

SVENSK STANDARD

SS-EN 16205:2020

Byggakustik – Labororiemätning av stegljudsnivå i samma rum

Laboratory measurement of walking noise on floors



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Utgåva: 2

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Europastandarden EN 16205:2020 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 16205:2020.

Denna standard ersätter SS-EN 16205:2013+A1:2018, utgåva 1.

The European Standard EN 16205:2020 has the status of a Swedish Standard. This document contains the official version of EN 16205:2020.

This standard supersedes the SS-EN 16205:2013+A1:2018, edition 1.

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EUROPEAN STANDARD

EN 16205

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2020

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English Version

Laboratory measurement of walking noise on floors

Mesurage en laboratoire du bruit des pas sur les
planchers

Messung von Gehschall auf Fußböden im Prüfstand

This European Standard was approved by CEN on 21 September 2020.

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

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SS-EN 16205:2020 (E)

Contents		Page
European foreword		3
Introduction		4
1	Scope	5
2	Normative references	5
3	Terms and definitions	5
4	Principle	7
5	Test arrangement	7
5.1	Test facilities	7
5.2	Equipment	7
5.3	Mounting of the specimens	8
6	Test procedure	8
7	Evaluation of results	9
8	Precision	9
9	Expression of results	10
10	Test report	10
Annex A (informative) Presentation of the walking noise spectrum with uncertainty bars (example)		11
Annex B (normative) Reference spectrum for laboratory bare floors		12
Annex C (informative) Fixing the pads below the tapping machine		13
Annex D (informative) Background of the measuring method		14
Annex E (informative) Calculation of perceived walking loudness on floor coverings installed floating		16
Bibliography		18

European foreword

This document (EN 16205:2020) has been prepared by 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of an identical text or by endorsement, at the latest by May 2021, and conflicting national standards shall be withdrawn at the latest by May 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 16205:2013+A1:2018.

In comparison with the previous edition, the following technical modifications have been made:

- amendment of the Annex E to include the room correction.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

SS-EN 16205:2020 (E)

Introduction

This document sets up a laboratory measurement method to determine noise radiated from a floor covering on a standard concrete floor when excited by a standard tapping machine. The noise is measured in the room where the floor covering and the excitation are located. There is no restriction concerning the type of floor covering unless the required small pads of the flooring could not be assembled. Using the standard tapping machine according to EN ISO 10140 (all parts) means that a more general excitation compared to walking alone is regarded – in the same way as it is accepted for impact sound improvement measurements of floor coverings. The results are expressed in terms of the normalized A-weighted average sound pressure level in the walking room. The results provide information about the noise radiated. A more sophisticated psychoacoustic evaluation did not seem to be appropriate in view of the fact that this measurement stands for a large range of sources with different acoustical behaviour (even if only different types of walking were regarded). A subjective classification of the quality of the floor coverings is not intended.

1 Scope

This document specifies a laboratory measurement method to determine noise radiated from a floor covering on a standard concrete floor when excited by a standard tapping machine.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN ISO 10140-1, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 1: Application rules for specific products (ISO 10140-1)*

EN ISO 10140-2, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 2: Measurement of airborne sound insulation (ISO 10140-2)*

EN ISO 10140-3, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 3: Measurement of impact sound insulation (ISO 10140-3)*

EN ISO 10140-4:2010, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 4: Measurement procedures and requirements (ISO 10140-4:2010)*

EN ISO 10140-5, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 5: Requirements for test facilities and equipment (ISO 10140-5)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 10140 (all parts) and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

sufficiently large specimen

specimen whose radiated sound power does not increase any longer with size, or which covers the total area of the floor

Note 1 to entry: In case of uncertainty, the testing laboratory will decide which size is sufficient.

3.2

pads

pieces of the flooring under test, which are as large as the hitting areas of the tapping machine hammers

Note 1 to entry: Quadratic pads should be the smallest possible including the whole hitting area.

3.3

walking sound pressure level (in third-octave band i)

$L_{n,walk,i}$

normalized impact sound pressure level in the upper (walking) room with a standardized contribution of the concrete bare floor underneath the floor covering under test

SS-EN 16205:2020 (E)

Note 1 to entry: It is calculated according to Formula (1):

$$L_{n,walk,i} = \begin{cases} L_{i,ref,b} + L_{i,Fl,c} - L_{i,Fl,b} & \text{if } L_{i,with} < \left(L_{i,pads} + 10 \log_{10} \left(\frac{T_{i,upper,with}}{T_{i,upper,pads}} \right) \right) \\ 10 \log_{10} \left(\frac{0,16 \cdot V_{upper}}{A_0} \left(\frac{10^{\frac{L_{i,with}}{10}}}{T_{i,upper,with}} - \frac{10^{\frac{L_{i,pads}}{10}}}{T_{i,upper,pads}} \right) + 10^{\frac{L_{i,ref,b} + L_{i,Fl,c} - L_{i,Fl,b}}{10}} \right) & \text{else} \end{cases} \quad (1)$$

where

- $L_{i,with}$ is the impact sound pressure level measured in the upper room, when a sufficiently large specimen is lying on the test floor;
- $L_{i,pads}$ is the impact sound pressure level measured in the upper room, when only pads of the flooring material are lying on the test floor below the tapping machine hammers;
- $L_{i,Fl,b}$ is the impact sound pressure level measured in the lower room, when the tapping machine acts on the bare floor in the upper room;
- $L_{i,Fl,c}$ is the impact sound pressure level measured in the lower room, when the tapping machine acts on the sufficiently large specimen in the upper room;
- $L_{i,ref,b}$ is the reference values for the bare floor as given in Annex B;
- V_{upper} is the volume of the upper room, in cubic metres;
- $T_{i,upper,with}$ is the reverberation time in the upper room with sufficiently large floor covering installed, in seconds;
- $T_{i,upper,pads}$ is the reverberation time in the upper room with pads installed, in seconds;
- A_0 10 m².

Note 2 to entry: This definition presumes, that the reverberation time in the lower room does not change between the measurements of $L_{i,Fl,c}$ and $L_{i,Fl,b}$.

Note 3 to entry: This can be achieved by leaving the lower room unchanged.

3.4

A-weighted walking sound pressure level

$L_{n,walk,A}$

A-weighted sound pressure level, calculated from $L_{n,walk,i}$ according to Formula (2) with C_i according to EN 61672-1:

$$L_{n,walk,A} = 10 \cdot \log_{10} \sum_{i=1}^{21} 10^{(L_{n,walk,i} + C_i)/10} \quad (2)$$

3.5

radiated walking sound

RWS

subjective perceived loudness radiated from a floor when a person with hard heel is walking on it

3.6

loudness

perceived strength of steady-state sound calculated according to Zwicker

Note 1 to entry: Its unit is sone. Loudness is a linear measure; hence a redoubling of the sone value results in a redoubling of the perceived loudness. Loudness is based on the concept of critical bands.

3.7

critical band

loudness-model for human hearing system processes perceived sound in sub-bands called critical bands

Note 1 to entry: Critical bandwidth differs within the frequency range.

Note 2 to entry: The critical band produces the critical band scale. Its unit is Bark.

4 Principle

A floor test facility, according to EN ISO 10140-1 through EN ISO 10140-5, for impact and airborne sound measurements is used. It consists of two medium-sized and medium damped rooms above each other, separated by a standard homogeneous concrete floor. As a walking noise source, a standard tapping machine according to EN ISO 10140-1 through EN ISO 10140-5 is applied. Several average sound pressure level measurements in third-octave bands are made in the upper and lower rooms with the bare floor either uncovered or covered with pads or sufficiently large “full-size” specimens of the tested flooring. In the upper room, the reverberation times with large specimens and with merely pads present shall be determined.

The walking sound pressure level is then calculated according to Formula (1) from the sound power directly radiated from the floor covering into the upper room plus the sound power from the bare floor under the floor covering, which radiates back into the upper room. Finally, the A-weighted walking sound pressure level is calculated from the measured average sound pressure levels.

In Formula (1), the radiation from the bare floor through the floor covering is corrected for deviations of the actual laboratory floor from the reference spectrum in Annex B. Furthermore, the tapping machine self-noise theoretically cancels out and, therefore, is not needed explicitly. However, because of the uncertainty of the measured quantities, the resulting walking sound pressure level in the second line in Formula (1) may become very uncertain and even complex, in particular when a loud tapping machine is used and the flooring does not radiate much itself. Complex values are avoided by setting the inner bracket to zero as a minimum [first line in Formula (1)]. To detect unreliable results, the uncertainty of $L_{n,walk}$ shall be calculated for each third-octave band and stated in the test report.

All details like test facility requirements, tapping machine characteristics, positioning of tapping machine and microphones, averaging, etc. are kept as close as possible to the requirements of laboratory measurements of impact noise as given in EN ISO 10140.

5 Test arrangement

5.1 Test facilities

A room arrangement for impact and airborne sound pressure level measurements according to EN ISO 10140 (all parts) shall be used.

5.2 Equipment

See EN ISO 10140 (all parts).