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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Acoustics -- Determination of sound absorption coefficient and
impedance in impedance tubes -- Part 2: Transfer function
method**

(English Translation)

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Foreword

This Standard was formulated according to the International Organization for Standardization's

standard ISO 10534-2:1998(E) Acoustics - Determination of Sound Absorption Coefficient and

Impedance in Impedance Tubes - Part 2: Transfer-Function Method.

ISO 10534 consists of 2 parts. Part 1: Method Using Standing Wave Ratio, which corresponds

to China's national standard GBJ 88-1985. This Standard is Part 2: Transfer Function Method.

This Standard is equivalent to ISO 10534-2 in the technical contents. There are two points that

need to be explained in the process of equivalent adoption:

1. 1 "Acoustic impedance" is one of the key terms in this Standard. The definition of it in this international standard (see Article 2.4 of ISO 10534-2) is inconsistent with the national standard

GB/T 3947-1996 "Acoustic Terms and Terminology". In order to correspond to ISO, the name

of this Standard still retains the original text, but the text uses "Specific acoustic impedance".

Correspondingly, formulas (19), (20), (C1) and (C3) are rewritten.

2. Microphone position is one of the important factors affecting the test accuracy. A positioning

ring must be provided at the inner end of the mounting hole. Figure 1 b) of this international standard has a ring, while Figure 1 a) has no ring, which has been supplemented now. At the

same time, seal the microphone mounting hole with the microphone dummy. This standard adds

Clause 2 "Normative Reference". Also corrected an error in Figure A.2.

The formulation of this Standard will standardize a modern measurement technology of sound

absorption coefficient and specific acoustic impedance that is more convenient, faster, less operating error, and more consistent in measurement results.

This Standard's Annexes A, B, and C are normative.

This Standard's Annexes D, E, F, and G are informative, only for reference.

This Standard was proposed by Chinese Academy of Sciences.

This Standard shall be under the jurisdiction of National Technical Committee on Acoustics of

Standardization Administration of China.

Chief drafting organizations of this Standard: Institute of Acoustics, Chinese Academy of Science; and Institute for Building Physics, China Academy of Building Research.

Chief drafting staffs of this Standard: Li Xiaodong, Dai Genghua, Lin Jie, and Xu Xin.

This Standard was entrusted to Foundation Subcommittee of National Technical Committee

on

Acoustics of Standardization Administration of China.

Acoustics - Determination of Sound Absorption Coefficient
and Impedance in Impedance Tubes - Part 2: Transfer
Function Method

1 Scope

This test method covers the use of an impedance tube, two microphone locations and a digital

frequency analysis system for the determination of the sound absorption coefficient of sound

absorbers for normal sound incidence. It can also be applied for the determination of the acoustical surface impedance or surface admittance of sound absorbing materials. Since the

impedance ratios of a sound absorptive material are related to its physical properties, such as

airflow resistance, porosity, elasticity and density, measurements described in this test method

are useful in basic research and product development.

The test method is similar to the test method specified in ISO 10534-1 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 noise 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, the normal incidence absorption and the impedance ratios

of the acoustic material. The test method is intended to provide an alternative, and

generally

much faster, measurement technique than that of ISO 10534-1.

Compared with the measurement of the sound absorption in a reverberation room according to

the method specified in ISO 354, there are some characteristic differences. The reverberation

room method will (under ideal conditions) determine the sound absorption coefficient for diffuse sound incidence, and the method can be used for testing of materials with pronounced

structures in the lateral and normal directions. However, the reverberation room method requires test specimens which are rather large, so it is not convenient for research and development work, where only small samples of the absorber are available. The impedance tube method is limited to parametric studies at normal incidence but 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, diffuse incidence sound absorption coefficients can be estimated from

measurement results obtained by the impedance tube method. For transformation of the test

results from the impedance tube method (normal incidence) to diffuse sound incidence, see annex F.

front surface. A sideways insertion also avoids compression of soft materials.

The back plate of the sample holder shall be rigid and shall be fixed tightly to the tube since it

serves as a rigid termination in many measurements. A metal plate of thickness not less than 20

mm is recommended.

For some tests, a pressure-release termination of the test object by an air volume behind it is

needed. This is described in annex C.