SLOVENSKI STANDARD
oSIST prEN ISO 9053-2:2020

01-marec-2020

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)

Ta slovenski standard je istoveten z: **prEN ISO 9053-2**

ICS:

17.140.01	Akustična merjenja in blaženje hrupa na splošno	Acoustic measurements and noise abatement in general
91.100.60	Materiali za toplotno in zvočno izolacijo	Thermal and sound insulating materials

oSIST prEN ISO 9053-2:2020 **en**

DRAFT INTERNATIONAL STANDARD

ISO/DIS 9053-2

ISO/TC **43**/SC **2** | Secretariat: **DIN**

Voting begins on:
2020-01-09

Voting terminates on:
2020-04-02

Acoustics — Determination of airflow resistance —

Part 2:
Alternating airflow method

ICS: 91.100.60

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 9053-2:2020(E)

Contents

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

3.1
airflow resistance
R
quantity defined by

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

where

Δp is the RMS air pressure difference, in pascal, across the test specimen due to the alternating airflow;

q_{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
$\boldsymbol{R_{\mathrm{s}}}$
quantity defined by

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

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 flow

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

3.3
airflow resistivity
$\boldsymbol{\sigma}$
quantity defined by the following equation if the material is considered as being homogeneous

$$\sigma = \frac{R_{\mathrm{s}}}{d}$$

where

R_{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

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

where

q_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
$\boldsymbol{L_\mathrm{p}}$
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:

$$L_\mathrm{p} = 10\,\mathrm{lg}\left(\frac{\frac{1}{T}\int_{t_1}^{t_2} p^2\,(t)\mathrm{d}t}{p_0^2}\right)\mathrm{dB}$$

where the reference value, p_0, is 20 µPa

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_s specific airflow resistance, in pascal second per metre, of the test specimen

p sound pressure, in µPa

p_0 sound pressure reference value, 20 µPa

p_s sound pressure when the test cell with the test specimen is mounted

p_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_s rms value of the volume flow when the test cell with the test specimen is mounted

q_t rms value of the volume flow when the air cavity is closed by the airtight termination

q_v rms volumetric airflow rate, in cubic metres per second, passing through the test specimen

u airflow velocity, in metre per second

u_{s} rms-value of the airflow velocity through the test specimen, in metre per second

L_{p} sound pressure level, in decibels

$L_{\mathrm{p,b}}$ background sound pressure level, in decibels

$L_{\mathrm{p,s}}$ sound pressure level in the air cavity when the measurement cell with the test specimen is mounted, in decibels

$L_{\mathrm{p,t}}$ 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_{P} cross sectional area of the piston, m^2

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_{t} amplitude of the stroke of the piston when the air cavity is closed by the airtight termination, in m

h_{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

b thickness of the thermal boundary layer

Z_{a} acoustic impedance of the cavity, in $\mathrm{Pa} \cdot \mathrm{m}^{-3} \cdot \mathrm{s}^{-1}$

c_0 speed of sound, in metres per seconds

l_{h} characteristic thermal diffusion length, in metres

k_{a} thermal conductivity, in $\mathrm{J} \cdot \mathrm{m}^{-1} \cdot \mathrm{s}^{-1} \cdot \mathrm{K}^{-1}$

ρ_0 density of air, in $\mathrm{kg} \cdot \mathrm{m}^{-3}$

C_{P} specific heat capacity at constant pressure, in $\mathrm{J} \cdot \mathrm{kg}^{-1} \cdot \mathrm{K}^{-1}$

j $\sqrt{-1}$

ω circular frequency, $2 \cdot \pi \cdot f$

S total area, in m^2

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

5 Principle

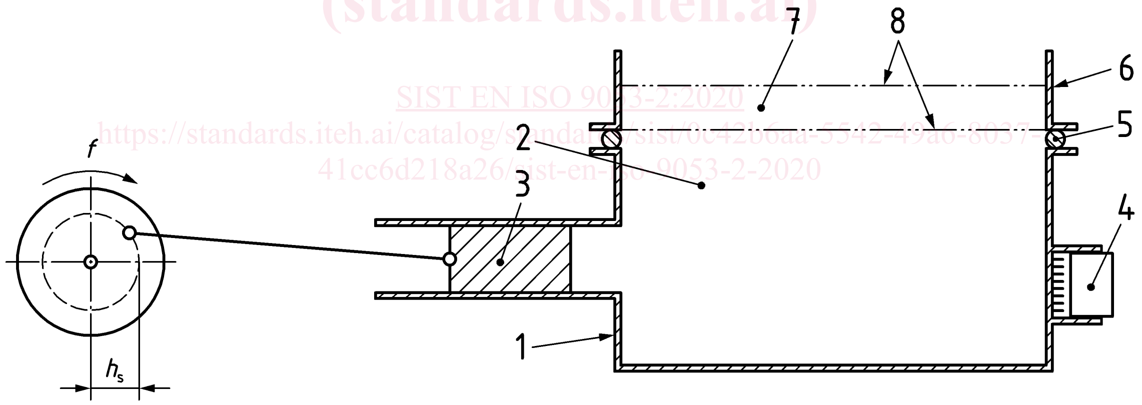
An alternating volume flow with a low frequency, f, for example of 2 Hz, is generated by a piston or similar device (see Figure 1 and Figure 2) moving sinusoidally. This volume flow acts on an air cavity which is either closed by an airtight termination or terminated by the test specimen mounted in a measurement cell. The sound pressure level is measured in the air cavity for both cases.

The pressure inside the cavity will be the outside atmospheric pressure modulated by the alternating flow generated by the piston. The microphone mounted inside the cavity will therefore measure the pressure difference across the specimen when the test cell with the specimen is mounted.

When the air cavity is closed, the volume flow creates a sound pressure in the air cavity which may be calculated from the piston movement, dimensional information of the cavity and the atmospheric air pressure.

When the measurement cell is mounted, the main part of the generated volume flow passes through the test specimen and a lower sound pressure is observed in the air cavity. The difference between the sound pressure levels when the vessel is closed and when the test cell is mounted is a direct function of the airflow resistivity of the test specimen. By the measurement of the sound pressure differences, the airflow resistance for the test specimen may be computed.

It can be practical to use different piston stroke lengths for the closed vessel and when the test cell is mounted.



Key

1	Vessel	2	Air cavity
3	Piston	4	Microphone
5	Seal	6	Measurement cell
7	Test specimen	8	Optional support for test specimen

Figure 1 — Basic principle, termination with the test specimen