

Electroacoustics — Hearing aids —

Part 8: Methods of measurement of performance characteristics of hearing aids under simulated *in situ* working conditions

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**Electroacoustics –
Hearing aids
Part 8: Methods of measurement of performance characteristics
of hearing aids under simulated *in situ* working conditions
(IEC 60118-8:2005)**

Electroacoustique –
Appareils de correction auditive
Partie 8: Méthodes de mesure
des caractéristiques fonctionnelles
des appareils de correction auditive
dans des conditions simulées
de fonctionnement *in situ*
(CEI 60118-8:2005)

Akustik –
Hörgeräte
Teil 8: Verfahren zur Messung der
Übertragungseigenschaften von
Hörgeräten unter simulierten
In-Situ-Bedingungen
(IEC 60118-8:2005)

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European Committee for Electrotechnical Standardization
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Foreword

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- | | | |
|--|-------|------------|
| – latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 2006-09-01 |
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Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60118-8:2005 was approved by CENELEC as a European Standard without any modification.

CONTENTS

INTRODUCTION.....	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 Limitations.....	10
5 Test equipment.....	11
5.1 Acoustical requirements for the test space	11
5.2 Sound source	11
5.3 Manikin	12
5.4 Ear simulator	12
5.5 Ear insert simulator	12
5.6 Equipment for the measurement of occluded-ear simulator sound pressure level	12
5.7 Equipment for automatic sweep frequency recording	13
5.8 Equipment for calibration of free field sound pressure level	13
6 Test conditions	13
6.1 Choice of test point.....	13
6.2 Ambient conditions	13
6.3 Manikin	13
6.4 Location of the hearing aid.....	14
6.5 Normal operating conditions for the hearing aid.....	14
7 Measurements.....	15
7.1 General.....	15
7.2 Adjustment of the reference input sound pressure level	15
7.3 Manikin frequency response (MFR).....	15
7.4 Full-on simulated insertion gain measured by the constant reference input SPL method	16
7.5 Full-on simulated insertion gain measured by the constant ear simulator SPL method.....	16
7.6 Directional characteristics.....	17
7.7 Simulated <i>in situ</i> OSPL90 measurements.....	19
7.8 Simplified method to measure simulated <i>in situ</i> and insertion gain response	20
8 Frequency response recording charts.....	20
9 Maximum permitted expanded uncertainty of measurements	20
Annex A (normative) Free-field to hearing-aid-microphone transformation	22
Annex B (normative) Manikin unoccluded-ear gain (open ear response).....	26
Annex C (informative) General requirements for a manikin.....	28
Annex ZA (normative) Normative references to international publications with their corresponding European publications	32
Bibliography	31

Figure A.1 – Microphone location and corresponding free-field to hearing-aid-microphone transformation for behind-the-ear instruments	23
Figure A.2 – Microphone location and corresponding free-field to hearing-aid-microphone transformation for full-concha instruments	23
Figure A.3 – Microphone location and corresponding free-field to hearing-aid-microphone transformation for canal size instruments	24
Figure A.4 – Microphone location and corresponding free-field to hearing-aid-microphone transformation for completely-in-the-ear canal instruments	24
Figure B.1 – Manikin unoccluded-ear gain frequency response	26
Figure C.1 – Manikin geometrical references	29
Figure C.2 – Co-ordinates for angles of azimuth and elevation	30
Table 1 – Values of $U_{\max}$ for basic measurements	21
Table A.1 – Numerical data for the various free-field to hearing-aid-microphone transformation responses	25
Table B.1 – Numerical data of manikin unoccluded-ear gain frequency response	27

INTRODUCTION

Measurement methods that take into account the acoustical influence of the wearer on the performance of hearing aids are important, particularly when the results are to be used to assist in the fitting of hearing aids. The information obtained using this standard is likely to be more relevant to the fitting of hearing aids than that provided by publications concerned with type approval and quality control such as IEC 60118-0, and IEC 60118-7.

The methods specified in this standard require a device such as a manikin to simulate the presence of the wearer. It has been found necessary to establish certain guidelines for simulated *in situ* measurements of hearing aids. The recommended methods are described in this standard.

ELECTROACOUSTICS – HEARING AIDS –

Part 8: Methods of measurement of performance characteristics of hearing aids under simulated *in situ* working conditions

1 Scope

The purpose of this part of IEC 60118 is to describe methods for a test which simulates the acoustical effects of a median adult wearer on the performance of a hearing aid.

It establishes certain guidelines for simulated *in situ* measurements of hearing aids; it describes a simplified method for simulated *in situ* measurements of hearing aids and a description for determination of the directivity index (DI) of directional microphones in hearing aids in the horizontal plane.

In addition this second edition now specifies tolerances. Conformance to the specifications in this International Standard is demonstrated only when the result of a measurement, extended by the actual expanded uncertainty of measurement of the testing laboratory, lies fully within the tolerances specified in this International Standard extended by the values for $U_{\max}$.

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 60118-0:1983, *Hearing aids – Part 0: Measurement of electroacoustical characteristics*

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

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

IEC 60959, *Provisional head and torso simulator for acoustic measurements of air conduction hearing aids*

3 Terms and definitions

For the purpose of this document, the following definitions apply:

3.1

sound pressure level

throughout this standard all sound pressure levels (abbreviated SPL) are referred to 20 μPa

3.2

pinna simulator

device which has the approximate shape and dimensions of a median adult human pinna

3.3

ear simulator

device for measuring the output sound pressure level of an earphone under well defined loading conditions in a specified frequency range. It consists essentially of a principal cavity, acoustic load networks and a calibrated microphone. The location of the microphone is chosen so that the sound pressure at the microphone corresponds approximately to the sound pressure existing at the human eardrum

3.4

occluded-ear simulator

ear simulator which simulates the inner part of the ear canal, from the tip of an ear insert to the eardrum

3.5

ear canal extension

device which connects the concha portion of the pinna simulator with the outer (reference plane) face of the occluded-ear simulator, simulating the outer part of the ear canal excluding the pinna

3.6

ear insert simulator

device used to represent the acoustic coupling between an earphone and the ear canal (e.g. an earmould or a similar device without a connecting tube)

3.7

manikin (head and torso simulator)

head and torso simulator extending downward from the top of the head to the waist and designed to simulate the acoustic diffraction produced by a median adult human head and torso. The head includes two pinna simulators, and contains at least one occluded-ear simulator

3.8

reference point of a subject or manikin

point bisecting the line joining the centres of the openings of the ear canals (at the junction between concha and ear canal) (see Figure C.1)

3.9

plane of symmetry of the manikin

plane passing through the reference point of the manikin that divides the left and right portions of the manikin into symmetrical halves (see Figure C.1)

3.10

axis of rotation of the manikin

straight line passing through the reference point of the manikin and lying in the plane of symmetry of the manikin, and having a direction that would be vertical if the manikin were mounted in a position corresponding to that of a standing person (and about which the manikin can be rotated) (see Figure C.1)

3.11**reference plane of the manikin**

plane perpendicular to the axis of rotation containing the reference point of the manikin (see Figure C.1)

3.12**test point**

reproducible position in the test space at which the sound pressure level is measured with the manikin absent and at which the reference point of the manikin is to be located for test purposes

3.13**reference input sound pressure level**

free field sound pressure level at the test point in the absence of the manikin

3.14**test axis**

line joining the test point and the centre of the sound source (see Figure C.2)

3.15**test plane (for measurement of the uniformity of the free field wavefront)**

plane perpendicular to the test axis and containing the test point

3.16**azimuth angle of sound incidence**

θ

angle between the plane of symmetry of the manikin and the plane defined by the axis of rotation and the test axis (see Figure C.2). When the manikin faces the sound source the azimuth angle of sound incidence is defined as 0° . When the right ear of the manikin faces the sound source, the azimuth angle is defined as 90° . When the left ear faces the sound source, the angle is defined as 270°

3.17**elevation angle of sound incidence**

α

angle between the reference plane of the manikin and the test axis (see Figure C.2). When the top of the manikin points towards the sound source the elevation angle is defined as 90° . When the test axis lies in the reference plane, the elevation angle is defined as 0°

3.18**reference position of the manikin in the test space**

position of the manikin in the test space that meets the following conditions:

- the reference point coincides with the test point, and
- the angles of azimuth and elevation are both equal to zero.

3.19**manikin unoccluded-ear gain****MUEG**

difference between the sound pressure level in the unoccluded-ear simulator and the reference input sound pressure level. This will be a function of manikin position

3.20

manikin unoccluded-ear gain frequency response

MUEGFR

manikin unoccluded-ear gain expressed as a function of frequency, MFR (see 7.3) being a function of manikin position

3.21

simulated *in situ* gain

SISG

difference between the SPL in the ear simulator produced by the hearing aid and the reference input SPL. This will be a function of manikin position

3.22

simulated *in situ* gain frequency response

SISGFR

SISG expressed as a function of frequency

3.23

simulated insertion gain

SIG

difference between the SPL in the ear simulator produced by the hearing aid and the SPL in the ear simulator with the hearing aid absent. This gain is equal to SISG-MUEG. This will be a function of manikin position

3.24

full-on simulated insertion gain

SIG obtainable from a hearing aid with the gain control at maximum (full-on) and at stated settings of the other hearing aid controls

3.25

simulated insertion gain frequency response

SIGFR

SIG expressed as a function of frequency

3.26

manikin unoccluded-ear directional response

MDR

sound pressure level in the ear simulator at a stated frequency as a function of azimuth and/or elevation angle with the hearing aid absent

3.27

simulated *in situ* directional response

SISDR

sound pressure level in the ear simulator produced by the hearing aid as a function of azimuth and/or elevation angle at a stated frequency, gain value and input level