IFA Forschungsberichte
Fahrzeugakustik und Antriebstechnik

Ostfalia Hochschule Braunschweig/Wolfenbüttel
Fakultät Fahrzeugtechnik

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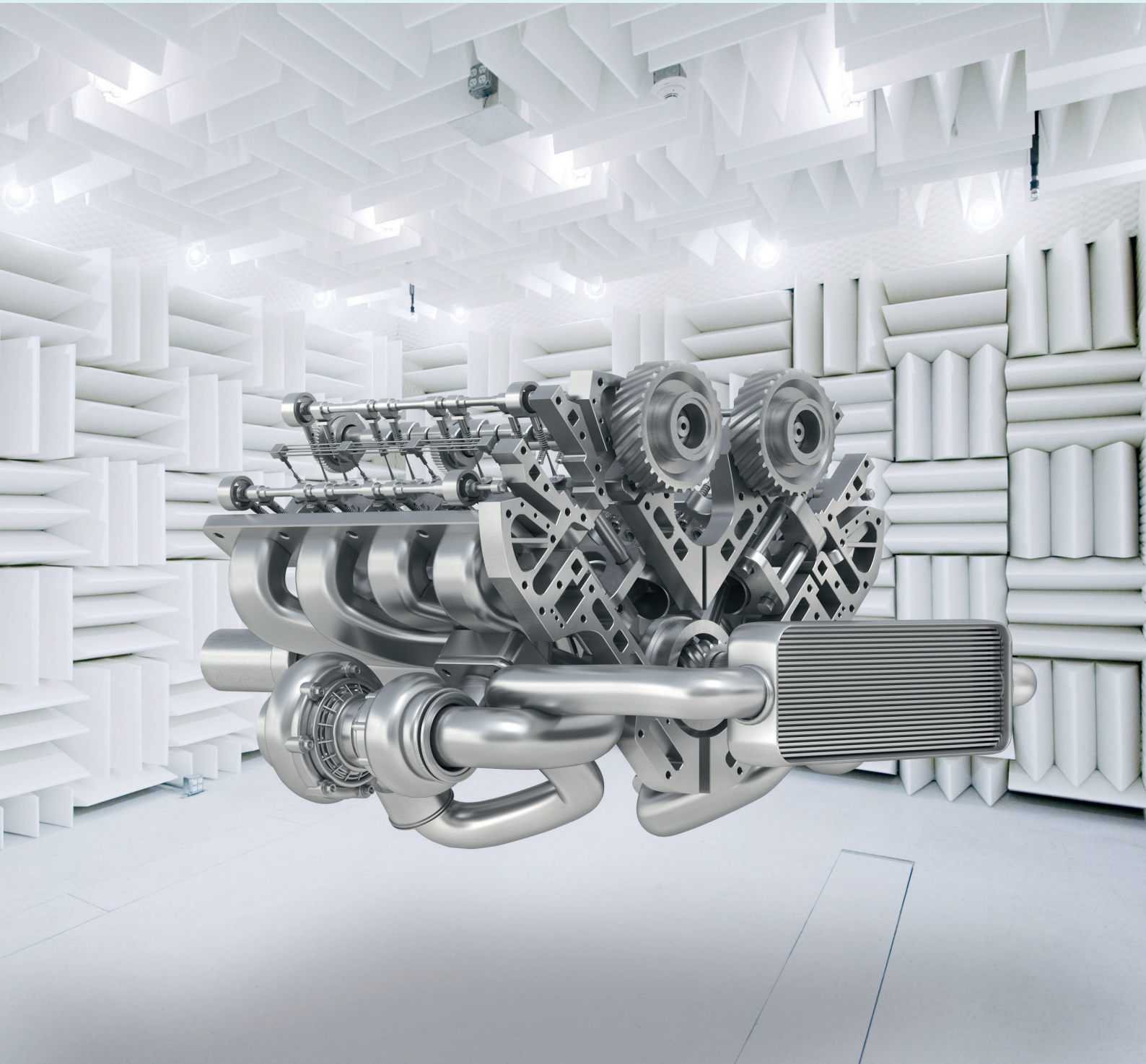
IFA Research Reports
Volume 1/2019



IFA Forschungsberichte Fahrzeugakustik und Antriebstechnik

Volume 1/2019

Udo Becker (Hrsg.)

IFA Research Reports

Shaker Verlag
Düren 2019

Bibliographic information published by the Deutsche Nationalbibliothek
The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at http://dnb.d-nb.de.

Printed in Germany.

ISBN 978-3-8440-6992-1
ISSN 2570-1320

Shaker Verlag GmbH • Am Langen Graben 15a • 52353 Düren
Phone: 0049/2421/99011-0 • Telefax: 0049/2421/99011-9
Internet: www.shaker.de • e-mail: info@shaker.de

Biot's theory for numerical determination of the acoustic performance of porous absorbers

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Abstract

A method for calculating the sound absorption coefficient of single- and multi-layered porous sound absorbers is developed. Existing theories for the mathematical description of porous sound absorbers are summarised. The normal sound incidence on a homogenous layer of porous material in contact with an acoustically hard wall is considered and the modelling is extended to allow for the analysis of several adjacent layers. The sound propagation in the air is described with well-known theoretical fundamentals and the wave field in the porous absorbers is modelled with Biot's theory for the wave propagation in fluid-saturated porous media. Equations for determining the sound absorption coefficient are derived using two different methods and the models are adapted for the determination of the sound transmission through free-standing absorbers. The sound absorption coefficient of a sample of melamine foam is calculated and the results are validated experimentally.

Keywords

Porous sound absorbers — Biot's theory — Multi-layered sound absorbers — Sound absorption coefficient — Sound transmission loss

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Contents