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ANSI/ASHRAE Standard 139-2025
Method of Testing for Rating Desiccant Dehumidifiers Utilizing Heat for the Regeneration Process

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NOTE

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

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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). The intent of this standard is to provide uniform test methods for rating desiccant dehumidifiers that use 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.

The 2025 edition of Standard 139 updates normative references. The standard was prepared under the auspices of ASHRAE. It may be used, in whole or in part, by an association or government agency with due credit to ASHRAE. Adherence is strictly on a voluntary basis and merely in the interests of obtaining uniform guidelines throughout the industry.

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 shall use solid or liquid desiccants that are regenerated using 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 used 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. Reference 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 using a desiccant for dehumidification,
c. Dehumidifiers not using heat for regeneration of the desiccant,
d. Ancillary equipment that may be used in any dehumidification process, such as fans or pre- or post-conditioning equipment, or
e. Dehumidifiers using a sealing arrangement that results in leakage rates in excess of 1% of process flow.

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 (British thermal units 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.