tests.
- Requirements on test specifications and test reports are revised and separated for each test
- Tightness tests is now mentioned with water tightness test as one example
- Modified requirements on water tightness test with respect to test procedure and test conditions
- Saddle adapter added as possible housing design to overview of common axlebox designs as possible housing design
- Modifications to rig performance test with respect to results obtained after the test, definition of grease sampling areas, test report and test procedure
- Modifications to field test requirements with respect to acceptance criteria

This series of European standards *Railway applications – Axleboxes* consists of:

- EN 12080, Railway applications — Axleboxes — Rolling bearings
- EN 12081, Railway applications — Axleboxes — Lubricating greases
- EN 12082-1, Railway applications — Axleboxes — Test procedures
- EN 12082-2, Railway applications — Axleboxes — Deployment procedure

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(s).

Introduction

This document has been drawn up with the purpose of standardizing component integration and the performance testing of axleboxes for rolling stock to ensure suitability for the required service, i.e. that the assembly of box housing, bearing(s), seal(s) and grease is well suited for the service requirements.

This axlebox performance testing is made in two stages, a “rig test”, described in detail in this document, and a “field test”. The extent of testing to be applied depends on the novelty of bearing design, seal design, grease formulation and/or box housing, as well as the application.

The second part of this European standard comprises requirements for the deployment with respect to design parameters of the axlebox and its components. This dedicated part of the standard is introduced to comply with CEN regulations regarding conformity assessment and mainly consists of clauses and requirements that were part of EN 12080 and EN 12081 before.

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prEN 12082-1:2024 (E)

1 Scope

This document specifies the principles and methods for a rig performance test of the system of axlebox rolling bearing(s), housing, seal(s) and grease, required for reliable operation of trains on European networks. It covers a rig performance test, a water tightness test and basic principles for a field test. Test parameters and minimum performance requirements for vehicles in operation on main lines are specified. Different test parameters and performance requirements may be selected for vehicles in operation on other networks (e.g. urban rail). This document is historically developed for outboard applications with rotating inner rings, but can be used for vehicles with inboard bearing arrangements.

It gives some possible examples where a sequenced rig performance test addresses the broad range of different service conditions within a specific application or vehicle platform into account.

It describes compatibility tests of components for their integration into the axlebox system.

With respect to design requirements on the rolling bearing(s) according EN 12080 and grease according EN 12081, it outlines requirements for the deployment of the respective component or assembly.

This document only applies to axleboxes equipped with rolling bearings and greases according to EN 12080 and EN 12081.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ASTM D7303:2012, *Standard Test Method for Determination of Metals in Lubricating Greases by Inductively Coupled Plasma Atomic Emission Spectrometry*

DIN 51460-1:2007, *Testing of petroleum products — Method for sample preparation — Part 1: Microwave incineration*

DIN 51829:2013, *Petroleum products — Determination of additive and wear elements in greases — Analysis by wavelength dispersive X-ray fluorescence spectrometry*

prEN 12081:2024,¹ *Railway applications — Axleboxes — Lubricating greases*

EN 15663, *Railway applications — Definition of vehicle reference masses*

EN ISO 11885, *Water quality - Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES) (ISO 11885:2007)*

ISO 15243:2017, *Rolling bearings — Damage and failures — Terms, characteristics and causes*

¹ Currently under revision

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

axlebox

assembly consisting of the following major components: rolling bearing(s), grease, seal(s) and box housing

Note 1 to entry: Further components such as axle end cap components, bearing sleeve, box cover(s), distance rings, fasteners, labyrinth(s) may be also part of the assembly but their presence depends on the axlebox type design.

3.2

box housing

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

3.3

ovality

change (permanent deformation) in the bore's shape of an axlebox housing becoming slightly oval

3.4

rolling bearing

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

3.5

cartridge bearing

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

3.6

grease

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

3.7

seal

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

3.8

roller set

assembly of cage and rollers

3.9

inboard

<axlebox with more than one bearing row> designates the bearing row closer to the middle of the wheelset or the test rig

prEN 12082-1:2024 (E)**3.10****inboard**

<vehicle or application> configuration with rolling bearings that are positioned on a wheelset axle between the wheels of a wheelset

3.11**outboard**

<axlebox with more than one bearing row> bearing row that is next to the inboard bearing row to the outside direction

3.12**outboard**

<vehicle or application> configuration with rolling bearings that are positioned on wheelset axle ends, outside of the space between the wheels of a wheelset

3.13**maximum operational test speed**

V_{\max}

maximum operational speed for normal service (in km/h) for which the vehicle shall be homologated

3.14**nominal rotational test speed**

n_{test}

rotational speed (using the half worn wheel diameter) corresponding to V_{\max} increased by 10 % (in rpm)

3.15**target zone**

defined area on the underside of an axlebox that is designed to have its temperature monitored by a hot axlebox detector (HABD)

3.16**main line**

railway network open to different types of rolling stock

3.17**urban rail**

public transport systems permanently guided at least by one rail, intended for the operation of local, urban and suburban passenger services with self-propelled vehicles and operated either segregated or not from general road and pedestrian traffic

[SOURCE: CEN-CENELEC Guide 26]

3.18**network**

infrastructure, on which any railway undertaking can operate rolling stock

3.19**deployment process**

methodical procedure of introducing an axlebox or a change to an axlebox into vehicle service

4 Symbols and abbreviations

For the purposes of this document, the symbols and abbreviations given in Table 1 and Table 2 apply.

Table 1 — Symbols

Symbol	Unit	Description
d_{average}	m	average wheel diameter between new and fully worn condition
d_{max}	m	wheel diameter in new condition
d_{min}	m	wheel diameter at limit of wear condition
D_{max_n}	m	maximum bore diameter under loaded condition of the new housing
D_{min_n}	m	minimum bore diameter under loaded condition of the new housing
D_{max_r}	m	maximum bore diameter under loaded condition of the reference housing
D_{min_r}	m	minimum bore diameter under loaded condition of the reference housing
F	N	force
F_0	N	reference vertical force applied per wheelset on the track
F_a	N	axial test force
F_{an}	N	nominal axial test force
F_r	N	radial test force
F_{rn}	N	nominal radial test force
g	m/s ²	acceleration due to gravity (9,81 m/s ²)
j	-	number of wheelsets per vehicle
m_2	kg	wheelset mass and masses on the wheelset between rolling circles, like brake disc, etc.
m_{max}	kg	vehicle design mass according to EN 15663
n	rpm	rotational test speed corresponding to v
n_{test}	rpm	(see 3.14 nominal rotational test speed definition)"
N_{trips}	-	estimated number of elementary trips needed to achieve the performance test (based on nominal speed)"
$N_{\text{trips_adj}}$	-	adjusted value of N_{trips} to account for variations in speed"
t_1	s	time of one test cycle (see A.6)
t_2	s	time of one elementary trip

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Symbol	Unit	Description
t_3	s	ramp up or ramp down time from $n = 0 \rightarrow n = n_{\text{test}}$ or $n = n_{\text{test}} \rightarrow n = 0$ during one elementary trip
t_4	s	time at rotational speed n_{test} during one elementary trip
t_5	s	stop time ($n = 0$)
t_6	s	time of one half load cycle of the alternating axial test force
t_7	s	time during which axial test force is applied (including ramp up and ramp down) within the period t_6
t_8	s	ramp up or ramp down time from $F_a = 0 \rightarrow F_a = F_{\text{an}}$ or $F_a = F_{\text{an}} \rightarrow F_a = 0$ during one half load cycle of the alternating axial test force
t_9	s	axial test force recovery time
T_a	°C	ambient temperature (A running average can be used for this value. If a running average is used, the duration for the running average shall be justified and documented)
T_{z20}	°C	measured temperature at a position z and then re-calculated to a temperature corresponding to an ambient temperature of 20 °C
T_{zm}	°C	measured temperature at a position z (measured positions are loading zones and target zones)
v	km/h	speed of the vehicle
v_{max}	km/h	(see 3.13 maximum operational test speed definition)

Table 2 — Abbreviations

Abbreviation	Description
HABD	hot axlebox detector
ICP	inductively coupled plasma (spectrometry)
MEP	mounted end play
XRF	X-ray fluorescence (spectrometry)

5 Tightness test

5.1 Water tightness test

An example for a water tightness test is given in Annex C.

5.2 Test specification

The test specification shall consist of all the information describing test parameters and acceptance criteria.

The following requirements shall at least be fully documented and included in the test specification:

- report recipients list