SLOVENSKI STANDARD
oSIST prEN IEC 61252:2024

01-september-2024

Elektroakustika - Merilniki osebne izpostavljenosti zvoku

Electroacoustics - Personal sound exposure meters

Elektroakustik - Anforderungen an Personenschallexposimeter

électroacoustique - Exposimètres acoustiques individuels

Ta slovenski standard je istoveten z: **prEN IEC 61252:2024**

ICS:

13.140	Vpliv hrupa na ljudi	Noise with respect to human beings
17.140.50	Elektroakustika	Electroacoustics

oSIST prEN IEC 61252:2024 **en**

29/1180/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 61252 ED2**	
DATE OF CIRCULATION: **2024-08-02**	CLOSING DATE FOR VOTING: **2024-10-25**
SUPERSEDES DOCUMENTS: **29/1153/CD, 29/1157A/CC**	

IEC TC 29 : ELECTROACOUSTICS	
SECRETARIAT: Denmark	SECRETARY: Ms Lise Aagesen
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any relevant "In Some Countries" clauses to be included should this proposal proceed. Recipients are reminded that the CDV stage is the final stage for submitting ISC clauses. (SEE AC/22/2007 OR NEW GUIDANCE DOC).

TITLE:

Electroacoustics - Personal sound exposure meters

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

At its meeting April 2024 in Warsaw, IEC/TC 29 took the following decision, doc. 29/1174/DL, refers:

DECISION 1
TC 29 decides to proceed with 2CD IEC 61252 "Electroacoustics – Personal sound exposure meters" as a CDV with the following target dates:
CDV: 2024-08-31
FDIS: 2025-08-31
Publication: 2025-11-30.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTROACOUSTICS – PERSONAL SOUND EXPOSURE METERS

FOREWORD

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IEC 61252 has been prepared by IEC technical committee 29: Electroacoustics. It is an International Standard.

This second edition cancels and replaces the first edition published in 1993, Amendment 1:2000, and Amendment 2:2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) personal sound exposure meters are required to provide indications of time-averaged sound level and peak sound level;
b) sound exposure is an optional quantity for indication;
c) specifications for physical quantities that do not follow the principle of equal-energy exchange rate have been added;
d) specifications for directional response have been added;

e) specifications for frequency weightings apply to the relative diffuse-field frequency response;

f) determination of conformance to specifications takes account of uncertainties of measurement;

g) detailed requirements for pattern-evaluation tests and periodic testing have been added.

The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The principal application for a personal sound exposure meter is the measurement of sound immission in the vicinity of a person's head, for example for assessment of occupational noise exposure in accordance with International Standards such as ISO 1999 and ISO 9612.

The microphone of a personal sound exposure meter is typically worn on the shoulder, collar, or other location close to the ear. In many practical situations the sound immission indicated by an instrument worn on a person is likely to be different from that which would be measured in the absence of a person. The influence of the person wearing a personal sound exposure meter should be considered when estimating the sound immission that would have been measured with the person absent.

The most common physical quantities for characterisation of sound immission are time-averaged sound levels and peak sound levels. For this reason, this document requires a personal sound exposure meter to provide indications of these sound levels.

It is also sometimes required to measure other quantities including sound exposure or sound exposure levels. Therefore, this document optionally allows a personal sound exposure meter to indicate these quantities.

Sound exposure is a physical measure that accounts for both the sound pressure and its duration, at a given location, through the time integral of the square of the instantaneous frequency-weighted sound pressure. A doubling (or halving) of the integration time of a constant sound level yields a doubling (or halving) of sound exposure. Similarly, an increase (or decrease) of 3 dB in a constant input sound level for a constant integration time yields a doubling (or halving) of the sound exposure. The same operating principle ("equal-energy exchange rate") underlies the measurement of sound exposure level.

The term "dose" is sometimes used to refer to a percentage of a predetermined criterion for exposure to noise in terms of a specified upper limit (often a legal limit) of a specified physical quantity. The physical quantity and the value of the limit vary between jurisdictions, and some jurisdictions specify quantities that are not based on the principle of equal-energy exchange. Therefore, this document allows a personal sound exposure meter to indicate these quantities and distinguishes between equal-energy-based and non-equal-energy-based quantities.

The title of this edition of the document has been changed because this edition includes requirements for pattern-evaluation tests and periodic testing in addition to performance specifications.

ELECTROACOUSTICS –
PERSONAL SOUND EXPOSURE METERS

1 Scope

This document specifies

– performance specifications for personal sound exposure meters,
– details of the tests necessary to verify conformance to all mandatory specifications for the purpose of pattern evaluation, and
– procedures for periodic testing of a personal sound exposure meter.

Personal sound exposure meters conforming to the requirements of this standard have a specified frequency response for sound incident on the microphone from all directions.

This document is applicable to instruments that are designed to be worn on a person in a configuration specified by the manufacturer for the measurement of sound immission resulting from steady, intermittent, fluctuating, irregular, or impulsive sounds. For reproducibility of results, specifications and tests for the response to sound waves apply without an operator present in the sound field.

This document specifies performance requirements for personal sound exposure meters of one performance class. The specifications generally correspond to those for a class 2 integrating-averaging sound level meter as given in IEC 61672-1:2013 for an A-weighted sound pressure level range at least from 67 dB to 137 dB and a nominal frequency range from 20 Hz to 8 kHz. The design goals and the acceptance limits for deviations from the design goals are representative of the performance of practical instruments. Personal sound exposure meters are unlikely to be suitable for measurement of sound levels outside these ranges.

Pattern evaluation tests and periodic tests described in this edition of this document apply to personal sound exposure meters for which the manufacturer claims conformance to the specifications given in this edition of this document.

The purpose of pattern evaluation is to determine whether a model of personal sound exposure meter conforms to all the performance specifications given in this document.

The purpose of periodic testing is to assure the user that the individual personal sound exposure meter conforms to the applicable performance specifications for a limited set of key tests and for the environmental conditions under which the tests are performed. The extent of the periodic tests is deliberately restricted to the minimum considered necessary. Because of the limited extent of the periodic tests, evidence of pattern approval is necessary to state that the individual personal sound exposure meter conforms to the complete set of specifications of this document.

The aim is to ensure that pattern evaluation and periodic testing are performed in a consistent manner by all laboratories.

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

ISO/IEC Guide 98-4, *Uncertainty of measurement – Part 4: Role of measurement uncertainty in conformity assessment*

ISO/IEC Guide 99, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

IEC 60942, *Electroacoustics – Sound calibrators*

IEC 61000-4-3:2020, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61094-6, *Electroacoustics – Measurement microphones – Part 6: Electrostatic actuators for determination of frequency response*

IEC 61183, Electroacoustics – Random-incidence and diffuse-field calibration of sound level meters

IEC 61672-1:2013, *Electroacoustics – Sound level meters – Part 1: Specifications*

IEC 61672-2:2013, *Electroacoustics – Sound level meters – Part 2: Pattern evaluation tests*

IEC 61672-3:2013, *Electroacoustics – Sound level meters – Part 3: Periodic tests*

IEC 62585:2012, *Electroacoustics – Methods to determine corrections to obtain the free-field response of a sound level meter*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC Guide 98-3, ISO/IEC Guide 98-4, ISO/IEC Guide 99, IEC 61000-4-3, IEC 61183, IEC 61672 (all parts), and IEC 62585 and the following apply.

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

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
sound exposure
time integral of the square of a frequency-weighted sound pressure signal over a stated time interval or event of stated duration

Note 1 to entry: Duration of integration is included implicitly in the time integral and is not always reported explicitly, although it is useful to state the nature of the event. For measurements of sound exposure over a specified time interval, duration of integration is usually reported and indicated by a suitable subscript to the letter symbol, for example as $E_{\mathrm{A,1\ h}}$.

Note 2 to entry: In symbols and as an example, A-weighted sound exposure $E_{A,T}$ is represented by

$$E_{A,T} = \int_{t_1}^{t_2} p_A^2(t)\mathrm{d}t \quad (1)$$

where $p_A^2(t)$ is the square of the A-weighted sound-pressure signal during integration time T starting at t_1 and ending at t_2.

Note 3 to entry: The unit of sound exposure is pascal-squared seconds (Pa^2s) if sound pressure is in pascals and running time is in seconds.

Note 4 to entry: For applications such as measurement of exposure to noise in the workplace, sound exposure in pascal-squared hours is more convenient than pascal-squared seconds.

[SOURCE: IEC 61672-1:2013, 3.11]

3.2
normalized 8 h-average sound level
level of the time-mean-square, A-weighted sound pressure during a normalization time period T_n of 8 h such that the sound exposure therefrom is equal to that of a time-varying sound at a place where total sound exposure occurs within a time period not necessarily 8 h

Note 1 to entry: The unit of normalized 8 h-average sound level is decibels.

Note 2 to entry: In symbols, a normalized 8 h-average sound level (letter symbol $L_{Aeq,8\,hn}$), relative to the reference sound pressure p_0 and the 8 h normalization time period T_n, is related to sound exposure E in pascal-squared hours by

$$L_{Aeq,8\,hn} = 10\lg\left[E \Big/ \left(p_0^2 T_n\right)\right] \quad (2)$$

or, alternatively, by:

$$E = \left(p_0^2 T_n\right)\left[10^{\left(0{,}1\times L_{Aeq,8\,hn}\right)}\right] \quad (3)$$

Note 3 to entry: For computations, a simpler form of Eq.(2) for normalized 8 h-average sound level is obtained, for sound exposure E in pascal-squared hours, after substituting the values of 20 µPa for p_0 and 8 h for T_n, as

$$L_{Aeq,8\,hn} = 10\lg\left[\left(E\times 10^9\right)\Big/ 3{,}2\right] \quad (4)$$

Note 4 to entry: When a total sound exposure is described indirectly by an A-weighted time-averaged sound pressure level $L_{Aeq,T}$, for an averaging time T greater or less than the normalization time period of 8 h, normalized 8 h-average sound level may be determined from

$$L_{Aeq,8\,hn} = L_{Aeq,T} + 10\lg\left(T/T_n\right) \quad (5)$$

Note 5 to entry: Annex A provides a table of normalized 8 h-average sound levels and corresponding sound exposures. For example, a sound exposure of 1 Pa^2h (irrespective of the period of time over which it is measured) corresponds to a normalized 8 h-average sound level of approximately 85 dB; a sound exposure of 3,20 Pa^2h corresponds to a normalized 8 h-average sound level of 90 dB.

Note 6 to entry: Normalized 8 h-average sound level in Eq.(2) is identical to "daily personal noise exposure" ($L_{EX,8h}$) defined in Article 2 of Directive 2003/10/EC of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise).

Note 7 to entry: Normalized 8 h-average sound level in Eq.(2) is also the same as "noise exposure level normalized to a nominal 8 h working day, $L_{EX,8\,h}$" defined in ISO 1999.

3.3

exchange rate

change in sound level corresponding to a doubling or halving of the duration of a steady input sound pressure signal while a constant percentage non-equal-energy sound exposure is maintained

3.4

non-equal-energy sound exposure

time integral of a power function of the time-weighted square of a frequency-weighted sound pressure signal over a stated time interval or event of stated duration

Note 1 to entry: Duration of integration is included implicitly in the time integral and is not always reported explicitly, although it is useful to state the nature of the event. For measurements of non-equal-energy sound exposure over a specified time interval, duration of integration is usually reported and indicated by a suitable subscript to the letter symbol, for example as $E_{\mathrm{neeA,1\ h}}$.

Note 2 to entry: In symbols and as an example, A-frequency weighted F-time weighted non-equal-energy sound exposure $E_{\mathrm{neeAF},T}$ is represented by

$$E_{\mathrm{neeAF},T} = \int_{t_1}^{t_2} \left(\left(\left/ \tau_{\mathrm{F}} \right. \right) \int_{-\infty}^{t} p_{\mathrm{A}}^2(\xi)\, \mathrm{e}^{-(t-\xi)/\tau_{\mathrm{F}}}\, \mathrm{d}\xi \right)^{10\lg(2)/Q} \mathrm{d}t \qquad (6)$$

where:

- τ_{F} is the exponential time constant in seconds for the F time weighting;
- ξ is a dummy variable of time integration from some time in the past, as indicated by -∞ for the lower limit of the integral, to the time of observation t;
- $p_{\mathrm{A}}(\xi)$ is the A-weighted instantaneous sound-pressure signal;
- Q is the exchange rate in decibels;
- T is the integration time beginning at t_1 and ending at t_2.

Note 3 to entry: The unit of sound exposure is pascal-squared seconds ($\mathrm{Pa^2s}$) if sound pressure is in pascals and running time is in seconds.

Note 4 to entry: For applications such as measurement of exposure to noise in the workplace, sound exposure in pascal-squared hours is more convenient than pascal-squared seconds.

Note 5 to entry: If the exchange rate were 3 dB and there were no time weighting, non-equal-energy sound exposure would be equivalent to sound exposure.

3.5

criterion duration

specified duration of time integration

Note 1 to entry: The criterion duration is typically chosen to be the maximum duration of exposure for the application, for example the duration of a working day.

3.6

criterion sound level

specified level of a sound

Note 1 to entry: The criterion sound level is typically chosen to be a level of sound which, if maintained for longer than the criterion duration or if exceeded, could have adverse effects.

3.7

criterion sound exposure

product of the criterion duration and the mean-square sound pressure corresponding to the criterion sound level

Note 1 to entry: The criterion sound exposure is typically chosen to be a legal limit. Such limits vary between jurisdictions and are subject to change.

3.8

criterion non-equal-energy sound exposure

product of the criterion duration and a power function of the mean-square sound pressure corresponding to the criterion sound level

Note 1 to entry: The criterion non-equal-energy sound exposure is typically chosen to be a legal limit. Such limits vary between jurisdictions and are subject to change.

3.9

percentage criterion sound exposure

quotient of sound exposure to criterion sound exposure, multiplied by 100

Note 1 to entry: The unit of percentage criterion sound exposure is per cent.

Note 2 to entry: In symbols and as an example, the percentage criterion sound exposure using frequency weighting A can also be calculated from:

$$D_{\mathrm{A}} = \left(100/T_{\mathrm{cr}}\right)\int_{t_1}^{t_2} 10^{0{,}1\left(L_{\mathrm{A}}-L_{\mathrm{cr}}\right)}\,\mathrm{d}t \tag{7}$$

where:

- T_{cr} is the criterion duration;
- the integration time begins at t_1 and ends at t_2;
- L_{A} is the A-frequency weighted sound level equivalent to the A-frequency-weighted input sound pressure;
- L_{cr} is the criterion sound level.

3.10

percentage criterion non-equal-energy sound exposure

quotient of non-equal-energy sound exposure to criterion non-equal-energy sound exposure, multiplied by 100

Note 1 to entry: The unit of percentage criterion non-equal-energy sound exposure is per cent.

Note 2 to entry: In symbols and as an example, the percentage criterion non-equal-energy sound exposure using frequency weighting A and time weighting S can also be calculated from:

$$D_{\mathrm{AS}Q} = \left(100/T_{\mathrm{cr}}\right)\int_{t_1}^{t_2} 10^{\left[\left(L_{\mathrm{AS}}-L_{\mathrm{cr}}\right)\left(\lg(2)/Q\right)\right]}\,\mathrm{d}t \tag{8}$$

where:

- Q is the exchange rate in decibels;
- T_{cr} is the criterion duration;
- the integration time begins at t_1 and ends at t_2;
- L_{AS} is the S-time-weighted A-frequency-weighted sound level equivalent to the A-frequency-weighted input sound pressure;
- L_{cr} is the criterion sound level.

Note 3 to entry: If the exchange rate were 3 dB and there were no time weighting, percentage criterion non-equal-energy sound exposure would be equivalent to percentage criterion sound exposure.

3.11

time-averaged non-equal-energy sound level

average sound level during the integration time over which a percentage criterion non-equal-energy sound exposure is measured

Note 1 to entry: In symbols and as an example, the time-averaged non-equal-energy sound level using frequency weighting A and time-weighting S can be calculated from:

$$L_{\mathrm{neeAS},T} = L_{\mathrm{cr}} + \left(Q/\lg(2)\right)\lg\left(D_{\mathrm{AS}Q}T_{\mathrm{cr}}/100T\right) \tag{9}$$

where:

- Q is the exchange rate in decibels;