ANSI/ASA S1.8-2016
(a revision of ANSI/ASA S1.8-1989)

AMERICAN NATIONAL STANDARD

Reference Values for Levels Used in Acoustics and Vibrations

ANSI/ASA S1.8-2016

Accredited Standards Committee S1, Acoustics

Standards Secretariat
Acoustical Society of America
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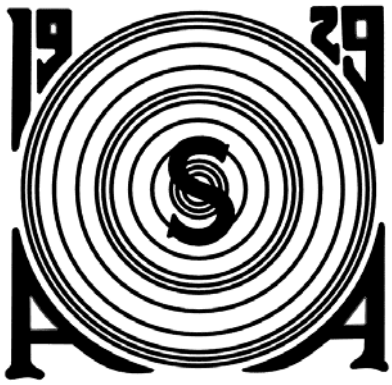

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(Revision of ANSI/ASA S1.8-1989 (R2011))

AMERICAN NATIONAL STANDARD

Reference Values for Levels Used in Acoustics and Vibrations

Secretariat:

Acoustical Society of America

Approved on May 6, 2016, by:

American National Standards Institute, Inc.

Abstract

This standard provides certain reference values to be used for acoustical and vibratory levels. Levels, when used in this standard, refer to a descriptor of mathematical calculation in which a ratio is used. The reference value is the denominator of that ratio. Reference values are stated in the International System of Units (SI). The descriptor of most acoustical levels is the decibel, abbreviated “dB.” Levels are equal to ten times the common (base-10) logarithm (abbreviated lg) of an appropriate nondimensional ratio of a variable quantity (in the numerator) to a reference value of the same kind (in the denominator). The multiplier ten is used when the numerator is a power or power-like quantity (such as the time average of the square of a time-varying sound pressure or vibration acceleration) or an energy-like quantity (such as sound exposure).

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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).

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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.

The use of an American National Standard is completely voluntary. Their existence does not in any respect preclude anyone, whether he or she has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

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.

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Contents

Tables

Foreword

[*This Foreword is for information only and is not a part of* ANSI/ASA S1.8-2016 American National Standard Reference Values for Levels Used in Acoustics and Vibrations*. As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the standard.*]

This standard comprises a part of a group of definitions, standards, and specifications for use in acoustics. It was developed and approved by Accredited Standards Committee S1 Acoustics, under its approved operating procedures. Those procedures have been accredited by the American National Standards Institute (ANSI). The Scope of Accredited Standards Committee S1 is as follows:

> *Standards, specifications, methods of measurement and test, and terminology, in the fields of physical acoustics, including architectural acoustics, electroacoustics, sonics and ultrasonics, and underwater sound, but excluding those aspects which pertain to biological safety, tolerance, and comfort.*

This American National Standard is a revision of ANSI/ASA S1.8-1989 (R2011). The reference values in this standard are consistent with those in ISO 1683.

The major technical changes made in this edition include:

- Substitution of the term “reference value” for “reference quantity” throughout.
- Incorporation of material formerly in the Introduction into the body of the standard.
- Table 1 was expanded.
- Elimination of references to field quantities.
- Deletion of old Appendix A which compared the obsolete reference values for vibration acceleration and velocity which were given in the 1969 edition against those given in the 1989 edition and elimination of clauses from old Appendix B (now Annex A) that used those obsolete values.
- Updated the references and eliminated obsolete references. All references are consolidated in the Bibliography.

The standard also was reformatted to fit the current template.

In this standard, letter symbols for variable and reference values and for acoustical levels are consistent with ANSI/IEEE 260.4, ISO 80000-8, or IEC 60027-3.

In general, the magnitude of a standard reference quantity is one; its unit is a derived SI unit with an SI prefix to indicate the appropriate negative power-of-ten multiplier. Examples are a reference vibratory force of one micronewton (1 μN), or a reference power of one picowatt (1 pW).

Historically, a variety of engineering applications, primarily related to structure-borne sound, have used a reference vibration acceleration and reference vibration velocity of 10 μm/s^2 and 10 nm/s for all media, i.e., as in ANSI/ASA S1.8-1969. In ISO 1683 and in this standard, those reference values are 1 μm/s^2 and 1 nm/s, respectively. See note to Table 1.

At the time this Standard was submitted to Accredited Standards Committee S1, Acoustics, for approval, the membership was as follows:

R.J. Peppin, *Chair*
A.A. Scharine, *Vice-Chair*

S.B. Blaeser, *Secretary*

3M Personal Safety Division, Detection Solutions ..... P.J. Battenberg
..... M. Wurm (Alt.)

Acoustical Society of America ..... R.J. Peppin
..... R.D. Hellweg (Alt.)

Air-Conditioning, Heating and Refrigeration Institute ..... S.J. Lind
..... D. Abbate (Alt.)

American Industrial Hygiene Association ..... D. Driscoll
..... D. Sandfort (Alt.)

Campanella Associates ..... A.J. Campanella

Casella USA ..... R. Brauch

ETS-Lindgren Acoustic Systems ..... D.F. Winker
..... M. Black (Alt.)

G.R.A.S. Sound & Vibration ..... B. Schustrich
..... J. Soendergaard (Alt.)

Information Technology Industry Council ..... W.M. Beltman
..... J. Rosenberg (Alt.)

Josephson Engineering, Inc. ..... D.L. Josephson

National Council of Acoustical Consultants ..... E. Logsdon
..... G.E. Winzer (Alt.)

National Institute of Standards & Technology (NIST) ..... R.P. Wagner
..... S. Fick (Alt.)

PCB Group ..... K. Cox
..... C.M. Walber (Alt.)

Scantek, Inc. ..... S. Marshall
..... M. Buzduga (Alt.)

U.S. Air Force (USAF) ..... R.L. McKinley
..... F. Mobley (Alt.)

U.S. Army Construction Engineering Research Laboratory ..... M. Swearingen
..... M.J. White (Alt.)

U.S. Army Research Laboratory, Human Research and Engineering Directorate ..... A.A. Scharine
..... M.A. Ericson (Alt.)

U.S. Department of Labor – Mine Safety and Health Administration ..... J. Novakovich

Individual Experts of Accredited Standards Committee S1, Acoustics, were:

V. Buzduga	T.R. Letwoski	C.M. Walber
P. Hanes	P.D. Schomer	L. Wu

Working Group S1/WG 30, Reference Quantities, which assisted Accredited Standards Committee S1, Acoustics, in the development of this standard, had the following membership.

R.J. Peppin, Chair

American National Standard

Reference Values for Levels Used in Acoustics and Vibrations

1 Scope

1.1 The scope of this standard includes reference values for commonly used levels in acoustics, electroacoustics, and mechanical vibrations.

1.2 The use of levels to describe acoustical or vibratory quantities is not made mandatory by this standard. Reference values are provided for use when levels are employed.

1.3 The purpose of this standard is to encourage uniformity of practice by providing reference values of convenient magnitude for various kinds of acoustical levels.

1.4 Variable quantities for which this standard applies may vary in time or position, or both.

1.5 Reference values for acoustical levels not described in this standard should be selected after consideration of the guidelines given in Clause 3.

2 Terms and definitions

2.1 variable quantity
The quantity in the numerator of the ratio whose logarithm is taken to form a level. A variable quantity may be a measure of any form of power or energy, or any quantity proportional to them.

NOTE 1 Forms of power for which the watt may be the unit, include: acoustic power, electric power, mechanical power, pneumatic power, and hydraulic power.

NOTE 2 Quantities proportional to power include: sound intensity or the time-mean-square of the amplitude of a time-varying quantity such as sound pressure or vibration acceleration.

NOTE 3 For certain applications, the mean-square value of a time-varying quantity may be the variable quantity. For other applications, a squared peak or maximum value of a time-varying quantity may be the variable quantity.

NOTE 4 Any desired form of frequency weighting may be applied to the variable quantity, e.g., the A or the C weighting from ANSI/ASA S1.4/Part 1 / IEC 61672-1. Frequency bandwidth limitations also may be employed, such as those provided by a fractional-octave-band filter.

2.2 reference value
The value in the denominator of the ratio whose logarithm is taken to form a level.

NOTE The reference value is always the same regardless of the type of time averaging or frequency weighting, if any, applied to the variable quantity in the numerator.

3 Reference values

3.1 Levels, logarithms of non-dimensional ratios, of various kinds are commonly used to describe acoustical and vibratory measurements in gases, liquids, and solids. A reference value, preferably