



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

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<input checked="" type="checkbox"/> 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.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**ELECTROACOUSTICS –
PERSONAL SOUND EXPOSURE METERS****FOREWORD**

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182 Publications.

183 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is
184 indispensable for the correct application of this publication.

185 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a)
186 patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in
187 respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which
188 may be required to implement this document. However, implementers are cautioned that this may not represent
189 the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC
190 shall not be held responsible for identifying any or all such patent rights.

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

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

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

197 a) personal sound exposure meters are required to provide indications of time-averaged sound
198 level and peak sound level;

199 b) sound exposure is an optional quantity for indication;

200 c) specifications for physical quantities that do not follow the principle of equal-energy
201 exchange rate have been added;

202 d) specifications for directional response have been added;

- 203 e) specifications for frequency weightings apply to the relative diffuse-field frequency
204 response;
- 205 f) determination of conformance to specifications takes account of uncertainties of
206 measurement;
- 207 g) detailed requirements for pattern-evaluation tests and periodic testing have been added.

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

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

209 Full information on the voting for its approval can be found in the report on voting indicated in
210 the above table.
211

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

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

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

- 220 • reconfirmed,
- 221 • withdrawn,
- 222 • replaced by a revised edition, or
- 223 • amended.

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225

INTRODUCTION

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

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

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

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

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

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

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

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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.

301 2 Normative references

302 The following documents are referred to in the text in such a way that some or all of their content
303 constitutes requirements of this document. For dated references, only the edition cited applies.
304 For undated references, the latest edition of the referenced document (including any
305 amendments) applies.

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

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

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

312 IEC 60942, *Electroacoustics – Sound calibrators*

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

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

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

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

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

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

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

324 3 Terms and definitions

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

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

- 330 • IEC Electropedia: available at <https://www.electropedia.org/>
- 331 • ISO Online browsing platform: available at <https://www.iso.org/obp>

332 3.1

333 sound exposure

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

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

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

$$341 \quad E_{A,T} = \int_{t_1}^{t_2} p_A^2(t) dt \quad (1)$$

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

344 Note 3 to entry: The unit of sound exposure is pascal-squared seconds (Pa²s) if sound pressure is in pascals and
345 running time is in seconds.

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

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

349 **3.2** 350 **normalized 8 h-average sound level**

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

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

355 Note 2 to entry: In symbols, a normalized 8 h-average sound level (letter symbol $L_{Aeq,8\text{ hn}}$), relative to the reference
356 sound pressure p_0 and the 8 h normalization time period T_n , is related to sound exposure E in pascal-squared hours
357 by
358

$$359 \quad L_{Aeq,8\text{ hn}} = 10 \lg \left[E / (p_0^2 T_n) \right] \quad (2)$$

360 or, alternatively, by:

$$361 \quad E = (p_0^2 T_n) \left[10^{(0,1 \times L_{Aeq,8\text{ hn}})} \right] \quad (3)$$

362 Note 3 to entry: For computations, a simpler form of Eq.(2) for normalized 8 h-average sound level is obtained, for
363 sound exposure E in pascal-squared hours, after substituting the values of 20 µPa for p_0 and 8 h for T_n , as
364

$$365 \quad L_{Aeq,8\text{ hn}} = 10 \lg \left[(E \times 10^9) / 3,2 \right] \quad (4)$$

366 Note 4 to entry: When a total sound exposure is described indirectly by an A-weighted time-averaged sound
367 pressure level $L_{Aeq,T}$, for an averaging time T greater or less than the normalization time period of 8 h, normalized
368 8 h-average sound level may be determined from
369

$$370 \quad L_{Aeq,8\text{ hn}} = L_{Aeq,T} + 10 \lg(T/T_n) \quad (5)$$

371 Note 5 to entry: Annex A provides a table of normalized 8 h-average sound levels and corresponding sound
372 exposures. For example, a sound exposure of 1 Pa²h (irrespective of the period of time over which it is measured)
373 corresponds to a normalized 8 h-average sound level of approximately 85 dB; a sound exposure of 3,20 Pa²h
374 corresponds to a normalized 8 h-average sound level of 90 dB.

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

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

381 **3.3**382 **exchange rate**

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

386 **3.4**387 **non-equal-energy sound exposure**

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

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

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

396

$$397 \quad E_{neeAF,T} = \int_{t_1}^{t_2} \left(\left(\frac{1}{\tau_F} \right) \int_{-\infty}^t p_A^2(\xi) e^{-(t-\xi)/\tau_F} d\xi \right)^{10 \lg(2)/Q} dt \quad (6)$$

398 where:

- 399 - τ_F is the exponential time constant in seconds for the F time weighting;
- 400 - ξ is a dummy variable of time integration from some time in the past, as indicated by $-\infty$ for the lower limit
401 of the integral, to the time of observation t ;
- 402 - $p_A(\xi)$ is the A-weighted instantaneous sound-pressure signal;
- 403 - Q is the exchange rate in decibels;
- 404 - T is the integration time beginning at t_1 and ending at t_2 .

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

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

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

411 **3.5**412 **criterion duration**

413 specified duration of time integration

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

416 **3.6**417 **criterion sound level**

418 specified level of a sound

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

421 **3.7**422 **criterion sound exposure**

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

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

427 **3.8**
428 **criterion non-equal-energy sound exposure**

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

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

433 **3.9**
434 **percentage criterion sound exposure**

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

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

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

439

$$440 \quad D_A = (100/T_{cr}) \int_{t_1}^{t_2} 10^{0,1(L_A - L_{cr})} dt \quad (7)$$

441 where:

- 442 - T_{cr} is the criterion duration;
- 443 - the integration time begins at t_1 and ends at t_2 ;
- 444 - L_A is the A-frequency weighted sound level equivalent to the A-frequency-weighted input sound pressure;
- 445
- 446 - L_{cr} is the criterion sound level.

447 **3.10**
448 **percentage criterion non-equal-energy sound exposure**

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

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

452 Note 2 to entry: In symbols and as an example, the percentage criterion non-equal-energy sound exposure using
453 frequency weighting A and time weighting S can also be calculated from: [24](https://standards.iteh.ai/catalog/standards/sist/e7acd5a6-220a-401b-af0c-bbbc75a77da0/osist-pren-iec-61252-2024)

454

$$455 \quad D_{ASQ} = (100/T_{cr}) \int_{t_1}^{t_2} 10^{[(L_{AS} - L_{cr})(\lg(2)/Q)]} dt \quad (8)$$

456 where:

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

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

465 **3.11**
466 **time-averaged non-equal-energy sound level**

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

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

471

$$472 \quad L_{neeAS,T} = L_{cr} + (Q/\lg(2)) \lg(D_{ASQ} T_{cr} / 100T) \quad (9)$$

473 where:

- 474 - Q is the exchange rate in decibels;