FINAL DRAFT
International Standard

ISO/FDIS 26101-2

ISO/TC **43**/SC **1**

Secretariat: **DIN**

Voting begins on:
2024-03-06

Voting terminates on:
2024-05-01

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

Part 2:
Determination of the environmental correction

Acoustique — Méthodes d'essai pour la qualification de l'environnement acoustique —

Partie 2: Détermination de la correction d'environnement

ISO/CEN PARALLEL PROCESSING

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

Reference number
ISO/FDIS 26101-2:2024(en)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 211, *Acoustics,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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 is one of the series ISO 26101, which specify various methods for qualifying the acoustic environment. The methods specified in this document permit the qualification of an acoustic environment that approximates to an acoustic free field near one or more reflecting planes. In other words, an acoustic environment in which the effect of reflected sound on sound pressure level measurements is sufficiently small, so that it can be corrected for with the so-called environmental correction K_2. K_2 can be needed to determine the sound power level, see e.g. ISO 3744 or ISO 3746[2], or the emission sound pressure level, see e.g. ISO 11201[5], ISO 11202[6] and ISO 11204[7].

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 can specify qualification criteria based on the environmental correction K_2 determined according to this document.

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

Part 2: Determination of the environmental correction

1 Scope

This document specifies methods for qualifying an environment that approximates to an acoustic free field near one or more reflecting planes. The goal of the qualification is to determine the environmental correction K_2, which is used to correct for reflected sound when determining the sound power level or sound energy level of a noise source from sound pressure levels measured on a surface enveloping the noise source (machinery or equipment) in such an environment.

In practice, the K_2 value determined will be a function of both the reflected sound from the test environment and the shape and size of the measurement surface used for the K_2 determination. For the purposes of this document and the documents that refer to it, the differences between K_2 values determined with different measurement surfaces are assumed to be included in the stated measurement uncertainty for the test method.

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 3744:—[1)], *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 3745:2012, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic rooms and hemi-anechoic rooms*

ISO 6926, *Acoustics — Requirements for the performance and calibration of reference sound sources used for the determination of sound power levels*

ISO 26101-1, *Acoustics — Test methods for the qualification of the acoustic environment — Part 1: Qualification of free-field environments*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3744 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 https://www.electropedia.org/

1) Under preparation. Stage at the time of the ballot: ISO/FDIS 3744:2024.

3.1
reverberation time
T
⟨room acoustic parameters⟩ duration required for the space-averaged sound energy density in an enclosure to decrease by 60 dB after the source emission has stopped

Note 1 to entry: The reverberation time is expressed in seconds.

Note 2 to entry: T can be evaluated based on a smaller dynamic range than 60 dB and extrapolated to a decay time of 60 dB. It is then labelled accordingly. Thus, if T is derived from the time at which the decay curve first reaches 5 dB and 25 dB below the initial level, it is labelled T_{20}. If decay values of 5 dB to 35 dB below the initial level are used, it is labelled T_{30}.

[SOURCE: ISO 3382-2:2008[1], 3.5]

3.2
measurement surface
hypothetical surface of area, S, on which the microphone positions are located at which the sound pressure levels are measured, enveloping the noise source under test and terminating on the reflecting plane(s) on which the source is located

[SOURCE: ISO 3744:—, 3.13]

3.3
environmental correction
K_2
correction applied to the mean (energy average) sound pressure levels over all the microphone positions on the *measurement surface* (3.2), to account for the influence of reflected or absorbed sound

Note 1 to entry: Environmental correction is expressed in decibels.

Note 2 to entry: The environmental correction is frequency dependent; the correction in the case of a frequency band is denoted K_{2f}, where f denotes the relevant mid-band frequency, and that in the case of overall A-weighting is denoted K_{2A}, which is determined from A-weighted sound pressure level measurements.

Note 3 to entry: In general, the environmental correction depends on the area of the measurement surface and usually K_2 increases with S.

[SOURCE: ISO 3744:—, 3.16, modified "determined as described in Annex A or in ISO 26101-2:—" and "Note 4 to entry" have been omitted.]

3.4
sound absorption coefficient
α
at a given frequency and for specified conditions, the relative fraction of sound power incident upon a surface which is not reflected

[SOURCE: ISO 3741:2010, 3.9, modified — The NOTE has been deleted.]

3.5
equivalent absorption area
A
product of the area and *sound absorption coefficient* (3.4) of a surface

Note 1 to entry: A hypothetical surface area with a sound absorption coefficient of 1,0 that would have the same total sound absorption as the test environment that is being qualified.

[SOURCE: ISO 3741:2010, 3.10, modified term "sound" has been omitted and the NOTE has been replaced by a Note 1 to entry with different content.]

4 Qualification procedures for the acoustic environment

4.1 General

Environmental influences shall be evaluated by selecting one of four qualification procedures (see 4.2 to 4.5) used to determine the magnitude of the environmental correction K_2. These qualification procedures shall be used to determine if any undesired environmental influences are present and to qualify a given measurement surface for an actual noise source under test in accordance with this document. Information on the uncertainty of the environmental correction can be found in Annex A.

4.2 Absolute comparison test

The absolute comparison test, see Clause 5, is carried out with a reference sound source (RSS) and may be used outdoors and indoors. This is the preferred procedure for qualifying a test environment according to ISO 3744, particularly if data in frequency bands are required, and if the noise source under test can be removed from the test site. However, it may also be used, if the noise source under test cannot be removed from the test site (see 5.2). This method is expected to yield the most accurate results in typical industrial environments[8].

4.3 Methods based on room absorption

The methods based on room absorption, see Clause 6, require the determination of the equivalent absorption area, A , of the test room and can be less accurate than the absolute comparison test in typical industrial environments. These tests are based on the assumption that the room has approximately a cubic shape, is substantially empty, and that sound is absorbed at the room boundaries only. Three methods are specified in which A is calculated either from measurements of reverberation time (see 6.2), from measurements of sound pressure levels from the noise source under test using a secondary measurement surface (see 6.3) or from measurements on a reference sound source (see 6.4).

4.4 Inverse-square-law qualification of parallelepiped and cylindrical measurement surfaces

This third qualification procedure (see Clause 7) may be used to qualify hemi-anechoic test rooms for parallelepiped or cylindrical measurement surfaces up to a maximum volume (qualification with the goal $K_2 = 0$). It is the preferred method to qualify a hemi-anechoic room and represents the most accurate method. To qualify an anechoic or a hemi-anechoic chamber for hemi-spherical measurement surfaces see ISO 26101-1 and ISO 3745.

NOTE In hemi-anechoic rooms, the other qualification procedures can yield unreliable results.

4.5 Approximate method based on an estimation of the equivalent absorption area

This method (see Clause 8) is based on an estimation of the equivalent absorption area A of the test room and is considered to be the least accurate method.

Figure 1 is a flowchart which provides guidance for the selection of a method to determine the environmental correction K_2. The method specified in Clause 5 may be used indoors and outdoors, while the methods specified in Clauses 6 and 8 may be used indoors only. As indicated in Figure 1, the inverse-square law method according to Clause 7 may be used in hemi-anechoic chambers only.

NOTE In some industrial buildings, which are of low height and have reflecting surfaces, the sound propagation can be distorted. In these conditions, the qualification procedures according to Clause 6 and Clause 8 might not be applicable.

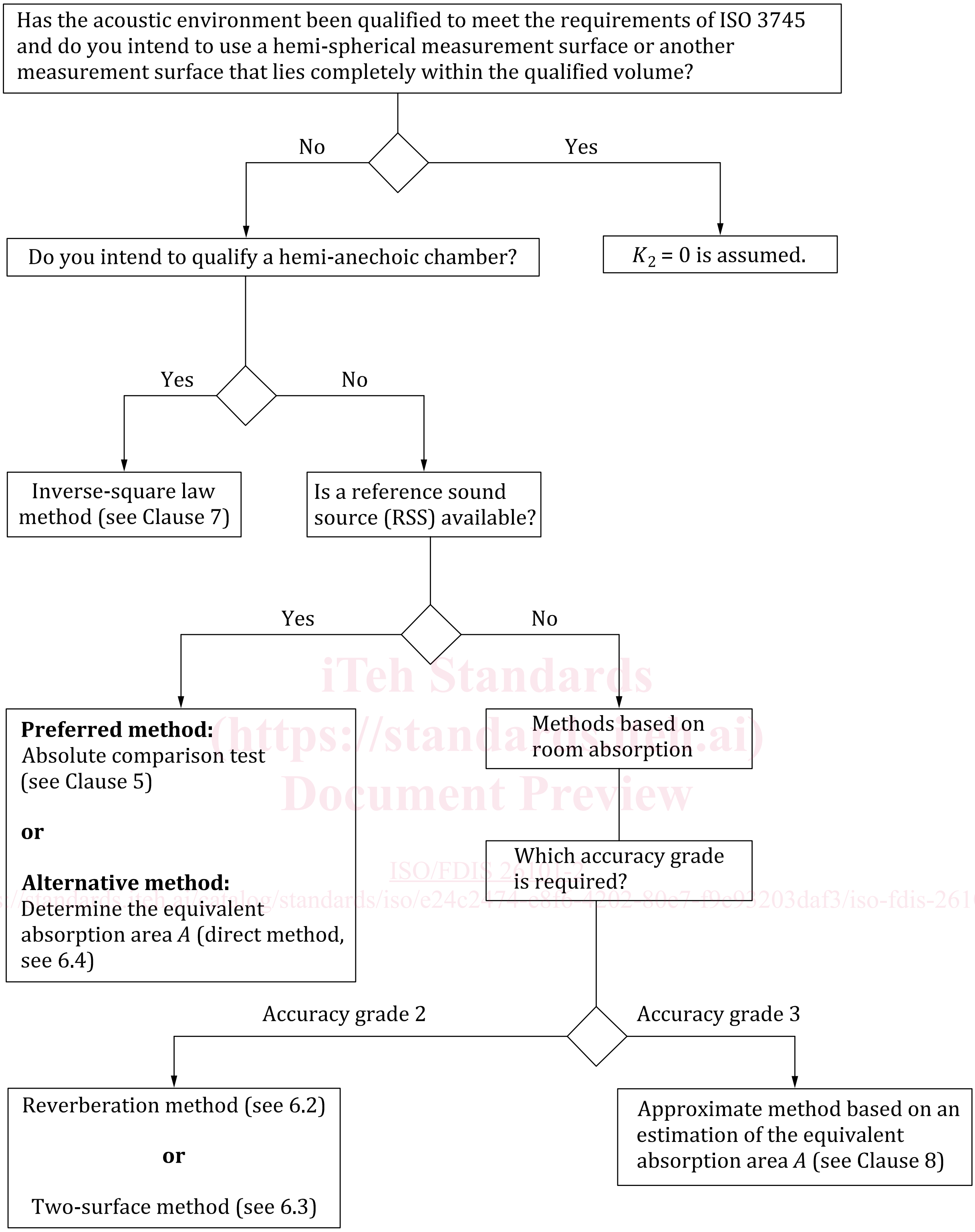

Figure 1 — Flowchart to select a method to determine K_2

5 Absolute comparison test

5.1 General

This method represents the preferred method to determine the environmental correction according to ISO 3744:—, Annex A.