SLOVENSKI STANDARD
SIST EN 15437-2:2014+A1:2023

01-marec-2023

Železniške naprave - Nadzor ohišja ležajev kolesnih dvojic - Mesto meritev in zahteve za načrtovanje - 2. del: Zahteve za načrtovanje naprav na vozilu za nadzor temperature (vključuje dopolnilo A1)

Railway applications - Axlebox condition monitoring - Interface and design requirements - Part 2: Performance and design requirements of on-board systems for temperature monitoring

Bahnanwendungen - Zustandsüberwachung von Radsatzlagern - Schnittstellen und Gestaltungsanforderungen - Teil 2: Leistungs- und Konstruktionsanforderungen von fahrzeugbasierten Systemen für Temperaturüberwachung

Applications ferroviaires - Surveillance des boîtes d'essieux - Exigences liées aux interfaces - Partie 2 : Exigences de performance et de conception des systèmes embarqués de surveillance de la température

Ta slovenski standard je istoveten z: **EN 15437-2:2012+A1:2022**

ICS:

45.060.01	Železniška vozila na splošno	Railway rolling stock in general

SIST EN 15437-2:2014+A1:2023 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15437-2:2012+A1

December 2022

ICS 45.060.01

Supersedes EN 15437-2:2012

English Version

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Ref. No. EN 15437-2:2012+A1:2022 E

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European foreword

This document (EN 15437-2:2012+A1:2022) 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of an identical text or by endorsement, at the latest by June 2023, and conflicting national standards shall be withdrawn at the latest by June 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document includes Amendment 1 approved by CEN on 21 November 2022.

This document will supersede EN 15437-2:2012.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

EN 15437 "*Railway applications - Axlebox condition monitoring - Interface and design requirements*" is comprised of the following parts:

— *Part 1: Track side equipment and rolling stock axlebox*;

— *Part 2: Performance and design requirements of on-board systems for temperature monitoring* (the present document).

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

Failed wheelset bearings on rolling stock create a hazard to the safe operation of the railway. If a bearing fails while rolling stock is in service there is the potential for a catastrophic event. A catastrophic event may result in fatalities, severe damage to rolling stock and/or the infrastructure and a risk that rolling stock may derail and/or a fire may develop.

One indication that a bearing is about to fail is a rise in the heat generated by the bearing. Bearings that are about to fail may, therefore, be detected by monitoring their temperature to identify an unacceptable rise.

This part of EN 15437 covers the monitoring of axlebox bearing temperature by on-board monitoring systems. According to the application, these may be considered to be basic systems or advanced systems.

In most cases, rolling stock axleboxes continue to be monitored by trackside Hot AxleBox Detectors [HABD] which is the subject of Part 1 of EN 15437. The monitoring system is fitted on the rolling stock and is able to function autonomously from trackside monitoring systems which are ground-based.

In contrast to trackside monitoring systems, the detection characteristic may be adapted to the particular vehicle design, such that the alarm levels employed are configured depending on the bearing properties, sensor arrangement, vehicle type, network characteristics, etc.

The use of on-board monitoring may also provide a solution for overcoming constraints related to bogie design or other aspects of vehicle design or operation which may prevent effective monitoring by means of the track-side monitoring systems.

Other devices which apply functionally equivalent alternatives (for example based on the principle of vibration monitoring) may be available and normalized elsewhere, such as in other parts of this series of European Standards.

1 Scope

This European Standard defines the minimum performance requirements of on-board monitoring systems for axlebox condition monitoring by means of temperature measurements.

This European Standard refers to temperature monitoring of the axlebox. However, the design may be such that the rolling bearing itself is monitored directly.

The requirements of this European Standard are intended to apply equally to basic monitoring systems for monitoring the axlebox temperature through to more technically complex systems that may employ a combination of mechatronics.

To ensure the compatibility of monitoring systems and the effective monitoring functions, this European Standard defines the requirements in the following areas:

— equipment and characteristics;

— monitoring performance;

— operation and interface.

This part of EN 15437 does not include:

— systems that do not give an indication to the driver;

— how an on-board monitoring system is structured and how it measures the temperature and identifies axlebox position. This is considered part of equipment design and not part of the functional requirements set out in this standard;

— operational requirements for acting on the information reported by the on-board monitoring system;

— operational requirements for conflict of information between trackside monitoring systems and on-board monitoring systems;

— maintenance requirements for on-board temperature monitoring systems.

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.

A1

EN 50121-2:2017, *Railway applications — Electromagnetic compatibility — Part 2: Emission of the whole railway system to the outside world*

EN 50121-3-1:2017, *Railway applications – Electromagnetic compatibility Part 3-1: Rolling stock - Train and complete vehicle*

EN 50121-3-2:2016, *Railway applications – Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus*

EN 50125-1:2014, *Railway applications — Environmental conditions for equipment — Part 1: Rolling stock and on-board equipment*

EN 50126-1:2017, *Railway applications — The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) — Part 1: Generic RAMS process*

EN 50128:2011, *Railway applications — Communication, signalling and processing systems — Software for railway control and protection systems*

EN 50129:2018, *Railway applications — Communication, signalling and processing systems — Safety related electronic systems for signalling*

EN 50155:2017, *Railway applications — Rolling stock — Electronic equipment*

EN 61373:2010, *Railway applications — Rolling stock equipment — Shock and vibration tests (IEC 61373:2010)*

EN 61508:2010 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems (IEC 61508:2010 (all parts))*

A1

3 Terms and definitions

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

ISO and IEC maintain terminology 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 of box housing, rolling bearings, sealing and grease

3.2
bearing
axle journal bearing or bearing assembly on a rail vehicle axle that transmits a proportion of the weight of the rail vehicle directly to the wheel set

3.3
rolling bearing
bearing operating with rolling motion between the parts, supporting load and moving in relation to each other

3.4
on-board monitoring system
system that is capable of detecting a temperature of an axlebox that is indicative of the health of that axlebox and indicates when acceptable temperature conditions have been exceeded

3.5
Safety Integrity Level (SIL)
one of a number of defined discrete levels to specify the safety integrity requirements of the safety functions to be allocated to the safety related systems

Note 1 to entry: The Safety Integrity Level with the highest figure has the highest level of safety integrity.

4 Equipment and characteristics

4.1 Design requirements

The equipment shall respect the applicable requirements regarding the environmental conditions for equipment on-board rolling stock as set out in [A1] EN 50125-1:2014 [A1]. In particular, vibration design of electrical and electronic equipment, as well as their fixing, associated with the measurements on the bearing unit or on the axle box shall respect the requirements set out in [A1] EN 61373:2010 [A1].

The equipment shall respect the applicable requirements regarding electronic equipment as set out in [A1] EN 50155:2017 [A1].

On-board monitoring systems shall not interfere or influence the behaviour of trackside equipment or other train-borne equipment.

NOTE This document does not set out the architecture of the environment in which an on-board temperature monitoring system may be installed. The range of architectures may differ significantly (from a freight wagon to a high speed EMU) and therefore the level of protection required for each installation may be quite different. It is the responsibility of the system installer to establish if the specification of an on-board temperature monitoring system (including any protection for interference from external sources such as electricity or heat) is suitable for the architecture in which it is to be installed and to perform.

4.2 Reliability

The reliability of the on-board monitoring system shall be expressed according to the methods set out in [A1] EN 50129:2018 [A1]. This is to enable the Railway Undertaking (or other responsible entity) to satisfy their requirements when making a risk analysis (concerning rolling stock running with an undetected hot axlebox), for example as described in [A1] EN 50126-1:2017 [A1].

4.3 Description of alarm levels

Temperature limits shall be determined for alarm levels depending on the bearing properties, sensor arrangement, vehicle type, network characteristics, etc. as follows:

— Alarm level 1 (“hot” alarm): The temperature limit, indicative of the condition of a bearing, above which damage will occur to the bearing and/or its functionality, with the potential to lead to a hazardous event.

— Alarm level 2 (“warm” alarm): The temperature limit, indicative of the condition of a bearing, above which accelerated deterioration of its serviceability is anticipated to occur.

The axle box tests undertaken as part of the requirements set out in EN 12082 can provide an indication of the values to which the alarm levels should be set. However, the range of operational conditions can be different (grease, loads, speeds, forces, etc.) to those of the tests and therefore the final choice of values should account for operational condition.

NOTE The design and function of trackside HABDs means that the differential alarm is required. However, because the on-board monitoring system is specific to an axlebox, a differential alarm is not required. This does not prevent installing an on-board system that includes a differential alarm.

5 Monitoring performance

5.1 General

To cater for different requirements, this standard sets out requirements for both basic and advanced on-board monitoring systems.

The essential requirement is that the on-board monitoring system shall determine the temperature condition of the axlebox and indicate that acceptable temperature conditions have been exceeded. Advanced on-board monitoring systems shall determine the temperature condition of the axlebox and deliver information on the temperature condition ready for further communication and diagnosis.

5.2 Required information

5.2.1 Basic

Essential information for a basic on-board monitoring system is:

— status that the temperature of the bearing has exceeded Alarm level 1.

5.2.2 Advanced

Essential information for an advanced on-board monitoring system is:

— status that the temperature of the bearing has exceeded Alarm level 1;

— status that the temperature of the bearing has exceeded Alarm level 2;

— position on the train of the bearing which has caused an alarm. This can be done by providing detail of the longitudinal and transverse positions, the axlebox identification number, or identification on the axlebox;

— status that the detection equipment is faulty.

NOTE 1 On some systems, the alarm level 1 and the alarm level 2 can be identical.

Each item of this essential information shall include unique identification of the source of the information (equipment or axlebox position in the train).

NOTE 2 Optional information can include for example: time and date stamp, temperature values, rates of change of temperature, trends, differential comparisons, status indicator for bearing OK, status indicator for equipment OK.

5.3 Monitoring capability

5.3.1 Basic on-board monitoring system

A basic on-board monitoring system shall be capable of determining that an acceptable axlebox temperature has been exceeded.

The tolerance on the temperature at which a basic on-board monitoring system is set to indicate that an unacceptable temperature has been exceeded shall be not worse than ± 5 °C.

For a basic on-board monitoring system based on a fusible plug, where the plug is designed to be activated by an axlebox temperature exceeding 95 °C, it should be activated by an axlebox temperature between 90 °C and 100 °C.