

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

---

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

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





## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2010 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC online collection - [oc.iec.ch](http://oc.iec.ch)

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

---

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Recherche de publications IEC - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC online collection - [oc.iec.ch](http://oc.iec.ch)

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

---

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

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 33.160.50

ISBN 978-2-8322-9436-9

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references .....	6
3 Terms and definitions .....	7
4 Classification, designation and coding.....	9
5 Marking of terminals, controls and polarity.....	13
6 User instructions .....	13
7 Conditions for specifications and measurements .....	14
7.1 Rated conditions .....	14
7.2 Standard conditions for measurement .....	15
7.3 Couplers and ear simulators.....	15
7.4 Measurement conditions for simulated programme signal.....	15
7.5 Loudness comparison conditions.....	16
7.5.1 General .....	16
7.5.2 Free-field comparison conditions .....	16
7.5.3 Diffuse-field comparison conditions .....	17
7.6 Ear canal sound pressure level measurement conditions.....	17
8 Characteristics to be specified and their methods of measurement.....	17
8.1 Power supply.....	17
8.2 Electrical impedance .....	17
8.2.1 Rated impedance .....	17
8.2.2 Impedance/frequency characteristic.....	18
8.2.3 Rated source impedance .....	18
8.3 Input voltage .....	18
8.3.1 Rated source e.m.f. ....	18
8.3.2 Limiting values of input voltage.....	18
8.3.3 Characteristic voltage.....	19
8.3.4 Simulated programme signal characteristic voltage .....	20
8.3.5 Simulated programme signal characteristic voltage corrected by A-weighting characteristics and free-field response compensation.....	20
8.3.6 Protective devices .....	21
8.4 Input power .....	21
8.5 Source pressure (level) .....	22
8.5.1 General .....	22
8.5.2 Characteristics to be specified .....	22
8.5.3 Method of measurement .....	22
8.6 Frequency response.....	23
8.6.1 General .....	23
8.6.2 Coupler or ear simulator (including HATS) frequency response .....	23
8.6.3 Free-field comparison frequency response .....	24
8.6.4 Diffuse-field comparison frequency response.....	25
8.6.5 Free-field and diffuse-field ear canal sound pressure level frequency responses.....	25
8.6.6 Rated frequency range .....	27
8.7 Amplitude non-linearity.....	27
8.7.1 General .....	27
8.7.2 Harmonic distortion .....	27

8.7.3	Modulation distortion .....	28
8.7.4	Difference-frequency distortion .....	28
8.8	Rated climatic conditions .....	29
8.9	External electric and/or magnetic field .....	29
8.9.1	Characteristics to be specified .....	29
8.9.2	Method of measurement .....	29
8.10	Unwanted sound radiation .....	29
8.10.1	Characteristic to be specified .....	29
8.10.2	Method of measurement .....	30
8.11	Sound attenuation .....	30
8.11.1	Characteristic to be specified .....	30
8.11.2	Method of measurement .....	30
8.12	Crosstalk attenuation for multi-channel headphones .....	30
8.12.1	Characteristic to be specified .....	30
8.12.2	Method of measurement .....	30
8.13	Application force .....	30
8.13.1	Characteristic to be specified .....	30
8.13.2	Method of measurement .....	30
8.14	Physical characteristics, cables and connectors .....	31
8.14.1	Characteristics to be specified .....	31
9	Classification of characteristics .....	32
Annex A (normative)	Pinna simulators for measurement of headphones and earphones .....	33
Annex B (normative)	Specification and conditions of use of a microphone for use inside the ear canal .....	42
Annex C (informative)	Practical details of free-field comparison conditions .....	43
Annex D (informative)	Practical details of diffuse field comparison conditions .....	44
Annex E (informative)	Practical details of the subjective comparison and ear canal sound pressure level conditions .....	45
	Bibliography .....	46
Figure 1	– Diagrammatic horizontal sections showing types of earphones and their spatial relationships with the pinna and/or canal entrance .....	11
Figure 2	– Diagrams showing the four possible construction: acoustically open or closed, and closed- or open-back .....	13
Figure 3	– Illustrated measurement diagram by simulated programme signal .....	16
Figure A.1	– Shape of the recommended pinna simulator .....	34
Figure A.2	– Coordinate for the recommended pinna simulator .....	35
Figure A.3	– Cross-sectional shapes and dimensions of the recommended pinna simulator, horizontal section .....	38
Figure A.4	– Cross-sectional shapes and dimensions of the recommended pinna simulator, vertical section .....	41
Table 1	– Classification of characteristics .....	32

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SOUND SYSTEM EQUIPMENT –****Part 7: Headphones and earphones**

## 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 Publications"). 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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 systems 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.

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 noise 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):1996, *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 testing*

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*