

AHRI Standard 1160-2022 (I-P)

2022 Standard for

Performance Rating of Heat Pump Pool Heaters



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ICS Code: 27.080

Note:

This standard supersedes AHRI Standard 1160 (I-P)-2014 with Addendum 1.

For SI ratings see ANSI/AHRI Standard 1161-2014 (SI).

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Intent

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

Review and Amendment

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

2022 Edition

This edition of AHRI Standard 1160-2022 (I-P), *Performance Rating of Heat Pump Pool Heaters* was prepared by the Water Heater Standards Technical Committee. It was issued by the Heating Standards Subcommittee in December 2022.

Origin and Development of AHRI Standard 1160

The standard was first published as ARI Standard 1160-2004 *Performance Rating of Heat Pump Pool Heaters*. Subsequent publications were:

ARI Standard 1160-2007 *Performance Rating of Heat Pump Pool Heaters*

AHRI Standard 1160-2008 *Performance Rating of Heat Pump Pool Heaters*

AHRI Standard 1160-2009 *Performance Rating of Heat Pump Pool Heaters*

In 2009 the standard was revised. AHRI 1160 (I-P) and AHRI 1161-2009 (SI) were published for the first time. Both versions were approved as American National Standards (ANS) on 3 November 2011.

In 2014 the standard was revised and was approved as an ANS on 19 November 2014.

In 2015 Addendum 1 was published to update Table 2 to remove the phrase, “however it may be no lower than 30 gpm.”

Summary of Changes

AHRI Standard 1160-2022 (I-P) contains the following update(s) to the previous edition:

- Incorporated Addendum 1 (March 2015) that updated [Table 2](#) to remove the phrase, “however it may be no lower than 30 gpm.”
- Minor editorial changes and updates

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Water Heater Standards Technical Committee Scope: This committee shall have responsibility for the development and maintenance of AHRI standards and guidelines pertaining to residential and commercial water heaters and pool heaters.

Heating Standards Subcommittee

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Heating Standards Subcommittee Scope: The scope of the Heating Standards Subcommittee is standards and guidelines related to the end products that are part of the AHRI Heating Industry Sector. (The definition of and list of products associated with each sector are found on the AHRI website.

These committee lists represent the membership at the time the Standards Working Group, Technical Committee, and Standards Subcommittee were balloted on the final text of this edition. Since that time, changes in the membership may have occurred. Membership on these committees shall not in and of itself constitute an endorsement by the committee members, employers of AHRI, or any document developed by the committee on which the member serves.

TABLE OF CONTENTS

Section

SECTIONS

Section 1. Purpose 1
Section 2. Scope..... 1
Section 3. Definitions 1
Section 4. Classifications 2
Section 5. Test Requirements 2
Section 6. Rating Requirements..... 3
Section 7. Minimum Data Requirements for Published Ratings 4
Section 8. Operating Requirements 4
Section 9. Marking and Nameplate Data 5
Section 10. Conformance Conditions 5

TABLES

Table 1 Classifications of Heat Pump Pool Heaters 3
Table 2 Standard Rating Conditions 3

APPENDICES

Appendix A. References – Normative 6
Appendix B. References - Informative 7

PERFORMANCE RATING OF HEAT PUMP POOL HEATERS

Section 1. Purpose

1.1 Purpose

This standard establishes definitions, classifications, test requirements, rating requirements, minimum data requirements for *published ratings*, operating requirements, marking and nameplate data, and conformance conditions for *heat pump pool heaters*.

Section 2. Scope

2.1 Scope

This standard applies to the rating and testing of complete factory-made *heat pump pool heaters* as defined in [Section 3](#).

2.2 Energy Source

This standard applies only to air-source, electrically driven, mechanical compression type systems.

2.3 Exclusions

This standard does not apply to the following:

- 1) Individual assemblies
- 2) Unitary Air-Conditioners as defined in AHRI 210/240 with capacities less than 65,000 Btu/h
- 3) Unitary heat operated air-conditioning equipment
- 4) Water-source heat pumps as defined in AHRI/ASHRAE/ISO 13256-1:1998 (RA 2012)
- 5) Commercial and Industrial Unitary Air Conditioning and Heat Pump Equipment with capacities of 65,000 Btu/h or greater as defined in AHRI 340/360
- 6) Single Package Vertical Air-Conditioners and Heat Pumps as defined in AHRI 390
- 7) Package Terminal Air-Conditioners and Heat Pumps as defined in AHRI 310/380

Section 3. Definitions

All terms in this document shall follow the standard industry definitions in the ASHRAE Terminology website unless otherwise defined in this section.

3.1 Expressions of Provision

Terms that provide clear distinctions between requirements, recommendations, permissions, options, and capabilities.

3.1.1 “Can” or “cannot”

Express an option or capability.

3.1.2 “May”

Signifies a permission expressed by the document.

3.1.3 “Must”

Indication of unavoidable situations and does not mean that an external constraint referred to is a requirement of the document.

3.1.4 “Shall” or “shall not”

Indication of mandatory requirements to strictly conform to the standard and where deviation is not permitted.

3.1.5 “Should” or “should not”

Indication of recommendations rather than requirements. In the negative form, a recommendation is the expression of potential choices or courses of action that is not preferred but not prohibited.

3.2 Standard Specific Definitions

3.2.1 Coefficient of Performance (COP)

A ratio of the *heating capacity* in watts to the power input values in watts at any given set of rating conditions expressed in watts/watt.

3.2.1.1 Standard Coefficient of Performance

A ratio of the capacity to power input value obtained at *standard rating conditions*.

3.2.2 Heat Pump Pool Heater

A factory-made assembly that contains the air moving device, compressor, refrigerant-to-water heat exchanger and air-to-refrigerant heat exchanger using ambient air as the heat source. Models can consist of more than one assembly to be used together for the purpose of cooling and heating pool water. Models with separated assemblies are designed to be used together, and the requirements of rating outlined in this standard are based upon the use of matched assemblies.

Heat pump pool heaters are capable of heating pool water to achieve a controlled temperature, and can include the capabilities of pool water cooling, air-heating, air cooling, air-circulating, air-cleaning, or dehumidifying.

3.2.3 Heating Capacity

The capacity associated with the change in water temperature expressed in Btu/h.

3.2.4 Published Rating

A statement of the assigned values of those performance characteristics, under stated *rating conditions*, where a unit can be chosen to fit the application. These values apply to all units of the same nominal size and type (identification) produced by the same manufacturer. This 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*.

3.2.4.1 Application Rating

A rating based on tests performed at rating conditions other than *standard rating conditions*.

3.2.4.2 Standard Rating

A rating based on tests performed at *standard rating conditions*.

3.2.5 Rating Conditions

Any set of operating conditions where a single level of performance results and causes only that level of performance to occur.

3.2.5.1 Standard Rating Conditions

Rating conditions used as the basis of comparison for performance characteristics.

Section 4. Classifications

4.1 Classifications

A *heat pump pool heater* within the scope of this standard shall be classified by Functions as shown in [Table 1](#).

Section 5. Test Requirements

All *standard ratings* shall be verified by tests conducted in accordance with ASHRAE 146.

Table 1 Classifications of Heat Pump Pool Heaters

| Designation | Unit type | |
|----------------|-------------------|--------------------------|
| | Pool Heating Only | Pool Heating and Cooling |
| Single Package | SPPH-H | SPPH-H/C |
| Split System | SSPH-H | SSPH-H/C |

Section 6. Rating Requirements

6.1 Standard Rating

Standard ratings shall be established by tests conducted at the *standard rating conditions* specified in [Table 2](#).

6.1.1 Values for Standard Ratings

Standard ratings relating to *heating capacity* shall be net values. If a circulating pump is within the unit and energized under normal operation, that electrical energy shall be included in the total power input to the unit. Supplementary electric heat shall not be included in the *standard ratings* of the unit.

6.1.1.1 Values for Standard Heating Capacity Ratings

Standard *heating capacity* ratings shall be expressed only in terms of Btu/h in multiples of 500 Btu/h for units with ratings less than 50,000 Btu/h, or multiples of 1000 Btu/h for units with ratings 50,000 Btu/h and greater.

6.1.1.2 Values for Standard Coefficient of Performance

Standard *coefficient of performance* shall be expressed in multiples of 0.1.

6.1.2 Electrical Conditions

Standard rating tests shall be conducted at nameplate rated voltage and frequency. For models with dual voltage nameplate ratings, the tests shall be conducted at the higher of the two voltages.

6.1.3 Requirements for Separated Assemblies

When a model consists of two separate assemblies, the length of the interconnecting refrigerant tubing shall not be less than 25 ft. The line sizes, insulation and details of installation shall be per the manufacturer’s installation instructions.

6.2 Application Ratings

Application ratings shall be established by tests conducted using *rating conditions* other than those specified in [Table 2](#).

Table 2 Standard Rating Conditions

| Temperature and Humidity (% RH) | Air Temperature Surrounding Unit | | Water Temperature Entering Unit, °F | Water Flow Rate gpm |
|---|----------------------------------|--------------|-------------------------------------|---|
| | Dry-bulb, °F | Wet-bulb, °F | | |
| High Air Temperature - High Humidity (80% RH) | 80.6 | 75.8 | 80.0 | Same as High Air Temperature – Mid Humidity |
| High Air Temperature - Mid Humidity (63% RH) | 80.6 | 71.2 | 80.0 | 1) Use 0.450 per 1000 Btu/h. or 2) Manufacturer can specify a flow rate lower than 0.450 per 1000 Btu/h |
| Low Air Temperature - Mid Humidity (63% RH) | 50.0 | 44.3 | 80.0 | Same as High Air Temperature – Mid Humidity |

6.3 Tolerances

To comply with this standard, measured test results for *heating capacity* and *COP* shall not be less than 95% of *published ratings*.

Section 7. Minimum Data Requirements for Published Ratings

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 AHRI Standard 1160 (I-P).” All claims to ratings outside the scope of this standard shall include the statement “Outside the scope of AHRI Standard 1160 (I-P).” *Application ratings* within the scope of the standard shall include a statement of the conditions under which the ratings apply.

Section 8. Operating Requirements

8.1 Performance Requirements

To comply with this standard, *heat pump pool heaters* shall be designed and produced in such a manner that any production unit will meet the requirements of this section.

8.2 Maximum Operating Conditions Test.

Heat pump pool heaters shall be designed and produced to pass the following maximum operating conditions test.

8.2.1 Temperature Conditions.

- 1) Air temperature surrounding unit:
 - a) 86.0°F dry-bulb
 - b) 68.0°F wet-bulb
- 2) Water temperature entering unit: 101.0°F
- 3) Water flow rate: Same flow rate as established in High Air Temperature - Mid Humidity (63% RH) in [Table 2](#).

8.2.2 Voltages

The test shall be run at the Range A minimum utilization voltage from AHRI Standard 110, Table 1, based upon the unit’s nameplate rated voltage(s). This voltage shall be supplied at the unit’s service connection and at rated frequency.

8.2.3 Procedure

The equipment shall be operated for one hour at the temperature conditions and voltage specified.

8.2.4 Requirements

The equipment shall operate continuously without interruption for any reason for one hour.

8.3 Voltage Tolerance Test

Heat pump pool heaters shall pass the following voltage tolerance test with the same water flow rate as established in High Air Temperature – Mid Humidity (63% RH) in [Table 2](#).

8.3.1 Temperature Conditions

Temperature conditions shall be maintained at the steady state conditions as shown in [Table 2](#).

8.3.2 Voltages

- 1) Tests shall be run at the Range B minimum and maximum utilization voltages from AHRI 110, Table 1, based upon the unit’s nameplate rated voltage(s). These voltages shall be supplied at the unit’s service connection and at rated frequency. A lower minimum or a higher maximum voltage shall be used, if listed on the nameplate.

- 2) The power supplied to single phase equipment shall be adjusted just prior to the shut-down period (Section 8.3.3(2)) so that the resulting voltage at the unit's service connection is 86% of nameplate rated voltage when the compressor motor is on locked-rotor. (For 200V or 208V nameplate rated equipment, the restart voltage shall be set at 180V when the compressor motor is on locked rotor.) Open circuit voltage for three-phase equipment shall not be greater than 90% of nameplate rated voltage.
- 3) Within one minute after the equipment has resumed continuous operation (Section 8.3.4(3)), the voltage shall be restored to the values specific in Section 8.3.2(1).

8.3.3 Procedure

- 1) The equipment shall be operated for one hour at the temperature conditions and voltage(s) specified.
- 2) All power to the equipment shall be interrupted for a period (not to exceed five seconds) to cause the compressor to stop and then be restored.

8.3.4 Requirements

- 1) During testing, the equipment shall operate without failure of any parts.
- 2) The equipment shall operate continuously without interruption for any reason for the one hour period preceding the power interruption.
- 3) The unit shall resume continuous operation within two hours of restoration of power and shall then operate continuously for one half hour. Operation and resetting of safety devices prior to establishment of continuous operation is permitted.

Section 9. Marking and Nameplate Data

As a minimum, the nameplate shall display the manufacturer's name, model designation, refrigerant, and electrical characteristics.

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

Section 10. Conformance Conditions

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

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

- A.1. AHRI Standard 110-2016, *Air-Conditioning, Heating, and Refrigerating Equipment Nameplate Voltages*, 2016, Air-Conditioning, Heating and Refrigeration Institute, 2311 Wilson Blvd, Suite 400, Arlington, VA 22201, USA.
- A.2. ANSI/ASHRAE Standard 146-2020, *Methods of Testing and Rating Pool Heaters*, 2020, ASHRAE, 180 Technology Parkway, Peachtree Corners, GA 30092, USA.
- A.3. ASHRAE Terminology. ASHRAE. Accessed October 19, 2021. <https://www.ashrae.org/technical-resources/free-resources/ashrae-terminology>.
- A.4. IEC Standard 60038, *IEC Standard Voltages*, 2002, International Electrotechnical Commission, 3, rue de Varembe, P.O. Box 131, 1211 Geneva 20, Switzerland.

APPENDIX B. REFERENCES - INFORMATIVE

Listed here are standards, handbooks, other publications, and exclusions listed in Section [2.3](#) which may provide useful information and background but are not considered essential. References in this appendix are not considered part of the standard.

- B.1.** AHRI Standard 210/240-2023 (2020) (I-P), *Unitary Air-Conditioning and Air-Source Heat Pump Equipment*, 2020, Air-Conditioning, Heating and Refrigeration Institute, 2311 Wilson Blvd, Suite 400, Arlington, VA 22201, USA.
- B.2.** AHRI Standard 310/380-2017 (CSA-C744-17) (SI/I-P), *Standard for Packaged Terminal Air-Conditioners and Heat Pumps*, 2017, Air-Conditioning, Heating and Refrigeration Institute, 2311 Wilson Blvd, Suite 400, Arlington, VA 22201, USA.
- B.3.** AHRI Standard 340/360-2022 (I-P), *Commercial and Industrial Unitary Air Conditioning and Heat Pump Equipment*, 2022, Air-Conditioning, Heating and Refrigeration Institute, 2311 Wilson Blvd, Suite 400, Arlington, VA 22201, USA.
- B.4.** AHRI Standard 390-2021 (I-P), *Performance Rating of Single Package Vertical Air-Conditioners and Heat Pumps*, 2021, Air-Conditioning, Heating and Refrigeration Institute, 2311 Wilson Blvd, Suite 400, Arlington, VA 22201, USA.
- B.5.** AHRI/ASHRAE/ISO Standard 13256-1:1998 (RA 2012), *Water-Source Heat Pumps-Testing and Rating for Performance-Part 1: Water-to-Air and Brine-to-Air Heat Pumps*, 2012, International Organization for Standardization, Case Postale 56, CH-1211, Geneva 20, Switzerland