

Second edition  
2005-11-01

**AMENDMENT 1**  
2016-07-15

---

---

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

Part 7:  
**Reference threshold of hearing under  
free-field and diffuse-field listening  
conditions**

**AMENDMENT 1: Reference threshold of  
hearing at 20 Hz and 18 000 Hz under  
free-field listening conditions and at  
20 Hz under diffuse-field listening  
conditions**

*Acoustique — Zéro de référence pour l'étalonnage d'équipements  
audiométriques —*

*Partie 7: Niveau liminaire de référence dans des conditions d'écoute  
en champ libre et en champ diffus*

*AMENDEMENT 1: Seuil d'audition de référence à 20 Hz et 18 000  
Hz dans des conditions d'écoute en champ libre et à 20 Hz dans des  
conditions d'écoute en champ diffus*



Reference number  
ISO 389-7:2005/Amd.1:2016(E)

© ISO 2016

STANDARDSISO.COM : Click to view the full PDF of ISO 389-7:2005/Amd 1:2016



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

## 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 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*.

STANDARDSISO.COM : Click to view the full PDF of ISO 389-7:2005/Amd 1:2016

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

Part 7:

### Reference threshold of hearing under free-field and diffuse-field listening conditions

#### AMENDMENT 1: Reference threshold of hearing at 20 Hz and 18 000 Hz under free-field listening conditions and at 20 Hz under diffuse-field listening conditions

Page 3, Table 1

In the column “Reference threshold of hearing under the condition of free-field listening (frontal incidence)” and “Reference threshold of hearing under the condition of diffuse-field listening”, replace the value “78,5” for “20 Hz” with the value “78,1” and remove the superscript “a”.

In the column “Reference threshold of hearing under the condition of free-field listening (frontal incidence)”, replace the value “73,2” for “18 000 Hz” with the value “70,4” and remove the superscript “a”.

Replace the note to the table with the following:

- <sup>a</sup> At 16 000 Hz, experimental data for  $\Delta L$  was reported from one laboratory only.

Page 6, A.1

Add the following paragraph and note after the last paragraph before Table A.1:

The values at 20 Hz and 18 000 Hz were replaced with the average of the median threshold values of two studies (References [25] and [26]) and those of three studies (References [27] to [29]), respectively, to increase the number of subjects involved and, thereby, improve the reliability of the threshold values. Weighting on the basis of the number of subjects was not carried out in the averaging.

NOTE As a result of this amendment, the reference thresholds at 20 Hz given in this part of ISO 389 differ from those given in ISO 226:2003.

Add Table A.2 after Table A.1.

**Table A.2 — Investigations of threshold of hearing used for determining the thresholds at 20 Hz and 18 000 Hz**

Investigation	Reference [25]	Reference [26]	Reference [27]	Reference [28]	Reference [29]
Year	1997	2008	2001	2003	2005
Country	Denmark	Japan	Japan	Japan	Japan
Sound field	Pressure field <sup>a</sup>	Pressure field <sup>a</sup>	Free field	Free field	Free field
Measurement frequency adopted for the threshold determination, Hz	20	20	18 000	18 000	18 000
Number of subjects (age)	23 (19 to 25)	51 (19 to 25)	32 (18 to 25)	51 (19 to 24)	38 (18 to 24)
<sup>a</sup> It is empirically known that, at low frequencies, the threshold measurement in a pressure field yields the same value as that in a free field.					

Page 9, Bibliography

Replace Reference [6] by the following:

[6] ISO 389-5, *Acoustics — Reference zero for the calibration of audiometric equipment — Part 5: Reference equivalent threshold sound pressure levels for pure tones in the frequency range 8 kHz to 16 kHz*

Delete the reference to Footnote 1) and the footnote “To be published”. Renumber the reference to Footnote 2) and the footnote itself to Footnote 1).

Add the following references:

[25] LYDOLF, M. and MØLLER, H. New measurements of the threshold of hearing and equal-loudness contours at low frequencies. *Proceedings of the 8th International Meeting on Low Frequency Noise and Vibration*, Gothenburg, Sweden, 1997, pp. 76–84

[26] KURAKATA, K., MIZUNAMI, T., SATO, H., and INUKAI, Y. Effect of ageing on hearing thresholds in the low frequency region. *J. Low Freq. Noise Vibr. Act. Cont.*, **27**, 2008, pp. 175–184

[27] TAKESHIMA, H., SUZUKI, Y., FUJII, H., KUMAGAI, M., ASHIHARA, K., FUJIMORI, T. and SONE, T. Equal-loudness contours measured by the randomized maximum likelihood sequential procedure. *Acta Acustica united with Acustica*, **87**, 2001, pp. 389–399

[28] KURAKATA, K., ASHIHARA, K., MATSUSHITA, K., TAMAI, H., and IHARA, Y. Threshold of hearing in free field for high-frequency tones from 1 to 20 kHz. *Acoust. Sci. Tech.*, **24**, 2003, pp. 398–399

[29] KURAKATA, K., MIZUNAMI, T., MATSUSHITA, K. and ASHIHARA, K. Statistical distribution of normal hearing thresholds under free-field listening conditions. *Acoust. Sci. Tech.*, **26**, 2005, pp. 440–446