



# ENERGY STAR® Program Requirements Product Specification for Furnaces

## Eligibility Criteria Version 3.0

Following is the Version 3.0 product specification for ENERGY STAR qualified furnaces. A product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

**1) Definitions:** Below are the definitions of the relevant terms in this document.

- A. Residential Furnace: A heating unit with a heat input rate of less than 225,000 Btu per hour whose function is the combustion of fossil fuel (natural gas, propane, or oil) for space heating with forced hot air. Unit must include burner(s), heat exchanger(s), blower(s) and connections to heating ducts. A heating unit that meets this definition and also provides hot water for domestic or other use may be considered a furnace for purposes of this agreement. Available furnace configurations<sup>1</sup> are provided below:
  - a. Upflow: A model with the airflow discharge vertically upward at or near the top of the furnace, with the blower mounted below the heating element.
  - b. Lowboy: A model generally with a shorter cabinet in which the airflow discharge is vertically upward at or near the top of the furnace with the blower mounted beside the heating element.
  - c. Downflow: A model with the airflow discharge vertically downward at or near the bottom of the furnace, with the blower mounted above the heating element.
  - d. Horizontal: A model designed for low headroom installation with airflow across the heating element in a horizontal path.
- B. Product Family: A group of models which have identical ratings for heating input, output heating capacity, electric power (PE), auxiliary electrical energy consumption (E<sub>AE</sub>), fossil fuel energy consumption (E<sub>F</sub>), and annual fuel utilization efficiency (AFUE).
- C. Annual Fuel Utilization Efficiency (AFUE): For the exact definition of AFUE, refer to the federal test method 10 CFR 430, Appendix N to Subpart B. In general, the percentage of the heat in the incoming fuel which is converted to space heat instead of being lost.
- D. Furnace Fan Efficiency ("e")<sup>2</sup>: The ratio of the furnace fan electrical consumption to the total energy consumption of the furnace during the heating mode.
- E. Air Leakage (Q<sub>leak</sub>): The percent of the rated airflow of the fan that is required to maintain the applied pressures, accounting for air that leaves or enters through cracks, joints and penetrations in the furnace cabinet rather than through supply and return ducts installed in accordance with manufacturer's instructions.
- F. Heating Degree Days (HDD): HDD for each state are calculated by subtracting the population-weighted daily average temperature for that state from a balance temperature of 65°F, and summing only positive values over an entire year.

<sup>1</sup> <http://www.ahridirectory.org/ahridirectory/helpdocs/RFRDirectory.pdf>

<sup>2</sup> Refer to "Interim Approach for Determining Furnace Fan Energy Use" document.

- G. Balance Temperature: Used in a heating degree day calculation, intended to represent a temperature at which neither heating or cooling is needed.

## 2) Scope:

- A. Included Products: Products that meet the definition of a Residential Furnace as specified herein are eligible for ENERGY STAR qualification, with the exception of products listed in Section 2.B. Only non-weatherized furnaces approved for residential installation are eligible.
- B. Excluded Products: Furnaces intended only for commercial installation and/or with a rating of 225,000 Btu per hour energy or higher are not eligible for ENERGY STAR. Weatherized furnaces are not eligible for ENERGY STAR.

## 3) Qualification Criteria:

- A. Regions: ENERGY STAR requirements are divided into the following three regions:
- U.S. North - States with population-weighted Heating Degree Days (HDD) equal to or greater than 5000.
  - U.S. South - States with population-weighted Heating Degree Days (HDD) less than 5000.
  - Canada - All provinces and territories.

| U.S. Regions | U.S. States per Region   |
|--------------|--|
| U.S. North   | Alaska, Colorado, Connecticut, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Washington, West Virginia, Wisconsin and Wyoming. |
| U.S. South   | Alabama, American Samoa, Arizona, Arkansas, California, Delaware, District of Columbia, Florida, Georgia, Guam, Hawaii, Kentucky, Louisiana, Maryland, Mississippi, Nevada, New Mexico, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas and Virginia.  |

Should the Department of Energy (DOE) issue a final rule on Residential Furnaces which uses regional distinctions, it is EPA's intention to align with them. EPA will monitor DOE rulemaking and will provide clarification or an update to the specification if necessary.

- B. Energy Efficiency Requirements:

**Table 1: ENERGY STAR Gas and Oil Furnace Requirements**

| Product Type | Regions           | AFUE    | Furnace Fan Efficiency (e) |
|--------------|-------------------|---------|----------------------------|
| Gas Furnace  | U.S. North/Canada | ≥ 95.0% | ≤ 2.0%                     |
|              | U.S. South        | ≥ 90.0% |                            |
| Oil Furnace  | U.S. (all)/Canada | ≥ 85.0% |                            |

- C. Multiple Configurations: To earn the ENERGY STAR, models offered in multiple configurations (i.e., upflow, downflow, horizontal, and lowboy) shall meet the regional ENERGY STAR levels presented in Table 1 for all configurations they are offered in. For example, if a model is intended to be sold in the U.S. North region and is offered in upflow, downflow, and horizontal configurations, then the model shall meet the U.S. North region ENERGY STAR levels as tested in all three configurations. Manufacturers cannot claim that a model meets ENERGY STAR U.S. North when installed in the downflow configuration only. Similarly, a model cannot be qualified across two different regions depending on configuration. For example, if sold in Canada all configurations shall meet the Canadian requirements in Table 1 to bear the ENERGY STAR.

Models may qualify for labeling in every region for which all offered configurations meet the requirements of that region. For instance, models qualified for labeling in Canada may also be labeled everywhere in the U.S and bear the standard ENERGY STAR logo, while models qualified only for labeling in the US South may only use the US South regional label.

**D. Significant Digits and Rounding:**

- a. All calculations shall be carried out with directly measured (unrounded) values.
- b. Unless otherwise specified, compliance with specification limits shall be evaluated using directly measured or calculated values without any benefit from rounding.
- c. Directly measured or calculated values that are submitted for reporting on the ENERGY STAR website shall be rounded to the nearest significant digit as expressed in the corresponding specification limit.

**4) Warranty Requirements:**

Manufacturer shall offer a limited warranty on all ENERGY STAR qualified furnaces. For purposes of this specification, a limited warranty is an assurance by the Partner that purchased system equipment and components are warranted by the manufacturer for a period of time. The period of time is typically expressed in numbers of years. The exact terms of the limited warranty shall be determined by the manufacturer.

**5) Test Requirements:**

A. A representative model shall be selected for testing per the following requirements:

- 1) For qualification of an individual product model, the representative model is that model;
- 2) For qualification of a product family, any model within that product family may be considered the representative model.

B. One of the following sampling plans shall be used for purposes of testing for ENERGY STAR qualification:

- 1) A single unit is selected, obtained, and tested. The measured performance of this unit and of each subsequent unit manufactured must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to qualify additional model variations within a product family as long as the definition for product family provided in Section 1, above, is met ; or
- 2) Units are selected for testing and results calculated according to the sampling requirements defined in 10 CFR Part 429, Subpart B § 429.18. Similar to AFUE,  $\eta$  must be calculated for each tested unit and a result for the model statistically calculated. The rated values must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to qualify additional model variations within a product family as long as the definition for product family provided in Section 1, above, is met.

C. When testing residential furnaces, the following test methods shall be used to determine ENERGY STAR qualification:

**Table 2: Test Methods for ENERGY STAR Qualification**

| <b>ENERGY STAR Requirement</b> | <b>Test Method Reference</b>                            |
|--------------------------------|---|
| AFUE                           | 10 CFR Part 430, Appendix N                             |
| e                              | Interim Approach for Determining Furnace Fan Energy Use |

**6) Effective Date:**

The ENERGY STAR Version 3.0 Furnace specification shall take effect on **February 1, 2012**. To qualify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on its date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.

**7) Future Specification Revisions:**

EPA reserves the right to change this specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through stakeholder discussions. In the event of a specification revision, please note that the ENERGY STAR qualification is not automatically granted for the life of a product model.

**Review of Energy Efficiency Requirements:** Over the next several years, EPA will monitor U.S. and Canadian markets and review AFUE and e data to determine whether the limits provided in Table 1 continue to provide sufficient differentiation for the consumer. If it is determined that revisions are needed, EPA will work closely with industry stakeholders to develop appropriate new levels. EPA may consider addressing digital communications and diagnostics features within HVAC systems as these technologies are more widely introduced into the marketplace.

**Review of Definitions for Purposes of DOE Harmonization:** EPA will monitor DOE efforts to revise definitions currently used in 10 CFR 430, Appendix N to Subpart B and will provide clarification or an update to the specification if necessary once finalized.