

Australian/New Zealand Standard™

**Acoustics—Reference zero for the  
calibration of audiometric equipment**

**Part 1: Reference equivalent threshold  
sound pressure levels for pure tones and  
supra-aural earphones**



AS/NZS ISO 389.1:2019

This Joint Australian/New Zealand Standard™ was prepared by Joint Technical Committee AV-003, Acoustics Human Effects. It was approved on behalf of the Council of Standards Australia on 29 January 2019 and by the New Zealand Standards Approval Board on 30 January 2019.

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The following are represented on Committee AV-003:

- Accident Compensation Corporation (New Zealand)
- Association of Australasian Acoustical Consultants
- Australian Acoustical Society
- Australian Chamber of Commerce and Industry
- Australian Council of Trade Unions
- Australian Hearing
- Engineers Australia
- New Zealand Audiological Society
- Worksafe Division, Department of Commerce, Western Australia

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## Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee AV-003, Acoustics Human Effects, to supersede AS ISO 389.1—2007.

The objective of this Standard is to specify a standard reference zero for the scale of hearing threshold level applicable to pure-tone air conduction audiometers, to promote agreement and uniformity in the expression of hearing threshold level measurements throughout the world.

This Standard is identical with, and has been reproduced from, ISO 389-1:2017, *Acoustics — Reference zero for the calibration of audiometric equipment — Part 1: Reference equivalent threshold sound pressure levels for pure tones and supra-aural earphones*.

As this document has been reproduced from an International Standard, a full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The term “informative” is used in Standards to define the application of the annexes to which it applies. An “informative” annex is only for information and guidance.

# Contents

<b>Preface</b> .....	<b>ii</b>
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Specifications</b> .....	<b>2</b>
4.1 General .....	2
4.2 Generic supra-aural earphones in conjunction with an IEC 60318-1 ear simulator .....	2
4.3 Model-specific earphones in conjunction with an IEC 60318-1 ear simulator .....	4
4.4 Model-specific earphones in conjunction with an IEC 60318-3 acoustic coupler .....	5
<b>Annex A</b> (informative) <b>Application of the RETSPLs</b> .....	<b>7</b>
<b>Annex B</b> (informative) <b>Notes on the derivation of the RETSPLs</b> .....	<b>8</b>
<b>Bibliography</b> .....	<b>10</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

The committee responsible for this document is ISO/TC 43, *Acoustics*.

This second edition cancels and replaces the first edition (ISO 389-1:1998), which has been technically revised.

The main changes compared to the previous edition are as follows:

- data for additional models of earphone have been introduced;
- wording and definitions have been aligned with the current versions of standards in the field of audiology.

A current list of all parts in the ISO 389 series can be found on the ISO website.

## Introduction

Each document in the ISO 389 series specifies reference threshold levels for the calibration of audiometric equipment. This document is applicable to equipment for pure-tone air-conduction audiometry that uses supra-aural earphones.

In principle, reference equivalent threshold sound pressure levels (RETSPLs) would be rendered independent of earphone model if they were referred to an ear simulator having acoustical properties exactly simulating those of the average human ear. A device designed with this aim in view is standardized in IEC 60318-1. The original data for the ISO 389 series were presented in ISO 389:1985, Addendum 1, which was prepared based on an assessment of technical data provided by laboratories listed in [Annex B](#) on RETSPL values specified on the IEC 60318-1 ear simulator and covering a variety of earphone models. These data were analysed to produce a set of RETSPL values which are, within an acceptable uncertainty, applicable to earphones of any model within a broadly defined class. A note on the derivation of the standard values and the origin of the data input is given in [Annex B](#) for information.

In recent years, new supra-aural earphone models have been developed and other models have been revised. If applicable, their RETSPLs were specified both on the IEC 60318-1 ear simulator and the IEC 60318-3 acoustic coupler, as a result of direct threshold measurements under the preferred test conditions given in ISO 389-9. These model-specific RETSPL values are given in this document in separate tables, along with the IEC 60318-3 acoustic coupler RETSPLs for Telephonics TDH 39<sup>1)</sup> and Beyer DT 48<sup>2)</sup> earphones, which were adopted from the former editions of ISO 389.

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1) TDH 39 is the name of a product supplied by Telephonics. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product name.

2) DT 48 is the name of a product supplied by Beyerdynamic. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named.

## NOTES

# Australian/New Zealand Standard

## Acoustics—Reference zero for the calibration of audiometric equipment

### Part 1: Reference equivalent threshold sound pressure levels for pure tones and supra-aural earphones

#### 1 Scope

This document specifies a standard reference zero for the scale of hearing threshold level applicable to pure-tone air conduction audiometers, to promote agreement and uniformity in the expression of hearing threshold level measurements throughout the world.

It states the information in a form suitable for direct application to the calibration of audiometers, that is, in terms of the reference equivalent threshold sound pressure levels of generic supra-aural earphones specified in 4.2, measured on an ear simulator complying with IEC 60318-1 and in terms of model-specific data given in two additional tables for the IEC 60318-3 acoustic coupler and the IEC 60318-1 ear simulator, respectively.

The data are based on an assessment of the information available from the various standardizing laboratories responsible for audiometric standards and from scientific publications.

Some notes on the application and derivation of the reference levels are given in [Annexes A](#) and [B](#).

#### 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 60318-1:2009, *Electroacoustics — Simulators of human head and ear — Part 1: Ear simulator for the measurement of supra-aural and circumaural earphones*

IEC 60318-3, *Electroacoustics — Simulators of human head and ear — Part 3: Acoustic coupler for the calibration of supra-aural earphones used in audiometry*

#### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

##### 3.1

##### **air conduction**

transmission of sound through the external and middle ear to the inner ear

##### 3.2

##### **acoustic coupler**

device for measuring the acoustic output of sound sources where the sound pressure is measured by a calibrated microphone coupled to the source by a cavity of predetermined shape and volume which does not necessarily approximate the acoustic impedance of the normal human ear

Note 1 to entry: An acoustic coupler is specified in IEC 60318-3.