

SLOVENSKI STANDARD
oSIST prEN ISO 3745:2010
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Akustika - Ugotavljanje ravni zvočnih moči in ravni zvočne energije virov hrupa z zvočnim tlakom - Precizijska metoda za gluhe in polgluhe prostore (ISO/DIS 3745:2010)

Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for anechoic test rooms and hemi-anechoic test rooms (ISO/DIS 3745:2010)

Akustik - Bestimmung der Schalleistungs- und Schallenergiepegel von Geräuschquellen aus Schalldruckmessungen - Verfahren der Genauigkeitsklasse 1 für reflexionsarme Räume und Halbräume (ISO/DIS 3745:2010)

Acoustique - Détermination des niveaux de puissance acoustique et des niveaux d'énergie acoustique émis par les sources de bruit à partir de la pression acoustique - Méthodes de laboratoire pour les salles d'essai anéchoïques et semi-anéchoïques (ISO/DIS 3745:2010)

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This draft European Standard is submitted to CEN members for parallel enquiry. It has been drawn up by the Technical Committee CEN/TC 211.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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Foreword

This document (prEN ISO 3745:2010) has been prepared by Technical Committee ISO/TC 43 "Acoustics" in collaboration with Technical Committee CEN/TC 211 "Acoustics" the secretariat of which is held by DS.

This document is currently submitted to the parallel Enquiry.

This document will supersede EN ISO 3745:2009.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

Endorsement notice

The text of ISO/DIS 3745:2010 has been approved by CEN as a prEN ISO 3745:2010 without any modification.

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Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic test rooms and hemi-anechoic test rooms

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[Revision of second edition (ISO 3745:2003)]

ICS 17.140.01

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ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

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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.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 3745 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, and by Technical Committee CEN/TC 211, *Acoustics* in collaboration.

This third edition cancels and replaces the second edition (ISO 3745:2003), which has been technically revised.

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Introduction

0.1 This International Standard is one of the series ISO 3740 to ISO 3747, which specify various methods for determining the sound power levels and sound energy levels of noise sources including machinery, equipment and their sub-assemblies. The selection of one of the methods from the series for use in a particular application will depend on the purpose of the test to determine the sound power level or sound energy level and on the facilities available. General guidelines to assist in the selection are provided in ISO 3740. The series of standards of which this International Standard is a part gives only general principles regarding the operating and mounting conditions of the machinery or equipment for the purposes of the test. It is important that test codes be established for individual kinds of noise sources, in order to give detailed requirements on mounting, loading and operating conditions under which the sound power levels or sound energy levels are to be obtained and to select the appropriate measurement surface and microphone array from among those specified in this International Standard.

0.2 The methods given in this International Standard require the source to be mounted in either a free-field test room or a hemi-free-field test room having specified acoustical characteristics. The methods are then based on the premise that the sound power or sound energy of the source is directly proportional to the mean square sound pressure over a hypothetical measurement surface enclosing the source and otherwise depends on the physical constants of air.

0.3 The methods given in this International Standard permit the determination of the sound power level and the sound energy level in frequency bands and/or with frequency weighting 'A' applied. The methods give a precision grade of accuracy (grade 1) as defined in ISO 12001. The resulting sound power levels and sound energy levels include corrections to allow for any differences that might exist between the meteorological conditions under which the tests are conducted and reference meteorological conditions.

0.4 For applications where there are large uncertainties due to operating conditions, or where reduced accuracy is acceptable, reference can be made to the more practical methods of ISO 3744 or ISO 3746. Guidance on evaluation of measurement uncertainty is given in Annex I.

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Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic test rooms and hemi-anechoic test rooms

1 Scope

1.1 General

This International Standard specifies methods for measuring the sound pressure levels on a measurement surface enveloping a noise source (machinery or equipment) in a free-field test room or a hemi-free-field test room. The sound power level (or, in the case of impulsive or transient noise emission, the sound energy level) produced by the noise source, in frequency bands of width one-third octave or with frequency weighting A applied, is calculated using those measurements, including corrections to allow for any differences between the meteorological conditions at the time and place of the test and those corresponding to a reference characteristic impedance.

In general, the frequency range of interest includes the one-third-octave bands with mid-band frequencies from 100 Hz to 10 000 Hz. In practice, the range is extended or restricted to frequencies beyond or within these limits, to those between which the test room is qualified for the purposes of the measurements.

1.2 Types of noise and noise sources

The methods specified in this International Standard are suitable for all types of noise (steady, non-steady, fluctuating, etc.) defined in ISO 12001.

The noise source under test may be a device, machine, component or sub-assembly. The maximum size of the noise source depends on the requirements of clause 8 regarding the radius of the hypothetical sphere or hemisphere used as the enveloping measurement surface.

1.3 Test room

The test rooms that are applicable for measurements made in accordance with this International Standard are an anechoic test room or hemi-anechoic test room, also called, respectively, free-field room or a hemi-free-field room.

1.4 Measurement uncertainty

Information is given on the uncertainty of the sound power levels and sound energy levels determined in accordance with this International Standard, for measurements made in limited bands of frequency and with frequency weighting A applied. The uncertainty conforms with that of the precision grade of accuracy (grade 1) defined in ISO 12001.

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2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently-valid International Standards.

ISO 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*

ISO 9613-1:1993, *Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere*

ISO 12001, *Acoustics – Noise emitted by machinery and equipment – Rules for the drafting and presentation of a noise test code*

IEC 60942:2003, *Electroacoustics – Sound calibrators*

IEC 61183, *Electroacoustics – Random-incidence and diffuse-field calibration of sound level meters*

IEC 61260:1995, *Electroacoustics – Octave-band and fractional-octave-band filters*

IEC 61672-1:2002, *Electroacoustics – Sound level meters – Part 1: Specifications*

ISO/IEC Guide 98-3, *Uncertainty in measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)¹⁾*

3 Definitions

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

3.1

sound pressure

p

difference between instantaneous pressure and static pressure

[ISO 80000-8:2007, 8-9.2]

NOTE Sound pressure is expressed in pascals.

3.2

sound pressure level

L_p

ten times the logarithm to the base 10 of the ratio of the square of the sound pressure, p , to the square of a reference value, p_0 , expressed in decibels

$$L_p = 10 \lg \frac{p^2}{p_0^2} \text{ dB} \quad (1)$$

where the reference value, p_0 , is 20 μPa (2×10^{-5} Pa)

NOTE 1 If specific frequency and time weightings as specified in IEC 61672-1 and/or specific frequency bands are applied, this should be indicated by appropriate subscripts; e.g. L_{pA} denotes the A-weighted sound pressure level.

1) ISO/IEC Guide 98-3 is published as a reissue of the *Guide to the expression of uncertainty in measurement (GUM)*.

NOTE 2 This definition is technically in accordance with ISO 80000-8:2007, 8-22.

3.3 time-averaged sound pressure level

$L_{p,T}$
ten times the logarithm to the base 10 of the ratio of the time average of the square of the sound pressure, p , 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 , expressed in decibels

$$L_{p,T} = 10 \lg \left[\frac{\frac{1}{T} \int_{t_1}^{t_2} p^2(t) dt}{p_0^2} \right] \text{ dB} \quad (2)$$

where the reference value, p_0 , is 20 μPa

NOTE 1 In general, the subscript “ T ” is omitted since time-averaged sound pressure levels are necessarily determined over a certain measurement time interval.

NOTE 2 Time-averaged sound pressure levels are often A-weighted, in which case they are denoted by $L_{pA,T}$, which is usually abbreviated to L_{pA} .

NOTE 3 Adapted from ISO/TR 25417:2007, 2.3.

3.4 single-event time integrated sound pressure level

L_E
ten times the logarithm to the base 10 of the ratio of the integral of the square of the sound pressure, p , of an isolated single sound event (burst of sound or transient sound) over a stated time interval T (starting at t_1 and ending at t_2) to a reference value, E_0 , expressed in decibels

$$L_E = 10 \lg \left[\frac{\int_{t_1}^{t_2} p^2(t) dt}{E_0} \right] \text{ dB} \quad (3)$$

where the reference value, E_0 , is $(20 \mu\text{Pa})^2 \text{ s} = 4 \times 10^{-10} \text{ Pa}^2 \text{ s}$

NOTE 1 This quantity can be obtained by $L_{p,T} + 10 \lg \frac{T}{T_0}$ dB, where $T_0 = 1$ s.

NOTE 2 When used to measure sound immission, this quantity is usually called “single-event sound exposure level”.

3.5 measurement time interval

T
portion or a multiple of an operational period or operational cycle of the noise source under test, for which the time-averaged sound pressure level is determined

NOTE Measurement time interval is expressed in seconds.