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Acoustics - Determination of occupational noise exposure - Engineering method
(ISO/DIS 9612:2007)

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Acoustique - Détermination de l'exposition au bruit en milieu de travail - Méthode
d'expertise (ISO/DIS 9612:2007)

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ICS:

13.140

Vpliv hrupa na ljudi

Noise with respect to human
beings

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March 2007

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English Version

Acoustics - Determination of occupational noise exposure - Engineering method (ISO/DIS 9612:2007)

Acoustique - Détermination de l'exposition au bruit en
milieu de travail - Méthode d'expertise (ISO/DIS 9612:2007)

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Foreword

This document (prEN ISO 9612:2007) 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.

Endorsement notice

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Acoustics — Determination of occupational noise exposure — Engineering method

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

[Revision of first edition (ISO 9612:1997)]

ICS 13.140

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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 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 totally revised.

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Introduction

This International Standard provides a stepwise approach for the determination of noise exposure level at work places from 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. The standard describes three different measurement strategies, i.e. task-based measurement, job-based measurement and full day measurement. The choice of the measurement strategy depends on the complexity of the work situation and the purpose of measurements. A guide on the selection of strategy is given.

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

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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 standard describes three different strategies for measurement. This method will be useful where a determination of noise exposure to engineering precision grade is required, for example, for detailed noise exposure studies or epidemiological studies in to the cause 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 protected ear when hearing protectors are worn.

Results of the measurements performed in accordance with this International Standard may 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 17025, *General requirements for the competence of testing and calibration laboratories*

IEC 60942, *Electroacoustics – Sound calibrators*

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

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

ISO Guide 98:1995, *Guide to the expression of uncertainty in measurement*¹⁾

1) Formerly known as *Guide to the expression of uncertainty in measurement* (GUM).

3 Terms and definitions

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

3.1

equivalent continuous A-weighted sound pressure level

$L_{pAeq,T}$

level, in decibels, given by the equation:

$$L_{pAeq,T} = 10 \lg \left[\frac{\frac{1}{T} \int_0^T p_A^2(t) dt}{p_0^2} \right] \text{ dB}$$

where

T is the period over which the average is taken;

p_A is the A-weighted sound pressure;

p_0 , is the reference value, $p_0 = 20 \mu\text{Pa}$.

3.2

noise exposure level normalized to a nominal 8 h working day

$L_{EX,8h}$

level, in decibels, given by the equation:

$$L_{EX,8h} = L_{pAeq,T_e} + 10 \lg \left[\frac{T_e}{T_0} \right] \text{ dB}$$

where

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

T_e is the effective duration 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 $L_{pAeq,8h}$. The quantity “noise exposure level normalized to a nominal 8 h working day” may also be called “daily noise exposure level”.

NOTE 2 If the exposure averaged over n days is desired, for example if noise exposure levels normalized to a nominal 8 h working day for weekly exposures are considered, the average value of $L_{EX,8h}$, in decibels, over the whole period may be determined from the values of $(L_{EX,8h})_i$ for each day, using the following equation:

$$\overline{L_{EX,8h}} = 10 \lg \left[\frac{1}{k} \sum_{i=1}^n 10^{0.1 \times (L_{EX,8h})_i} \right] \text{ dB}$$

The value of k is chosen according to the purpose of the averaging process: it will be equal to n if an average value is desired; it will be a conventional fixed number if the exposure is to be normalized to a nominal number of days (for example, $k = 5$ will lead to a daily noise exposure level normalized to a nominal week of 5 eight-hour working days).

3.3

nominal day

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

NOTE 1 The nominal day is determined from the work analysis and depends on the purpose of the measurements.

NOTE 2 For example, it may be a typical day representing the work performed over several days or the day with the highest noise exposure. See also 6.3.

NOTE 3 The noise exposure is normally calculated on a daily basis but there may be circumstances where the use of weekly or longer periods of noise exposure level is considered appropriate.

3.4

C-weighted peak sound pressure level

L_{pCpeak}

the level of greatest absolute observed C-weighted sound pressure, in decibels, during the measurement time when using instrument setting *peak* as specified in IEC 61672-1

The reference value is $p_0 = 20 \mu\text{Pa}$.

3.5

task

part of the worker's occupational activity in a specified work time interval

NOTE 1 The work time interval generally consists of a sequence of coordinated activities that may make up a work cycle.

NOTE 2 See Figure 1 in 3.6 for illustration.

3.6

job

set of all tasks performed by the worker during the entire working day or shift

NOTE 1 In the industry, usually, a worker has a job title (e.g., mechanical maintainer, cleaner, painter) that describes his/her job.

NOTE 2 A job is usually named after the job title of the worker complemented with few words ensuring clear identification of the job (e.g. "production - operation of process line X23B", "maintenance of hall C machines").

NOTE 3 Figure 1 illustrates the hierarchy of jobs and tasks. The different jobs may for instance be: J1 = scaffolders, J2 = welders, J3 = painters and J4 = store keepers. A welder performs the following tasks: T1= planning, T2 = grinding and T3 = welding.

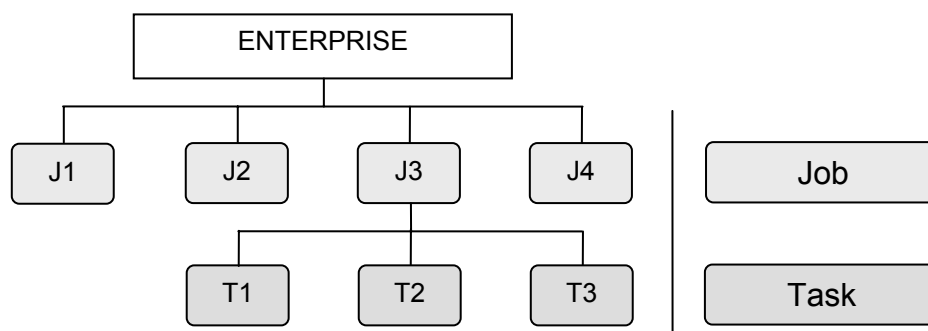


Figure 1 — An example illustrating jobs and tasks

4 Instrumentation

4.1 Sound level meters and personal sound exposure meters

Measurements can be made by using either sound level meters or personal sound exposure meters.

The sound level meter, including the microphone and associated cables, shall meet the requirements for class 1 or class 2 instrumentation specified in IEC 61672-1. Class 1 instrumentation is preferred, and shall be