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

ANSI/AMCA STANDARD 301-06

Methods for Calculating Fan Sound Ratings from Laboratory Test Data

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Authority

This document was developed by the AMCA Technical Advisory Committee on Sound. It is based on the methods adopted by the various product divisions of AMCA and was originally approved by the membership in February, 1965. This edition was revised to conform to ANSI/AMCA 300-05. It was adopted by the membership of the Air Movement and Control Association International, Inc., on 30 July 2005 and became effective on 1 November 2005, superceding AMCA 301-90. It was approved by ANSI as an American National Standard on 3 August 2006.

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Methods for Calculating Fan 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.