SLOVENSKI STANDARD
SIST EN 50332-1:2014

01-april-2014

Nadomešča:
SIST EN 50332-1:2001

Elektroakustične naprave: Naglavne in ušesne slušalke s pripadajočimi osebnimi glasbenimi predvajalniki - Metodologija za merjenje ravni največjega zvočnega tlaka - 1. del: Splošna metoda za "en komplet"

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"

Elektroakustische Geräte: Kopfhörer und Ohrhörer in Verbindung mit tragbaren Audiogeräten - Verfahren zur Messung des maximalen Schalldruckpegels -- Teil 1: Allgemeines Verfahren für "Original-Geräte-Sets"

Equipement de systèmes acoustiques: Casques et écouteurs associés avec un baladeur - Méthode de mesure de niveau maximal de pression acoustique -- Partie 1: Méthode générale pour "un équipement complet"

Ta slovenski standard je istoveten z: **EN 50332-1:2013**

ICS:

17.140.50	Elektroakustika	Electroacoustics
33.160.50	Pribor	Accessories

SIST EN 50332-1:2014 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50332-1

October 2013

ICS 17.140.50; 33.160.50

Supersedes EN 50332-1:2000

English version

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"

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CENELEC

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

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

Ref. No. EN 50332-1:2013 E

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Foreword

This document (EN 50332-1:2013) 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)	2014-09-23
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2016-09-23

This document supersedes EN 50332-1:2000.

EN 50332-1:2013 includes the following significant technical changes with respect to EN 50332-1:2000:

- deletion of limits;
- addition of digital signals;
- adaptations to use the term "personal music players".

EN 50332, *Sound system equipment: Headphones and earphones associated with personal music players — Maximum sound pressure level measurement methodology,* is composed with the following parts:

– *Part 1: General method for "one package equipment"*;
– *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*.

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1 Scope

The scope of this European Standard is to set up a suitable measuring methodology allowing accurate measurement of the maximum sound pressure level produced by consumer's headphones and earphones when associated with personal music players.

NOTE This standard does not apply to acoustically open or acoustically closed headphones associated with mains operated Hi-Fi home equipement nor does it apply to headphones for medical purposes (hard of hearing etc.) or to headphones or similar parts being part of active hearing protection systems. Other requirements for safety, e.g. for noise protection in offices and industry are not affected by this standard.

Requested features:

- The method should be reproducible and easily applicable to every type and shape of headphone or earphone available on the market (good mechanical adaptability).
- As safety and health are addressed, the method should faithfully reflect the pressure level effective at the user's ear (good correlation with subjective tests) to support protection against excessive sound pressure from personal music players (the limits themselves are found in EN 60950-1:2006/A12:2011 and EN 60065:2002/A12:2011 respectively).
- And finally, it is desirable to establish a global measuring procedure, including each component in the chain:

  Portable set
  + specific test signal
  + associated headphone or earphone.

The standard is split into two parts:

- Part 1 deals with sets provided as a package equipment by the manufacturer. In this case, "Personal music players" means the association of one set (compact cassette player, FM radio receiver, digital media player, streaming audio player…) with supplied headphones or earphones.
- Part 2 gives guidelines to associate portable audio sets (FM radio receiver, digital media player, streaming audio player…) with headphones or earphones provided separately by any source. And the package sets with standardised connectors or interfaces between the two allowing to combine components of different manufacturers or different design.

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.

HD 483.1 S2, *Sound system equipment — Part 1: General (IEC 60268-1)*

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 60094-7, *Magnetic tape sound recording and reproducing systems — Part 7: Cassette for commercial tape records and domestic use (IEC 60094-7)*

EN 60268-7, *Sound system equipment — Part 7: Headphones and earphones (IEC 60268-7)*

EN 60315-4, *Methods of measurement on radio receivers of various classes of emission — Part 4: Receivers for frequency-modulated sound broadcasting emissions (IEC 60315-4)*

EN 60318-4, *Electroacoustics — Simulators of human head and ear — Part 4: Occluded-ear simulator for the measurement of earphones coupled to the ear by means of ear inserts (IEC 60318-4)*

EN 61260, *Elecroacoustics — Octave-band and fractional-octave-band filters (IEC 61260)*

EN 61672-1, *Electoacoustics — Sound level meters — Part 1: Specifications (IEC 61672-1)*

IEC 60318-7, *Electroacoustics — Simulators of human head and ear — Part 7: Head and torso simulator for acoustic measurement of hearing aids*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
equivalent continuous A-weighted sound pressure level
$L_{Aeq,T}$
equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$) defined in EN 61672-1 as follows:

$$L_{Aeq,T} = 10\lg\left\{\left(\frac{1}{T}\int_{t_1}^{t_2} p_A^2(t)dt\right) \Big/ p_0^2\right\} \quad dBA$$

where

$L_{Aeq,T}$ is the equivalent continuous A-weighted sound pressure level re 20 μPa, determined over a time integration interval $T = t_2 - t_1$;

$p_A(t)$ is the instantaneous A-weighted sound pressure of the sound signal;

p_0 is the reference sound pressure of 20 μPa

4 Measuring principle

4.1 General description

The free field frequency response of a head and torso simulator is defined as follows:

The difference, as a function of frequency, between the sound pressure level at the ear simulator microphone with the reference point of the manikin at the test point and the sound pressure level at the test point with the manikin absent from a sound source at the 0 degree azimuth and 0 degree elevation angles.

The diffuse field frequency response of a head and torso simulator is defined as follows:

The difference, as a function of frequency, between the sound pressure level at the ear simulator microphone with the reference point of the manikin at the test point and the sound pressure level at the test point with the manikin absent from a sound field with a high number of reflections that, at any given point in that diffuse field, sound arrives from all angles in a uniform manner.

The sound pressure level produced by headphones or earphones can be measured by subjective methods or by objective methods.

The reference method for evaluating the sound pressure level emitted by earphones is a psycho acoustic method known as "equal loudness" (EN 60268-7). It consists in using human test subjects to compare the level of sound emitted by a speaker to that emitted by an earphone.

Nevertheless, this subjective method becomes inadequate – and hazardous – when high levels are to be evaluated.

The solution is to use an objective measurement method, giving both a good reproducibility and a good correlation with subjective tests.

4.2 Measuring principle

This standard is based on the use of a Head and Torso Simulator (HATS). The manikin in accordance with IEC 60318-7 is fitted with an occluded ear simulator (as described in EN 60318-4) and an ear canal extension (8,8 mm length and diameter 7,5 mm ± 0,02 mm). Alternatively, the HATS as described in ITU-T P.58 in conjunction with ITU-T P.57 may be used, which is usually used for telephonometric use.

NOTE 1 Industrial realisation of these simulators use pinnaes of different material properties leading to different results. Thus, the type of pinnae needs to be stated in the measurement protocol.

NOTE 2 Because the full range of equipment covered by this standard used to be measured with two different types of HATS, this standard offers to select between both.

The sound pressure level measured by the ear simulator microphone represents the pressure found at eardrum level and differs from that of the free field or diffuse field pressure by the HATS transfer function.

Free field (0-0 free field) or diffuse field response shall be used.

Weighting curve A shall be used.

The results are given as “(free field) or (diffuse field) related A-weighted equivalent continuous sound pressure levels (L_{Aeq})”.

5 Test signal

5.1 General

Actual musical signals are continuously fluctuating in both amplitude and spectral contents and thus cannot be used as test signals.

As the frequency response curve of earphones may show considerable fluctuations, accurate measurements cannot be performed using a sinusoidal signal at a determined frequency (e.g. 1 kHz).

The test signal shall therefore be a full audio frequency band for the equipment under test, the spectral content of which is representative of the musical signals.

The test signal used to determine the maximum sound pressure level of headphones shall be programme simulation noise, as defined in HD 483.1 S2.

NOTE 1 HD 483.1 S2 defines a test signal called "programme simulation signal" described as: "A signal whose mean power spectral density closely resembles the average of the mean power spectral densities of a wide range of programme material, including both speech and music of several kinds". This signal is a weighted stationary Gaussian noise and can be obtained from pink noise with a suitable filter network.

This programme simulation noise shall have a crest factor ranging between 1,8 and 2,2. Thus, this signal will be easy to record on various media.

NOTE 2 Analog noise generated with higher crest factor can be adjusted to the given range by clipping. For digital interfaces this value remains if the analog peak values do not leave the A/D conversion range.

Since portable cassette and CD players are playback only devices, it is necessary to define a reference cassette and a reference CD for test.

The test signal level is a major issue, as the whole measuring process will depend on this setting.

5.2 Test signal level for analogue recorders

With analogue tape recording on compact cassette, "0 dB" level recording corresponds by definition to a flux value of 250 nWb/m at a frequency of 315 Hz (EN 60094-2).

The recording level of the test cassette shall be set considering both the frequency spectrum and the crest factor of programme simulation noise:

- the test recording tape shall be type 1 magnetic tape according to EN 60094-7;
- the test signal shall be recorded at an RMS value of - 6 dB (ref 250 nWb/m at 315 Hz);
- the noise reduction system shall be switched off.

5.3 Test signal level for FM radio

Measurements on receivers for frequency modulated sound broadcasting emissions are defined in EN 60315-4.

NOTE Signal peak to peak level at a receiver's output is directly proportional to the peak frequency deviation of the RF carrier.

In order to comply with the definition of maximum peak frequency deviation (determined with a sinusoidal modulating waveform), and to take into account pre-emphasis influence, the test signal applied at the input of the RF generator shall be set at an RMS value of - 6 dB related to the amplitude of a sinusoidal waveform at 250 Hz, producing a peak to peak deviation of ± 75 kHz.

5.4 Test signal level for digital music players

This subclause also covers DAB players and music players as part of other digital equipment, such as mobile phones.

The test signal is the programme simulation noise as defined in HD 483.1 S2. For digital listening devices, the test signal shall be applied to the listening device with an r.m.s. amplitude of - 10 dBFS, where 0 dBFS is defined as being the maximum RMS amplitude of a sinusoidal signal corresponding to the full scale of the digital interface.

The test signal shall be recorded, prior to the test, into the memory of the personal music player or on any appropriate media in a lossless format (such as WAV). The recorded signal shall not be clipped

NOTE Lossy compression will alter the frequency content of the test signal in unpredictable ways.

6 Measuring arrangement and test protocol

6.1 General

The device under test plays the recorded test signal (for operating conditions, see 6.3). Earphones or headphones shall be correctly positioned on the HATS. The sound pressure level emitted by the earphones or headphones of the personal music player is measured, for both right and left ear, by a third octave analyser connected to the microphone of the HATS ear simulator.

For each third octave band, the 0-0 free field or diffuse field response of HATS is subtracted from the value of the pressure level delivered by HATS.