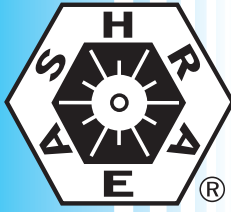


**ANSI/ASHRAE Standard 130-2008**  
(Supersedes ANSI/ASHRAE Standard 130-1996 [RA 06])



# ASHRAE STANDARD

## Methods of Testing Air Terminal Units

Approved by the ASHRAE Standards Committee on January 19, 2008; by the ASHRAE Board of Directors on January 23, 2008; and by the American National Standards Institute on February 27, 2008.

ASHRAE Standards are scheduled to be updated on a five-year cycle; the date following the standard number is the year of ASHRAE Board of Directors approval. The latest copies may be purchased from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: [orders@ashrae.org](mailto:orders@ashrae.org). Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide) or toll free 1-800-527-4723 (for orders in US and Canada).

© Copyright 2008 ASHRAE, Inc.

ISSN 1041-2336



[www.ansi.org](http://www.ansi.org)

**American Society of Heating, Refrigerating  
and Air-Conditioning Engineers, Inc.**

1791 Tullie Circle NE, Atlanta, GA 30329

[www.ashrae.org](http://www.ashrae.org)

**ASHRAE Standard Project Committee 130**

**Cognizant TCs: TC 5.3, Room Air Distribution, and TC 9.1, Large Building Air-Conditioning Systems**  
**SPLS Liaison: Carol E. Marriott**

Jerry M. Sipes, *Chair\**  
James Dale Aswegan\*  
Jason P. Bobruk  
Ted N. Carnes\*  
Alfred T. Dyck  
Eugene W. Faris\*  
Charles D. Kieffer\*  
Marvin L. Kloostra  
David James Lingrey

Frederick A. Lorch\*  
Gregory L. Meeuwesen\*  
Roger Gaylon Richardson\*  
Julian Rochester  
Jeffery R. Stein\*  
Jack L. Stegall  
Ronald E. Woodbury\*  
Michael W. Woodford\*

*\*Denotes members of voting status when the document was approved for publication.*

---

**ASHRAE STANDARDS COMMITTEE 2007–2008**

Stephen D. Kennedy, *Chair*  
Hugh F. Crowther, *Vice-Chair*  
Robert G. Baker  
Michael F. Beda  
Donald L. Brandt  
Steven T. Bushby  
Paul W. Cabot  
Kenneth W. Cooper  
Samuel D. Cummings, Jr.  
K. William Dean  
Robert G. Doerr  
Roger L. Hedrick  
Eli P. Howard, III  
Frank E. Jakob

Nadar R. Jayaraman  
Byron W. Jones  
Jay A. Kohler  
James D. Lutz  
Carol E. Marriott  
R. Michael Martin  
Merle F. McBride  
Frank Myers  
H. Michael Newman  
Lawrence J. Schoen  
Bodh R. Subherwal  
Jerry W. White, Jr.  
Bjarne W. Olesen, *BOD ExO*  
Lynn G. Bellenger, *CO*

Claire B. Ramspeck, *Assistant Director of Technology for Standards and Special Projects*

---

**SPECIAL NOTE**

This American National Standard (ANS) is a national voluntary consensus standard developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). *Consensus* is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this standard as an ANS, as "substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution." Compliance with this standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Assistant Director of Technology for Standards and Special Projects of ASHRAE should be contacted for:

- a. interpretation of the contents of this Standard,
- b. participation in the next review of the Standard,
- c. offering constructive criticism for improving the Standard, or
- d. permission to reprint portions of the Standard.

**DISCLAIMER**

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE's Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

**ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS**

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.

## CONTENTS

### ANSI/ASHRAE Standard 130-2008 Methods of Testing Air Terminal Units

SECTION	PAGE
Foreword.....	2
1 Purpose .....	2
2 Scope .....	2
3 Definitions and Symbols .....	2
4 Instrumentation and Facilities .....	4
5 Test Methods .....	6
6 Modulating Diffuser Terminal Testing.....	13
7 References .....	13
Informative Appendix A: Means of Airflow Rate Measurement .....	13
Informative Appendix B: Example for Measurement of Pressure-Control Performance .....	16
Informative Appendix C: Examples for Measurement of Mixing Efficiency .....	17
Informative Appendix D: Illustrations of Acoustically Isolated Ducts .....	18

#### NOTE

When addenda, interpretations, or errata to this standard have been approved, they can be downloaded free of charge from the ASHRAE Web site at <http://www.ashrae.org>.

© Copyright 2008 American Society of Heating,  
Refrigerating and Air-Conditioning Engineers, Inc.

1791 Tullie Circle NE  
Atlanta, GA 30329  
[www.ashrae.org](http://www.ashrae.org)  
All rights reserved.

**(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)**

## FOREWORD

*First published in 1996 and reaffirmed in 2006, Standard 130 specifies instrumentation and facilities, test installation methods, and procedures for determining the capacity and related performance of constant-volume and variable-volume air terminal units. The standard is classified as an ASHRAE standard method of measurement.*

*This revision of the standard includes updates and revisions to all parts of the standard, including its title, purpose, and scope. It updates definitions, adds modulating diffusers, redefines airflow sensor performance testing, and adds a method to determine the power factor. New appendices contain some material that was formerly in the body of the standard and some new reference material.*

*This standard is required for compliance with ARI Standard 880.*

*The project committee wishes to acknowledge Dan Int-Hout, Kerstin Kenty, Patrick Schoof, and Jim Kline for the assistance they provided in revising this standard.*

## 1. PURPOSE

This standard specifies instrumentation and facilities, test installation methods, and procedures for measuring the capacity and related performance of constant-volume, variable-volume, and modulating integral diffuser air terminals.

## 2. SCOPE

**2.1** The methods of test in this standard apply to air control devices used in air distribution systems. These devices provide control of air volume with or without temperature control by one or more of the following means, and may or may not include a fan:

- a. Fixed or adjustable directional vanes (i.e., bypass terminals)
- b. Pressure-dependent volume dampers or valves (including air induction nozzles and dampers)
- c. Pressure-compensated volume dampers or valves (including air induction nozzles and dampers)
- d. Integral heat exchange
- e. ON/OFF fan control
- f. Variable-speed fan control
- g. Modulating integral diffuser terminals

**2.2** This standard covers test methods for use in determining the following performance characteristics:

- a. Sound power
- b. Temperature mixing and stratification
- c. Minimum operating pressure

- d. Air leakage
- e. Induced airflow
- f. Fan airflow
- g. Fan motor electrical power
- h. Condensation
- i. Airflow sensor performance

**2.3** This standard does not cover individual control components or products addressed in other ASHRAE standards or methods of testing, including but not limited to, the standards listed in the reference section of this standard.

## 3. DEFINITIONS

**3.1** This section provides definitions of key terms used in this standard. For terms not defined below, refer to the definitions listed in *ASHRAE Terminology of Heating, Ventilation, Air Conditioning, and Refrigeration*.<sup>1</sup>

**airflow:** for the purpose of this test method, airflow is the unit volume displacement of standard air per unit of time. It is normally measured in cubic feet per minute (cfm) or liters per second (L/s).

**air terminal:** a device that automatically modulates the volume of air delivered to or removed from a defined space in response to an external demand.

**amplification factor ( $F$ ):** the ratio of sensor output to true velocity pressure. For example, a pressure sensor with a reading of 1.0 in. of pressure at a velocity pressure of 0.43 in. would have an amplification factor of  $1.0/0.43 = 2.3$ .  $F$  may be calculated from  $K$  with the following formula, where  $A$  is the nominal duct area in ft<sup>2</sup>. The nominal duct area is calculated based on the geometry of the duct, not on the actual free area.

$$F = \left( \frac{4005 \times A}{K} \right)^2$$

**average mixing temperature:** the average of the discharge temperatures at a particular operating condition for a given terminal.

**booster fan-powered terminal:** a terminal that is similar to a series terminal unit but without a primary valve. It may have supplemental heat or reheat, depending upon its application.

**bypass terminal:** a terminal, typically having more than one outlet, that uses a method of volume modulation whereby airflow is varied by distributing the volume required to meet the space requirements, the balance of primary air being diverted away from the space.

**discharge sound power level:** sound power that is transmitted from the terminal outlet.

**dual-duct terminal:** a terminal that may mix, for individual zones, varying portions of two independent sources of primary air.

**equivalent diameter:** the diameter of a circular-duct equivalent that will have a cross-sectional area that is equal to that of a particular rectangular duct. The equivalent diameter is calculated by the following equation: