

# **ANSI/AMCA Standard 230-23**

## **Laboratory Methods of Testing Air Circulating Fans for Rating and Certification**

An American National Standard  
Approved by ANSI on February 10, 2023



### **Air Movement and Control Association International**

#### **AMCA Corporate Headquarters**

30 W. University Drive, Arlington Heights, IL 60004-1893, USA  
communications@amca.org ■ Ph: +1-847-394-0150 ■ www.amca.org

© 2023 Air Movement & Control Association International, Inc.

# **ANSI/AMCA Standard 230-23**

## **Laboratory Methods of Testing Air Circulating Fans for Rating and Certification**

---



Air Movement and Control Association International  
30 West University Drive  
Arlington Heights, Illinois  
60004

# AMCA Publications

**Authority** ANSI/AMCA Standard 230-23 was adopted by the membership of the Air Movement and Control Association International Inc. on February 7, 2023. It was approved as an American National Standard on February 10, 2023.

**Copyright** © 2023 by the Air Movement and Control Association International Inc.

All rights reserved. Reproduction or translation of any part of this work beyond that permitted by sections 107 and 108 of the United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the executive director, Air Movement and Control Association International Inc. at 30 West University Drive, Arlington Heights, IL 60004-1893, USA.

**Objections** The Air Movement and Control Association (AMCA) International Inc. will consider and take action upon all written complaints regarding its standards, certification programs or interpretations thereof. For information on procedures for submitting and handling complaints, write to:

AMCA International Inc.  
30 West University Drive  
Arlington Heights, IL 60004-1893  
USA

European and Middle East Regions  
Dubai Association Centre Office  
One Central, Building 2, Desk 40  
Dubai World Trade Centre Complex  
P.O. Box 9292, Dubai  
UAE

Asia AMCA Sdn Bhd  
No. 7, Jalan SiLC 1/6,  
Kawasan Perindustrian SiLC Nusajaya,  
Mukim Jelutong, 79200 Nusajaya, Johor  
Malaysia

**Disclaimer** AMCA uses its best efforts to produce publications for the benefit of the industry and the public in light of available information and accepted industry practices. However, AMCA does not guarantee, certify or assure the safety or performance of any products, components or systems tested, designed, installed or operated in accordance with AMCA publications or that any tests conducted under its publications will be non-hazardous or free from risk.

# Review Committee

## Voting Members

Adam Sterne, Chair  
Christian Taber, Vice Chair  
Nazme Mohsina  
Daniel Linder  
Benjamin Heyser  
Abhishek Jain  
Armin Hauer  
Alec Preston  
Bill Walker  
Greg Brown  
Koushik Ganguly  
Jitendrakumar Devmani Yadav  
Logan Mikesell

## Non-Voting Members

Ryan Perkinson  
Jeremy Dunklin  
David Rose  
Matthew Wassmann  
Peter Sandvik  
Sanaee Iyama  
Mike Dettor  
Umamaheswararao Lakamana  
Zafar Ahmed Syed  
Vikas Shevale  
Merlin Slots

## Staff

Joseph Brooks

## Company/Affiliation

Acme Engineering & Manufacturing Corp.  
Big Ass Fans  
2050 Partners  
4Front Engineered Solutions  
AHRI  
Air Flow Pvt. Ltd.  
ebm-papst Inc.  
Greenheck Fan Corp.  
Hunter Fan Company  
J&D Manufacturing  
Leminar Air Conditioning Industries LLC  
Prime A/C Industries LLC  
Vostermans Ventilation

## Company/Affiliation

4Front Engineered Solutions  
Appliance Standards Awareness Project  
Big Ass Fans  
Greenheck  
Guidehouse  
LBNL  
MacroAir  
Maico Gulf LLC  
Shan Associates  
Vibrosolve India private limited  
Vostermans Ventilation

AMCA International Inc.

**This page intentionally left blank**

# Contents

## Laboratory Methods of Testing Air Circulating Fans for Rating and Certification

<b>1. Purpose</b> .....	<b>1</b>
<b>2. Scope</b> .....	<b>1</b>
<b>3. References</b> .....	<b>1</b>
<b>4. Definitions/Units of Measurement/Symbols</b> .....	<b>2</b>
4.1 Definitions .....	2
4.2 Units of measurement .....	4
4.3 Symbols and subscripts .....	5
<b>5. Instruments and Methods of Measurement</b> .....	<b>6</b>
5.1 Accuracy .....	6
5.2 Measurements to determine thrust and airflow rate .....	7
5.3 Power .....	7
5.4 Fan speed .....	8
5.5 Air density .....	8
<b>6. Equipment and Setups</b> .....	<b>8</b>
6.1 Allowable test setups .....	8
6.2 Load cell orientation .....	9
6.3 Minimum testable configuration .....	9
<b>7. Observations and Conduct of Test</b> .....	<b>9</b>
7.1 General test requirements.....	9
7.2 Data to be recorded .....	10
7.3 Test procedures .....	11
<b>8. Calculations</b> .....	<b>11</b>
8.1 Calibration correction .....	11
8.2 Ambient air density.....	11
8.3 Thrust .....	12
8.4 Area.....	12
8.5 Airflow rate .....	12
8.6 Power .....	13
8.7 Fan total pressure .....	13
8.8 Overall efficiency .....	13
8.9 Circulating fan efficacy .....	14
8.10 Ceiling fan energy index (CFEI).....	14
8.11 Thrust efficiency ratio .....	14
<b>9. Report and Results of Test</b> .....	<b>14</b>

<b>10. Figures .....</b>	<b>16</b>
Test Figure 10.1A — Vertical Airflow Setup with Load Cell Direct (Ceiling Fans).....	16
Test Figure 10.1B — Vertical Airflow Setup with Load Cell Pivot Above Test Subject (Ceiling Fans)...	17
Test Figure 10.2A — Horizontal Airflow Setup with Counterweights Pivot Above Test Subject (Air Circulating Fan Heads) .....	18
Test Figure 10.2B1 — Horizontal Airflow Setup with Load Cell Pivot Above Test Subject (Air Circulating Fan Heads).....	19
Test Figure 10.2B2 — Horizontal Airflow Setup with Load Cell Pivot Below Test Subject (Air Circulating Fan Heads).....	20
Test Figure 10.3A — Horizontal Airflow Setup with Load Cell Parallel Bars Above Test Subject (Air Circulating Fan Heads) .....	21
Test Figure 10.3B — Horizontal Airflow Setup with Load Cell Parallel Bars Below Test Subject (Air Circulating Fan Heads) .....	22
<b>Annex A Circulating Fans and Their Relationship to Airflow and Velocity (Informative) .....</b>	<b>23</b>
<b>Annex B Air Circulating Fan Subcategories (Informative) .....</b>	<b>25</b>
B.1 Purpose .....	25
B.2 Air circulating fan primary categories .....	25
B.3 Air circulating fan subcategories.....	25

# Laboratory Methods of Testing Air Circulating Fans for Rating and Certification

## 1. Purpose

The purpose of this standard is to establish uniform methods for laboratory testing of air circulating fans to determine performance for rating or certification.

## 2. Scope

This standard shall be used as the basis for testing electrically powered air circulating fan heads and ceiling fans when air is used as the test gas. The scope is limited to air circulating fans with an input power greater than or equal to 125 W—except for ceiling fans, which do not have a lower input power limit. The diameter of the fan being tested shall be limited by the minimum dimensions as shown in the applicable test figures.

Exclusions:

- Jet fans as defined in ANSI/AMCA Standard 214
- Powered roof ventilators, induced flow fans, laboratory exhausts
- Positive pressure ventilators as defined in ANSI/AMCA Standard 240
- Compressors
- Positive displacement machines

Only tests that fulfill all mandatory requirements of this standard may be designated as tests conducted in accordance with this standard.

## 3. References

ANSI/AMCA Standard 208-18, Calculation of the Fan Energy Index, Air Movement and Control Association International Inc., Arlington Heights, IL USA.

ANSI/AMCA Standard 214-21, Test Procedure for Calculating Fan Energy Index (FEI) for Commercial and Industrial Fans and Blowers, Air Movement and Control Association International Inc., Arlington Heights, IL USA.

ANSI/AMCA Standard 240, Laboratory Methods of Testing Positive Pressure Ventilators for Aerodynamic Performance Rating, Air Movement and Control Association International Inc., Arlington Heights, IL USA.

ANSI/AMCA Standard 250, Laboratory Methods of Testing Jet Fans for Performance, Air Movement and Control Association International Inc., Arlington Heights, IL USA.

ANSI/ASHRAE Standard 41.1-2020, Standard Methods for Temperature Measurement, American Society of Heating, Refrigerating and Air-Conditioning Engineers Inc., Peachtree Corners, GA USA.

ANSI/ASHRAE Standard 41.11-2020, Standard Methods for Power Measurement, American Society of Heating, Refrigerating and Air-Conditioning Engineers Inc., Peachtree Corners, GA USA.

ASHRAE Handbook — Fundamentals, American Society of Heating, Refrigerating and Air-Conditioning Engineers Inc., Peachtree Corners, GA USA.