

## PROGRESS ON THE DEVELOPMENT OF STANDARDS FOR SOUND INTENSITY MEASUREMENTS

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### Introduction

Sound intensity measurements are increasingly being employed in machinery and industrial noise assessment and control. Using sound intensity measurements sound power levels of noise sources can be determined in their normal operating environment, without the requirement of special facilities. The international and ANSI standards organizations have been involved in developing both instrument and calibration standards, and procedural standards to determine sound power. The sound power document based on discrete point measurements, developed by the ISO, has already become an approved standard. The ANSI sound power draft is expected to receive final approval in a short time. Both the ANSI and IEC working groups are striving hard to develop instrument standards. The progress has been rather slow due to difficulties associated in standardizing many types of instruments and the lack of appropriate calibrating procedures.

This paper discusses the progress made by the ANSI and international standards working groups, highlighting the differences between the two approaches.

### Instrument Standards

The instrument standards that are being prepared by the ANSI and IEC working groups are in the final stages of development. Due to insufficient progress on the techniques relating to the performance evaluation of pressure/velocity probes, both the working groups decided to develop standards for the two microphone probe. The approaches taken by both the working groups are similar, with small variations in some sections. The probe and the processor forming the sound intensity instrument, are treated separately and together. Requirements and tolerance limits are based on the current state of technology. Performance verification requirements are written in terms of type tests to be carried out by the manufacturers, and periodic calibrations to be performed either by the manufacturer or in an accredited laboratory, as they require high degree of specialized knowledge and facility. Simple field checks of the instruments are also required to be carried out during the measurements. Important performance indicators of the instruments are the residual intensity-pressure index, performance of the probe under free field condition and inside standing wave apparatus. The methods and procedures to carry out these performance tests are specified in the documents.

### Sound Power Standards

The standards developed by ANSI and ISO, specify methods for determining the sound power of noise sources from sound intensity measurements on a surface enclosing the source. The standards

contain information on the procedures for the selection of measurement surface, methods for sampling sound intensity on the measurement surface, and procedures for the calculation of sound power levels and achieving the desired grades of accuracy. The approved ISO standard is based on the measurements at discrete points, and the uncertainties are determined by certain ancillary tests using indicators. The procedures prescribed in this standard is rather complex and time consuming, and sometimes lead to too many points. Now this working group is involved in developing a much simpler scanning document. The ANSI draft, which is currently being balloted for the second time for adaptation as an approved standard, includes both fixed point measurements and the scanning of the measurement surface. The required measurement points are determined by successively doubling the number of points on the measurement surface until the specified convergence index for each frequency band is less than the tolerance value. The uncertainties in the scanning method is evaluated either by using the data indicators, given in an appendix, or by varying the scanning rate and pattern.

### References

- IEC 1043, *Instruments for the Measurement of Sound Intensity*, Second Committee Draft, July 1991.
- ISO 9614, *Determination of Sound Power Levels of Noise Sources Using Sound Intensity - Part 1: Measurement at Discrete Points*, April 1990.
- ANSI S12, 12-199X, *Engineering Method for Determination of Sound Power of Levels of Noise Sources Using Sound Intensity*, April 1991.