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INTERNATIONAL STANDARD

Sound system equipment –
Part 7: Headphones and earphones

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FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60268-7 has been prepared by IEC technical committee TC 100: Audio, video and multimedia systems and equipment.

This third edition cancels and replaces the second edition published in 1996, and constitutes a technical revision. This edition contains the following changes:

- clause/subclause renumbering in accordance with ISO/IEC Directives, Part 2;
- addition of a measurement system using HATS;
- addition of details on pinna simulators for high measurement reproducibility, see Annex A.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/1621/FDIS	100/1641/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 60268 series, published under the general title *Sound system equipment,* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

A bilingual version of this publication may be issued at a later date.

The contents of the corrigendum of November 2012 have been included in this copy.

SOUND SYSTEM EQUIPMENT –

Part 7: Headphones and earphones

1 Scope

This part of IEC 60268, is applicable to headphones, headsets, earphones and earsets, intended to be used on, or in, the human ear. It also applies to equipment, such as pre-amplifiers, passive networks and power supplies which form an integral part of the headphone system.

It does not deal with:

a) safety, for which reference should be made to IEC 60065 or another appropriate standard;

b) the characteristics of microphones of headsets, for which reference should be made to IEC 60268-4;

c) earphones and other devices for hearing aids, for which reference should be made to IEC 60118-0;

d) headphones for audiometry;

e) headphones and other devices which form part of an active ear-defender system, although some of its provisions may be applicable.

This standard specifies the characteristics which should be included by the manufacturer in specifications, and relevant methods of measurement. It includes a classification of the different types of earphone, mainly characterized by the way in which the transducer is coupled acoustically to the ear, and a classification code which may also be used for marking.

2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60038, *IEC standard voltages*

IEC 60050(801):1994, *International Electrotechnical Vocabulary – Chapter 801: Acoustics and electroacoustics*

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60086-1, *Primary batteries – Part 1: General*

IEC Guide 106, *Guide for specifying environmental conditions for equipment performance rating*

IEC 60263, *Scales and sizes for plotting frequency characteristics and polar diagrams*

IEC 60268-1, *Sound system equipment – Part 1: General*

IEC 60268-2, *Sound system equipment – Part 2: Explanation of general terms and calculation methods*

IEC 60268-11, *Sound system equipment – Part 11: Application of connectors for the interconnection of sound system components*

IEC 60268-12, *Sound system equipment – Part 12: Application of connectors for broadcast and similar use*

IEC 60711, *Occluded-ear simulator for the measurement of earphones coupled to the ear by ear inserts*[1]

IEC TR 60959, *Provisional head and torso simulator for acoustic measurements on air conduction hearing aids*[2]

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

ISO 3741, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Precision methods for reverberation rooms*

ISO 4869-1, *Acoustics – Hearing protectors – Part 1: Subjective method for the measurement of sound attenuation*

ISO 4869-3, *Acoustics – Hearing protectors – Part 3: Measurement of insertion loss of ear-muff type protectors using an acoustic test fixture*

ISO 7619-1, *Rubber, vulcanized and thermoplastic – Determination of indentation hardness – Part 1: Durometer method (Shore hardness)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply, see also IEC 60050-801 (IEV).

NOTE Any device defined in 3.1 to 3.15 and their connector(s) for electrical input should be regarded as part of the transducer.

3.1
earphone
electroacoustic transducer by which acoustic oscillations are obtained from electric signals and intended to be closely coupled acoustically to the ear

[IEV 801-27-18]

3.2
headphone
assembly of one or two earphones on a headband or chinband, the use of which may be optional (e.g. with intra-concha earphones)

3.3
headset
headphones equipped with a microphone

3.4
earset
earphones equipped with a microphone

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1 This publication will be replaced by future IEC 60318-4 (to be published).

2 This publication is planned to be replaced by future IEC 60318-7 (under consideration).

NOTE This definition is included because the term appears in the catalogue of IEC publications.

3.5
insert earphone
small earphone that is attached directly to a connecting element, for example an earmould, inserted into the ear canal

[IEV 801-27-22, modified]

3.6
intra-concha earphone
small earphone that fits in the concha cavity, with its acoustic exit close to the entrance of the ear canal

3.7
supra-aural earphone
earphone applied externally to the outer ear and intended to rest on the pinna

[IEV 801-27-23, modified]

3.8
supra-concha earphone
earphone intended to rest on the ridges of the concha cavity

3.9
circumaural earphone
earphone having a cavity large enough to cover the region of the head including the ear

[IEV 801-27-24]

3.10
ear shell
circumaural type of earphone hanging on the ear

3.11
stethoscopic headphone
insert headphone by which the earphone(s) is/are coupled to the ears by means of a pair of rigid tubes, so that the assembly resembles a stethoscope

3.12
acoustically open earphone
earphone which intentionally provides an acoustic path between the external environment and the ear canal

3.13
acoustically closed earphone
earphone which is intended to prevent acoustic coupling between the external environment and the ear canal

3.14
closed-back earphone
earphone which does not emit significant sound radiation from the back of the transducer to the external environment

3.15
open-back earphone
earphone which emits significant sound radiation from the back of the transducer to the external environment

3.16
simulated programme signal
signal whose mean power spectral density closely resembles the average of the mean power spectral densities of a wide range of programme material, in accordance with IEC 60268-1.

NOTE This signal is called as “wide band signal” in a few standards.

4 Classification, designation and coding

The following designations and classification codes shall be used:

60268-7 - IEC - XXXX - NNRN - N

where

60268-7-IEC is the standard form of prefix.

- X (first letter) gives the principle of the transducer:
  - D - electrodynamic (moving coil);
  - E - electret (self-polarizing);
  - F - piezo-electric (polymer);
  - M - electromagnetic (moving armature or diaphragm);
  - P - piezo-electric (ceramic);
  - S - electrostatic (externally polarized).
- X (second letter) gives the type of earphone:
  - C - circumaural;
  - E - intra-concha;
  - H - earshell;
  - I - insert;
  - M - supra-concha;
  - S - supra-aural;
  - T - stethoscopic.

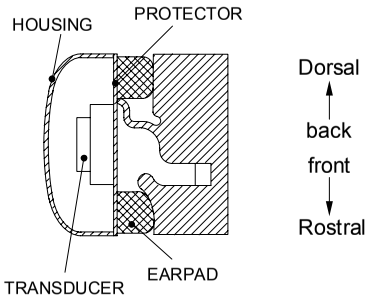
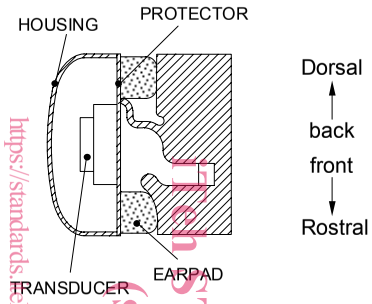
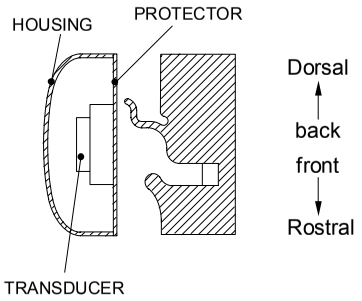
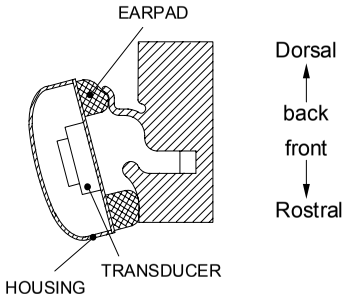
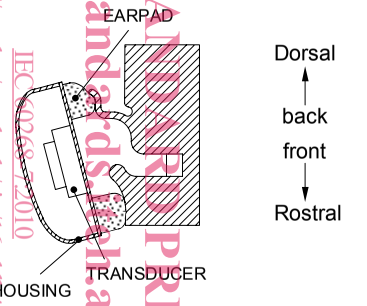
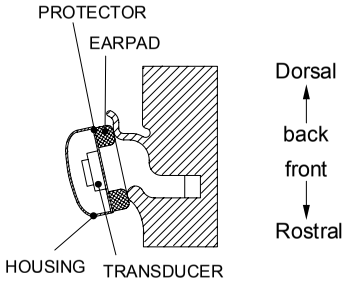
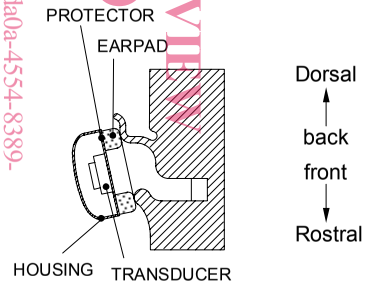
An illustration of the types, except “H”, is given in Figure 1.

- X (third letter) gives the intended nature of the acoustic coupling to the ear canal:
  - L - acoustically open (controlled leakage);
  - S - acoustically closed (minimum leakage).
- X (fourth letter) gives the intended nature of the radiation to the external environment:
  - C - closed-back (see 3.14);
  - O - open-back (see 3.15).

An illustration of the four possibilities defined in 3.12 to 3.15, and indicated by the third and fourth classification letters, is given in Figure 2:

- NNRN (first number) gives the impedance in ohms in "mantissa and exponent" form. (For example, 8 Ω as "08R0", 32 Ω as "32R0" and 600 Ω as "06R2");
- N (second number) gives the number of channels.

The code, compiled in accordance with the above rules, may be used for marking.

Type of earphone	Acoustically closed earphone (minimum leakage)	Acoustically open earphone (controlled leakage)	Ear loudspeaker
Circumaural			
Supra-aural			
Supra-concha			

NOTE The transducers shown in the schematics are not necessarily positioned in the centre of the housings or concentric to the ear canal.

Figure 1 – Diagrammatic horizontal sections showing types of earphones and their spatial relationships with the pinna and/or canal entrance

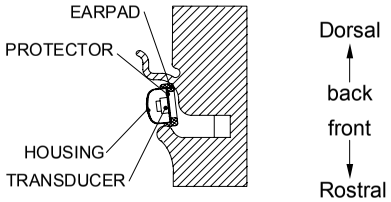
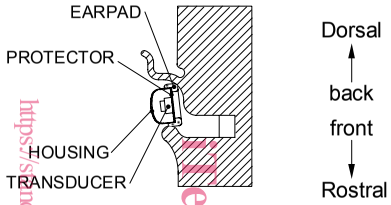
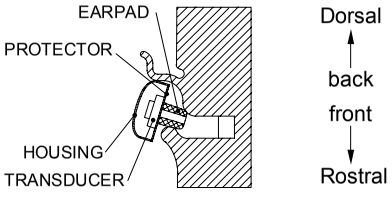
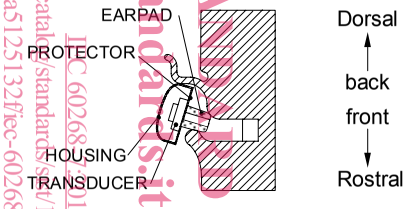
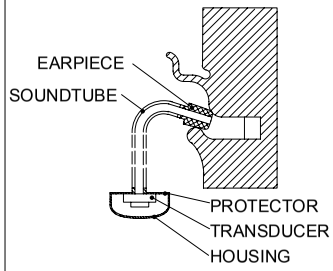
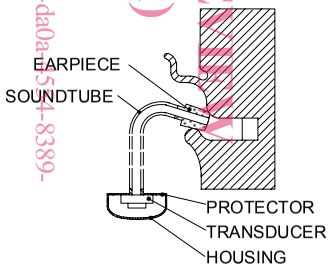
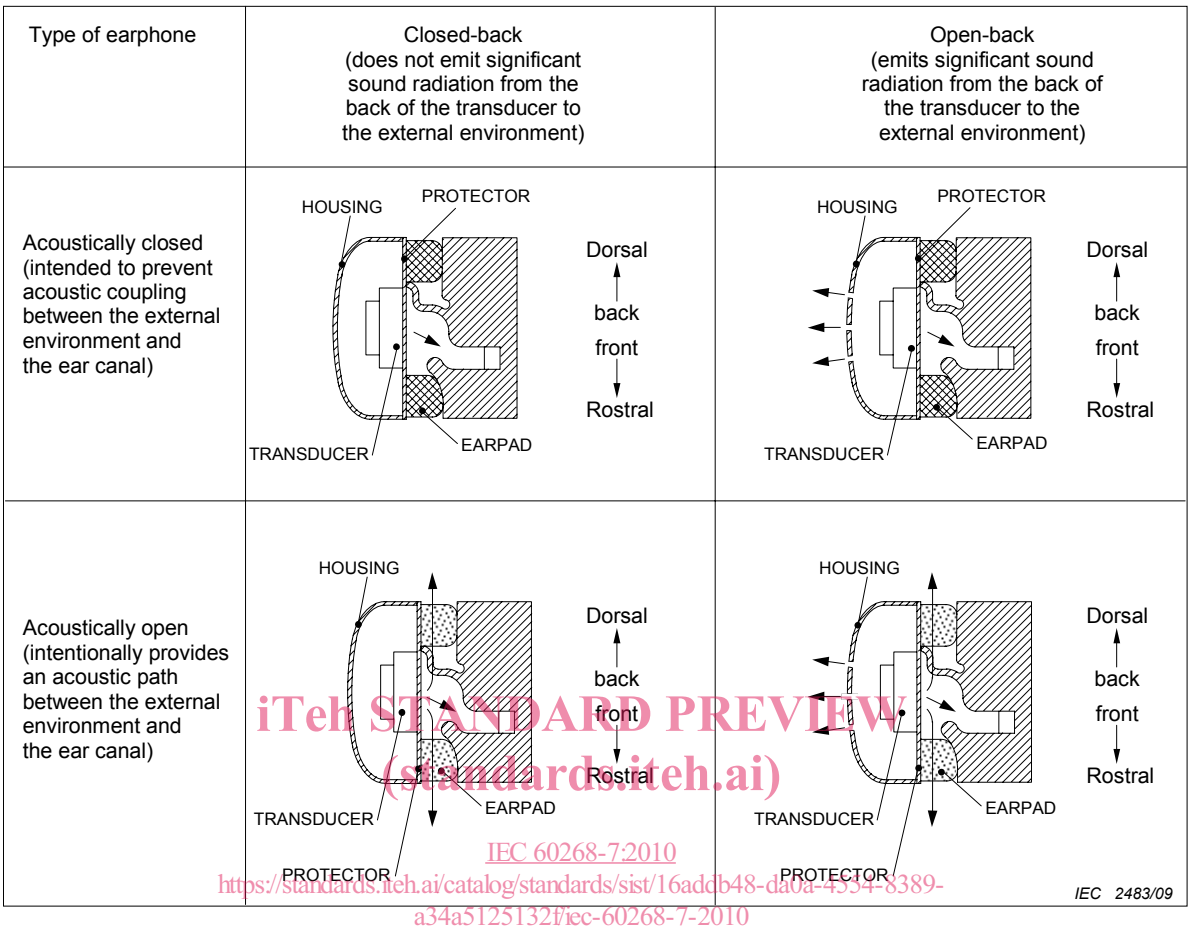
Type of earphone	Acoustically closed earphone (minimum leakage)	Acoustically open earphone (controlled leakage)	
Intra-concha			
Insert			
Insert with sound tube between transducer and earpiece (for example, stethoscopic type of earphone for hearing aid)			Key Cross hatching shows acoustically closed earpad to accomplish minimum leakage. Spotted by small circle shows porous material earpad to accomplish controlled leakage. IEC 2482/09

Figure 1 *(continued)*



NOTE 1 Arrows show sound flow or sound leakage.

NOTE 2 The transducers shown in the schematics are not necessary positioned in the centre of the housings or concentric to the ear canal.

Figure 2 – Diagrams showing the four possible construction: acoustically open or closed, and closed- or open-back

5 Marking of terminals, controls and polarity

Requirements for marking terminals and controls are given in IEC 60268-1, and for polarity in IEC 60268-2. In addition, headphones which are intended to be worn with a particular earphone on each ear shall be marked to indicate the "left" and "right" earphones. If a colour marking is used, the "right" earphone shall be indicated by a red marking. For the sake of visually-impaired persons, it is recommended to indicate the left earphone by a projection of at least 1,5 mm diameter and 0,3 to 0,5 mm height.

6 User instructions

The user instructions shall include information on:

- connector contact assignments (see IEC 60268-11);
- controls and switches (if any);
- microphone (if any);