

OPERATIONS MANUAL

SINGLE PACKAGED VERTICAL AIR-CONDITIONERS AND HEAT PUMPS CERTIFICATION PROGRAM



AHRI SPVU OM – JANUARY 2023

2311 Wilson Blvd, Suite 400
Arlington, Virginia 22201
(703) 524-8800

Sponsored and administered by:



PREFACE

The following manual outlines the procedures and policies of the Performance Certification Program for Single Packaged Vertical Air-Conditioners (SPVA) and Single Packaged Vertical Heat Pumps (SPVH) operated by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI). This manual is to be used in conjunction with the AHRI General Operations Manual (OM) 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 SPVA and SPVH Certification Program by AHRI provides for independent verification of the SPVA and SPVH 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 SPVA and SPVH Certification Mark hereinafter referred to as the "Mark". The Mark is the Participant's public representation that the ratings of randomly selected samples 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 Mark 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 Single Packaged Vertical Air-Conditioners and Heat Pumps Certification Program Operations Manual, May 2022 and is effective January 1, 2023.

CERTIFICATION OPERATIONS MANUAL FOR
SINGLE PACKAGED VERTICAL AIR CONDITIONERS AND HEAT PUMPS CERTIFICATION
PROGRAM

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1. Program Overview

1.1. Applicable Rating Standard. It is mandatory for program Participants to comply with the provisions of ANSI/AHRI Standard 390-2003, *Performance Rating of Single Package Vertical Air conditioners and Heat Pumps* (Standard). A copy of the Standard is available for download from the AHRI website, www.ahrinet.org.

1.2 Product Type Definitions.

1.2.1 Single Package Vertical Air Conditioner (SPVA). A type of air-cooled small or large commercial package air conditioning and heating equipment; factory assembled as a single package having its major components arranged vertically, which is an encased combination of cooling and optional heating components. This equipment is intended for exterior mounting on, adjacent interior to, or through, an outside wall; and is powered by single or three-phase current. It may contain separate indoor grille(s), outdoor louvers, various ventilation options, indoor free air discharge, ductwork, wall plenum or sleeve. Heating components may include electrical resistance, steam, hot water, gas or no heat, but may not include reverse cycle refrigeration as a heating means.

1.2.1.1 SPVA Functions. SPVAs, either alone or in combination with a heating plant, shall provide air-circulation, air-cleaning, cooling with controlled temperature and dehumidification, and may optionally include the function of heating and possible humidifying and ventilation.

1.2.2 Single Package Vertical Heat Pump (SPVH). An SPVA that utilizes reverse cycle refrigeration as its primary heat source, with secondary supplemental heating by means of electrical resistance, steam, hot water or gas.

1.3 Program Scope. This program applies to 50 and 60 Hz Production Models of SPVA and SPVH, as defined in Section 1.2.

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 shall consist of models with the same or comparable compressor used with the same or comparable refrigerant-to-air heat exchanger having Cooling Capacities within 1,500 Btu/h of one another, and with electrical resistance, steam, hot water, or gas heating options.

1.5.1 Optional BMGs Greater than 65,000 Btu/h Cooling Capacity. The Participant, at its option, can increase its number of BMGs by including voltage classifications.

2. Qualification Process

2.1 Original Equipment Manufacturer (OEM) Applicants. With the additions noted below, the OEM qualification process shall 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 and New Applicant License Fee Form – Sales Volume 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 per product type ; and
- An Applicant requesting AHRI to submit data to CEC and NRCan shall submit third-party authorization, compliance forms and other necessary information.

Electronic forms shall be obtained from AHRI. (available on www.ahrinet.org under the Product-Specific Certification Program).

STEP 2.1.2 Processing Application Package.

STEP 2.1.2.1 Performance Certification Agreement for Original Equipment Manufacturer (OEM Agreement). No further action is 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 is 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. 30% of an Applicant's BMGs with a minimum of two (2) models for both SPVA and SPVH shall be tested. Fractional numbers shall be rounded to the nearest whole number using traditional rounding methods.

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 one of the following Operating Tests, chosen by AHRI, to be conducted at the end of the performance tests for:

SPVA

- Maximum High-Temperature Operating Test;
- Voltage Tolerance Test;
- Low-Temperature Operation Test (Cooling);
- Insulation Effectiveness Test (Cooling);
- Condensate Disposal Test (Cooling); or
- Thermal Efficiency (if applicable)

SPVH

- Maximum High-Temperature Operating Test (Heating and Cooling);
- Voltage Tolerance Test;
- Low-Temperature Operation Test (Cooling);
- Insulation Effectiveness Test (Cooling); or
- Condensate Disposal Test (Cooling); or
- Thermal Efficiency (if applicable)

If a first sample test fails any Operating Test, a second sample, shall be tested. If the second sample fails any Operating Test, 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. An additional qualification sample shall be selected and tested (if all BMGs have not been 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 is 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 Processing Application Package.

STEP 2.2.1.1 Performance Certification Agreement for Private Brand Marketer (PBM Agreement). No further action is required beyond that listed in Section 5, STEP 5.2.1 of the AHRI General Operations Manual.

STEP 2.2.1.2 OEM Agreement on Behalf of the PBM Applicant. No further action is required beyond that listed in Section 5, STEP 5.2.2 of the AHRI General Operations Manual.

STEP 2.2.1.3 Licensing Fee Invoice. Payment of the Licensing Fee is due within 30 calendar days of the invoice issue date.

STEP 2.2.2 Welcome to the Program. No further action is 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 with a minimum of two (2) models for both SPVA and SPVH shall be tested annually. Fractional numbers shall be rounded to the nearest whole number using traditional rounding methods.

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, provided in printed or electronic format.

3.3 Selection of Test Samples. Prior to the start of the testing year, AHRI shall notify the Participant, in writing of the number of tests required for the testing year. AHRI shall establish the start and end dates for each quarter in the test year. Model selections shall be made on a quarterly basis using data contained in the Directory. First, second and third quarter selection letters shall be issued prior to the start of the respective quarter. Samples shall arrive at the laboratory by the start of each quarter.

3.4 Method of Acquiring Test Samples. AHRI or the Laboratory personnel shall make a Random Sample Selection or Random Component Selection from the Participant's stock inventory within 30

calendar days of selection by AHRI. AHRI, at its discretion, may request that a Laboratory Representative visit a Participant's facility to make a random selection from the facility without sending prior notification about which model(s) has been selected for testing. 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 Operations Manual.

3.4.1 Pretesting. Pretesting refers to a procedure by which models that have been chosen by AHRI for the test year undergo performance testing to validate ratings prior to arriving at the third-party laboratory. This excludes normal quality checks that are performed on every unit. Once AHRI has chosen the specific model to test, the sample shall not be manipulated in any way by the Participant. Pretesting is specifically prohibited for the selection pool.

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

3.6 Test Set-up and Start-up Punch List. A complete equipment submittal shall include a Punch List of items that are specific to performance testing. The Punch List shall include all unique considerations and a summary of items that shall be verified prior to the start of the first sample test. If there are no items, then the Participant shall submit a Punch List clearly stating, "There are no special test set-up or installation considerations."

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 the complete equipment 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 AHRI Directory, the AHRI Directory shall take precedent.

The Participant may choose to furnish a single Punch List for multiple units in electronic or paper format. It is the Participant's responsibility to update the Punch List as it pertains to their SPVA and SPVH products.

3.7 Optional "Break-In" Period. A Participant may elect to instruct the Laboratory to operate the equipment for a manufacturer-specified number of "break-in" hours prior to beginning the Performance Tests. The Participant shall pay for all costs for this optional break-in operation.

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

Table 1: Certified Data

	SPVA	SPVH
Capacity Ratings (Btu/h)	✓	✓
Cooling	✓	✓
Heating (High Temp.)		✓
Gas Heat Input (MBtu/h)	✓	✓
Part Load Rating (IPLV)	✓†	✓†
Efficiency Ratings		
EER	✓	✓
COP (47°F)		✓
Gas Thermal Efficiency (%)	✓	✓
(✓) Indicates information supplied by Participant and published in the Directory.		
(†) For multiple compressor units or units with compressor capacity modulation.		

3.9 Tests

3.9.1 SPVA. All SPVAs shall be tested in accordance with the Standard to verify Cooling Capacity and Energy Efficiency Ratio (EER). Additionally, systems which are capable of capacity reduction shall be rated at 100% (full load) and at each point of certified capacity reduction provided by the refrigeration system(s) as published by the Participant. These rating points shall be used to calculate an Integrated Part Load Value (IPLV). Tests shall be performed at the nameplate rated voltage and frequency. For 2023 testing, additional requirements per Appendix B apply.

3.9.2 SPVH. All SPVHs shall be tested in accordance with the Standard to verify Cooling and Heating Capacities, EER, and heating Coefficient of Performance (COP). Additionally, systems which are capable of capacity reduction shall be rated at 100% (full load) and at each point of certified capacity reduction provided by the refrigeration system(s) as published by the Participant. These rating points shall be used to calculate an Integrated Part Load Value (IPLV). Tests shall be performed at the nameplate rated voltage and frequency. For 2023 testing, additional requirements per Appendix B apply.

3.9.3 SPVA or SPVH Equipped with a Gas Heating Component. If an SPVA or SPVH is equipped with a gas heating component, the Thermal Efficiency of the unit shall be verified in accordance with the relevant non-residential procedures outlined in ANSI Z21.47-2006/CSA 2.3-2006. If an SPVA or SPVH is equipped with a condensing gas heating component, the Thermal Efficiency shall be adjusted in accordance with the procedure outlined in Appendix A.

3.10 Test Failures

3.10.1 Options Following 1st Sample Failure. When the Participant is notified of a first sample certified rating failure, the Participant has seven (7) calendar days to select one 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 shall be available within the timeframe and procedure allotted in Section 3.4 following notification of decision to AHRI via Manufacturer's Decision Form [MDF]); or
- Obsolete the model, which also obsoletes all models within the corresponding BMG.

3.10.2 Options Following 2nd Sample Failure. When the Participant is notified of a second-sample certified rating failure, the Participant has seven (7) calendar days to select one 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.

4. Challenge Tests

Refer to Section 10 of the AHRI General Operations Manual.

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

- AHRI Certified Reference Number;
- Name of Manufacturer;
- Model Status;
- Trade/Brand Name;
- Model Number(s) or Designation(s);
- Phase;
- Cooling Capacity, Btu/h;
- EER;
- IPLV¹;
- Gas Heat Input Capacity, Btu/h²;
- COP³;and
- Thermal Efficiency, %².

¹For multiple compressor units or units with compressor capacity modulation.

²For units equipped with gas heat.

³For all SPVHs.

5.2 Data Submittal Sheets. 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: PROCEDURE FOR DETERMINATION OF THERMAL EFFICIENCY FOR SPVA OR SPVH EQUIPPED WITH A CONDENSING GAS HEATING COMPONENT

A1 SPVA or SPVH Equipped with a Condensing Gas Heating Component. If an SPVA or SPVH is equipped with a condensing gas heating component, the Thermal Efficiency of the unit shall be verified in accordance with the procedure outlined in this appendix. The procedure outlined in this appendix is taken directly from the U.S. Code of Federal Regulations Title 10 Chapter 11 Subchapter D Section 431.76, *Uniform test method for the measurement of energy efficiency of commercial warm air furnaces.*

A2 Procedure for the Measurement of Condensate. The test procedure for the measurement of the condensate from the flue gas under steady-state operation shall be conducted as specified in Sections 7.2.2.4, 7.8, and 9.2 of ASHRAE 103-2007 under the maximum rated input conditions. The condensate measurement shall be conducted for an additional 30 minutes of steady-state operation after completion of the steady-state thermal efficiency test specified in Section 3.9.3.

A3 Calculation of Additional Heat Gain and Loss (Condensate). The latent heat gain from the condensation of the water vapor in the flue gas, and heat loss due to the flue condensate down the drain shall be calculated as specified in Sections 11.3.7.1 and 11.3.7.2 of ASHRAE 103-2007, with the exception that in the equation for the heat loss due to hot condensate flowing down the drain in Section 11.3.7.2, the assumed indoor temperature of 70 °F and the temperature term T_{OA} must be replaced by the measured room temperature as specified in Section 2.2.8 of ANSI Z21.47-2006/CSA 2.3-2006.

A4 Adjustment to Thermal Efficiency (Condensate). The thermal efficiency as calculated in ANSI Z21.47-2006/CSA 2.3-2006 shall be adjusted by adding the latent gain, expressed in percent, from the condensation of the water vapor in the flue gas, and subtracting the heat loss (due to the flue condensate down the drain), also expressed in percent, both as calculated in Section A3, to obtain the thermal efficiency of a condensing furnace. See Equation 1 for clarification.

$$TE = TE' + L_{G,SS} - L_{C,SS} \qquad 1$$

Where:

- $L_{C,SS}$ = Steady-state heat loss due to condensation discharged, %
- $L_{G,SS}$ = Latent heat gain due to condensate under steady state conditions, %
- TE = Final Adjusted Thermal Efficiency, %
- TE' = Thermal Efficiency without accounting for condensate, %

APPENDIX B: ADDITIONAL ANNUAL TESTING REQUIREMENTS FOR 2023

B1 Integrated Energy Efficiency Ratio (IEER) Testing to AHRI Standard 390-2021. All samples will be subject to an additional test for IEER according to AHRI Standard 390-2021. IEER according to AHRI Standard 390-2021 is not a certified metric and is therefore not subject to test failure.

B2 COP Testing to AHRI Standard 390-2021. All SPVH samples that have a heating airflow that differs from their full-load cooling airflow will be subject to an additional test for COP according to AHRI Standard 390-2021. COP according to AHRI Standard 390-2021 is not a certified metric and is therefore not subject to test failure.