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Acoustics - Determination of occupational noise exposure - Engineering method (ISO 9612:2009)

I.S. EN ISO 9612:2009

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English Version

**Acoustics - Determination of occupational noise exposure -
Engineering method (ISO 9612:2009)**

Acoustique - Détermination de l'exposition au bruit en
milieu de travail - Méthode d'expertise (ISO 9612:2009)

Akustik - Bestimmung der Lärmexposition am Arbeitsplatz -
Verfahren der Genauigkeitsklasse 2 (Ingenieurverfahren)
(ISO 9612:2009)

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Foreword

This document (EN ISO 9612:2009) 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 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of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by October 2009.

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Endorsement notice

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INTERNATIONAL
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ISO
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Second edition
2009-04-01

**Acoustics — Determination of
occupational noise exposure —
Engineering method**

*Acoustique — Détermination de l'exposition au bruit en milieu de
travail — Méthode d'expertise*



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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.

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ISO 9612 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This second edition cancels and replaces the first edition (ISO 9612:1997), which has been technically revised.

Introduction

This International Standard provides a stepwise approach to the determination of occupational noise exposure from noise level measurements. The procedure contains the following major steps: work analysis, selection of measurement strategy, measurements, error handling and uncertainty evaluations, calculations, and presentation of results. This International Standard specifies three different measurement strategies: task-based measurement; job-based measurement; and full-day measurement. This International Standard gives guidance on selecting an appropriate measurement strategy for a particular work situation and purpose of investigation. This International Standard also provides an informative spreadsheet to allow calculation of measurement results and uncertainties. ISO is not responsible for errors that may arise or occur with the use of this spreadsheet.

This International Standard recognizes the use of hand-held sound level meters as well as personal sound exposure meters. The methods specified optimize the effort required for obtaining a given accuracy.

Acoustics — Determination of occupational noise exposure — Engineering method

1 Scope

This International Standard specifies an engineering method for measuring workers' exposure to noise in a working environment and calculating the noise exposure level. This International Standard deals with A-weighted levels but is applicable also to C-weighted levels. Three different strategies for measurement are specified. The method is useful where a determination of noise exposure to engineering grade is required, e.g. for detailed noise exposure studies or epidemiological studies of hearing damage or other adverse effects.

The measuring process requires observation and analysis of the noise exposure conditions so that the quality of the measurements can be controlled. This International Standard provides methods for estimating the uncertainty of the results.

This International Standard is not intended for assessment of masking of oral communication or assessment of infrasound, ultrasound and non-auditory effects of noise. It does not apply to the measurement of the noise exposure of the ear when hearing protectors are worn.

Results of the measurements performed in accordance with this International Standard can provide useful information when defining priorities for noise control measures.

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 1999, *Acoustics — Determination of occupational noise exposure and estimation of noise-induced hearing impairment*

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

IEC 60942:2003, *Electroacoustics — Sound calibrators*

IEC 61252, *Electroacoustics — Specifications for personal sound exposure meters*

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**A-weighted time-averaged sound pressure level** $L_{p,A,T}$ **A-weighted equivalent continuous sound pressure level** $L_{p,A,eqT}$

ten times the logarithm to the base 10 of the ratio of the time average of the square of the A-weighted sound pressure, p_A , 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

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

where the reference value, p_0 , is 20 μPa

NOTE Adapted from ISO/TR 25417:2007 [9].

3.2**A-weighted noise exposure level normalized to an 8 h working day daily noise exposure level** $L_{EX,8h}$

(occupational noise) level, in decibels, given by the equation:

$$L_{EX,8h} = L_{p,A,eqT_e} + 10 \lg \left[\frac{T_e}{T_0} \right] \text{ dB} \quad (2)$$

where

L_{p,A,eqT_e} is the A-weighted equivalent continuous sound pressure level for T_e ;

T_e is the effective duration, in hours, of the working day;

T_0 is the reference duration, $T_0 = 8 \text{ h}$

NOTE 1 If the effective duration of the working day, T_e , is equal to 8 h, then $L_{EX,8h}$ equals $L_{p,A,eq,8h}$.

NOTE 2 If the average or normalized exposure over a number of days is desired, Equation (3) can be used:

$$\bar{L}_{EX,8h} = 10 \lg \left[\frac{1}{X} \sum_{x=1}^X 10^{0,1 \times L_{EX,8h,x}} \right] \text{ dB} \quad (3)$$

The value of X is chosen according to the purpose of the averaging process. For example, $X = 5$ leads to a daily noise exposure level normalized to a nominal week of five 8 h working days.

NOTE 3 This definition differs from that given in ISO/TR 25417:2007 [9].

3.3**nominal day**

working day over which it is chosen to determine the noise exposure

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