

OPERATIONS MANUAL

HEAT PUMP POOL HEATERS CERTIFICATION PROGRAM



AHRI OM 1160 – DECEMBER 2019

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Sponsored and administered:



PREFACE

The following manual outlines the procedures and policies of the Performance Certification Program of AHRI Heat Pump Pool Heaters (HPPH) Certification Program operated by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI). This manual is to be used in conjunction with the AHRI General Operations Manual for AHRI Certification Programs. Where the AHRI General Operations Manual and this product-specific manual differ, this product-specific operations manual shall prevail.

The revision of this manual supersedes all previous revisions. The current edition of this manual, as well as the AHRI General Operations Manual, can be accessed through the AHRI website, www.ahrinet.org.

The HPPH Certification Program by AHRI provides for independent verification of the HPPH manufacturers' stated equipment performance. Safety criteria are not within the scope of this program.

Participation in the program is voluntary. Any manufacturer, regardless of AHRI membership, may obtain approval of Program Ratings and use of the AHRI HPPH Certification Mark hereinafter referred to as the "Mark". The Mark is the Participant's public representation that the ratings of randomly selected units have been verified by an independent laboratory in accordance with test procedures prescribed by this operations manual. A Certification Agreement is executed between the manufacturer and AHRI specifying the conditions under which such Ratings and the Mark may be used. No manufacturer has the right to use Program Ratings or to state that their products have been tested in conformance with the procedures outlined in this Rating Procedure unless and until they have received written authority from AHRI to use the Marks as applied to the specific approved Program Ratings.

This Operations Manual has been prepared to assure that administration of the program is carried out in a uniform manner. It is an amplification of the Certification Agreement signed by licensees and AHRI. General information, procedural details, and copies of forms are included in this Operations Manual. Provisions of the Operations Manual may be amended as provided in the Certification Agreement.

This certification program complies with requirements of the ISO/IEC Standard 17065:2012, *General Requirements for Bodies Operating Product Certification Systems*.

Note:

This manual supersedes the AHRI Heat Pump Pool Heaters Certification Program Operations Manual January 2018.

CERTIFICATION OPERATIONS MANUAL FOR

HEAT PUMP POOL HEATERS

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1. Program Overview

1.1 Applicable Rating Standard. It is mandatory for program Participants to comply with the provisions of the latest edition of AHRI Standard 1160, *Performance Rating of Heat Pump Pool Heaters* (Standard). A copy of the Standard is available for download from the AHRI website, www.ahrinet.org.

1.2 Product Definition All terms in this document shall follow the AHRI GOM and the Standard definitions unless otherwise defined in this section.

1.2.1 Heat Pump Pool Heaters. A factory-made assembly, which 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 may consist of more than one assembly to be used together for the purpose of cooling and heating pool water. Models with separated assemblies shall be designed to be used together, and the requirements of rating outlined in the Standard are based upon the use of matched assemblies. Heat Pump Pool Heaters shall provide the function of heating pool water to achieve a controlled temperature, but may include the functions of pool water cooling, air-heating, air cooling, air-circulating, air-cleaning, or dehumidifying.

1.3 Program Scope. This program applies to 60 Hz Production Models of Heat Pump Pool Heaters, as defined in Section 1.2, with a heating capacity of up to and including 200,000 Btu/h at the High Temperature, High Humidity Standard Rating Condition.

1.3.1 Program Scope Exclusions. This program does not cover gas-fired, oil-fired, geothermal, ground source, solar or electric resistance pool heaters.

1.4 Intended Market. The Intended Market for this certification program includes all products defined in Section 1.3 that are sold for use in the U.S. (including U.S. Territories) and Canada.

1.5 Basic Model Groups (BMGs). A Participant's listing shall be grouped by BMG. A BMG is interpreted as meaning models with the same or comparable Heating Capacity and efficiency (COP). A model with like or identical ratings but different major components from another model (i.e. heat/cool model versus heat-only model), however, is not considered to be in the same BMG. The Participant has the option to further subdivide the BMGs for prudent engineering reasons.

1.6 Certify-All Policy. Refer to Section 7.1 of the General Operations Manual for the Certify-All Policy.

In addition, all models manufactured by the OEM and sold to the market including those sold under another company's name, shall be listed in the Directory under the OEM's name and the product's Brand Name. This does not apply if the other company is an HPPH Certification Program Participant.

2. Qualification Process

2.1 Original Equipment Manufacturer (OEM) Applicants. With the additions noted below, the OEM qualification process will proceed according to the AHRI General Operations Manual, Section 4.

STEP 2.1.1 Certification Application Package. In addition to the Application for AHRI Certification, Annual Sales Volume Form, and product-specific ratings and data, noted in the AHRI General Operations Manual, Section 4, STEP 4.1, Applicants shall submit the following documentation to AHRI:

- One test report for each BMG.

Electronic forms shall be obtained from AHRI.

STEP 2.1.2 Processing Application Package.

STEP 2.1.2.1 Performance Certification Agreement for Original Equipment Manufacturer (OEM Agreement). No further action required beyond that listed in Section 4, STEP 4.2 of the AHRI General Operations Manual.

STEP 2.1.2.2 Participation and Licensing Fee Invoice. Payment of the Participation and Licensing Fee is due within 30 calendar days of the invoice issue date. Testing shall not be conducted until the invoice is paid in full. No further action required beyond that listed in Section 4, STEP 4.2 of the AHRI General Operations Manual.

STEP 2.1.3 Selection and Acquisition of Test Samples.

STEP 2.1.3.1 Number of Qualification Tests. One model from each BMG shall be tested, with a minimum of two (2) models.

STEP 2.1.3.2 Acquisition of Qualification Test Samples/Selection Criteria. Within 30 calendar days of a request from AHRI, the Applicant shall have samples available for selection. Samples shall be acquired in accordance with Section 3 of this manual.

STEP 2.1.4 Qualification Testing. AHRI shall supply the Independent Third-party Laboratory Contracted by AHRI (Laboratory) with the Published Ratings. The Laboratory shall conduct the testing of the samples in accordance with the Standard, against the Published Ratings.

STEP 2.1.4.1 Operating Tests. In addition to the Performance Rating tests, all qualification tests shall include the following Operating Tests to be conducted at the end of the performance tests:

- Maximum Operating Conditions (MOC)
- Voltage Tolerance Test (VTT)

If the samples fail any of the Operating Tests, a second sample, to be selected by AHRI, shall pass both operating tests in order to qualify into the program. If the second sample does not pass, then that model and BMG shall not be entered into the AHRI Directory of Certified Product Performance (Directory) and the Applicant shall cease production and sale of the failed model and BMG in order to qualify into the certification program. A new sample shall be selected and tested to continue the qualification process.

STEP 2.1.4.2 Successful Completion of All Qualification Tests. If all qualification tests pass, proceed to STEP 2.1.5.

STEP 2.1.4.3 First Sample Qualification Test Failure. Refer to Section 4, STEP 4.4.2 of the AHRI General Operations Manual for details regarding the first sample qualification failure options:

STEP 2.1.4.4 Second Sample Qualification Test Failure. Refer to Section 4, STEP 4.4.3 of the AHRI General Operations Manual for details regarding the second sample qualification failure options.

STEP 2.1.5 Welcome to the Program. No further action required beyond that listed in Section 4, STEP 4.5 of the AHRI General Operations Manual.

2.2 Private Brand Marketer (PBM) Applicants. With the additions noted below, the PBM qualification process shall proceed according to the AHRI General Operations Manual, Section 5.

PBM Applicants are not required to undergo qualification testing. PBM product certification is contingent upon the certification of the associated OEM product.

STEP 2.2.1 Certification Application Package. No further action required beyond that listed in Section 5, STEP 5.1 of the AHRI General Operations Manual.

STEP 2.2.2 Processing Application Package.

STEP 2.2.2.1 Performance Certification Agreement for Private Brand Marketer (PBM Agreement). No further action required beyond that listed in Section 5, STEP 5.2.1 of the AHRI General Operations Manual.

STEP 2.2.2.2 OEM Agreement on Behalf of the PBM Applicant. No further action required beyond that listed in Section 5, STEP 5.2.2 of the AHRI General Operations Manual.

STEP 2.2.2.3 Licensing Fee Invoice. Payment of the Licensing Fee is due within 30 calendar days of the invoice issue date.

STEP 2.2.3 Welcome to the Program. No further action required beyond that listed in Section 5, STEP 5.3 of the AHRI General Operations Manual.

3. Equipment Selection and Testing

3.1 Annual Testing Requirement. 20% of a Participant's BMGs shall be tested annually, with a minimum of two (2) models. Fractional numbers shall be rounded to the nearest whole number using traditional rounding methods.

In accordance with the Standard Rating Conditions defined in the Standard, AHRI shall randomly select two (2) out of the three (3) Standard Rating Conditions for COP and Heating Capacity to be verified on the sample.

3.2 Location of Tests. Testing shall be performed at the Laboratory and the sample shall be installed in the test facility in accordance with the Participant's published installation instructions in printed or electronic format and any additional instructions provided.

3.3 Selection of Test Samples. Selections shall be made based on data contained in the Directory. AHRI shall inform the Participant, in writing, of the sample(s) selected for test.

3.4 Methods for Acquiring Test Samples. AHRI or the Laboratory personnel shall make a Random Sample Selection or a Random Component Selection from the Participant's stock inventory within 30 calendar days of a selection by AHRI. Selected samples shall be shipped to the Laboratory accompanied by the Participant's published installation instructions in printed or electronic format. Refer to Section 9 of the AHRI General Operation Manual.

3.5 Sample Acquisition Timeframe. The Participant shall deliver the selected sample(s) to the Laboratory within 14 calendar days of Random Sample Selection or Random Component Selection by Laboratory personnel.

3.6 Requirement for Introduction of New BMG. Prior to being listed in the AHRI Directory of Certified Product Performance (Directory), any new BMG introduced by the Participant shall submit the DS1 form to AHRI. Following approval from AHRI, the BMG will be listed on the Directory.

All new BMGs are subject to Annual testing and will have the Operating Tests performed the first time they are selected for Annual testing. If the samples fail any of the Operating Tests, a second sample, to be selected by AHRI, shall pass both operating tests in order to qualify into the program. If the second sample

does not pass, then that model and BMG shall be removed from the AHRI Directory of Certified Product Performance (Directory) and the Participant shall cease production and sale of the failed model and BMG.

3.7 Test Set-up and Start-up Punch List. The Participant shall complete and provide a Punch List (refer to Appendix A) in electronic or paper format to the Laboratory. The Participant may choose to furnish a single Punch List for multiple units.

The Punch List items shall be taken from the installation instructions that are available as part of the Participant's product data, as well as submittal to the Laboratory. The Punch List shall not contradict the installation and operations manual provided by the Participant. If there is a discrepancy between notes written on the Punch List, Installation and Operations Manual, and/or the Directory, the Directory shall take precedent.

Refrigerant Pressures shall not be measured when the “do not verify charge” option on the Punch List is selected. Calculated values that require refrigerant pressure measurements shall not be recorded.

3.8 Certified Data. In accordance with the Standard, the following certified ratings are verified, by test:

- Standard Rating Heating Capacity – High Air Temperature, High Humidity Btu/h;
- Standard Rating COP – High Air Temperature, High Humidity W/W;
- Standard Rating Heating Capacity – High Air Temperature, Mid-Humidity Btu/h;
- Standard Rating COP – High Air Temperature, Mid-Humidity W/W;
- Standard Rating Heating Capacity – Low Air Temperature, Mid-Humidity Btu/h;
- Standard Rating COP – Low Air Temperature, Mid-Humidity, W/W.

3.9 Voltage. Standard Rating Tests shall be performed at the nameplate-rated voltage and frequency. For equipment with dual nameplate voltage ratings, the tests shall be performed at both voltages or at the higher of the two voltages if only a single Standard Rating is to be published.

3.10 Test Failures.

3.10.1 Options Following First Sample Failure. In the event of a first sample failure for either of the two (2) randomly selected Standard Rating Conditions, the third untested Standard Rating Condition shall be automatically tested while the sample is still on the test stand. When the Participant is notified of a first sample certified rating failure, the Participant has seven (7) calendar days to select one (1) of the following options:

- Re-rate all models within the failed sample's BMG proportionate to the failed test's results;
- Test second sample of the same model (sample must be available within the timeframe and procedure allotted in Section 3.4 following notification of decision to AHRI via Manufacturer's Decision Form. The two selected Standard Rating Conditions for second sample testing shall be the same as the two randomly selected Standard Rating Conditions for first sample testing; or
- Obsolete the model, which also obsoletes all models within the corresponding BMG.

3.10.2 Options Following Second Sample Failure. In the event of a second sample failure for either of the two original randomly selected Standard Rating Conditions, the original third untested Standard Rating Condition shall be automatically tested while the sample is still on the test stand. When the Participant is notified of a second sample certified rating failure, the Participant has seven (7) calendar days to select one (1) of the following options:

- Re-rate all models within the failed sample's BMG proportionate to the failed test's results; or

- Obsolete the model, which also obsoletes all models within the corresponding BMG.

Example: Two (2) certified data points are reported at three (3) Standard Rating Conditions - X, Y, and Z. A sample is randomly selected for testing at Standard Rating Conditions X and Y. During the first sample test, the sample fails a test at Standard Rating Condition X. The sample is automatically tested at Standard Rating Condition Z. A test at Standard Rating Condition Z fails. A second sample is chosen. The second sample is tested at Standard Rating Conditions X and Y. The second sample fails a test at Standard Rating Condition X. The sample is automatically tested at Standard Rating Condition Z. A test at Standard Rating Condition Z fails. The sample is not Defective and the manufacturer decides to re-rate. All models in the applicable BMG are re-rated for the failed test data at Standard Rating Conditions X and Z according to the results from the second sample test.

3.11 *Sound Ratings.* If Participants in the AHRI HPPH Certification program wish to publish sound ratings for certified heat pump pool heaters, these ratings shall be determined in accordance with AHRI Standard 270, *Sound Rating of Outdoor Unitary Equipment* and identified as tested in accordance with AHRI Standard 270.

4. Challenge Tests

Refer to Section 10 of the AHRI General Operations Manual. All three (3) Standard Rating Conditions shall be verified during a Challenge Test.

5. AHRI Directory of Certified Product Performance

All certified products shall be listed in the Directory, www.ahridirectory.org. Certification shall not be implied nor claimed for any product not listed in the Directory. Except as noted below, the Participant shall follow the steps outlined in Section 11 of the AHRI General Operations Manual.

5.1 *Publication of Certified Ratings in Certified Directory.* The following information pertaining to each model certified shall be published in the Directory:

- AHRI Certified Number;
- Model Status;
- Name of Manufacturer;
- Brand Name;
- AHRI Type.
- Model Number (For Split System - Air side or for Packaged Unit)
- Model Number2 - For Split System Only - water side
- High Temperature, High Humidity Capacity, Btu/h;
- High Temperature, High Humidity COP, W/W;
- High Temperature, Mid-Humidity Capacity, Btu/h;
- High Temperature, Mid-Humidity COP, W/W;
- Low Temperature, Mid-Humidity Capacity, Btu/h;
- Low Temperature, Mid-Humidity COP, W/W; and
- Refrigerant Type;

5.2 *Data Forms.* Each Participant shall list its products by BMG. OEM and PBM Participants shall submit/edit product data via the Directory.

6. Assessment and Payment of Certification Fees

Refer to Section 12 of the AHRI General Operations Manual.

7. Issuance of Violations and/or Termination

Refer to Section 14 of the AHRI General Operations Manual.

8. Program Hierarchy, Complaints, and the Appeals Process

Refer to Section 15 of the AHRI General Operations Manual.

9. Proper Use of the AHRI Certification Mark and Claims to Certification

Refer to Section 8 of the AHRI General Operations Manual.

APPENDIX A. - HPPH PUNCH LIST

Refer to the AHRI HPPH Certification website to download the HPPH Punch List:
<http://www.ahrinet.org/HPPHcertification.aspx>

APPENDIX B – SET-UP PROCEDURES

1. Purpose

Set up and testing of Heat Pump Pool Heaters (HPPH) for Certification.

2. Supporting Documents

Latest edition of AHRI Standard 1160 and ASHRAE Standard 146 (Standards), Individual Manufacturer's Installation Instructions and Other Supporting Documents.

3. Scope

This Local Operation Procedure describes the procedures for testing of Heat Pump Pool Heaters.

4. Responsibilities

It is the responsibility of the Laboratory to adhere to all appropriate Standards involved in the performance testing of Heat Pump Pool Heaters.

4.1 Uncrate, inspect for shipping damage, nameplate, install thermocouples.

4.2 Check nameplate Model data on test sample and compressor against the AHRI certification sheet. AHRI shall be contacted for any non-compliance. If sample is ready to test, the Participant will be notified.

4.3 Set up the test sample in the test chamber using the required test equipment.

5. Test Equipment

The Laboratory shall use the following test equipment:

5.1 Water Flow meter

5.2 Four Temperature RTDs with 2 for inlet water and 2 for outlet water inserted into wells on the inlet and the outlet water pipe headers

5.3 Three air samplers attached to a psychrometer box containing dry and wet bulb RTDs

5.4 Voltage, current, phase and power in watts shall be measured by a power analyzer

5.5 Three thermocouples shall measure the refrigerant circuit temperatures

5.6 When required per the Punch List, High and Low Side pressure transducers shall measure the refrigerant pressures

5.7 Electronic data acquisition system for all data

All equipment shall comply with ASHRAE Standard 146 regarding measurement accuracy.

6. Procedure

- 6.1 Test Sample Confirmation: The test sample model number and compressor model number will be confirmed with the test data sheet. Any discrepancies shall be submitted to AHRI and the sample not tested until AHRI approves.
- 6.2 Test Sample preparation: The test sample shall have thermocouples soldered and wrapped on the suction line, the discharge line, and the liquid line. Supply and return insulated water headers shall be attached with dual RTD wells. Supply power of the correct voltage shall be applied. When required per the Punch List, no loss refrigerant pressure hoses shall be connected to the compressor discharge and suction ports.
- 6.3 Water Flow shall be calculated per Table 2 of AHRI Standard 1160 and set. The test facility shall be started but the sample will not be energized yet. The water temperature of the 2 inlet and 2 outlet temperatures shall be measured and recorded to the nearest 0.01 °F. The total range from minimum to maximum shall not exceed 2 times the uncertainty for heat pumps listed in Section 6.2 of ASHRAE Standard 146.
- 6.4 Test sample shall be energized.
- 6.5 Test sample water flow rate will be adjusted to the High Temperature, Mid-Humidity test condition per Table 2 of the latest edition of AHRI Standard 1160.
- 6.6 Room airflow circulation shall set at least 1.5 times the rated test sample air flow rate.

Facility stabilization shall be considered to have occurred when data collected for 3 consecutive readings at 10 minute intervals is within tolerance for average and maximum allowable range for wet-bulb, dry-bulb and water temperatures.
- 6.7 After facility stabilization, the pressures and temperatures shall be measured and compared to the submitted Participant's data per the AHRI General Operations Manual, Section 9. Charge may be adjusted accordingly, provided instructions have been supplied. Once Section 9 of the AHRI General Operations Manual is completed, data shall be collected at a frequency not to exceed 15 seconds for a 30-minute period, averaged, and the results calculated.
- 6.8 AHRI shall determine the testing conditions based on the latest edition of AHRI Standard 1160. After facility stabilization data shall be collected at a frequency not to exceed 15 seconds for a 30-minute period, average, and the results calculated.
 - 6.8.1 Low Temperature, Mid-Humidity Tests. During facility stabilization or during the test, should the air dry bulb temperature drop below 48°F, the test shall stop, and the dry bulb raised to 60°F for 15 minutes or as otherwise specified by the Participant to eliminate excess ice due to improper testing conditions. Collected data is to be compared to Participant's submitted data to verify ice has been removed. If submitted data is not available, visual inspection shall be used. Testing may then resume.
- 6.9 Test facility shall be adjusted to either the Operating Test (MOC or VTT condition) as specified by AHRI and the selected test shall be conducted.
- 6.11 At the completion of the testing, a report shall be submitted to AHRI.

Refer to data sheet to be used by the Laboratory in Appendix C.

APPENDIX C – LABORATORY DATA SHEET

Manufacturer Name:			
	Submitted Value	Observed Value	
AHRI Certified Number			
Model Number			
Serial Number	N/A		
Condenser Coil			
Compressor			
Water Flow (gpm) @ High Temp. Mid-Humidity Condition			
Power (Voltage, Phase, Frequency)			
Btu/h Output (High Temperature, High Humidity)		N/A	
Btu/h Output (High Temperature, Mid-Humidity)		N/A	
Btu/h Output (Low Temperature, Mid-Humidity)		N/A	
COP (High Temperature, High Humidity)		N/A	
COP (High Temperature, Mid-Humidity)		N/A	
COP (Low Temperature, Mid-Humidity)		N/A	
Power Consumption (Watts) (High Temperature, High Humidity)		N/A	
Power Consumption (Watts) (High Temperature, Mid-Humidity)		N/A	
Power Consumption (Watts) (Low Temperature, Mid-Humidity)		N/A	
Amps (High Temperature, High Humidity)		N/A	
Amps (High Temperature, Mid-Humidity)		N/A	
Amps (Low Temperature, Mid-Humidity)		N/A	
<i>(Before unit is started)</i>			
Temperature Sensor Verification (write N/A for Standard Rating Condition not being tested)	High Temp. High Humidity	High Temp. Mid-Humidity	Low Temp. Mid-Humidity
Inlet Water Temperature 1			
Inlet Water Temperature 2			
Outlet Water Temperature 1			
Outlet Water Temperature 2			
<i>(After unit is started)</i>	High Temp. High Humidity	High Temp. Mid-Humidity	Low Temp. Mid-Humidity
When required, Charge Verification at high temperature AHRI conditions (write N/A for Standard Rating Condition not being tested, or when not required)			
Room Temperature			
Water Temperature			
Wet-Bulb Temperature			
Discharge Pressure			
Suction Pressure			
Discharge Temperature			
Suction Temperature			
Liquid temperature			
Room Airflow			

<i>(During the Test)</i>	High Temp. High Humidity	High Temp. Mid-Humidity	Low Temp. Mid-Humidity
Facility Stabilization time			
AHRI Test Data (write N/A for Standard Rating Condition not being tested)			
Btu/h Output			
COP			
Power Consumption (Watts)			
Amps			
Voltage (Volts)			
Frequency (Hz)			
Super Heat			
Sub Cooling*			
Discharge Pressure*			
Suction Press*			
Dry-Bulb 1			
Dry-Bulb 2			
Dry-Bulb 3			
Wet-Bulb 1			
Wet-Bulb 2			
Wet-Bulb 3			
% RH			
Water In Temperature 1			
Water In Temperature 2			
Water Out Temperature 1			
Water Out Temperature 2			
Water Delta T			
Evap. Saturation Temperature*			
Cond. Saturation Temperature*			
Suction Temperature			
Discharge Temperature			
Liquid Line Temperature			
Water Flow			
Phase (Single or Three)			
Operating Test (MOC, VTT)			
Pass/Fail			

* When required per the Punch List refrigerant charge requirements