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Akustika - Ugotavljanje upora pretoku zraka - 2. del: Metoda izmeničnega pretoka zraka (ISO/DIS 9053-2:2020)

Acoustics - Determination of airflow resistance - Part 2: Alternating airflow method (ISO/DIS 9053-2:2020)

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Acoustics — Determination of airflow resistance — Part 2: Alternating airflow method

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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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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*.

This standard cancels and replaces method B included in the first edition (ISO 9053:1991), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the requirement to the dimensions of the test specimen is changed;

— a correction for heat conduction is added.

A list of all parts in the ISO 9053 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.

Acoustics — Determination of airflow resistance —

Part 2: Alternating airflow method

1 Scope

This International Standard specifies an alternating airflow method for the determination of the airflow resistance [1], [2] of porous materials for acoustical applications.

Determination of the airflow resistance based on static flow is described in ISO 9053-1.

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 9053-1, Acoustics — Determination of airflow resistance — Part 1: Static airflow method

ISO/IEC Guide 98-3: Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)

IEC 61672-1, Electroacoustics — Sound level meters — Part 1: Specifications

IEC 61260-1, Electroacoustics — Octave-band and fractional-octave-band filters — Part 1: Specifications

IEC 61094-2:2009, *Electroacoustics* — *Measurement microphones* — *Part 2: Primary method for the pressure calibration of laboratory standard microphones by the reciprocity technique*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

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3.1 airflow resistance *R*

quantity defined by

$$R = \frac{\Delta p}{q_{\rm v}}$$

where

- Δp is the RMS air pressure difference, in pascal, across the test specimen due to the alternating airflow;
- $q_{\rm v}\,$ is the RMS volumetric airflow rate, in cubic metres per second, passing through the test specimen

Note 1 to entry: Airflow resistance is expressed in pascal second per cubic metre.

3.2 specific airflow resistance *R*_s quantity defined by

 $R_{\rm s} = R \cdot A$

where

R is the airflow resistance, in pascal second per cubic metre, of the test specimen;

A is the cross-section area, in square metre, of the test specimen perpendicular to the direction of https://standarfloweh.ai/catalog/standards/sist/0c42b6aa-5542-49a6-8037-41cc6d218a26/sist-en-iso-9053-2-2020

Note 1 to entry: Specific airflow resistance is expressed in pascal second per metre.

3.3 airflow resistivity

airflow resistivity

quantity defined by the following equation if the material is considered as being homogeneous

$$\sigma = \frac{R_s}{d}$$

where

- $R_{\rm s}$ is the specific airflow resistance, in pascal second per metre, of the test specimen;
- *d* is the thickness, in metre, of the test specimen in the direction of flow

Note 1 to entry: Airflow resistivity is expressed in pascal second per square metre.

3.4 airflow velocity

u quantity defined by

$$u = \frac{q_{\rm v}}{A}$$

where

- $q_{\rm v}$ is the RMS volumetric airflow rate, in cubic metre per second, passing through the test specimen;
- *A* is the cross-sectional area, in square metre, of the test specimen perpendicular to the direction of flow

Note 1 to entry: Airflow velocity is expressed in metre per second.

3.5 Sound pressure level

*L*_p

ten times the logarithm to the base 10 of the ratio of the time average of the square of the sound pressure, p(t), during a stated time interval of duration, T (starting at t_1 and ending at t_2), to the square of a reference value, p_0 :

$$L_{\rm p} = 10 \, \log \left(\frac{\frac{1}{T} \int_{t_1}^{t_2} p^2(t) dt}{p_0^2} \right) dB \text{ Document Preview}$$

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where the reference value, p_0 , is 20 μ Pa (0.42b6aa-5542-49a6-8037-41cc6d218a26/sist-en-iso-9053-2-2020)

Note 1 to entry: The sound pressure level is expressed in decibel.

4 Symbols and abbreviations

- *R* airflow resistance, in pascal second per metre, of the test specimen
- $R_{\rm s}$ specific airflow resistance, in pascal second per metre, of the test specimen
- *p* sound pressure, in μ Pa
- p_0 sound pressure reference value, 20 µPa
- $p_{\rm s}$ sound pressure when the test cell with the test specimen is mounted
- $p_{\rm t}$ sound pressure when the air cavity is closed by the airtight termination
- Δp rms air pressure difference, in pascal, across the test specimen due to the alternating airflow
- *P*_s static pressure, in Pa
- $q_{\rm s}$ rms value of the volume flow when the test cell with the test specimen is mounted
- $q_{\rm t}$ rms value of the volume flow when the air cavity is closed by the airtight termination
- $q_{\rm v}$ rms volumetric airflow rate, in cubic metres per second, passing through the test specimen
- *u* airflow velocity, in metre per second

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- $u_{\rm s}$ rms-value of the airflow velocity through the test specimen, in metre per second
- $L_{\rm p}$ sound pressure level, in decibels
- $L_{p,b}$ background sound pressure level, in decibels
- $L_{p,s}$ sound pressure level in the air cavity when the measurement cell with the test specimen is mounted, in decibels
- $L_{p,t}$ sound pressure level in the air cavity with the airtight termination, in decibels
- *d* thickness, in metre, of the test specimen in the direction of flow
- *A* cross-section area, in square metre, of the test specimen
- $A_{\rm P}$ cross sectional area of the piston, m²
- σ airflow resistivity, in pascal second per metre, of the test specimen
- *f* frequency of the piston movement, in Hz
- *h* amplitude of the stroke of the piston, in m
- $h_{\rm t}$ amplitude of the stroke of the piston when the air cavity is closed by the airtight termination, in m
- $h_{\rm s}$ amplitude of the stroke of the piston when the measurement cell with the test specimen is mounted, in m
- κ ratio of specific heats for air
- κ' effective ratio of specific heats for air
- *V* volume of the air cavity with the airtight termination, in m^3 W
- *b* thickness of the thermal boundary layer
- Z_a acoustic impedance of the cavity, in Pa \cdot m⁻³ \cdot s⁻¹ 2.2020

://standards.iteh.ai/catalog/standards/sist/0c42b6aa-5542-49a6-8037-41cc6d218a26/sist-en-iso-9053-2-2020 c_0 speed of sound, in metres per seconds

- $l_{\rm h}$ characteristic thermal diffusion length, in metres
- $k_{\rm a}$ thermal conductivity, in J \cdot m⁻¹ \cdot s⁻¹ \cdot K⁻¹
- ρ_0 density of air, in kg \cdot m⁻³
- C_P specific heat capacity at constant pressure, in J \cdot kg⁻¹ \cdot K⁻¹
- $j \quad \sqrt{-1}$
- ω circular frequency, $2 \cdot \pi \cdot f$
- S total area, in m²
- λ wavelength, in m
- *N* acoustic compliance
- *r* ratio between the stroke amplitudes
- *u* standard uncertainty
- *U* expanded uncertainty
- *y* thickness of the support in metres
- η dynamic viscosity of air, in Pa s
- ϕ perforation rate