

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*



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

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:

- ^a At 16 000 Hz, experimental data for ΔL was reported from one laboratory only.

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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 ^a	Pressure field ^a	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)
^a 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.					

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

