Acoustics - Determination of acoustic properties in impedance tubes - Part 2: Two-microphone technique for normal sound absorption coefficient and normal surface impedance (ISO 10534-2:2023, Corrected version 2025-08)

EESTI STANDARDIMIS- JA AKREDITEERIMISKESKUS
ESTONIAN CENTRE FOR STANDARDISATION AND ACCREDITATION

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 10534-2:2023 sisaldab Euroopa standardi EN ISO 10534-2:2023 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 10534-2:2023 consists of the English text of the European standard EN ISO 10534-2:2023.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 11.10.2023.	Date of Availability of the European standard is 11.10.2023.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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EUROPEAN STANDARD

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EN ISO 10534-2

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English Version

Acoustics - Determination of acoustic properties in impedance tubes - Part 2: Two-microphone technique for normal sound absorption coefficient and normal surface impedance (ISO 10534-2:2023, Corrected version 2025-08)

Acoustique - Détermination des propriétés acoustiques aux tubes d'impédance - Partie 2: Méthode à deux microphones pour le coefficient d'absorption acoustique normal et l'impédance de surface normale (ISO 10534-2:2023, Version corrigée 2025-08)

Akustik - Bestimmung der akustischen Eigenschaften in Impedanzrohren - Teil 2: 2-Mikrofontechnik für Schallabsorptionsgrad und Oberflächenimpedanz bei senkrechtem Einfall (ISO 10534-2:2023, korrigierte Fassung 2025-08)

This European Standard was approved by CEN on 2 October 2023.

This European Standard was corrected and reissued by the CEN-CENELEC Management Centre on 03 September 2025.

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

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

Ref. No. EN ISO 10534-2:2023 E

European foreword

This document (EN ISO 10534-2:2023) has been prepared by Technical Committee ISO/TC 43 "Acoustics" in collaboration with 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 April 2024, and conflicting national standards shall be withdrawn at the latest by April 2024.

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 ISO 10534-2:2001.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. 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, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO 10534-2:2023, Corrected version 2025-08 has been approved by CEN as EN ISO 10534-2:2023 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 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 2, *Building acoustics,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 126, *Acoustics properties of building products and of buildings,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 10534-2:1998), which has been technically revised.

The main changes are as follows:

— the introduction of the measurement procedure to estimate the characteristic properties of porous materials (characteristic impedance, wavenumber, dynamic mass density, dynamic bulk modulus) in an informative annex. The signal processing techniques have been updated since the first version of this document.

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.

This corrected version of ISO 10534-2:2023 incorporates the following correction:

— In Formula (A.2), $\sqrt{f/(c_0 d)}$ was corrected to $\sqrt{f}/(c_0 d)$.

Acoustics — Determination of acoustic properties in impedance tubes —

Part 2: Two-microphone technique for normal sound absorption coefficient and normal surface impedance

1 Scope

This test method covers the use of an impedance tube, two microphone locations and a frequency analysis system for the determination of the sound absorption coefficient of sound absorbing materials for normal incidence sound incidence. It can also be applied for the determination of the acoustical surface impedance or surface admittance of sound absorbing materials. As an extension, it can also be used to assess intrinsic properties of homogeneous acoustical materials such as their characteristic impedance, characteristic wavenumber, dynamic mass density and dynamic bulk modulus.

The test method is similar to the test method specified in ISO 10534-1[1] in that it uses an impedance tube with a sound source connected to one end and the test sample mounted in the tube at the other end. However, the measurement technique is different. In this test method, plane waves are generated in a tube by a sound source, and the decomposition of the interference field is achieved by the measurement of acoustic pressures at two fixed locations using wall-mounted microphones or an in-tube traversing microphone, and subsequent calculation of the complex acoustic transfer function and quantities reported in the previous paragraph. The test method is intended to provide an alternative, and generally much faster, measurement technique than that of ISO 10534-1[1].

Normal incidence absorption coefficients coming from impedance tube measurements are not comparable with random incidence absorption coefficients measured in reverberation rooms according to ISO 354[2]. The reverberation room method will (under ideal conditions) determine the sound absorption coefficient for diffuse sound incidence. However, the reverberation room method requires test specimens which are rather large. The impedance tube method is limited to studies at normal and plane incidence and requires samples of the test object which are of the same size as the cross-section of the impedance tube. For materials that are locally reacting only, diffuse incidence sound absorption coefficients can be estimated from measurement results obtained by the impedance tube method (see Annex E).

Through the whole document, a $e^{+j\omega t}$ time convention is used.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and symbols

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

ISO and IEC maintain terminology 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/