
Železniške naprave - Zgornji ustroj proge - Protihrupne ovire in pripadajoče naprave, ki vplivajo na širjenje zvoka po zraku - Preskusna metoda za ugotavljanje akustičnih lastnosti - 3-1. del: Normalizirani spekter železniškega hrupa in enomestne številске stopnje razpršenega zvočnega polja

Railway applications - Track - Noise barriers and related devices acting on airborne sound propagation - Test method for determining the acoustic performance - Part 3-1: Normalized railway noise spectrum and single number ratings for diffuse field applications

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Bahnanwendungen - Oberbau - Lärmschutzwände und verwandte Vorrichtungen zur Beeinflussung der Luftschallausbreitung - Prüfverfahren zur Bestimmung der akustischen Eigenschaften - Teil 3-1 Standardisiertes Schienenverkehrslärmspektrum und Einzahl-Angaben für diffuse Schallfelder

Applications ferroviaires - Voie - Dispositifs de réduction du bruit - Méthode d'essai pour la détermination des performances acoustiques - Partie 3-1: Spectre de bruit ferroviaire normalisé et indices uniques d'évaluation pour des applications en champs diffus

Ta slovenski standard je istoveten z: EN 16272-3-1:2012

ICS:

17.140.30	Emisija hrupa transportnih sredstev	Noise emitted by means of transport
45.020	Železniška tehnika na splošno	Railway engineering in general

SIST EN 16272-3-1:2014

en,fr,de

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EUROPEAN STANDARD

EN 16272-3-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2012

ICS 93.100

English Version

Railway applications - Track - Noise barriers and related devices acting on airborne sound propagation - Test method for determining the acoustic performance - Part 3-1: Normalized railway noise spectrum and single number ratings for diffuse field applications

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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Foreword

This document (EN 16272-3-1:2012) 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 April 2013, and conflicting national standards shall be withdrawn at the latest by April 2013.

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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This European Standard is one of the series EN 16272 "Railway applications — Track — Noise barriers and related devices acting on airborne sound propagation — Test method for determining the acoustic performance" as listed below:

- Part 1: Intrinsic characteristics — Sound absorption in the laboratory under diffuse sound field conditions
- Part 2: Intrinsic characteristics — Airborne sound insulation in the laboratory under diffuse sound field conditions
- Part 3-1: Normalized railway noise spectrum and single number ratings for diffuse field applications
- Part 3-2: Normalized railway noise spectrum and single number ratings for direct field applications ¹⁾
- Part 4: Intrinsic characteristics — In situ values of sound diffraction under direct sound field conditions ¹⁾
- Part 5: Intrinsic characteristics — In situ values of sound reflection under direct sound field conditions ²⁾
- Part 6: Intrinsic characteristics — In situ values of airborne sound insulation under direct sound field conditions ¹⁾
- Part 7: Extrinsic characteristics — In situ values of insertion loss ²⁾

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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1) In preparation.

2) This document has been prepared as a CEN Technical Specification and is in preparation.

Introduction

This document is to be read in conjunction with EN 16272-1 and EN 16272-2 and should be applied only to situations as described in those documents (diffuse sound field).

As the two main intrinsic acoustic characteristics of noise barriers and related devices acting on airborne sound propagation in a diffuse sound field, sound absorption and airborne sound insulation are frequency dependent; and there is a need to define a reference railway noise spectrum for test purposes. This European Standard defines the basic properties of railway noise measured at the rail track side in terms of a characteristic normalised railway noise spectrum which is needed to evaluate single-number ratings of noise barriers and related devices acting on airborne sound propagation in reverberant conditions, e.g. inside tunnels or deep trenches.

This European Standard should be read in conjunction with:

- EN 16272-1, *Railway applications — Track — Noise barriers and related devices acting on airborne sound propagation — Test method for determining the acoustic performance — Part 1: Intrinsic characteristics — Sound absorption in the laboratory under diffuse sound field conditions*;
- EN 16272-2, *Railway applications — Track — Noise barriers and related devices acting on airborne sound propagation — Test method for determining the acoustic performance — Part 2: Intrinsic characteristics — Airborne sound insulation in the laboratory under diffuse sound field conditions*.

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1 Scope

This European Standard specifies a normalised railway noise spectrum for the evaluation and assessment of the acoustic performance of devices designed to reduce airborne railway noise near railways.

All noise reducing devices that differ from noise barriers and related devices acting on airborne sound propagation, e.g. devices for attenuation of ground borne vibration and on board devices, are out of the scope of this European Standard.

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 16272-1, *Railway applications — Track — Noise barriers and related devices acting on airborne sound propagation — Test method for determining the acoustic performance — Part 1: Intrinsic characteristics — Sound absorption in the laboratory under diffuse sound field conditions*

EN 16272-2, *Railway applications — Track — Noise barriers and related devices acting on airborne sound propagation — Test method for determining the acoustic performance — Part 2: Intrinsic characteristics — Airborne sound insulation in the laboratory under diffuse sound field conditions*

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3 Terms and definitions (standards.iteh.ai)

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

3.1

normalised railway noise spectrum

spectrum that is used for the calculation of the acoustic performance of noise barriers and related devices acting on airborne sound propagation near railways, in terms of single-number ratings of sound absorption and airborne sound insulation

Note 1 to entry: The spectrum is expressed in terms of relative A-weighted sound pressure levels in decibels, for one-third octave bands, L_i , in the frequency range from 100 Hz to 5 kHz.

3.2

one-third octave bands level L_i

relative A-weighted sound pressure levels in decibels, of a normalised railway noise spectrum for one-third octave bands with centre frequency f_i

4 Normalised railway noise spectrum

The normalised railway noise spectrum shown in Table 1 shall be used to assess the acoustic performance of noise barriers and related devices acting on airborne sound propagation near railways.

Table 1 — Normalised railway noise spectrum

f_i Hz	L_i railways dB
100	- 27
125	- 25
160	- 23
200	- 21
250	- 19
315	- 17
400	- 15
500	- 13
630	- 12
800	- 11
1 000	- 10
1 250	- 9
1 600	-9
2 000	-9
2 500	- 9
3 150	- 10
4 000	- 13
5 000	- 17

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5 Single-number rating of sound absorption DL_α

A single-number rating shall be derived from frequency dependent data to indicate the performance of the product.

The individual absorption coefficient values shall be weighted according to the normalised railway noise spectrum defined in Table 1.

The single-number rating of sound absorption DL_α , in decibels, is given by:

$$DL_\alpha = -10 \cdot \lg \left[1 - \frac{\sum_{i=1}^{18} \alpha_{S_i} 10^{0,1L_i}}{\sum_{i=1}^{18} 10^{0,1L_i}} \right] \quad (1)$$

where:

L_i is the relative A-weighted sound pressure level (dB) of the normalised railway noise spectrum, as defined in table 1, in the i -th one-third octave band;

α_{S_i} is the sound absorption coefficient value in the i -th one-third octave band.

In some cases, the ratio of the summation terms in Formula (1) can exceed 1 which precludes the calculation of DL_α . For this reason the maximum value of this ratio shall be limited to 0,99.

NOTE Annex A provides guidance on the use of the single-number rating of sound absorption.

6 Single-number rating of airborne sound insulation DL_R

A single-number rating shall be derived to indicate the performance of the product.

The individual sound reduction index values shall be weighted according to the normalised traffic noise spectrum defined in Table 1.

The single-number rating of airborne sound insulation DL_R , in decibels, is given by:

$$DL_R = -10 \cdot \lg \left[\frac{\sum_{i=1}^{18} 10^{-0,1R_i} 10^{0,1L_i}}{\sum_{i=1}^{18} 10^{0,1L_i}} \right] \quad (2)$$

where:

L_i is the relative A-weighted sound pressure level (dB) of the normalised railway noise spectrum, as defined in Table 1, in the i -th one-third octave band;

R_i is the airborne sound reduction index value in the i -th one-third octave band.

NOTE Annex B provides guidance on the use of the single-number rating of airborne sound insulation.