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Railway applications - Noise emission - Characterisation of the dynamic properties of track sections for pass by noise measurements

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NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 15461:2008 sisaldab Euroopa standardi EN 15461:2008 ingliskeelset teksti.	This Estonian standard EVS-EN 15461:2008 consists of the English text of the European standard EN 15461:2008.
Standard on kinnitatud Eesti Standardikeskuse 24.04.2008 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 24.04.2008 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 13.02.2008.	Date of Availability of the European standard text 13.02.2008.
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English Version

Railway applications - Noise emission - Characterisation of the dynamic properties of track sections for pass by noise measurements

Applications ferroviaires - Emission sonore - Caractérisation des propriétés dynamiques de sections de voie pour le mesurage du bruit au passage

Bahnanwendungen - Schallemission - Charakterisierung der dynamischen Eigenschaften von Gleisabschnitten für Vorbeifahrtgeräuschmessungen

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Foreword

This document (EN 15461:2008) 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of an identical text or by endorsement, at the latest by August 2008, and conflicting national standards shall be withdrawn at the latest by August 2008.

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.

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

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, 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 interaction between the wheels of a railway vehicle and the track during operation is translated by vibrations which, in movement, generate rolling noise. The vibration response of the track structure determines the level of its sound contribution to this noise.

The method assumes that the vibration waves in the rail can be regarded as the superposition of two bending waves, one vertical and the other transverse, of the rail represented as a simple beam. Although the track rail does not behave in this way over all the frequencies covered by the measurement, this simplification permits the "decay rates" to be measured for an estimation of the dynamic behaviour of the track which is one of the basic parameters influencing the generation of rolling noise.

1 Scope

This European Standard specifies a method for characterizing the dynamic behaviour of the structure of a track relative to its contribution to the sound radiation associated with the rolling noise.

This European Standard describes a method for:

a) acquiring data on mechanical frequency response functions on a track;

b) processing measurement data in order to calculate an estimate of the vibration decay rates along the rails in an audible frequency range associated with the rolling noise;

c) presenting this estimate for comparison with the lower limits of the decay rates.

It is applicable for evaluating the performance of sections of reference tracks for measuring railway vehicle noise within the framework of official approval tests.

The method is not applicable for characterizing the vibration behaviour of tracks on loadbearing structures such as bridges or embankments.

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 61260, *Electroacoustics — Octave-band and fractional-octave-band filters (IEC 61260:1995)*

EN ISO 266, *Acoustics — Normal frequencies (ISO 266:1997)*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)*

ISO 2041, *Vibration and shock — Vocabulary*

ISO 7626-1, *Vibration and shock — Experimental determination of mechanical mobility — Part 1: Basic definitions and transducers*

ISO 7626-5, *Vibration and shock — Experimental determination of mechanical mobility – Part 5: Measurements using impact excitation with an exciter which is not attached to the structure*

3 Terms and definitions

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

3.1
frequency-response function (FRF)
frequency-dependent ratio of the motor-response phasor to the phasor of the excitation force (see ISO 7626-1)

NOTE 1 In this document, the term also refers to the mean spectral amplitude of the FRF in the form of a one-third octave spectrum.

NOTE 2 In this standard, the term frequency-response function (FRF) is used to refer generically either to accelerance (accelerometric response/excitation force) or to mobility (speed response/excitation force). The term is not used to refer to receptance (dynamic compliance).

NOTE 3 The FRF is generally calculated as the interspectrum ratio between the response and the force with the autospectrum. This estimate of the FRF is called estimate H1.

NOTE 4 A set of FRF between a single excitation point and multiple response points or even between a single response point and multiple excitation points may be used. In this standard, the case of a fixed accelerometer and a mobile instrumented excitation hammer is the easiest to implement.

3.2
accelerance
complex ratio of the acceleration at one point in a mechanical system to the force at the same point or at a different point during a single harmonic motion (see also ISO 7626-1 and ISO 2041)

NOTE Accelerance is an FRF currently expressed as a narrow-band complex spectrum. It is also used in this standard to express a one-third octave spectrum.

3.3
mobility
complex ratio of the speed at one point in a mechanical system to the force at the same point or at a different point during a single harmonic motion (see also ISO 7626-1 and ISO 2041)

NOTE Mobility is an FRF currently expressed as a narrow-band complex spectrum. It is also used in this standard to express a one-third octave spectrum.

3.4
direct FRF, FRF at the point of application
FRF for which the response is measured at the same position (as close as possible physically with an impact hammer and an accelerometer) and the same direction (see also ISO 7626-1)

NOTE In this standard, the term refers both to force and response FRF in the vertical and transverse directions.

3.5
transfer FRF
FRF for which the response amplitude is measured at a different position to the force application point

NOTE In order to define the FRF, the direction and position of the application force and the response should be mentioned.