

# Standard Test Method for Measuring Air Performance Characteristics of Vacuum Cleaner Motor/Fan Systems<sup>1</sup>

This standard is issued under the fixed designation F 2105; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method covers procedures for determining air performance characteristics of series universal motor/fan systems used in commercial and household upright, canister, stick, hand-held utility, combination type vacuum cleaners and household central vacuum cleaning systems.

1.2 These tests and calculations include determination of suction, airflow, air power, maximum air power, and input power under specified operating conditions.

NOTE 1—For more information on air performance characteristics, see References (1) through (6).<sup>2</sup>

1.3 The inch-pound system of units is used in this standard. The values in parentheses are given for information only.

1.4 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:

E 1 Specification for ASTM Thermometers<sup>3</sup>

F 395 Terminology Relating to Vacuum Cleaners

F 431 Specification for Air Performance Measurement Plenum Chamber for Vacuum Cleaners<sup>3</sup>

### 2.2 AMCA Standard:

210-85 Laboratory Methods of Testing Fans for Rating<sup>4</sup>

## 3. Terminology

### 3.1 Definitions:

3.1.1 *air power, AP, W, n*—in a vacuum cleaner motor/fan system, the net time rate of work performed by an air stream

while expending energy to produce an airflow by a vacuum cleaner motor/fan system under specified air resistance conditions.

3.1.2 *corrected airflow, Q, cfm, n*—in a vacuum cleaner motor/fan system, the volume of air movement per unit of time under standard atmospheric conditions.

3.1.3 *input power, W, n*—the rate at which electrical energy is absorbed by a vacuum cleaner motor/fan system.

3.1.4 *model, n*—the designation of a group of vacuum cleaner motor/fan systems having the same mechanical and electrical construction.

3.1.5 *population, n*—the total of all units of a particular model vacuum cleaner motor/fan system being tested.

3.1.6 *repeatability limit (r), n*—the value below which the absolute difference between two individual test results obtained under repeatability condition may be expected to occur with a probability of approximately 0.95 (95 %).

3.1.7 *repeatability standard deviation (S<sub>r</sub>), n*—the standard deviation of test results obtained under repeatability conditions.

3.1.8 *reproducibility limit (R), n*—the value below which the absolute difference between two test results obtained under reproducibility conditions may be expected to occur with a probability of approximately 0.95 (95 %).

3.1.9 *reproducibility standard deviation (S<sub>R</sub>), n*—the standard deviation of test results obtained under reproducibility conditions.

3.1.10 *sample, n*—a group of vacuum cleaner motor/fan systems taken from a large collection of vacuum cleaner motor/fan systems of one particular model which serves to provide information that may be used as a basis for making a decision concerning the larger collection.

3.1.11 *standard air density,  $\rho_{std}$ , lb/ft<sup>3</sup>, n*—atmospheric air density of 0.075 lb/ft<sup>3</sup> (1.2014 kg/m<sup>3</sup>).

3.1.11.1 *Discussion*—This value of air density corresponds to atmospheric air at a temperature of 68°F (20°C), 14.696 psi (101.325 kPa), and approximately 30 % relative humidity.

3.1.12 *suction, inches of water, n*—in a vacuum cleaner motor/fan system, the absolute difference between ambient and sub-atmospheric pressure.

3.1.13 *test run, n*—the definitive procedure that produces the singular result of calculated maximum air power.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee F11 on Vacuum Cleaners and is the direct responsibility of Subcommittee F11.22 on Air Performance.

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<sup>2</sup> The boldface numbers in parentheses refer to the list of references appended to this test method.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 15.08.

<sup>4</sup> Available from Air Movement and Control Association, Inc. 30 West University Dr., Arlington Heights, IL 60004-1893.