

# SVENSK STANDARD

## SS-EN ISO 9612:2009

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### **Akustik – Bestämning av bullerexponering i arbetsmiljön Teknisk metod (ISO 9612:2009)**

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

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN ISO 9612**

April 2009

ICS 13.140

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)

This European Standard was approved by CEN on 5 March 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of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by October 2009.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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## 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

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

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

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:

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

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:

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

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

NOTE 1 The nominal day is determined from the work analysis and depends on the purpose of the measurements. 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 7.3.

NOTE 2 The noise exposure level is normally calculated on a daily basis, but there may be circumstances where the use of weekly or longer periods of noise exposure is considered appropriate.

**3.4 C-weighted peak sound pressure level**

$L_{p,Cpeak}$   
ten times the logarithm to the base 10 of the ratio of the square of the C-weighted peak sound pressure,  $p_{Cpeak}$ , to the square of a reference value,  $p_0$ , expressed in decibels

$$L_{p,Cpeak} = 10 \lg \frac{p_{Cpeak}^2}{p_0^2} \text{ dB} \tag{4}$$

where the reference value,  $p_0$ , is 20 µPa.

**3.5 task**

⟨occupational noise⟩ distinct part of a worker's occupational activity

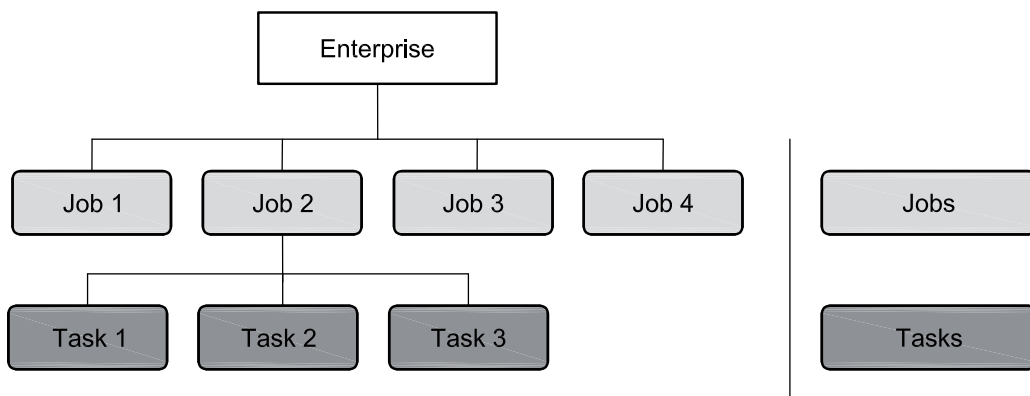
Figure 1 illustrates the hierarchy of jobs and tasks.

**3.6 job**

⟨occupational noise⟩ overall occupational activity that is carried out by a worker, consisting of all the tasks performed by the worker during the entire working day or shift

NOTE A worker often has a job title that describes his or her job, sometimes complemented with an additional description to ensure clear identification, e.g. "welder - process line A".

Figure 1 illustrates the hierarchy of jobs and tasks.



**Key**

- |                     |                 |
|---------------------|-----------------|
| Job 1 scaffolders   | Task 1 planning |
| Job 2 welders       | Task 2 grinding |
| Job 3 painters      | Task 3 welding  |
| Job 4 store keepers |                 |

**Figure 1 — An example illustrating the hierarchy of jobs and tasks**