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Akustik – Hörselskydd –

Del 2: Uppskattning av effektiv A-vägd ljudtrycksnivå vid användning av hörselskydd (ISO 4869-2:2018)

Acoustics – Hearing protectors –

Part 2: Estimation of effective A-weighted sound pressure levels when hearing protectors are worn (ISO 4869-2:2018)

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Denna standard ersätter SS-EN ISO 4869-2, utgåva 1 och SS-EN ISO 4869-2/AC:2007, utgåva 1

The European Standard EN ISO 4869-2:2018 has the status of a Swedish Standard. This document contains the official version of EN ISO 4869-2:2018.

This standard supersedes the SS-EN ISO 4869-2, edition 1 and SS-EN ISO 4869-2/AC:2007, edition 1

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Denna standard är framtagen av kommittén för Akustik och buller, SIS/TK 110.

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EUROPEAN STANDARD

EN ISO 4869-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2018

ICS 13.340.20

Supersedes EN ISO 4869-2:1995

English Version

Acoustics - Hearing protectors - Part 2: Estimation of effective A-weighted sound pressure levels when hearing protectors are worn (ISO 4869-2:2018)

Acoustique - Protecteurs individuels contre le bruit - Partie 2: Estimation des niveaux de pression acoustique pondérés A en cas d'utilisation de protecteurs individuels contre le bruit (ISO 4869-2:2018)

Akustik - Gehörschützer - Teil 2: Abschätzung der beim Tragen von Gehörschützern wirksamen A-bewerteten Schalldruckpegel (ISO 4869-2:2018)

This European Standard was approved by CEN on 23 April 2018.

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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-CENELEC 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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN ISO 4869-2:2018) 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 DIN.

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 May 2019, and conflicting national standards shall be withdrawn at the latest by May 2019.

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

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Endorsement notice

The text of ISO 4869-2:2018 has been approved by CEN as EN ISO 4869-2:2018 without any modification.

Introduction

This document estimates an “effective” level, i.e. the A-weighted sound pressure level at the head centre with the listener absent, minus the attenuation of the hearing protection devices. Effective values are estimated since those are required to assess noise hazard with respect to permissible noise exposure limits. An effective level differs from that in the ear canal since it has been converted to a sound-field value via the transfer function of the open ear. Effective levels are typically 5 dB to 10 dB less than ear canal levels depending on the spectrum of the incident noise.

Ideally, the A-weighted sound pressure level effective when a hearing protector is worn should be estimated on the basis of both the octave-band sound attenuation data of the hearing protector (measured in accordance with ISO 4869-1) and the octave-band sound pressure levels of the noise. It is recognized, however, that in many situations information on the octave-band sound pressure levels of the noise might not be available. Therefore, for many practical purposes, there is a need for simpler methods to determine the effective A-weighted sound pressure levels which are only based on the A- and C-weighted sound pressure levels of the noise. This document addresses both of these situations by specifying an octave-band calculation method as well as two alternative simplified procedures, the *HML* method and the *SNR* method.

The octave-band method is a calculation method involving the workplace octave-band sound pressure levels and the octave-band sound attenuation data for the hearing protector that is being assessed. Although it can be thought of as an “exact” reference method, it has its own inherent inaccuracies, since it is based upon mean sound attenuation values and standard deviations for a group of test subjects, and not the specific sound attenuation values for the individual person in question.

The *HML* method specifies three attenuation values, *H*, *M* and *L*, determined from the octave-band sound attenuation data of a hearing protector. These values, when combined with the C- and A-weighted sound pressure levels of the noise, are used to calculate the effective A-weighted sound pressure level when the hearing protector is worn.

The *SNR* method specifies a single attenuation value, the single number rating, determined from the octave-band sound attenuation data of a hearing protector. This value is subtracted from the C-weighted sound pressure level of the noise to calculate the effective A-weighted sound pressure level when the hearing protector is worn.

Due to the large spread of the sound attenuation provided by hearing protectors when worn by individual persons, all three methods are nearly equivalent in their accuracy in the majority of noise situations. Even the simplest method, the *SNR* method, will provide a reasonably accurate estimate of the effective A-weighted sound pressure level to aid in the selection and specification of hearing protectors. In special situations, for example especially high- or low-frequency noises, it is necessary to use either the *HML* or the octave-band method.

Depending on the choice of a certain parameter in the calculation process, various protection performances can be obtained. It should be noted that the protection performance values for all three methods are only valid when:

- the hearing protectors are worn correctly and in the same manner as they were worn by subjects when carrying out the ISO 4869-1 test;
- the hearing protectors are properly maintained;
- the anatomical characteristics of the subjects involved in the ISO 4869-1 test are a reasonable match for the population of actual wearers.

Thus, the principal source of potential inaccuracy in use of the three methods described in this document is the basic ISO 4869-1 input data. If the input data do not accurately describe the degree of protection achieved by the target population, then no calculation method will provide sufficient accuracy.

The uncertainty of the attenuation values and ratings is described in [Annex E](#).

NOTE Differences of 3 dB or less in the determination of the effective sound pressure level for comparable hearing protectors are generally insignificant.

Acoustics — Hearing protectors —

Part 2:

Estimation of effective A-weighted sound pressure levels when hearing protectors are worn

1 Scope

This document specifies three methods (the octave-band, *HML* and *SNR* methods) of estimating the A-weighted sound pressure levels effective when hearing protectors are worn. The methods are applicable to either the sound pressure level or the equivalent continuous sound pressure level of the noise. Although primarily intended for steady noise exposures, the methods are also applicable to noises containing impulsive components. It is possible that these methods could not be suitable for use with peak sound pressure level measurements.

The octave-band, *H*, *M*, *L* or *SNR* values are suitable for establishing sound attenuation criteria for selecting or comparing hearing protectors, and/or setting minimum acceptable sound attenuation requirements.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 4869-1, *Acoustics — Hearing protectors — Part 1: Subjective method for the measurement of sound attenuation*

ISO 9612:2009, *Acoustics — Determination of occupational noise exposure — Engineering method*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4869-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <http://www.electropedia.org/>

3.1

protection performance

x

percentage of individuals for which the achieved protection is equal to or greater than the designated value, where the percentage is indicated by adding a subscript to the symbols representing the different methods, e.g. APV_{fx} , H_x , M_x , L_x , SNR_x

Note 1 to entry: The value of protection performance is often chosen to be 84 % [corresponding to the constant $\alpha = 1$ (see [Clause 5](#))].