



BSI Standards Publication

Acoustics — Test methods for the qualification of the acoustic environment

Part 1: Qualification of free-field environments

National foreword

This British Standard is the UK implementation of EN ISO 26101-1:2022. It is identical to ISO 26101-1:2021. It supersedes BS ISO 26101-1:2021, which is withdrawn and together with BS ISO 26101-2, it supersedes BS ISO 26101:2017, which will be withdrawn on publication of BS ISO 26101-2.

The UK participation in its preparation was entrusted to Technical Committee EH/1/4, Machinery noise.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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31 October 2022	This corrigendum renumbers BS ISO 26101-1:2021 as BS EN ISO 26101-1:2022. The supersession details in the national foreword have also been updated.

English Version

Acoustics - Test methods for the qualification of the
acoustic environment - Part 1: Qualification of free-field
environments (ISO 26101-1:2021)

Acoustique - Méthodes d'essai pour la qualification de
l'environnement acoustique - Partie 1: Qualification
des environnements en champ libre (ISO 26101-
1:2021)

Akustik - Verfahren für die Qualifizierung von Freifeld-
Prüfumgebungen - Teil 1: Qualifizierung von
Freifeldumgebungen (ISO 26101-1:2021)

This European Standard was approved by CEN on 13 April 2022.

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

The text of ISO 26101-1:2021 has been prepared by Technical Committee ISO/TC 43 "Acoustics" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 26101-1:2022 by Technical Committee CEN/TC 211 "Acoustics" the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by November 2022, and conflicting national standards shall be withdrawn at the latest by November 2022.

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.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations 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.

Endorsement notice

The text of ISO 26101-1:2021 has been approved by CEN as EN ISO 26101-1:2022 without any modification.

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This first edition of ISO 26101-1 cancels and replaces the second edition of ISO 26101:2017, of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- The title of the document was changed from “*Acoustics — Test methods for the qualification of free-field environments*” to “*Acoustics — Test methods for the qualification of the acoustic environment — Part 1: Qualification of free-field environments*”, so that an additional part, “*ISO 26101-2, Acoustics — Test methods for the qualification of the acoustic environment — Part 2: Determination of the environmental correction*”, can be introduced.

A list of all parts in the ISO 26101 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document describes the divergence loss method of measurement of performance of an environment designed to provide a free sound field or free sound field over a reflecting plane. An acoustical environment is a free sound field if it has bounding surfaces that absorb all sound energies incident upon them. This is normally achieved using specialized test environments, such as anechoic or hemi-anechoic chambers. In practice, these provide a controlled free sound field for acoustical measurements in a confined space within the facility.

The purpose of this document is to promote uniformity in the method and conditions of measurement when qualifying free sound field environments.

It is expected that the qualification procedures outlined in this document will be referred to by other International Standards and industry test codes. In such cases, these documents making reference to this document may specify qualification criteria appropriate for the test method and may require specific traverse paths.

Acoustics — Test methods for the qualification of the acoustic environment —

Part 1: Qualification of free-field environments

1 Scope

This document specifies methodology for qualifying acoustic spaces as anechoic and hemi-anechoic spaces meeting the requirements of a free sound field.

This document specifies discrete-frequency and broad-band test methods for quantifying the performance of anechoic and hemi-anechoic spaces, defines the qualification procedure for an omnidirectional sound source suitable for free-field qualification, gives details of how to present the results and describes uncertainties of measurement.

This document has been developed for qualifying anechoic and hemi-anechoic spaces for a variety of acoustical measurement purposes. It is expected that, over time, various standards and test codes will refer to this document in order to qualify an anechoic or hemi-anechoic space for a particular measurement. [Annex D](#) provides guidelines for the specification of test parameters and qualification criteria for referencing documents.

In the absence of specific requirements or criteria, [Annex A](#) provides qualification criteria and measurement requirements to qualify anechoic and hemi-anechoic spaces for general purpose acoustical measurements.

This document describes the divergence loss method for measuring the free sound field performance of an acoustic environment.

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.

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

IEC 61260-1, *Electroacoustics — Octave-band and fractional-octave-band filters — Part 1: Specifications*

IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

free sound field

sound field in a homogeneous, isotropic medium free of boundaries

[SOURCE: ISO/TR 25417:2007, 2.17]

3.2

anechoic space

volume which has been qualified as a sound field in a homogeneous, isotropic medium free of boundaries

3.3

hemi-anechoic space

volume above a reflecting plane which has been qualified as a sound field in a homogeneous, isotropic medium free of boundaries

3.4

acoustic centre

<for a test sound source and for a given test signal> position of the point from which approximately spherical wave fronts appear to diverge

3.5

background noise

sum of all the signals except the one under investigation

Note 1 to entry: Background noise can include contributions from airborne sound, structure-borne vibration and electrical noise in instrumentation.

3.6

divergence loss

reduction in sound pressure along a straight path due to the spreading of sound when a sound wave propagates away from a source

3.7

frequency range of interest

contiguous one-third-octave-band frequencies from the lowest to the highest frequencies to be qualified, inclusive

3.8

referencing document

standard or test code that refers to this document for the purpose of specifying the qualification method of an *anechoic space* ([3.2](#)) or *hemi-anechoic space* ([3.3](#))

4 Allowable deviations from inverse square law

The theoretical reduction in mean-square sound pressure along a straight path due to spherical propagation of a sound wave in a free sound field shall be hereafter referred to as the inverse square law.

For a space to be deemed anechoic or hemi-anechoic, as defined by criteria in a referencing document, the deviations of the measured sound pressure levels from those estimated using the inverse square law, obtained according to this document, shall not exceed the values specified by the referencing document.

In the absence of specific criteria for the allowable deviations in a referencing document, the criteria in [Annex A](#) shall be used to qualify anechoic and hemi-anechoic spaces for general purpose acoustical measurements.

The allowable deviations specified by a referencing document may be more or less stringent than the criteria given in [Annex A](#).