



International Standard

ISO 10534-2

Acoustics — Determination of acoustic properties in impedance tubes —

Part 2:

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

*Acoustique — Détermination des propriétés acoustiques aux
tubes d'impédance —*

*Partie 2: Méthode à deux microphones pour le coefficient
d'absorption sonore normal et l'impédance de surface normale*

**Second edition
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Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms, definitions and symbols	1
4 Principle	5
5 Test equipment	5
5.1 Construction of the impedance tube	5
5.2 Working frequency range	6
5.3 Length of the impedance tube	7
5.4 Microphones	7
5.5 Positions of the microphones	7
5.6 Acoustic centre of the microphone	8
5.7 Test sample holder	8
5.8 Signal processing equipment	9
5.9 Loudspeaker	9
5.10 Signal generator	9
5.11 Thermometer, barometer and relative humidity	9
6 Preliminary test and measurements	10
7 Test specimen mounting	10
8 Test procedure	11
8.1 Specification of the reference plane	11
8.2 Determination of the sound velocity, wavelength and characteristic impedance	11
8.3 Selection of the signal amplitude	12
8.4 Selection of the number of averages	12
8.5 Correction for microphone mismatch	12
8.5.1 General	12
8.5.2 Measurement repeated with the channels interchanged	13
8.5.3 Predetermined calibration factor	14
8.6 Determination of the transfer function between the two locations	14
8.6.1 General	14
8.6.2 Cross- and autospectra-based estimate	15
8.6.3 Frequency-domain deconvolution	15
8.6.4 Impulse-response based estimate	15
8.7 Determination of the reflection coefficient	16
8.8 Determination of the sound absorption coefficient	16
8.9 Determination of the specific acoustic impedance ratio	16
8.10 Determination of the specific acoustic admittance ratio	17
9 Precision	17
10 Test report	17
Annex A (normative) Preliminary measurements	20
Annex B (normative) Procedure for the one-microphone technique	22
Annex C (informative) Theoretical background	23
Annex D (informative) Error sources	25
Annex E (informative) Estimation of diffuse sound absorption coefficient α_{st} of locally reacting absorbers from the results of this document	27
Annex F (informative) Estimation of intrinsic properties	28
Bibliography	30

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).

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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/>