ENERGY STAR® Program Requirements
Product Specification for Dehumidifiers

Eligibility Criteria
Draft 1 Version 5.0

Following is the Draft 1 Version 5.0 product specification for ENERGY STAR certified dehumidifiers. 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. Where noted below, definitions are identical to the definitions in the U.S Department of Energy (DOE) test procedure at 10 Code of Federal Regulations (CFR) 430, Subpart B, Appendix X1 or in 10 CFR 430.2. The definitions from the CFR have been reprinted for ease of use; however, the CFR definitions take precedence and may be modified by DOE.

A. Dehumidifier: A product, other than a portable air conditioner, room air conditioner, or packaged terminal air conditioner, that is a self-contained, electrically operated, and mechanically encased assembly consisting of: (a) a refrigerated surface (evaporator) that condenses moisture from the atmosphere; (b) a refrigerating system, including an electric motor; (c) an air-circulating fan; and (d) means for collecting or disposing of the condensate.

   a. Portable Dehumidifier: A dehumidifier designed to operate within the dehumidified space without the attachment of additional ducting, although means may be provided for optional duct attachment.

   b. Whole-home Dehumidifier: A dehumidifier designed to be installed with ducting to deliver return process air to its inlet and to supply dehumidified process air from its outlet to one or more locations in the dehumidified space.

B. Product Capacity: A measure of the ability of a dehumidifier to remove moisture from its surrounding atmosphere, measured in pints collected per 24 hours of operation under the specified ambient conditions. Product Capacity shall be measured according to the test standard referenced in Section 4, below.

C. Integrated Energy Factor (IEF) A measure of energy efficiency of a dehumidifier calculated by dividing the corrected product capacity with unit and test time adjustments by the summation of the energy consumed during the 6-hour dehumidification mode test and the annual low-power mode with an applied conversion factor, expressed in liters per kilowatt hour (L/kWh). IEF shall be calculated according to the test standard referenced in Section 4, below.

D. Basic Model: All units of a given type of product (or class thereof) manufactured by one manufacturer, having the same primary energy source, and which have essentially identical electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency, water consumption, or water efficiency.

Note: EPA has replaced the definitions for Stand Alone and Whole House dehumidifiers with those for Portable and Whole-home, respectively, aligning with 10 CFR 430.2.

EPA has also updated the definition for Product Capacity as well as replaced the definition for Energy Factor (EF) with that for Integrated Energy Factor (IEF) to align with the definitions for these metrics in DOE's test procedure for dehumidifiers codified in 10 CFR 430, Subpart B, Appendix X1. Product capacity and IEF measured according to the Appendix X1 test procedure reflect changes in ambient dry-bulb temperatures and consideration of non-dehumidification mode (off-cycle mode and inactive mode or off

mode) energy consumption. Per the Appendix X1 test procedure, portable and whole-home dehumidifiers are tested at 65°F and 73°F dry bulb, respectively, rather than at the 80°F dry bulb specified in the test procedure codified in 10 CFR 430, Subpart B, Appendix X. In general, for the same dehumidifier, the IEF and product capacity per Appendix X1 are expected to be smaller values than EF and product capacity per Appendix X. These changes are reflected throughout the draft specification.

2) Scope:

A. Included Products: Products that meet the definition of a dehumidifier as specified herein are eligible for ENERGY STAR qualification, with the exception of products listed in Section 2B. Portable units with product capacities measuring less than or equal to 50.00 U.S. pints/day (23.66 liters/day) and whole-home units with product capacities measuring less than or equal to 155 U.S. pints/day (73.34 liters/day) are eligible for ENERGY STAR.

B. Excluded Products: Dehumidifiers with product capacities greater than 50.00 U.S. pints/day (23.66 liters/day) for portable units and 155 U.S. pints/day (73.34 liters/day) for whole-home units are not eligible for ENERGY STAR.

Note: EPA has aligned the product types in Sections 2A and 2B to with those defined in Section 1 (i.e., portable and whole-home). EPA updated the specification product capacity limit to 50.00 pints/day for portable units and 155 pints/day for whole-home units. EPA's product capacity limit in the Version 4.0 specification is 185 pints/day for all types, when tested according to Appendix X.

The proposed product capacity limit for whole-home dehumidifiers, 155 pints/day, is based on translating this level to product capacity as tested according to Appendix X1. This limit is intended to exclude commercial and industrial units because EPA's analysis does not cover the use cases, paybacks, or full range of technologies for commercial and industrial dehumidification. EPA requests comment on whether there is a better way to exclude commercial units than with a product capacity limit.

For portable dehumidifiers with greater than 50.00 pints/day product capacity per Appendix X1, EPA was unable to find an efficiency level higher than the new DOE standards that reflected models with reasonable payback. This is explained more thoroughly in a later note box.

3) Certification Criteria:

A. Energy Efficiency Requirements: To qualify for ENERGY STAR, dehumidifiers shall meet the IEF requirements provided in Table 1 and Table 2, below.

Table 1: Performance Criteria for ENERGY STAR Certified Portable Dehumidifiers

Product Capacity (Pints/Day)	Integrated Energy Factor Under Test Conditions (L/kWh)
≤ 25.00	≥ 1.57
25.01 to 50.00	≥ 1.80

Table 2: Performance Criteria for ENERGY STAR Certified Whole-home Dehumidifiers

Product Case Volume (ft^3)	Integrated Energy Factor Under Test Conditions (L/kWh)
≤ 8.0	≥ 2.09
> 8.0	≥ 3.52

Note: Dehumidifiers with the ability to operate, as both a portable and whole-home dehumidifier, by means of installation or removal of an optional ducting kit, shall meet requirements under both configurations to be certified.

Note: Proposed certification criteria for ENERGY STAR dehumidifiers are presented in Tables 1 and 2. EPA has aligned with DOE's product capacity and product case volume ranges for portable and whole-home dehumidifiers, respectively. EPA is proposing IEF requirements that offer differentiation from the Federal standard levels that require compliance in June 2019. The proposed levels are based on efficiency levels documented by DOE in the most recent dehumidifier rulemaking process (trial standard level (TSL) 4 for portable and TSL 3 for whole-home), and they offer a potential program unit energy savings of 14% over the 2019 federal minimum standards. More data and calculations are available in the data packet accompanying this draft specification, which can be found on the Version 5.0 product development webpage.

The payback period for ENERGY STAR dehumidifiers at these levels compared to the 2019 federal minimum level is around two years for all included categories, according to data from DOE's final rule technical support document for dehumidifiers, compared to average lifetimes of 11 and 19 years for portable and whole-home dehumidifiers, respectively.

For dehumidifiers greater than 50.00 pints/day in product capacity, potential ENERGY STAR efficiency levels above the DOE requirement offered a payback period of just over 10 years. This product category only makes up one percent of the dehumidifier market, and from additional research conducted by EPA, the category primarily seems to be made up of products that are meant more for commercial use. For these reasons, EPA is proposing not to include this product category in scope for ENERGY STAR Version 5.0. EPA welcomes stakeholder feedback on this decision, particularly performance, cost, and use case data that might support continued inclusion of these units in the ENERGY STAR program.

EPA has included a permanent note in this Draft 1 specification stating that dehumidifiers with the ability to operate as both a portable and whole-home dehumidifier must be certified under both configurations. This is consistent with EPA's usual practice in cases where products have alternate configurations (e.g., furnaces, range hoods, etc.), and parallels a requirement under the Department of Energy's 2019 energy conservation standards.

Without this revision, market share of units at the current ENERGY STAR levels would be expected to be over 90% in 2019 and 2020, providing poor differentiation. Following past major revisions of the specification, the market penetration of ENERGY STAR dehumidifiers climbed very quickly, typically reaching 50% or more of the market within a couple years of revising the specification. Thus, EPA is comfortable with the proposed levels, despite the relatively low availability of models meeting them today. EPA welcomes stakeholder comment on the proposed levels, particularly from stakeholders with information not currently reflected EPA's reasoning as detailed here and in the attached data packet.

B. Other Requirements:

Qualifying units shall be equipped with an adjustable humidistat control or shall require a remote humidistat control to operate.

4) Test Requirements:

A. One of the following sampling plans shall be used to test energy performance for certification to ENERGY STAR:

a. 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. Note that to determine the represented value per 10 CFR 429.36, additional testing outside of ENERGY STAR is required. The represented value must also be equal to or better than the ENERGY STAR specification requirements; or

b. At least two units are selected, obtained and tested. The represented value is calculated from the test results according to the sampling requirements defined in 10 CFR 429.36. The represented value must be equal to or better than the ENERGY STAR specification requirements.

Results of the tested unit(s) may be used to certify additional individual model variations within a Basic Model as long as the definition for Basic Model provided in Section 1, above, and in 10 CFR 430.2 is met.

B. When testing dehumidifiers, the following test methods shall be used to determine ENERGY STAR certification:

Table 3: Test Methods for ENERGY STAR Certification

ENERGY STAR Requirement	Test Method Reference
Product Capacity, Product Case Volume, and Integrated Energy Factor (IEF)	10 CFR 430, Subpart B, Appendix X1 OR DOE-approved test procedure waiver pursuant to 10 CFR 430.27

C. Represented Value: The represented value is the identical value certified to DOE, listed on the ENERGY STAR QPL, and shown on consumer facing materials.

D. For the purpose of ENERGY STAR certification, the performance of efficient variable speed dehumidifiers shall require a test procedure waiver from DOE per 10 CFR 430.27.

E. Significant Digits and Rounding: All calculations shall be carried out as specified in 10 CFR 430, Subpart B, Appendix X1 and 10 CFR 430.23(z). Do not round individual test results. Rounding is specified in 10 CFR 429.36 for the represented value.

Note: EPA has updated the sampling language in section 4A to better harmonize sampling procedures between ENERGY STAR and DOE standards. Though the intent of this section has essentially remained the same for ENERGY STAR, the updates provide clearer information about appropriate sampling and clarify that additional testing is required for compliance with minimum standards if the sampling procedure outlined in section 4.A.a is chosen.

EPA has updated the test method reference for ENERGY STAR certification to the test method codified in 10 CFR 430, Subpart B, Appendix X1. This test method identifies the means to determine product capacity, product case volume, and integrated energy factor for portable and whole-home dehumidifiers. EPA has provided additional guidance in this section for brand owners that wish to certify efficient variable speed dehumidifiers. Brand owners of variable speed dehumidifiers will be expected to first submit a test procedure waiver request per 10 CFR 430.27 to DOE and follow instructions from DOE regarding the appropriate efficiency determination pursuant to the test procedure waiver process. The following elements must be contained in the DOE waiver request: (1) Identify the particular basic model(s) for which a waiver is requested; (2) Identify manufacturers of all other basic models distributed in commerce in the U.S. and known to the petitioner to incorporate design characteristic(s) similar to those found in the basic model that is the subject of the petition; (3) Include any alternate test procedures known to the petitioner to evaluate the performance of the product type in a manner representative of the energy and/or water consumption characteristics of the basic model; and (4) Be signed by the petitioner or an authorized representative. For additional information, please see the DOE test procedure regulations found at 10 CFR 430.27.

For purposes of demonstrating ENERGY STAR certification, efficient variable speed models must meet the efficiency criteria for the relevant product class as indicated in Section 3 when tested according to the method contained in DOE's interim waiver or final decision and order.

EPA also moved the Significant Digits and Rounding section from section 3 to section 4 for this Draft specification. The language has been slightly altered to reference the CFR for rounding applicable to the Appendix X1 test procedure.

5) Effective Date:

The ENERGY STAR Version 5 Dehumidifier Specification shall take effect on **TBD**. To certify for ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on the 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.

Note: Once this specification is finalized, brand owners will be free to certify products to it immediately, using the Appendix X1 test method or interim waiver process for variable speed dehumidifiers. EPA hopes to finalize late in 2018 or early in 2019. Products that are currently certified will remain on the list of certified products until the effective date of the specification, which is likely to be fall 2019, depending on when the specification is finalized.

6) Future Specification Revisions:

EPA reserves the right to change the 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 industry discussions. In the event of a specification revision, please note that the ENERGY STAR certification is not automatically granted for the life of a product model. EPA in interested in the following considerations for future specification revisions:

A. Dehumidifiers are tested under steady state conditions, now including periods of off-cycle and inactive/off time. However, in real situations, dehumidifiers with humidistats typically cycle on and off. EPA continues to be interested in any data showing technologies with superior performance in these real world conditions.

B. EPA is aware that there are Wi-Fi dehumidifiers on the market now. EPA will continue to watch this trend, and is particularly interested to see whether consumers are interested in these devices. If they gain any significant market presence, EPA anticipates including optional connected criteria in a future revision.

Note: EPA has added sections 6A and 6B to indicate the areas that EPA are interested in learning more about for future specification revisions. Future specification revisions will not necessarily address these topics, but EPA anticipates considering them.