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ANSI/ASHRAE 51-07

Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating

An American National Standard
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ANSI/AMCA STANDARD 210-07
ANSI/ASHRAE STANDARD 51-07

Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating

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Foreword

This edition of AMCA 210/ASHRAE 51 is the eleventh revision, spanning over eighty years of improvements in its test methods. The major changes reflected in this revision are:

-Added requirements for checking effectiveness of the airflow settling means (Annex A)

-Added methods for testing chamber leakage (Annex B)

-Introduced usage of a Star type straightener

-Refined the conversion from in. wg to Pa, which necessitated small but important changes in the constants used in I-P equations

Authority

ANSI/AMCA 210 - ANSI/ASHRAE 51 was approved by the membership of the Air Movement and Control Association on July 28, 2006 and by ASHRAE on March 17, 2008. It was approved by ANSI and became an American National Standard on August 17, 2007.

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Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating

1. Purpose and Scope

This standard establishes uniform test methods for a laboratory test of a fan or other air moving device to determine its aerodynamic performance in terms of airflow rate, pressure developed, power consumption, air density, speed of rotation, and efficiency for rating or guarantee purposes.

This standard applies to a fan or other air moving device when air is used as the test gas with the following exceptions:

(a) air circulating fans (ceiling fans, desk fans);
(b) positive pressure ventilators;
(c) compressors with inter-stage cooling;
(d) positive displacement machines;
(e) test procedures to be used for design, production, or field testing.

2. Normative References

The following standards contain provisions that, through specific reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below.

IEEE 112-96 *Standard Test Procedure for Polyphase Induction Motors and Generators*, The Institute of Electrical and Electronic Engineers, 445 Hoes Lane, Piscataway, NJ 08855-1331, U.S.A. (AMCA #1149)

3. Definitions/Units of Measure/Symbols

3.1 Definitions

3.1.1 Fan. A device that uses a power-driven rotating impeller to move air or gas. The internal energy increase imparted by a fan to air or a gas is limited to 25 kJ/kg (10.75 Btu/lbm). This limit is approximately equivalent to a pressure of 30 kPa (120 in. wg). (AMCA 99-0066)

3.1.2 Fan inlet and outlet boundaries. The interfaces between a fan and the remainder of the air system; the respective planes perpendicular to an airstream entering or leaving a fan. Various appurtenances (inlet box(es), inlet vanes, inlet cone(s), silencer(s), screen(s), rain hood(s), damper(s), discharge cone(s), evasé, etc.), may be included as part of a fan between the inlet and outlet boundaries.

3.1.3 Fan input power boundary. The interface between a fan and its driver.

3.1.4 Fan outlet area. The gross inside area measured in the plane(s) of the outlet opening(s).

3.1.5 Fan inlet area. The gross inside area measured in the plane(s) of the inlet connection(s). For converging inlets without connection elements, the inlet area shall be considered to be that where a plane perpendicular to the airstream first meets the mouth of the inlet bell or inlet cone.

3.1.6 Dry-bulb temperature. Air temperature measured by a temperature sensing device without modification to compensate for the effect of humidity. (AMCA 99-0066)

3.1.7 Wet-bulb temperature. The air temperature measured by a temperature sensor covered by a water-moistened wick and exposed to air in motion. (AMCA 99-0066)

3.1.8 Wet-bulb depression. Wet-bulb depression is the difference between the **dry-bulb** and **wet-bulb** temperatures at the same location. (AMCA 99-0066)

3.1.9 Stagnation (total) temperature. The temperature that exists by virtue of the internal and kinetic energy of the air. If the air is at rest, the stagnation (total) temperature will equal the **static temperature**. (AMCA 99-0066)

3.1.10 Static temperature. The temperature that exists by virtue of the internal energy of the air. If a portion of the internal energy is converted into kinetic energy, the static temperature is decreased accordingly.

3.1.11 Air density. The mass per unit volume of air. (AMCA 99-0066)