AS ISO 7029:2019
ISO 7029:2017

AS ISO 7029:2019

Australian STANDARD

Acoustics — Statistical distribution of hearing thresholds related to age and gender

STANDARDS Australia

AS ISO 7029:2019

This Australian Standard ® was prepared by EV-010, Acoustics Community Noise. It was approved on behalf of the Council of Standards Australia on 27 February 2019.

This Standard was published on 23 April 2019.

The following are represented on Committee EV-010:

Association of Australasian Acoustical Consultants
Australian Acoustical Society
Austroads
Bureau of Steel Manufacturers of Australia
Department of Defence (Australian Government)
Engineers Australia
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This Standard was issued in draft form for comment as DR AS ISO 7029:2018.

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ISBN 978 1 76072 430 6

AS ISO 7029:2019
ISO 7029:2017

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Acoustics — Statistical distribution of hearing thresholds related to age and gender

First published as AS ISO 7029—2003.
This edition AS ISO 7029:2019.

Preface

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee EV-010, Acoustics Community Noise, to supersede AS ISO 7029—2003, *Acoustics—Statistical distribution of hearing thresholds as a function of age.*

The objective of this Standard is to provide descriptive statistics of the hearing threshold deviation for populations of otologically normal persons of various ages under monaural earphone listening conditions. It specifies the following, for populations within the age limits from 18 years to 80 years for the range of audiometric frequencies from 125 Hz to 8 000 Hz:

(a) The expected median value of hearing thresholds given relative to the median hearing threshold at the age of 18 years.

(b) The expected statistical distribution above and below the median value.

This Standard is identical with, and has been reproduced from, ISO 7029:2017, *Acoustics — Statistical distribution of hearing thresholds related to age and gender*.

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.

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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).

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).

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 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.

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

This third edition cancels and replaces the second edition (ISO 7029:2000), which has been technically revised with the following changes:

— new data has been adopted, as explained in the introduction;

— estimation accuracy of expected medians and statistical distributions of hearing thresholds were generally improved by modifying the formulae used;

— the age range for which the expected medians and statistical distributions of hearing thresholds are calculable was extended to the age of 80 years at audiometric frequencies of 2 000 Hz and below; it was up to 70 years for all frequencies in the previous editions.

Introduction

The sensitivity of human hearing is well known to decrease with age and the impairment of hearing develops more rapidly for sound at high frequencies than at low frequencies. Moreover, the magnitude of this effect varies considerably among individuals.

When testing the hearing of persons markedly over 18 years of age, part of any observed hearing loss will probably be associated with age. It is important to be aware of this when estimating the amount of hearing loss attributable to other causes under investigation.

It should be noted that a decrease in hearing ability may not necessarily be caused by ageing itself, but by many injurious influences during lifetime, which are not known in detail.

This document is based on a thorough examination of literature data on the differences between groups having different ages for populations of otologically normal persons as defined herein. Distinction is made between males and females since the difference is found to be of significance in the case of older age groups. The data have been derived from investigations using pure tones transmitted to the ear from an earphone, but no evidence is known that disqualifies their use for noise band stimuli.

This document is a revision of the second edition (ISO 7029:2000). The expected medians and statistical distributions of hearing thresholds were re-estimated using audiometric data published after the establishment of the first edition (ISO 7029:1984). All the data on which the second edition had been based were discarded. Thus, this third edition describes the hearing sensitivity profile of people in recent years.

Hearing thresholds presented in this document are generally lower at high frequencies than those in the previous editions of this document. The 4 kHz dip observed in males has become negligibly small. The source data of the previous editions might not have been screened rigorously in terms of hearing abnormalities. Problems related to instrumentation might also have affected measurement data.

The expected median hearing thresholds at the frequencies from 9 000 Hz to 12 500 Hz are presented for information. Audiometry at those frequencies is executable using an extended high-frequency audiometer.

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Acoustics — Statistical distribution of hearing thresholds related to age and gender

1 Scope

This document provides descriptive statistics of the hearing threshold deviation for populations of otologically normal persons of various ages under monaural earphone listening conditions. It specifies the following, for populations within the age limits from 18 years to 80 years for the range of audiometric frequencies from 125 Hz to 8 000 Hz:

a) the expected median value of hearing thresholds given relative to the median hearing threshold at the age of 18 years;

b) the expected statistical distribution above and below the median value.

For the frequencies from 3 000 Hz to 8 000 Hz, the median and statistical distribution for populations above 70 years are presented for information only.

This document also provides for information the expected median values at audiometric frequencies from 9 000 Hz to 12 500 Hz within the age limits from 22 years to 80 years.

The data are applicable for estimating the amount of hearing loss caused by a specific agent in a population. Such a comparison is valid if the population under study consists of persons who are otologically normal except for the effect of the specific agent. Noise exposure is an example of a specific agent and for this application, selected data from this document are referred to as "database A" in ISO 1999.

NOTE 1 ISO 1999:2013, Database A is based on a previous edition of ISO 7029.

The data may also be used to assess an individual's hearing in relation to the distribution of hearing thresholds which is normal for the person's age group. However, it is not possible to determine for an individual precisely which part of an observed hearing loss is attributable to an accumulation of detrimental effects on the hearing which increase with age, and which part has been caused by other factors such as noise.

The hearing threshold deviation as defined herein and the hearing threshold level as defined in other International Standards (ISO 389-1, ISO 389-2, ISO 389-5, ISO 389-8, ISO 8253-1, ISO 8253-2, IEC 60645-1) express the hearing threshold of an individual or an individual ear, respectively, relative to

— the expected median hearing threshold of 18-year-old age group of the same gender, or

— a reference zero level specified in various parts of ISO 389.

To the extent that the reference zero level represents the median of the 18-year-old population, the values of the two terms will be the same.

NOTE 2 The values of these two are not always the same for some reasons. One reason is that the reference zero level has been determined based on the hearing threshold levels of persons older than 18 years, including those aged up to 25 years or to 30 years, who have slightly worse hearing sensitivity on average.

NOTE 3 ISO 28961 specifies the expected statistical distribution of hearing thresholds, expressed in sound pressure level in decibels, for populations of otologically normal persons of the age from 18 years to 25 years under binaural, free-field listening conditions. It enables the calculation not only at audiometric frequencies, but also for other frequencies at one-third-octave intervals from 20 Hz to 16 000 Hz.

2 Normative references

There are no normative references in this document.