

STN	Elektroakustika Simulátory ľudskej hlavy a ucha Časť 8: Akustický väzbový člen na vysokofrekvenčné merania sluchových protéz a slúchadiel pripojených na ucho prostredníctvom ušných vložiek	STN EN IEC 60318-8 36 8820
------------	---	--

Electroacoustics - Simulators of human head and ear - Part 8: Acoustic coupler for high-frequency measurements of hearing aids and earphones coupled to the ear by means of ear inserts

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 07/22

Obsahuje: EN IEC 60318-8:2022, IEC 60318-8:2022

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN IEC 60318-8

May 2022

ICS 17.140.50

English Version

**Electroacoustics - Simulators of human head and ear - Part 8:
Acoustic coupler for high-frequency measurements of hearing
aids and earphones coupled to the ear by means of ear inserts
(IEC 60318-8:2022)**

Electroacoustique - Simulateurs de tête et d'oreille
humaines - Partie 8: Coupleur acoustique pour les
mesurages à hautes fréquences des appareils de correction
auditive et des écouteurs couplés à l'oreille par des
embouts
(IEC 60318-8:2022)

Akustik - Simulatoren des menschlichen Kopfes und Ohres
- Teil 8: Akustischer Kuppler zur Hochfrequenzmessung
von Hörgeräten und Kopfhörern die mit dem Ohr mittels
Ohreinsätzen gekoppelt sind
(IEC 60318-8:2022)

This European Standard was approved by CENELEC on 2022-05-12. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 60318-8:2022 (E)**European foreword**

The text of document 29/1111/FDIS, future edition 1 of IEC 60318-8, prepared by IEC/TC 29 "Electroacoustics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60318-8:2022.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2023-02-12
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2025-05-12

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 60318-8:2022 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60318-5	NOTE Harmonized as EN 60318-5
IEC 60318-4	NOTE Harmonized as EN 60318-4
IEC 60118-0	NOTE Harmonized as EN 60118-0
IEC 61094-4	NOTE Harmonized as EN 61094-4
IEC 61094-2:2009	NOTE Harmonized as EN 61094-2:2009 (not modified)
IEC 60318-1:2009	NOTE Harmonized as EN 60318-1:2009 (not modified)
IEC 61094-6	NOTE Harmonized as EN 61094-6



IEC 60318-8

Edition 1.0 2022-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Electroacoustics – Simulators of human head and ear –
Part 8: Acoustic coupler for high-frequency measurements of hearing aids and
earphones coupled to the ear by means of ear inserts**

**Électroacoustique – Simulateurs de tête et d'oreille humaines –
Partie 8: Coupleur acoustique pour les mesurages à hautes fréquences des
appareils de correction auditive et des écouteurs couplés à l'oreille par des
embouts**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2022 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 Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
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

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

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

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

IEC Products & Services Portal - products.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

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 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

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

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

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

IEC Products & Services Portal - products.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

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.



IEC 60318-8

Edition 1.0 2022-04

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Electroacoustics – Simulators of human head and ear –
Part 8: Acoustic coupler for high-frequency measurements of hearing aids and
earphones coupled to the ear by means of ear inserts**

**Électroacoustique – Simulateurs de tête et d'oreille humaines –
Partie 8: Coupleur acoustique pour les mesurages à hautes fréquences des
appareils de correction auditive et des écouteurs couplés à l'oreille par des
embouts**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 17.140.50

ISBN 978-2-8322-1092-5

**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
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and abbreviated terms	7
3.1 Terms and definitions.....	7
3.2 Abbreviated terms.....	8
4 Mechanical design of the 0,4 cm ³ coupler	8
4.1 General.....	8
4.1.1 Overall design guidelines.....	8
4.1.2 Acceptance limits.....	9
4.2 Cavity dimensions.....	9
4.2.1 Critical dimensions	9
4.2.2 Effective coupler volume and cavity dimensions	9
4.3 Verification procedure of the effective coupler volume	9
4.4 Microphone	9
4.4.1 General	9
4.4.2 Microphone type	9
4.5 Static pressure equalisation vent	10
4.6 Acoustic transfer impedance level.....	10
5 Calibration.....	10
5.1 Reference environmental conditions	10
5.2 Method of calibration	10
6 Coupling of receivers and hearing aids to the coupler.....	11
6.1 Coupling to a hearing aid receiver by means of tubing	11
6.2 Coupling to a hearing aid embedded in or connected to an earmould.....	11
6.3 Coupling to a receiver in the canal (RIC).....	12
6.4 Coupling to a BTE hearing aid with 2 mm continuous internal diameter tubing	13
6.5 Coupling to a BTE hearing aid with earmould simulator.....	14
6.6 Coupling to a BTE hearing aid with thin acoustic coupling tubing	15
7 Maximum permitted expanded uncertainty for coupler conformance testing	16
Annex A (informative) Example of a method for verification of the effective volume of the coupler	18
A.1 Method for verification of the effective volume of the coupler	18
A.2 Measurement uncertainty.....	19
Annex B (informative) Example of a method for the measurement of the acoustic transfer impedance of the 0,4 cm ³ coupler	20
B.1 Measurement procedure	20
B.1.1 Acoustic transfer impedance.....	20
B.1.2 Setup for measuring the coupler acoustic transfer impedance	21
B.2 Typical coupler acoustic transfer impedance.....	22
B.3 Measurement uncertainty.....	24
Annex C (informative) Example of one specific design of the coupler.....	25
Annex D (informative) Electrical analogue representation of the coupler as a tube model	26

Annex E (informative) Example assessments of conformance to specifications of this document	31
E.1 General.....	31
E.2 Conformance criteria.....	31
E.3 Example test results	31
Bibliography.....	34
Figure 1 – Coupling to a hearing aid receiver by means of coupling tubing	11
Figure 2 – Coupling to an ITE, ITC, or CIC.....	12
Figure 3 – Coupling to a receiver in the canal (RIC).....	13
Figure 4 – Coupling to a BTE hearing aid with 2 mm continuous internal diameter coupling tubing	14
Figure 5 – Coupling to a BTE hearing aid with earmould simulator.....	15
Figure 6 – Coupling to a BTE hearing aid with thin coupling tubing	16
Figure 7 – Relationship between tolerance interval, corresponding acceptance interval and the maximum permitted uncertainty of measurement.....	17
Figure A.1 – Measurement setup for coupler volume measurement.....	19
Figure B.1 – Test set-up for measuring the coupler acoustic transfer impedance	22
Figure B.2 – Typical coupler acoustic transfer impedance.....	22
Figure B.3 – Typical acoustic transfer impedance times frequency.....	23
Figure C.1 – Example of a specific design of the 0,4 cm ³ coupler, shown with removable coupling plate with a nipple for the attachment of coupling tubing	25
Figure D.1 – Electrical analogue of the coupler as a lossy transmission line tube with lossy terminations.....	26
Figure D.2 – Transfer impedance model vs. measurements	29
Figure D.3 – Equivalent volume calculated from the model vs. measurements	29
Figure D.4 – Model predictions of coupler impedance	30
Figure E.1 – Examples of assessment of conformance	33
Table 1 – The acoustic transfer impedance level modulus and the associated acceptance intervals	10
Table 2 – Values of $U_{\max}$ for measurements	17
Table A.1 – Typical components of measurement uncertainty in the measurement of effective volume.....	19
Table B.1 – Typical acoustic transfer impedance values	23
Table B.2 – Typical components of measurement uncertainty in the measurement of acoustic transfer impedance	24
Table D.1 – List of constants	28
Table E.1 – Examples of assessment of conformance.....	32

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROACOUSTICS – SIMULATORS OF HUMAN HEAD AND EAR –**Part 8: Acoustic coupler for high-frequency measurements of hearing aids and earphones coupled to the ear by means of ear inserts****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) 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.

IEC 60318-8 has been prepared by IEC technical committee 29: Electroacoustics. It is an International Standard.

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

Draft	Report on voting
29/1111/FDIS	29/1117/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.

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/standardsdev/publications.

A list of all parts in the IEC 60318 series, published under the general title *Electroacoustics – Simulators of human head and ear*, can be found on the IEC website.

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

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Advancement in hearing aid design makes it possible to increase the bandwidth of hearing aids up to 16 kHz.

The 2 cm³ coupler as described in IEC 60318-5 [1]¹ is suitable for measurements up to 8 kHz. At frequencies above 8 kHz, high measurement uncertainty will occur in earphone responses, due to acoustic resonances in the coupler.

The occluded-ear simulator as described in IEC 60318-4 [2] simulates the human external ear up to 10 kHz and can be used as an acoustic coupler up to 16 kHz. It is designed with a principal cavity length which produces a half-wavelength resonance of the sound pressure at approximately 13,5 kHz. This resonance, which is also present in a person's ear canal but more controlled by the tympanic membrane, can also cause measurement uncertainty in earphone responses above 10 kHz.

Accordingly, there is a need for a well-defined and robust acoustic coupler to be used by designers of transducers (receiver, earphone), and by the designer and dispensers of hearing aids when making measurements on earphones in the frequency range 8 kHz to 16 kHz.

The sound pressure developed by an earphone is, in general, not the same in an acoustic coupler as in a person's ear. However, results obtained with an acoustic coupler can be used as a simple and ready means for the exchange of specifications and test data on hearing aids and insert earphones used in audiometry.

This document describes an acoustic coupler for loading a hearing aid or insert earphone with a specified acoustic impedance when testing acoustic performance, in the frequency range up to 16 kHz, as required in IEC 60118-0 [3].

¹ Numbers in square brackets refer to the Bibliography.

ELECTROACOUSTICS – SIMULATORS OF HUMAN HEAD AND EAR –

Part 8: Acoustic coupler for high-frequency measurements of hearing aids and earphones coupled to the ear by means of ear inserts

1 Scope

This part of IEC 60318 describes an acoustic coupler for loading a hearing aid or insert earphone with a specified acoustic impedance when testing its acoustic performance, in the frequency range up to 16 kHz. It is suitable for air-conduction hearing aids and earphones, coupled to the ear by means of ear inserts, earmoulds or similar devices.

The acoustic coupler does not simulate the human ear. However, it has an effective volume of only 0,4 cm³, which is small enough not to produce significant resonances in the coupler in the frequency range below 16 kHz. Therefore, it will load the earphone with a known acoustic impedance, which allows repeatable measurements with low uncertainty to be obtained on earphones used in extended high-frequency audiometry.

2 Normative references

There are no normative references in this document.

koniec náhl'adu – text ďalej pokračuje v platenej verzii STN