
Akustika - Merjenje zvočne izolirnosti v stavbah in zvočne izolirnosti stavbnih elementov - 12. del: Laboratorijsko merjenje zvočne izolirnosti pri bočnem prenosu zvoka v zraku in udarnem zvoku med sosednima prostoroma (ISO 140-12:2000)

Acoustics - Measurement of sound insulation in buildings and of building elements - Part 12: Laboratory measurement of room-to-room airborne and impact sound insulation of an access floor (ISO 140-12:2000)

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Akustik - Messung der Schalldämmung in Gebäuden und von Bauteilen - Teil 12: Messung der Luft- und Trittschalldämmung durch einen Doppel- und Hohlrumboden zwischen benachbarten Räumen im Prüfstand (ISO 140-12:2000)

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Acoustique - Mesurage de l'isolement acoustique des immeubles et des éléments de construction - Partie 12: Mesurage en laboratoire de la transmission latérale entre deux pièces des bruits aériens et des bruits de choc par un plancher surélevé (ISO 140-12:2000)

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This European Standard was approved by CEN on 28 October 1999.

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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 Central Secretariat has the same status as the official versions.

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Foreword

The text of EN ISO 140-12:2000 has been prepared by Technical Committee CEN/TC 126 "Acoustic properties of building products and of buildings", the secretariat of which is held by AFNOR, in collaboration with Technical Committee ISO/TC 43 "Acoustics".

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of an identical text or by endorsement, at the latest by July 2000, and conflicting national standards shall be withdrawn at the latest by July 2000.

The present draft is a part of a series of standards whose list is given below :

EN ISO 140 "Acoustics - Measurement of sound insulation in buildings and of building elements"

- *Part 1 : Requirements for laboratory test facilities with suppressed flanking transmission (ISO 140-1:1997) ;*
- *Part 2 : Determination, verification and application of precision data (ISO 140-2:1991);*
- *Part 3 : Laboratory measurements of airborne sound insulation of building elements ;*
- *Part 4 : Field measurements of airborne sound insulation between rooms (ISO 140-4:1998);*
- *Part 5 : Field measurements of airborne sound insulation of façade elements and façades (ISO 140-5:1998);*
- *Part 6 : Laboratory measurements of impact sound insulation of floors (ISO 140-6:1998);*
- *Part 7 : Field measurements of impact sound insulation of floors (ISO 140-7:1998);*
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- *Part 8 : Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight standard floor (ISO 140-8:1997);*
- *Part 9 : Laboratory measurements of room-to-room airborne sound insulation of a suspended ceiling with a plenum above it (ISO 140-9:1985);*
- *Part 10 : Laboratory measurement of airborne sound insulation of small building elements (ISO 140-10:1991);*
- *Part 12 : Laboratory measurement of room-to-room airborne and impact sound insulation of an access floor (ISO 140-12:2000)*

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

1 Scope

This standard specifies a laboratory method to measure the airborne and impact sound insulation of an access floor with a plenum of defined height mounted below an acoustical barrier which separates two rooms of a specified test facility.

This method utilizes a laboratory space arranged in such a manner that it simulates a pair of horizontally adjacent, typical offices or rooms sharing a common access floor system, plenum space and a dividing wall. The dividing wall extends from the ceiling to the upperside of the floor system which at the junction is either continuous or discontinuous.

The quantities being measured are the airborne and impact sound insulation between two rooms of a specified test facility when the sound transmitted by paths other than the access floor and common plenum space is negligible. These quantities are called the normalized flanking level difference and the normalized flanking impact sound pressure level.

The method can be extended to the study of the additional sound insulation that can be achieved by auxiliary systems, such as material used either as plenum barriers or as backing for all of, or part of the floor.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places 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 European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

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EN 20140-2, *Acoustics - Measurement of sound insulation in buildings and of building elements - Part 2 : Determination, verification and application of precision data (ISO 140-2:1991)*.

EN 20354, *Acoustics - Measurement of sound absorption in a reverberation room (ISO 354:1985)*.

EN 60651, *Sound level meters (IEC 60651)*.

EN 60804, *Integrating-averaging sound level meters (IEC 60804)*.

EN 61260, *Electroacoustics – Octave-band and fractional-octave-band filters (IEC 61260)*.

EN ISO 140-1, *Acoustics - Measurement of sound insulation in buildings and of building elements - Part 1 : Requirements of laboratory test facilities with suppressed flanking transmission (ISO 140-1:1997)*.

EN 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)*.

EN ISO 140-6:1998, *Acoustics - Measurement of sound insulation in buildings and of building elements - Part 6 : Laboratory measurements of impact sound insulation of floors (ISO 140-6:1998)*.

EN ISO 717-1, *Acoustics - Rating of sound insulation in buildings and of building elements - Part 1 : Airborne sound installation (ISO 717-1:1996)*.

EN ISO 717-2, *Acoustics - Rating of sound insulation in buildings and of building elements - Part 2 : Impact sound insulation (ISO 717-2:1996)*.

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply :

3.1

average sound pressure level in a room

10 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 :

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

where

p is the sound pressure in pascals ;

$p_0 = 20 \mu\text{Pa}$ is the reference sound pressure ;

T_m is the integration time in seconds.

If fixed microphone positions are used, L is determined by :

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

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where

p_1, p_2, \dots, 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 :

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

where

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

**3.2
flanking level difference**

the difference in the space and time average sound pressure levels produced in two rooms by a sound source in one of the rooms resulting from the flanking transmission due to the tested element. This quantity is denoted by D_f and is expressed in decibels.

$$D_f = L_1 - L_2 \quad (4)$$

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.

**3.3
normalized flanking level difference**

the flanking level difference corresponding to a reference value of absorption area in the receiving room. This quantity is denoted by $D_{n,f}$ and is expressed in decibels.

$$D_{n,f} = D_f - 10 \lg \frac{A}{A_0} \quad \text{dB} \quad (5)$$

where

A is the equivalent absorption area in the receiving room ;

A_0 is the reference absorption area (for the laboratory, $A_0 = 10 \text{ m}^2$).

The maximum value of the normalized flanking level difference of the facility obtained according to 5.1.3 is noted $D_{n,f,max}$.

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**3.4
flanking impact sound pressure level**

the average value of average sound pressure level in the receiving room produced by a standardized tapping machine operating at different positions on the element in the emission room, by the flanking transmission due to the tested element

$$L_f = 10 \lg \left(\frac{1}{n} \sum_i^n 10^{L_i/10} \right) \quad \text{dB} \quad (6)$$

where L_i is the average sound pressure level in the receiving room produced by the tapping machine at position i .

**3.5
normalized flanking impact sound pressure level**

the flanking impact sound pressure level corresponding to a reference value of absorption area in the receiving room. This quantity is denoted $L_{n,f}$ and is expressed in decibels.

$$L_{n,f} = L_f - 10 \lg \frac{A}{A_0} \quad \text{dB} \quad (7)$$

3.6**plenum space**

the whole of the void below the access floor in both rooms in the test facility

4 Measuring equipment

The equipment shall be suitable for meeting the requirements of clause 6.

The tapping machine shall meet the requirements given in annex A of EN ISO 140-6:1998.

The sound level measurement equipment shall meet the requirements of a type 0 or 1 instrument according to EN 60651 and EN 60804.

The third-octave band filters shall meet the requirement of EN 61260.

The reverberation time measurement equipment shall meet the requirements of EN 20354.

NOTE Requirements for pattern evaluation and regular verification tests on the fulfilment of the equipment requirements should be considered. Recommendations on the extend of the evaluation and verification procedure are given for sound level meters in OIML R 58 and R 88, for the standard tapping machine those recommendations are given in annex A of EN ISO 140-6:1996.

5 Test arrangement**5.1 Requirements for the laboratory**

The laboratory test facility is divided into two rooms of approximately equal volumes by a wall. The essential features of the test facility are specified in 5.1.1 to 5.1.6 and are shown schematically in figure 1.

5.1.1 Construction of the test facility

The ground plan of the test facility shall be rectangular. A vibration break shall be provided in the floor of the facility between the two rooms in order to ensure that flanking transmission by the floor is negligible.

Vibration breaks in the outer walls and the roof are recommended.

The level of the background noise shall be sufficiently low to permit a measurement of the sound transmitted from the source room, taking into consideration the power output of the source room and the isolating properties of the specimens for which the laboratory is intended. The reverberation time in the rooms should not be excessively long. Where the reverberation time at low frequencies exceeds 2 s or is less than 1 s, a check should be made to determine whether the measured quantities depend on the reverberation time. When such a dependence is found (even with diffusers in the rooms) the room shall be modified to reduce the reverberation time to values between 1 s and not higher than :

$$2 \left(\frac{V}{50} \right)^{2/3} \text{ s}$$

at low test frequencies (V is the room volume in cubic metres).

These requirements refer to the test rooms without test object and a heavy dividing wall.

NOTE For the purposes of determining the reverberation time of each room, a suitable impervious plenum barrier should be installed between the foot of the dividing wall and the floor.