

OPERATIONS MANUAL

DIRECT GEOEXCHANGE HEAT PUMPS CERTIFICATION PROGRAM



AHRI DGX OM – JANUARY 2018

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PREFACE

The following manual outlines the procedures and policies of the Performance Certification Program for Direct Geothermal Heat Pumps Certification Program (DGX) 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 DGX Certification Program by AHRI provides for independent verification of the Direct Geothermal Heat Pumps Certification Program 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 DGX 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 DGX Operations Manual, January 2017.

CERTIFICATION OPERATIONS MANUAL FOR
DIRECT GEOEXCHANGE 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 the latest edition of AHRI Standard 870-2016, *Performance Rating of Direct Geoexchange Heat Pumps* (Standard). A copy of the Standard is available for download from the AHRI website, www.ahrinet.org.

1.2 Product Definitions.

1.2.1 Direct Geoexchange (DGX) Heat Exchanger. A continuous sealed underground closed loop heat exchanger with one refrigerant supply tube and one refrigerant return tube. More than one such Direct Geoexchange Heat Exchanger may be supplied with each heat pump and the Direct Geoexchange Heat Exchanger(s) may be factory or field assembled.

1.2.2 Direct Geoexchange Heat Pump. A heat pump consisting of one or more factory made assemblies which normally include an indoor conditioning coil with air moving means, compressor(s) and refrigerant-to-earth heat exchanger(s), including means to provide a heating function or a cooling function or both. The separate 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.

1.2.2.1 Functions. Direct Geoexchange Heat Pumps shall provide the function of air-circulating, cooling and/or heating with controlled temperature, and may include the functions of water heating, air-cleaning, dehumidifying or humidifying. Models designated as "cooling only" models need not include the heating function, and models designated as "heating only" models need not include the cooling function.

1.3 Program Scope. This program applies to all 60 Hz factory made residential, commercial and industrial Production Models of the DGX Certification Program, as defined in Section 1.2, rated up to 100,000 Btu/h at Standard Rating Conditions (Cooling).

1.3.1 Program Scope Exclusions. This Certification program does not include individual assemblies, such as condensing units or coils, for separate use.

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 US and Canada (U.S., 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 a model or models where the Same Remote Unit is used with several blower coil combinations (horizontal, vertical, A-coil, etc.). "The Same Remote Unit" is defined as models with the same or comparable compressor, used with the same or comparable DGX heat exchanger.

Participants may be able to certify combinations with their DGX components and any manufacturer's air handling unit. All certified combinations shall be made available for testing at the request of AHRI.

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, 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;
- An Applicant requesting AHRI to submit data to CEC and NRCAN shall submit third-party authorization, compliance forms and other necessary information; and

- Additional information may be needed to meet EPA ENERGY STAR® program requirements.

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. 20% of an Applicant's BMGs shall be tested, with a minimum of two (2) models. 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 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:

- Maximum Operating Conditions Test;
- Minimum Operating Conditions Test;
- Voltage Tolerance Test;
- Insulation Effectiveness Test; or
- Low-Temperature Start and Operating Test.

If any of the samples fail the Operating Test, a second sample shall pass one of the other four operating tests, to be selected by AHRI, 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). The Applicant shall cease production and sale of the failed model and BMG in order to qualify into the DGX Certification Program. A new sample shall be selected and tested with a different Operating Test to continue the qualification process. Refer to Section 3.10.1 for additional information.

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. In addition to the Application for AHRI Certification Form noted in the AHRI General Operations Manual, Section 5, STEP 5.1, Applicants shall submit the following documentation to AHRI:

- An Applicant requesting AHRI to submit data to CEC and NRCAN shall submit third-party authorization, compliance forms and other necessary information.
- Additional information may be needed to meet EPA ENERGY STAR® program requirements.

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.

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.

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

3.4 Method of Acquiring Test Samples. AHRI or the Laboratory personnel shall make a Random Sample or 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 for additional requirements and for the Two-Sample Supply Option.

3.4.1 Presence of Participant Personnel at the Laboratory. Within three (3) calendar days of Random Sample or Random Component Selection, the Participant shall notify the Laboratory if they wish to witness the setup and/or testing of the selected sample. Prior to and during the test of the sample, Participant personnel are permitted in the Laboratory test facility. Participants may be present at the Laboratory to validate that their equipment is installed and operated in accordance with the supplied installation instructions. Once testing commences, Participants are not permitted to tamper with or adjust samples unless previously approved by AHRI.

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. Failure to have second samples or replacement samples available within the given timeframe shall forfeit the Participant's opportunity for further testing, and constitutes a program violation.

3.6 Break-in Operation and Start-up of Test Samples. A Participant may instruct the Laboratory to operate the equipment for a manufacturer-specified number of "break-in" hours prior to testing. The Participant is required to pay all costs involved.

3.7 Repairs and Adjustments Prior to Testing. Prior to the initiation of the test by the Laboratory, the Applicant/Participant may make minor adjustments to the sample consistent with the Participant's published installation instructions, Punch List, and the Directory. These adjustments shall include:

- Repair leaks;
- Repair or replace items damaged by shipping or handling;
- Assure correct refrigerant charge; and/or
- Assure correct fan speed(s) where adjustable speed fans are used.

Once testing commences, no further adjustments shall be made to the sample.

3.8 Required Equipment and Test Provisions. The Laboratory shall give the Participant two (2) or more weeks advanced notification when that Participant's sample is scheduled to be tested. The Laboratory shall give the Participant no less than three (3) calendar days advanced notice prior to the sample's installation into the test room.

The Participant shall provide a complete equipment submittal for each model, which include the following mandatory and suggested information:

Mandatory

- Published installation instructions in printed or electronic format.
- Punch List (Refer to Appendix C).

Suggested

- Highlight pertinent items in the installation manual for testing.
- Photograph of manufacturer's test setup.

3.9 Test Requirements. All selected samples shall be tested to verify Cooling and Heating Capacities as well as measures of EER and COP. Those rated at one (1) application point shall be tested at that point only, even though other models in the BMG are rated at other application points. Models rated at multiple application points shall be tested at only one (1) application point, chosen by AHRI.

3.9.1 Operating Tests. In addition to the Standard Rating Conditions test, AHRI shall select one (1) of the following Operating Tests to be conducted on each model:

- Maximum Operating Conditions Test;
- Minimum Operating Conditions Test;
- Voltage Tolerance Test;
- Insulation Effectiveness Test; or
- Low-Temperature Start and Operating Test.

The Operating Test shall be run at the discretion of AHRI and shall be unknown to the Participant until after the test is completed.

The most severe Operating Test conditions shall be chosen from the rated applications for the model. This is defined as the highest entering liquid temperature at Maximum Operating Conditions and the lowest entering fluid temperature at Minimum Operating Conditions and insulation efficiency tests.

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

- Full Load Cooling Capacity, Btu/h;
- Full Load Heating Capacity, Btu/h;
- EER, Btu/h/W;
- COP, Btu/h/W;
- Part Load Cooling Capacity (if applicable), Btu/h;
- Part Load Heating Capacity (if applicable), Btu/h;
- Part Load EER (if applicable), Btu/h/W; and
- Part Load COP (if applicable), Btu/h/W.

Certified data at a Participant's specified Part Load and Full Load values shall be verified by test. Capacity ratings below the Participant's lowest Part Load value and above the Full Load value shall be considered Application Ratings. A Participant may certify a Full Load Capacity, and up to three (3) Part Load Capacities. The highest Part Load rating in heating or cooling shall be no greater than 80% of the certified Full Load capacity rating in heating or cooling.

3.11 Test Failures.

3.11.1 Operating Test Failure. If the initial failure is an Operating Test, the Participant shall obsolete all models within the same BMG or elect to have a second sample tested. If the second sample fails a Performance Test, the BMG shall be obsolete.

3.11.2 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 lowest rating ratio. The re-rate of the failed certified rating shall affect corresponding ratings of all models within the BMG. The Participant's listings shall show ratings indicated by the final test(s) along with a "WAS" rating of the original certification.
- Test a second sample of the same model (sample shall be available within 30 calendar days following notification of failure); or
- Obsolete the model, which also obsoletes all models within the corresponding BMG.

3.11.3 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;
- Model Status;
- Manufacturer;
- Trade/Brand Name(s);
- Compressor Unit Assembly Model Number;
- Indoor Air Handler Model Number;
- Cooling Capacity, Btu/h;
- Heating Capacity, Btu/h;
- EER, Btu/h/W;
- COP, Btu/h/W; and
- AHRI Type.

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

Except as noted below, the assessment and payment of certification fees shall proceed according to the AHRI General Operations Manual, Section 12.

6.1 Equipment Delivery/Disposal Fees. The Participant is responsible for the delivery and expenses associated with shipping test samples to and from the Laboratory. Following the completion of the test, the Participant shall provide instruction to the Laboratory regarding the disposal/shipment of the sample(s). The Laboratory shall invoice the Participant for expenses associated with the disposal/shipment of the sample from the Laboratory's facility to a location designated by the Participant.

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

Publication of Non-Certified Ratings (Application Ratings). Participant's publications may contain Application Ratings. However, certification can only be implied for products operating at Standard Rating Conditions. Where ratings are included that are outside the scope of the certification program, they shall be accompanied by the following statement: "Ratings outside of the scope of the AHRI DGX Certification Program."

9.2 Certified Ratings for Packages and Split Systems. Certified ratings shall be given for all single package units and all combinations of split systems which are intended by the Participant to be used together.

9.3 Certified Ratings for Models with Multiple Coil Orientations. Systems having coils with both horizontal and vertical orientations, when ratings are different, shall be certified to reflect the capacity and efficiency ratings for both positions.

9.4 Part Load Data. Whenever ratings are shown, both Full Load and Part Load Ratings shall be clearly listed in all published literature.