



**SLOVENSKI STANDARD**  
**oSIST prEN ISO 10140-5:2009**  
**01-januar-2009**

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Acoustics - Laboratory measurement of sound insulation of building elements - Part 5:  
 Requirements for test facilities and equipment (ISO/DIS 10140-5:2008)

Akustik - Messung der Schalldämmung von Gebäudeteilen im Prüfstand - Teil 5:  
 Anforderungen an Prüfstände und Prüfeinrichtungen (ISO/DIS 10140-5:2008)

Acoustique - Détermination de l'isolation acoustique des éléments de construction -  
 Partie 5: Exigences pour installations et équipements d'essai (ISO/DIS 10140-5:2008)

**Ta slovenski standard je istoveten z: prEN ISO 10140-5**

**ICS:**

91.120.20 Acoustics in building. Sound insulation

**oSIST prEN ISO 10140-5:2009 en**



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NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN ISO 10140-5**

October 2008

ICS 91.120.20

Will supersede EN ISO 140-6:1998

English Version

## Acoustics - Laboratory measurement of sound insulation of building elements - Part 5: Requirements for test facilities and equipment (ISO/DIS 10140-5:2008)

Acoustique - Détermination de l'isolation acoustique des éléments de construction - Partie 5: Exigences pour installations et équipements d'essai (ISO/DIS 10140-5:2008)

Akustik - Messung der Schalldämmung von Gebäudeteilen im Prüfstand - Teil 5: Anforderungen an Prüfstände und Prüfeinrichtungen (ISO/DIS 10140-5:2008)

This draft European Standard is submitted to CEN members for parallel enquiry. It has been drawn up by the Technical Committee CEN/TC 126.

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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## Foreword

This document (prEN ISO 10140-5:2008) 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 document is currently submitted to the parallel Enquiry.

This document will supersede EN ISO 140-6:1998.

### Endorsement notice

The text of ISO/DIS 10140-5:2008 has been approved by CEN as a prEN ISO 10140-5:2008 without any modification.

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# DRAFT INTERNATIONAL STANDARD ISO/DIS 10140-5

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## Acoustics — Laboratory measurement of sound insulation of building elements —

### Part 5: Requirements for test facilities and equipment

*Acoustique — Détermination de l'isolation acoustique des éléments de construction —*

*Partie 5: Exigences pour installations et équipements d'essai*

(Revision of ISO 140-1:1997 and ISO 140-1:1997/Amd 1:2004, ISO 140-10:1991, ISO 140-3:1995 and ISO 140-3:1995/Amd 1:2004, ISO 140-6:1998 and ISO 140-8:1997)

ICS 91.120.20

#### ISO/CEN PARALLEL ENQUIRY

The CEN Secretary-General has advised the ISO Secretary-General that this ISO/DIS covers a subject of interest to European standardization. **In accordance with the ISO-lead mode of collaboration as defined in the Vienna Agreement, consultation on this ISO/DIS has the same effect for CEN members as would a CEN enquiry on a draft European Standard.** Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month FDIS vote in ISO and formal vote in CEN.

**In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.**

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## ISO/DIS 10140-5

### 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 10140-5 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 2, *Building acoustics*.

ISO 10140 consists of the following parts, under the general title *Acoustics — Laboratory measurement of sound insulation of building elements*:

- *Part 1: Test codes*
- *Part 2: Measurement of airborne sound insulation*
- *Part 3: Measurement of Impact sound insulation*
- *Part 4: Measurement procedures and requirements*
- *Part 5: Requirements for test facilities and equipment*

## Introduction

ISO 140 is one of the basic series of standards in building acoustics. It currently has several parts describing laboratory measurements, mounting conditions of test elements in the laboratory, and field measurements. To improve the layout of Standards for laboratory measurements, to ensure consistency, and to simplify future changes and additions, ISO/TC 43/SC 2 have created a new series of Standards, ISO 10140. The parts of ISO 140 that are concerned with laboratory measurement of the acoustic performance of products (ISO 140-1, -3, -6, -8, -10, -11, and -16) have been re-written and re-arranged with minimal alteration to the contents. The new Standard, ISO 10140, consists of the parts stated in the Foreword.

ISO 10140-1 describes the test codes for elements and products, including specific requirements for preparation, mounting, operating and test conditions for elements and products. In the future, Part 1 will be updated in cooperation with the relevant product Technical Committees. ISO 10140-2 and ISO 10140-3 contain the general procedures for airborne and impact sound insulation measurements respectively and refer to ISO 10104-4 and ISO 10140-5 where appropriate. For elements and products without a specific test code described in ISO 10140-1 it is still possible to apply ISO 10140-2 and ISO 10140-3. ISO 10140-4 contains the basic measurement techniques and processes. ISO 10140-5 contains the requirements on test facilities and equipment.

In the future it will be possible to insert other measurement techniques and standards into this series, for example, sound insulation measurement using intensity techniques (ISO 15186) and rainfall noise measurement (ISO 140-18).

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## ISO/DIS 10140-5

## Structure and contents of the new ISO 10140 series:

## “Acoustics – Laboratory measurement of sound insulation of building elements”

<b>ISO number &amp; subtitle</b>	<b>Main purpose, contents &amp; use</b>	<b>Detailed contents</b>
ISO 10140-1 <i>Test codes</i>	Indicates the appropriate test procedure for elements and products. For some types of elements / products, the standard may contain additional and more specific instructions about quantities and test element size and about preparation, mounting and operating conditions. Where no specific details are included, the general guidelines in parts 2 and 3 shall be followed.	Appropriate references to parts 2 and 3 and product related, specific and additional instructions on: - specific quantities to be measured - size of test element - boundary and mounting conditions - conditioning, testing and operating conditions - additional specifics for test report
ISO 10140-2 <i>Measurement of airborne sound insulation</i>	Complete procedure for airborne sound insulation measurements, referring to parts 4 and 5. It shall be sufficiently complete and general to perform measurements for products without a specific test code, but specifics in part 1 shall be applied, if available.	- Definitions of main quantities to be measured - General mounting & boundary conditions - General measurement procedure - Data processing - Test report (general points)
ISO 10140-3 <i>Measurement of impact sound insulation</i>	Complete procedure for impact sound insulation measurements, referring to parts 4 and 5. It shall be sufficiently complete and general to perform measurements for products without a specific test code, but specifics in part 1 shall be applied, if available.	- Definitions of main quantities to be measured - General mounting & boundary conditions - General measurement procedure - Data processing - Test report (general points)
ISO 10140-4 <i>Measurement procedures and requirements</i>	All needed basic measurement techniques and processes, for measurements following parts 2 and 3 or facility qualifications following part 5. Much of the contents implemented in software.	- Definitions - Frequency range - Microphone positions - SPL measurements - Averaging, space and time - Correction for background noise - Reverberation time measurements - Loss factor measurements - Low frequency measurements - radiated sound power by velocity measurement
ISO 10140-5 <i>Requirements for test facilities and equipment</i>	All information needed to design, construct and qualify the laboratory facility, its additional accessories and measurement equipment (hardware).	Test facilities, design criteria: - volumes, dimensions - flanking transmission - laboratory loss factor - maximum achievable sound reduction index - reverberation time - influence of lack of diffusivity in the lab  Test openings: - standard openings for walls, floors - other openings (windows, doors, small technical elements) - filler walls in general  Requirements for equipment: - loudspeakers, number, positions - tapping machine and other impact sources - measurement equipment  Reference constructions: - basic elements for airborne and impact insulation improvement - corresponding reference performance curves

## 1 Scope

This document specifies laboratory test facilities and equipment for sound insulation measurements of building elements, such as:

- components and materials;
- building elements;
- technical elements (small building elements);
- sound insulation improvement systems.

It applies to laboratory test facilities with suppressed radiation from flanking elements and/or structural insulation between source and receiving rooms.

This part of ISO 10140 specifies qualification procedures that shall be used when commissioning a new test facility with equipment for sound insulation measurements. These procedures shall be repeated periodically to ensure that there are no issues with the equipment and the test facility.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/DIS 10140-1, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 1: Test codes*

ISO/DIS 10140-2, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 2: Measurements of airborne sound insulation*

ISO/DIS 10140-3, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 3: Measurements of impact sound insulation*

ISO/DIS 10140-4:2008, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 4: Measurement procedures and requirements*

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

ISO 717-2, *Acoustics — Rating of sound insulation in buildings and of building elements — Part 2: Impact sound insulation*

ISO 3382-2, *Acoustics — Measurement of the reverberation time of rooms with reference to other acoustical parameters — Part 2: Ordinary rooms*

ISO 9052-1, *Acoustics — Determination of dynamic stiffness — Part 1: Materials used under floating floors in dwelling*

ISO 15186-1, *Acoustics — Measurement of sound insulation in buildings and of building elements using sound intensity — Part 1: Laboratory measurements*

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

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IEC 60942:2003, *Electroacoustics — Sound calibrators*

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

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

IEC 61672-2, *Electroacoustics — Sound level meters - Part 2: Pattern evaluation tests*

IEC 61672-3, *Electroacoustics — Sound level meters - Part 3: Periodic tests*

**3 Laboratory test facilities for airborne sound insulation measurements**

The laboratory test facility shall consist of two adjacent reverberant rooms with a test opening between them in which the test element is inserted.

The area of the test opening can vary depending on the type of test element. This standard defines full-size test openings, a specific small size test opening and alternative reduced size test openings.

For measurement of the improvement of sound reduction index by acoustical linings these rooms shall be separated by a standard basic element on which the lining under test is installed (see Annex B).

**3.1 Test rooms****3.1.1 Volume**

The volumes of the test rooms shall be at least 50 m<sup>3</sup>. Volumes and corresponding dimensions of the two test rooms should not be exactly the same. A difference in room volumes and/or in the linear dimensions of at least 10% is recommended.

Choose the ratios of the room dimensions so that the mode frequencies in the low-frequency bands are spaced as uniformly as possible.

NOTE When measuring the sound insulation of walls or floors, theoretical calculation as well as experiments have indicated that the test element should cover a total partition wall or ceiling of the test room, i.e. the test opening should extend from wall to wall and/or from floor to ceiling. In such a case, a volume of 50 m<sup>3</sup> to 60 m<sup>3</sup> is appropriate in view of the recommended size of the test opening.

**3.1.2 Diffusion**

Large variations of the sound pressure level in the room indicate the presence of dominating strong standing waves. In this case it is necessary to install diffusing elements in the rooms. The positioning and number of diffusing elements should be arranged so that the sound reduction index is not influenced when further diffusing elements are installed.

NOTE For some kind of test elements the installation of diffusing elements is mandatory, as for elements with one surface being significantly more absorbent than the other; see ISO/DIS 10140-2.

**3.1.3 Reverberation time**

The reverberation time in the rooms under normal test conditions (with negligible absorption by the test element) should not be excessively long or short. When the reverberation time at frequencies at and above 100 Hz exceeds 2 s or is less than 1 s, check whether the measured sound reduction index depends on the reverberation time. When such a dependence is found, even with diffusers in the rooms, the room shall be modified to adjust the reverberation time,  $T$ , such that

$$1 \leq T \leq 2(V/50)^{2/3} \quad (1)$$

where

$V$  is the value of the room volume, in cubic meters;

$T$  is the reverberation time, in seconds.

For measurement of the reverberation time see ISO/DIS 10140-4:2008.

### 3.1.4 Background noise

The background noise level in the receiving room shall be sufficiently low to permit measurements of the sound transmitted from the source room, considering the power output in the source room and the sound insulation of the test elements for which the laboratory is intended (see ISO/DIS 10140-4:2008, 4.3).

### 3.1.5 Suppression of flanking transmission

In laboratory test facilities for measuring the sound reduction index, the sound transmitted by any indirect path should be negligible compared with the sound transmitted through the test element. One approach to achieve this in such facilities is to provide sufficient structural isolation between source and receiving room. Another approach would be to cover all surfaces of both rooms with linings that reduce the flanking transmission in such a way that the requirements on room volumes and reverberation times are still met.

Methods for the estimation of the maximum achievable sound reduction index  $R'_{\max}$ , which is determined by indirect paths are given in Annex A.

## 3.2 Test opening

A horizontal and a vertical full-size test opening is defined as well as a specific vertical small size test opening. Other reduced size test openings may be applied under certain restrictions.

### 3.2.1 Full size test opening

The area of the full-size test opening shall be approximately 10 m<sup>2</sup> for walls, and between 10 m<sup>2</sup> and 20 m<sup>2</sup> for floors, with the length of the shorter edge not less than 2,3 m for both walls and floors.

#### 3.2.1.1 General frame specification

The measured sound reduction index of a test element can be affected by the connections to the laboratory structure surrounding the element. The mass ratio of the tested structure to the surrounding structure should be taken into consideration. For tests on lightweight structures ( $m < 150 \text{ kg/m}^2$ ) there are no special requirements to be taken into account. For heavier structures under test it should be ensured that the loss factor,  $\eta$ , of the test element is not less than

$$\eta_{\min} = 0,01 + \frac{0,3}{\sqrt{f}} \quad (2)$$

where

$f$  is the value of test frequency, in Hertz.

To check this requirement, use a brick or block wall having a mass of  $(400 \pm 40) \text{ kg/m}^2$  plastered on one side as the test element. For measurement of the loss factor see ISO/DIS 10140-4:2008.