SLOVENSKI STANDARD
SIST EN 1793-1:2017

01-maj-2017

Nadomešča:

SIST EN 1793-1:2013

Protihrupne ovire za cestni promet - Preskusna metoda za ugotavljanje akustičnih lastnosti - 1. del: Karakteristike, značilne za absorpcijo zvoka pri razpršenem zvočnem polju

Road traffic noise reducing devices - Test method for determining the acoustic performance - Part 1: Intrinsic characteristics of sound absorption under diffuse sound field conditions

Lärmschutzvorrichtungen an Straßen - Prüfverfahren zur Bestimmung der akustischen Eigenschaften - Teil 1: Produktspezifische Merkmale der Schallabsorption in diffusen Schallfeldern

Dispositifs de réduction du bruit du trafic routier - Méthode d'essai pour la détermination de la performance acoustique - Partie 1 : Caractéristique intrinsèques de l'absorption acoustique dans des conditions de champ acoustique diffus

Ta slovenski standard je istoveten z: EN 1793-1:2017

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

SIST EN 1793-1:2017 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1793-1

March 2017

ICS 17.140.30; 93.080.30

Supersedes EN 1793-1:2012

English Version

Road traffic noise reducing devices - Test method for determining the acoustic performance - Part 1: Intrinsic characteristics of sound absorption under diffuse sound field conditions

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Lärmschutzvorrichtungen an Straßen - Prüfverfahren zur Bestimmung der akustischen Eigenschaften - Teil 1: Produktspezifische Merkmale der Schallabsorption in diffusen Schallfeldern

This European Standard was approved by CEN on 6 February 2017.

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

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

Ref. No. EN 1793-1:2017 E

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European foreword

This document (EN 1793-1:2017) has been prepared by Technical Committee CEN/TC 226 “Road equipment”, the secretariat of which is held by AFNOR.

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 September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

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 supersedes EN 1793-1:2012.

With respect to the superseded document, the following changes have been made:

— the description of the test arrangement has been improved;

— the method for determining sound absorption coefficients in each one-third octave band, as described in EN ISO 354, has been modified: the Sabine absorption coefficient α_{Si} has been replaced by a new absorption coefficient $\alpha_{NRD,i}$ that is specific to noise reducing devices and which takes account of the volume of the test sample (the new coefficient $\alpha_{NRD,i}$ might be derived from α_{Si});

— the contents of the test report have been better defined;

— the declaration of the 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 addressing 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;

— a detailed example is presented (Annex C).

EN 1793-1 is part of a series and should be read in conjunction with the following:

— EN 1793-2, *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*;

— 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*.

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

Introduction

Where a sound reflecting surface is installed along a road, it may be effective to use sound absorbing devices on its traffic side to reduce additional noise nuisance caused by reflected sound. This treatment may be needed in the presence of the following:

— noise barriers, rocks or retaining walls that can reflect sound waves toward unprotected areas;

— vertical cuttings or reflective surfaces that face each other;

— tunnels and their approaches;

— traffic passing close to a barrier where reflections between the vehicles and the barrier may reduce effectiveness.

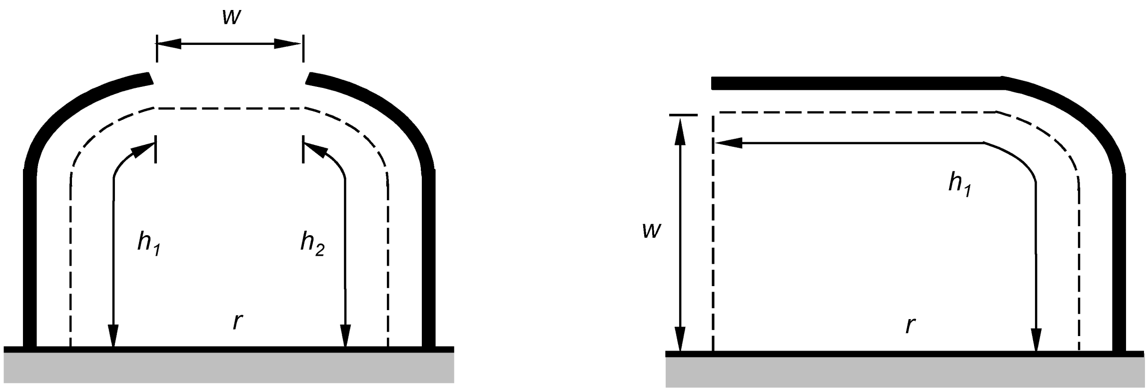
This European Standard specifies a test method for qualifying the sound absorption performance of noise reducing devices designed for roads (a measure of intrinsic performance). It is not concerned with determining insertion loss (extrinsic performance) which depends on additional factors which are not 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 sound absorption performance of the device to be measured under diffuse sound field conditions; the resulting rating should aid the selection of devices for particular roadside applications.

The measurement results of this method for sound absorption are not directly comparable with the results of the in situ method (EN 1793-5), mainly because the present method uses a diffuse sound field, while the in situ method assumes a directional sound field. The test method described in the present document should not be used to determine the intrinsic characteristics of sound absorption for noise reducing devices to be installed on roads under non-reverberant conditions.

Research studies suggest that some correlation exists between laboratory data, measured according to EN 1793-5 and laboratory data, measured according to the method described in this European Standard [1], [2], [3], [4].

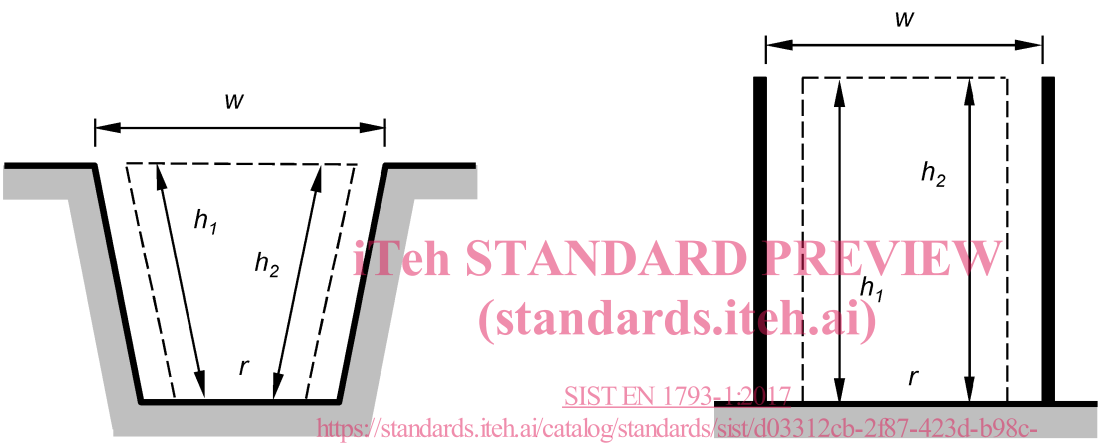
For the purpose of this European Standard, reverberant conditions are defined based on the envelope, *e*, across the road formed by the device under test, trench sides or buildings (the envelope does not include the road surface) as shown by the dashed lines in Figure 1. Conditions are defined as being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

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 should 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, $e = w+h_1$



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 to scale.

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

1 Scope

This European Standard specifies the laboratory method for measuring the sound absorption performance of road traffic noise reducing devices in reverberant conditions. It covers the assessment of the intrinsic sound absorption performance of devices that can reasonably be assembled inside the testing facility described in EN ISO 354.

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

The test method in EN ISO 354 referred to in this European Standard excludes devices that act as weakly damped resonators. Some devices will depart significantly from these requirements and in these cases, care is needed in interpreting the results.

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 354:2003, *Acoustics - Measurement of sound absorption in a reverberation room (ISO 354:2003)*

ISO 9613-1, *Acoustics — Attenuation of sound during propagation outdoors — Part 1: Calculation of the absorption of sound by the atmosphere*

3 Symbols and abbreviations

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

Symbol or abbreviation	Designation	Unit
α_{NRDi}	Sound absorption coefficient in the i^th^ one-third octave band	-
A_1	Equivalent sound absorption area of the empty reverberation room	m^2
A_2	Equivalent sound absorption area of the reverberation room containing a test specimen	m^2
A_T	Equivalent sound absorption area of the test specimen	m^2
c_1	Propagation speed of sound in air in the empty reverberation room	ms^{-1}
c_2	Propagation speed of sound in air in the reverberation room with the test specimen during the measurement	ms^{-1}
$DL_{\alpha,NRD}$	Single-number rating of sound absorption performance expressed as a difference of A weighted sound pressure levels	dB
L	Length of the test panels on one side of the post	m
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

Symbol or abbreviation	Designation	Unit
m_1	Power attenuation coefficient calculated according to ISO 9613-1 using the climatic conditions that have been present in the empty reverberation room during the measurement. The value of m can be calculated from the attenuation coefficient, α, which is used in ISO 9613-1	m^{-1}
m_2	Power attenuation coefficient calculated according to ISO 9613-1 using the climatic conditions that have been present in the reverberation room with the test specimen during the measurement. The value of m can be calculated from the attenuation coefficient, α, which is used in ISO 9613-1	m^{-1}
S	Area (of the floor of the reverberation room) covered by the test specimen	m^2
T_1	Reverberation time of the empty reverberation room	s
T_2	Reverberation time of the reverberation room after the test specimen has been introduced	s
V_1	Net volume of the empty reverberation room	m^3
V_2	Net volume of the reverberation room containing a test specimen	m^3
V_s	Net volume of the test sample	m^3

4 Test arrangement

The test arrangement shall be as described in EN ISO 354, with the following modifications.

— The test specimen shall be assembled in the test chamber in the same manner as the manufactured device is used in practice, with the same connections and seals between the component parts.

— All the reflecting parts exposed on the road traffic side of the material (posts, brackets and other parts) shall be present on the specimen as in practice.

— 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 $L \geq 2$ m (Figures 2 and 3). The side that would face the road traffic shall face the inner part of the room (Figures 2 and 3). The post shall be sealed as in practice.

— The test specimen shall have a reflecting frame sealed against it on its entire perimeter and without any gap between the frame and the surface on which the test specimen is placed (Figures 2 to 6).

— The test specimen shall be placed directly against one of the surfaces (floor, wall or ceiling) of the chamber without any gap (Figures 2, 3 and 4). A dense filling material, such as sand or concrete (density > 200 kg/m^3), shall always be inserted between the panels and chamber surface to completely fill all gaps.

— If the sample under test includes a plenum as part of the design, this shall be reproduced in the reverberation room and reported in the test report. If the sample under test includes a plenum that is not a design feature, the plenum shall be completely filled with a dense filling material such as sand or concrete.

— If the sample under test includes a post, it is recommended to cut it to fit the panel thickness.

— If the sample under test includes a post having a thickness larger than that of the acoustic elements and protruding toward the interior of the test chamber, the reflective area created by the post fitting the acoustic elements shall be reproduced covering it by reflective strips (Figure 5). Alternatively, a T-shaped element with the same width of reflective surface as the visible face of the post can be used to replace the post.

— If the sample under test includes a post having a thickness larger than that of the acoustic elements and protruding toward the floor of the test chamber, the cavities created by the post under the acoustic elements shall be completely filled with a dense filling material such as sand or concrete (Figure 6). Alternatively a T-shaped element with the same width of reflective surface as the visible face of the post can be used to replace the post.

— Any combination of the conditions above may be applied in order to be sure that no cavities, gaps or plenum exist between the sample under test and the chamber surface unless explicitly prescribed for the device in its normal use.

— For testing absorptive cladding for use on retained cuttings, tunnel walls and other reflective surfaces, the specimen shall be mounted against one of the surfaces of the chamber leaving the same gap and using the same components as proposed for the actual construction. In this case, the mounting conditions and components, e.g. the distance between the back of the sample and the surface of the chamber, shall be clearly reported.