

ANSI/AHRI Standard 1301-2013 (R2023) (SI)

**2013 R2023 Standard for
Performance Rating
of Commercial Heat Pump
Water Heaters**



Approved by ANSI on 18 August 2023



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ICS Code: 91.140.65

Note:

This is a new standard

For I-P ratings, see ANSI/AHRI Standard 1300-2013 (R2023) (I-P).

This standard was reaffirmed June 2023.

This standard was approved as an American National Standard (ANS) on 18 August 2023.

Forward:

Commercial Heat Pump Water Heaters (CHPWH) use an electrically driven, mechanical vapor compression refrigeration system to transfer heat from a heat source (e.g. air, ground, water, brine solution) to potable water to provide service hot water. This rating method standard covers CHPWH that are not subject to the U.S. Department of Energy (DOE) efficiency regulations for residential heat pump water heaters.

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PERFORMANCE RATING OF COMMERCIAL HEAT PUMP WATER HEATERS

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish for Commercial Heat Pump Water Heaters (CHPWH): definitions; test requirements; classifications; 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 *Limits.* This standard covers CHPWH with input capacities less than or equal to 50 kW, including all three phase products and single phase products not covered by the Code of Federal Regulations, 10 CFR Part 430, Appendix E to Subpart B of Part 430 - *Uniform Test Method for Measuring the Energy Consumption of Water Heaters.*

1.1.3 *Review and Amendments.* This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 *Scope.* This standard applies to factory assembled Commercial Heat Pump Water Heaters (CHPWH) defined as equipment to provide potable or service hot water using alternate sources of energy as air, water and ground (geothermal) by means of electrically driven, mechanical vapor compression refrigerant systems. Different type of CHPWH are defined in Section 3.

2.1.1 This standard does not apply to testing and rating of heat pumps or water heaters covered in ANSI/AHRI/ASHRAE ISO Standard 13256-1 & 2, ANSI/AHRI Standard 1160, or ANSI/AHRI Standard 870.

2.1.2 This standard does not apply to testing and rating of Air-Cooled or Water Cooled Heat Reclaim Condensers covered in ANSI/AHRI Standard 550/590 with Addenda.

Section 3. Definitions

All terms in this document will follow the standard industry definitions in the *ASHRAE Wikipedia* website (<https://www.ashrae.org/technical-resources/authoring-tools/terminology>), unless otherwise defined in this section.

3.1 *Condenser.* A refrigeration system component that condenses refrigerant vapor. Desuperheating and sub-cooling of refrigerant may occur as well.

3.1.1 *Water-Cooled Condenser.* A component that utilizes refrigerant-to-water heat transfer means causing the refrigerant to condense and water to be heated.

3.2 *Coefficient of Performance.* A ratio of the heating capacity in kW, to the power input value in kW at any given set of rating conditions expressed in kW/kW.

3.3 *Evaporator.* A refrigeration system component that evaporates refrigerant liquid and extracts heat from the air, ground or a fluid.

3.4 *Commercial Heat Pump Water Heater (CHPWH).* A device using a vapor compression refrigeration system to transfer heat from a low temperature source to a higher temperature sink for the purpose of heating potable or service water including all ancillary equipment as fans, blowers, pumps, storage tanks, piping and controls.

3.4.1 *Air Source Commercial Heat Pump Water Heater (AS-CHPWH).* A CHPWH that utilizes indoor or outdoor air as the heat source.

3.4.2 *Direct Geo Exchange Commercial Heat Pump Water Heater (DG-CHPWH).* A CHPWH that utilizes the earth as the heat source.

3.4.3 *Water Source Commercial Heat Pump Water Heater (WS-CHPWH).* A CHPWH that utilizes water or a brine solution as the heat source.

3.5 *Heating Capacity.* The capacity associated with the change in water temperature expressed in kW.

3.6 *Outdoor Air.* Ambient outdoor air that enters the AS-CHPWH.

3.7 *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.

3.7.1 *Application Rating.* A rating based on tests performed at application Rating Condition other than Standard Rating conditions

3.7.2 *Standard Rating.* A rating based on tests performed at Standard Rating Conditions as listed in Tables 2, 3, 4 and at Hot Water Standard Rating Conditions as listed in Table 5.

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

3.8.1 *Standard Rating Conditions.* Rating Conditions used as the basis of comparison for performance characteristics as listed in Tables 2, 3, 4 and 5.

3.9 *"Shall" or "Should".* "Shall" or "Should" shall be interpreted as follows:

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

3.9.1 *Should.* "Should" is used to indicate provisions that are not mandatory but are desirable as good practice.

Section 4. Classifications

4.1 *Classification.* Commercial Heat Pump Water Heaters (CHPWH) within the scope of this standard shall be classified as shown in Table 1.

Table 1 - Classification of Commercial Heat Pump Water Heaters (CHPWH)		
Designation	AHRI Type	Arrangement
Air Source CHPWH	AS-CHPWH	Air Evaporator
		Compressor
		Condenser
Direct Geo Exchange CHPWH	DG-CHPWH	Ground Evaporator
		Compressor
		Condenser
Water Source CHPWH	WS-CHPWH	Liquid Evaporator
		Compressor
		Condenser

Section 5. Test Requirements

5.1 Commercial HPWH Standard Rating shall be verified by test conducted in accordance with procedures for CHPWH specified in ANSI/ASHRAE Standard 118.1.

5.1.1 Exception. In the case of models offered with multiple voltages, the test shall be conducted at the lowest voltage specified on the nameplate. At the manufacturer's option, the test may be repeated at the highest voltage specified on the nameplate.

Section 6. Rating Requirements

6.1 *Standard Ratings.* Standard Ratings shall be established by test conducted in Standard Rating Conditions specified in Tables 2, 3, 4 and 5.

6.1.1 Values for Standard Ratings. Standard Rating relating to heating capacity shall be net values. If a circulating pump is within the unit and energized under normal operation, the electrical energy shall be included in the total power input of the unit. If the unit does not include a circulating pump a penalty equal to the pump power input (in watts) required to meet the manufacturer's specified water flow shall be applied.

6.1.1.1 Values for Standard Heating Capacity. Standard heating capacity rating shall be expressed only in terms of kW, in multiples of 0.15 for units with ratings less than 15 kW, in multiple of 0.30 for units with ratings of 15 kW and greater but less than 39.6 kW Btu/h, in multiples of 0.60 for units with ratings of 39.6 kW and greater but less than 117 kW and in multiples of 1.5 for units with ratings above 117 kWh.

6.1.1.2 *Values for Standard Coefficient of Performance.* Standard Coefficient of Performance shall be expressed in multiples of 0.1.

6.1.1.3 *Entering Water Temperature (EWT).* For rating and labeling, EWT 21.1°C and EWT 43.5 °C are mandatory, and EWT 54.5 °C is optional.

Table 2. AS-CHPWH Standard Source Rating Conditions	
Evaporator Entering Air Temperature, °C	
Dry-bulb	Wet-bulb
35.0	24.0
27.0	21.8
10.0	7.0
-8.5	-9.5

Table 3. DG-CHPWH Standard Source Rating Conditions
Equipment Entering Refrigerant Vapor Temperature, °C
0.0

Table 4. WS-CHPWH Standard Source Rating Conditions
Evaporator Entering Water Temperature, °C
20.0
10.0
0.0

Table 5. CHPWH Standard Hot Water Rating Conditions
Entering Water Temperature (EWT), °C
21.1 - Mandatory
43.5 - Mandatory
54.5 - Optional

6.2 *Tolerances.* To comply with this standard, measured test results shall not be less than 95% of Published Ratings for Water Heating Capacity and COP values.

Section 7. Minimum Data Requirements for Published Ratings

7.1 *Minimum Data Requirement for Published Ratings.* Published Ratings shall include, at a minimum, all Standard Ratings. All claims to ratings within the scope of this standard shall include the statement "Rated in accordance with ANSI/AHRI Standard 1301 (SI)." All claims to ratings outside the scope of the standard shall include the statement: "Outside the scope of ANSI/AHRI Standard 1301 (SI)". Whenever Application Ratings are published or printed, they shall include a statement of the conditions at which the ratings applies.

7.2 *Published Ratings.* Published Ratings shall state all of the standard operating conditions and shall include the following:

7.2.1 General.

7.2.1.1 Refrigerant designation in accordance with ANSI/AHRI Standard 34 with Addenda.

7.2.1.2 Model number designations providing identification of the Commercial Heat Pump Water Heater to which the ratings apply

7.2.1.3 Water Heating Capacity at the Standard Rating conditions, kW

7.2.1.4 Total Power Input of the Commercial Heat Pump Water Heater, kW

7.2.1.5 Coefficient of performance at the Standard Rating Conditions, kW/kW

7.2.1.6 Nominal voltage, V, and frequency, Hz, at which the ratings were determined

7.2.2 Air Source CHPWH.

7.2.2.1 Entering air dry-bulb and wet-bulb, °C (as stated in Table 2)

7.2.2.2 Air flow through the evaporator, l/s

7.2.3 Direct Geo Exchange CHPWH.

7.2.3.1 Equipment entering refrigerant temperature, °C (as stated in Table 3)

7.2.4 Water Source CHPWH.

7.2.4.1 Evaporator water entering and leaving temperatures, °C (as stated in Table 4)

7.2.4.2 Evaporator water flow rate, l/s

7.2.4.3 Evaporator water pressure drop, kPa

Section 8. Marking and Nameplate Data

8.1 *Marking and Nameplate Data.* As a minimum, the nameplate shall display the following:

8.1.1 Manufacturer's name and location

8.1.2 Model number designation providing complete identification

8.1.3 Refrigerant designation (in accordance with ANSI/ASHRAE Standard 34 with Addenda)

8.1.4 Water heating capacity at all applicable entering temperatures (from Table 5)

8.1.5 Voltage, phase, frequency. 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 utilizations shown in Table 1 of IEC Standard Publication 60038.

Section 9. Conformance Conditions

9.1 *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 standard. All references in this appendix are considered as part of the standard.

A1.1 ANSI/AHRI Standard 110-2012, *Air-Conditioning and Refrigerating Equipment nameplate Voltages*, 2012, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.2 ANSI/AHRI Standard 340/360-2007 with Addenda 1 and 2, *Commercial and Industrial Unitary Air Conditioning and Heat Pump Equipment*, 2007, Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, U.S.A.

A1.3 ANSI/AHRI Standard 551/591 (SI)-2011 with Addenda, *Performance Rating of Water- Chilling Packages using the Vapor Compression Cycle*, 2011, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.4 ANSI/AHRI Standard 870-2005, *Performance Rating of Direct Geo Exchange Heat Pumps*, 2005, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.5 ANSI/AHRI Standard 1161 (SI)-2011, *Performance Rating of Heat Pump Pool Heaters*, Air-Conditioning, Heating, and Refrigeration Institute, 2311 Wilson Boulevard, Suite 400, Arlington, VA 22201, U.S.A.

A1.6 ANSI/AHRI/ASHRAE/ISO 13256-1 (RA2012), *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 21 Switzerland.

A1.7 ANSI/AHRI/ASHRAE/ISO 13256-2 (RA2012), *Water-Source Heat Pumps – Testing and Rating for Performance – Part 2: Water-to Water and Brine-to-Water Heat Pumps*, 2012, International Organization for Standardization, Case Postale 56, CH-1211, Geneva 21 Switzerland.

A1.8 ANSI/ASHRAE Standard 34-2010 with Addenda, *Number Designation and Safety Classification of Refrigerants*, 2010, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tillie Circle, N.E., Atlanta, GA 30329, U.S.A.

A1.9 ANSI/ASHRAE Standard 118.1-2012 *Method of Testing for Rating Commercial Gas, Electric and Oil Service Water Heating Equipment*, 2012, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tillie Circle, N.E., Atlanta, GA 30329, U.S.A.

A1.10 *ASHRAEwiki, Terminology*, <https://www.ashrae.org/technical-resources/authoring-tools/terminology>, 2012, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329, U.S.A.

A1.11 IEC Standard 60038, *IEC Standard Voltages*, 2009, International Electrotechnical Commission, Rue de Varembe, P.O.Box131, 1211 Geneva 20, Switzerland.

APPENDIX B. REFERENCES - INFORMATIVE

None.