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Acoustics — Measurement of airborne noise emitted and structure-borne vibration induced by small air-moving devices —

Part 1: Airborne noise measurement

Acoustique — Mesurage du bruit aérien émis et des vibrations de structure induites par les petits équipements de ventilation —

Partie 1: Mesurage du bruit aérien

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This second edition cancels and replaces the first edition (ISO 10302-1:2011), which has been technically revised.

The main changes are as follows:

— In Clause 3, the most terms were editorially improved with no technical changes, and their cross-references to the main body were also clarified.

— In Clause 4, the allowable fan static pressure range, 750 Pa for a full-size plenum, was extended up to 1,500 Pa for a half-size plenum and 3,000 Pa for a quarter-size plenum.

— In Clause 7, for the selection of points of operation, in addition to the existing Method A (conventional method), Method B (alternative method) was introduced.

— In Clause 11, Note was amended to clarify the reference to Annex D.

— In Annex A, to be consistent to the definition of micro-fan (3.1.2), the abscissa of Figure A.1 and related descriptions were amended.

A list of all parts in the ISO 10302 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document shows in detail methods for determining and reporting the airborne noise emissions of small air-moving devices (AMDs) used primarily for cooling electronic equipment, such as that for information technology and telecommunications.

To provide compatibility with measurements of acoustical noise emitted by such equipment, this document uses the noise emission descriptors and sound power measurement methods of ISO 7779. The descriptor of overall airborne noise emission of the AMD under test is the A-weighted sound power level. The one-third-octave-band sound power level is the detailed descriptor of the noise emission. Octave-band sound power levels may be provided in addition to the one-third-octave-band sound power levels.

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Acoustics — Measurement of airborne noise emitted and structure-borne vibration induced by small air-moving devices —

Part 1: Airborne noise measurement

1 Scope

This document specifies methods for measuring the airborne noise emitted by small air-moving devices (AMDs), such as those used for cooling electronic, electrical, and mechanical equipment where the sound power level of the AMD is of interest.

Examples of these AMDs include propeller fans, tube-axial fans, vane-axial fans, centrifugal fans, motorized impellers, and their variations.

This document describes the test apparatus and methods for determining the airborne noise emitted by small AMDs as a function of the volume flow rate and the fan static pressure developed by the AMD on the test apparatus. It is intended for use by AMD manufacturers, by manufacturers who use AMDs for cooling electronic equipment and similar applications, and by testing laboratories. It provides a method for AMD manufacturers, equipment manufacturers and testing laboratories to obtain comparable results. Results of measurements made in accordance with this document are expected to be used for engineering information and performance verification, and the methods can be cited in purchase specifications and contracts between buyers and sellers. The ultimate purpose of the measurements is to provide data to assist the designers of electronic, electrical or mechanical equipment which contains one or more AMDs.

Based on experimental data, a method is given for calculating the maximum volume flow rate of the scaled plenum up to which this document is applicable.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3741, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for reverberation test rooms*

ISO 3744, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 3745, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Precision methods for anechoic rooms and hemi-anechoic rooms*

ISO 5801, *Fans — Performance testing using standardized airways*

ISO 7779:2018, *Acoustics — Measurement of airborne noise emitted by information technology and telecommunications equipment*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

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ANSI/ASA S2.32, *Methods for the experimental determination of mechanical mobility — Part 2: Measurements using single-point translational excitation*

JBMS-72-1:2010, *Acoustics — Method for the measurement of airborne noise emitted and structure-borne vibration induced by small air-moving devices — Part 1: Airborne noise measurement*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7779 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 General definitions

3.1.1
air-moving device
AMD
fan
device for moving air which utilizes a rotating impeller driven by an electric motor with electronic or mechanical command

Note 1 to entry: An air-moving device has at least one inlet opening and at least one outlet opening. The openings can have elements for connection to ductwork or to other parts of the airflow path.

Note 2 to entry: Tests can be run with a particular frame, motor, and rotor, but with different accessories (e.g. finger guards). For the purposes of this document, each such configuration is referred to as an air-moving device.

Note 3 to entry: Within some industries, including information technology, the unmodified term "fan" means "axial flow air-moving device", and the unmodified term "blower" means "centrifugal air-moving device". In this document, the term "fan" is used to mean "air-moving device" and does not necessarily imply axial flow. Modifiers (such as axial, centrifugal or mixed flow) are added as necessary to distinguish between types.

3.1.2
micro-fan
air-moving device (3.1.1) which has a maximum volume flow rate less than or equal to 0,015 m^3/s

Note 1 to entry: Micro-fans are a subset of fans under test according to this document.

Note 2 to entry: ISO 5801 limits the range of applicability to Reynolds numbers of 12 000 or higher. This Reynolds number corresponds to the lower limit of volume flow rate of approximately 0,01 m^3/s. Since lower volume fans are of interest for many cooling applications, the methodology of JBMS-72-1:2010, Annex A[1)] is used to measure the *p*-*q* curve of a micro-fan.

3.2 Acoustical definitions

3.2.1
sound power level
L_W
ten times the logarithm to the base 10 of the ratio of the sound power, P, to a reference value, P_0, expressed in decibels

$$L_W = 10 \lg \frac{P}{P_0}$$

1) The English version of JBMS-72-1:2010, Annex A is freely available from https://hyojunka.jbmia.or.jp/hyojun2/upload-v3/archive/JBMS-72-1-1.pdf.

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