ANSI S12.12-1992
(ASA 104-1992)

AMERICAN NATIONAL STANDARD

ENGINEERING METHOD FOR THE DETERMINATION OF SOUND POWER LEVELS OF NOISE SOURCES USING SOUND INTENSITY

Accredited Standards Committee S12, Noise

Standards Secretariat
c/o Acoustical Society of America
335 East 45th Street
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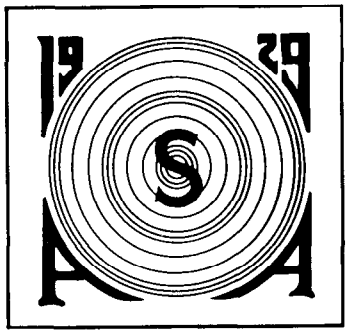

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AMERICAN NATIONAL STANDARD
Engineering Method for the Determination of Sound Power Levels of Noise Sources Using Sound Intensity

ACCREDITED STANDARDS COMMITTEE S12, NOISE

ABSTRACT

This standard describes a method for *in situ* determination of the sound power level of noise sources in indoor or outdoor environments using sound intensity measurements. The standard contains information on instrumentation, installation and operation of the source, procedures for the selection of a measurement surface, methods for the sampling of sound intensity on the measurement surface, procedures for the calculation of sound power level, and techniques that can be used to qualify the measurement environment.

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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.

This standard was approved by the American National Standards Institute as ANSI S12.12-1992 on 27 January 1992.

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FOREWORD

[This Foreword is not a part of the American National Standard Engineering Method for the Determination of Sound Power Levels of Noise Sources Using Sound Intensity, ANSI S12 12-1992 (ASA Catalog No 104-1992)]

This American National Standard contains procedures for the determination of the sound power of noise sources from sound intensity measurements. Previous sound power determinations required special facilities such as anechoic, hemi-anechoic, or reverberation rooms and the estimation of the sound power of sources from sound pressure measurements which resulted in various errors. Using this new standard, the sound power of noise sources can be directly determined from sound intensity measurements made *in situ* even when intrusive background noise is present in the environment. The approaches in this standard are useful also for the relative ranking of machinery noise sources in terms of sound power.

This standard was developed using the American National Standards Institute (ANSI) Accredited Standards Committee Procedure under the Secretariat of the Acoustical Society of America.

Accredited Standards Committee S12, Noise, under whose jurisdiction this standard was developed, has the following scope:

> 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

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

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Working Group S12/WG21, Determination of Sound Power Using Sound Intensity Measurements, which assisted Accredited Standards Committee S12, Noise, in the development of this standard, had the following membership:

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Suggestions for improvement of this standard will be welcomed. They should be sent to **Accredited Standards Committee S12, Noise, in care of the ASA Standards Secretariat, 335 East 45th Street, New York, NY 10017-3483. Telephone (212) 661-9404.**

CONTENTS

American National Standard Engineering Method for the Determination of Sound Power Levels of Noise Sources Using Sound Intensity

1 INTRODUCTION

In previous engineering standards on sound power determination (S12.31–S12.36), sound intensity (the primary quantity needed to determine sound power) is estimated by sound pressure measurement, and therefore is subject to several sources of errors and uncertainties. These uncertainties include errors due to measurements in the near field, test environment shortcomings, and errors caused by the lack of a vector measurement. Previous standards also required the use of special facilities such as anechoic, semi-anechoic, or reverberation rooms. By using this standard, the sound power can be determined in the usual operating or test environment of the sound source by measuring sound intensity directly.

2 SCOPE

2.1 General

This standard gives engineering methods for determining *in situ* sound power using sound intensity measurements on a measurement surface enclosing a source. It provides guidelines on the acoustical environment, including ambient noise, the measurement surface enclosing the source, and the number of measurements on the surface.

This standard does not include specification of instruments or calibration procedures. It is not limited to any one technique of intensity measurement.

2.2 Field of Application

This standard is intended for use primarily to determine the sound power radiated by sources *in situ* for the purpose of noise control, rating, and compliance with purchase specifications. There are no explicit restrictions on the size or shape of the source. The standard applies to any source emitting essentially steady noise during test, except those sources for which the measurement surface cannot be fixed in space. This, in most cases, should enable the sound power level of a noise source to be determined in its usual operating environment when the source of interest is a prominent source.

2.3 Measurement Uncertainty

Sound power determinations made in conformity with this standard should result in standard deviations which are equal to or less than those given in Table 1. This table includes uncertainty in the sound intensity measurement technique due to the test environment, background noise levels, and selection of the number of measurement points.

TABLE 1. Uncertainty in determining sound power levels for engineering measurements *in situ*.

Octave band center frequencies (Hz)	One-third octave band center frequencies (Hz)	Standard deviation (dB)
125	100 to 160	3.0
250 to 500	200 to 630	2.0
1000 to 4000	800 to 5000	1.5
8000	6300 to 10 000	2.5

NOTE: The standard deviations given in Table 1 reflect the cumulative effects of all causes of measurement uncertainty, excluding variations in the sound power level from machine to machine or from test to test which may be caused, for example, by changes in the mounting or operating conditions of the source The reproducibility and repeatability of the test results may be considerably better (i e., smaller standard deviations) than the uncertainties given in Table 1 would indicate.

3 DEFINITIONS

For the purpose of this standard, the following definitions apply:

measurement surface (see Fig. 1): an arbitrary boundary or hypothetical surface of area S chosen so that it encloses the source surface, and on which measurements are made. If present, reflective surfaces, e.g., a supporting or ground plane, usually terminate the measurement surface. Such reflective surfaces are not a part of the measurement surface.