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Third edition
2023-03

Acoustics — Normal equal-loudness-level contours

Acoustique — Lignes isosoniques normales



Reference number
ISO 226:2023(E)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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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 of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 43, *Acoustics*.

This third edition cancels and replaces the second edition (ISO 226:2003), which has been technically revised.

The main changes are as follows:

- clarification of the scope in the introduction;
- updated bibliography;
- alignment with ISO 389-7 regarding the 0 phon data;
- correction of systematic errors that lead to minor changes in the entire data up to 0,6 dB.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Curves defining combinations of pure tones in terms of frequency and sound pressure level, which are perceived as equally loud, express a fundamental property of the human auditory system and are of basic importance in the field of psychoacoustics. Such equal-loudness-level contours were specified in the previous editions of this document.

NOTE 1 In this document, only the equal-loudness-level contours for pure tones are specified because of insufficient equal-loudness-level data for other sounds. Nevertheless, this International Standard could be applicable to one-third-octave or narrower bands of noise. It may be less valid for broader bands of noises or noises with prominent tones.

NOTE 2 For the calculation of loudness of arbitrary signals or the calculation of the tonal loudness other standards must be applied (e.g., for loudness of arbitrary stationary and non-stationary (time-varying) sounds: ISO 532-1^[2], for loudness of arbitrary stationary sounds: ISO 532-2^[3], for tonal loudness and tonality: ECMA-418-2^[4]). The tonal loudness is the loudness of the tonal components of a complex sound as the basis for the tonality calculation in Reference ^[4].

During the technical revision of this document, it was decided to maintain separate documents for the specification of the threshold and supra-threshold data. The threshold values are specified in ISO 389 7^[1], as a part of the series of International Standards concerning reference zero values for the calibration of audiometric equipment. The equal-loudness-level contours are presented in this document.

NOTE 3 The equal-loudness-level values given by this document differ from those of the previous edition of ISO 226, although the differences are small, i.e., up to 0,6 dB for the entire range of data. This change was caused by the application of an improved model for the perception of loudness as described in Reference ^[5]. The normal equal-loudness-level contours for pure tones in this document are essentially identical to those described in Reference ^[5] since both are based on the same equal-loudness-level data. The only difference is the low equal-loudness levels at 20 Hz caused by the revision of ISO 389-7 in 2019, which introduced a 0,4 dB change in the normative hearing threshold at that frequency.