



ENERGY STAR® Program Requirements for Residential Dishwashers

Partner Commitments

Following are the terms of the ENERGY STAR Partnership Agreement as it pertains to the manufacture and labeling of ENERGY STAR certified products. The ENERGY STAR Partner must adhere to the following partner commitments:

Qualifying Products

1. Comply with current ENERGY STAR Eligibility Criteria, which define performance requirements and test procedures for residential dishwashers. A list of eligible products and their corresponding Eligibility Criteria can be found at www.energystar.gov/specifications.
2. **Prior to associating the ENERGY STAR name or mark with any product**, obtain written certification of ENERGY STAR qualification from a Certification Body recognized by EPA for residential dishwashers. As part of this certification process, products must be tested in a laboratory recognized by EPA to perform residential dishwasher testing. A list of EPA-recognized laboratories and Certification Bodies can be found at www.energystar.gov/testingandverification.

Using the ENERGY STAR Name and Marks

3. Comply with current ENERGY STAR Identity Guidelines, which define how the ENERGY STAR name and marks may be used. Partner is responsible for adhering to these guidelines and ensuring that its authorized representatives, such as advertising agencies, dealers, and distributors, are also in compliance. The ENERGY STAR Identity Guidelines are available at www.energystar.gov/logouse.
4. Use the ENERGY STAR name and marks only in association with certified products. Partner may not refer to itself as an ENERGY STAR Partner unless at least one product is certified and offered for sale in the U.S. and/or ENERGY STAR partner countries.
5. Provide clear and consistent labeling of ENERGY STAR certified residential dishwashers.
 - 5.1. The ENERGY STAR mark must be clearly displayed on the top/front of the product (by placement of the ENERGY STAR logo on the FTC's EnergyGuide label, on product labels, and/or as a permanent mark), in product literature (i.e., user manuals, spec sheets, etc.), and on the manufacturer's Internet site where information about ENERGY STAR certified models is displayed.
 - 5.2. It is also recommended that the mark appear on the product packaging.

Verifying Ongoing Product Qualification

6. Participate in third-party verification testing through a Certification Body recognized by EPA for residential dishwashers, providing full cooperation and timely responses. EPA/DOE may also, at its discretion, conduct tests on products that are referred to as ENERGY STAR certified. These products may be obtained on the open market, or voluntarily supplied by Partner at the government's request.

Providing Information to EPA

7. Provide unit shipment data or other market indicators to EPA annually to assist with creation of ENERGY STAR market penetration estimates, as follows:

- 7.1. Partner must submit the total number of ENERGY STAR certified residential dishwashers shipped in the calendar year or an equivalent measurement as agreed to in advance by EPA and Partner. Partner shall exclude shipments to organizations that rebrand and resell the shipments (unaffiliated private labelers).
- 7.2. Partner must provide unit shipment data segmented by meaningful product characteristics (e.g., type, capacity, presence of additional functions) as prescribed by EPA.
- 7.3. Partner must submit unit shipment data for each calendar year to EPA or an EPA-authorized third party, preferably in electronic format, no later than March 1 of the following year.

Submitted unit shipment data will be used by EPA only for program evaluation purposes and will be closely controlled. If requested under the Freedom of Information Act (FOIA), EPA will argue that the data is exempt. Any information used will be masked by EPA so as to protect the confidentiality of the Partner.

8. Report to EPA any attempts by recognized laboratories or Certification Bodies (CBs) to influence testing or certification results or to engage in discriminatory practices.
9. Notify EPA of a change in the designated responsible party or contacts within 30 days using the My ENERGY STAR Account tool (MESA) available at www.energystar.gov/mesa.

Performance for Special Distinction

In order to receive additional recognition and/or support from EPA for its efforts within the Partnership, the ENERGY STAR Partner may consider the following voluntary measures, and should keep EPA informed on the progress of these efforts:

- Provide quarterly, written updates to EPA as to the efforts undertaken by Partner to increase availability of ENERGY STAR certified products, and to promote awareness of ENERGY STAR and its message.
- Consider energy efficiency improvements in company facilities and pursue benchmarking buildings through the ENERGY STAR Buildings program.
- Purchase ENERGY STAR certified products. Revise the company purchasing or procurement specifications to include ENERGY STAR. Provide procurement officials' contact information to EPA for periodic updates and coordination. Circulate general ENERGY STAR certified product information to employees for use when purchasing products for their homes.
- Feature the ENERGY STAR mark(s) on Partner website and other promotional materials. If information concerning ENERGY STAR is provided on the Partner website as specified by the ENERGY STAR Web Linking Policy (available in the Partner Resources section of the ENERGY STAR website), EPA may provide links where appropriate to the Partner website.
- Ensure the power management feature is enabled on all ENERGY STAR certified displays and computers in use in company facilities, particularly upon installation and after service is performed.
- Provide general information about the ENERGY STAR program to employees whose jobs are relevant to the development, marketing, sales, and service of current ENERGY STAR certified products.
- Provide a simple plan to EPA outlining specific measures Partner plans to undertake beyond the program requirements listed above. By doing so, EPA may be able to coordinate, and communicate Partner's activities, provide an EPA representative, or include news about the event in the ENERGY STAR newsletter, on the ENERGY STAR website, etc. The plan may be as simple as providing a list of planned activities or milestones of which Partner would like EPA to be aware. For example, activities may include: (1) increasing the availability of ENERGY STAR certified products by converting the entire product line within two years to meet ENERGY STAR guidelines; (2) demonstrating the economic and environmental benefits of energy efficiency through special in-store displays twice a year; (3) providing information to users (via the website and user's manual) about energy-saving features and operating characteristics of ENERGY STAR certified products; and (4) building awareness of the ENERGY STAR Partnership and brand identity by collaborating with EPA on one print advertorial and one live press event.

- Join EPA's SmartWay Transport Partnership to improve the environmental performance of the company's shipping operations. The SmartWay Transport Partnership works with freight carriers, shippers, and other stakeholders in the goods movement industry to reduce fuel consumption, greenhouse gases, and air pollution. For more information on SmartWay, visit www.epa.gov/smartway.
- Join EPA's Green Power Partnership. EPA's Green Power Partnership encourages organizations to buy green power as a way to reduce the environmental impacts associated with traditional fossil fuel-based electricity use. The partnership includes a diverse set of organizations including Fortune 500 companies, small and medium businesses, government institutions as well as a growing number of colleges and universities. For more information on Green Power, visit www.epa.gov/greenpower.



ENERGY STAR® Program Requirements Product Specification for Residential Dishwashers

Eligibility Criteria Version 6.0

Following is the **Version 6.0** ENERGY STAR Product Specification for Residential Dishwashers. A product shall meet all of the identified required 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 C1 or in 10 CFR 430.2. When in conflict, the definitions in the CFR take precedence.

- A. Dishwasher¹: A cabinet-like appliance which with the aid of water and detergent, washes, rinses, and dries (when a drying process is included) dishware, glassware, eating utensils, and most cooking utensils by chemical, mechanical and/or electrical means and discharges to the plumbing drainage system.
 - a. Compact Dishwasher²: A dishwasher that has a capacity of less than eight place settings plus six serving pieces as specified in ANSI/AHAM DW-1-2010 (incorporated by reference; see §430.3), using the test load specified in section 2.7 of 10 CFR 430, Subpart B, Appendix C1.
 - b. Standard Dishwasher²: A dishwasher that has a capacity equal to or greater than eight place settings plus six serving pieces as specified in ANSI/AHAM DW-1-2010 (incorporated by reference; see §430.3), using the test load specified in section 2.7 of 10 CFR 430, Subpart B, Appendix C1.
 - c. Portable Dishwasher³: A dishwasher which is not permanently connected to the household water and electric supply lines. It can be mounted on wheels and easily moved from one place to another in normal use. This definition includes dishwashers intended to be used on a countertop or table.
- B. Basic Model¹: All units of a given type of covered 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.
- C. Consumer Product¹: Any product (other than an automobile, as defined in Section 501(1) of the Motor Vehicle Information Cost Savings Act) which: (1) in operation consumes, or is designed to consume, energy and (2) to any significant extent, is distributed in commerce for personal use or consumption by individuals.

¹ 10 CFR 430, Subpart A, Section 430.2 Note: Definition of consumer product has been abbreviated to be specific to residential dishwashers by omitting the regulatory definition's references to lighting and water.

² 10 CFR 430, Subpart B, Appendix C1

³ ANSI/AHAM DW-1-2010

2) Scope

- A. Included Products: Products that meet the definition of a dishwasher and are a consumer product as specified herein are eligible for ENERGY STAR certification, with the exception of products listed in Section 2B.
- B. Excluded Products: Product types not specifically identified in Section 2A are not eligible for ENERGY STAR certification under this specification. Products that are covered under other ENERGY STAR product specifications (e.g., Commercial Dishwashers) are not eligible for certification under this specification.

3) Certification Criteria

A. Energy Performance Requirements

Annual Energy Consumption (AEC) shall be less than or equal to Maximum Annual Energy Consumption (AEC_{MAX}), as calculated per Equation 1.

Equation 1: Calculation of Maximum Annual Energy Consumption

$$AEC_{MAX} = AEC_{BASE} + AEC_{AdderConnected}$$

where,

AEC_{BASE} is the annual energy consumption base allowance (kWh/year), per Table 1

$AEC_{AdderConnected}$ is the annual energy connected allowance, per Table 2

Table 1: Annual Energy Consumption Base Allowances

Product Type	AEC_{BASE} (kWh per year)
Standard	270
Compact	203

Table 2: Connected Allowance

Product Type	$AEC_{AdderConnected}$
Standard Dishwashers	$0.05 \times AEC_{BASE}$

¹ There is no connected allowance for compact dishwashers.

² Product must be certified using the final and validated ENERGY STAR Test Method for Residential Dishwashers to Validate Demand Response (TBD) to use the allowance.

³ Calculated allowance shall be rounded down to the nearest whole number before being applied in Equation 1.

B. Water Performance Requirements

Table 3: Maximum Water Consumption

Product Type	Water Consumption (gallons per cycle)
Standard	≤ 3.5
Compact	≤ 3.1

- C. Significant Digits and Rounding: All calculations shall be carried out as specified in Appendix C1 to Subpart B of Part 430 and 10 CFR Part 430.23(c).
- D. Model Numbers: Model numbers used for ENERGY STAR qualified product submissions shall be consistent with Federal Trade Commission (FTC) and Department of Energy (DOE) submissions.

4) Optional Cleaning Performance Reporting

The following optional cleaning performance reporting is applicable to those products included under Section 2A. Partners are encouraged to provide one complete set of cleaning performance data for each ENERGY STAR certified product.

- A. Data Reporting: The per-cycle Cleaning Index (CI) as defined in the ENERGY STAR Test Method for Determining Residential Dishwasher Cleaning Performance Section 5.3A, may be reported for each test cycle (heavy, medium, and light). If multiple units are tested, reported Cleaning Indices shall be in accordance with Section 4B of this specification. Cleaning performance data may be submitted directly to the ENERGY STAR program, or through the data reporting templates available to EPA recognized certification bodies.
- B. Sampling Plan: For those basic models for which the manufacturer wishes to submit voluntary cleaning performance data, the CI should be calculated as the average of the units in the sample for each test cycle (heavy, medium, and light). The units comprising the sample must be the identical units (i.e., same serial numbers) used in determining the energy and water consumption and must be tested at the same lab pursuant to Section 6 of this specification.
- C. Test Method: Testing of cleaning performance shall be performed using the ENERGY STAR Test Method for Residential Dishwasher Cleaning Performance (Rev. Feb-2014).

5) Connected Criteria:

The following optional connected criteria are applicable to Included Products, Section 2A, that meet the definition of a standard dishwasher as defined in Section 1Ab.

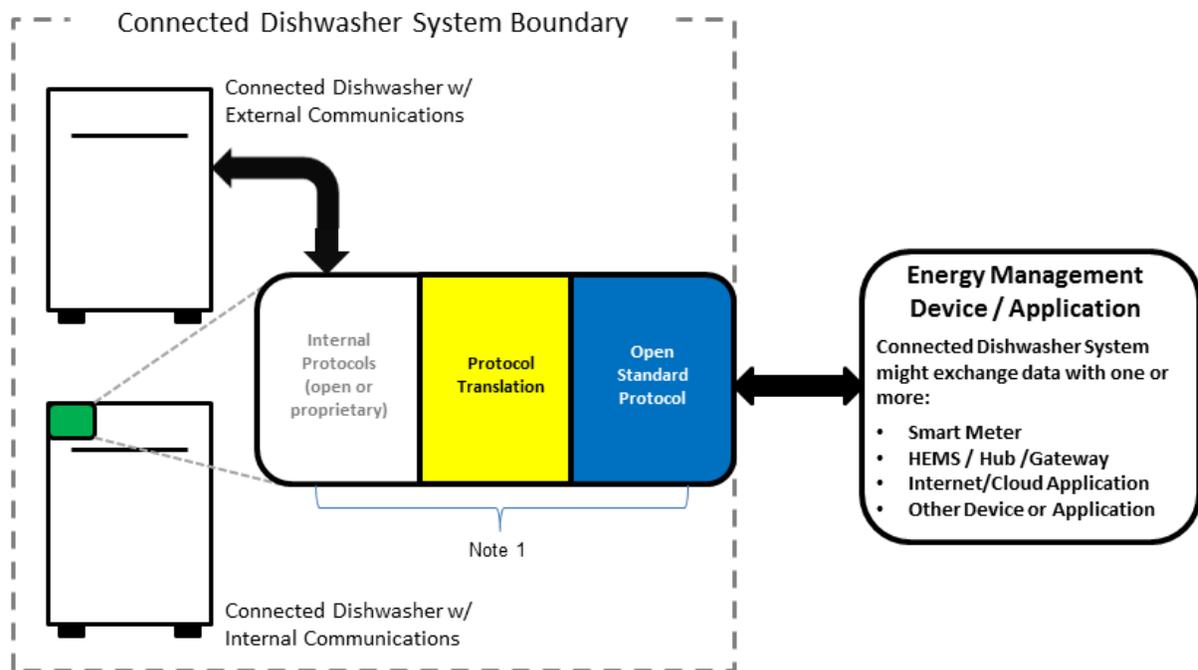
A. Connected Dishwasher System

To be recognized as connected and to be eligible for the connected allowance, a “connected dishwasher system” (as shown in Figure 1) shall include the base appliance plus all elements (hardware, software) required to enable communications in response to consumer-authorized energy related commands (*not including third-party remote management which may be made available solely at the discretion of the manufacturer*). These elements may be resident inside or outside of the base appliance.

The specific design and implementation of the connected dishwasher system is at the manufacturer’s discretion provided it is interoperable with other devices via open communications protocol and enables economical consumer-authorized third party access to the functionalities provided for in sections 5D, 5F, and 5G. The capabilities shall be supported through one or more means, as identified in section 5B2. A product that enables economical and direct, on-premises, open-standards based interconnection is the preferred option for meeting this requirement, but alternative approaches are also acceptable.

The product must continue to comply with the applicable product safety standards – the addition of the functionality described below shall not override existing safety protections and functions. The appliance must meet manufacturer’s internal minimum performance guidelines, e.g., cleaning performance.

Figure 1. Connected Dishwasher System Boundary – Illustrative Example



Note 1: Communication device(s), link(s) and/or processing that enables open standards-based communication between the connected dishwasher system and Energy Management Device/Application(s). These elements could be within the base appliance, and/or an external communication module, a hub/gateway, or in the Internet/cloud.

B. Communications

1. Open Standards – Communication with entities outside the connected dishwasher system that enables connected functionality (sections 5D, 5F, 5G) must use, for all communication layers, standards:
 - a. Included in the Smart Grid Interoperability Panel (SGIP) Catalog of Standards,⁴ and/or
 - b. Included in the NIST Smart Grid framework Tables 4.1 and 4.2, and/or
 - c. Adopted by the American National Standards Institute (ANSI) or another well-established international standards organization such as the International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), International Telecommunication Union (ITU), Institute of Electrical and Electronics Engineers (IEEE), or Internet Engineering Task Force (IETF).
2. Communications Hardware Architecture – Communication with entities outside the connected dishwasher system that enables connected functionality shall be enabled by any of the following means, according to the manufacturer's preference:
 - a. Built-in communication technology
 - b. Manufacturer-specific external communication module(s) and/or device(s)
 - c. Open standards-based communication port on the appliance combined with open standards-based communications module
 - d. Open standards-based communication port(s) on the appliance in addition to a, b or c, above

If option b or c is used, the communication module/device(s) must be easy for a consumer to install and shipped with the appliance, provided to the consumer at the time of sale, or provided to the consumer in a reasonable amount of time after the sale.

C. Open Access

To enable interconnection with the product, in addition to section 5B1 that requires open-standards, an interface specification, Application Programming Interface (API) or similar documentation shall be made available to interested parties that at a minimum, allows transmission, reception and interpretation of the following information:

1. Energy Consumption Reporting specified in section 5D (must include accuracy, units and measurement interval);
2. Operational Status, User Settings & Messages specified in section 5F (if transmitted via a communication link);
3. Demand Response specified in section 5G.

⁴ http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PMO#Catalog_of_Standards_Processes

D. Energy Consumption Reporting

In order to enable simple, actionable energy use feedback to consumers and consumer authorized energy use reporting to 3rd parties, the product shall be capable of transmitting energy consumption data via a communication link to energy management systems and other consumer authorized devices, services, or applications. This data shall be representative of the product's interval energy consumption. It is recommended that data be reported in watt-hours for intervals of 15 minutes or less, however, representative data may also be reported in alternate units and intervals as specified in the product manufacturer's interface specification or API detailed in section 5C.

The product may also provide energy use feedback to the consumer on the product itself. On-product feedback, if provided, may be in units and format chosen by the manufacturer (e.g., \$/month).

E. Remote Management

The product shall be capable of receiving and responding to consumer authorized remote requests (*not including third-party remote management which may be made available solely at the discretion of the manufacturer*), via a communication link, similar to consumer controllable functions on the product. The product is not required to respond to remote requests that would compromise performance and/or product safety as determined by the product manufacturer.

F. Operational Status, User Settings & Messages

1. The product shall be capable of providing the following information to energy management systems and other consumer authorized devices, services or applications via a communication link:
 - Operational / Demand Response (DR) status (e.g., off/standby, cycle in process, delay appliance load, temporary appliance load reduction).
2. The product shall be capable of providing the following information on the product and/or to energy management systems and other consumer authorized devices, services or applications via communication link:
 - At least two types of messages relevant to the energy consumption of the product. For example, messages for dishwashers might address performance issues or report energy consumption that is outside the product's normal range.

G. Demand Response

A connected dishwasher system shall have the capability to receive, interpret and act upon consumer-authorized signals by automatically adjusting its operation depending on both the signal's contents and settings from consumers. At a minimum, the product shall be capable of providing the following capabilities for all cycle and setting combinations, except where otherwise noted:

1. *Delay Appliance Load Capability*: The capability of the product to respond to a signal in accordance with consumer settings, except as permitted below, by delaying the start of an operating cycle beyond the delay period.
 - a. Default settings – The product shall ship with default settings that enable a response for at least 4 hours.
 - b. Consumer override – The consumer shall be able to override the product's Delay Appliance Load response before or during a delay period.
 - c. The product shall be able to provide a Delay Appliance Load response at the start of each consumer initiated operating cycle, but is not required to provide more than three Delay Appliance Load responses in a rolling 24-hour period (with a maximum of one 4-hour response per dishwasher cycle).

2. *Temporary Appliance Load Reduction Capability*: The capability of the product to respond to a signal by providing load reduction for a short time period, typically 10 minutes. Upon receipt of signal and in accordance with consumer settings, except as permitted below, the product shall restrict its average power draw during the load reduction period to no more than 250 watts.
 - a. Default settings - The product shall ship with default settings that enable a response for a time period of least 10 minutes.
 - b. The product is not required to provide a response if the consumer selected wash cycle is a cycle explicitly designed or primarily intended for sanitization, such as those in compliance with NSF/ANSI Standard 184. The product user documentation and/or the product itself must indicate that the cycle is designed or intended for sanitization.

Note: EPA encourages products to provide Temporary Appliance Load Reduction responses in these cycles whenever consumer expectations would not be impacted.
 - c. Consumer override – The consumer shall be able to override the product’s Temporary Appliance Load Reduction response before or during a load reduction period.
 - d. The product shall be able to provide at least one Temporary Appliance Load Reduction response per consumer initiated operating cycle.

H. Information to Consumers

If additional modules, devices, services and/or infrastructure are part of the configuration required to activate the product’s communications capabilities, prominent labels or other forms of consumer notifications with instructions shall be displayed at the point of purchase and in the product literature. These shall provide specific information on what consumers must do to activate these capabilities (e.g., *“This product has Wi-Fi capability and requires Internet connectivity and a wireless router to enable interconnection with an Energy Management System, and/or with other external devices, systems or applications.”*).

6) Test Requirements

- A. One of the following sampling plans shall be used for certification to ENERGY STAR.
 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 certify additional individual model variations within a Basic Model as long as the definition for Basic Model 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 § 429.19. The certified rating must be equal to or better than the ENERGY STAR specification requirements. Results of the tested unit may be used to certify additional model variations within a Basic Model as long as the definition provided above and in 10 CFR Part 430.2 is met.
- B. When testing residential dishwashers, the test methods specified in Table 4 shall be used to determine ENERGY STAR certification:

Table 4: Test Methods for ENERGY STAR Certification

ENERGY STAR Requirement	Test Method Reference
Energy Consumption (kWh/year)	10 CFR 430, Subpart B, Appendix C1 ¹
Water Consumption (gallons/cycle)	

¹And in accordance with any applicable DOE issued test procedure guidance, listed here: <http://www1.eere.energy.gov/guidance/default.aspx?pid=2&spid=1>

- C. Compliance with Connected functionality, as specified in Section 5, shall be through examination of product and/or product documentation. In addition, upon publication of a final test method, demand response functionality shall be tested using the ENERGY STAR Test Method for Residential Dishwashers to Validate Demand Response. After publication of the final Test Method, it must be used to certify demand response functionality in order for a product to remain listed as having connected functionality on the Qualified Product List, and to be eligible for any connected allowance.

7) Effective Date

The ENERGY STAR Residential Dishwasher specification shall take effect on **January 29, 2016**. To certify as 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 (e.g., month and year) on which a unit is considered to be completely assembled.

8) 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. Revisions to the specification will be 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.