



Portable Household Humidifiers

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PREFACE

The Association of Home Appliance Manufacturers develops standards in accordance with AHAM's "Policy and Procedures Governing Technical Standards" which states:

"AHAM standards shall be in the best interest, mutually, of consumers who use appliances, the industries which provide and service appliances, and other interested parties. They shall relate to actual use conditions, be technically and scientifically sound."

Use or observance of AHAM standards is voluntary.

This standard contains:

Test procedures that may be applied to any brand or model of portable humidifier.
Results of tests in accordance with this standard may be publicly stated.

Methods for determining residential humidification requirements. Determination made in accordance with these methods can be used as a guide when estimating the appliance humidifier water output capacity recommended for specific residential applications.

An appendix that sets forth recommended humidifier operating guidelines and practices.

With regard to safety, AHAM recommends that all appliance products -- both major and portable -- manufactured or marketed in the United States be submitted to an appropriate independent nationally recognized testing laboratory for inspection and listing in conformance with the appropriate national safety standard. The relevant standard for humidifiers is Underwriters Laboratories 998, "Standard for Humidifiers."

AHAM welcomes comments and suggestions regarding this standard. Any standard may be reviewed and improved as needed. All standards must be updated or reconfirmed at least every five years. Any interested party, at any time, may request a change in an AHAM standard. Such request should be addressed to AHAM's President, and should be accompanied by a statement of reason for the request and a suggested alternate proposal.

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1. PURPOSE

This standard establishes a uniform, repeatable procedure and standard methods for measuring specified product characteristics of portable household humidifiers.

The standard methods provide a means to compare and evaluate different brands, models, and types of portable household humidifiers regarding characteristics significant to product use.

The standard methods are not intended to preclude the exercise of ingenuity in testing nor to inhibit improvement and innovation in product testing, design or performance.

2. SCOPE

This standard applies to portable household humidifiers as defined in Section 3.

This standard provides definitions, methods for testing and rating, and safety recommendations for portable household humidifiers.

This standard does not apply to humidifying apparatus (central system humidifiers) which must be permanently connected to systems for heating, cooling, distributing, or otherwise treating circulated air within a building enclosure.

3. DEFINITIONS

3.1 Portable Humidifier.

An electric cord-connected appliance in an encased assembly with the function of adding moisture to the air in the living space of a residence and which can be moved from room to room.

3.2 Types of Humidifier.

3.2.1 Evaporative Humidifier. A humidifier that transmits moisture into the air in an invisible or imperceptible form of water vapor by means of fan-forced air traveling through a moistened medium or filter.

3.2.2 Non-Evaporative Humidifier. A humidifier that transmits moisture to the air in a visible (perceptible) form. Non-evaporative humidifier technologies include:

3.2.2.1 Ultrasonic Humidifier. A humidifier which turns water to vapor by means of ultrasonic vibrations.

3.2.2.2 Cool Mist Impeller Humidifier. A humidifier that transmits moisture into the air in a visible cool mist by transforming water into a fine mist by means of centrifugal force.

3.2.2.3 Steam Vaporizer. A humidifier that transmits moisture into the air by means of a steam vapor created by boiling water within a water container by means of an electrical heating element or electrodes.

3.2.2.4 Warm Mist Humidifier. A humidifier that transmits moisture into the air in a warm mist by means of an electrical heating element in a small and well-defined heating chamber or tray.

3.3 Water Output Capacity.

The water output capacity is a measure of the ability of a humidifier to add moisture to its surrounding atmosphere and is stated as the number of gallons of water added per 24 hours of continuous operation at specified ambient conditions. (See Sections 4, 7.1 and 7.2)

4. STANDARD TEST CONDITIONS

Determine the water output capacity of a humidifier by testing at the following standard test conditions.

4.1. Standard Test Temperatures for Ambient Air.

The ambient air entering the humidifier, as measured by a psychrometer sampler positioned in accordance with paragraph 6.2.2.1 is to have the following temperatures, except for a barometric pressure adjustment to the wet-bulb shown in Table I below for evaporative humidifiers.

Dry-Bulb Temperature = 70°F (21.1°C)

Wet-Bulb Temperature = 53.2°F (11.7°C)
(Relative Humidity = 30%)

Note 1: See Clause 6.6 for allowable tolerances.

Table I (for evaporative humidifiers)

Barometric Pressure, in. Hg	Test Wet-Bulb Temperature, °F
30.72	53.4
30.32	53.3
29.92	53.2
29.52	53.1
29.12	53.0
28.72	52.9
28.31	52.8

4.2. Standard Voltage.

Maintain $\pm 1\%$ of the appropriate standard voltages of 120, 208 or 230 volts at the service connection during the testing.

4.3. Standard Frequency.

The standard testing frequency is to be 60 ± 1 hertz (Hz).

4.4. Standard Water Hardness.

For the tests, including the run-in period, the water hardness is to be 250 ppm of CaCO₃ (2.5 mmol/l) prepared in accordance with Method C of IEC60734, third edition 2001, *Household electrical appliances-Performance-Hard water for testing*

4.5. Test Water Temperature.

The water to be added to the humidifier shall be at ambient dry-bulb temperature, $\pm 5^\circ\text{F}$, prior to start of the test.

5. NAMEPLATE DATA

It is recommended that the following minimum information be included on the nameplate of each humidifier.

5.1. Electrical Data.

Electrical data as required by the applicable Underwriters Laboratories' standard for humidifiers (see Section 8).

5.2. Voltage.

The voltage (nameplate voltage) at which the water output capacity was determined.

5.3. Heater Wattage.

Electric heater wattage (if applicable).

5.4. Output Capacity.

Water output capacity in gallons per 24 hours, liters per 24 hours, or Imperial gallons per 24 hours at normal room conditions. (See Section 7.2 and 7.3)

5.5. Cleaning Advisory.

The words, "Clean Humidifier – Follow Instructions."

6. WATER OUTPUT CAPACITY TEST

6.1. Instrumentation

6.1.1 Temperature Measuring Instruments. Temperature measurements shall be made with an instrument or instrument system, including read-out devices, meeting the accuracy and precision requirements below:

- a. Dry-bulb and wet-bulb temperatures, $\pm 0.1^{\circ}\text{F}$ ($\pm 0.06^{\circ}\text{C}$).
- b. All other temperatures, $\pm 1.0^{\circ}\text{F}$ (0.6°C). The following are in common use for this purpose but are not all inclusive:
 1. Electric Resistance Thermometers, including thermistors
 2. Mercury-in-glass thermometers
 3. Thermocouples

6.1.2 Psychrometer Apparatus. Use an aspirating type psychrometer sampler to measure dry-bulb and wet-bulb temperatures. Maintain air velocity across the sensing bulbs between 700 and 1000 ft/min (3.6 and 5.1 m/s).

6.1.3 Electrical Measuring Instruments. Make electrical measurements with meters having the following characteristics:

Voltmeters. Voltmeters accurate to within $\pm 0.5\%$ of the quantity measured, with the smallest scale division representing a maximum of 2.0 volts.

Ammeters. Ammeters accurate to within $\pm 0.5\%$ of the quantity measured, with the smallest scale division representing a maximum of 0.1 amperes.

Wattmeters. Wattmeters accurate to within $\pm 0.5\%$ of the quantity measured, with the smallest scale division representing a maximum of 5 watts.

6.1.4 Time Measuring Instruments. Use time measuring instruments accurate to within $\pm 0.1\%$ of the quantity measured.

6.1.5 Weight Measuring Instruments. Use an instrument having an accuracy and readability each of $\pm 0.5\%$ of the quantity measured.

6.2. Test Setup.

6.2.1 Test Room. Test the humidifier in a room that has been provided with a means for maintaining the standard test conditions as specified in Section 4.

6.2.2 Positioning of Test Unit. Position the humidifier under test in the test room with both the air inlet and outlet at least 3 ft (91 cm) from any wall or partition and so shielded that there will be no direct heat radiation to or from other objects in the test room.

6.2.2.1. Position the psychrometer sampling tube inlet 1 ft (30 cm) in front of the humidifier intake opening, so shielded as not to be influenced by recirculation.

6.2.3 Air Circulation. The air circulation in the test room is to be such that the dry and wet-bulb temperatures will be uniform over the humidifier air intake opening(s) and introduced into the test room in such a manner as not to aid or hinder the air circulated by the humidifier. Air currents measured three feet from the humidifier shall not have a velocity greater than 50 ft/min (0.25 m/s) with the humidifier “off.”

6.3. Run-In Period.

A run in period will pre-condition all types of humidifiers to average use conditions prior to testing at standard conditions. The humidifier controls and any other adjustable features are to be positioned, as recommended by the manufacturer, to obtain maximum output. The humidifier under test is to be run-in until the amount of water equivalent to the product “Claimed Water Output Capacity in 24 hours” has been dispersed by the unit. The run-in period does not require the use of the test room or instrumentation.

6.3.1. Total Water Holding Capacity. The amount of water added to the humidifier to obtain the manufacturers recommended full level. Using the container provided with the product or other suitable container, fill the humidifier following the manufacturers’ instructions. 1) to its marked full level; or 2) to the level at which overflow occurs if no full level is indicated; or 3) until the water bottle/bottles have been emptied and refilled as many times as necessary until no more water drains out of the bottle/bottles. If the humidifier contains an evaporative media, allow the media to reach saturation before adding the final fill. If desired, this measurement may be substantiated by testing.

6.4. Procedure for Developing 50 Percent Water Test Weight.

Applicable to all humidifiers, this test procedure will determine 50% of the total water holding capacity as defined in Section 6.3.1 above. This procedure is necessary to provide an average start weight for the output test by calculating one half the difference in the weight of water between the humidifier empty condition and the full condition.

6.4.1. Test Start Weight. Using weight measuring apparatus, record the “empty” weight of the fully assembled humidifier when completely dry. Add water to the humidifier until the “total water holding capacity” (see 6.3.1) has been reached, and record the “full” weight. The weight of water in the humidifier is the difference between the “full” weight and the “empty” weight. Determine the 50% full weight of the humidifier by dividing the water weight at the “full” condition by 2 and then adding the humidifier “empty” weight. The 50% full weight shall be the “Test Start Weight” for the Output Capacity Test.

$$\begin{aligned}
 W_{\text{FULL}} &= \text{“Full” weight} \\
 W_{\text{DRY}} &= \text{“Empty” or dry weight} \\
 \text{Start Test Weight} &= \frac{1}{2}(W_{\text{FULL}} - W_{\text{DRY}}) + W_{\text{DRY}}
 \end{aligned}$$

6.5. Equilibrium Test Conditions Prior to the Output Capacity Test.

Position the humidifier on a weight measuring device in the test room (see 6.2.2) and fill with conditioned water to a level greater than the “Test Start Weight.” The humidifier controls and any other adjustable features are to be positioned, as recommended by the manufacturer, to obtain maximum output. Place the humidifier in operation and adjust the test room control settings to maintain the standard test temperatures (see Section 4.1) within the limits shown in Table II, Testing Tolerances, under the column heading “Maximum Variation of Individual Readings” (see 6.6). To ensure equilibrium, observe and record the dry-bulb, wet-bulb, and humidifier water temperature at 10 minute intervals. Proceed with the Test for Water Output Capacity (see 6.7) when four consecutive observations of the test room conditions are within the limits of Table II and when four consecutive observations of humidifier water temperature do not vary more than 2°F.

6.6. Testing Tolerances.

Each reading of dry-bulb and wet-bulb temperatures during the output capacity test is to agree with the standard test temperatures of 4.1 within the tolerances shown in Table II under the column heading “Maximum Variation of Individual Readings.” The arithmetical averages are also to agree with the standard test temperatures of 4.1 within the tolerances shown in Table II under the column heading “Maximum Variation of Arithmetical Average.”

Table II - Testing Tolerances

Temperature	Max. Variation of Individual Readings	Max. Variation of Arithmetical Average
Dry-Bulb		
70°F (21.1°C) –	±2°F (1.1°C)	±0.5°F (0.3°C)
Wet-Bulb		
53.2°F (11.7°C)	±1°F (0.6°C)	±0.3°F (0.2°C)
Voltage	±1%	

6.7. Test for Water Output Capacity.

After the equilibrium test conditions have been established, the humidifier shall be allowed to operate until the test start weight is achieved (see 6.4.1). The test start weight (Initial Weight