



Room Air Conditioners

ANSI/AHAM RAC-1-2015



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 room air conditioner.
Results of tests in accordance with this standard may be publicly stated.

Recommended levels of performance which are considered important to include but which, necessarily, are recommendations only.

AHAM standards are presented to the American National Standards Institute (ANSI) for recognition as American National Standards. This standard was so recognized on May 13, 2015 and bears the American National Standard designation ANSI/AHAM RAC-1-2015.

The test results may be compared with AHAM's recommended level of performance, if any, for a particular product characteristic.

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 laboratory such as Underwriters Laboratories, Inc., or the American Gas Association Laboratories, Inc., for inspection and listing in conformance with the safety standards and procedures followed by such laboratories. The relevant standards for room air conditioners are UL 484, *Room Air Conditioners*, and this standard, AHAM RAC-1, *Room Air Conditioners*.

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.

When metric units are not specified, conversion from customary units should be done in accordance with the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) Metric Practice Guide, and the AHAM SI Metric Practice Guide for the Appliance Industry.

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CONTENTS

1.	PURPOSE	1
2.	SCOPE	1
3.	DEFINITIONS	1
3.1.	Room Air Conditioner	1
3.2.	Cooling Capacity	1
3.3.	Moisture Removal Capacity	1
3.4.	Heating Capacity	1
3.5.	Recirculated Air	2
3.6.	Ventilating Air	2
3.7.	Exhaust Air	2
3.8.	Standard Air	2
3.9.	Energy Efficiency Ratio	2
3.10.	Active mode	2
3.11.	Inactive mode	2
3.12.	Off mode	2
3.13.	Standby mode	3
3.14.	Rounding	3
4.	TESTING CONDITIONS	3
4.1.	General	3
4.2.	Active Mode	3
4.3.	Standby and Off Modes	4
5.	STANDARD MEASUREMENT TEST	5
5.1.	Standard Measurements	5
5.2.	Standard Test Conditions	5
5.3.	Nameplate	6
6.	PERFORMANCE TESTS - COOLING UNITS	6
6.1.	Cooling Capacity Test	6
6.2.	Electrical Input Test	6
6.3.	Standby and Off Mode Test	7
6.4.	Standby and Off Mode Annual Energy Consumption (E_{TSO})	7
6.5.	Energy Efficiency Ratio (EER)	8
6.6.	Average Annual Energy Consumption (E_{AAC})	8
6.7.	Combined Annual Energy Consumption (E_{CAE})	8
6.8.	Combined Energy Efficiency Ratio (CEER)	8
6.9.	Moisture Removal Capacity Test	8
6.10.	Recirculated Air Quantity Test	9
6.11.	Ventilating Air Quantity Test and Exhaust Air Quantity Test	9
6.12.	Maximum Operating Conditions Test	9
6.13.	Freeze-Up Tests	11
6.14.	Enclosure Sweat Test	13
6.15.	Condensate Disposal Test	14

7.	PERFORMANCE TESTS HEATING-COOLING UNITS.....	15
7.1.	Heating-Cooling Units.....	15
7.2.	Heating Capacity Test.....	15
7.3.	Electrical Input Test.....	15
7.4.	Application Heating Capacity Test.....	15
7.5.	Maximum Operating Conditions Test	16
7.6.	Outside Coil De-Icing Test	17
8.	SAFETY.....	18
	APPENDIX A.....	19
	APPENDIX B.....	23

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1. PURPOSE

This standard establishes a uniform, repeatable procedure or standard method for measuring specified product characteristics of room air conditioners.

The standard methods and the recommended levels of performance, where they appear, are intended to provide a means to compare and evaluate different brands and models of room air conditioners regarding characteristics significant to product use.

The standard methods and the recommended levels of performance are not intended to preclude the exercise of ingenuity or to prevent improvement and innovation in design and performance.

2. SCOPE

This standard establishes standard methods for measuring performance and includes sections on definitions, test conditions, tests for standard measurements, performance tests, and safety which apply to room air conditioners as defined in 3.1.

Performance tests for Heating-Cooling Units (Section 7) apply to units designed as air-to-air source heat pumps with or without supplementary electric resistance heat. The tests do not apply to units with electric resistance as the only heat source.

3. DEFINITIONS

3.1. Room Air Conditioner

A room air conditioner is an encased assembly designed as a unit to be mounted in a window or through a wall, or as a console. It is designed primarily to provide free delivery of conditioned air to an enclosed space, room or zone. It includes a prime source of refrigeration for cooling and dehumidification and means for circulating and cleaning air, and may also include means for ventilating and heating.

A packaged terminal air conditioner, a system designed to accommodate various components for heating methods (steam, electric, hot water, etc.) is not considered a room air conditioner.

3.2. Cooling Capacity

Cooling capacity is a measure of the ability of a unit to remove heat from an enclosed space, room or zone.

3.3. Moisture Removal Capacity

Moisture removal capacity is a measure of the ability of a unit to remove moisture from an enclosed space, room or zone.

3.4. Heating Capacity

Heating capacity is a measure of the ability of a unit to add heat to an enclosed space, room or zone.

3.5. Recirculated Air

Recirculated air is the air discharged by a unit into an enclosed space, room or zone when all ventilating and exhaust dampers are closed.

3.6. Ventilating Air

Ventilating air is the air introduced from outside by a unit into an enclosed space, room or zone.

3.7. Exhaust Air

Exhaust air is the air discharged to the outside by a unit from an enclosed space, room or zone.

3.8. Standard Air

Standard air is air having a density of 0.075 lb/ft^3 (1.20 kg/m^3) and is equivalent to dry air at a temperature of 70°F (21.1°C) and barometric pressure of 29.92 inches (101.325 kPa) of mercury.

3.9. Energy Efficiency Ratio

The energy efficiency ratio (EER) is a value representing the relative electrical efficiency of a room air conditioner. It is expressed in Btu/Wh and is obtained by dividing the measured cooling capacity in Btu/h by the measured average electrical power input in watts during the cooling capacity determination.

3.10. Active mode

A mode in which the room air conditioner is connected to a mains power source, has been activated and is performing the main function of cooling or heating the conditioned space, or circulating air through activation of its fan or blower, with or without energizing active air-cleaning components or devices such as ultraviolet (UV) radiation, electrostatic filters, ozone generators, or other air-cleaning devices.

3.11. Inactive mode

A standby mode that facilitates the activation of active mode by remote switch (including remote control) or internal sensor or which provides continuous status display.

3.12. Off mode

A mode in which a room air conditioner is connected to a mains power source and is not providing any active or standby mode function and where the mode may persist for an indefinite time. An indicator that only shows the user that the product is in the off position is included within the classification of an off mode.

3.13. Standby mode

Any product modes where the energy using product is connected to a mains power source and offers one or more of the following user oriented or protective functions which may persist for an indefinite time:

- a) To facilitate the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, or timer.
- b) Continuous functions, including information or status displays (including clocks) or sensor-based functions. A timer is a continuous clock function (which may or may not be associated with a display) that provides regular scheduled tasks (e.g., switching) and that operates on a continuous basis.

3.14. Rounding

When this test procedure calls for rounding off of test results, and the results fall equally between two values of the nearest dollar, kilowatt-hour, or other specified nearest value, the result shall be rounded up to the nearest higher value.

4. TESTING CONDITIONS

4.1. General

Test room air conditioners in accordance with the procedures given in this standard. Tolerances on all Standard Measurement Test readings are to be in accordance with American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) **Standard 16-1983 (RA 2009)**, "Method of Testing for Rating Room Air Conditioners and Packaged Terminal Air Conditioners"¹, the latest edition of ASHRAE Standard 58, "Method of Testing for Rating Room Air Conditioner and Packaged Terminal Air Conditioner Heating Capacity", and International Electrotechnical Commission (IEC) Publication 62301 (first edition June 2005).

4.2. Active Mode

4.2.1. Temperature Tolerances

$\pm 1^{\circ}\text{F}$ (0.5°C) for air dry bulb and wet bulb temperatures

$\pm 0.5^{\circ}\text{F}$ (0.3°C) for water temperatures

4.2.2. Voltage

Conduct all tests at nameplate voltage unless otherwise specified.

Tolerance: $\pm 1\%$ for voltage readings

¹ Copies are available Online from ASHRAE (www.ashrae.org).

4.2.3. Frequency

Conduct all tests at manufacturer's rated frequency unless otherwise specified.

4.3. Standby and Off Modes

4.3.1. Temperature Tolerances

$\pm 9^{\circ}\text{F}$ (5°C) for air dry bulb temperatures (indoor only)

$\pm 1^{\circ}\text{F}$ (0.5°C) for air dry bulb and wet bulb temperatures (outdoor only) if chamber described in 5.2.2.1 of ASHRAE 16-1983 (RA 2009) is utilized to conduct Standby and Off Mode testing.

4.3.2. Voltage

Conduct all tests at nameplate voltage unless otherwise specified. Supply voltage waveform to conform to section 4.4 of IEC 62301(2005).

Tolerance: $\pm 1\%$ for voltage readings.

4.3.3. Frequency

Conduct all tests at manufacturer's rated frequency unless otherwise specified.

Tolerance: $\pm 1\%$ for frequency readings.

4.3.4. Air Speed

Air speed close to the appliance ≤ 0.5 m/s (1.64 ft/s).

4.3.5. Power Measurement

Comply with Section 4.5 and 5.3.2(a) of IEC 62301(2005).

5. STANDARD MEASUREMENT TEST

5.1. Standard Measurements

Establish standard measurements at the Standard Test Conditions specified in this section.

Standard Measurements for room air conditioners are Cooling Capacity, Heating Capacity, Moisture Removal Capacity, Recirculated Air Quantity, Ventilating Air Quantity, Exhaust Air Quantity, and Electrical Input.

5.2. Standard Test Conditions

5.2.1. Temperature Conditions for Cooling Capacity Test

5.2.1.1. Air Cooled Units

Room Air Temperature 80°F (26.7°C) dry bulb
67°F (19.4°C) wet bulb
Outside Air Temperature 95°F (35.0°C) dry bulb
75°F (23.9°C) wet bulb

5.2.1.2. Water Cooled Units

Room Air Temperature 80°F (26.7°C) dry bulb
67°F (19.4°C) wet bulb
Condenser Water Temperature 75°F (23.9°C) entering
95°F (35.0°C) leaving

5.2.2. Temperature Conditions for Heating Capacity Test

Room Air Temperature 70°F (21.1°C) dry bulb
60°F (15.6°C) wet bulb (Max)
Outside Air Temperature 47°F (8.3°C) dry bulb
43°F (6.1°C) wet bulb

5.2.3. Temperature Conditions for Standby and Off Mode Test

Room Air Temperature 73.4°F (23°C) dry bulb
Outside Alternate Test Conditions 95°F (35.0°C) dry bulb
75°F (23.9°C) wet bulb



5.2.4. Voltages for Standard Measurement Test

The voltage at the unit supply connection is the voltage that is stated on the nameplate at a frequency of 60 Hz. It is 115, 208, 230, 230/208, 265 volts. For units manufactured for export, the voltage and frequency is as stated on the nameplate.

5.3. Nameplate

The following minimum information based on data obtained in accordance with the provisions of this section should be included on the nameplate of each room air conditioner.

5.3.1. Nameplate Data

Nameplate data in accordance with Underwriters Laboratories (UL) Standard 484² for Room Air Conditioners, latest edition.

5.3.2. Electrical Power Input

Average electrical power input in watts measured during the cooling capacity determination in 6.1.

5.3.3. Cooling and Heating Capacity

Cooling capacity in Btu/h, or if heating is also provided, cooling and heating capacity in Btu/h, at standard test conditions with all controls set for maximum capacity.

6. PERFORMANCE TESTS - COOLING UNITS

6.1. Cooling Capacity Test

Setup unit in accordance with manufacturer's instructions. If the unit has an outdoor air ventilation damper close it during this test. Calculate the cooling capacity of air-cooled and water-cooled room air conditioners from test data obtained at the Standard Test Conditions specified in Section 5.2 when tested according to ASHRAE Standard 16-1983 (RA 2009), "Method of Testing for Rating Room Air Conditioners and Packaged Terminal Air Conditioners."

State the cooling capacity in Btu/h.

6.2. Electrical Input Test

Determine electrical input data at nameplate voltage at the Standard Test Conditions specified in Section 5.2 when tested according to ASHRAE Standard 16-1983 (RA 2009), "Method of Testing for Rating Room Air Conditioners and Packaged

² Copies are available Online from Comm-2000 (<http://www.comm-2000.com/>); by phone (United States or Canada) toll-free 1-888-UL33503 or 1-888-853-3503; by fax 1.630.932.7312; by email orders@comm-2000.com; or by mail at COMM 2000, 1414 Brook Drive, Downers Grove, IL 60515.

Terminal Air Conditioners."

State the electrical input in watts (W) and amperes.

6.3. Standby and Off Mode Test

Determine if the air conditioner has an inactive mode, off mode, or both modes. Usually, a room air conditioner will have either an inactive or off mode but not both.

Setup air conditioner in accordance with manufacturer's instructions. If no instructions are provided, the factory settings shall be used. If the unit has an outdoor air ventilation damper close it during this test.

Set the unit in the appropriate mode/s at the start of this test. Allow the unit to stabilize at least five minutes prior to testing in accordance with section 5 of IEC 62301(2005)

Record the inactive power and/or off mode power, rounded to the nearest 0.01 watts, as defined in 5.3.2(a) of IEC 62301 (2005).

6.4. Standby and Off Mode Annual Energy Consumption (E_{TSO})

Calculate the standby mode and off mode annual energy consumption for room air conditioners, E_{TSO} : expressed in kilowatt-hours per year, according to the following:

$$E_{TSO} = [(P_{IA} \times S_{IA}) + (P_{OFF} \times S_{OFF})] \times 0.001 \text{ kWh/Wh}$$

Where:

E_{TSO} : Annual energy from inactive and off modes in kilowatt-hours per year

P_{IA} = room air conditioner inactive mode power, in watts.

P_{OFF} = room air conditioner off mode power, in watts.

If the room air conditioner has an inactive mode but no off mode, the inactive mode annual hours, S_{IA} , is equal to 5,115 and the off mode annual hours, S_{OFF} , is equal to 0

If the room air conditioner has an off mode but no inactive mode, the off mode annual hours, S_{OFF} , is equal to 5,115 and the inactive mode annual hours, S_{IA} , is equal to 0

If the room air conditioner has both inactive mode and off mode, S_{IA} and S_{OFF} both equal $5,115 \div 2 = 2,557.5$, where 5,115 is the total inactive and off mode annual hours;