



Standard Guide for Measurement of In-Duct Sound Pressure Levels from Large Industrial Gas Turbines and Fans¹

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1. Scope

1.1 This guide is intended to provide a simple and consistent procedure for the *in-situ* field measurement of in-duct sound pressure levels in large low pressure industrial air ducts, such as for gas turbines or fans, where considerations such as flow velocity, turbulence or temperature prevent the insertion of sound pressure sensors directly into the flow. This standard guide is intended for both ambient temperature intake air and hot exhaust gas flow in ducts having cross sections of four (4) square meters, or more.

1.2 The described procedure is intended to provide a repeatable and reproducible measure of the in-duct dynamic pressure level at the inlet or exhaust of the gas turbine, or fan. The guide is not intended to quantify the “true” sound pressure level or sound power level. Silencers, as well as Waste Heat Boilers, must be designed using the in-duct sound power level as the basis. Developing the true sound power level based on in-duct measurements of true sound pressure within a complete operating system is complex and procedures are developmental and often proprietary.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Extreme caution is mandatory when working near hot exhaust gas systems and appropriate safety precautions such as the installation of quick acting isolation valves are recommended.*

2. Referenced Documents

2.1 ASTM Standards:²

C634 Terminology Relating to Building and Environmental Acoustics

¹ This guide is under the jurisdiction of ASTM Committee E33 on Building and Environmental Acoustics and is the direct responsibility of Subcommittee E33.08 on Mechanical and Electrical System Noise.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

2.2 ANSI Standards:

S1.4 Specification for Sound Level Meters³

S1.43 Specification for Integrating Averaging Sound Level Meters³

3. Terminology

3.1 Definitions of the acoustical terms used in this guide are given in Terminology C634.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *anechoic tube*—a constant diameter tube of sufficient length that a sound wave reflected from the far end of the tube termination arrives at the microphone position sufficiently attenuated that it will not appreciably affect the microphone reading.

3.2.2 *dynamic pressure*—the total instantaneous pressure incident upon the opening of the test port, including the influence of convective turbulence, local tangential modes, localized boundary layer effects at the test port and the indeterminate effects of all duct acoustical modes.

3.2.3 *fixture*—the apparatus containing the microphone fitting which locates the microphone flush with the inside diameter of the anechoic tube, the necessary fittings permitting airtight connection of the fixture and anechoic tube to the test port, and the anechoic tube.

3.2.4 *probe microphone*—a commercially available microphone termination near the test port connection. Some probes require a pressure compensation connection. Use and installation shall follow manufacturer's procedures/instructions.

3.2.5 *test port*—the hole in the duct wall to which the anechoic tube is connected and whose diameter is equal to the inside diameter of the anechoic tube. In general the term test port, as used herein, will usually include any semi-permanently installed hardware in the wall of the duct permitting closure of the test port when not in use (ball valve and threaded pipe cap, or both) as well as the pipe elements permitting attachment of the fixture and the anechoic tube.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.