

# **ANSI/AMCA Standard 610-19**

## **Laboratory Methods of Testing Airflow Measurement Stations for Performance Rating**

An American National Standard  
Approved by ANSI on April 9, 2019



## **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

# ANSI/AMCA Standard 610-19

## Laboratory Methods of Testing Airflow Measurement Stations for Performance Rating

---



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



## AMCA Standard

**Authority** AMCA Standard 610-19 was adopted by the membership of the Air Movement and Control Association International Inc. on March 22, 2019. It was approved as an American National Standard on April 9, 2019

**Copyright** © 2012 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, U.S.A.

**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  
30 West University Drive  
Arlington Heights, IL 60004-1893  
U.S.A.

European AMCA  
Avenue des Arts, numéro 46  
à Bruxelles (1000 Bruxelles)

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**

Sekar Chinnaiyan	Saipem
Glenn Esser	Ruskin Company
Keith Foszcz	Paragon Controls Inc.
Marty Gissel	Greenheck Fan
James Maciupa	Ultratech Industries Inc.
Dave Paresh	Air Monitor
Alex Talwar	Greenheck Fan
Tim Vogel	Ruskin Company
Tim Orris	AMCA International

# Contents

<b>Laboratory Methods of Testing Airflow Measurement Stations for Performance Rating .....</b>	<b>8</b>
<b>1. Purpose and Scope .....</b>	<b>8</b>
<b>2. Normative References .....</b>	<b>8</b>
<b>3. Definitions/Units of Measure/Symbols .....</b>	<b>8</b>
<b>3.1 Definitions .....</b>	<b>8</b>
3.1.1 Airflow Measurement Station (AMS) .....	8
3.1.2 AMS — Differential (velocity) pressure output type .....	8
3.1.3 AMS — Electronic output type .....	8
3.1.4 Test reference airflow rate .....	8
3.1.5 AMS performance variables .....	9
3.1.5.1 AMS airflow rate .....	9
3.1.5.2 AMS differential pressure .....	9
3.1.5.3 AMS electronic output .....	9
3.1.5.4 AMS face area .....	9
3.1.5.5 AMS free area .....	9
3.1.6 Shall and should .....	9
3.1.7 Point of operation .....	9
3.1.8 Determination .....	9
3.1.9 Test .....	9
<b>3.2 Units of measure .....</b>	<b>9</b>
3.2.1 System of units .....	9
3.2.2 Basic units .....	9
3.2.3 Airflow rate and velocity .....	9
3.2.4 Pressure .....	9
3.2.5 Power, energy and torque .....	10
3.2.6 Efficiency .....	10
3.2.7 Rotational speed .....	10
3.2.8 Density, viscosity and gas constant .....	10
3.2.9 Dimensionless groups .....	10
<b>3.3 Symbols and subscripts .....</b>	<b>10</b>
<b>4. Instruments .....</b>	<b>11</b>
<b>4.1 Electronic indicating manometer .....</b>	<b>11</b>
4.1.1 Calibration .....	11

<b>4.2 Digital multimeter (DMM)</b>	<b>11</b>
<b>5. Equipment and Setup</b>	<b>11</b>
<b>5.1 General</b>	<b>11</b>
<b>5.2 Leakage</b>	<b>11</b>
<b>5.3 Air supply/exhaust</b>	<b>11</b>
<b>5.4 Duct(s)</b>	<b>12</b>
<b>5.5 Fittings</b>	<b>12</b>
<b>5.6 AMS under test</b>	<b>12</b>
<b>6. Observations and Conduct of Test</b>	<b>12</b>
<b>6.1 General requirements</b>	<b>12</b>
6.1.1 Stability of conditions	12
6.1.2 Test airflow rates	12
<b>6.2 Data to be recorded</b>	<b>12</b>
6.2.1 Test subject	12
6.2.2 Test setup	12
6.2.3 Instruments	12
6.2.4 Test data	12
6.2.4.1 All tests	12
6.2.4.2 Chamber test	13
6.2.4.3 Ducted nozzle test	13
6.2.4.4 Test duct or chamber	13
6.2.4.5 Low pressure test	13
6.2.5 AMS output	13
<b>6.3 Airflow resistance test</b>	<b>13</b>
<b>7. Calculations</b>	<b>13</b>
<b>7.1 Calibration correction</b>	<b>13</b>
<b>7.2 Air density in duct or chamber</b>	<b>13</b>
<b>7.3 Airflow rate at test conditions</b>	<b>13</b>
7.3.1 Test reference airflow rate	13
7.3.2 Airflow rate of unit under test	14
<b>8. Report and Results of Test</b>	<b>14</b>
<b>8.1 Report</b>	<b>14</b>
<b>8.2 Performance data (curve)</b>	<b>14</b>
8.2.1 AMS comparison-to-reference	14

8.2.2 Additional plot.....	14
8.2.3 Airflow resistance .....	14
<b>8.3 Test points.....</b>	<b>14</b>
<b>8.4 Identification .....</b>	<b>15</b>



# Laboratory Methods of Testing

## Airflow Measurement Stations for Performance Rating

### 1. Purpose and Scope

This standard covers field-installed airflow measurement stations for heating, ventilating and air-conditioning applications.

This standard establishes uniform test methods for the determination of the performance characteristics and accuracy of airflow measurement stations under varied airflow rates and conditions.

It is not the purpose of this standard to specify testing procedures to be used for design, production or in-field measurement practice.

Only tests that do not violate the mandatory requirements of this standard shall be designated as tests conducted in accordance with this standard.

### 2. Normative References

The following standards contain provisions that, through specific reference in this text, constitute provisions of AMCA Standard 610. At the time of publication, the editions indicated were valid. All standards are subject to periodic 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 standard(s) listed below.

ANSI/AMCA Standard 99, Standards Handbook, Air Movement and Control Association International, Inc., 30 West University Drive, Arlington Heights, IL, 60004-1893, U.S.A.

ANSI/AMCA Standard 210, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating, Air Movement and Control Association International, Inc., 30 West University Drive, Arlington Heights, IL, 60004-1893, U.S.A.

ANSI/AMCA Standard 500-D, Laboratory Methods of Testing Dampers for Rating, Air Movement and Control Association International, Inc., 30 West University Drive, Arlington Heights, IL, 60004-1893, U.S.A.

SMACNA HVAC Systems Duct Design, 3rd edition. SMACNA HVAC Systems Duct Design, 3rd edition, Sheet Metal and Air Conditioning Contractors' National Association, Inc., 4201 Lafayette Center Drive, Chantilly, VA, 20151-1219, U.S.A.

### 3. Definitions/Units of Measure/Symbols

#### 3.1 Definitions

##### 3.1.1 Airflow Measurement Station (AMS)

A single- or multiple-point sensing device used to measure the airflow rate in a duct system or fan appurtenance. It may consist of a single sensor or an array of sensors in permanent position in the air system. It may be supplied as a probe to be inserted into a ductwork or in a casing approximating the size of the air system in which it is installed.

##### 3.1.2 AMS — Differential (velocity) pressure output type

A type of AMS that converts air velocity into a differential (velocity) pressure signal that correlates to the velocity or volume of air flowing through a duct.

##### 3.1.3 AMS — Electronic output type

A type of AMS that converts air velocity into an electronic signal that correlates directly and proportionately to the air volume flowing through a duct.

##### 3.1.4 Test reference airflow rate

The calculated airflow rate at a measurement plane.