

INTERNATIONAL STANDARD

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**Sound system equipment –
Part 7: Headphones and earphones**

**Equipements pour systèmes électroacoustiques –
Partie 7: Casques et écouteurs**

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**Sound system equipment -
Part 7: Headphones and earphones**

FOREWORD

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IEC 60268-7 has been prepared by technical area 20: Analog and digital audio, of IEC technical committee 100: Audio, video and multimedia systems and equipment. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2010, and Amendment 1 of 2020. This edition constitutes a technical revision.

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

- consolidated with IEC 60268-7:2010/AMD1:2020;
- clause/subclause/annex reconstruction and renumbering;
- addition of effective frequency range of the free-field / diffuse-field compensated frequency response;

- update of measurement methods of modulation distortion and difference-frequency distortion;
- addition of details of two-tone distortion measurements, see Annex I;
- addition of details of left-right tracking response for stereo headphones, see Annex J.

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

Draft	Report on voting
100/4303/FDIS	100/4341/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.

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

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.

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- reconfirmed,
- withdrawn, or
- revised.

1 Scope

This part of IEC 60268 is applicable to headphones, earphones, headsets 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.

This document does not deal with:

- a) safety, for which reference is made to IEC 62368-1 or another appropriate standard;
- b) the characteristics of microphones of headsets, for which reference is made to IEC 60268-4;
- c) earphones and other devices for hearing aids, for which reference is 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 the provisions of this document can be applicable;
- f) active noise cancelation characteristics as covered by IEC 60268-24.

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

Rated conditions and characteristics in this document provided by the manufacturer are not generally intended for external verification. Measurement methods for rated characteristics are informative and are provided for the benefit of manufacturers for the purpose of test repeatability and data comparison. All other specifications and tests are provided for testing by the manufacturer and for external testing and verification.

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.

IEC 60038, *IEC standard voltages*

IEC 60050-801, *International Electrotechnical Vocabulary – Part 801: Acoustics and electroacoustics*, available at <https://www.electropedia.org>

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

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 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 60318-7, *Electroacoustics – Simulators of human head and ear – Part 7: Head and torso simulator for the measurement of sound sources close to the ear*

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

ISO 266:1997, *Acoustics – Preferred frequencies*

ISO 48-4:2018, *Rubber, vulcanized or thermoplastic – Determination of hardness – Part 4: Indentation hardness by durometer method (Shore hardness)*

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-801 (IEV) 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>

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 intended to be closely coupled to the ear

[SOURCE: IEC 60050-801:1994, 801-27-18, modified – Reference to acoustical oscillations has been omitted from the definition.]

3.2

headphone

assembly of one or two earphones on a headband

Note 1 to entry: The use of a headband (or chin-band) can be optional, e.g. in the case of intra-concha or insert devices.

[SOURCE: IEC 60050-801:1994, 801-27-20, modified – Note to entry added.]

3.3

headset

headphones equipped with a microphone

3.4

earset

earphones equipped with a microphone

3.5

insert earphone

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

[SOURCE: IEC 60050-801:1994, 801-27-22, modified – Reference to outer ear has been omitted from the definition.]

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

[SOURCE: IEC 60050-801:1994, 801-27-23, modified – The wording "and intended to rest on the pinna" has been added to the definition.]

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

[SOURCE: IEC 60050-801:1994, 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 or earphones 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 1 to entry: This signal is called a "wide band signal" in a few standards.

3.17**head and torso simulator****HATS**

simulator of a median adult human head and part of the torso extending in total from the top of the head to the waist and designed to simulate the sound pick-up characteristics and acoustic diffraction

Note 1 to entry: The head and torso simulator includes two pinna simulators, and at least one occluded-ear simulator.

[SOURCE: IEC 60318-7:2022, 3.1, modified – The preferred term "manikin" has been omitted, and the abbreviated term "HATS" added.]

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 - piezoelectric (polymer);
 - M - electromagnetic (moving armature or diaphragm);
 - P - piezoelectric (ceramic);
 - S - electrostatic (externally polarized).
- X (second letter) gives the type of earphone:
 - C - circumaural;
 - E - intra-concha;
 - H - ear shell;
 - I - insert;
 - M - supra-concha;
 - S - supra-aural;
 - T - stethoscopic.

An illustration of the types of earphones, 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.

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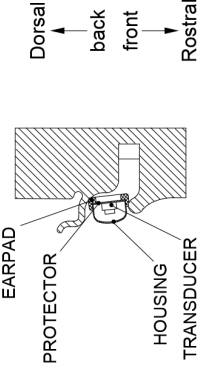
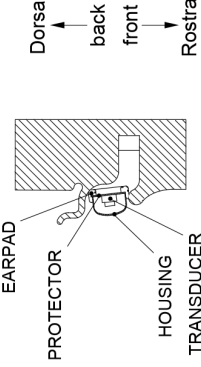
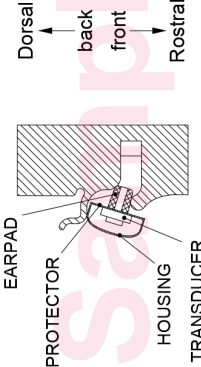
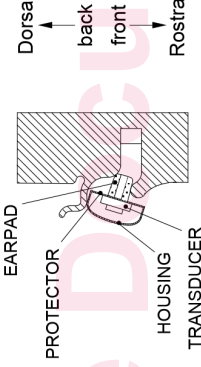
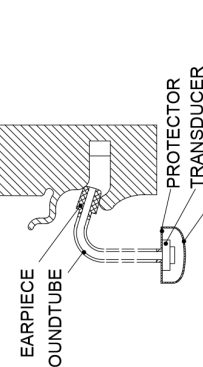
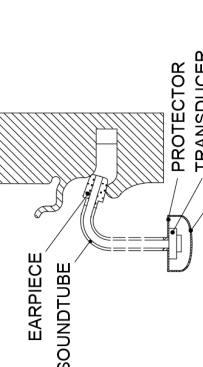


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Type of earphone	Acoustically closed earphone (minimum leakage)	Acoustically open earphone (controlled leakage)	Ear loudspeaker
Circumaural			
Supra-aural			
Supra-concha			

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

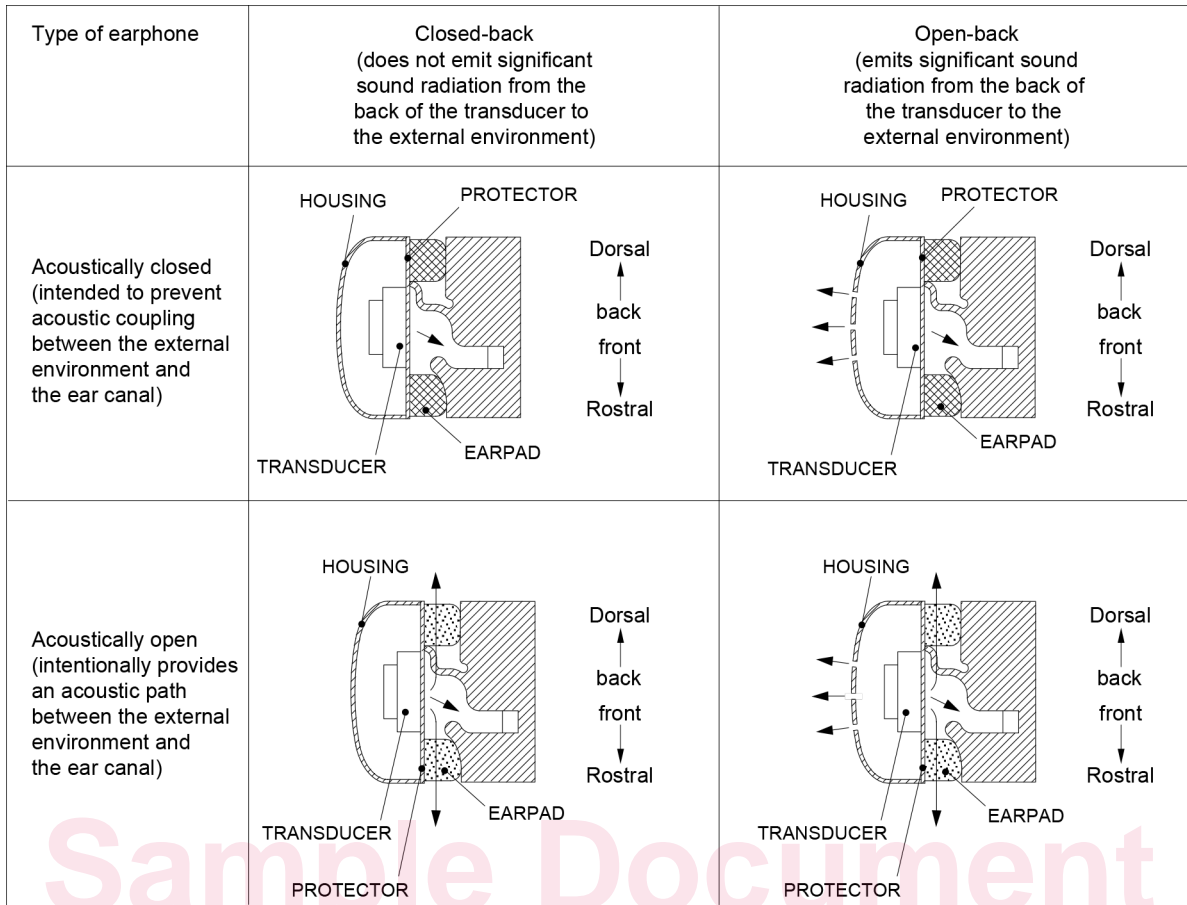
a) Circumaural, supra-aural and supra-concha type earphone

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)			<p>Key</p> <ul style="list-style-type: none">  Cross hatching shows acoustically closed earpad to accomplish minimum leakage.  Spotted by small circle shows porous material earpad to accomplish controlled leakage.

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b) Intra-concha, insert and insert with sound tube between transducer and earpiece type earphone

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



IEC

NOTE 1 Arrows show sound flow or sound leakage.

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

**Figure 2 – Diagrams showing the four possible constructions:
Acoustically open or closed, and closed- or open-back earphones**

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 mm to 0,5 mm height.