



STANDARD

ANSI/ASHRAE Standard 84-2013
(Supersedes ANSI/ASHRAE Standard 84-2008)

Method of Testing Air-to-Air Heat/Energy Exchangers

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NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE Web site at www.ashrae.org/technology.

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FOREWORD

This standard provides rules for the testing of air-to-air heat/energy exchangers in both the laboratory and in the field. Application of this standard should be determined by reviewing introductory Sections 1 through 3. Section 4 details the necessary steps to be taken in the performance evaluation of a heat/energy exchanger, including a pretest uncertainty analysis. (Informative Appendix B presents a comprehensive discussion of the original definition, test procedure, and application of effectiveness as a dimensionless ratio and how it has been modified to characterize air-to-air heat/energy exchangers. A brief discussion of the definition and different test procedures and calculations for EATR and OACF rounds out this appendix.) Discussion of laboratory testing begins in Section 5 and continues in Sections 6 through 8. (Informative Appendix C shows how test conditions can be selected to meet specified uncertainty limits.) The quality of test data is covered in Section 6, which outlines the use of measurement inequalities to detect and reject invalid tests. Section 7 sets out the uncertainty levels that a performance test must satisfy to be acceptable. A discussion of the allowable instruments and measurement methods is contained in Section 8. Various other standards are mentioned as being acceptable for use with instrument measurements. Performance calculations and test result reporting are presented in Sections 9 and 10, respectively. Field testing conditions are discussed and specified in Informative Appendix D. The extrapolation of test performance data is discussed in Informative Appendix E.

Versions of this standard prior to the 2008 edition were very prescriptive in measurement processes and yielded testing uncertainty within generally acceptable limits. This new edition, as does the 2008 edition of the standard, instead stipulates the desired uncertainty, while allowing laboratories the flexibility of selecting various testing apparatus as long as the uncertainty limits are satisfied. It should be noted that laboratories must evaluate their testing apparatus to ensure their instrumentation achieves the minimum required test uncertainty.

In preparing this edition, significant validation of the test inequality equations and limits was performed to be certain that (a) the tests could be performed on all technologies within the standards scope; (b) the uncertainties of test results would be as low as practically possible; and (c) the inequality equations are robust in detecting as many sources of error as possible.

This edition provides reformatted versions of the fundamental effectiveness Equations 1 and 2 and the developed

effectiveness equation (30). An attempt was made to clarify the relationship of effectiveness calculations with respect to the supply and exhaust airstreams.

An alternative approach to calculating effectiveness, using both the supply and exhaust effectiveness, was first presented in the 2008 edition. To eliminate ambiguity, it has been moved from the normative body of the standard to an informative appendix.

This edition also discusses the impacts of testing at conditions in which condensate and frosting can occur on test validity.

1. PURPOSE

The purpose of this standard is to

- a. establish a uniform method of test for obtaining performance data for air-to-air heat/energy exchangers;
- b. specify the test conditions, data required, uncertainty analysis to be performed, calculations to be used, and reporting procedures for testing the performance of an air-to-air heat/energy exchanger; and
- c. specify the types of test equipment for performing such tests.

2. SCOPE

2.1 This standard prescribes the methods for testing the performance of air-to-air heat/energy exchangers.

2.2 In this standard, an air-to-air heat/energy exchanger is a device to transfer heat and/or water vapor from one airstream to another. The types of air-to-air heat/energy exchangers covered by this standard are

- a. regenerative energy exchangers (including heat wheels and total energy wheels),
- b. heat pipe exchangers,
- c. thermosiphon exchangers,
- d. recovery loop exchangers (also called run-around exchangers), and
- e. fixed-plate exchangers.

2.3 The scope of this standard also includes both laboratory and field tests, provided that appropriate levels of uncertainty can be achieved when testing.

2.4 A test is deemed to be within the scope of this standard if both a pretest uncertainty analysis and a posttest uncertainty analysis yield satisfactory uncertainty limits.

3. DEFINITIONS

air leakage: air transferred from the exhaust to the supply airstream because of pressure differentials.

bias: the difference between the mean indicated value of repeated measurements for one physical property (or the calculation of a parameter using several properties) and the true value of the same physical quantity. Bias is sometimes referred to as accuracy.