ANSI/AHRI Standard 250-2013

2013 Standard for

Performance and Calibration of Reference Sound Sources

Approved American National Standard

ANSI

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This standard supersedes ANSI/AHRI Standard 250-2008.

This standard differs from the 2008 version in that it references ISO 6926 for atmospheric and barometric corrections and ANSI Standard S12.55 for room qualification methods.

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PERFORMANCE AND CALIBRATION OF REFERENCE SOUND SOURCES

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish the performance characteristics of a Reference Sound Source, define the acoustical calibration procedures, and define the method for transfer of calibration from a Primary to a Secondary Reference Sound Source.

1.1.1 *Intent.* This standard is intended for the guidance of the industry, including manufacturers, engineers, installers, contractors and users.

1.1.2 *Review and Amendment.* This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 *Scope.* This standard applies to all Reference Sound Sources used in conjunction with AHRI sound rating standards and covers the one-third octave band frequency range from 50 to 10,000 Hz. This standard also includes calibration over a limited frequency range. Multiple Reference Sound Sources may be used to cover the entire frequency range from 50 to 10,000 Hz.

Section 3. Definitions

All terms in this document will follow standard industry definitions in the *ASHRAE Wikipedia* website (http://wiki.ashrae.org/index.php/ASHRAEwiki) unless otherwise defined in this section.

3.1 *Directivity Index (D_i).* An indicator, expressed in decibels (dB), of the non-uniform spatial sound radiation of the Reference Sound Source being calibrated.

3.2 *Hertz (Hz).* A unit of frequency equal to one cycle per second.

3.3 *Octave Band.* A band of sound covering a range of frequencies such that the highest is twice the lowest. The Octave Bands used in this standard are those defined in ANSI Standard S1.11.

3.4 *One-third Octave Band.* A band of sound covering a range of frequencies such that the highest frequency is the cube root of two times the lowest frequency. The One-third Octave Bands used in this standard are those defined in ANSI Standard S1.11.

3.5 *Reference Sound Source (RSS).* A portable, aerodynamic sound source that produces a known stable broad band sound power output. The device shall meet the performance requirements as defined in Section 4.

3.5.1 *Primary Reference Sound Source.* A laboratory RSS whose Sound Power Levels are determined by using the procedures as defined in Section 5.

3.5.2 *Secondary Reference Sound Source.* A laboratory RSS whose Sound Power Levels are determined by using the transfer calibration procedure as defined in Section 6.

3.6 *Sound Intensity Level, L_i.* Ten times the logarithm to the base ten of the ratio of the magnitude of the intensity to the reference intensity of 1 picowatt per square meter (pW/m^2).

3.7 *Sound Power Level, L_w.* Ten times the logarithm to the base ten of the ratio of the sound power radiated by the source to a reference sound power, expressed in decibels (dB). The reference sound power used in this standard is 1 picowatt (pW).

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3.8 *Sound Pressure Level, L_p.* Twenty times the logarithm to the base ten of the ratio of a given sound pressure to a reference sound pressure of 20 µPa, expressed in decibels (dB).

3.9 *"Shall" or "Should".* "Shall" or "should" shall be interpreted as follows:

3.9.1 *Shall.* Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

3.9.2 *Should. "Should"* is used to indicate provisions which are not mandatory but which are desirable as good practice.

Section 4. Performance Requirements

4.1 *Type of Sound Source.* A portable, aerodynamic sound source that produces a known stable broad band sound power output. The sound source shall have no pure tones within the frequency range of interest. The presence of a tone is indicated by variation in adjacent One-third Octave Bands of more than 3 decibels.

4.2 *Reference Sound Source Spectral Characteristics.* The spectrum of the Reference Sound Source shall be broad band and the spread of one-third octave band Sound Power Levels of the RSS when calibrated over the frequency range of 50 – 10,000 Hz shall not exceed 16 dB. When the Reference Sound Source is only calibrated over the frequency range of 100 to 10,000 Hz the spread of one-third octave band Sound Power Levels of the RSS shall not exceed 12 dB. Regardless of the frequency range of calibration adjacent bands shall not deviate by more than 3 dB to avoid the presence of tones when tested in accordance with this standard.

4.3 *Reference Sound Source Size.* The largest dimension of the source shall not exceed 0.5 m.

4.4 *Vibration Isolation.* The RSS shall be equipped with integral vibration isolation so that it will provide a minimum of 95% isolation at its rotational speed.

4.5 *Temporal Steadiness and Repeatability of the Sound Power Output.* The Reference Sound Source shall be designed and constructed so that the Sound Power Level in each One-third Octave Band is constant in time within the limits defined in Table 1 for the required measurement period. The values in Table 1 represent the expected repeatability of the measurements. Temperature and barometric pressure corrections shall be performed per Clause 8.4 of ISO 6926.

Table 1. RSS Sound Power Level Output Standard Deviations

Frequency Range, Hz	Sound Power Level Output Standard Deviation, dB
50 - 80	0.8
100 - 160	0.4
200 – 10,000	0.2

4.5.1 *Sound Power Level Variation from Electrical Variation.* The RSS Sound Power Level in any One-third Octave Band shall not vary by more than ±0.3 dB within the range of the source electrical power. The manufacturer of the RSS shall provide the tolerances of electrical input power to assure no more than a ±0.3 dB deviation.

4.5.2 *Sound Power Level Variation from Atmospheric Conditions.* The Sound Power Level of the Reference Sound Source may depend on the atmospheric pressure and temperatures along with the altitude. The manufacturer of the RSS shall provide correction values for these variables.

4.6 *Directivity Index.* The Directivity Index of the Reference Sound Source in any One-third Octave Band from 50 to 10,000 Hz at any microphone height shall not exceed + 6 dB. See Section 5.8 for procedure to determine Directivity Index.

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