



**Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic rooms and hemi-anechoic rooms**



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- Association of Australasian Acoustical Consultants
- Australian Acoustical Society
- Austrroads
- Bureau of Steel Manufacturers of Australia
- Department of Defence (Australian Government)
- Engineers Australia
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## Preface

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee EV-010, Acoustics Community Noise.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to specify methods for measuring the sound pressure levels on a measurement surface enveloping a noise source (machinery and equipment) in an anechoic room or a hemi-anechoic room, in order to determine the sound power level or sound energy level produced by the noise source. This Standard specifies requirements for the test environment and instrumentation, as well as techniques for obtaining the surface sound pressure level from which the sound power level or sound energy level is calculated, leading to results which have a grade 1 accuracy.

This Standard is identical with, and has been reproduced from, ISO 3745:2012, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic rooms and hemi-anechoic rooms*.

As this document has been reproduced from an International Standard, the following applies:

- (a) In the source text “this International Standard” should read “this Australian Standard”.
- (b) A full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an ‘informative’ appendix or annex is only for information and guidance.

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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 3745 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This third edition cancels and replaces the second edition (ISO 3745:2003), which has been technically revised.

## Introduction

This International Standard is one of the series ISO 3741<sup>[3]</sup> to ISO 3747<sup>[8]</sup>, which specify various methods for determining the sound power levels and sound energy levels of noise sources including machinery, equipment and their sub-assemblies. The selection of one of the methods from the series for use in a particular application depends on the purpose of the test to determine the sound power level or sound energy level and on the facilities available. General guidelines to assist in the selection are provided in ISO 3740<sup>[2]</sup>. ISO 3741<sup>[3]</sup> to ISO 3747<sup>[8]</sup> give only general principles regarding the operating and mounting conditions of the machinery or equipment for the purposes of the test. It is important that test codes be established for individual kinds of noise source, in order to give detailed requirements on mounting, loading and operating conditions under which the sound power levels or sound energy levels are to be obtained and to select the appropriate measurement surface and microphone array from among those specified in this International Standard.

The methods given in this International Standard require the source to be mounted in either an anechoic room or a hemi-anechoic room having specified acoustical characteristics. The methods are then based on the premise that the sound power or sound energy of the source is directly proportional to the mean-square sound pressure over a hypothetical measurement surface enclosing the source and otherwise depends on the physical constants of air.

The methods specified in this International Standard permit the determination of the sound power level and the sound energy level in frequency bands and/or with frequency A-weighting applied.

The methods give a precision grade of accuracy (grade 1) as defined in ISO 12001. The resulting sound power levels and sound energy levels include corrections to allow for any differences that might exist between the meteorological conditions under which the tests are conducted and reference meteorological conditions. For applications where there are large uncertainties due to operating conditions or where reduced accuracy is acceptable, reference can be made to the more practical methods of ISO 3744<sup>[6]</sup> or ISO 3746<sup>[7]</sup>. Guidance on evaluation of measurement uncertainty is given in Annex I.

# Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic rooms and hemi-anechoic rooms

## 1 Scope

### 1.1 General

This International Standard specifies methods for measuring the sound pressure levels on a measurement surface enveloping a noise source (machinery or equipment) in an anechoic room or a hemi-anechoic room. The sound power level (or, in the case of impulsive or transient noise emission, the sound energy level) produced by the noise source, in frequency bands of width one-third octave or with frequency weighting A applied, is calculated using those measurements, including corrections to allow for any differences between the meteorological conditions at the time and place of the test and those corresponding to a reference characteristic acoustic impedance.

In general, the frequency range of interest includes the one-third-octave bands with mid-band frequencies from 100 Hz to 10 000 Hz. In practice, the range is extended or restricted to frequencies beyond or within these limits, to those between which the test room is qualified for the purposes of the measurements.

### 1.2 Types of noise and noise sources

The methods specified in this International Standard are suitable for all types of noise (steady, non-steady, fluctuating, isolated bursts of sound energy, etc.) defined in ISO 12001.

The noise source under test can be a device, machine, component or sub-assembly. The maximum size of the noise source depends on specified requirements regarding the radius of the hypothetical sphere or hemisphere used as the enveloping measurement surface.

### 1.3 Test room

The test rooms that are applicable for measurements made in accordance with this International Standard are an anechoic room or hemi-anechoic room, also called, respectively, a free-field test room or hemi-free-field test room.

### 1.4 Measurement uncertainty

Information is given on the uncertainty of the sound power levels and sound energy levels determined in accordance with this International Standard, for measurements made in limited bands of frequency and with frequency weighting A applied. The uncertainty conforms to ISO 12001:1996, accuracy grade 1 (precision grade).

## 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 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*

ISO 9613-1:1993, *Acoustics — Attenuation of sound during propagation outdoors — Part 1: Calculation of the absorption of sound by the atmosphere*

ISO 12001:1996, *Acoustics — Noise emitted by machinery and equipment — Rules for the drafting and presentation of a noise test code*