International Standard

ISO 13472-2

Acoustics — Measurement of sound absorption properties of road surfaces in situ —

Part 2: Spot method for reflective surfaces

Acoustique — Mesurage in situ des propriétés d'absorption acoustique des revêtements de chaussées —

Partie 2: Méthode ponctuelle pour les surfaces réfléchissantes

Second edition
2025-05

Reference number
ISO 13472-2:2025(en)

© ISO 2025



COPYRIGHT PROTECTED DOCUMENT

© ISO 2025
All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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 ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Principle of the method ... **3**
4.1 Measurement principle ... 3
4.2 Signal analysis ... 4
4.3 In situ fixture ... 4
5 Test equipment ... **5**
5.1 Components of the test system ... 5
5.2 Sound source ... 5
5.3 Test signal ... 5
5.4 Impedance tube ... 5
5.4.1 Tube diameter ... 5
5.4.2 Tube length and microphone positions ... 5
5.4.3 Microphones ... 6
5.5 In situ test fixture between impedance tube and test surface ... 6
5.6 Signal processing system ... 7
5.7 Thermometer and barometer ... 7
6 Measurement and analysis requirements ... **7**
6.1 Stabilizing the system ... 7
6.2 Calibration of the system ... 7
6.3 Reference measurement ... 7
6.4 Measurement of a road surface ... 7
6.5 Data analysis ... 8
6.6 One-third octave band absorption spectrum ... 9
7 Positioning of the equipment ... **9**
7.1 Location of the measurement positions ... 9
7.1.1 Test surfaces such as those meeting ISO 10844 requirements ... 9
7.1.2 Regular roads ... 9
7.2 Temperature ... 9
8 Measurement and analysis procedure ... **9**
9 Measurement uncertainty requirements ... **10**
10 Test report ... **11**
Annex A (informative) **Correction on base of reference measurement** ... **13**
Annex B (informative) **Measurement uncertainty** ... **14**
Annex C (informative) **Alternative procedures to improve accuracy** ... **17**
Annex D (informative) **In situ test fixture** ... **20**
Annex E (informative) **Example of a test report** ... **22**
Bibliography ... **25**

© ISO 2025 – All rights reserved

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*.

This second edition cancels and replaces the first edition (ISO 13472-2:2010), which has been technically revised.

The main changes are as follows:

— mandatory choice of the transfer function formulation and quality requirements for the coherence function;

— an alternative microphone arrangement and application of alternating transfer functions are presented to cancel the distortion due to destructive interference at the microphone positions.

A list of all parts in the ISO 13472 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.

© ISO 2025 – All rights reserved

Introduction

This method provides a means to evaluate the sound absorption characteristics of a road surface without damaging the surface. The field of application is limited to low absorption surfaces such as those in accordance with ISO 10844[2] and similar surfaces. Due to air leakage the method is not reliable if the measured sound absorption coefficient exceeds 0,15. Surfaces with a sound absorption coefficient of 0,10 or below are considered reflective.

The method in this document is based on propagation of the test signal from the source to the road surface and back to the receiver through an impedance tube with a diameter of 80 mm to 100 mm. The tube covers an area of approximately 0,005 m^2 to 0,008 m^2 and a frequency range, in one-third octave bands, from 250 Hz to 1 600 Hz for a 100 mm diameter, or from 250 Hz to 2 000 Hz, for an 80 mm diameter tube. It uses the test procedure and signal processing described in ISO 10534-2, but because of the defined frequency range of application, the dimensions of the system are not freely adjustable.

The essential part in the ISO 10534-2 procedure is the determination of the transfer function between two microphones at different distances from the sample at the end of the tube. In this case of a reflecting sample at specific frequencies destructive interferences (nodes) will occur at the microphone positions jeopardizing the correct determination of the transfer function between the microphone pair.

Therefore in this document the ISO 10534-2 procedure is extended with a preference for transfer function H calculated as the ratio of the auto spectrum S_{22} at the lowest microphone position and the cross spectrum S_{21} and requirements on the resolution, the sample frequency and the block length in the FFT analysis added with a requirement on the average narrow band coherence within a one-third octave band. Recommendations for improvement of the accuracy by alternative microphone arrangement, variation in transfer function and type of random noise are presented in Annex C.

This method is complementary to the extended surface method (ISO 13472-1[3]) that covers an area of approximately 3 m^2 and a frequency range, in one-third octave bands, from 250 Hz to 4 000 Hz.

Both methods should give similar results in the valid frequency range, but their fields of application and therefore their accuracy will differ strongly. The method described in ISO 13472-1 has limited accuracy at small sound absorption values and is therefore unfit to check compliance of surfaces with the requirements in ISO 10844 or similar regulations, while the method described in this standard fails at higher sound absorption values.

Within their ranges of applicability the methods are applicable also to acoustic materials other than road surfaces.

The measurement results by this method are comparable with the results of the impedance tube method, performed on bore cores taken from the surface such as ISO 10534-1, ISO 10534-2 and ASTM E 1050-19[5].

The measurement results obtained with this method are in general not comparable with the results of the reverberation room method (ISO 354[1]), because the method described in this International Standard uses a plane progressive wave at normal incidence, while the reverberation room method uses a diffuse sound field.

© ISO 2025 – All rights reserved

Acoustics — Measurement of sound absorption properties of road surfaces in situ —

Part 2:
Spot method for reflective surfaces

1 Scope

This document specifies a test method for measuring in situ the sound absorption coefficient of road surfaces for the one-third octave band frequencies ranging from 250 Hz to 1 600 Hz under normal incidence conditions. If necessary for practical applications the diameter of the tube can be reduced to 80 mm. This will increase the upper boundary of the frequency range to 2 000 Hz one-third octave band (see 5.4) but reduces the area under test.

The test method is intended for the following applications:

— determination of the sound absorption coefficient (and, if of interest, also the complex acoustical impedance) of semi-dense to dense road surfaces;

— determination of the sound absorption properties of test tracks according to ISO 10844[2] or other similar standards and test surfaces defined in national and international type approval regulations for road vehicles and their tyres;

— verification of the compliance of the sound absorption coefficient of a road surface with design-specifications or other requirements.

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 10534-2:2023, *Acoustics — Determination of acoustic properties in impedance tubes — Part 2: Two-microphone technique for normal sound absorption coefficient and normal surface impedance*

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

3 Terms and definitions

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/

© ISO 2025 – All rights reserved