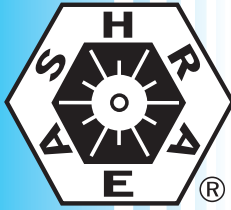


ANSI/ASHRAE Standard 139-2007
(Supersedes ANSI/ASHRAE Standard 139-1998)



ASHRAE STANDARD

Method of Testing for Rating Desiccant Dehumidifiers Utilizing Heat for the Regeneration Process

Approved by the ASHRAE Standards Committee on June 23, 2007; by the ASHRAE Board of Directors on June 27, 2007; and by the American National Standards Institute on June 28, 2007.

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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>.

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FOREWORD

First published in 1998, ANSI/ASHRAE Standard 139 was developed under guidance from TC 8.12, Desiccant Dehumidification Equipment and Components (previously TC 3.5). This intent of this standard is to provide uniform test methods for rating desiccant dehumidifiers that utilize heat for the regeneration process. It addresses the test methods, apparatus and instruments to be used, data to be obtained, and calculations needed to confirm valid test results.

This 2007 edition of the standard updates the original publication by cleaning up the figures showing test loop configurations, adding reference calculations to aid in troubleshooting of mass balance results outside the acceptable range, and making minor editorial revisions. All cited references have been updated to the latest versions at the time of publication.

1. PURPOSE

The purpose of this standard is to provide test methods for determining the moisture removal capacity of heat-regenerated desiccant dehumidifiers as well as the coincident thermal energy performance so that comparative evaluations of capacity and performance can be made irrespective of the type or make of the device.

2. SCOPE

2.1 This standard applies to desiccant-based dehumidifiers operating at atmospheric pressure. The dehumidifier may utilize solid or liquid desiccants that are regenerated utilizing heat energy.

2.2 Normally, equipment within this standard would consist of one or more desiccant contact stations through which the air to be dehumidified is moved, a means to expose the moisture-laden desiccant to a source of heat energy for regeneration, and a heating device.

2.3 Ancillary devices are normally utilized to move air to be dehumidified through the device and to provide ventilation for regeneration, but they are not a part of this standard.

2.4 This standard is intended to

- a. describe a uniform method of testing for obtaining performance data,
- b. describe and specify test instruments and apparatus,
- c. describe and specify test data to be recorded, and
- d. describe and specify calculations to be made from the test data.

2.5 This standard does not apply to:

- a. dehumidifiers operating at other than atmospheric pressure,
- b. dehumidifiers not utilizing a desiccant for dehumidification,
- c. dehumidifiers not utilizing heat for regeneration of the desiccant, or
- d. ancillary equipment that may be used in any dehumidification process such as fans or pre- or post-conditioning equipment.

3. DEFINITIONS

airflow: the rate of flow of air through any part of a dehumidifier expressed in standard cubic meters per hour (SCMH) or standard cubic feet per minute (SCFM).

conditioner: a device in which the process air is dehumidified in a liquid desiccant system.

desiccant contactor: the structure or section containing the desiccant contacting the air to be dehumidified.

heat input: the gross heating value of the fuel supplied to the regeneration heater, expressed in watts (Btu per hour).

humidity ratio (G): the ratio of the mass of water vapor in the air to the mass of dry air; the ratio is defined as grams of moisture per kilogram of dry air (grains of moisture per pound of dry air).

liquid desiccant concentration: the concentration of liquid desiccant expressed as kilograms (pounds) of anhydrous desiccant per kilogram (pound) of desiccant solution.

liquid desiccant transfer to conditioner: the amount of kilograms (pounds) per hour of concentrated desiccant solution transferred from the regenerator to the conditioner.

moisture removal capacity (MRC): the mass of water vapor removed from the process air per unit of time and expressed in kg/h (lb/h).

moisture removal rate (MRR): the mass of water vapor removed from the desiccant per unit of time via the regeneration process (desorption) and expressed in kg/h (lb/h).

process air: the airstream to be dehumidified.

regeneration air: the airstream used as a carrier for the desorbed moisture and/or a mechanism to transfer heat for the regeneration of the desiccant in a dry desiccant system.

regeneration heater: a device used to heat the regeneration air or the liquid desiccant.

regeneration specific heat input (RSHI): the energy per unit moisture removed expressed in kJ/kg (Btu/lb).

regenerator: the structure or section containing the desiccant to be regenerated.

standard air: for the purpose of this standard, standard air is air with a density of 1.20 kg/m³ (0.075 lb/ft³). This is substan-