SLOVENSKI STANDARD
oSIST prEN 16703:2014

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Akustika - Preskusni postopek za suhomontažne sisteme iz mavčno-kartonskih plošč s kovinsko konstrukcijo - Izolirnost pred zvokom v zraku

Acoustics - Test code for drywall systems of plasterboard with steel studs - Airborne sound insulation

Akustik - Prüfvorschrift für Trockenwandsysteme aus Metallständerwänden mit Gipskartonbeplankung - Messung der Luftschalldämmung

Acoustique - Code d'essai pour systèmes de cloisons sèches en plaques de plâtre avec montants en acier - Mesure de l'affaiblissement aérien

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Acoustics - Test code for drywall systems of plasterboard with steel studs - Airborne sound insulation

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

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Contents

Foreword

This document (prEN 16703:2014) 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 document is currently submitted to the CEN Enquiry.

This standard is a complement to the European Standard EN ISO 10140-1 and is not intended to replace it. The complement includes more stringent rules, narrower tolerances and new, additional requirements.

Introduction

Product standard EN 520 “Gypsum plasterboards – Definitions, requirements and test methods” specifies requirements and test methods and establishes how to declare characteristics and to affix the CE marking of products accordingly. In EN 520, when a drywall partition with plasterboard and steel studs has an airborne sound insulation performance property, its sound reduction should be determined in accordance with EN ISO 140-3, now replaced by EN ISO 10140-2 and EN ISO 717-1. The measured sound reductions are calculated into sound reduction index R, in third octave bands and into single number indexes, in accordance with EN ISO 717-1. Those single number ratings are used for the CE marking.

Measurement of sound reduction according to EN ISO 10140-2 was known, through earlier interlaboratory tests (ILT), to generate large spread in results from different laboratories. This was not suitable, either from a competition point of view or from an end-user perspective. Therefore CEN/TC 126 “Acoustic properties of building elements and of buildings” decided to set up a working group, WG 9 “Test Code for drywall partition with plasterboard and steel studs”, with the scope to improve reproducibility by developing a Test Code. One part of this work was to organize ILT for sound reduction measurements, to assess the uncertainty of acoustic quantities. Then the working group prepared the test code presented in this standard that gives the level of uncertainty of the acoustic measurement in laboratories of a drywall system of plasterboard with steel stud.

1 Scope

This draft European Standard specifies additional information necessary to carry out efficiently and under standardized conditions the determination of the sound reduction index of drywall systems of plasterboard with steel studs according to EN ISO 10140-2 “Acoustics — Laboratory measurement of sound insulation of building elements — Part 2: Measurement of airborne sound insulation”. It specifies the additional requirements of the sound reduction measurements, the operating and mounting conditions that shall be used for the test and additional test report information to be reported. Observe that all demands in EN ISO 10140-2 still must be fulfilled. The results obtained are used to convert frequency-dependent sound reduction index into single number ratings, according to EN ISO 717-1. These performances can be used to compare different products, or, and to express a requirement, or, and as input into estimation methods, such as the series EN 12354-1.

2 Normative references

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

EN 520, *Gypsum plasterboards — Definitions, requirements and test methods.*

EN 13162, *Thermal insulation products for buildings — Factory made Mineral wool (MW) products — Specification.*

EN 13963, *Jointing materials for gypsum plasterboards — Definitions, requirements and test methods.*

EN 14195, *Metal framing components for gypsum board systems — Definitions, requirements and test methods.*

EN 14566, *Mechanical fasteners for gypsum plasterboard systems — Definitions, requirements and test methods.*

EN ISO 10140 (All parts), *Acoustics — Laboratory measurement of sound insulation of building elements.*

EN ISO 717-1, *Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation (ISO 717-1:2013).*

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).*

3 Terms and definitions

For the purposes of this document, the following term and definition apply.

3.1
drywall system of plasterboard with steel studs
partition comprising a rigid metal frame and enclosed by plasterboard

4 Test code for drywall systems of plasterboard with steel studs

4.1 Application

4.1.1 This standard applies to non-load bearing metal frame partition comprising a rigid metal frame enclosed by boards.

In general, the type, size, gauge and spacing of the studs, and the size, type and number of layers of plasterboard and eventual amount and type of cavity filling material in partition constructions are determined by the performance requirements of the system.

4.1.2 The quantity to be determined is the sound reduction index R as a function of frequency. The definition of R is given in EN ISO 10140-2.

4.2 Test element

The test opening for walls should be 10 m^2 (+/- 1 m^2).

For all others information, refer to EN ISO 10140-2.

4.3 Boundary and mounting conditions

4.3.1 General rules

The test mounting should be mounted directly on the facilities frame; it cannot be a prefabricated full partition.

The test element should be installed in a similar manner to the actual construction with careful simulation of typical connections and sealing conditions at the perimeter and at all joints.

4.3.2 Perimeters mounting

A gap of about 5 mm to 10 mm shall remain between the panel and the reveal of the test opening. This gap shall be filled with appropriate material. Drying time has to respect product instruction according to 4.3.1. The type of putty will have an influence on performance of the partition.

Cracks in the perimeter may occur, resulting in air leakage. A control procedure has to be set in laboratory to avoid risk.

4.3.3 Partition positions

The sound reduction index of lightweight especially for twin leaf partitions (e.g. twin leaf gypsum board walls) is influenced by the mounting conditions in the test opening of the laboratory. Important installation parameters include the niche depth and the position of the partition in relation to the acoustic break in the test aperture.

The partition shall be installed into the test opening so that the niches on both sides of the partition have different depths with a ratio of 2:1.

To improve the reproducibility between laboratories and facilitate comparison of sound reduction indices for different lightweight walls, the partition (even double wall) shall not be mounted across the acoustic break of the laboratory, but on the same side of the break as indicated in Figure C.1 Partition example.

Main mounting conditions are reported in Annex C other may be used but shall be fully described in the test report.

NOTE Mounting the lightweight partition with one leaf on one side and the other leaf on the other side of the acoustic break can result in higher values for the sound reduction index.

Other mounting conditions may be suitable for certain types of twin leaf walls, for example, walls for semidetached houses where the leaves are vibrationally uncoupled (for example on separate foundations). In such cases the wall leaves can be mounted on each side of the acoustic break.

No absorption material should be located close (less than 1 meter) to the perimeter of the partition. The acoustic break has to be covered with soft reflecting materials.

4.4 Test and operating conditions

4.4.1 Standard uncertainties

To reduce expanded uncertainty in a reproducibility condition of drywall plasterboard partition with steel stud, it is required to realize preliminary tests with two laboratory reference partitions described in Annexes A and B.

If the measured spectra fall within the envelopes presented below or the sum over all third octave bands of the deviations between the measured and the envelope values does not exceed 4 dB it could be assumed that the expanded uncertainty of R_w; $R_w + C$ and $R_w + C_{tr}$ of further measurements will be taken from Table 1.

The deviation of 4 dB has been decided to take into account of modal behaviours in low frequency but also for the frequency where critical frequency has influenced the sound reduction. It has been observed both laboratory configuration origin and panel stiffness. For the panel if critical frequency is not in the third octave 3150 Hz, it is recommended to control with the value of the E modulus to be at +/- 20% of what has been used for the initial qualification of this method (see Annexes E and F)

Thanks to those preliminary tests, Table 1 and 2 could be used to give the standard uncertainties in a reproducibility condition for airborne sound insulation in one third-octave bands are given and for different single-number quantities.

Table 1 — Standard uncertainties by third octave bands

1/3 octave frequency band (f, Hz)	Standard uncertainty in a reproducibility condition (u, dB) [a]
50	2,5
63	3,1
80	2,7
100	1,8
125	1,6
160	1,0
200	1,0
250	0,8
315	1,1
400	0,9
500	0,7
630	1,2
800	1,5
1000	1,6
1250	2,2
1600	2,4
2000	2,2
2500	2,3
3150	1,5
4000	1,7
5000	2,1

[a] Standard deviations determined by interlaboratory measurements (σ) served as an estimate for the standard uncertainty.

Table 2 — Standard uncertainties of single number quantities

Single number	Standard uncertainty (dB)
R_{w}	0,7
R_{w+C}	0,7
R_{w+ctr}	1,1

For measurement results obtained in accordance with the ISO 140 series, the expanded uncertainty U shall be calculated by:

$U = k\,u$

Where

u is the standard uncertainty determined in Table 1 and 2 of this standard; and

k is the coverage factor. Its value depends on the distribution of the possible values of the measurand and on the confidence level.

For the purpose of this standard it is assumed that the values of the k is fixed at 2.

A measurement result shall then by stated as follows

$Y = y \pm U$

Where

Y is the measurand, y the best estimate found by the measurement; and

U is the expanded uncertainty calculated for a given confidence level for the two-sided test 95 %.

For all other information refer to EN ISO 10140-2 and ISO 12999-1.

4.4.2 Diffusivity conditions

The diffusivity of the sound fields in the source and receiving room has been identified as one parameter that can reduce the expanded uncertainty.

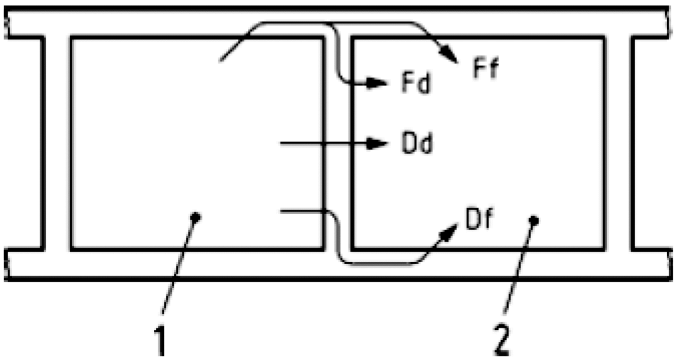
Large variations of the sound pressure level in the room indicate the presence of dominating strong standing waves. EN ISO 10140-5 already imposes to have diffuse field conditions by proposing to install diffusing elements in the rooms, it requires to ensure that the positioning and number of diffusing elements should be arranged so that the sound reduction index is not influenced when further diffusing elements are installed.

In order to evaluate the diffuse field condition, put two additional simple diffusers as plasterboard panels (1,2 m x 2,4 m) for each room (source and receiving room). Install them with two different slopes and according to the EN ISO 10140-5 section 3.2.2 specifications (minimum distance to microphone and loudspeaker and test specimen) preferably on the back of the chamber.

To confirm the diffusivity, do the test with these two additional simple diffusers and check that results are within the internal repeatability limits of the laboratory. Continue until results are inside the internal repeatability of the laboratory. When necessary, add further diffusers.

4.4.3 Flanking transmission

A sketch showing the different transmission paths between the rooms in a test facility is given in Figure 1.



Key

1	Source room
2	Receiving room
Dd	Direct path
Fd, Ff and Df	Flanking paths.

Figure 1 — Transmission path in a test facilities

EN ISO 10140-5 describes possible solutions to limit flanking transmission within the laboratory. Nevertheless, inter laboratory test have showed that the evaluation of flanking transmission is very complex and are very important for highly insulating lightweight constructions.

4.4.4 Reference partition Type 1

The Sound Reduction Index (SRI) of reference partition type 1 as described in Annex A; Figure A.1 shall be in the range as given in Table 3.