SLOVENSKI STANDARD

SIST EN ISO 140-3:1997

01-april-1997

Akustika - Merjenje zvočne izolirnosti v zgradbah in zvočne izolirnosti gradbenih elementov - 3. del: Laboratorijska merjenja izolirnosti gradbenih elementov pred zvokom v zraku (ISO 140-3:1995)

Acoustics - Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements (ISO 140-3:1995)

Akustik - Messung der Schalldämmung in Gebäuden und von Bauteilen - Teil 3: Messung der Luftschalldämmung von Bauteilen in Prüfständen (ISO 140-3:1995)

Acoustique - Mesurage de l'isolation acoustique des immeubles et des éléments de construction - Partie 3: Mesurage en laboratoire de l'isolation aux bruits aériens des éléments de construction (ISO 140-3:1995)

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<u>**ICS:**</u>

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91.120.20	Akustika v stavbah. Zvočna izolacija	Acoustics in building. Sound insulation

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English version

Acoustics - Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements (ISO 140-3:1995)

Acoustique - Mesurage de l'isolement acoustique des immeubles et des éléments de construction - Partie 3: Mesurage en laboratoire de l'affaiblissement des bruits aériens par les éléments de construction (ISO 140-3:1995)

Akustik - Messung der Schalldämmung in Gebäuden und von Bauteilen - Teil 3: Messung der Luftschalldämmung von Bauteilen in Prüfständen (ISO 140-3:1995)

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CEN

European Committee for Standardization
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Europäisches Komitee für Normung

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Foreword

The text of the International Standard ISO 140-3:1995 has been prepared by Technical Committee ISO/TC 43 "Acoustics" in collaboration with CEN/TC 126 "Acoustic properties of building products and of buildings". It has been submitted to Parallel Vote and has been approved on 1995-01-11 as a European Standard.

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of an identical text or by endorsement, at the latest by November 1995, and conflicting national standards shall be withdrawn at the latest by June 1997.

According to CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 140-3:1995 was approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 140-3

Second edition
1995-05-15

Acoustics — Measurement of sound insulation in buildings and of building elements —

Part 3: Laboratory measurements of airborne sound insulation of building elements

Acoustique — Mesurage de l'isolement acoustique des immeubles et des éléments de construction —

Partie 3: Mesurage en laboratoire de l'affaiblissement des bruits aériens par les éléments de construction

Reference number
ISO 140-3:1995(E)

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.

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.

International Standard ISO 140-3 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 2, *Building acoustics*.

This second edition cancels and replaces the first edition (ISO 140-3:1978) and its amendment ISO 140-3:1978/Amd.1:1990.

ISO 140 consists of the following parts, under the general title *Acoustics — Measurement of sound insulation in buildings and of building elements*:

— *Part 1: Requirements for laboratory test facilities with suppressed flanking transmission*

— *Part 2: Determination, verification and application of precision data*

— *Part 3: Laboratory measurements of airborne sound insulation of building elements*

— *Part 4: Field measurements of airborne sound insulation between rooms*

— *Part 5: Field measurements of airborne sound insulation of facade elements and facades*

— *Part 6: Laboratory measurements of impact sound insulation of floors*

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— *Part 7: Field measurements of impact sound insulation of floors*

— *Part 8: Laboratory measurement of the reduction of transmitted impact noise by floor coverings on a solid standard floor*

— *Part 9: Laboratory measurement of room-to-room airborne sound insulation of a suspended ceiling with a plenum above it*

— *Part 10: Laboratory measurement of airborne sound insulation of small building elements*

— *Part 12: Laboratory measurement of room-to-room airborne and impact sound insulation of an access floor*

Annexes A, B and C form an integral part of this part of ISO 140. Annexes D, E, F and G are for information only.

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Acoustics — Measurement of sound insulation in buildings and of building elements —

Part 3:
Laboratory measurements of airborne sound insulation of building elements

1 Scope

This part of ISO 140 specifies a laboratory method of measuring the airborne sound insulation of building elements such as walls, floors, doors, windows, façade elements and façades, except those classified as small building elements (for which a measuring method is specified in ISO 140-10[1]).

The results obtained can be used to design building elements with appropriate acoustic properties, to compare the sound insulation properties of building elements and to classify such elements according to their sound insulation capabilities.

The measurements are performed in laboratory test facilities in which transmission of sound on flanking paths is suppressed. Results of measurements made in accordance with this part of ISO 140 therefore shall not be applied directly in the field without accounting for other factors affecting sound insulation, especially flanking transmission and loss factor.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 140. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 140 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 140-1:—[2], *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 1: Requirements for laboratory test facilities with suppressed flanking transmission.*

ISO 140-2:1991, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 2: Determination, verification and application of precision data.*

ISO 354:1985, *Acoustics — Measurement of sound absorption in a reverberation room.*

ISO 717-1:—[3], *Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation.*

IEC 225:1966, *Octave, half-octave and third-octave band filters intended for the analysis of sounds and vibrations.*

IEC 651:1979, *Sound level meters.*

1) ISO 140-10:1991, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 10: Laboratory measurement of airborne sound insulation of small building elements.*

2) To be published. (Revision of ISO 140-1:1990)

3) To be published. (Revision of ISO 717-1:1982)

IEC 804:1985, *Integrating-averaging sound level meters.*

IEC 942:1988, *Sound calibrators.*

3 Definitions

For the purposes of this part of ISO 140, the following definitions apply.

3.1 average sound pressure level in a room: Ten times the common logarithm of the ratio of the space and time average of the squared sound pressure to the square of the reference sound pressure, the space average being taken over the entire room with the exception of those parts where the direct radiation of a sound source or the near field of the boundaries (walls, etc.) is of significant influence.

This quantity is denoted by L and is expressed in decibels.

If a continuously moving microphone is used, L is determined by

$$L = 10 \lg \frac{\frac{1}{T_m}\int_0^{T_m} p^2(t)\,dt}{p_0^2} \quad \text{dB} \qquad \ldots (1)$$

where

p is the sound pressure, in pascals;

p_0 is the reference sound pressure and is equal to 20 µPa;

T_m is the integration time, in seconds.

If fixed microphone positions are used, L is determined by

$$L = 10 \lg \frac{p_1^2 + p_2^2 + \ldots + p_n^2}{np_0^2} \quad \text{dB} \qquad \ldots (2)$$

where $p_1, p_2 \ldots, p_n$ are r.m.s. sound pressures at n different positions in the room. In practice, usually the sound pressure levels L_i are measured. In this case L is determined by

$$L = 10 \lg \frac{1}{n}\sum_{i=1}^{n} 10^{L_i/10} \quad \text{dB} \qquad \ldots (3)$$

where L_i are the sound pressure levels L_1 to L_n at n different positions in the room.

3.2 sound reduction index: Ten times the common logarithm of the ratio of the sound power W_1 which is incident on a partition under test to the sound power W_2 transmitted through the specimen.

This quantity is denoted by R and is expressed in decibels.

$$R = 10 \lg \frac{W_1}{W_2} \quad \text{dB} \qquad \ldots (4)$$

In this part of ISO 140 the sound reduction index is evaluated from

$$R = L_1 - L_2 + 10 \lg \frac{S}{A} \quad \text{dB} \qquad \ldots (5)$$

where

L_1 is the average sound pressure level in the source room, in decibels;

L_2 is the average sound pressure level in the receiving room, in decibels;

S is the area of the test specimen, in square metres, which is equal to the free test opening;

A is the equivalent sound absorption area in the receiving room, in square metres.

NOTES

1 The derivation of equation (5) from equation (4) assumes that the sound fields are perfectly diffuse and that the sound radiated into the receiving room is transmitted only through the specimen.

2 The expression "sound transmission loss" (TL) is also in use in English-speaking countries. It is equivalent to "sound reduction index".

3.3 apparent sound reduction index: Ten times the common logarithm of the ratio of the sound power W_1 which is incident on a partition under test to the total sound power transmitted into the receiving room if, in addition to the sound power W_2 transmitted through the specimen, the sound power W_3, transmitted by flanking elements or by other components, is significant.

This quantity is denoted by R' and is expressed in decibels.

$$R' = 10 \lg \left(\frac{W_1}{W_2 + W_3} \right) \quad \text{dB} \qquad \ldots (6)$$

In general, the sound power transmitted into the receiving room consists of the sum of several components. Also in this case, under the assumption that there are sufficiently diffuse sound fields in the two rooms, the apparent sound reduction index in this part of ISO 140 is evaluated from

$$R' = L_1 - L_2 + 10 \lg \frac{S}{A} \text{ dB} \qquad \dots (7)$$

Thus, in the apparent sound reduction index, the sound power transmitted into the receiving room is related to the sound power which is incident on the test specimen as in equation (5), irrespective of the actual conditions of transmission.

4 Equipment

The equipment shall comply with the requirements of clause 6.

The accuracy of the sound level measurement equipment shall comply with the requirements of accuracy classes 0 or 1 defined in IEC 651 and IEC 804. Diffuse field calibration of the measurement equipment is required unless microphones with the same diffuse field frequency response are used in both the source and the receiving room.

If absolute values of sound pressure levels have to be obtained, the complete measuring system including the microphone shall be adjusted before each measurement using a sound calibrator which complies with the requirements of accuracy class 1 defined in IEC 942.

The third-octave band filters shall comply with the requirements defined in IEC 225.

The reverberation time measurement equipment shall comply with the requirements defined in ISO 354.

Requirements for the sound source are given in 6.1 and annex C.

NOTE 3 For pattern evaluation (type testing) and regular verification tests, recommended procedures for sound level meters are given in OIML R58 and OIML R88[4)].

5 Test arrangement

5.1 Rooms

Laboratory test facilities shall comply with the requirements of ISO 140-1.

5.2 Test specimen

The sound transmission of a specimen can depend on the temperature and relative humidity in the test rooms at time of test and/or during curing or conditioning of the test specimen. The conditions shall be reported.

5.2.1 Partitions

The size of the test partitions is determined by the size of the test opening of the laboratory test facility, as it is defined in ISO 140-1. These sizes are approximately 10 m^2 for walls, and between 10 m^2 and 20 m^2 for floors, with the shorter edge length for both walls and floors being not less than 2,3 m.

A smaller size is permissible if the wavelength of free flexural waves at the lowest frequency considered is smaller than half the minimum dimension of the specimen. The smaller the specimen, however, the more sensitive the results will be to edge constraint conditions and to local variations in sound fields.

Preferably install the test partition in a manner as similar as possible to the actual construction with a careful simulation of normal connections and sealing conditions at the perimeter and at joints within the partition. The mounting conditions shall be stated in the test report.

The sound reduction index of solid walls and floors depends strongly on coupling to surrounding structures. In order to describe properly the effect of the mounting, it is recommended to measure and to report the loss factor in these cases (see annex E).

If the test specimen is installed in an aperture between the source room and the receiving room, the ratio of the aperture depths shall be approximately 2:1 unless this is inconsistent with the practical use of the test specimen.

If the specimen has one surface which is significantly more absorbent than the other, the surface with the

4) OIML R58:1984, *Sound level meters.*

OIML R88:1989, *Integrating-averaging sound level meters.*

These documents may be obtained from: Organisation internationale de métrologie légale, 11, rue Turgot, 75009 Paris, France.