ASA/ANSI S12.56-2011 / ISO 3746:2010
(a revision of ANSI S12.56-1999 /
ISO 3746:1995)

Reaffirmed by ANSI June 19, 2020

AMERICAN NATIONAL STANDARD

Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane

(a nationally adopted international standard)

Secretariat:

Acoustical Society of America

Approved on June 28, 2011:

American National Standards Institute, Inc.

Abstract

This American National Standard specifies methods for determining the sound power level or sound energy level of a noise source from sound pressure levels measured on a surface enveloping a noise source (machinery or equipment) in a test environment for which requirements are given. The sound power level (or, in the case of noise bursts or transient noise emission, the sound energy level) produced by the noise source with frequency A-weighting applied is calculated using those measurements.

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ANSI/ASA S12.56-2011 / ISO 3746:2010

Accredited Standards Committee S12, Noise

Standards Secretariat
Acoustical Society of America
1305 Walt Whitman Road, Suite 300
Melville, NY 11747

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The American National Standards Institute, Inc. (ANSI) is the national coordinator of voluntary standards development and the clearinghouse in the U.S.A. for information on national and international standards.

The Acoustical Society of America (ASA) is an organization of scientists and engineers formed in 1929 to increase and diffuse the knowledge of acoustics and to promote its practical applications.

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AMERICAN NATIONAL STANDARDS ON ACOUSTICS

The Acoustical Society of America (ASA) provides the Secretariat for Accredited Standards Committees S1 on Acoustics, S2 on Mechanical Vibration and Shock, S3 on Bioacoustics, S3/SC 1 on Animal Bioacoustics, and S12 on Noise. These committees have wide representation from the technical community (manufacturers, consumers, trade associations, organizations with a general interest, and government representatives). The standards are published by the Acoustical Society of America as American National Standards after approval by their respective Standards Committees and the American National Standards Institute (ANSI).

These standards are developed and published as a public service to provide standards useful to the public, industry, and consumers, and to Federal, State, and local governments.

Each of the Accredited Standards Committees (operating in accordance with procedures approved by ANSI) is responsible for developing, voting upon, and maintaining or revising its own Standards. The ASA Standards Secretariat administers Committee organization and activity and provides liaison between the Accredited Standards Committees and ANSI. After the Standards have been produced and adopted by the Accredited Standards Committees, and approved as American National Standards by ANSI, the ASA Standards Secretariat arranges for their publication and distribution.

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered and that a concerted effort be made towards their resolution.

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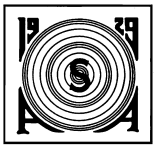
NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this Standard.



Acoustical Society of America
ASA Secretariat
1305 Walt Whitman Road, Suite 300
Melville, New York 11747
Telephone: 1 (631) 390-0215
Fax: 1 (631) 923-2875
E-mail: asastds@acousticalsociety.org

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Foreword

[This Foreword is for information only, and is not a part of the American National Standard ANSI/ASA S12.56-2011 / ISO 3746:2010 American National Standard Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane.]

This standard comprises a part of a group of definitions, standards, and specifications for use in noise. It was developed and approved by Accredited Standards Committee S12, Noise, under its approved operating procedures. Those procedures have been accredited by the American National Standards Institute (ANSI). The Scope of Accredited Standards Committee S12 is as follows:

> *Standards, specifications, and terminology in the field of acoustical noise pertaining to methods of measurement, evaluation, and control, including biological safety, tolerance, and comfort, and physical acoustics as related to environmental and occupational noise.*

This standard is a revision of ANSI S12.56-1999 (R 2004) / ISO 3746:1995, which has been technically revised.

This Standard is identical to International Standard ISO 3746, Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane, which was prepared by Technical Committee ISO/TC 43 Subcommittee SC 1, Noise. However, in conformance with ANSI and ISO rules, the words "American National Standard" replace the words "International Standard" where they appear in the ISO document, decimal points were substituted in place of the decimal commas used in ISO documents, and American English spelling is used in place of British English spelling.

The ANSI or ANSI/ASA equivalents for the ISO standards in the ISO 3740 series and other referenced nationally adopted standards are given below:

- ANSI S12.5 / ISO 6926 is an identical national adoption of ISO 6926;
- ANSI/ASA S12.50/ISO 3740 is an identical national adoption of ISO 3740;
- ANSI/ASA S12.51/ISO 3741 is an identical national adoption of ISO 3741;
- ANSI/ASA S12.53/Part 1/ISO 3743-1 is an identical national adoption of ISO 3743-1;
- ANSI/ASA S12.53/Part 2/ISO 3743-2 is an identical national adoption of ISO 3743-2;
- ANSI/ASA S12.54/ISO 3744 is an identical national adoption of ISO 3744;
- ANSI S12.55/ISO 3745 is an identical national adoption of ISO 3745;
- ANSI/ASA S12.56/ISO 3746 is an identical national adoption of ISO 3746; and
- ANSI/ASA S12.57/ISO 3747 is an identical national adoption of ISO 3747.

At the time this Standard was submitted to Accredited Standards Committee S12, Noise for approval, the membership was as follows:

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R.D. Hellweg, *Vice-Chair*

S.B. Blaeser, *Secretary*

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..... H. Gallagher (Alt.)

U.S. Army Aeromedical Research Lab ..... W.A. Ahroon

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..... M.S. Binseel (Alt.)

U.S. Department of Transportation ..... A. Konheim

U.S. Naval Surface Warfare Center - Carderock ..... M. Craun
..... VACANT (Alt.)

Université du Québec ETS ..... J. Voix
..... F. Laville (Alt.)

Individual Experts of Accredited Standards Committee S12, Noise, were:

P.K. Baade	R.D. Hellweg	R.J. Peppin
E.H. Berger	W.W. Lang	J. Schmitt
B.M. Brooks	D. Lubman	P.D. Schomer
A.J. Campanella	D. Michaud	L.C. Sutherland
K.M. Eldred	N.P. Miller	W.R. Thornton
L.S. Finegold	W.J. Murphy	L.A. Wilber
R.D. Godfrey	M.A. Nobile	G.E. Winzer

Working Group S12/WG 23, Determination of Sound Power, which assisted Accredited Standards Committee S12, Noise, in the development of this standard, had the following membership.

B.M. Brooks, Co-Chair
J. Schmitt, Co-Chair

M.C. Black	K. Cunefare	M.A. Nobile
S. Bly	R.D. Hellweg	M. O'Connell
A.J. Campanella	A.T. Herfat	P.D. Schomer
D.A. Collings	S. Keith	J. Weinstein
	G.C. Maling	

Suggestions for improvements of this standard will be welcomed. They should be sent to Accredited Standards Committee S12, Noise, in care of the Standards Secretariat of the Acoustical Society of America, 35 Pinelawn Road, Suite 114E, Melville, New York 11747-3177. Telephone: 631-390-0215; FAX: 631-390-0217; E-mail: asastds@aip.org.

Introduction

This American National Standard is a national adoption of one of the series ISO 3741[2] to ISO 3747[6], which specify methods for determining the sound power levels and sound energy levels of noise sources including machinery, equipment and their sub-assemblies. Guidelines to select one of those methods are provided in ISO 3740[1]. The selection depends on the environment of the available test facility and on the precision of the sound power level or sound energy level values required. It may be necessary to establish a test code for the individual noise source in order to select the appropriate sound measurement surface and microphone array from among those allowed in each of the ISO 3740[1] to ISO 3747[6] series, and to give requirements for test unit mounting, loading, and operating conditions under which the sound power levels or sound energy levels are to be obtained. The sound power emitted by a given source into the test environment is calculated from the mean square sound pressure that is measured over a hypothetical measurement surface enclosing the source, and the area of that surface. The sound energy for a single machine event is calculated from this sound power and the time over which it existed.

This American National Standard specifies methods giving results of ISO 12001:1996, accuracy grade 3 (survey grade) when measurements are performed within industrial buildings or outdoors. Ideally, the test source should be mounted on a sound-reflecting plane located in a large open space. For sources normally installed on the floor of machine rooms, corrections are defined to account for undesired reflections from nearby objects, walls, and the ceiling, and for the residual background noises that occur there.

The methods specified in this American National Standard permit the determination of the sound power level and the sound energy level with frequency A-weighting applied.

For applications where greater accuracy is required, reference can be made to ISO 3744, ISO 3745[5] or an appropriate part of ISO 9614[14]-[16]. If the relevant criteria for the measurement environment specified in this American National Standard are not met, it might be possible to refer to another of the ISO 3741[2] to ISO 3747[6] series, or to an appropriate part of ISO 9614[14]-[16].

Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane

1 Scope

1.1 General

This American National Standard specifies methods for determining the sound power level or sound energy level of a noise source from sound pressure levels measured on a surface enveloping a noise source (machinery or equipment) in a test environment for which requirements are given. The sound power level (or, in the case of noise bursts or transient noise emission, the sound energy level) produced by the noise source with frequency A-weighting applied is calculated using those measurements.

NOTE Differently shaped measurement surfaces can yield differing estimates of the sound power level of a given noise source and an appropriately drafted test code (see ISO 12001) gives detailed information on the selection of the surface.

1.2 Types of noise and noise sources

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

This American National Standard is applicable to all types and sizes of noise source (e.g. stationary or slowly moving plant, installation, machine, component or sub-assembly), provided the conditions for the measurements can be met.

NOTE The conditions for measurements given in this American National Standard can be impracticable for very tall or very long sources such as chimneys, ducts, conveyors, and multi-source industrial plants. A test code for the determination of noise emission of specific sources can provide alternative methods in such cases.

1.3 Test environment

The test environments that are applicable for measurements made in accordance with this American National Standard can be located indoors or outdoors, with one or more sound-reflecting planes present on or near which the noise source under test is mounted.

1.4 Measurement uncertainty

Information is given on the uncertainty of the sound power levels and sound energy levels determined in accordance with this American National Standard, for measurements made with frequency A-weighting applied. The uncertainty conforms with that of ISO 12001:1996, accuracy grade 3 (survey grade).