SLOVENSKI STANDARD

SIST EN 1793-6:2013

01-februar-2013

Protihrupne ovire za cestni promet - Preskusna metoda za ugotavljanje akustičnih lastnosti - 6. del: Bistvene lastnosti - Terenske vrednosti izolirnosti pred zvokom v zraku

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

Lärmschutzeinrichtungen an Straßen - Prüfverfahren zur Bestimmung der akustischen Eigenschaften - Teil 6: Produktspezifische Merkmale - In-situ der Luftschalldämmung

Dispositifs de réduction du bruit du trafic routier - Méthode d'essai pour la détermination de la performance acoustique - Partie 6: Caractéristiques intrinsèques - Valeurs in situ d'isolation aux bruits aériens dans des conditions de champ acoustique direct

Ta slovenski standard je istoveten z: EN 1793-6:2012

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 1793-6:2013 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1793-6

November 2012

ICS 17.140.30; 93.080.30

English Version

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

Dispositifs de réduction du bruit du trafic routier - Méthode d'essai pour la détermination de la performance acoustique - Partie 6: Caractéristiques intrinsèques - Valeurs in situ d'isolation aux bruits aériens dans des conditions de champ acoustique direct

Lärmschutzvorrichtungen an Straßen - Prüfverfahren zur Bestimmung der akustischen Eigenschaften - Teil 6: Produktspezifische Merkmale - In-situ-Werte der Luftschalldämmung in gerichteten Schallfeldern

This European Standard was approved by CEN on 29 September 2012.

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

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Ref. No. EN 1793-6:2012: E

Contents

Page

Foreword

This document (EN 1793-6:2012) 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 May 2013, and conflicting national standards shall be withdrawn at the latest by March 2014.

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.

This European Standard has been prepared, under the direction of Technical Committee CEN/TC 226 “Road equipment”, by Working Group 6 “Anti noise devices”.

EN 1793-6 is part of a series of documents 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*;

— 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;*

— CEN/TS 1793-4, *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 4: Intrinsic characteristics — In situ values of sound diffraction;*

— CEN/TS 1793-5, *Road traffic noise reducing devices — Test method for determining the acoustic performance — Part 5: Intrinsic characteristics — In situ values of sound reflection and airborne sound insulation.*

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.

Introduction

Noise reducing devices alongside roads have 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 assessing the intrinsic airborne sound insulation performance for noise reducing devices designed for roads in non-reverberant conditions. It can be applied in situ, i.e. where the noise reducing devices are installed. The method can be applied without damaging the surface.

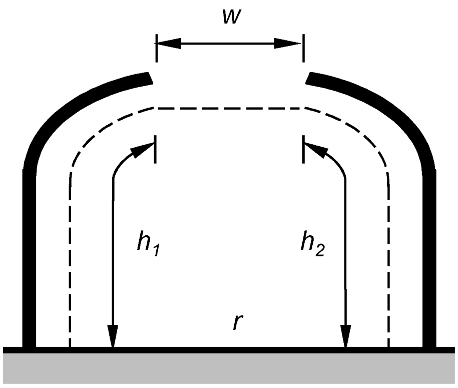
The method can be used to qualify products to be installed along roads as well as to verify the compliance of installed noise reducing devices to design specifications. Regular application of the method can be used to verify the long term performance of noise reducing devices.

The method requires the averaging of results of measurements taken at different points behind the device under test. The method is able to investigate flat and non-flat products.

The method uses the same principles and equipment for measuring sound reflection (see CEN/TS 1793-5) and airborne sound insulation (the present document).

The measurement results of this method for airborne sound insulation are comparable but not identical with the results of the EN 1793-2 method, mainly because the present method uses a directional sound field, while the EN 1793-2 method assumes a diffuse sound field (where all angles of incidence are equally probable). 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 in reverberant conditions, e.g. inside tunnels or deep trenches or under covers.

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 $e = (w+h_1+h_2)$.



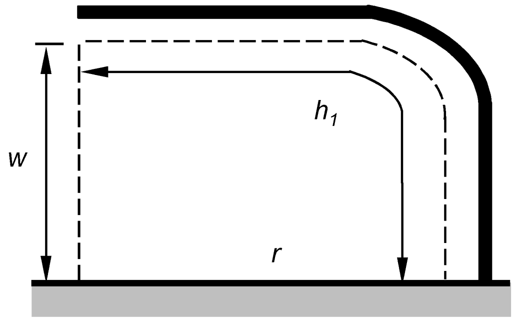
Key

h_1: length of left barrier surface

h_2: length of right barrier surface

envelope, $e = w+h_1+h_2$

(a) Partial cover on both sides of the road

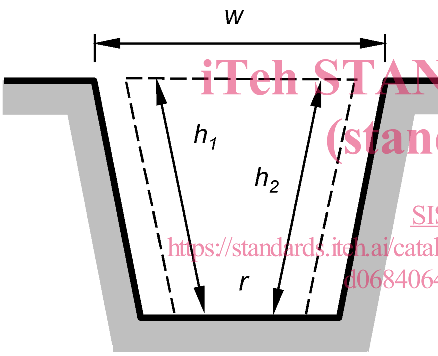


Key

h_1: length of partial cover surface envelope

$e = w+h_1$

(b) Partial cover on one side of the road



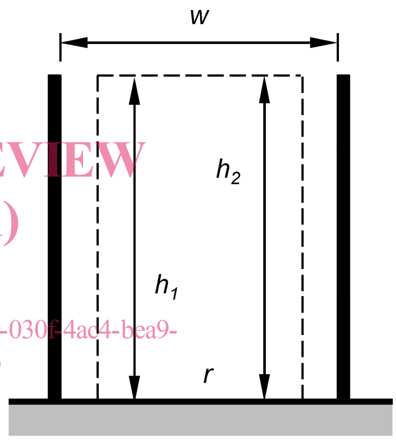
Key

h_1: length of left trench side

h_2: length of right trench side

envelope, $e = w+h_1+h_2$

(c) Deep trench



Key

h_1: length of left barrier/building

h_2: length of right barrier/building

envelope, $e = w+h_1+h_2$

(d) Tall barriers or buildings

In all cases:
r: road surface;
w: width of open space.

Figure 1 — Sketch of the reverberant condition check in four cases (not to scale)

This European Standard introduces a specific quantity, called sound insulation index, to define the airborne sound insulation of a noise reducing device. This quantity should not be confused with the sound reduction index used in building acoustics, sometimes also called transmission loss. Research studies suggest that a very good correlation exists between data measured according to EN 1793-2 and data measured according to the method described in this document.

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

1 Scope

This European Standard describes a test method for measuring a quantity representative of the intrinsic characteristics of airborne sound insulation for traffic noise reducing devices: the sound insulation index.

The test method is intended for the following applications:

— determination of the intrinsic characteristics of airborne sound insulation of noise reducing devices to be installed along roads, to be measured either in situ or in laboratory conditions;

— determination of the in situ intrinsic characteristics of airborne sound insulation of noise reducing devices in actual use;

— comparison of design specifications with actual performance data after the completion of the construction work;

— verification of the long term performance of noise reducing devices (with a repeated application of the method);

— interactive design process of new products, including the formulation of installation manuals.

The test method is not intended for the determination of the intrinsic characteristics of airborne sound insulation of noise reducing devices to be installed in reverberant conditions, e.g. inside tunnels or deep trenches or under covers.

Results are expressed as a function of frequency in one-third octave bands, where possible, between 100 Hz and 5 kHz. If it is not possible to get valid measurement results over the whole frequency range indicated, the results need to be given in a restricted frequency range and the reasons for the restriction(s) need to be clearly reported.

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*

IEC 61672-1:2002, *Electroacoustics — Sound level meters — Part 1: Specifications*

3 Terms and definitions

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

3.1
noise reducing device
device that is designed to reduce the propagation of traffic noise away from the road environment

Note 1 to entry: This may be a noise barrier, cladding, a road cover or an added device. These devices may include both acoustic and structural elements.

3.2
acoustical elements
elements whose primary function is to provide the acoustic performance of the device

3.3
structural elements
elements whose primary function is to support or hold in place acoustic elements

3.4
sound insulation index
result of airborne sound insulation test described by Formula (1)

3.5
reference height
height h_S equal to half the height, h_B, of the noise reducing device under test: $h_S = h_B/2$ (see Figures 2 and 3)

Note 1 to entry: When the height of the device under test is greater than 4 m and, for practical reasons, it is not advisable to have a height of the source $h_S = h_B/2$, it is possible to have $h_S = 2$ m, accepting the corresponding low frequency limitation (see 4.5.8).

3.6
source reference plane for sound insulation index measurements
plane facing the sound source side of the noise reducing device and touching the most protruding parts of the device under test within the tested area (see Figures 2, 4 and 9)

Note 1 to entry: The device under test includes both structural and acoustic elements.

3.7
microphone reference plane
plane facing the receiver side of the noise reducing device and touching the most protruding parts of the device under test within the tested area (see Figures 4 and 9)

Note 1 to entry: The device under test includes both structural and acoustic elements.

3.8
source reference position
position facing the side to be exposed to noise when the device is in place, located at the reference height h_S and placed so that its horizontal distance to the source reference plane is $d_s = 1$ m (see Figures 2, 5, 8 and 9)

Note 1 to entry: The actual dimensions of the loudspeaker used for the background research on which this European Standard is based are: 0,40 m x 0,285 m x 0,285 m (length x width x height).

3.9
measurement grid for sound insulation index measurements
vertical measurement grid constituted of nine equally spaced points

Note 1 to entry: A microphone is placed at each point (see Figures 3, 5, 6, 8, 9 and subclause 4.5).

3.10
barrier thickness for sound insulation index measurements
distance t_B between the source reference plane and the microphone reference plane at a height equal to the reference height h_S (see Figures 4, 8 and 9)

3.11
free-field measurement for sound insulation index measurements
measurement taken with the loudspeaker and the microphone in an acoustic free field in order to avoid reflections from any nearby object, including the ground (see Figure 6)

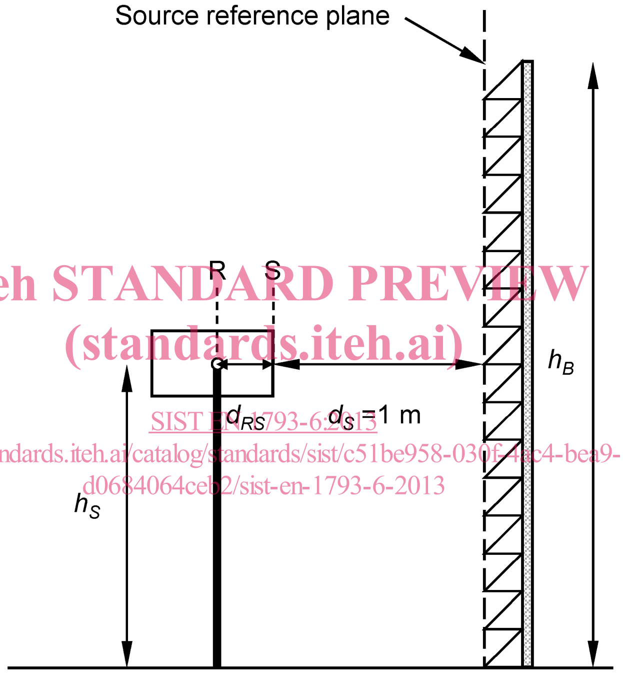
3.12
Adrienne temporal window
composite temporal window described in 4.5.6

3.13
background noise
noise coming from sources other than the source emitting the test signal

3.14
signal-to-noise ratio, S/N
difference in decibels between the level of the test signal and the level of the background noise at the moment of detection of the useful event (within the Adrienne temporal window)

3.15
impulse response
time signal at the output of a system when a Dirac function is applied to the input

Note 1 to entry: The Dirac function, also called δ function, is the mathematical idealisation of a signal that is infinitely short in time which carries a unit amount of energy.



Key

R: axis of rotation

S: loudspeaker front panel

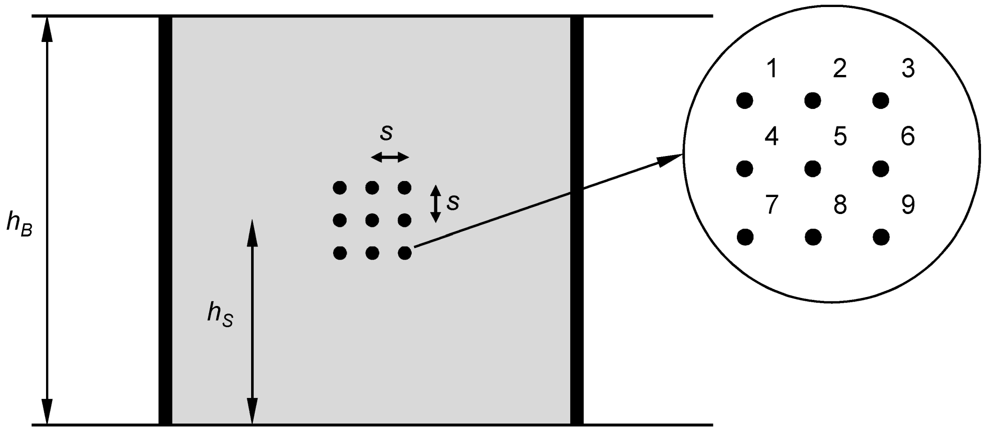
h_S: reference height

h_B: barrier height

d_{RS}: distance R - S

d_S: horizontal distance loudspeaker - source reference plane

Figure 2 —Sketch of the loudspeaker-microphone assembly in front of the noise reducing device under test for sound insulation index measurements (not to scale)



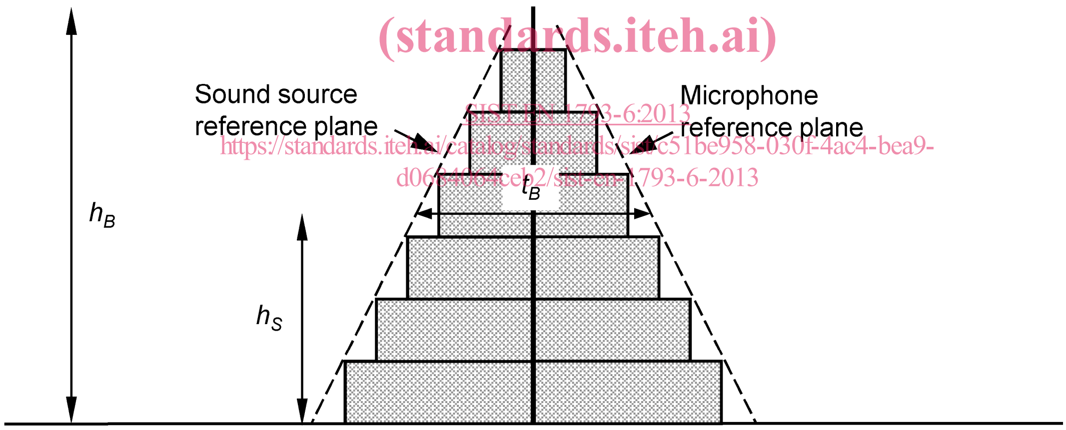
Key

s: distance between two vertical or horizontal microphones in the grid

h_S: reference height

h_B: barrier height

Figure 3 — Measurement grid for sound insulation index measurements (receiver side) and numbering of the measurement points (not to scale)



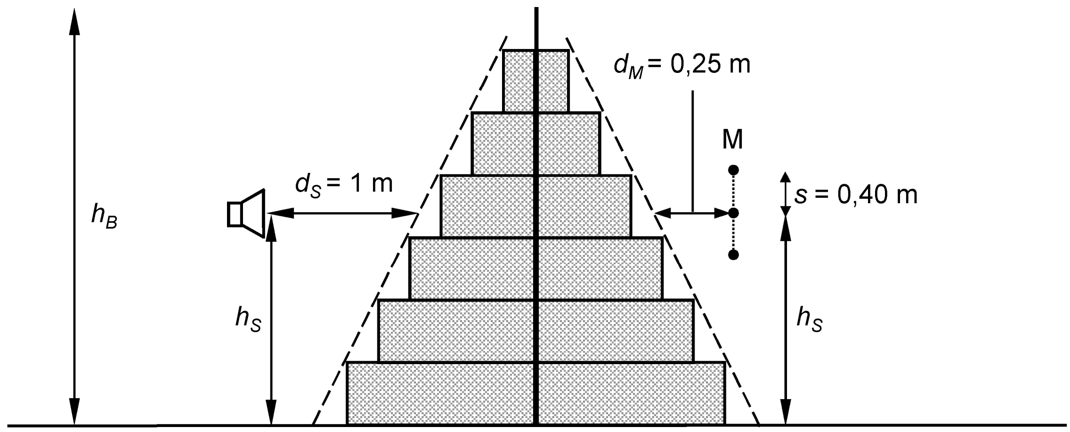
Key

t_B: barrier thickness at h_S

h_S: reference height

h_B: barrier height

Figure 4 — Sound source and microphone reference planes (side view, not to scale)



Key

M: measurement grid

s: distance between two vertical or horizontal microphones in the grid

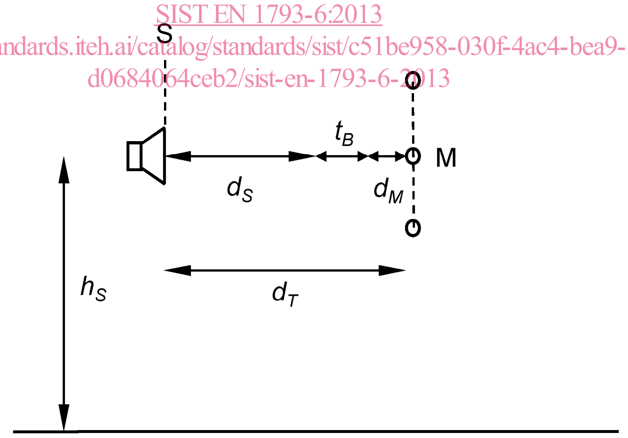
h_S: reference height

h_B: barrier height

d_S: horizontal distance [loudspeaker - source reference plane] at h_S

d_M: horizontal distance [microphone 5 - source reference plane] at h_S

Figure 5 — Placement of the sound source and measurement grid for sound insulation index measurement (side view, not to scale)



Key

S: loudspeaker front panel

M: measurement grid

h_S: reference height

d_S: horizontal distance [loudspeaker - source reference plane] at h_S

t_B: barrier thickness at h_S

d_M: horizontal distance [microphone 5 - source reference plane] at h_S

d_T: horizontal distance [loudspeaker - microphone 5] at h_S

NOTE $d_T = d_S + t_B + d_M$; see Formula (3).

Figure 6 — Sketch of the set-up for the reference "free-field" sound measurement for the determination of the sound insulation index (not to scale)