



BSI Standards Publication

Fans — Laboratory test methods for air circulating fans

National foreword

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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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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*.

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.

Introduction

This document aims to establish uniform methods for laboratory testing of air circulating fans to determine performance for rating.

Fans — Laboratory test methods for air circulating fans

1 Scope

This document specifies laboratory testing methods for electrically powered air circulating fan heads and ceiling fans when air is used as the test gas.

This document is applicable to air circulating fans with an input power greater than or equal to 125 W, except for ceiling fans that are larger than 1 800 mm, which do not have a lower input power limit. The diameter of the fan being tested is limited by the minimum dimensions as shown in the applicable test figures.

See [annex A](#) for information on common names used for various air circulating fans.

This document does not apply to:

- jet fans;
- powered roof ventilators, induced flow fans, laboratory exhausts;
- positive pressure ventilators as defined in ISO 24660:2024;
- compressors;
- positive displacement machines.

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 13349-1:2022, *Fans — Vocabulary and definitions of categories — Part 1: Vocabulary*

ISO 12759-6:2024, *Fans — Efficiency classification for fans — Part 6: Calculation of the fan energy index*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

IEC 62301:2011, *Household electrical appliances — Measurement of standby power*, International Electrotechnical Commission, Geneva, Switzerland

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13349-1 and the following 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 Air circulating fans

3.1.1

air circulating fan

fan, used for moving air within a space, which is unconnected to any ducting, in installation category E

Note 1 to entry: Jet fans are not considered circulating fans.

Note 2 to entry: Operates against zero external static pressure loss.

3.1.2

air circulating fan head

ACFH

<housed> *air circulating fan* (3.1.1) with housing, that is not a *ceiling fan*, with an axial or centrifugal impeller

3.1.3

air circulating fan head

ACFH

<unhoused> *air circulating fan* (3.1.1) without housing, having an axial impeller

Note 1 to entry: The impeller may or may not be guarded.

Note 2 to entry: An *unhoused air circulating fan* (3.1.3) has a ratio of fan-blade span in millimetres to a maximum rotation rate (in revolutions per minute) of less than or equal to 1 524 mm/rpm and discharges air in a horizontal direction.

3.1.4

ceiling fan

non-portable fan that is designed to be suspended from the ceiling or overhead structure of a building, usually with a vertically oriented fan shaft

Note 1 to entry: The impeller may or may not be guarded.

Note 2 to entry: A ceiling fan has a ratio of fan blade span in millimetres to maximum rotation rate (in revolutions per minute) greater than 1 524 mm/rpm and discharges air up or down.

3.1.5

cylinder

circular *housing* (3.1.6) with a width greater than 200 mm

3.1.6

housing

stationary part which interacts with the air stream passing through the impeller

Note 1 to entry: *Housed ACFHs* (3.1.2) are typically in a box, *cylinder* (3.1.5), panel, orifice plate, *ring* (3.1.7) or scroll.

3.1.7

ring

circular *housing* (3.1.6) with a width less than or equal to 200 mm

Note 1 to entry: Width means the depth of the housing in the axial direction.

3.1.8

discharge area

area of a circle having a diameter equal to the blade tip diameter

Note 1 to entry: 'Discharge area' is not the same as an 'outlet area' as defined in ISO 13349-1:2022. 'Outlet area' applies to the casing, 'discharge area' applies only to the axial impeller.

3.1.9

fan outlet area

gross inside area, perpendicular to the airstream, measured at the plane of the outlet opening

Note 1 to entry: This definition differs from that found in ISO 13349-1 since this definition requires the area to be in a plane perpendicular to the airstream.

3.2 Fan performance variables

3.2.1

electrical input power

electrical power required to drive the fan and any elements in the drive train that are considered a part of the fan

Note 1 to entry: Electrical input power (P_{ed}) is the measured electrical input power ($P_{ed,m}$) converted to standard air density (the subscript “m” is to indicate that it is a measured value).

3.2.2

fan speed

rotational speed of the impeller

Note 1 to entry: Also known as impeller speed.

3.2.3

thrust

reaction force due to the momentum change of the mass flow through the fan

3.2.4

standby power consumption

electrical power consumed when the fan is connected to a main power source, fan speed is 0 rpm and the unit offers one or more of the following user-oriented or protective functions:

- facilitates the activation or deactivation of other functions (including active mode) by remote switch (including remote control), internal sensor or timer;
- continuous tasks, including information or status displays (including clocks) or sensor-based

3.3 Force

3.3.1

load differential

difference in measured force, using either standard weights or a load cell, when the fan is energized vs. when it is not energized

3.4 General definitions

3.4.1

determination

complete set of measurements for the free-air operation of an air circulating fan

3.4.2

test

series of determinations for one or more points of fan operation, e.g., various fan speeds, voltages or frequencies

3.4.3

jet fan

fan used for producing a jet of air in a space and unconnected to any ducting

Note 1 to entry: The air jet can be used, for example, for adding momentum to the air within a duct, tunnel or other space, or for intensifying the heat transfer in a determined zone.

Note 2 to entry: Jet fans are designed and marketed specifically to produce a high-velocity air jet in a space to increase its air momentum.

3.5 Psychrometrics

3.5.1

air density

ρ

air density calculated from the *absolute pressure*, p , (3.5.6) and the air temperature, θ

$$\rho = \frac{p}{R_{\text{wet}} \theta}$$

3.5.2

dry-bulb temperature

air temperature as measured by a dry temperature sensor

3.5.3

standard air

air with a density of 1,2 kg/m³

Note 1 to entry: Air at 20 °C, 50 % relative humidity and 101 325 kPa barometric pressure has these properties, approximately.

3.5.4

wet-bulb temperature

air temperature measured by a temperature sensor covered by a water-moistened wick and exposed to air in motion

Note 1 to entry: When properly measured, it is a close approximation of the temperature of adiabatic saturation.

3.5.5

pressure

force per unit area

3.5.6

absolute pressure

p

pressure, measured with respect to absolute zero pressure

3.5.7

barometric pressure

absolute pressure (3.5.6) exerted by the atmosphere

Note 1 to entry: This corresponds to energy per unit volume of fluid.

3.6 Test configuration

3.6.1

minimum testable configuration

fan with sufficient components (impeller, motor, shaft, transmission, bearings, etc.) to allow for wire-to-air testing and rating calculation

Note 1 to entry: Appurtenances and other devices that are sold or supplied with the product must be installed on the test fan, but not energized. If sold or supplied with the fan, an on/off switch or speed control device shall be included in the minimum testable configuration.