

Hearing aids —

Part 10: Guide to hearing aid standards

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- British Medical Association
- British Society of Audiology
- Confederation of British Industry
- Department of Health and Social Security
- Department of Trade and Industry (National Physical Laboratory)
- Health and Safety Executive
- Hearing Aid Industry Association
- Institute of Acoustics
- Institute of Sound & Vibration Research
- Institution of Electronic & Radio Engineers
- Medical Research Council
- National Health Services
- Royal Aeronautical Society
- Royal National Institute for the Deaf
- Society of Hearing Aid Audiologists Limited
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National foreword

This Part of BS 6083 has been prepared under the direction of the Electronic Equipment Standards Committee and is identical with IEC Publication 118-10:1986 "*Hearing aids*" Part 10 "*Guide to hearing aid standards*", published by the International Electrotechnical Commission (IEC).

For ease of reference the original text of Appendix C has been reproduced in English alphabetical order.

The category descriptions in clause 6 are not those normally used in the United Kingdom and should not be interpreted as performance requirements for hearing aids.

Terminology and conventions. The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

Wherever page numbers are quoted, they refer to IEC page numbers given in brackets at the bottom of each page.

Cross-references

International Standard	Corresponding British Standard
IEC 90:1973	BS 2813:1981 <i>Specification for dimensions of plugs for hearing aids</i> (Identical)
IEC 118	BS 6083 <i>Hearing aids</i>
IEC 118-0:1983	Part 0:1984 <i>Methods for measurement of electroacoustical characteristics</i> (Identical)
IEC 118-1:1983	Part 1:1984 <i>Method for measurement of characteristics of hearing aids with induction pick-up coil input</i> (Identical)
IEC 118-2:1983	Part 2:1984 <i>Methods for measurement of electroacoustical characteristics of hearing aids with automatic gain control circuits</i> (Identical)
IEC 118-3:1983	Part 3:1984 <i>Methods for measurement of electroacoustical characteristics of hearing aid equipment not entirely worn on the listener</i> (Technically equivalent)
IEC 118-4:1981	Part 4:1981 <i>Specification for magnetic field strength in audio-frequency induction loops for hearing aid purposes</i> (Technically equivalent)
IEC 118-5:1983	Part 5:1984 <i>Specification for dimensions of the nipple and sealing device for insert earphones</i> (Identical)
IEC 118-6:1984	Part 6:1985 <i>Specification for characteristics of electrical input circuits for hearing aids</i> (Identical)
IEC 118-7:1983	Part 7:1985 <i>Methods for measurement of the performance characteristics of hearing aids for quality inspection on delivery</i> (Identical)
IEC 118-8:1983	Part 8:1985 <i>Methods for measurement of the performance characteristics of hearing aids under simulated in situ working conditions</i> (Identical)

International Standard	Corresponding British Standard
IEC 118-9:1985	Part 9:1986 <i>Methods for measurement of characteristics of hearing aids with bone vibrator output</i> (Identical)
IEC 118-10:1986	Part 10:1988 <i>Guide to hearing aid standards</i> (Identical)
IEC 118-11:1983	Part 11:1984 <i>Specification for symbols and other markings on hearing aids and related equipment</i> (Identical)
IEC 126:1973	BS 6111:1981 <i>Specification for reference coupler for the measurement of hearing aids using earphones coupled to the ear by means of ear inserts</i> (Identical)
IEC 268	BS 5428 <i>Methods for specifying and measuring the characteristics of sound system equipment</i> (Identical)
	BS 6840 <i>Sound system equipment</i> (Identical)
IEC 303:1970	BS 4668:1971 <i>Specification for an acoustic coupler (IEC reference type) for calibration of earphones used in audiometry</i> (Technically equivalent)
IEC 318:1970	BS 4669:1971 <i>Specification for an artificial ear of the wide band type for the calibration of earphones used in audiometry</i> (Technically equivalent)
IEC 373:1971	BS 4009:1975 <i>Specification for an artificial mastoid for the calibration of bone vibrators used in hearing aids and audiometers</i> (Technically equivalent)
IEC 711:1981	BS 6310:1982 <i>Specification for occluded-ear simulator for the measurement of earphones coupled to the ear by ear inserts</i> (Identical)

The IEC publication for “Provisional Head and Torso Simulator for Acoustic Measurements of Air Conduction Hearing Aids” referred to in 3.2.6, is still in preparation.

Parts of BS 6840 when issued will supersede BS 5428 which will be withdrawn.

NOTE *Typographical error.* In 3.1.5 “Scope” in line 1, “producing and alternating” should be read as “producing an alternating”.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Introduction

This report is intended as an introduction to and a catalogue of the existing IEC publications on hearing aids. Different types of hearing aid measurement call for different test methods. There is therefore, a need for guidance to ensure the proper use of the different IEC publications. It is furthermore considered necessary to provide a survey of the existing IEC publications concerning hearing aids and also a glossary of terms defined in these publications.

1 Scope and object

The object of this report is to provide a guide to appropriate IEC publications related to hearing aids. The report includes a glossary of terms and the scope of each publication. The particular measurement needs are indicated. A method of classifying hearing aids is given based upon maximum saturation sound pressure level.

2 Glossary of terms

This glossary lists all terms for which definitions are given in the IEC Publication 118 series. See also Appendix C.

The number of the publication containing the definition is stated.

2.1 Acoustic gain (at a specified frequency and under specified operating conditions)
(IEC Publication 118-0).

The difference between the sound pressure level developed in the occluded ear simulator by the hearing aid and the sound pressure level measured at the test point.

NOTE 1 See also IEC Publication 118-7 where constant entrance sound pressure method is used and the occluded-ear simulator is replaced by the IEC reference coupler (IEC Publication 126). See also Sub-clause 3.2.2 of this report.

NOTE 2 For acoustic couplers mentioned in IEC Publication 118-3, reference is made to Sub-clauses 3.2.3 and 3.2.4 of this report.

2.2 Acousto-mechanical sensitivity
(IEC Publication 118-9)

At a specified frequency and under specified operating conditions, the quotient of the vibratory force produced on the mechanical coupler by the hearing aid and the sound pressure at the reference point of the hearing aid.

2.3 Acousto-mechanical sensitivity level (AMSL) (IEC Publication 118-9)

Twenty times the logarithm to the base 10 of the ratio of the acousto-mechanical sensitivity to the reference sensitivity of $\frac{1 \mu\text{N}}{20 \mu\text{Pa}}$ expressed in decibels.

NOTE To calculate the acousto-mechanical sensitivity level (AMSL) from measurements made in this report the following formula may be used: $\text{AMSL} = (\text{Output force level}) - \text{OFL}$ expressed in dB (re $1 \mu\text{N}$) minus (sound pressure level applied to the hearing aid microphone in dB (re $20 \mu\text{Pa}$)).
 $\text{AMSL} = \text{OFL} - \text{input SPL}$.

2.4 Attack time (IEC Publication 118-2)

The time interval between the moment when the input signal level is increased abruptly by a stated number of decibels and the moment when the output sound pressure from a hearing aid with an AGC circuit stabilizes at the elevated steady-state level within ± 2 dB.

2.5 Attack time for the normal dynamic range of speech (IEC Publication 118-2)

The attack time, when the initial input sound pressure level is 55 dB and the increase in input sound pressure level is 25 dB.

2.6 Automatic gain control (AGC)
(IEC Publication 118-2)

A means in a hearing aid by which the gain is automatically controlled as a function of the magnitude of the envelope of the input signal or other signal parameter.

2.7 Axis of rotation of the manikin
(IEC Publication 118-8)

A 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).

2.8 Azimuth angle of sound incidence (Θ)
(IEC Publication 118-8)

The angle between the plane of symmetry of the manikin and the plane defined by the axis of rotation and the test axis. 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 $+90^\circ$. When the left ear faces the sound source, the angle is defined as $+270^\circ$.

2.9 Basic force level frequency response curve
(IEC Publication 118-9)

The output force level frequency response curve obtained with the gain control in the reference test gain position and with an input SPL of 60 dB.

2.10 Basic frequency response curve
(IEC Publication 118-0)

The frequency response curve obtained at the reference test gain setting with an input sound pressure level of 60 dB.

2.11 Bone vibrator (IEC Publication 118-9)

An electromechanical transducer intended to produce the sensation of hearing by vibrating the cranial bones.

2.12 Comparison method (IEC Publication 118-0)

A method of measurement in which the hearing aid and the microphone employed to measure the free-field sound pressure are placed simultaneously at two acoustically equivalent points in the sound field.

2.13 Comprehensive frequency response curves (IEC Publication 118-0)

A family of frequency response curves obtained with the gain control in the reference test gain position using a series of input sound pressure levels to exhibit the input-output characteristics of the hearing aid over its full range of operation.

2.14 Compression ratio (between specified input sound pressure level values) (IEC Publication 118-2)

Under steady-state conditions, the ratio of an input sound pressure level difference to the corresponding output sound pressure level difference, both expressed in decibels.

2.15 Dynamic output characteristics (IEC Publication 118-2)

The output sound pressure envelope shown as a function of time when an input sound signal of a predetermined frequency and level is modulated by a square envelope pulse with a predetermined pulse amplitude.

2.16 Ear canal extension (IEC Publication 118-8)

A 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.

2.17 Ear insert simulator (IEC Publication 118-8)

A device used to provide the acoustic coupling between an earphone and the ear canal (e.g. an ear-mould or a similar device without a connecting tube).

2.18 Ear simulator (IEC Publications 118-0, 118-8 and 711)

An ear simulator is a device for measuring the output sound pressure 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.

2.19 Elevation angle of sound incidence (α) (IEC Publication 118-8)

The angle between the reference plane of the manikin and the test axis. When the vertex points towards the sound source, the elevation angle is defined as $+90^\circ$. When the test axis lies in the reference plane, the elevation angle is defined as 0° .

2.20 Frequency response (IEC Publication 118-0)

The sound pressure level developed in the ear simulator by the hearing aid expressed as a function of frequency under specified test conditions.

NOTE See Notes 1 and 2 of Sub-clause 2.1.

2.21 Full-on acoustic gain (IEC Publication 118-0)

At a specified frequency or as a function of frequency.

The acoustic gain under essentially linear input/output conditions obtained from the hearing aid measured with the gain control at maximum (full on) and at stated settings of the other hearing aid controls.

See also IEC Publication 118-7.

2.22 Full-on simulated insertion gain (IEC Publication 118-8)

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

2.23 High level attack time (IEC Publication 118-2)

The attack time, when the initial input sound pressure level is 60 dB and the increase in input sound pressure level is 40 dB.

2.24 High level recovery time (IEC Publication 118-2)

The recovery time, when the initial sound pressure level is 100 dB and the decrease in input sound pressure level is 40 dB.

2.25 Lower AGC limit or AGC threshold (IEC Publication 118-2)

The input sound pressure level which, when applied to the hearing aid, gives a reduction in the gain of 2 ± 0.5 dB with respect to the gain in the linear mode.

2.26 Manikin (head and torso simulator) (IEC Publication 118-8)

A 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.