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Acoustics — Determination of sound power levels of noise sources — Precision methods for discrete-frequency and narrow-band sources in reverberation rooms

Acoustique — Détermination des niveaux de puissance acoustique émis par les sources de bruit — Méthodes de laboratoire en salles réverbérantes pour les sources émettant des bruits à composantes tonales et à bande étroite

ISO 3742:1988

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 3742 was prepared by Technical Committee ISO/TC 43, *Acoustics*.

This second edition cancels and replaces the first edition (ISO 3742 : 1975), of which it constitutes a minor revision.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Acoustics — Determination of sound power levels of noise sources — Precision methods for discrete-frequency and narrow-band sources in reverberation rooms

0.1 Related International Standards

This International Standard is one of a series specifying various methods for determining the sound power levels of machines and equipment. These basic documents specify only the acoustical requirements for measurements appropriate for different test environments as shown in table 1.

When applying these basic documents, it is necessary to decide which one is most appropriate for the conditions and purposes of the test. The operating and mounting conditions of the machine or equipment to be tested are given as general principles stated in each of the basic documents. Guidelines for making these decisions are provided in ISO 3740. If no noise test code is specified for a particular machine, the mounting and operating conditions shall be fully described in the test report.

0.2 Synopsis of ISO 3742

0.2.1 Applicability

0.2.1.1 Test environment

Specified reverberation room which is to be qualified in accordance with a test procedure given in clause 3 of the main part of this International Standard and in the annex; additional test room requirements are given in ISO 3741.

0.2.1.2 Size of noise source

Volume of the source preferably less than 1 % of volume of the test room.

0.2.1.3 Character of noise radiated by the source

Steady (as defined in ISO 2204), discrete-frequency and/or narrow-band.

0.2.2 Precision

Measurements made in conformity with this International Standard will, with very few exceptions, result in standard deviations equal to or less than 1,5 dB from 400 to 5 000 Hz, 2 dB from 200 to 315 Hz, increasing to 3 dB below 200 Hz and above 5 000 Hz (see 1.3 and table 2).

0.2.3 Quantities to be measured

Sound pressure levels in frequency bands on a specified path or at several discrete microphone positions.

0.2.4 Quantities to be determined

Sound pressure levels in frequency bands; A-weighted sound power levels (optional).

0.2.5 Quantities which cannot be obtained

Directivity characteristics of the source; temporal pattern of radiated noise for sources emitting non-steady noise.

0.3 Introduction

This International Standard specifies in detail two laboratory methods for determining the sound power of small sources using a reverberation test room.

The procedure specified in ISO 3741 applies to sources which produce steady, broad-band noise. This International Standard gives additional precautions that have to be observed if discrete frequencies or narrow bands of noise are present in the spectrum of the noise radiated by the sound source.

If a source emits narrow-band or discrete-frequency sound, a precise determination of the radiated sound power requires greater effort. The accuracy objectives for characterizing broad-band sound sources (table 2 of ISO 3741) cannot be achieved with a microphone traverse of 3 m (or with only three microphones in a fixed array) and with only one source location in the reverberation room. The reasons are as follows:

- the space/time-averaged sound pressure along the microphone path (see 7.1 in ISO 3741), or as determined with an array of three microphones, is not always a good estimate of the space/time-averaged mean-square pressure throughout the room;
- the sound power radiated by the source is more strongly influenced by the normal modes of the room and by the position of the source within the room.

If narrow bands of noise or discrete frequencies are emitted by a source, a determination of its sound power level in a reverberation room requires the use of a greater number of source locations and microphone positions (or a greater path length for a moving microphone). The required numbers of locations and positions depend on the desired accuracy, the spectrum of the radiated noise, and the properties of the test

Table 1 — International Standards specifying various methods for determining the sound power levels of machines and equipment

Inter-national Standard No.*	Classification of method**	Test environment	Volume of source	Character of noise	Sound power levels obtainable	Optional information available
3741	Precision (grade 1)	Reverberation room meeting specified requirements	Preferably less than 1 % of test room volume	Steady, broad-band	In one-third octave or octave bands	A-weighted sound power level
3742				Steady, discrete-frequency or narrow-band		
3743	Engineering (grade 2)	Special reverberation test room	Greatest dimension less than 15 m	Steady, broad-band, narrow-band, or discrete-frequency	A-weighted and in octave bands	Other weighted sound power levels
3744	Engineering (grade 2)	Outdoors or in large room		Any		
3745	Precision (grade 1)	Anechoic or semi-anechoic room	Preferably less than 0,5 % of test room volume	Any	A-weighted and in one-third octave or octave bands	Directivity information and sound pressure levels as a function of time; other weighted sound power levels
3746	Survey (grade 3)	No special test environment	No restrictions: limited only by available test environment	Any	A-weighted	Sound pressure levels as a function of time; other weighted sound power levels
3747	Survey (grade 3)	No special test environment; source under test not movable	No restrictions	Steady, broad-band, narrow-band, or discrete-frequency	A-weighted	Sound power levels in octave bands

* See clause 2.

** See ISO 2204.