

---

---

**Acoustics — Determination of high-frequency sound power levels emitted by machinery and equipment**

*Acoustique — Détermination des niveaux de puissance acoustique à haute fréquence émis par les machines et équipements*



This document is a preview generated by EBS



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

# Contents

Page

<b>Foreword</b>	<b>v</b>
<b>Introduction</b>	<b>vi</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>1</b>
<b>4 Conformity requirements</b>	<b>1</b>
<b>5 Requirements for measurements in a reverberation test room</b>	<b>1</b>
5.1 General	1
5.2 Meteorological conditions	2
5.3 Instrumentation	2
5.4 Installation and orientation of microphone	2
5.5 Installation and orientation of equipment	3
5.6 Calibration of measurement system	3
5.7 Measurement of sound pressure level	3
<b>6 Method using measured reverberation time</b>	<b>4</b>
6.1 General	4
6.2 Measurement of reverberation time	5
6.3 Calculation of room absorption	5
6.4 Installation of microphone and equipment	5
6.5 Measurement of sound pressure level	5
6.6 Calculation of sound power level	6
<b>7 Method using calculated air absorption</b>	<b>6</b>
7.1 General	6
7.2 Calculation of room constant	6
7.3 Installation of microphone and equipment	6
7.4 Measurement of sound pressure level	6
7.5 Calculation of sound power level	7
<b>8 Method using a reference sound source</b>	<b>8</b>
8.1 Reference sound source	8
8.2 Installation of microphone and equipment	8
8.3 Installation of reference sound source	9
8.4 Measurement of sound pressure level	9
8.5 Calculation of sound power level	9
8.5.1 Equipment emitting broad-band noise	9
8.5.2 Equipment emitting discrete tone(s)	10
<b>9 Method using a free field over a reflecting plane</b>	<b>10</b>
9.1 General	10
9.2 Meteorological conditions	10
9.3 Instrumentation	11
9.4 Installation and orientation of microphone	11
9.5 Installation of equipment	11
9.6 Calibration of measurement system	11
9.7 Measurement of sound pressure level	12
9.8 Calculation of surface sound pressure level and sound power level	12
<b>10 Calculation of sound power level under reference meteorological conditions</b>	<b>13</b>
10.1 Reverberation rooms	13
10.2 Hemi-anechoic rooms	13
<b>11 Measurement uncertainty</b>	<b>13</b>
<b>12 Information to be recorded</b>	<b>13</b>

12.1	General.....	13
12.2	Equipment under test.....	13
12.3	Acoustic environment.....	14
12.4	Instrumentation.....	14
12.5	Acoustical data.....	14
<b>13</b>	<b>Information to be reported.....</b>	<b>14</b>
<b>Annex A (normative) Calculation of air absorption coefficient.....</b>		<b>16</b>
<b>Bibliography.....</b>		<b>18</b>

## 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](http://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](http://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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary information](#).

The committee responsible for this document is ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This second edition cancels and replaces the first edition (ISO 9295:1988), which has been technically revised.

## Introduction

Some machinery and equipment emit high-frequency noise which might be broad-band noise (e.g. paper noise of high-speed printing) or narrow-band noise and discrete tones (e.g. noise of switching power supplies and video display units or medical devices).

This International Standard specifies methods for the determination of the sound power levels in the frequency range covered by the octave band centred at 16 kHz. The measured levels are not frequency-weighted. The principal objective of this International Standard is to prescribe methods for determining the sound power levels and frequencies of tones which are contained within the 16 kHz octave band.

# Acoustics — Determination of high-frequency sound power levels emitted by machinery and equipment

## 1 Scope

This International Standard specifies four methods for the determination of the sound power levels of high-frequency noise emitted by machinery and equipment in the frequency range covered by the octave band centred at 16 kHz, which includes frequencies between 11,2 kHz and 22,4 kHz. They are complementary to the methods described in ISO 3741 and ISO 3744. The first three methods are based on the reverberation test room technique. The fourth method makes use of a free field over a reflecting plane.

The test conditions which prescribe the installation and operation of the equipment are those specified in ISO 3741 or ISO 3744 as applicable.

## 2 Normative references

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

ISO 3741, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for reverberation test rooms*

ISO 3744, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 6926, *Acoustics — Requirements for the performance and calibration of reference sound sources used for the determination of sound power levels*

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

## 3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 3741 and ISO 3744 apply.

## 4 Conformity requirements

A method for the measurement of high-frequency noise is in conformance with this International Standard if it satisfies all the mandatory requirements of one of the four methods described herein specified in [Clauses 6 to 9](#), and if the information recorded and reported is as specified in [Clauses 12 and 13](#), respectively.

## 5 Requirements for measurements in a reverberation test room

### 5.1 General

This International Standard describes three methods using the reverberation test room technique of ISO 3741. The first and the second methods are usually called “direct methods” because they use directly measured or calculated reverberation times. The third method is a so-called “comparison method”. A calibrated reference sound source is used from which the sound power levels of the equipment are determined by comparison.