



Standard Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions¹

This standard is issued under the fixed designation E104; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice describes one method for generating constant relative humidity (rh) environments in relatively small containers.

1.2 This practice is applicable for obtaining constant relative humidities ranging from dryness to near saturation at temperatures spanning from 0 to 50°C.

1.3 This practice is applicable for closed systems such as environmental conditioning containers and for the calibration of hygrometers.

1.4 This practice is not recommended for the generation of continuous (flowing) streams of constant humidity unless precautionary criteria are followed to ensure source stability. (See Section 9.)

1.5 **Caution**—Saturated salt solutions are extremely corrosive, and care should be taken in their preparation and handling. There is also the possibility of corrosive vapors in the atmospheres over the saturated salt solutions.²

1.6 *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.* For more specific safety precautionary information see 1.5 and 10.1.

2. Referenced Documents

2.1 ASTM Standards:³

D1193 Specification for Reagent Water

¹ This practice is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.11 on Meteorology.

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² Opila, R., Jr., Weschler, C. J., and Schubert, R., "Acidic Vapors Above Saturated Salt Solutions Commonly Used for Control of Humidity," *IEEE Trans. Components, Hybrids and Manufacturing Technology*, Vol 12, No. 1, March 1989, pp. 114–120.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

2.2 Other Document:

DIN50008 "Konstantklimate über waessrigen Loseungen" (Constant Climates Over Aqueous Solutions). Part 1: Saturated Salt and Glycerol Solutions.⁴

3. Terminology

3.1 *non-hygroscopic material*—material which neither absorbs nor retains water vapor.

3.2 For definitions of other terms used in this practice refer to Terminology D1356.

4. Summary of Practice

4.1 Standard value relative humidity environments are generated using selected aqueous saturated salt solutions.

5. Significance and Use

5.1 Standard value relative humidity environments are important for conditioning materials in shelf-life studies or in the testing of mechanical properties such as dimensional stability and strength. Relative humidity is also an important operating variable for the calibration of many species of measuring instruments.

6. Interferences

6.1 Temperature regulation of any solution-head space environment to $\pm 0.1^\circ\text{C}$ is essential for realizing generated relative humidity values within $\pm 0.5\%$ (expected).

6.2 Some aqueous saturated salt solutions change composition following preparation by hydrolysis or by reaction with environmental components (for example, carbon dioxide absorption by alkaline materials). These solutions should be freshly prepared on each occasion of use.

7. Apparatus

7.1 **Container**—The container, including a cover or lid which can be secured airtight, should be made of corrosion

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