



BSI Standards Publication

Electroacoustics - Audio-frequency induction loop systems for assisted hearing

Part 1: Methods of measuring and specifying the performance of system components

National foreword

This British Standard is the UK implementation of EN 62489-1:2010+A2:2018. It is identical to IEC 62489-1:2010, incorporating amendment 1:2014 and amendment 2:2017. It supersedes BS EN 62489-1:2010+A1:2015, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment A1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee EPL/29, Electroacoustics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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31 July 2018	Implementation of IEC amendment 2:2017 with CENELEC endorsement A2:2018. Annex ZA amended.

English Version

**Electroacoustics - Audio-frequency induction loop systems for
assisted hearing - Part 1: Methods of measuring and specifying
the performance of system components
(IEC 62489-1:2010)**

Electroacoustique - Systèmes de boucles d'induction
audiofréquences pour améliorer l'audition - Partie 1:
Méthodes de mesure et de spécification des performances
des composants de systèmes
(IEC 62489-1:2010)

Akustik - Audiofrequenz-Induktionsschleifenanlagen zur
Unterstützung von Hörsystemen - Teil 1: Verfahren zur
Messung und Angabe des Betriebsverhaltens der
Systemkomponenten
(IEC 62489-1:2010)

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European foreword

The text of document 29/667/CDV, future edition 1 of IEC 62489-1, prepared by IEC TC 29, Electroacoustics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62489-1 on 2010-04-01.

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- latest date by which the national standards conflicting
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Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62489-1:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standards indicated:

[1] IEC 60065 NOTE Harmonized as EN 60065.

Foreword to amendment A1

The text of document 29/853/FDIS, future IEC 62489-1:2010/A1, prepared by IEC TC 29, Electroacoustics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62489-1:2010/A1:2015.

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standards conflicting with the
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Foreword to amendment A2

The text of document 29/955/CDV, future edition 1 of IEC 62489-1:2010/A2:2017, prepared by IEC/TC 29 "Electroacoustics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62489-1:2010/A2:2018.

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Endorsement notice

The text of the International Standard IEC 62489-1:2010/A2:2017 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60118-4	2014	Electroacoustics - Hearing aids -- Part 4: Induction loop systems for hearing aid purposes - System performance requirements	EN 60118-4	2015
IEC 60268-1	1985	Sound system equipment -- Part 1: General	HD 483.1 S2	1989
IEC 60268-2	1987	Sound system equipment - Part 2: Explanation of general terms and calculation methods	HD 483.2 S2	1993
IEC 60268-3	2013	Sound system equipment -- Part 3: Amplifiers	EN 60268-3	2013
IEC 60268-4	2014	Sound system equipment -- Part 4: Microphones	EN 60268-4	2014
IEC 60417	database	Graphical symbols for use on equipment	-	-
IEC 60603-11	1992	Connectors for frequencies below 3 MHz for use with printed boards -- Part 11: Detail specification for concentric connectors (dimensions for free connectors and fixed connectors)	-	-
IEC 61938	2013	Multimedia systems - Guide to the recommended characteristics of analogue interfaces to achieve interoperability	EN 61938	2013
ISO/IEC Guide 98-3-		Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-

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1 Scope

This part of the IEC 62489 series applies to the components of audio-frequency induction-loop systems for assisted hearing. It may also be applied to such systems used for other purposes, as far as it is applicable. This standard is intended to encourage accurate and uniform presentation of manufacturers' specifications, which can be verified by standardized methods of measurement. It is intended for type testing.

The components considered are the following:

- amplifiers;
- microphones;
- other components, such as playback equipment.

This standard does not deal with safety, for which IEC 60065 applies. It also does not deal with EMC (Electromagnetic compatibility) and EMF (Electromagnetic fields, in the context of human exposure).

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.

Ⓐ₂ IEC 60118-4:2014, *Electroacoustics — Hearing aids — Part 4: Induction-loop systems for hearing aid purposes — System performance requirements* Ⓐ₂

IEC 60268-1:1985, *Sound system equipment — Part 1: General*

Ⓐ₂ IEC 60268-2:1987, *Sound system equipment — Part 2: Explanation of general terms and calculation methods* Ⓐ₂

Ⓐ₁ IEC 60268-3:2013, *Sound system equipment — Part 3: Amplifiers* Ⓐ₁

Ⓐ₂ IEC 60268-4:2014, *Sound system equipment — Part 4: Microphones* Ⓐ₂

Ⓐ₁ IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphicalsymbols.info/equipment>) Ⓐ₁

Ⓐ₂ IEC 60603-11:1992, *Connectors for frequencies below 3 MHz for use with printed boards — Part 11: Detail specification for concentric connectors (dimensions for free connectors and fixed connectors)* Ⓐ₂

Ⓐ₂ IEC 61938:2013, *Multimedia systems — Guide to the recommended characteristics of analogue interfaces to achieve interoperability* Ⓐ₂

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

3 Terms and definitions

For the purposes of this document, the following definition applies.

3.1

useful magnetic field volume

volume within which the system provides hearing-aid users with a signal of acceptable quality (see 6.7 of Ⓐ₂ IEC 60118-4:2014) Ⓐ₂

Ⓐ₁ 3.2

phased loop array

system of neighbouring loops in which the currents are not in phase with each other

3.3

neck loop

small induction loop intended to be worn around the neck

Note 1 to entry: See [Annex D](#).

3.4

telecoil

magnetic pickup coil intended to receive signals from an induction-loop system in accordance with IEC 60118-4

Note 1 to entry: A telecoil can be part of a hearing aid or of any other device for receiving signals for an induction-loop system in accordance with IEC 60118-4.

3.5

loop listener

system consisting of a portable amplifier incorporating a telecoil and headphones or earphones, intended to receive signals from an induction-loop system in accordance with IEC 60118-4

Note 1 to entry: The functions of loop listener and assistive listening device (see [3.6](#)) can be combined.

3.6

assistive listening device

ALD

system consisting of a microphone, a portable amplifier and headphones, earphone or a neck loop

Note 1 to entry: This device is not the portable receiver described in IEC 62489-1:2010/AMD1:2014, [\[A2\]](#) IEC 60118-4:2014 [\[A2\]](#), which includes measurement of magnetic field strength but no compensation for frequency-dependent hearing loss and AGC.

Note 2 to entry: This note applies to the French language only. [\[A1\]](#)

4 Rated values

The term “rated” means the value stated by the manufacturer. Rated values are of two kinds; rated conditions, fundamental values that can be determined only by the manufacturer, and others that can be measured. See [5.2.1](#). For a full explanation, see IEC 60268-2.

5 Amplifiers

5.1 General

In most systems, the amplifier(s) accepts input from microphone(s) and delivers current to the induction loop(s). If there are separate preamplifier or mixer and final amplifier components, the methods described can be used with the interpretation that input signals are applied to the preamplifier or mixer and measurements of output characteristics are made at the output of the final amplifier.

The characteristics to be specified are consistent with the lists in [\[A2\]](#) IEC 60118-4:2014 [\[A2\]](#).

NOTE For characteristics not mentioned in this standard, the provisions of IEC 60268-3 can be applied, with the provisions of [5.2](#) of this standard replacing those of 3.1 of [\[A1\]](#) IEC 606268-3:2013 [\[A1\]](#).

5.2 Rated conditions and standard measuring conditions

5.2.1 Rated conditions

The rated conditions for amplifiers are the following:

- rated power supply voltage;

- rated source impedance;
- rated source e.m.f. (electromotive force);
- rated load;
- rated temperature-limited output current;
- rated maximum time for delivery of rated distortion-limited output current (see below);
- rated total harmonic distortion of the output current;
- rated mechanical and climatic conditions.

NOTE 1 Total harmonic distortion and (distortion-limited) output current are interdependent. Both cannot be taken as rated conditions simultaneously because normally a given sample amplifier produces less than rated total harmonic distortion at rated output current.

NOTE 2 If the power supply frequency is critical, it is also a rated condition.

NOTE 3 The rated temperature-limited output current and the rated maximum time for delivery of rated distortion-limited output current need not be included in published specifications, provided they are supplied on request.

To obtain the correct conditions for measurements, the values for the above-mentioned rated conditions shall be taken from the manufacturer's specification. These values themselves are not subject to verification, but they constitute the basis for measuring the other characteristics.

Methods of measurement for these other characteristics are given in this standard and the manufacturer is required or permitted to state rated values for these characteristics in the specification of the equipment. These include

- rated maximum distortion limited output current;
- rated equivalent noise source e.m.f., or a measure of noise performance related to it.

An amplifier, considered as a four-terminal network with regard to a specified pair of input terminals and a specified pair of output terminals, shall be understood to be working under rated conditions when the following conditions are fulfilled:

- a) the amplifier is connected to its rated power supply;
- b) the source e.m.f. is connected in series with the rated source impedance to the input terminals;
- c) the output terminals are terminated with the rated load;
- d) the terminals which are not used during the measurement are terminated, if necessary, as specified by the manufacturer;
- e) the source e.m.f. is a sinusoidal voltage equal to the rated source e.m.f. at 1 000 Hz according to IEC 60268-1;
- f) the volume control, if any, is set to such a position that the rated distortion-limited output current appears at the output terminals;
- g) the tone controls, if any, are set to a specified position to give as flat a frequency response as possible;
- h) other controls, if any, are set to their normal positions as specified by the manufacturer;
- i) the climatic conditions given in Clause 8 of IEC 60268-1:1985 are complied with.

Amplifiers for which the rated distortion-limited output current exceeds the rated temperature-limited output current are likely to be subject to unacceptable effects when operated under rated conditions

for an extended period of time. For these amplifiers, rated conditions shall be maintained for no longer than can be tolerated by the amplifier.

5.2.2 Standard measurement conditions

Standard measurement conditions are obtained by bringing the amplifier under rated conditions (see [5.2.1](#)) and then reducing the output current to a level of –10 dB referred to the rated output current.

NOTE 1 Since testing for temperature rise is carried out according to IEC 60065 under conditions normally requiring an input source e.m.f. greater than that specified above, it is not expected that amplifier would overheat under standard measuring conditions.

NOTE 2 Many amplifiers have an output current control that can be adjusted for the above purpose. For an amplifier without such a control, the source e.m.f. can be adjusted instead.

5.3 Pre-conditioning

Immediately before any measurements are made, the amplifier shall be operated under standard measuring conditions for at least 10 min. The measurements may be made in any order.

5.4 Characteristics to be specified, methods of measurement and presentation of results

NOTE [5.4.1](#) to [5.4.5](#) describe rated conditions, which can be determined only by the manufacturer. See [5.2.1](#).

5.4.1 Rated source impedance

5.4.1.1 Characteristic to be specified

For each input, the internal impedance of the signal source, or range of acceptable impedances, stated by the manufacturer. This is a rated condition.

NOTE The relevant provisions of [A2](#) IEC 61938:2013 [A2](#) should be applied.

5.4.1.2 Presentation of results

The value or range shall be stated in ohms or a suitable SI multiple, and is assumed to be a pure resistance unless otherwise stated.

5.4.2 Rated source e.m.f.

5.4.2.1 Characteristic to be specified

For each input, the e.m.f. of the signal source, stated by the manufacturer, which, when connected through the rated source impedance to the input, produces rated output current into the rated load impedance, with all controls set as specified in [5.2.1](#). This is a rated condition.

NOTE The signal levels and impedance values given in [A2](#) IEC 61938:2013 [A2](#) should be applied.

5.4.2.2 Presentation of results

The value for each input shall be stated in volts or millivolts, or as a level in decibels referred to 1 V or 0,775 V. See IEC 60268-1.