SLOVENSKI STANDARD
SIST EN 50332-3:2017

01-september-2017

Oprema sistema ozvočenja: naglavne in ušesne slušalke skupaj z osebnimi glasbenimi predvajalniki - Metodologija za merjenje nivoja največjega zvočnega tlaka - 3. del: Merilna metoda za upravljanje z dozo zvoka

Sound system equipment: headphones and earphones associated with personal music players - maximum sound pressure level measurement methodology - Part 3: measurement method for sound dose management

Elektroakustische Geräte: Kopfhörer und Ohrhörer in Verbindung mit tragbaren Audiogeräten - Verfahren zur Messung des maximalen Schalldruckpegels - Teil 3: Messmethode für Schalldosis Management

Équipements de diffusion sonore: casques et écouteurs associés avec un lecteur de musique individuel - Méthode de mesure de niveau maximal de pression acoustique - Partie 3: Méthode de mesure pour la gestion de la dose de bruit

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17.140.50	Elektroakustika	Electroacoustics
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EUROPEAN STANDARD

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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European foreword

This document (EN 50332-3:2017) has been prepared by CLC/TC/108X "*Safety of electronic equipment within the fields of Audio/Video, Information Technology and Communication Technology*".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2018-01-02
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Introduction

Ideally, sound exposure assessment should be done with a normalized dosimeter located close to the head (ears) of the user during the whole time of the exposure. However, in the context of leisure activities, and for evident practical and economical reasons, this ideal methodology cannot be applied. For a user of a Personal Music Player (PMP), a dosimeter would even have to sit inside the ear canal, close to the tympanic membrane, with exposure data transformed to diffuse field equivalent. The aim of this European Standard is to define an alternative and more applicable methodology for estimating sound exposure from PMPs.

A PMP should inform the user about potentially harmful sound exposure, long-term as well as short-term. This is accomplished by including a rolling calculation of sound dose, *CSD*, and an estimation of momentary sound exposure level, *MEL*. In case *CSD* or *MEL* exceeds defined thresholds, the user is warned and/or PMP gain is lowered. All protections should remain in place when listening to any kind of typical PMP source (music, broadcast, game etc.), but not when, for instance, having a phone call. Annex A shows a block diagram of how a complete protection system might be realized.

By adding actual PMP dose estimation to EN 50332-1 and EN 50332-2, rather than assuming the average energy of programs and tracks, warnings become more relevant to the user. Relevance and trustworthiness is essential for one of the standard's objectives: its educational value.

If estimation relies only on feed-forward principles, some uncertainty in the prediction of *in vivo* dose will persist, for instance how earplugs or headphones are mounted, spread between transducers, spectral properties of transducers, broken transducers etc. Some uncertainties can be effectively dealt with when known combinations of PMPs and headphones are employed, while it may add to the uncertainty when components are acquired separately.

Regardless that earphones, earbuds or headphones for use with PMPs may not exceed defined limits with regard to sensitivity, it is acknowledged that extra uncertainty in the exposure estimation with arbitrary combinations of PMPs and transducers will persist. However, with this part 3, actual electrical measurement of source audio as part of dose estimation, a major contributor to warning errors in general, is eliminated.

1 Scope

This European Standard specifies sound dose measurement, and the alerts associated, to reduce the risk of listeners developing hearing impairment when using a Personal Music Player (PMP). The standard does not cover exposure from other sources than PMPs.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50332-1:2013, *Sound system equipment: Headphones and earphones associated with personal music players - Maximum sound pressure level measurement methodology - Part 1: General method for "one package equipment"*

EN 50332-2:2013, *Sound system equipment: Headphones and earphones associated with personal music players - Maximum sound pressure level measurement methodology - Part 2: Matching of sets with headphones if either or both are offered separately, or are offered as one package equipment but with standardised connectors between the two allowing to combine components of different manufacturers or different design*

EN 62368-1, *Audio/video, information and communication technology equipment - Part 1: Safety requirements (IEC 62368-1:2014)*

HD 483.1 S2, *Sound system equipment - Part 1: General*

3 Terms and definitions

For the purposes of this document, the terms and definitions of EN 50332-1:2013, EN 50332-2:2013 and EN 62368-1 apply.

4 Limits and calibration

4.1 General

EN 50332-3 builds on definitions from EN 50332-1 and EN 50332-2. Output limits and the calibration of the electro-acoustic loop remain unchanged, but actual audio shall be taken into account to determine maximum and minimum gain settings.

With the test signal, the relationship between sound exposure level and r.m.s. voltage remains the same, e.g. 80 dB SPL and 15 mV (EN 50332-2), see Figure 1.

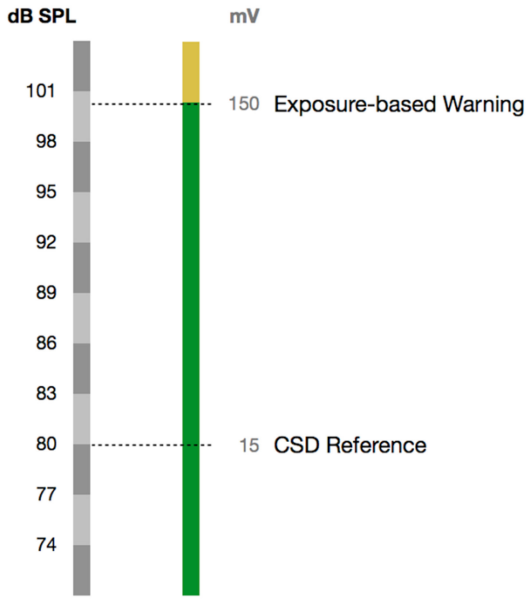

Figure 1 — Relationship between SPL and analog output voltage (mV r.m.s.), *CSD* reference and *MEL*-based warning; for the standard test signal

4.2 Headset Type variations

If a manufacturer implements a means of detecting the sensitivity of a headset plugged in, or provides a user selectable option, this sensitivity can be used to re-calibrate the electro-acoustic loop used for the limits and dose calculation, as long as the acoustic limits remain unchanged.

4.3 Headset Fit-variation

If a manufacturer implements a system accounting for headset fit-variation, in which the acoustic level estimates are more accurate than the proposed feed-forward system (for example, a closed-loop or hybrid system), these levels can serve as the limits and inputs to the dose calculation, as long as the acoustic limits remain unchanged.

5 Testing

5.1 General

This procedure verifies PMP sound exposure and dose estimation, based on the HATS method for acoustic testing, see EN 50332-1. (Five times re-seat calibration ref).

The “programme simulation” test signal specified in EN 50332-1 and EN 50332−2 is here referred to as “HD 483”. The same signal, but attenuated by 12 dB, is referred to as “HD 483-12L”.

Additional signals and more extensive procedures could be included to test the warning system rigorously; for example, mark-space ratio noise, test music etc. To keep it simple, however, requirements are based only on continuous noise as described in EN 50332–1 and −2, as the intentions behind dose estimation should be clear.

5.2 Test of PMP with headphones/plugs included

1) Exposure-based warning: Use measurement procedure of EN 50332-1. Play the HD 483 signal and adjust PMP gain control until the *MEL* warning is just activated. Measure the manikin diffuse field equivalent sound exposure and verify performance to be within tolerances, +- 3 dB.

   In case PMP maximum SPL is less than 99 dB, no Exposure-based warning is required.

2a) Dose estimation: Reset the *CSD* measurement and adjust the gain for a close to 100 dB SPL diffuse field equivalent measurement. Based on Table 1 and on the SPL measured, verify the time it takes for *CSD* to reach 100 %. Duration tolerance: +/- 3 dB time equivalents (Table 1). Verify that an appropriate *CSD* warning is given.

2b) Continue playing and verify that SPL is reduced to 80 dB SPL +/- 3 dB when a *CSD* of 500 % is reached. Duration tolerance: +/- 3 dB time equivalents (Table 1).

In case PMP maximum SPL is less than 80 dB, no Dose estimation is required. In case PMP max SPL is between 80 dB and 100 dB, set max PMP gain and use interpolation to verify dose estimates.

3) EBU R128 compatibility (optional): Switch source to HD 483-12L and verify that gain can be turned up high enough to produce SPL greater than or equal to 90 dB.

5.3 Test of PMP with headphones/plugs not included

1) Exposure warning: Play the HD 483 test signal and adjust PMP gain control until the *MEL* warning is just activated. Measure the output r.m.s. voltage and verify performance within tolerances, 133 mV - 169 mV = +/- 1dB.In case PMP maximum output is less than 133 mV, no Exposure-based warning is required.

2a) Dose estimation: Reset the *CSD* measurement and adjust the gain for a close to 150 mV r.m.s. per channel reading. Based on Table 1 and on the voltage measured, verify the time it takes for *CSD* to reach 100 %. Duration tolerance: +/- 1 dB time equivalents (Table 1). Verify that an appropriate *CSD* warning is given.

2b) Continue playing and verify that output voltage is reduced to 15 mV +/- 1 dB when a *CSD* of 500 % is reached. Duration tolerance: +/- 1 dB time equivalents (Table 1).

In case the PMP's maximum output voltage less than or equal to 15 mV, no dose estimation is required. In case the PMP's maximum output voltage is between 15 mV and 150 mV, set max PMP gain and use interpolation to verify dose estimates.

3) EBU R128 compatibility (optional): Switch source to HD 483-12L and verify that the gain can be turned up high enough to generate an output voltage of greated than or equal to 47 mV.