

ANSI/AMCA Standard 301-06

Methods for Calculating Fan Sound Ratings from Laboratory Test Data

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**AIR MOVEMENT AND CONTROL
ASSOCIATION INTERNATIONAL, INC.**

The International Authority on Air System Components



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ANSI/AMCA Standard 301-06

Methods for Calculating Fan Sound Ratings from Laboratory Test Data



Air Movement and Control Association International, Inc.
30 W. University Drive
Arlington Heights, Illinois 60004

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Air Movement and Control Association International
30 West University Drive
Arlington Heights, IL 60004-1893 U.S.A.

AMCA International, Incorporated
c/o Federation of Environmental Trade Associations
2 Waltham Court, Milley Lane, Hare Hatch
Reading, Berkshire, United Kingdom
RG10 9TH

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Related AMCA Documents

Related Publications	AMCA Publication 11	<i>Certified Ratings Program Operating Manual</i>
	AMCA Publication 311	<i>Certified Ratings Program Product Rating Manual for Fan Sound Performance</i>
Related Standards	ANSI/AMCA Standard 300	<i>Reverberant Room Method for Sound Testing of Fans</i>
	ANSI/AMCA Standard 320	<i>Laboratory Methods of Sound Testing of Fans Using Sound Intensity</i>

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Methods for Calculating Sound Ratings from Laboratory Test Data

1. Purpose

This document establishes standard methods for calculating consistent fan sound ratings from laboratory test data.

2. Scope

This standard applies to fans, blowers, exhausters, or other air moving devices.

3. Symbols and Subscripts

See Table 1.

4. Methods of Presenting Sound Ratings in Octave Band Sound Power Levels

4.1 Octave band sound power level

All octave band sound power levels for each size fan shall be presented in decibels (re 1.0×10^{-12} W) for each of the eight octave bands identified by mid-band frequencies 63, 125, 250, 500, 1000, 2000, 4000 and 8000 Hz for various points of operation and for various speeds. For ducted products, ratings must be presented as pertaining to the same installation type as tested. Those having one-third octave sound test results should do the initial rating calculations for twenty-four one-third octave bands, with final data presented in eight octave bands. Better accuracy will result.

4.1.1 Presenting double width data from single width tests

Tests of single width centrifugal fans may be used as the basis for similar symmetrical (including inlet obstructions) double width fans of the same size at the equivalent point of rating by adding three dB to single width L_W or L_{WA} values. L_W or L_{WA} for double width fans that are not symmetrical (such as those with internally mounted motors) cannot be calculated in this manner.

5. Calculation of Sound Power Ratings

5.1 General

Fan aerodynamic performance has an acoustical counterpart called sound. Sources of fan sound may be aerodynamic, mechanical noise resulting from dynamic unbalance including belts and bearings, and electrical sources such as motors and motors with variable frequency drives. Mechanical noise is normally not a significant component of

the fan sound power level. Published sound power levels primarily reflect aerodynamic sound obtained from sound test standards such as ANSI/AMCA 300, ANSI/AMCA 320, and ANSI/AMCA 330.

Sound power levels can be adjusted for density as follows:

$$L_{Wref} = L_W + 20 \log_{10} (\rho_{ref} / \rho)$$

Where:

ρ = test density

ρ_{ref} = reference density

L_W = sound power level calculated from test data

L_{Wref} = sound power level at reference density

The formula above can be used for laboratory ambient air temperatures from 0-60 °C (32-140 °F), or when ρ_{ref} / ρ is less than 1.14. If the magnitude of the correction is equal to or greater than 3 dB, the correction should be used with caution. It should be noted that if it is ever desired to make a correction to any **sound pressure** values, the correction is ten times the logarithm rather than twenty times:

$$L_{Pref} = L_P + 10 \log_{10} (\rho_{ref} / \rho)$$

It is desirable to publish fan sound power levels that reflect the full aerodynamic envelope of the published catalog; i.e., sizes, speed range, and points of operation. Due to test lab capabilities, it is likely that not all fan sizes and speeds can be tested. It is, therefore, the fan manufacturer's responsibility to develop catalog sound performance ratings. This section provides guidelines for developing sound performance ratings from tests.

5.2 Sound prediction techniques

There are two main calculation techniques used in the prediction of sound power. These are interpolation and extrapolation, which are based on the sound power fan laws. The interpolation method yields better accuracy than extrapolation using the fan laws. In order to improve the accuracy of the sound power prediction, it is recommended that the fan law approach be performed using one-third octave band data.

5.2.1 Interpolation

Interpolation by its nature requires that results are known for the upper and lower boundaries for a particular fan size. The sound data for the operating points inside these bound-