SLOVENSKI STANDARD
SIST EN ISO 389:1999

01-november-1999

Akustika - Standardna referenļ na niļ la za umerjanje avdiometrov s ļ istimi toni za zraļ no prevodnost (ISO 389:1991)

Acoustics - Standard reference zero for the calibration of pure-tone air conduction audiometers (ISO 389:1991)

Akustik - Standard-Bezugspegel für die Kalibrierung von Reinton-Luftleitungs-Audiometern (ISO 389:1991)

Acoustique - Zéro normal de référence pour l'étalonnage des audiometres a sons purs en conduction aérienne (ISO 389:1991)

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English version

Acoustics - Standard reference zero for the calibration of pure-tone air conduction audiometers (ISO 389:1991)

Acoustique - Zéro normal de référence pour l'étalonnage des audiomètres à sons purs en conduction aérienne (ISO 389:1991)

Akustik - Standard-Bezugspegel für die Kalibrierung von Reinton-Luftleitungs-Audiometern(ISO 389:1991)

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Foreword

The text of the International Standard has been taken as a European Standard by the Technical Committee CEN/TC 211 "Acoustics" from ISO/TC 43 "Acoustics" of the International Organization for Standardization (ISO).

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 1996, and conflicting national standards shall be withdrawn at the latest by March 1996.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 389:1991 has been approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 389

Third edition
1991-03-01

Acoustics — Standard reference zero for the calibration of pure-tone air conduction audiometers

Acoustique — Zéro normal de référence pour l'étalonnage des audiomètres à sons purs en conduction aérienne

Reference number
ISO 389:1991(E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 389 was prepared by Technical Committee ISO/TC 43, *Acoustics*.

This third edition cancels and replaces the second edition (ISO 389:1985). It incorporates Addenda 1 (published in 1983) and 2 (published in 1986).

Annexes A and B of this International Standard are for information only.

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Introduction

The first edition of ISO 389 specified a standard reference zero for the scale of hearing threshold level applicable to pure-tone air conduction audiometers in terms of the response of certain models of earphone measured on an artificial ear or coupler of stated type. Five of these earphone-coupler combinations corresponded with those used at that time in standardizing laboratories in France, Germany, the United Kingdom, the USA and the USSR. In a second set of values the corresponding reference equivalent threshold sound pressure levels (RETSPL) for eleven audiometric earphones were given, referred to a single type of coupler, the National Bureau of Standards, Washington, USA, type 9A coupler, which was later specified in IEC 303.

Most of the earphone-coupler combinations mentioned in the first edition of ISO 389 are now no longer in use. The ISO member bodies of the countries primarily concerned with those types of standard earphones and artificial ears agreed to eliminate obsolete data. This was done in the second edition of ISO 389. It contained only RETSPL values for two earphone models still widely in use for audiometric purposes, namely Telephonics type THD 39 with cushion type MX 41/AR (or model 51) and Beyer type DT 48, both in conjunction with an acoustic coupler complying with IEC 303.

The two remaining sets of data differ mainly as a consequence of differences between the acoustical properties of the coupler and those of the average human ear.

For the same reason, the RETSPL for an earphone of a model not covered by ISO 389 could not be inferred from the data given in that International Standard. Until then it had been necessary to obtain the appropriate values by subjective comparison with one of the specified models of earphone.

In principle, RETSPL values would be rendered independent of earphone model if they were referred to an artificial ear having acoustical properties exactly simulating those of the average human ear. A device designed with this aim in view was standardized in 1971 in IEC 318.

Addendum 1 to ISO 389:1985 had therefore been prepared based on an assessment of technical data provided by laboratories listed in annex A on RETSPL values relative to the IEC artificial ear, covering a variety of earphone models.

These data had been analysed to produce a set of RETSPL values which, within an acceptable tolerance, provide a standard audiometric reference zero for 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 A for information.

Use of the standard reference zero specified in Addendum 1 obviated the need for subjective calibration of supra-aural audiometric earphones which meet the broad requirements specified, and thus promoted

agreement and uniformity in the expression of hearing threshold levels throughout the world, without inhibiting the development of improved models of supra-aural earphone.

The data of Addendum 1 are now incorporated in this third edition of ISO 389.

In both ISO 389 and ISO 389/Add. 1, the RETSPL values were specified for pure tones in octave steps from 125 Hz to 8 000 Hz and for the intermediate audiometric frequencies 1 500 Hz, 3 000 Hz and 6 000 Hz. However, in addition, 750 Hz is sometimes used as an intermediate audiometric frequency, and Addendum 2 to ISO 389:1985 therefore specified RETSPL values for that frequency.

Moreover, it had been considered desirable to harmonize intermediate frequencies used in pure-tone audiometry with the preferred frequencies in acoustics as specified in ISO 266. Addendum 2 therefore specified RETSPL values at all preferred frequencies in one-third octave steps in the frequency range from 125 Hz to 8 000 Hz. Details of the derivation of the RETSPL values are given in annex A for further information. The data of Addendum 2 are now also incoporated in this third edition of ISO 389.

The RETSPL value specified at 750 Hz is intended for calibration of audiometers providing pure tones of a fixed frequency of 750 Hz. The other RETSPL values specified are primarily intended for calibration of pure-tone audiometers having a continuously variable frequency, but they may also be used in other applications, for example for establishing reference levels for masking noise. The frequencies given in ISO 389:1985 and Addendum 2 are consistent with the frequencies used in ISO 7566 for the specification of the standard reference zero for the calibration of bone conduction audiometers. Three sets of RETSPL values were specified. Two of these concern the same earphone models as in ISO 389:1985. The third set of RETSPL values were specified for supra-aural earphones other than those covered by ISO 389:1985 but which fulfil the requirements specified in ISO 389/Add. 1.

Acoustics — Standard reference zero for the calibration of pure-tone air conduction audiometers

1 Scope

This International Standard specifies a standard reference zero for the scale of hearing threshold level applicable to pure-tone air conduction audiometers in order 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 response of two different standard models of earphone measured on a coupler complying with IEC 303 and in terms of other supra-aural earphones of models specified in 4.2 measured on an artificial ear complying with IEC 318.

It is 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 derivation and application of the recommended reference levels are given in annex A.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 303:1970, *IEC provisional reference coupler for the calibration of earphones used in audiometry*.

IEC 318:1970, *An IEC artificial ear, of the wideband type, for the calibration of earphones used in audiometry*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 air conduction: Transmission of sound through the external and middle ear to the inner ear.

3.2 acoustic coupler: A cavity of specified shape and volume which is used for the calibration of a supra-aural earphone in conjunction with a calibrated microphone to measure the sound pressure developed within the cavity.

NOTE 1 An acoustic coupler is specified in IEC 303.

3.3 artificial ear: A device for the calibration of an earphone which presents to the earphone an acoustic impedance equivalent to the impedance presented by the average human ear. It is equipped with a calibrated microphone for the measurement of the sound pressure developed by the earphone.

NOTE 2 An artificial ear is specified in IEC 318.

3.4 threshold of hearing: The level of a sound at which, under specified conditions, a person gives 50 % of correct detection responses on repeated trials.

3.5 otologically normal person: A person in a normal state of health who is free from all signs or symptoms of ear disease and from obstructing wax in the ear canal, who has no history of undue exposure to noise.

3.6 equivalent threshold sound pressure level (monaural earphone listening): For a given ear, at a specified frequency, for a specified model of earphone and for a stated force of application of the earphone to the human ear, the sound pressure level set up by the earphone in a specified acoustic coupler or artificial ear when the earphone is actuated by that voltage which, with the earphone ap-