SLOVENSKI STANDARD
SIST EN ISO 3744:2010

01-december-2010

Nadomešča:
SIST EN ISO 3744:2009

Akustika - Ugotavljanje ravni zvočnih moči virov hrupa z merjenjem zvočnega tlaka - Inženirska metoda v pretežno prostem polju nad odbojno ravnino (ISO 3744:2010)

Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)

Akustik - Bestimmung der Schallleistungs- und der Schallenergiepegel von Geräuschquellen aus Schalldruckmessungen - Hüllflächenverfahren der Genauigkeitsklasse 2 für ein im Wesentlichen freies Schallfeld über einer reflektierenden Ebene (ISO 3744:2010)

Acoustique - Détermination des niveaux de puissance et d'énergie acoustique émis par les sources de bruit à partir de la pression acoustique - Méthodes d'expertise pour des conditions approchant celles du champ libre sur plan réfléchissant (ISO 3744:2010)

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SIST EN ISO 3744:2010 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 3744

October 2010

ICS 17.140.01

Supersedes EN ISO 3744:2009

English Version

Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

The text of ISO 3744:2010 has been prepared by Technical Committee ISO/TC 43 “Acoustics” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 3744:2010 by Technical Committee CEN/TC 211 “Acoustics” the secretariat of which is held by DS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2011, and conflicting national standards shall be withdrawn at the latest by April 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 3744:2009.

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.

For relationship with EU Directive, see informative Annex ZA, which is an integral part of this document.

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Endorsement notice

The text of ISO 3744:2010 has been approved by CEN as a EN ISO 3744:2010 without any modification.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide one means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

INTERNATIONAL STANDARD

ISO 3744

Third edition
2010-10-01

Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane

Acoustique — Détermination des niveaux de puissance et d'énergie acoustiques émis par les sources de bruit à partir de la pression acoustique — Méthodes d'expertise pour des conditions approchant celles du champ libre sur plan réfléchissant

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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 3744 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This third edition of ISO 3744 cancels and replaces the second edition (ISO 3744:1994) and ISO 4872:1978, of which it constitutes a merger and a technical revision.

Introduction

This International Standard is one of the series ISO 3741[2] to ISO 3747[6], which specify various methods for determining the sound power levels and sound energy levels of noise sources including machinery, equipment and their sub-assemblies. General guidelines to assist in the selection are provided in ISO 3740[1]. The selection depends on the environment of the available test facility and on the precision of the sound power level or sound energy level values required. It may be necessary to establish a noise test code (see ISO 12001) for the individual noise source in order to select the appropriate sound measurement surface and microphone array from among those allowed in each member of the ISO 3741[2] to ISO 3747[6] series, and to give requirements on test unit mounting, loading and operating conditions under which the sound power levels or sound energy levels are to be obtained. The sound power emitted by a given source into the test environment is calculated from the mean square sound pressure that is measured over a hypothetical measurement surface enclosing the source, and the area of that surface. The sound energy for a single sound event is calculated from this sound power and the time over which it existed.

The methods specified in this International Standard permit the determination of the sound power level and the sound energy level in frequency bands optionally with frequency A-weighting applied.

For applications where greater accuracy is required, reference can be made to ISO 3745, ISO 3741[2] or ISO 9614[13]-[15]. If the relevant criteria for the measurement environment specified in this International Standard are not met, it might be possible to refer to another standard from this series, or to ISO 9614[13]-[15].

This International Standard describes methods of accuracy grade 2 (engineering grade) as defined in ISO 12001, when the measurements are performed in a space that approximates an acoustically free field over a reflecting plane. Such an environment can be found in a specially designed room, or within industrial buildings or outdoors. Ideally, the test source should be mounted on a sound-reflecting plane located in a large open space. For sources normally installed on the floor of machine rooms, corrections are defined to account for undesired reflections from nearby objects, walls and the ceiling, and for the residual background noises that occur there.

Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane

1 Scope

1.1 General

This International Standard specifies methods for determining the sound power level or sound energy level of a noise source from sound pressure levels measured on a surface enveloping the noise source (machinery or equipment) in an environment that approximates to an acoustic free field near one or more reflecting planes. The sound power level (or, in the case of noise bursts or transient noise emission, the sound energy level) produced by the noise source, in frequency bands or with A-weighting applied, is calculated using those measurements.

NOTE Differently shaped measurement surfaces can yield differing estimates of the sound power level of a given noise source and an appropriately drafted noise test code (see ISO 12001) gives detailed information on the selection of the surface.

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, isolated bursts of sound energy, etc.) defined in ISO 12001.

This International Standard is applicable to all types and sizes of noise source (e.g. stationary or slowly moving plant, installation, machine, component or sub-assembly), provided the conditions for the measurements can be met.

NOTE It is possible that the conditions for measurements given in this International Standard are impracticable for very tall or very long sources such as chimneys, ducts, conveyors and multi-source industrial plants. A noise test code for the determination of noise emission of specific sources can provide alternative methods in such cases.

1.3 Test environment

The test environments that are applicable for measurements made in accordance with this International Standard can be located indoors or outdoors, with one or more sound-reflecting planes present on or near which the noise source under test is mounted. The ideal environment is a completely open space with no bounding or reflecting surfaces other than the reflecting plane(s) (such as that provided by a qualified hemi-anechoic chamber), but procedures are given for applying corrections (within limits that are specified) in the case of environments that are less than ideal.

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 A-weighting applied. The uncertainty conforms to ISO 12001:1996, accuracy grade 2 (engineering grade).

2 Normative references

The following referenced documents are indispensable for the application 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 3382-2, *Acoustics — Measurement of room acoustic parameters — Part 2: Reverberation time in ordinary rooms*

ISO 3745, *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 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*

ISO 6926, *Acoustics — Requirements for the performance and calibration of reference sound sources for the determination of sound power levels*

ISO 12001:1996, *Acoustics — Noise emitted by machinery and equipment — Rules for the drafting and presentation of a noise test code*

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

IEC 60942:2003, *Electroacoustics — Sound calibrators*

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

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

3 Terms and definitions

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

3.1
sound pressure
p
difference between instantaneous pressure and static pressure

NOTE 1 Adapted from ISO 80000-8:2007[21], 8-9.2.

NOTE 2 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

[ISO/TR 25417:2007[20], 2.2]

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

NOTE 2 This definition is technically in accordance with ISO 80000-8:2007[21], 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

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

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[20], 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

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

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

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

NOTE 2 When used to measure sound immission, this quantity is usually called "sound exposure level" (see ISO/TR 25417:2007[20]).