

AKUSTIKA. HELIISOLATSIOONI MÕÕTMINE HOONETES
JA HOONE OSADEL. OSA 3: FASSAADI HELIISOLATSIOON

Acoustics - Field measurement of sound insulation in
buildings and of building elements - Part 3: Façade
sound insulation (ISO 16283-3:2016)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 16283-3:2016 sisaldab Euroopa standardi EN ISO 16283-3:2016 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 16283-3:2016 consists of the English text of the European standard EN ISO 16283-3:2016.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 24.02.2016.	Date of Availability of the European standard is 24.02.2016.
Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 91.060.10, 91.120.20

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autoriõiguse kaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about standards copyright protection, please contact the Estonian Centre for Standardisation and Accreditation: Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

Acoustics - Field measurement of sound insulation in
buildings and of building elements - Part 3: Façade sound
insulation (ISO 16283-3:2016)

Acoustique - Mesurage in situ de l'isolement
acoustique des bâtiments et des éléments de
construction - Partie 3: Isolement aux bruits de façades
(ISO 16283-3:2016)

Akustik - Messung der Schalldämmung in Gebäuden
und von Bauteilen am Bau - Teil 3:
Fassadenschalldämmung (ISO 16283-3:2016)

This European Standard was approved by CEN on 2 January 2016.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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.

CEN members are the national standards bodies of 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 United Kingdom.



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

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

European foreword

This document (EN ISO 16283-3:2016) has been prepared by Technical Committee ISO/TC 43 “Acoustics” in collaboration with Technical Committee CEN/TC 126 “Acoustic properties of building elements and of buildings” 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 August 2016, and conflicting national standards shall be withdrawn at the latest by August 2016.

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 document supersedes EN ISO 140-14:2004, EN ISO 140-5:1998.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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.

Endorsement notice

The text of ISO 16283-3:2016 has been approved by CEN as EN ISO 16283-3:2016 without any modification.

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	2
3 Terms and definitions	3
4 Instrumentation	8
4.1 General	8
4.2 Calibration	8
4.3 Verification	8
5 Frequency range	9
6 General	9
7 Indoor sound pressure level measurements	11
7.1 General	11
7.2 Default procedure	11
7.2.1 Fixed microphone positions	11
7.2.2 Mechanized continuously-moving microphone	11
7.2.3 Manually scanned microphone	11
7.2.4 Minimum distances for microphone positions	13
7.2.5 Averaging times	13
7.2.6 Calculation of energy-average sound pressure levels	14
7.3 Low-frequency procedure (element or global loudspeaker methods)	15
7.3.1 General	15
7.3.2 Microphone positions	15
7.3.3 Averaging time	15
7.3.4 Calculation of low-frequency energy-average sound pressure levels	16
7.4 Background noise (default and low-frequency procedure)	16
7.4.1 General	16
7.4.2 Correction to the signal level for background noise	17
8 Reverberation time measurements in the receiving room (default and low-frequency procedure)	17
8.1 General	17
8.2 Generation of sound field	17
8.3 Default procedure	18
8.4 Low-frequency procedure	18
8.5 Interrupted noise method	18
8.6 Integrated impulse response method	18
9 Outdoor measurements using a loudspeaker as a sound source (default and low-frequency procedure)	19
9.1 General	19
9.2 Generation of the sound field	19
9.3 Loudspeaker requirements	19
9.4 Loudspeaker positions	20
9.5 Element loudspeaker method	20
9.5.1 Outdoor sound pressure level measurements on the test surface	20
9.6 Global loudspeaker method	21
9.6.1 Outdoor sound pressure level measurements near the façade	21
9.6.2 Large rooms or façades comprising more than one outside wall	21
9.6.3 Calculation of measurement results	21
10 Outdoor measurements using road traffic as a sound source (default procedure)	21
10.1 General	21

10.2	Test requirements	22
10.3	Element road traffic method	22
10.3.1	General	22
10.3.2	Requirements on road traffic and façade geometry	22
10.3.3	Outdoor sound pressure level measurements on the test surface	23
10.4	Global road traffic method	23
10.4.1	Outdoor sound pressure level measurements at a distance of 2 m in front of the façade	23
10.4.2	Calculation of measurement results	24
11	Conversion to octave bands	24
12	Expression of results	25
13	Uncertainty	26
14	Test report	26
Annex A	(normative) Determination of area, S	27
Annex B	(normative) Control of sound transmission through the wall surrounding the test specimen	28
Annex C	(normative) Requirements for loudspeakers	29
Annex D	(informative) Examples of verification of test requirements	30
Annex E	(informative) Measurements with aircraft and railway traffic noise (default procedure)	31
Annex F	(informative) Forms for recording results	35
Bibliography	37

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 43, *Acoustics*, Subcommittee SC 2, *Building acoustics*.

This first edition cancels and replaces ISO 140-5:1998 and ISO 140-14:2004, which have been technically revised.

ISO 16283 consists of the following parts, under the general title *Acoustics — Field measurement of sound insulation in buildings and of building elements*:

- *Part 1: Airborne sound insulation*
- *Part 2: Impact sound insulation*
- *Part 3: Façade sound insulation*

Introduction

ISO 16283 (all parts) describes procedures for field measurements of sound insulation in buildings. Airborne, impact, and façade sound insulation are described in ISO 16283-1, ISO 16283-2, and in this part of ISO 16283, respectively.

Field sound insulation measurements that were described previously in ISO 140-4, ISO 140-5, and ISO 140-7 were (a) primarily intended for measurements where the sound field could be considered to be diffuse and (b) not explicit as to whether operators could be present in the rooms during the measurement. ISO 16283 differs from ISO 140-4, ISO 140-5, and ISO 140-7 in that (a) it applies to rooms in which the sound field can or cannot approximate to a diffuse field, (b) it clarifies how operators can measure the sound field using a hand-held microphone or sound level metre, and (c) it includes additional guidance that was previously contained in ISO 140-14.

NOTE Survey test methods for field measurements of façade sound insulation are dealt with in ISO 10052.

Acoustics — Field measurement of sound insulation in buildings and of building elements —

Part 3: Façade sound insulation

1 Scope

This part of ISO 16283 specifies procedures to determine the airborne sound insulation of façade elements (element methods) and whole façades (global methods) using sound pressure measurements. These procedures are intended for room volumes in the range from 10 m³ to 250 m³ in the frequency range from 50 Hz to 5 000 Hz.

The test results can be used to quantify, assess, and compare the airborne sound insulation in unfurnished or furnished rooms where the sound field can or cannot approximate to a diffuse field. The measured airborne sound insulation is frequency-dependent and can be converted into a single number quantity to characterize the acoustic performance using the rating procedures in ISO 717-1.

The element methods aim to estimate the sound reduction index of a façade element, for example, a window. The most accurate element method uses a loudspeaker as an artificial sound source. Other less accurate element methods use available traffic noise. The global methods, on the other hand, aim to estimate the outdoor/indoor sound level difference under actual traffic conditions. The most accurate global methods use the actual traffic as sound source. A loudspeaker can be used as an artificial sound source when there is insufficient level from traffic noise inside the room. An overview of the methods is given in [Table 1](#).

The element loudspeaker method yields an apparent sound reduction index which, under certain circumstances, can be compared with the sound reduction index measured in laboratories in accordance with ISO 10140. This method is the preferred method when the aim of the measurement is to evaluate the performance of a specified façade element in relation to its performance in the laboratory.

The element road traffic method will serve the same purposes as the element loudspeaker method. It is particularly useful when, for different practical reasons, the element loudspeaker method cannot be used. These two methods will often yield slightly different results. The road traffic method tends to result in lower values of the sound reduction index than the loudspeaker method. In [Annex D](#), this road traffic method is supplemented by the corresponding aircraft and railway traffic methods.

The global road traffic method yields the real reduction of a façade in a given place relative to a position 2 m in front of the façade. This method is the preferred method when the aim of the measurement is to evaluate the performance of a whole façade, including all flanking paths, in a specified position relative to nearby roads. The result cannot be compared with that of laboratory measurements.

The global loudspeaker method yields the sound reduction of a façade relative to a position that is 2 m in front of the façade. This method is particularly useful when, for practical reasons, the real source cannot be used; however, the result cannot be compared with that of laboratory measurements.

Table 1 — Overview of the different measurement methods

No.	Method Element	Reference in this part of ISO 16283	Result	Field of application
1	Element loudspeaker	9.5	R'_{45°	Preferred method to estimate the apparent sound reduction index of façade elements
2	Element road traffic	10.3	$R'_{tr,s}$	Alternative to method No.1 when road traffic as a sound source provides a sufficient level
3	Element railway traffic	Annex E	$R'_{rt,s}$	Alternative to method No.1 when railway traffic as a sound source provides a sufficient level
4	Element aircraft traffic	Annex E	$R'_{at,s}$	Alternative to method No.1 when aircraft traffic as a sound source provides a sufficient level
	Global			
5	Global loudspeaker	9.6	$D_{ls,2m,nT}$ $D_{ls,2m,n}$	Alternative to methods Nos. 6, 7, and 8
6	Global road traffic	10.4	$D_{tr,2m,nT}$ $D_{tr,2m,n}$	Preferred method to estimate the global sound insulation of a façade exposed to road traffic as a sound source
7	Global railway traffic	Annex E	$D_{rt,2m,nT}$ $D_{rt,2m,n}$	Preferred method to estimate the global sound insulation of a façade exposed to railway traffic as a sound source
8	Global aircraft traffic	Annex E	$D_{at,2m,nT}$ $D_{at,2m,n}$	Preferred method to estimate the global sound insulation of a façade exposed to aircraft traffic as a sound source

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.

ISO 717-1, *Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation*

ISO 3382-2, *Acoustics — Measurement of room acoustic parameters — Part 2: Reverberation time in ordinary rooms*

ISO 12999-1, *Acoustics — Determination and application of measurement uncertainties in building acoustics — Part 1: Sound insulation*

ISO 15712-3, *Building acoustics — Estimation of acoustic performance of buildings from the performance of elements — Part 3: Airborne sound insulation against outdoor sound*

ISO 18233, *Acoustics — Application of new measurement methods in building and room acoustics*

IEC 60942, *Electroacoustics — Sound calibrators*

IEC 61183, *Electroacoustics — Random-incidence and diffuse-field calibration of sound level meters*

IEC 61260, *Electroacoustics — Octave-band and fractional-octave-band filters*

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