

Acoustics — Normal equal-loudness-level contours

ICS 13.140

National foreword

This British Standard reproduces verbatim ISO 226:2003 and implements it as the UK national standard. It supersedes BS 3383:1988 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee EH/1, Acoustics, to Subcommittee EH/1/1, Hearing, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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Summary of pages

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 226 was prepared by Technical Committee ISO/TC 43, *Acoustics*.

This second edition cancels and replaces the first edition (ISO 226:1987), which has been technically revised.

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. Together with data on the threshold of hearing under free-field and diffuse-field listening conditions, such equal-loudness-level contours were specified in ISO 226:1987.

NOTE 1 Equal-loudness levels can also be determined for bands of noise. However, only the equal-loudness-level contours for pure tones are specified in this International Standard because insufficient data for bands of noise are available. Nevertheless, this International Standard could be applicable to one-third-octave-bands of noise.

During the technical revision of this International Standard, it was decided to separate threshold and supra-threshold data into two separate documents because the available equal-loudness-level data were not sufficient and hearing thresholds were needed. The threshold values were specified in ISO 389-7:1996, *Acoustics — Reference zero for the calibration of audiometric equipment — Part 7: Reference threshold of hearing under free-field and diffuse-field listening conditions*, 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 International Standard. They have been revised relative to the data in ISO 226:1987.

NOTE 2 ISO 389-7:1996 is presently under revision in order to align the threshold data with this edition of ISO 226.

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1 Scope

This International Standard specifies combinations of sound pressure levels and frequencies of pure continuous tones which are perceived as equally loud by human listeners. The specifications are based on the following conditions:

- a) the sound field in the absence of the listener consists of a free progressive plane wave;
- b) the source of sound is directly in front of the listener;
- c) the sound signals are pure tones;
- d) the sound pressure level is measured at the position where the centre of the listener's head would be, but in the absence of the listener;
- e) listening is binaural;
- f) the listeners are otologically normal persons in the age range from 18 years to 25 years inclusive.

The data are given in graphical form in Annex A and in numerical form in Annex B for the preferred frequencies in the one-third-octave series from 20 Hz to 12 500 Hz, inclusive, in accordance with ISO 266.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 266, *Acoustics — Preferred frequencies*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

otologically normal person

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 canals, and who has no history of undue exposure to noise, exposure to potentially ototoxic drugs or familial hearing loss

3.2

free sound field

sound field where the boundaries of the room exert a negligible effect on the sound waves