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English version

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

Lärmschutzeinrichtungen an Straßen - Prüfverfahren zur  
Bestimmung der akustischen Eigenschaften - Teil 5:  
Produktspezifische Merkmale - In-situ-Werte der  
Schallreflexion und der Luftschalldämmung

This Technical Specification (CEN/TS) was approved by CEN on 27 October 2002 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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**Management Centre: rue de Stassart, 36 B-1050 Brussels**

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## Foreword

This document (CEN/TS 1793-5:2003) has been prepared by Technical Committee CEN/TC 284 "Road equipment", the secretariat of which is held by AFNOR.

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

It should be read in conjunction with :

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*

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

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

This document describes a test method for determining the intrinsic characteristics of sound reflection and airborne sound insulation of traffic noise reducing devices. 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 device 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 average of results of measurements taken in different points in front of the device under test and/or for specific angles of incidences. The method is able to investigate flat and non flat products.

The method uses the same principles and equipment for measuring sound reflection and airborne sound insulation.

The measurements results of this method for sound reflection are not directly comparable with the results of the laboratory method (EN 1793-1), mainly because the present method uses a directional sound field, while the laboratory method assumes a diffuse sound field. Moreover, this method introduces a specific quantity, called reflection index, to define the sound reflection in front of a noise reducing device, while the laboratory method gives a sound absorption coefficient. Laboratory values of the sound absorption coefficient can be converted to conventional values of a reflection coefficient taking the complement to one. In this case, research studies suggest that a quite good correlation exists between laboratory data, measured according to EN 1793-1 and field data, measured according to the method described in the present document.

The measurements results of this method for airborne sound insulation are comparable but not identical with the results of the laboratory method (EN 1793-2), mainly because the present method uses a directional sound field, while the laboratory method assumes a diffuse sound field. This method 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 laboratory data, measured according to EN 1793-2, and field data, measured according to the method described in the present document.

NOTE – 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

The present document describes a test method for measuring two quantities representative of the intrinsic characteristics of traffic noise reducing devices : the reflection index for sound reflection and the sound insulation index for airborne sound insulation.

The test method is intended for the following applications :

- determination of the intrinsic characteristics of sound reflection and 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 sound reflection and 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).

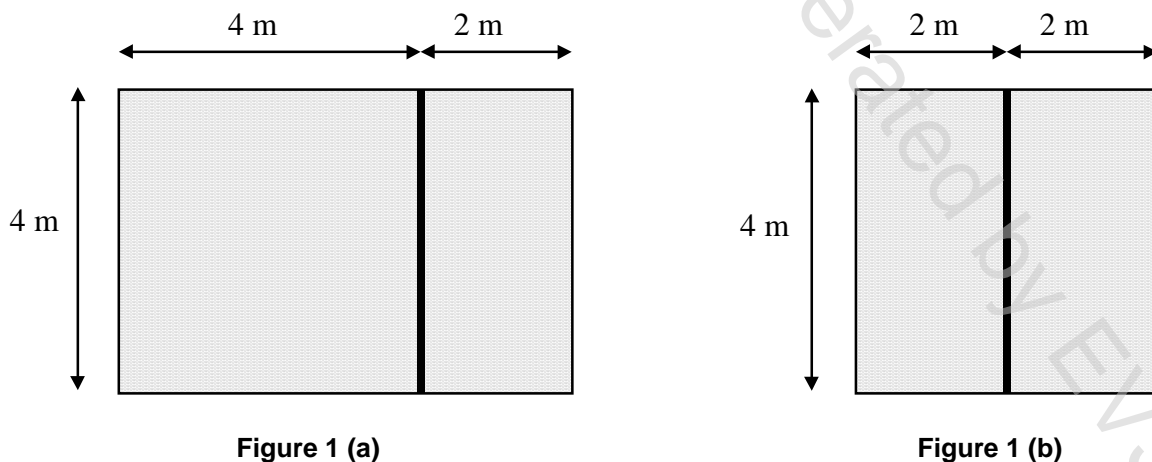
The test method can be applied both in situ and on barriers purposely built to be tested using the method described here. In the second case the sample shall be built as follows (see Figure 1) :

- a part, composed of acoustic elements, that extends 4 m and is 4 m high ;
- a post 4 m high (if applicable for the specific noise reducing device under test) ;
- a part, composed of acoustic elements, that extends at least 2 m and is 4 m high ;

NOTE For qualifying the reflection index only, it is only necessary to have acoustic elements that extend 4 m or more.

NOTE For qualifying the sound insulation index of posts only, it is only necessary to have acoustic elements that extend 2 m or more on either side of the post (see Figure 1).

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



**Figure 1 — Sketch of the sample required for measurements in laboratory conditions - (a) : Reflection index and sound insulation index measurements (elements and posts) - (b) : sound insulation index measurements in front of a post only**

## 2 Normative references

This Technical Specification incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate place in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Technical Specification only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication applies (including amendments).

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

EN 60651, *Sound level meters.*

## 3 Terms and definitions

For the purposes of this Technical Specification the following terms and definitions apply.

### 3.1

#### **structural elements**

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

### 3.2

#### **acoustical elements**

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

### 3.3

#### **roadside exposure**

use of the product as a noise reducing device installed alongside roads

### 3.4

#### **reflection index**

result of a sound reflection 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 Figure 2)

### 3.6

#### **reference axis of rotation-front panel distance for the loudspeaker**

distance between the centre of rotation of the loudspeaker cabinet and its front panel ; it is equal to :  $d_{RS} = 0,15$  m (see Figure 2)

NOTE The actual dimensions of the loudspeaker used for the background research on which this Technical Specification is based are : 0,40 x 0,285 x 0,285 m (length x width x height)

### 3.7

#### **reference loudspeaker-microphone distance**

distance between the front panel of the loudspeaker and the microphone ; it is equal to :  $d_{SM} = 1,25$  m (see Figure 2)

### 3.8

#### **reference circle for reflection index measurements**

circle of radius equal to 1,65 m ( $= d_{RS} + d_{SM} + d_M$ ) with centre at the reference height, drawn so that it just touches the noise reducing device under test. The centre of the circle lies on the axis of rotation of the sound source (see Figure 2)