International Standard

ISO 13347-3

# Fans — Determination of fan sound power levels under standardized laboratory conditions —

## Part 3: Enveloping surface methods

*Ventilateurs — Détermination des niveaux de puissance acoustique des ventilateurs dans des conditions de laboratoire standardisées —*

*Partie 3: Méthodes de la surface enveloppante*

Second edition
2026-03

Reference number
ISO 13347-3:2026(en)

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Published in Switzerland

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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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 117, *Fans*.

This second edition cancels and replaces the first edition (ISO 13347-3:2004), which has been technically revised. It also incorporates the Technical Corrigendum ISO 13347-3:2004/Cor 1:2006 and the Amendment ISO 13347-3:2004/Amd 1:2010.

The main changes are as follows:

— inclusion of acoustic methods for installation category E fans;

— symbols have been harmonized with those used in ISO 5801 and other ISO documents listed in the Normative references;

— editorial corrections have been incorporated.

A list of all parts in the ISO 13347 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 gives a method for determining the sound power level of a fan. The method is reproducible in all laboratories which are qualified according to the requirements of this document.

The method employs standard sound measurement instrumentation, applied to rooms which are restricted in certain acoustic properties. The test set-ups are generally designed to represent the physical orientation of a fan as installed, in accordance with ISO 5801 or ISO 13350.

Since sound power levels are considered independent of the acoustic environment around the fan, a good comparison can be made between two or more fans proposed for any specific air performance condition. Moreover, these values establish an accurate base for estimating the acoustical outcome of the fan installation in terms of sound pressure levels. A successful estimate of sound pressure levels requires extensive information on the fan and the environment in which it is to be located.

It is often advantageous for the equipment user to employ acoustical consultation to ensure that all factors affecting final sound pressure levels are considered. More detailed information on the complexity of this situation can be found in acoustic text books.

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# Fans — Determination of fan sound power levels under standardized laboratory conditions —

# Part 3: Enveloping surface methods

## 1 Scope

This document specifies a method for determining the sound power level of a fan. This document is applicable to fans as defined in ISO 13349-1. The applicability of this document is limited to the determination of airborne sound emission for the specified set-ups. Vibration is not measured, nor is the sensitivity of airborne sound emission to vibration effects determined.

The sizes of fan which can be tested in accordance with this document are limited only by the practical aspects of the test set-up. Dimensional limitations, test fan dimensions, and air performance will control the room size, power and mounting requirements for the test fan.

NOTE Small fans can be tested according to this document or to ISO 10302-1, according to usage.

The test arrangements in this document establish the laboratory conditions necessary for a successful test. Rarely will it be possible to meet these requirements in situ and this document is not intended for field measurements.

NOTE Intending users are reminded that, in these situations, there can be additional acoustic system effects where inlet and outlet conditions at the fan are less than ideal.

The enveloping surface methods can be used for the determination of open inlet and/or open outlet sound power level of fans for the standardized installation categories given in 4.1.

An estimation (with increased uncertainty) of ducted sound power for fans too small, or otherwise inconvenient, for testing by the in-duct method described in ISO 5136 can also be obtained by the addition of end reflection corrections (see ISO 13347-1:2025, Annex C).

## 2 Normative references

The following referenced documents are indispensable for the application 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 3744, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane*

ISO 5136, *Acoustics — Determination of sound power radiated into a duct by fans and other air-moving devices — In-duct method*

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

ISO 10302-1, *Acoustics — Measurement of airborne noise emitted and structure-borne vibration induced by small air-moving devices — Part 1: Airborne noise measurement*

ISO 13347-1:2025, *Fans — Determination of fan sound power levels under standardized laboratory conditions — Part 1: General overview*

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ISO 13349-1, *Fans — Vocabulary and definitions of categories — Part 1: Vocabulary*

ISO 13350, *Fans — Performance testing of jet fans*

# 3 Terms, definitions and symbols

## 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13347-1 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/

## 3.2 Symbols and units

For consistency and mutual understanding, it is recommended that the symbols and units shown in Table 1 be used in reporting and calculation. Unless otherwise noted, the subscript number refers to the mid-frequency of the octave band or one-third octave band number.

**Table 1 — Symbols, units**

| Symbol | Term | SI unit |
|---|---|---|
| $L_W$ | sound power level, re 1 pW ($1 \times 10^{-12}$ W) | dB |
| $E$ | duct end correction | dB |
| $D_e$ | equivalent diameter | m |
| $D_O$ | the largest dimension of the circular or rectangular orifice | m |
| $D_r$ | the measurement distance | m |
| $D_N$ | the nominal diameter of the inlet configuration | m |
| $h$ | the height of centre of orifice above floor level or above another reflecting plane | m |
| $l_1, l_2, l_3$ | dimensions of the reference box | m |
| $S$ | the measurement surface area | $m^2$ |
| $S_H$ | the cross-sectional area of a section through the fan in the measurement surface plane), only to be determined approximately; illustrated here for axial fans in examples a), c) and e) above | $m^2$ |
| $S_S$ | the portion of measurement surface in contact with the discharge flow, for fans with outlet orifice | $m^2$ |

# 4 Acoustic environment and ducting

## 4.1 General

The fan installation conditions shall conform to the five installation categories, as specified in ISO 13349-1:

— installation category A: free inlet, free outlet with a partition;

— installation category B: free inlet, ducted outlet;

— installation category C: ducted inlet, free outlet;

— installation category D: ducted inlet, ducted outlet, (casing breakout noise may also be determined for category D ducted inlet, ducted outlet);

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