AMERICAN NATIONAL STANDARD

Electroacoustics – Sound Level Meters – Part 1: Specifications (a nationally adopted international standard)

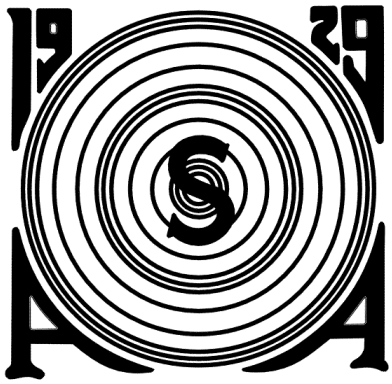
ANSI/ASA S1.4-2014/Part 1 / IEC 61672-1:2013

Accredited Standards Committee S1, Acoustics

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

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.



ANSI/ASA S1.4-2014/Part 1 / IEC 61672-1:2013
(Revision of ANSI S1.4-1983 [R2006], ANSI S1.4a-1985 [R2006], and ANSI S1.43-1997 [R2007])

AMERICAN NATIONAL STANDARD

Electroacoustics – Sound Level Meters – Part 1: Specifications

(a nationally adopted international standard)

Secretariat:

Acoustical Society of America

Approved on July 21, 2014 by:

American National Standards Institute, Inc.

Abstract

This part of ANSI/ASA S1.4 / IEC 61672 gives electroacoustical performance specifications for three kinds of sound-measuring instruments: a time-weighting sound level meter that measures exponential-time-weighted, frequency-weighted sound levels; an integrating-averaging sound level meter that measures time-averaged, frequency-weighted sound levels; and an integrating sound level meter that measures frequency-weighted sound exposure levels.

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.

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.

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

Contents

Tables

Figures

Foreword

[*This Foreword is for information only and is not a part of the American National Standard* ANSI/ASA S1.4-2014/Part 1 / IEC 61672-1:2013 American National Standard Electroacoustics – Sound level meters – Part 1: Specifications. *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 field of physical acoustics, including architectural acoustics, electroacoustics, sonics and ultrasonics, and underwater sound, but excluding those aspects which pertain to biological safety, tolerances, and comfort.*

This nationally adopted international standard is a revision of ANSI S1.4-1983 (R 2006), ANSI S1.4A-1985 (R 2006), and ANSI S1.43-1997 (R 2007), which have been technically revised.

This standard is identical to IEC 61672-1:2013, which was prepared by IEC Technical Committee 29, in cooperation with the International Organization of Legal Metrology (OIML). However, in conformance with ANSI and IEC rules, the words “this part of ANSI/ASA S1.4 / IEC 61672” replace the words “this part of IEC 61672” where they appear in the IEC document, decimal points were substituted in place of the decimal commas used in IEC documents, and American English spelling is used in place of British English spelling. An informational annex is also included that is not found in IEC 61672/Part 1. In accordance with clause A.1 b) of *ANSI Procedures for the National Adoption of ISO and IEC Standards as American National Standards*, a standard will still be considered identical if it includes “any regional or national informative material (e.g. informative annexes that do not alter, add to or delete from the provision of the ISO or IEC standard); examples of informative material are advice to users, training guidance or suggested forms or reports.”

This standard includes six Annexes. Annexes B, D and E are normative and are considered to be a part of this standard. Annexes A and C are informative and are not considered part of this standard. Annex F is additional, totally informative material for U.S. users and is shown in **bold, blue text within a blue border**.

The ANSI/ASA equivalents for the IEC standards in the IEC 61672 series are given below:

- ANSI/ASA S1.4-2014/Part 1 / IEC 61672-1:2013 is an identical national adoption of IEC 61672-1:2013.
- ANSI/ASA S1.4-2014/Part 2 / IEC 61672-2:2013 is an identical national adoption of IEC 61672-2:2013.
- ANSI/ASA S1.4-2014/Part 3 / IEC 61672-3:2013 is an identical national adoption of IEC 61672-3:2013.

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. 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

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. Winker
..... M. Black (Alt.)

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

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

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

National Institute of Standards & Technology (NIST) ..... D.J. Evans
..... R.P. Wagner (Alt.)

PCB Group ..... K. Cox
..... L. Harbaugh (Alt.)

Scantek, Inc. ..... S. Marshall
..... M. Golden (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. Scharine
..... M. Ericson (Alt.)

U.S. Department of Labor – Mine Safety and Health Administration ..... J.P. Seiler
..... J. Homer (Alt.)

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

V. Buzduga	W.W. Lang	C. Walber
P. Hanes	V. Nedzelnitsky	L. Wu
	P.D. Schomer	

Working Group S1/WG 17, Sound Level Meters and Integrating Sound Level Meters, which assisted Accredited Standards Committee S1, Acoustics, in the development of this standard, had the following membership.

G.R. Stephany, Chair

M. Alexander	B.M. Brooks	P. Hanes
R.J. Anderson	K. Cox	R.J. Peppin
P.J. Battenberg	J.J. Earshen	J.P. Seiler

Suggestions for improvements to this standard will be welcomed. They should be sent to Accredited Standards Committee S1, Acoustics, in care of the Standards Secretariat of the Acoustical Society of America, 1305 Walt Whitman Road, Suite 300, Melville, New York 11747. Telephone: 631-390-0215; FAX: 631-923-2875; E-mail: asastds@acousticalsociety.org.

Introduction

U.S. NOTE: The following introductory text describes the differences between the current version of IEC 61672-1 and the 2002 version; it does NOT present the differences between this version and the previous version of ANSI S1.4-1983, ANSI S1.4A-1985, or ANSI S1.43-1997.

For assessments of conformance to performance specifications, this second edition of IEC 61672-1 uses different criteria than were used for the 2002 first edition.

In the period from 1961 to 1985, International Standards for sound level meters did not provide any requirements or recommendations to account for the uncertainty of measurement in assessments of conformance to specifications.

This absence of requirements or recommendations to account for uncertainty of measurement created ambiguity in determinations of conformance to specifications for situations where a measured deviation from a design goal was close to a limit of the allowed deviation. If conformance was determined based on whether a measured deviation did or did not exceed the limits, the end-user of the sound level meter incurred the risk that the true deviation from a design goal exceeded the limits.

To remove this ambiguity, IEC Technical Committee 29, at its meeting in 1996, adopted a policy to account for measurement uncertainty in assessments of conformance in International Standards that it prepares.

The first edition (2002) of IEC 61672-1 accounted for measurement uncertainty by giving two explicit criteria for determining conformance to the specifications. The two criteria were (a) that measured deviations from design goals, extended by the expanded uncertainty of measurement, do not exceed the applicable tolerance limits and (b) that the expanded uncertainty of measurement does not exceed agreed-upon maximum values. For most performance specifications, the tolerance limits were calculated essentially by extending the allowances for design and manufacturing from the 1979 and 1985 International Standards for sound level meters by the applicable maximum-permitted expanded uncertainties of measurement. Tolerance limits were intended to represent the limits for true deviations from design goals with a coverage probability of 95 %.

This second edition of IEC 61672-1 uses an amended criterion for assessing conformance to a specification. Conformance is demonstrated when (a) measured deviations from design goals do not exceed the applicable *acceptance limits* and (b) the uncertainty of measurement does not exceed the corresponding maximum-permitted uncertainty. Acceptance limits are analogous to the allowances for design and manufacturing implied in the first edition (2002) of IEC 61672-1. Actual and maximum-permitted uncertainties are determined for a coverage probability of 95 %. The amended criterion for assessing conformance does not necessitate any change to the design of a sound level meter in order to conform to the specifications of this International Standard.

The maximum-permitted uncertainties of measurement are not equivalent to the uncertainties associated with the measurement of a sound level. The uncertainty of a measured sound level is evaluated from the anticipated deviations of the electroacoustical performance of the sound level meter from the relevant design goals as well as estimates of the uncertainties associated with the specific measurement situation. Unless more-specific information is available, the evaluation of the contribution of a specific sound level meter to a total measurement uncertainty can be based on the acceptance limits and maximum-permitted uncertainties specified in this standard.

American National Standard

Electroacoustics – Sound level meters – Part 1: Specifications

1 Scope

This part of ANSI/ASA S1.4 / IEC 61672 gives electroacoustical performance specifications for three kinds of sound measuring instruments:

- a time-weighting sound level meter that measures exponential-time-weighted, frequency-weighted sound levels;
- an integrating-averaging sound level meter that measures time-averaged, frequency-weighted sound levels; and
- an integrating sound level meter that measures frequency-weighted sound exposure levels.

Sound level meters conforming to the requirements of this standard have a specified frequency response for sound incident on the microphone from one principal direction in an acoustic free field or successively from random directions.

Sound level meters specified in this standard are intended to measure sounds generally in the range of human hearing.

NOTE The AU frequency weighting specified in IEC 61012 can be applied for measurements of A-weighted sound levels of audible sound in the presence of a source that contains spectral components at frequencies greater than 20 kHz.[1]

Two performance categories, class 1 and class 2, are specified in this standard. In general, specifications for class 1 and class 2 sound level meters have the same design goals and differ mainly in the acceptance limits and the range of operational temperature. Acceptance limits for class 2 are greater than, or equal to, those for class 1.

This standard is applicable to a range of designs for sound level meters. A sound level meter may be a self-contained hand-held instrument with an attached microphone and a built-in display device. A sound level meter may be comprised of separate components in one or more enclosures and may be capable of displaying a variety of acoustical signal levels. Sound level meters may include extensive analogue or digital signal processing, separately or in combination, with multiple analogue and digital outputs. Sound level meters may include general-purpose computers, recorders, printers, and other devices that form a necessary part of the complete instrument.

---

1 IEC 61012, *Filters for the measurement of audible sound in the presence of ultrasound*.