

AHRI Standard 621 (SI)

**2014 Standard for
Performance Rating
of Self-contained
Humidifiers for
Residential Applications**



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IMPORTANT

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Note:

This is a new standard.

For I-P ratings, see AHRI Standard 620 (I-P)-2014.

Approved as an American National Standard (ANS) on 19 November 2014.

AHRI withdrew ANS due to age on 20 September 2024.

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PERFORMANCE RATING OF SELF-CONTAINED HUMIDIFIERS FOR RESIDENTIAL APPLICATIONS

Section 1. Purpose

1.1 Purpose. The purpose of this standard is to establish for Self-contained Humidifiers: definitions; classifications; test requirements; rating requirements; minimum data requirements for Published Ratings; operating requirements; marking and nameplate data; and conformance conditions.

1.1.1 Intent. This standard is intended for the guidance of the industry, including manufacturers, engineers, installers, contractors and users.

1.1.2 Review and Amendment. This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 Scope. This standard applies to factory-made Self-contained Humidifiers for Residential Applications, as defined in Section 3.

2.1.1 Energy Source. This standard applies to electrically operated Self-contained Humidifiers that are independent of the air stream of a central air system for moisture evaporation and distribution.

2.1.2 Installation. The Self-contained Humidifier is intended for installation through an interior wall.

2.2 Exclusions. This standard does not apply to the following:

2.2.1 Central system humidifiers as defined in AHRI Standard 611.

2.2.2 Portable humidifiers as defined in AHAM HU-1.

2.2.3 Humidifiers for commercial and industrial applications as defined in ANSI/AHRI Standard 640.

Section 3. Definitions

All terms in this document shall follow the standard industry definitions in the current edition of ASHRAE Terminology website (<https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology>) unless otherwise defined in this section.

3.1 Humidification Capacity. The capacity associated with a Humidifier's ability to add moisture to air expressed in L/day of continuous operation.

3.2 Humidifier. A device designed to add moisture to air.

3.2.1 Self-contained Humidifiers for Residential Applications (Self-contained Humidifier). A class of Humidifier intended for non-ducted installation, but may be employed in ductwork, to be installed with a water make-up line and/or drain, electrical service, and is independent of a central air system. It may or may not be installed within the humidified space.

3.3 Published Rating. A statement of the assigned values of those performance characteristics, under stated Rating Conditions, by which a unit may be chosen to fit its application. These values apply to all units of like nominal size and type (identification) produced by the same manufacturer. The term Published Rating includes the rating of all performance characteristics shown on the unit or published in specifications, advertising or other literature controlled by the manufacturer, at stated Rating Conditions.

3.3.1 Application Rating. A rating based on tests performed at application Rating Conditions (other than Standard Rating Conditions).

3.3.2 Standard Rating. A rating based on tests performed at Standard Rating Conditions.

3.4 Rating Conditions. Any set of operating conditions under which a single level of performance results and which causes only that level of performance to occur.

3.4.1 Standard Rating Conditions. Rating Conditions used as the basis of comparison for performance characteristics.

3.5 "Shall" or "Should". "Shall" or "should" shall be interpreted as follows:

3.5.1 Shall. Where "shall" or "shall not" is used for a provision specified, that provision is mandatory if compliance with the standard is claimed.

3.5.2 Should. "Should" is used to indicate provisions which are not mandatory but which are desirable as good practice.

3.6 Supplementary Heat. Heat used to enhance evaporation by heating the water and/or air for direct evaporation when the Humidifier is used in a recirculating system.

3.7 Wet-bulb and Dry-bulb Temperatures. Temperatures t_i and t'_i are the average of the test temperatures entering the test section immediately before entering the Self-contained Humidifier under test. Temperatures t_r and t'_r are the rated temperatures at the same point.

Section 4. Classifications

4.1 Self-contained Humidifiers within the scope of this standard shall be classified according to the location of the evaporative process and the source of evaporative energy, as follows:

- 4.1.1** Within the unit without Supplementary Heat
- 4.1.2** External to unit without Supplementary Heat
- 4.1.3** Within the unit with Supplementary Heat
- 4.1.4** External to unit with Supplementary Heat

Section 5. Test Requirements

5.1 Test Requirements. Published Ratings shall be verified by tests conducted in accordance with the test method described in ANSI/ASHRAE 164.2-2012 and at the rating conditions in Section 6, except as listed below:

5.1.1 Humidification Capacity The humidification capacity shall be calculated using the following equation (in lieu of ANSI/ASHRAE 164.2 Equation 1):

$$H_m = K_1 \cdot F \cdot (H_s - H_t) \quad 1$$

$$F = \frac{t_r - t'_r}{t_t - t'_t} \quad 2$$

Where:

- F = Temperature correction factor
- H_m = Humidification Capacity, L/day
- H_s = Water supply rate, L/day
- H_t = Waste water rate, L/day

K_1	=	0.264
t_r	=	Return air Dry-bulb temperature at Rating Conditions, °C
$t_{r,w}$	=	Return air Wet-bulb temperature at Rating Conditions, °C
t_t	=	Return air Dry-bulb test temperature, °C
$t_{t,w}$	=	Return air Wet-bulb test temperature, °C

5.1.2 Observations and Conduct of Test. The method of testing shall be in accordance with ANSI/ASHRAE 164.2 Section 7 and with the following test procedure outlined below:

5.1.2.1 Water Supply Source Adjustment. If the water quantity measuring apparatus prescribed in ANSI/ASHRAE 164.2 Section 7 does not permit supply water flow rate determination while the Self-contained Humidifier is connected to the water supply source, the procedure described below shall be followed. The purpose for adjusting the water flow rate is to establish the water level that is to be maintained in a Self-contained Humidifier which has a float or balanced-pan valve, or the water flow rate for a Self-contained Humidifier equipped with an electrical water control valve (solenoid valve).

5.1.2.1.1 Water Level Determination. A Self-contained Humidifier which contains a reservoir shall be installed in the test apparatus and adjusted in accordance with the manufacturer's recommendations. It shall be operated in the test apparatus while connected to the water supply source described in ANSI/ASHRAE 164.2 Section 7. The water level in the reservoir shall be observed. After it has remained constant during an operating period of not less than 30 minutes, a water-level line shall be marked on the reservoir. This reservoir water level shall be maintained during the capacity test.

5.1.2.1.2 Water Flow Rate Determination. A Self-contained Humidifier which utilizes an electric water control valve shall be adjusted in accordance with the manufacturer's recommendations. (An alternative procedure is to remove the water control valve from the Self-contained Humidifier and adjust the flow rate in accordance with the manufacturer's recommendations.) The water control valve shall be opened electrically. The water to and the waste water from the Self-contained Humidifier shall be determined using ANSI/ASHRAE 164.2 Section 7. The period of the preliminary test shall not be less than 30 minutes.

5.1.2.1.3 Water or Steam Flow Rate Determination - Supplementary Heat Using a Recirculating Coil. The water or steam flow rate through the recirculating coil or Self-contained Humidifiers using such a coil for Supplementary Heat shall be adjusted as necessary to maintain the required inlet water temperature and pressure or inlet steam pressure during the test.

5.1.2.1.4 Air Pressures. Air pressures or a differential pressure shall be observed and recorded at the following locations:

5.1.2.1.4.1	Static pressure drop across flow nozzle, Pa
5.1.2.1.4.2	Absolute pressure of air entering flow nozzle, kPa
5.1.2.1.4.3	Pressure entering humidifier test section, Pa below atmospheric pressure

5.1.2.1.5 Water Quantity. Weights or water flow rates shall be recorded (when converting Humidification Capacity from kg/hr to L/day, one liter of water shall be assumed to weigh 1 kg):

5.1.2.1.5.1	Supply water to Self-contained Humidifier, kg or L
5.1.2.1.5.2	Waste water from the Self-contained Humidifier, kg or L
5.1.2.1.5.3	Recirculating water (where used), kg/h or L/h
5.1.2.1.5.4	Steam condensate (where used), kg/h

5.2 Equipment. Self-contained Humidifiers shall be tested using all components as recommended by the manufacturer.

5.3 Electrical Conditions. Nameplate voltages are shown in Table 1 of ANSI/AHRI Standard 110. Nameplate voltages for 50 Hz systems shall include one or more of the utilization voltages shown in Table 1 of International Standard IEC 60038. Tests shall be performed at the nameplate rated voltage and frequency unless otherwise specified in this Standard.

For all dual nameplate voltage equipment covered by this standard, tests shall be performed at both voltages or at the lower voltage if only a single rating is to be published.

5.4 Outlet-side Air-flow Rate. Published Ratings shall be determined at an outlet-side air flow rate delivered when operating against zero external static pressure or at a lower air flow rate if so specified by the manufacturer. All power consumed by the fan(s) shall be included in the power input to the unit. All air flow rates shall be expressed in m³/s.

Section 6. Rating Requirements

6.1 Published Ratings. Published Ratings shall include Humidification Capacity, power input, and the energy input of Supplementary Heat. Humidification Capacity shall be expressed in terms of L/day and stated to the nearest 0.5 L/day. Power input shall be expressed in W stated to the nearest 5 W. Energy input of Supplementary Heat shall be expressed in W stated to the nearest 30 W. Air flow rates shall be expressed in increments of 0.005 m³/s.

6.2 Standard Ratings. Ratings based on data determined by the test requirements prescribed in Section 5 shall be published as Standard Ratings when conducted at the Standard Rating Conditions in Table 1.

Table 1. Standard Rating Conditions	
Rating Name	Rating Value
Air temperature entering Self-contained Humidifier	24.0°C Dry-bulb Temperature and 13.5°C Wet-bulb Temperature
Air velocity in humidifier test section (with Self-contained Humidifier not operating)	0.25 m/s
Static pressure difference between inlet and outlet of Self-contained Humidifier	0 Pa
Water pressure entering control valve	415 Pa
Water temperature entering control valve	15.5°C

6.2.1 Supplementary Heat (Water) Test Conditions.

Water pressure entering control valve..... 100 kPa gage
Water temperature entering control valve..... 49.0°C

6.2.2 Supplementary Heat (Steam) Test Conditions.

Steam pressure entering control valve 14 kPa gage

6.3 Application Ratings. Ratings based on data determined by test requirements prescribed in Section 5 and conducted using Rating Conditions other than those specified in 6.2 shall be published as Application Ratings.

6.4 Tolerances. To comply with this standard, measured test results shall not be less than 95% of Published Ratings for Humidification Capacity and shall not exceed 110% of Published Ratings for power input or energy input of Supplementary Heat. Where Supplementary Heat (water) is used, the energy input from this source shall not be more than the rated power input.

Section 7. Minimum Data Requirements for Published Ratings

7.1 Minimum Data Requirements for Published Ratings. As a minimum, Published Ratings shall consist of the following information:

- 7.1.1** Humidification Capacity, L/day
- 7.1.2** Power input, kW

7.1.3 Energy input of Supplementary Heat, W (where Supplementary Heat is used)

As a minimum, Published Ratings shall include all Standard Ratings. All claims to ratings within the scope of this standard shall include the statement “Rated in accordance with ANSI/AHRI Standard 621 (SI)”. All claims to ratings outside the scope of this standard shall include the statement “Outside the scope of ANSI/AHRI Standard 621 (SI)”. Wherever Application Ratings are published or printed, they shall include a statement of the conditions at which the ratings apply.

Section 8. Operating Requirements

8.1 *Operating Requirements.* To comply with this standard, any production unit shall meet the minimum operating requirements detailed in this section.

8.2 *Water-trace Test.* Self-contained Humidifiers shall pass a water-trace test for each class designation as specified in the manufacturer’s installation instructions when operated at Standard Rating Conditions specified in Section 6.2.

8.2.1 *Procedure.* The Self-contained Humidifier shall operate for the duration of the Standard Rating test.

8.2.2 *Requirements.*

8.2.2.1 During the test, water shall not drip or run off the Self-contained Humidifier under test.

8.2.2.2 After the test, the surface under or surrounding the Self-contained Humidifier shall be dry, provided that the surface temperature exceeds 5.5°C.

8.3 *Water Flow Control Test.* Self-contained Humidifiers shall pass the following water flow control test when operated at Standard Rating Conditions specified in Section 6.2 except for water pressure conditions.

8.3.1 *Water Pressure Conditions.* Water pressure conditions shall be maintained at 140 kPa.

8.3.2 *Procedure.* The Self-contained Humidifier shall operate continuously for 30 minutes. The water pressure shall then be raised to 860 kPa and the Self-contained Humidifier shall then operate continuously for an additional 30 minutes. Operation and resetting of the water control valve prior to establishment of continuous operation shall be permitted.

8.3.3 *Requirements.* During the test there shall be no dripping or run-off of water from the Self-contained Humidifier.

Section 9. Marking and Nameplate Data

9.1 *Marking and Nameplate Data.* As a minimum, the nameplate shall display the manufacturer's name, model designation, and electrical characteristics.

Nameplate voltages for 60 Hz systems shall include one or more of the equipment nameplate voltage ratings shown in Table 1 of ANSI/AHRI Standard 110. Nameplate voltages for 50 Hz systems shall include one or more of the utilization voltages shown in Table 1 of International Standard IEC 60038.

Section 10. Conformance Conditions

10.1 *Conformance.* While conformance with this standard is voluntary, conformance shall not be claimed or implied for products or equipment within the standard's *Purpose* (Section 1) and *Scope* (Section 2) unless such product claims meet all of the requirements of the standard and all of the testing and rating requirements are measured and reported in complete compliance with the standard. Any product that has not met all the requirements of the standard shall not reference, state, or acknowledge the standard in any written, oral, or electronic communication.

APPENDIX A. REFERENCES – NORMATIVE

A1 Listed here are all standards, handbooks and other publications essential to the formation and implementation of the standards. All references in this appendix are considered as part of the standard.

A1.1 AHAM HU-1-2006, *Household Humidifiers*, 2006, Association of Home Appliance Manufacturers, 1111 19th St., NW, Ste. 402, Washington, DC 20036 U.S.A.

A1.2 ANSI/AHRI Standard 110-2012, *Air-Conditioning, Heating and Refrigerating Equipment Nameplate Voltages*, 2012, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.3 ANSI/AHRI Standard 611 (SI)-2014, *Standard for Central System Humidifiers for Residential Applications*, 2014, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.4 ANSI/AHRI Standard 620 (I-P)-2014, *Standard for Self-Contained Humidifiers for Central System Application*, 2014, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.5 ANSI/AHRI Standard 640-2005, *Commercial & Industrial Humidifiers*, 2005, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.6 ANSI/ASHRAE Standard 164.2-2012, *Method of Test for Residential Self-contained Humidifiers*, 2012, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329, U.S.A.

A1.7 ASHRAE *Terminology*, <https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology>, 2014, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329, U.S.A.

A1.8 International Standard IEC 60038, 2002, *IEC Standard Voltages*, International Electrotechnical Commission, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland.

APPENDIX B. REFERENCES – INFORMATIVE

B1 Listed here are all standards, handbooks, and other publications which may provide useful information and background but are not considered essential. References in this appendix are not considered part of the standard.

B1.1 ANSI/AMCA Standard 210-2007/ANSI/ASHRAE 51-2007, *Laboratory Methods Of Testing Fans for Aerodynamic Performance Rating*, 2007, Air Movement and Control Association International, 30 West University Drive, Arlington Heights, Illinois 60004-1893, U.S.A or the American Society of Heating, Refrigerating and Air-Conditioning Engineers, 1791 Tullie Circle N.E., Atlanta, GA 30329, U.S.A.

B1.2 ANSI/ASHRAE Standard 41.1-2013, *Standard Method for Temperature Measurement*, 2001, American Society of Heating Refrigeration and Air-Conditioning Engineers, 1791 Tullie Circle, N.E., Atlanta, GA 30329, U.S.A.

B1.3 ANSI/ASHRAE Standard 41.3-1989, *Standard Method for Pressure Measurement*, 1989, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329, U.S.A.