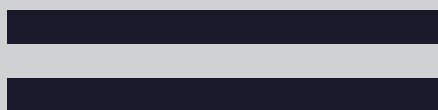


# SVENSK STANDARD

## SS-EN 16205:2020

**Byggakustik – Labororiemätning av stegljudsnivå i samma rum**

**Laboratory measurement of walking noise on floors**



**sis** Svenska  
Institutet för  
Standarder

Språk: engelska/English

Utgåva: 2

This preview is downloaded from [www.sis.se](http://www.sis.se). Buy the entire standard via <https://www.sis.se/std-80026392>

Den här standarden kan hjälpa dig att effektivisera och kvalitetssäkra ditt arbete. SIS har fler tjänster att erbjuda dig för att underlätta tillämpningen av standarder i din verksamhet.

#### **SIS Abonnemang**

Snabb och enkel åtkomst till gällande standard med SIS Abonnemang, en prenumerationstjänst genom vilken din organisation får tillgång till all världens standarder, senaste uppdateringarna och där hela din organisation kan ta del av innehållet i prenumerationen.

#### **Utbildning, event och publikationer**

Vi erbjuder även utbildningar, rådgivning och event kring våra mest sålda standarder och frågor kopplade till utveckling av standarder. Vi ger också ut handböcker som underlättar ditt arbete med att använda en specifik standard.

#### **Vill du delta i ett standardiseringsprojekt?**

Genom att delta som expert i någon av SIS 300 tekniska kommittéer inom CEN (europeisk standardisering) och/eller ISO (internationell standardisering) har du möjlighet att påverka standardiseringsarbetet i frågor som är viktiga för din organisation. Välkommen att kontakta SIS för att få veta mer!

#### **Kontakt**

Skriv till [kundservice@sis.se](mailto:kundservice@sis.se), besök [sis.se](https://www.sis.se) eller ring 08 - 555 523 10

---

© Copyright/Upphovsrätten till denna produkt tillhör Svenska institutet för standarder, Stockholm, Sverige. Upphovsrätten och användningen av denna produkt regleras i slutanvändarlicensen som återfinns på [sis.se/slutanvandarlicens](https://www.sis.se/slutanvandarlicens) och som du automatiskt blir bunden av när du använder produkten. För ordlista och förkortningar se [sis.se/ordlista](https://www.sis.se/ordlista).

© Copyright Svenska institutet för standarder, Stockholm, Sweden. All rights reserved. The copyright and use of this product is governed by the end-user licence agreement which you automatically will be bound to when using the product. You will find the licence at [sis.se/enduserlicenseagreement](https://www.sis.se/enduserlicenseagreement).

Upplysningar om sakinnehållet i standarden lämnas av Svenska institutet för standarder, telefon 08 - 555 520 00. Standarder kan beställas hos SIS som även lämnar allmänna upplysningar om svensk och utländsk standard.

Standarden är framtagen av kommittén för Byggakustik, SIS/TK 197.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på [www.sis.se](https://www.sis.se) - där hittar du mer information.

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.

## LÄSANVISNINGAR FÖR STANDARDER

I dessa anvisningar behandlas huvudprinciperna för hur regler och yttre begränsningar anges i standardiseringsprodukter.

### Krav

Ett krav är ett uttryck i ett dokumentets innehåll som anger objektivt verifierbara kriterier som ska uppfyllas och från vilka ingen avvikelse tillåts om efterlevnad av dokumentet ska kunna åberopas. Krav uttrycks med hjälpverbet **ska** (eller **ska inte** för förbud).

### Rekommendation

En rekommendation är ett uttryck i ett dokumentets innehåll som anger en valmöjlighet eller ett tillvägagångssätt som bedöms vara särskilt lämpligt utan att nödvändigtvis nämna eller utesluta andra. Rekommendationer uttrycks med hjälpverbet **bör** (eller **bör inte** för avrådanden).

### Instruktion

Instruktioner anges i imperativ form och används för att ange hur något görs eller utförs. De kan underordnas en annan regel, såsom ett krav eller en rekommendation. De kan även användas självständigt, och är då att betrakta som krav.

### Förklaring

En förklaring är ett uttryck i ett dokumentets innehåll som förmedlar information. En förklaring kan uttrycka tillåtelse, möjlighet eller förmåga. Tillåtelse uttrycks med hjälpverbet **får** (eller motsatsen **behöver inte**). Möjlighet och förmåga uttrycks med hjälpverbet **kan** (eller motsatsen **kan inte**).

## READING INSTRUCTIONS FOR STANDARDS

These instructions cover the main principles for the use of provisions and external constraints in standardization deliverables.

### Requirement

A requirement is an expression, in the content of a document, that conveys objectively verifiable criteria to be fulfilled, and from which no deviation is permitted if conformance with the document is to be claimed. Requirements are expressed by the auxiliary **shall** (or **shall not** for prohibition).

### Recommendation

A recommendation is an expression, in the content of a document, that conveys a suggested possible choice or course of action deemed to be particularly suitable, without necessarily mentioning or excluding others. Recommendations are expressed by the auxiliary **should** (or **should not** for dissuasion).

### Instruction

An instruction is expressed in the imperative mood and is used in order to convey an action to be performed. It can be subordinated to another provision, such as a requirement or a recommendation. It can also be used independently and is then to be regarded as a requirement.

### Statement

A statement is an expression, in the content of a document, that conveys information. A statement can express permission, possibility or capability. Permission is expressed by the auxiliary **may** (its opposite being **need not**). Possibility and capability are expressed by the auxiliary **can** (its opposite being **cannot**).

EUROPEAN STANDARD

**EN 16205**

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2020

ICS 91.120.20

Supersedes EN 16205:2013+A1:2018

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.

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, 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 United Kingdom.



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

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

**SS-EN 16205:2020 (E)**

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

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).