SIST

SLOVENSKI STANDARD

oSIST prEN ISO 3744:2006

01-junij-2006

Akustika - Ugotavljanje ravni zvoļ nih moļ i virov hrupa z merjenjem zvoļ nega tlaka - Inģenirska metoda v preteģno prostem polju nad odbojno ravnino (ISO/DIS 3744:2006)

Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane (ISO/DIS 3744:2006)

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/DIS 3744:2006)

Acoustique - Détermination des niveaux de puissance acoustique et des niveaux d'énergie acoustique émis par les sources de bruit a partir de la pression acoustique - Méthode d'expertise pour des conditions approchant celles du champ libre sur plan réfléchissant (ISO/DIS 3744:2006)

Ta slovenski standard je istoveten z: **prEN ISO 3744**

ICS:

17.140.01	Akustiļ na merjenja in blaģenje hrupa na sploģno	Acoustic measurements and noise abatement in general

oSIST prEN ISO 3744:2006 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN ISO 3744

March 2006

ICS

Will supersede EN ISO 3744:1995

English Version

Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane (ISO/DIS 3744:2006)

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 - Méthode d'expertise pour des conditions approchant celles du champ libre sur plan réfléchissant (ISO/DIS 3744:2006)

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.

This draft European Standard was established by CEN 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 Management Centre has the same status as the official versions.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. prEN ISO 3744:2006: E

Foreword

This document (prEN ISO 3744:2006) 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 3744:1995.

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 3744:2006 has been approved by CEN as prEN ISO 3744:2006 without any modifications.

DRAFT INTERNATIONAL STANDARD ISO/DIS 3744

ISO/TC **43**/SC **1** | Secretariat: **DS**

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

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[Revision of second edition (ISO 3744:1994) and ISO 4872:1978]

ICS 17.140.01

ISO/CEN PARALLEL ENQUIRY

The CEN Secretary-General has advised the ISO Secretary-General that this ISO/DIS covers a subject of interest to European standardization. **In accordance with the ISO-lead mode of collaboration as defined in the Vienna Agreement, consultation on this ISO/DIS has the same effect for CEN members as would a CEN enquiry on a draft European Standard.** Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month FDIS 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.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

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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 also ISO 4872:1978, which have been merged and technically revised.

Introduction

0.1 This International Standard is one of the series ISO 3740 to ISO 3747, that specifies methods for determining the sound power levels and sound energy levels of noise sources including machinery, equipment and their sub-assemblies. Guidelines to select one of those methods are provided in ISO 3740. The selection will depend 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 test code for the individual noise source in order to select the appropriate sound measurement surface and microphone array from among those allowed in each standard, 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 machine event is calculated from this sound power and the time over which it existed.

0.2 This International Standard provides an engineering grade of accuracy (grade 2) 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.

0.3 The methods specified 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.

0.4 For applications where greater accuracy is required, reference can be made to ISO 3745, ISO 3741 or an appropriate part of ISO 9614. 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 an appropriate part of ISO 9614.

Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering method 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 frequency-weighting A 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 a test code should give 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 The conditions for measurements given in this International Standard could be impracticable for very tall or very long sources such as chimneys, ducts, conveyors and multi-source industrial plants. A 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 may 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-free-field 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 weighting A applied. The uncertainty conforms with that of the engineering grade of accuracy (grade 2) defined in ISO 12001.

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[1)], *Acoustics — Measurement of the reverberation time — Part 2: Ordinary rooms*

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

ISO 7574-1, *Acoustics — Statistical methods for determining and verifying stated noise emission values of machinery and equipment — Part 1: General considerations and definitions*

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

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

Guide to the expression of uncertainty in measurement (GUM). International Organization for Standardization, Geneva, Switzerland. ISBN 92-67-10188-9, First Edition 1993, corrected and reprinted 1995

3 Terms and definitions

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

3.1
sound pressure
p
a fluctuating pressure superimposed on the static pressure by the presence of sound, 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

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

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

NOTE The frequency weighting or the midband frequency of the frequency band used should be indicated in the symbol.

1) In preparation

3.3
time-averaged sound pressure level

$L_{p,T}$

level of the time-averaged square of the sound pressure over the measurement time interval $T = t_2 - t_2$, expressed in decibels

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

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}.

3.4
single-event sound pressure level

L_E

level of the time-integrated square of the sound pressure of an isolated single sound event (burst of sound or transient sound) of specified duration T (or specified measurement time interval $T = t_2 - t_1$) normalized to reference time interval T_0 = 1 s, expressed in decibels

$$L_E = 10 \lg \left[\frac{1}{T_0} \int_{t_1}^{t_2} \frac{p^2(t)}{p_0^2} \mathrm{d}t \right] \text{dB} = L_{p,T} + 10 \lg \frac{T}{T_0} \text{ dB} \tag{3}$$

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, expressed in seconds

3.6
acoustic free field

sound field in a homogeneous, isotropic medium free of boundaries; in practice, it is a field in which reflections at the boundaries are negligible over the frequency range of interest

3.7
acoustic free field over a reflecting plane

acoustic free field in the half-space above an infinite reflecting plane in the absence of any other obstacles

3.8
reflecting plane

sound reflecting planar surface on which the noise source under test is located

3.9
frequency range of interest

for general purposes, the range of octave bands with nominal midband frequencies from 125 Hz to 8 000 Hz (including one-third octave bands with midband frequencies from 100 Hz to 10 000 Hz)

NOTE For special purposes, the range may be extended or reduced, provided that the test environment and instrument specifications are satisfactory for use over the modified range. For sources which emit sound at predominantly high or low frequencies, it might be desirable to extend or reduce the frequency range of interest in order to optimize the test facility and procedures, provided this is made clear in the test report.

3.10
reference box
hypothetical rectangular parallelepiped terminating on the reflecting plane(s) on which the noise source under test is located, that just encloses the source including all the significant sound radiating components and any test table on which the source is mounted (see 6.2)

3.11
characteristic source dimension
d_0
distance from the origin of the co-ordinate system to the farthest corner of the reference box (see 7.1), expressed in metres

3.12
measurement distance
d
distance from the reference box to a measurement surface, expressed in metres

3.13
measurement radius
r
radius of a hemispherical measurement surface, expressed in metres

3.14
measurement surface
hypothetical surface of area S, on which the microphone positions are located at which the sound pressure levels are measured, enveloping the noise source under test and terminating on the reflecting plane(s) on which the source is located

3.15
background noise
noise from all sources other than the noise source under test

NOTE Background noise may include contributions from airborne sound, noise from structure-borne vibration, and electrical noise in the instrumentation.

3.16
background noise correction
K_1
correction applied to the measured time-averaged sound pressure levels to account for the influence of background noise, expressed in decibels

NOTE The background noise correction is frequency dependent; the correction in the case of a frequency band is denoted K_{1f}, where f denotes the relevant midband frequency, and that in the case of A-weighting is denoted K_{1A}.

3.17
environmental correction
K_2
correction applied to the mean (energy-average) of the time-averaged sound pressure levels at all the microphone positions on the measurement surface, to account for the influence of reflected or absorbed sound, expressed in decibels

NOTE 1 The environmental correction is frequency dependent; the correction in the case of a frequency band is denoted K_{2f}, where f denotes the relevant midband frequency, and that in the case of A-weighting is denoted K_{2A}.

NOTE 2 In general, the environmental correction depends on the area of the measurement surface and usually K_2 increases with S.

3.18
surface time-averaged sound pressure level

$\overline{L_p}$

mean (energy average) of the time-averaged sound pressure levels at all the microphone positions on the measurement surface, with the background noise correction, K_1, and the environmental correction, K_2, applied, expressed in decibels

3.19
surface single-event sound pressure level

$\overline{L_E}$

mean (energy average) of the single-event sound pressure levels at all the microphone positions on the measurement surface, with the background noise correction, K_1, and the environmental correction, K_2, applied, expressed in decibels

3.20
sound power

W

rate per unit time at which airborne sound energy is radiated by a source, expressed in watts

3.21
sound power level

L_W

ten times the logarithm to the base 10 of the ratio of the sound power of a source, W, to a reference value, W_0, expressed in decibels

$$L_W = 10 \lg \frac{W}{W_0} \text{ dB} \tag{4}$$

The reference value, W_0, is 1 pW (10^{-12} W).

NOTE 2 The frequency weighting, or the midband frequency of the frequency band used, is indicated in the symbol. For example, the A-weighted sound power level is L_{WA}.

3.22
sound energy

J

energy of a single burst of sound or transient sound emitted by a source, expressed in joules

3.23
sound energy level

L_J

ten times the logarithm to the base 10 of the ratio of the sound energy of a source, J, to a reference value, J_0, expressed in decibels

$$L_J = 10 \lg \frac{J}{J_0} \text{ dB} \tag{5}$$

The reference value, J_0, is 1 pJ (10^{-12} J).

NOTE The frequency weighting, or the midband frequency of the frequency band used, is indicated in the symbol. For example, the A-weighted sound energy level is L_{JA}.