IEC 60268-7

Edition 4.0 2025-06
COMMENTED VERSION

INTERNATIONAL STANDARD

Sound system equipment –
Part 7: Headphones and earphones

ICS 33.160.50

ISBN 978-2-8327-0547-6

IEC 60268-7:2025-06 CMV(en)

CONTENTS

FOREWORD 4
~~INTRODUCTION to Amendment 1 .....~~
1 Scope 7
2 Normative references 7
3 Terms and definitions 8
4 Classification, designation and coding 11
5 Marking of terminals, controls and polarity 14
6 User instructions 15
7 Conditions for specifications and measurements 15
7.1 Rated conditions 15
7.2 Standard conditions for measurement 16
7.3 Couplers and ear simulators 16
7.3.1 General 16
7.3.2 HATS 17
7.4 Measurement conditions for simulated programme signal 17
7.5 Loudness comparison conditions 18
7.5.1 General 18
7.5.2 Free-field comparison conditions 19
7.5.3 Diffuse-field comparison conditions 19
7.6 Ear canal sound pressure level measurement conditions 19
7.7 Graphical presentation of results 19
8 Characteristics to be specified and their methods of measurement 19
8.1 Power supply 19
8.2 Electrical impedance 20
8.2.1 Rated impedance 20
8.2.2 Impedance/frequency characteristic 20
8.2.3 Rated source impedance 20
8.3 Input voltage 20
8.3.1 Rated ~~source e.m.f.~~ input voltage 20
8.3.2 Limiting values of input voltage 21
8.3.3 Characteristic voltage 22
8.3.4 Simulated programme signal characteristic voltage 22
8.3.5 Simulated programme signal characteristic voltage corrected by A-weighting characteristics and free-field response compensation 23
8.3.6 Protective devices 23
8.4 Input power 24
8.5 Sound pressure (level) 24
8.5.1 General 24
8.5.2 Characteristics to be specified 24
8.5.3 Method of measurement 25
8.6 Frequency response 25
~~8.6.1 General .....~~
8.6.1 Coupler or ear simulator (including HATS) frequency response 26
8.6.2 Free-field compensated frequency response 30
~~8.6.3 Free-field comparison frequency response .....~~
8.6.3 Diffuse-field compensated frequency response 31

~~8.6.4 Diffuse-field comparison frequency response~~
8.6.4 Rated frequency range 32
~~8.6.5 Free-field and diffuse-field ear canal sound pressure level frequency responses~~
8.6.5 Effective frequency range of the free-field / diffuse-field compensated frequency response 32
~~8.6.6 Rated frequency range~~
8.7 Amplitude non-linearity 33
8.7.1 General 33
8.7.2 Harmonic distortion 33
8.7.3 Modulation distortion 34
8.7.4 Difference-frequency distortion 34
8.8 Rated ~~climatic~~ environmental conditions 35
8.9 External electric and/or magnetic field 35
8.9.1 Characteristics to be specified 35
8.9.2 Method of measurement 36
8.10 Unwanted sound radiation 36
8.10.1 Characteristic to be specified 36
8.10.2 Method of measurement 36
8.11 Sound attenuation 36
8.11.1 Characteristic to be specified 36
8.11.2 Method of measurement 36
8.12 Crosstalk attenuation for multi-channel headphones 36
8.12.1 Characteristic to be specified 36
8.12.2 Method of measurement 37
8.13 Application force 37
8.13.1 Characteristic to be specified 37
8.13.2 Method of measurement 37
8.14 Physical characteristics, cables and connectors 37
~~8.14.1 Characteristics to be specified~~
9 Classification of characteristics 37
Annex A (normative) Pinna simulators for measurements of headphones and earphones 39
Annex B (normative) Free-field comparison frequency response 49
B.1 Characteristic to be specified 49
B.2 Method of measurement (direct) 49
B.3 Method of measurement (by substitution) 49
Annex C (normative) Diffuse-field comparison frequency response 50
C.1 Characteristic to be specified 50
C.2 Method of measurement (direct) 50
C.3 Method of measurement (by substitution) 50
Annex D (normative) Free-field and diffuse-field ear canal sound pressure level frequency responses 51
D.1 Characteristic to be specified 51
D.2 Method of measurement (direct) 51
D.3 Method of measurement (indirect) 52
Annex ~~B~~E (normative) Specification and conditions of use of a microphone for use inside the ear canal 53
Annex ~~C~~F (informative) Practical details of free-field comparison conditions 54

Annex ~~D~~G (informative) Practical details of diffuse-field comparison conditions 55
Annex ~~E~~H (informative) Practical details of the subjective comparison and ear canal sound pressure level conditions 56
Annex I (informative) Two-tone distortion measurements 57
I.1 General 57
I.2 Difference frequency distortion 57
I.3 Procedure for measuring difference frequency distortion 58
I.4 Intermodulation distortion 60
I.5 Procedure for measuring intermodulation distortion 61
Annex J (informative) Left-right tracking response for stereo headphones 63
Bibliography 64
List of comments 66

Figure 1 – Diagrammatic horizontal sections showing types of earphones and their spatial relationships with the pinna and/or canal entrance 13
Figure 2 – Diagrams showing the four possible constructions: Acoustically open or closed, and closed- or open-back earphones 14
Figure 3 – ~~Illustrated measurement diagram by~~ Measurement system using simulated programme signal 18
Figure 4 – Example of a setup for the measurement of free-field/diffuse-field compensated frequency response 32
Figure A.1 – Shape of the recommended pinna simulator 41
Figure A.2 – Coordinate for the recommended pinna simulator 42
Figure A.3 – Cross-sectional shapes and dimensions of the recommended pinna simulator, horizontal section 45
Figure A.4 – Cross-sectional shapes and dimensions of the recommended pinna simulator, vertical section 48
Figure I.1 – Definition of difference frequency distortion products and orders 58
Figure I.2 – Example of difference frequency distortion of a headphone 59
Figure I.3 – Example of total difference frequency distortion of a headphone 60
Figure I.4 – Definition of intermodulation distortion products and orders 60
Figure I.5 – Example of intermodulation distortion of a headphone 61
Figure I.6 – Example of total Intermodulation distortion of a headphone 62
Figure J.1 – Example of a left-right tracking response for a stereo headphone 63

Table 1 – Classification of characteristics 37

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 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.
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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

This commented version (CMV) of the official standard IEC 60268-7:2025 edition 4.0 allows the user to identify the changes made to the previous IEC 60268-7:2010+AMD1:2020 CSV edition 3.1. Furthermore, comments from IEC TC 100 experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION to Amendment 1

This Amendment 1 contains the following significant technical changes with respect to IEC 60268-7:2010:

- evaluation of free-field compensated frequency response has been added;
- evaluation of diffuse-field compensated frequency response has been added;
- the Bibliography has been updated;
- some normative references have been updated;
- the term "HATS" and its definition has been added.

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 ~~should be~~ is made to IEC 62368-1 or another appropriate standard;

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

c) earphones and other devices for hearing aids, for which reference ~~should be~~ 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 ~~may~~ can be applicable;

f) active noise cancelation characteristics as covered by IEC 60268-24.

This document specifies the characteristics which ~~should be~~ 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 ~~may~~ 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~~:1994~~, *International Electrotechnical Vocabulary – Part 801: Acoustics and electroacoustics*, available at https://www.electropedia.org

~~*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 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 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 TS 60318-7, *Electroacoustics – Simulators of human head and ear – Part 7: Head and torso simulator for the measurement of air-conduction hearing aids*~~

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 4869-1, *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)*~~

~~[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).~~

IEC 60268-7

Edition 4.0 2025-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Sound system equipment – Part 7: Headphones and earphones

Equipements pour systèmes électroacoustiques – Partie 7: Casques et écouteurs

ICS 33.160.50

ISBN 978-2-8327-0478-3

IEC 60268-7:2025-06(en-fr)

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 14
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
7.3.1 General 15
7.3.2 HATS 16
7.4 Measurement conditions for simulated programme signal 16
7.5 Loudness comparison conditions 17
7.5.1 General 17
7.5.2 Free-field comparison conditions 17
7.5.3 Diffuse-field comparison conditions 17
7.6 Ear canal sound pressure level measurement conditions 17
7.7 Graphical presentation of results 17
8 Characteristics to be specified and their methods of measurement 18
8.1 Power supply 18
8.2 Electrical impedance 18
8.2.1 Rated impedance 18
8.2.2 Impedance/frequency characteristic 18
8.2.3 Rated source impedance 18
8.3 Input voltage 19
8.3.1 Rated input voltage 19
8.3.2 Limiting values of input voltage 19
8.3.3 Characteristic voltage 20
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 22
8.5 Sound pressure (level) 22
8.5.1 General 22
8.5.2 Characteristics to be specified 22
8.5.3 Method of measurement 23
8.6 Frequency response 23
8.6.1 Coupler or ear simulator (including HATS) frequency response 23
8.6.2 Free-field compensated frequency response 24
8.6.3 Diffuse-field compensated frequency response 25
8.6.4 Rated frequency range 26
8.6.5 Effective frequency range of the free-field / diffuse-field compensated frequency response 26
8.7 Amplitude non-linearity 26

8.7.1 General 26
8.7.2 Harmonic distortion 26
8.7.3 Modulation distortion 27
8.7.4 Difference-frequency distortion 28
8.8 Rated environmental conditions 28
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 29
8.11 Sound attenuation 29
8.11.1 Characteristic to be specified 29
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 30
9 Classification of characteristics 30
Annex A (normative) Pinna simulators for measurements of headphones and earphones 32
Annex B (normative) Free-field comparison frequency response 41
B.1 Characteristic to be specified 41
B.2 Method of measurement (direct) 41
B.3 Method of measurement (by substitution) 41
Annex C (normative) Diffuse-field comparison frequency response 42
C.1 Characteristic to be specified 42
C.2 Method of measurement (direct) 42
C.3 Method of measurement (by substitution) 42
Annex D (normative) Free-field and diffuse-field ear canal sound pressure level frequency responses 43
D.1 Characteristic to be specified 43
D.2 Method of measurement (direct) 43
D.3 Method of measurement (indirect) 44
Annex E (normative) Specification and conditions of use of a microphone for use inside the ear canal 45
Annex F (informative) Practical details of free-field comparison conditions 46
Annex G (informative) Practical details of diffuse-field comparison conditions 47
Annex H (informative) Practical details of the subjective comparison and ear canal sound pressure level conditions 48
Annex I (informative) Two-tone distortion measurements 49
I.1 General 49
I.2 Difference frequency distortion 49
I.3 Procedure for measuring difference frequency distortion 50
I.4 Intermodulation distortion 52

I.5 Procedure for measuring intermodulation distortion 53
Annex J (informative) Left-right tracking response for stereo headphones 55
Bibliography 56

Figure 1 – Diagrammatic horizontal sections showing types of earphones and their spatial relationships with the pinna and/or canal entrance 12
Figure 2 – Diagrams showing the four possible constructions: Acoustically open or closed, and closed- or open-back earphones 13
Figure 3 – Measurement system using simulated programme signal 16
Figure 4 – Example of a setup for the measurement of free-field/diffuse-field compensated frequency response 25
Figure A.1 – Shape of the recommended pinna simulator 33
Figure A.2 – Coordinate for the recommended pinna simulator 34
Figure A.3 – Cross-sectional shapes and dimensions of the recommended pinna simulator, horizontal section 37
Figure A.4 – Cross-sectional shapes and dimensions of the recommended pinna simulator, vertical section 40
Figure I.1 – Definition of difference frequency distortion products and orders 50
Figure I.2 – Example of difference frequency distortion of a headphone 51
Figure I.3 – Example of total difference frequency distortion of a headphone 52
Figure I.4 – Definition of intermodulation distortion products and orders 52
Figure I.5 – Example of intermodulation distortion of a headphone 53
Figure I.6 – Example of total Intermodulation distortion of a headphone 54
Figure J.1 – Example of a left-right tracking response for a stereo headphone 55

Table 1 – Classification of characteristics 31

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 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.
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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- 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*

SOMMAIRE

AVANT-PROPOS 4
1 Domaine d'application 6
2 Références normatives 6
3 Termes et définitions 7
4 Classification, désignation et codage 10
5 Marquage des bornes, commandes et polarité 13
6 Instructions d'utilisation 14
7 Conditions applicables aux spécifications et aux mesures 14
7.1 Conditions assignées 14
7.2 Conditions de mesure normalisées 15
7.3 Coupleurs et simulateurs d'oreille 15
7.3.1 Généralités 15
7.3.2 HATS 16
7.4 Conditions de mesure avec signal de programme simulé 16
7.5 Conditions de comparaison de sonie 17
7.5.1 Généralités 17
7.5.2 Conditions de comparaison en champ libre 17
7.5.3 Conditions de comparaison en champ diffus 17
7.6 Conditions de mesure du niveau de pression acoustique du canal auditif 17
7.7 Représentation graphique des résultats 17
8 Caractéristiques à spécifier et méthodes de mesure correspondantes 18
8.1 Alimentation électrique 18
8.2 Impédance électrique 18
8.2.1 Impédance assignée 18
8.2.2 Caractéristique de fréquence/impédance 18
8.2.3 Impédance de source assignée 18
8.3 Input voltage 19
8.3.1 Tension d'entrée assignée 19
8.3.2 Valeurs limites de la tension d'entrée 19
8.3.3 Tension caractéristique 20
8.3.4 Tension caractéristique du signal de programme simulé 20
8.3.5 Tension caractéristique du signal de programme simulé corrigée par les caractéristiques de pondération A et la compensation de la réponse en champ libre 21
8.3.6 Dispositifs de protection 21
8.4 Puissance d'entrée 22
8.5 Pression acoustique (niveau) 22
8.5.1 Généralités 22
8.5.2 Caractéristiques à spécifier 22
8.5.3 Méthode de mesurage 23
8.6 Réponse en fréquence 23
8.6.1 Réponse en fréquence du coupleur ou du simulateur d'oreille (HATS compris) 23
8.6.2 Réponse en fréquence compensée en champ libre 24
8.6.3 Réponse en fréquence compensée en champ diffus 25
8.6.4 Plage de fréquences assignée 26

8.6.5 Plage effective de fréquence de la réponse en fréquence compensée en champ libre/diffus 26
8.7 Non-linéarité d'amplitude 27
8.7.1 Généralités 27
8.7.2 Distorsion harmonique 27
8.7.3 Distorsion de modulation 27
8.7.4 Distorsion par différence de fréquence 28
8.8 Conditions environnementales assignées 29
8.9 Champ électrique et/ou magnétique externe 29
8.9.1 Caractéristiques à spécifier 29
8.9.2 Méthode de mesurage 30
8.10 Rayonnement sonore indésirable 30
8.10.1 Caractéristique à spécifier 30
8.10.2 Méthode de mesurage 30
8.11 Atténuation acoustique 30
8.11.1 Caractéristique à spécifier 30
8.11.2 Méthode de mesurage 30
8.12 Atténuation de diaphonie pour casques multicanaux 30
8.12.1 Caractéristique à spécifier 30
8.12.2 Méthode de mesurage 31
8.13 Force d'application 31
8.13.1 Caractéristique à spécifier 31
8.13.2 Méthode de mesurage 31
8.14 Caractéristiques physiques, câbles et connecteurs 31
9 Classification des caractéristiques 31
Annexe A (normative) Simulateurs de pavillon pour la mesure des casques et des écouteurs 33
Annexe B (normative) Réponse en fréquence de la comparaison en champ libre 42
B.1 Caractéristique à spécifier 42
B.2 Méthode de mesure (directe) 42
B.3 Méthode de mesure (par substitution) 42
Annexe C (normative) Réponse en fréquence de la comparaison en champ diffus 43
C.1 Caractéristique à spécifier 43
C.2 Méthode de mesure (directe) 43
C.3 Méthode de mesure (par substitution) 43
Annexe D (normative) Réponses en fréquence du niveau de pression acoustique du canal auditif en champ libre et en champ diffus 44
D.1 Caractéristique à spécifier 44
D.2 Méthode de mesure (directe) 44
D.3 Méthode de mesure (indirecte) 45
Annexe E (normative) Spécification et conditions d'utilisation d'un microphone à l'intérieur du canal auditif 46
Annexe F (informative) Détails pratiques des conditions de comparaison en champ libre 47
Annexe G (informative) Détails pratiques des conditions de comparaison en champ diffus 48
Annexe H (informative) Détails pratiques de la comparaison subjective et conditions de mesure du niveau de pression acoustique du canal auditif 49
Annexe I (informative) Mesures de distorsion à deux sons 50

I.1 Généralités 50
I.2 Distorsion par différence de fréquence 50
I.3 Procédure de mesure de la distorsion par différence de fréquence 51
I.4 Distorsion d'intermodulation 53
I.5 Procédure de mesure de la distorsion d'intermodulation 54
Annexe J (informative) Réponse de suivi gauche-droite pour casques stéréo 56
Bibliographie 57

Figure 1 – Sections horizontales schématiques qui représentent les types d'écouteurs et leurs relations spatiales avec le pavillon et/ou l'entrée du canal 12
Figure 2 – Schémas qui représentent les quatre constructions possibles: à ouverture ou fermeture acoustique, et ouvert ou fermé 13
Figure 3 – Système de mesure utilisant le signal de programme simulé 16
Figure 4 – Exemple de montage de mesure de la réponse en fréquence compensée en champ libre/en champ diffus 26
Figure A.1 – Forme du simulateur de pavillon recommandé 34
Figure A.2 – Coordonnées du simulateur de pavillon recommandé 35
Figure A.3 – Formes et dimensions du simulateur de pavillon recommandé en coupe transversale, section horizontale 38
Figure A.4 – Formes et dimensions du simulateur de pavillon recommandé en coupe transversale, section verticale 41
Figure I.1 – Définition des produits et ordres de distorsion par différence de fréquence 51
Figure I.2 – Exemple de distorsion par différence de fréquence d'un casque 52
Figure I.3 – Exemple de distorsion par différence de fréquence totale d'un casque 53
Figure I.4 – Définition des produits et ordres de distorsion d'intermodulation. 53
Figure I.5 – Exemple de distorsion d'intermodulation d'un casque 54
Figure I.6 – Exemple de distorsion d'intermodulation totale d'un casque 55
Figure J.1 – Exemple de réponse de suivi gauche-droite pour un casque stéréo 56

Tableau 1 – Classification des caractéristiques 32

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

_____

Équipements pour systèmes électroacoustiques - Partie 7: Casques et écouteurs

AVANT-PROPOS

1) La Commission Électrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
9) L'IEC attire l'attention sur le fait que la mise en application du présent document peut entraîner l'utilisation d'un ou de plusieurs brevets. L'IEC ne prend pas position quant à la preuve, à la validité et à l'applicabilité de tout droit de brevet revendiqué à cet égard. À la date de publication du présent document, l'IEC n'avait pas reçu notification qu'un ou plusieurs brevets pouvaient être nécessaires à sa mise en application. Toutefois, il y a lieu d'avertir les responsables de la mise en application du présent document que des informations plus récentes sont susceptibles de figurer dans la base de données de brevets, disponible à l'adresse https://patents.iec.ch. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets.

L'IEC 60268-7 a été établie par le domaine technique 20: Audio analogique et numérique, du comité d'études 100 de l'IEC: Systèmes et équipements audio, vidéo et services de données. Il s'agit d'une Norme internationale.

Cette quatrième édition annule et remplace la troisième édition parue en 2010, et l'Amendement 1 de 2020. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- consolidée avec l'IEC 60268-7:2010/AMD1:2020;
- reconstruction et renumérotation de l'article/du paragraphe/de l'annexe;
- ajout de la plage effective de fréquence de la réponse en fréquence compensée en champ libre/diffus;
- mise à jour des méthodes de mesurage de la distorsion de modulation et de la distorsion par différence de fréquence;
- ajout de détails relatifs aux mesures de distorsion à deux sons, voir Annexe I;
- ajout de détails relatifs à la réponse de suivi gauche-droite pour un casque stéréo, voir Annexe J.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
100/4303/FDIS	100/4341/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

La version française de la norme n’a pas été soumise au vote.

Une liste de toutes les parties de la série IEC 60268, publiées sous le titre général *Équipement pour systèmes électroacoustiques*, se trouve sur le site web de l'IEC.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé, ou
- révisé.

1 Domaine d'application

La présente partie de l'IEC 60268 s'applique aux casques, aux écouteurs, aux casques téléphoniques et aux écouteurs téléphoniques destinés à être utilisés sur ou dans l'oreille humaine. Elle s'applique également aux équipements, tels que les préamplificateurs, les réseaux passifs et les alimentations qui font partie intégrante du système de casque.

Le présent document ne traite pas:

a) de la sécurité, pour laquelle il est fait référence à l'IEC 62368-1 ou à une autre norme appropriée;

b) des caractéristiques des microphones des casques téléphoniques, pour lesquels il est fait référence à l'IEC 60268-4;

c) des écouteurs et autres appareils de correction auditive, pour lesquels il est fait référence à l'IEC 60118-0;

d) des casques d'audiométrie;

e) des écouteurs et autres appareils qui font partie d'un système de protection auditive, bien que certaines dispositions du présent document puissent être applicables;

f) des caractéristiques de la suppression active du bruit de fond telles que traitées par l'IEC 60268-24.

Le présent document spécifie les caractéristiques incluses par le fabricant dans les spécifications, ainsi que les méthodes de mesure applicables. Elle comprend une classification des différents types d'écouteurs, principalement caractérisés par la façon dont le transducteur est couplé acoustiquement à l'oreille, ainsi qu'un code de classification qui peut également être utilisé pour le marquage.

Les caractéristiques et les conditions assignées du présent document fournies par le fabricant ne sont généralement pas destinées à une vérification externe. Les méthodes de mesure des caractéristiques assignées sont informatives et sont fournies dans l'intérêt des fabricants aux fins de répétabilité des essais et de comparaison des données. Toutes les autres spécifications et essais sont fournis pour les essais par le fabricant, ainsi que pour les essais et vérification externes.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60038, *Tensions normales de l'IEC*

IEC 60050-801, *Vocabulaire Électrotechnique International (IEV) – Partie 801: Acoustique et électroacoustique*, disponible à l'adresse https://www.electropedia.org

IEC 60086-1, *Piles électriques – Partie 1: Généralités*

IEC 60263, *Échelles et dimensions des graphiques pour le tracé des courbes de réponse en fréquence et des diagrammes polaires*

IEC 60268-1, *Équipements pour systèmes électroacoustiques – Partie 1: Généralités*

IEC 60268-2, *Équipements pour systèmes électroacoustiques – Partie 2: Explication des termes généraux et méthodes de calcul*

IEC 60268-11, *Équipements pour systèmes électroacoustiques – Partie 11: Application des connecteurs pour l'interconnexion des éléments des systèmes électroacoustiques*

IEC 60268-12, *Équipements pour systèmes électroacoustiques – Partie 12: Application des connecteurs pour radiodiffusion et usage analogue*

IEC 60318-4, *Électroacoustique – Simulateurs de tête et d'oreille humaines – Partie 4: Simulateur d'oreille occluse pour la mesure des écouteurs couplés à l'oreille par des embouts*

IEC 60318-7, *Électroacoustique – Simulateurs de tête et d'oreille humaines – Partie 7: Simulateur de tête et de torse pour le mesurage des sources sonores à proximité de l'oreille*

IEC 61672-1, *Électroacoustique – Sonomètres – Partie 1: Spécifications*

ISO 266:1997, *Acoustique – Fréquences normales*

ISO 48-4:2018, *Caoutchouc vulcanisé ou thermoplastique – Détermination de la dureté – Partie 4: Dureté par pénétration par la méthode au duromètre (dureté Shore)*

ISO 3741, *Acoustique – Détermination des niveaux de puissance acoustique et des niveaux d'énergie acoustique émis par les sources de bruit à partir de la pression acoustique – Méthodes de laboratoire en salles d'essais réverbérantes*

ISO 4869-3, *Acoustique – Protecteurs individuels contre le bruit – Partie 3: Mesurage de l'affaiblissement acoustique des protecteurs du type serre-tête au moyen d'un dispositif d'essai acoustique*