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AMERICAN NATIONAL STANDARD **SPECIFICATIONS FOR INTEGRATING- AVERAGING SOUND LEVEL METERS**

ANSI S1.43-1997

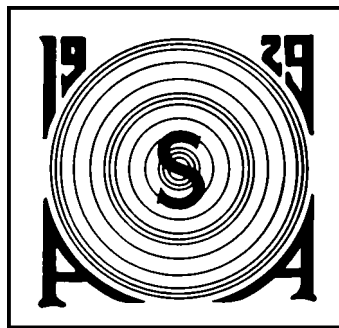
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American National Standard

Specifications for Integrating-Averaging Sound Level Meters

Secretariat

Acoustical Society of America

Approved 12 June 1997

American National Standards Institute, Inc.

Abstract

This Standard describes instruments for the measurement of frequency-weighted and time-average sound pressure levels. Optionally, sound exposure levels may be measured. This Standard is consistent with the relevant requirements of ANSI S1.4-1983 (R 1997) *American National Standard Specification for Sound Level Meters*, but specifies additional characteristics that are necessary to measure the time-average sound pressure level of steady, intermittent, fluctuating, and impulsive sounds.

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Foreword

[This Foreword is not an integral part of ANSI S1.43-1997 *American National Standard Specifications for Integrating-Averaging Sound Level Meters*.]

This Standard is intended to be consistent with IEC 804:1985, *Integrating averaging sound level meters*, including Amendment No. 1 and Amendment No. 2. The Standard differs from IEC 804:1985 in the following ways:

- a) References to corresponding ANSI Standards are given instead of exclusive references to International Standards;
- b) No specifications for Type 3 accuracy class are included, to be consistent with ANSI S1.4-1983 (R 1997) *American National Standard Specification for Sound Level Meters*;
- c) Requirements for the response of the instrument to sounds incident from random directions or in a diffuse sound field are consistent with similar requirements in ANSI S1.4-1983 (R 1997);
- d) Texts of Amendment No. 1 and Amendment No. 2 to IEC 804:1985 are incorporated into the main text of the Standard rather than as separate amendments;
- e) Specifications for time-average A1-weighted sound pressure level are retained for compatibility with IEC 804:1985. It is recommended that time-average A1-weighted sound pressure level not be used in any future standards or regulations.

This Standard was developed under the jurisdiction of Accredited Standards Committee S1, Acoustics, which has the following scope:

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 safety, tolerance, and comfort.

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

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*Mr. Krug died during 1996 whereupon Mr. Kuemmel assumed the position of Chair of the Working Group.

American National Standard

Specifications for Integrating-Averaging Sound Level Meters

1 Scope

1.1 Scope

1.1.1 General

This Standard describes instruments for the measurement of frequency-weighted, time-average sound pressure levels. Optionally, sound exposure levels may be measured. This Standard is consistent with the relevant requirements of ANSI S1.4-1983 (R 1997) *American National Standard Specification for Sound Level Meters*, but specifies additional characteristics that are necessary to measure the time-average sound pressure level of steady, intermittent, fluctuating, and impulsive sounds.

NOTE – Throughout this document, reference to ANSI S1.4-1983 (R 1997) includes the ANSI S1.4A-1985 amendment.

Though a complete integrating-averaging sound level meter is specified, the combination of a conventional sound level meter that satisfies ANSI S1.4-1983 (R 1997) and an accessory or “plug-in” that provides the time averaging capability is admissible if the complete system conforms to the specifications of this Standard.

The instrument is called “integrating-averaging sound level meter,” but the short form “integrating sound level meter” or “averaging sound level meter” may also be used. In this Standard, “integrating sound level meter” is used.

There are some important differences between the time averaging characteristics of an integrating sound level meter and those of a conventional sound level meter with exponential time weighting. Integrating-averaging sound level meters are inherently different from conventional sound level meters with exponential time weighting. As such, they may produce different results. These differences are discussed in annex A.

1.1.2 Types

This Standard specifies integrating sound level meters of three grades of accuracy, designated Types 0, 1, and 2. For each Type, the specification for directional characteristics and frequency weighting and amplifier characteristics are identical with those of ANSI S1.4-1983 (R 1997). Time averaging and indicator specifications differ from those specified in ANSI S1.4-1983 (R 1997).

1.1.3 Characteristics specified

1.1.3.1 This Standard specifies the following characteristics for integrating sound level meters:

- (a) integrating and time averaging;
- (b) indicator; and
- (c) overload indications.

1.1.3.2 Integrating sound level meters also shall comply with the requirements in ANSI S1.4-1983 (R 1997) as follows:

- (a) directional characteristics [from 4.1 and 4.2 of ANSI S1.4-1983 (R 1997)];
- (b) frequency weighting characteristics [from 5.1 and 5.2 of ANSI S1.4-1983 (R 1997)];
- (c) sensitivity to various environments [from 7 of ANSI S1.4-1983 (R 1997)].

1.1.4 Tolerances

Specifications for Types 0, 1, and 2 integrating sound level meters have the same design goals and differ only in the tolerance limits allowed. Tolerance limits broaden as the Type number increases.

1.1.5 Tests specified

This Standard specifies acoustical and electrical tests to verify conformance to the characteristics specified.

1.2 Purpose

The purpose of this Standard is to ensure specified accuracy and stability of an integrating sound level meter and to reduce to the practical minimum any differences between equivalent measurements

taken with instruments of various makes and models that satisfy the requirements of this Standard.

1.3 Applications

The Type 0 integrating sound level meter is intended for use as a laboratory reference standard. Type 1 is intended for laboratory use and for field use where the acoustical environment can be closely specified or controlled. The Type 2 integrating sound level meter is suitable for general field applications.

An integrating sound level meter is well suited for measurement of the average sound level (time-average sound pressure level) or sound exposure levels of impulsive sounds. Such impulsive sounds have high peak amplitude and duration as short as 1 ms.

NOTE – Measurement of the time-average sound pressure level or sound exposure level of impulses with durations less than 1 ms should be regarded as an extrapolation because testing is not required for toneburst durations of less than 1 ms.

Integrating sound level meters intended for field use shall conform to the environmental specifications of ANSI S1.4-1983 (R 1997).

Integrating sound level meters are usually designed to be hand-held or bench mounted. Personal noise dosimeters that may be worn on a person with performance characteristics of Type 2 integrating sound level meters are also available [see ANSI S1.25-1991 (R 1997)].

Integrating sound level meters are used to measure many types of sound, under different conditions and for a variety of reasons. For each application, the measurement technique should be chosen and controlled carefully to obtain valid and consistent results. It is important to recognize that the method of use may have as much effect on a measurement as the quality of the instrument itself; errors will often result if the effect of the environment and (especially for hand-held instruments) the presence of the observer are ignored. Annexes A and B provide additional guidance on the use of integrating sound level meters.

Instruments designed to conform to the specifications of this Standard may not be appropriate for measurements that require a function other than the time integral of the square of the instantaneous sound pressure signal to determine the time-mean-square sound pressure. For such measurements, with a constant sound pressure at the

microphone, the indicated signal level does not change by 3 dB for a doubling or halving of the duration of the integration period.

2 Normative references

The following standards contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of approval by the American National Standards Institute, Inc. (ANSI), the editions indicated were valid. All standards are subject to revision. Parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Information on the most recent editions is available from the ASA Standards Secretariat.

- [1] ANSI S1.1-1994 *American National Standard Acoustical Terminology*.
- [2] ANSI S1.4-1983 (R 1997) *American National Standard Specification for Sound Level Meters and Amendment 1*, ANSI S1.4A-1985.
- [3] ANSI S1.6-1984 (R 1997) *American National Standard Preferred Frequencies, Preferred Frequency Levels, and Band Numbers for Acoustical Measurements*.
- [4] ANSI S1.10-1966 (R 1997) *American National Standard Method for the Calibration of Microphones*.
- [5] ANSI S1.15-19997/Part 1 *American National Standard Measurement Microphones—Part 1: Specifications for Laboratory Standard Microphones*.
- [6] ANSI S1.25-1991 (R 1997) *American National Standard Specification for Personal Noise Dosimeters*. (Revision of ANSI S1.25-1978).
- [7] ANSI S1.40-1984 (R 1997) *American National Standard Specification for Acoustical Calibrators*.
- [8] IEC 804:1985 *Integrating-averaging sound level meters*, First edition 1985, Amendment 1 (1989 September), and Amendment 2, (1993 September). Geneva, Switzerland.

3 Definitions

Definitions of most of the terms used in this Standard may be found in ANSI S1.1-1994. Certain additional terms are given in ANSI S1.4-1983 (R 1997) or are defined below.