
Protihrupne ovire za cestni promet - Preskusna metoda za ugotavljanje akustičnih lastnosti - 2. del: Karakteristike, značilne za izolacijo pred zvokom v zraku pri razpršenem zvočnem polju

Road traffic noise reducing devices - Test method for determining the acoustic performance - Part 2: Intrinsic characteristics of airborne sound insulation under diffuse sound field conditions

Lärmschutzvorrichtungen an Straßen - Prüfverfahren zur Bestimmung der akustischen Eigenschaften - Teil 2: Produktspezifische Merkmale der Luftschalldämmung in diffusen Schallfeldern

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Dispositifs de réduction du bruit du trafic routier - Méthode d'essai pour la détermination de la performance acoustique - Partie 2: Caractéristiques intrinsèques de l'isolation aux bruits aériens dans des conditions de champ acoustique diffus

Ta slovenski standard je istoveten z: prEN 1793-2

ICS:

17.140.30	Emisija hrupa transportnih sredstev	Noise emitted by means of transport
93.080.30	Cestna oprema in pomožne naprave	Road equipment and installations

oSIST prEN 1793-2:2017

en,fr,de

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 1793-2

November 2016

ICS 17.140.30; 93.080.30

Will supersede EN 1793-2:2012

English Version

Road traffic noise reducing devices - Test method for determining the acoustic performance - Part 2: Intrinsic characteristics of airborne sound insulation under diffuse sound field conditions

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zur Bestimmung der akustischen Eigenschaften - Teil
2: Produktspezifische Merkmale der
Luftschalldämmung in diffusen Schallfeldern

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 226.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (prEN 1793-2:2016) has been prepared by Technical Committee CEN/TC 226 “Road equipment”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1793-2:2012.

With respect to the superseded document, the following changes have been made:

- The declaration of measurement uncertainty and the related confidence level is now mandatory. The reported uncertainties have an impact on the determination of informative categories of single number rating performance; depending on the performance of the product this could potentially result in products being 'downgraded' to a lower category. As a result, the informative annex in the previous version of this European Standard that addressed categories of single number rating has been removed. The performance of the noise reducing device is, from now on, only to be reported in terms of the numeric values of the single number rating.

EN 1793-2 is part of a series and should be read in conjunction with the following:

- EN 1793-1, Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 1: Intrinsic characteristics of sound absorption under diffuse sound field conditions;
- EN 1793-3, Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 3: Normalized traffic noise spectrum;
- EN 1793-4, Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 4: Intrinsic characteristics — In situ values of sound diffraction;
- EN 1793-5, Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 5: Intrinsic characteristics — In situ values of sound reflection under direct sound field conditions;
- EN 1793-6, Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 6: Intrinsic characteristics — In situ values of airborne sound insulation under direct sound field conditions.

Introduction

Noise reducing devices alongside roads need to provide adequate sound insulation so that sound transmitted through the device is not significant compared with the sound diffracted over the top. This European Standard specifies a test method for qualifying the intrinsic airborne sound insulation performance for noise reducing devices designed for roads in reverberant conditions, e.g. inside tunnels or deep trenches or under covers.

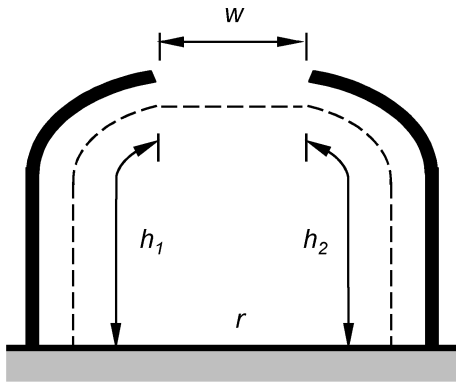
The measurement results of this method for airborne sound insulation are comparable but not identical with the results of the test method EN 1793-6, mainly because the present method uses a diffuse sound field, while the other method assumes a directional sound field. Research studies suggest that good correlation exists between field data, measured according to EN 1793 6 and laboratory data, measured according to the method described in the present document [1], [2], [3], [4].

The test method described in this European Standard should not be used to determine the intrinsic characteristics of airborne sound insulation for noise reducing devices to be installed on roads in non-reverberant conditions.

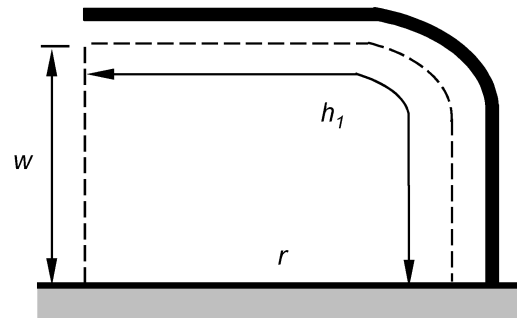
This European Standard is not concerned with determining insertion loss (extrinsic performance) which additionally depends on factors which are not related to the product itself; e.g. the dimensions of the barrier and quality of installation work and site factors such as ground impedance, site geometry etc. The test is designed to allow the intrinsic airborne sound insulation performance of the device to be measured; the resulting rating should aid the selection of devices for reverberant roadside applications.

For the purpose of this European Standard reverberant conditions are defined based on the geometric envelope, e , across the road formed by the barriers, trench sides or buildings (the envelope does not include the road surface) as shown by the dashed lines in Figure 1. Conditions are defined as being reverberant when the percentage of open space in the envelope is less than or equal to 25 %, i.e. reverberant conditions occur when $w/e \leq 0,25$, where $e = (w+h_1+h_2)$.

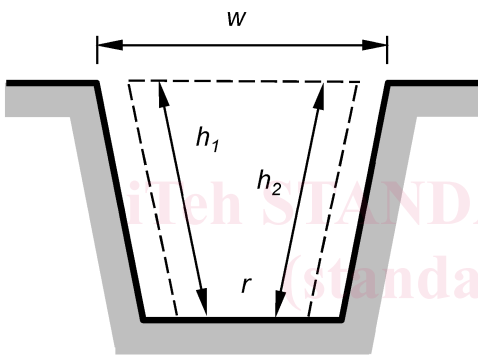
NOTE This method may be used to qualify noise reducing devices for other applications, e.g. to be installed nearby industrial sites. In this case, the single-number ratings will preferably be calculated using an appropriate spectrum.



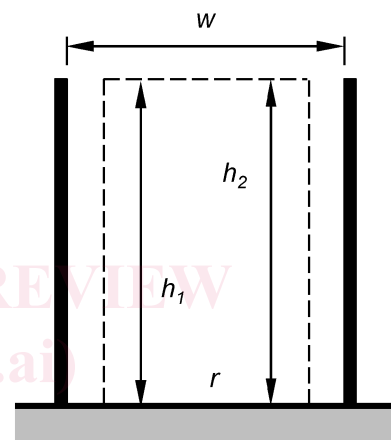
a) Partial cover on both sides of the road;
envelope, $e = w+h_1+h_2$



b) Partial cover on one side of the road;
envelope, $e = w+h_1+h_2$



c) Deep trench;
envelope, $e = w+h_1+h_2$



d) Tall barriers or buildings;
envelope, $e = w+h_1+h_2$

Key

r road surface

w width of open space

NOTE Figure 1 is not too scale.

Figure 1 — Sketch of the reverberant condition check in four cases

prEN 1793-2:2016 (E)

1 Scope

This European Standard specifies the laboratory method for measuring the airborne sound insulation performance of road traffic noise reducing devices in reverberant conditions. It covers the assessment of the intrinsic performance of barriers that can reasonably be assembled inside the testing facility described in EN ISO 10140-2 and EN ISO 10140-4.

This method is not intended for the determination of the intrinsic characteristics of airborne sound insulation of noise reducing devices to be installed on roads in non-reverberant conditions.

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 1793-3, *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 3: Normalized traffic noise spectrum*

EN ISO 10140-1, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 1: Application rules for specific products (ISO 10140-1)*

EN ISO 10140-2, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 2: Measurement of airborne sound insulation (ISO 10140-2)*

EN ISO 10140-4, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 4: Measurement procedures and requirements (ISO 10140-4)*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Symbols and abbreviations

For the purposes of this document, the following symbols apply.

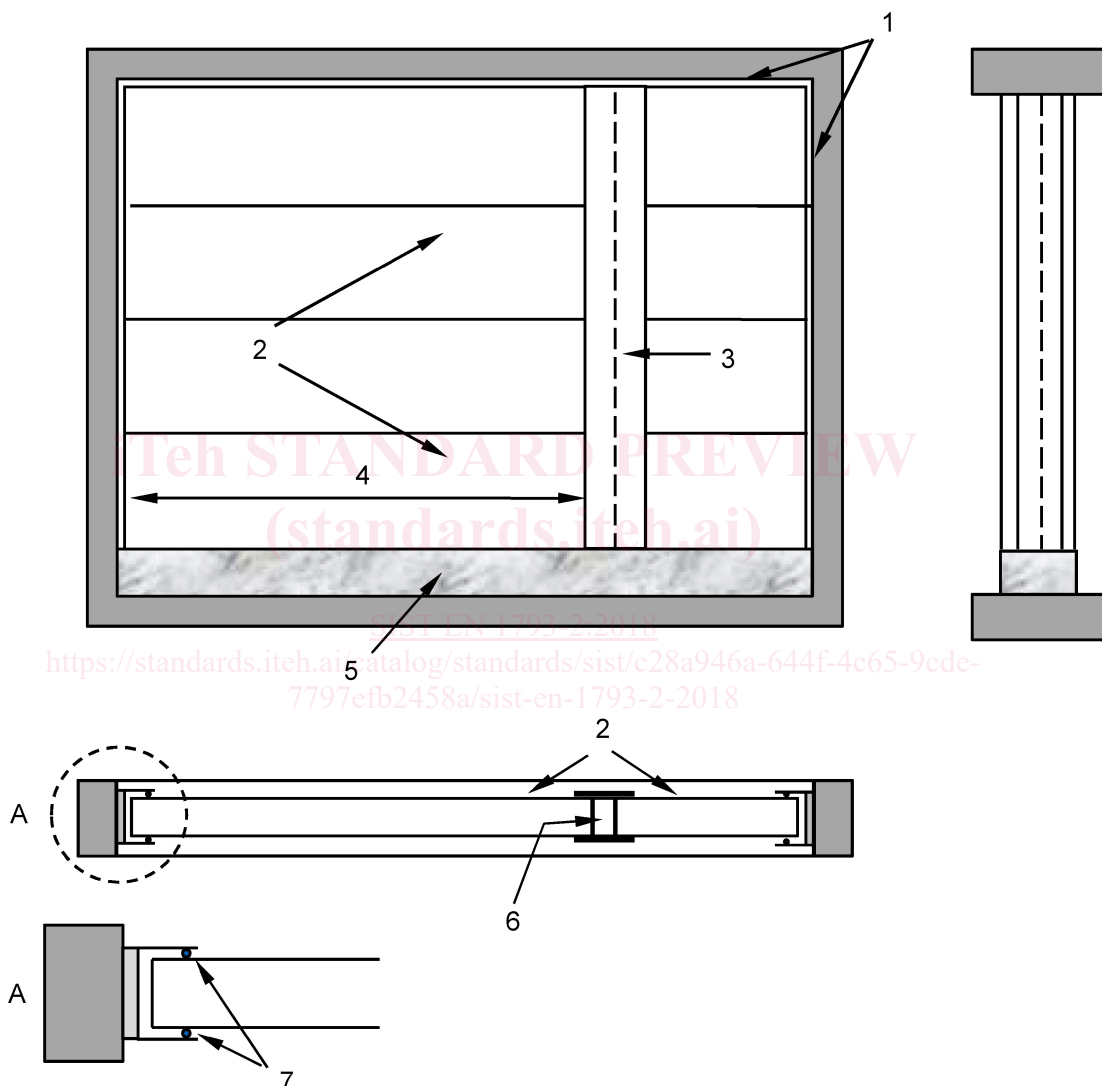
Symbol or abbreviation	Designation	Unit
R_i	Sound reduction index in the i^{th} one-third octave band	dB
L_i	Normalized A weighted sound pressure level of traffic noise in the i^{th} one-third octave band defined in EN 1793-3	dB
DL_R	Single-number rating of airborne sound insulation performance expressed as a difference of A weighted sound pressure levels	dB

4 Test arrangement

The test arrangement shall be as described in EN ISO 10140-1, EN ISO 10140-2 and EN ISO 10140-4 for partitions with the following modifications:

- The test specimen shall be mounted in the test opening and assembled in the same manner as the manufactured device is used in practice with the same connections and seals between component parts. The edge supports shall not overlap the sample by more than 70 mm and shall be sealed to prevent the leakage of sound.

- Where posts are employed in construction, at least one post shall be included in the specimen with panels attached on both sides. The length of the panels on one side of the post shall be ≥ 2 m (see Figure 2). The side that would face the traffic shall face the source room.
- The sample under test, excluding the plinth for levelling, shall have a windowed area not less than $9,5 \text{ m}^2$.
- The sample surface area to be used in calculations shall be the total surface area of the sample excluding the plinth for levelling and the overlap surface of the edge supports.



Key

- | | | | |
|---|--------------------------------|---|------------------------------------------------|
| 1 | sealing materials | 5 | bricked up plinth for levelling (if necessary) |
| 2 | panels (sealed as in practice) | 6 | post (sealed as in practice) |
| 3 | post | 7 | sealing materials to prevent edge leakage |
| 4 | $L \geq 2 \text{ m}$ | | |

Figure 2 — Mounting conditions for test specimen

5 Test procedure and evaluation

5.1 Test method

The sound reduction indices R_i in each one-third octave band in the range 100 Hz to 5 kHz shall be determined using the method described in EN ISO 10140-2.

5.2 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 indices shall be weighted according to the normalised traffic noise spectrum defined in EN 1793-3.

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

$$DL_R = -10 \lg \left| 1 - \frac{\sum_{i=1}^{18} 10^{0,1 L_i} 10^{-0,1 R_i}}{\sum_{i=1}^{18} 10^{0,1 L_i}} \right|$$

where

- DL_R is the single-number rating of airborne sound insulation performance expressed as a difference of A weighted sound pressure levels, in decibels;
- R_i is the sound reduction index in the i^{th} one-third octave band;
- L_i is the normalized A weighted sound pressure level, in decibels, of traffic noise in the i^{th} one-third octave band defined in EN 1793-3.

NOTE Annex B provides guidance on the use of the single number rating.

6 Measurement uncertainty

The uncertainty of results obtained from measurements according to this European Standard shall be evaluated, preferably in compliance with ISO/IEC Guide 98-3. If reported, the expanded uncertainty together with the corresponding coverage factor for a stated coverage probability of 95 % as defined in ISO/IEC Guide 98-3 shall be given. More information on measurement uncertainty is given in Annex C.

7 Test report

7.1 Expression of results

The one-third octave band values of the sound reduction indices R_i shall be given at all frequencies of measurement in tabular form and in the form of a graph. The indices shall be rounded to the nearest first decimal place.

The single-number rating of airborne sound insulation DL_R shall be reported after being rounded to the nearest integer.

7.2 Further information

The test report shall include the information listed below:

- a) reference to this document;
- b) name and address of testing organisation;