



# ENERGY STAR® Program Requirements Product Specification for Residential Dishwashers

## Eligibility Criteria Final Draft Version 6.0

1 Following is the **Final Draft Version 6.0** ENERGY STAR Product Specification for Residential Dishwashers. A  
2 product shall meet all of the identified required criteria if it is to earn the ENERGY STAR.

### 3 **1) Definitions:**

4 Below are the definitions of the relevant terms in this document. Where noted below, definitions are identical  
5 to the definitions in the U.S Department of Energy (DOE) test procedure at 10 Code of Federal Regulations  
6 (CFR) 430, Subpart B, Appendix C1 or in 10 CFR 430.2. When in conflict, the definitions in the CFR take  
7 precedence.

- 8 A. Dishwasher<sup>1</sup>: A cabinet-like appliance which with the aid of water and detergent, washes, rinses, and  
9 dries (when a drying process is included) dishware, glassware, eating utensils, and most cooking  
10 utensils by chemical, mechanical and/or electrical means and discharges to the plumbing drainage  
11 system.
- 12 a. Compact Dishwasher<sup>2</sup>: A dishwasher that has a capacity of less than eight place settings plus six  
13 serving pieces as specified in ANSI/AHAM DW-1-2010 (incorporated by reference; see §430.3),  
14 using the test load specified in section 2.7 of 10 CFR 430, Subpart B, Appendix C1.
- 15 b. Standard Dishwasher<sup>2</sup>: A dishwasher that has a capacity equal to or greater than eight place  
16 settings plus six serving pieces as specified in ANSI/AHAM DW-1-2010 (incorporated by reference;  
17 see §430.3), using the test load specified in section 2.7 of 10 CFR 430, Subpart B, Appendix C1.
- 18 c. Portable Dishwasher<sup>3</sup>: A dishwasher which is not permanently connected to the household water  
19 and electric supply lines. It can be mounted on wheels and easily moved from one place to another  
20 in normal use. This definition includes dishwashers intended to be used on a countertop or table.
- 21 B. Basic Model<sup>1</sup>: All units of a given type of covered product (or class thereof) manufactured by one  
22 manufacturer, having the same primary energy source, and which have essentially identical electrical,  
23 physical, and functional (or hydraulic) characteristics that affect energy consumption, energy efficiency,  
24 water consumption, or water efficiency.
- 25 C. Consumer Product<sup>1</sup>: Any product (other than an automobile, as defined in Section 501(1) of the Motor  
26 Vehicle Information Cost Savings Act) which: (1) in operation consumes, or is designed to consume,  
27 energy and (2) to any significant extent, is distributed in commerce for personal use or consumption by  
28 individuals.  
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<sup>1</sup> 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.

<sup>2</sup> 10 CFR 430, Subpart B, Appendix C1

<sup>3</sup> ANSI/AHAM DW-1-2010

31 **2) Scope**

32 A. Included Products: Products that meet the definition of a dishwasher and are a consumer product as  
33 specified herein are eligible for ENERGY STAR certification, with the exception of products listed in  
34 Section 2B.

35 B. Excluded Products: Product types not specifically identified in Section 2A are not eligible for ENERGY  
36 STAR certification under this specification. Products that are covered under other ENERGY STAR  
37 product specifications (e.g., Commercial Dishwashers) are not eligible for certification under this  
38 specification.

39 **3) Certification Criteria**

40 A. Energy Performance Requirements

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

43 **Equation 1: Calculation of Maximum Annual Energy Consumption**

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

45 *where,*

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

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

48 **Table 1: Annual Energy Consumption Base Allowances**

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

49 **Table 2: Connected Allowance**

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

50 <sup>1</sup> There is no connected allowance for compact dishwashers.

51 <sup>2</sup> Product must be qualified using the final and validated ENERGY STAR Test Method for Residential  
52 Dishwashers to Validate Demand Response (TBD) to use the allowance.

53 <sup>3</sup> Calculated allowance shall be rounded down to the nearest whole number before being applied in Equation 1.  
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55 B. Water Performance Requirements

56 **Table 3: Maximum Water Consumption**

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

57 C. Significant Digits and Rounding: All calculations shall be carried out as specified in Appendix C1 to  
58 Subpart B of Part 430 and 10 CFR Part 430.23(c).

59 D. Model Numbers: Model numbers used for ENERGY STAR qualified product submissions shall be  
60 consistent with Federal Trade Commission (FTC) and Department of Energy (DOE) submissions.

61 **4) Optional Cleaning Performance Reporting**

62 The following optional cleaning performance reporting is applicable to those products included under Section  
63 2A. Partners are encouraged to provide one complete set of cleaning performance data for each ENERGY  
64 STAR certified product.

65 A. Data Reporting: The per-cycle Cleaning Index (CI) as defined in the ENERGY STAR Test Method for  
66 Determining Residential Dishwasher Cleaning Performance Section 5.3A, may be reported for each test  
67 cycle (heavy, medium, and light). If multiple units are tested, reported Cleaning Indices shall be in  
68 accordance with Section 4B of this specification. Cleaning performance data may be submitted directly  
69 to the ENERGY STAR program, or through the data reporting templates available to EPA recognized  
70 certification bodies.

71 B. Sampling Plan: For those basic models for which the manufacturer wishes to submit voluntary cleaning  
72 performance data, the CI should be calculated as the average of the units in the sample for each test  
73 cycle (heavy, medium, and light). The units comprising the sample must be the identical units (i.e., same  
74 serial numbers) used in determining the energy and water consumption and must be tested at the same  
75 lab pursuant to Section 6 of this specification.

76 C. Test Method: Testing of cleaning performance shall be performed using the ENERGY STAR Test  
77 Method for Residential Dishwasher Cleaning Performance (Rev. Feb-2014).

78 **5) Connected Criteria:**

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

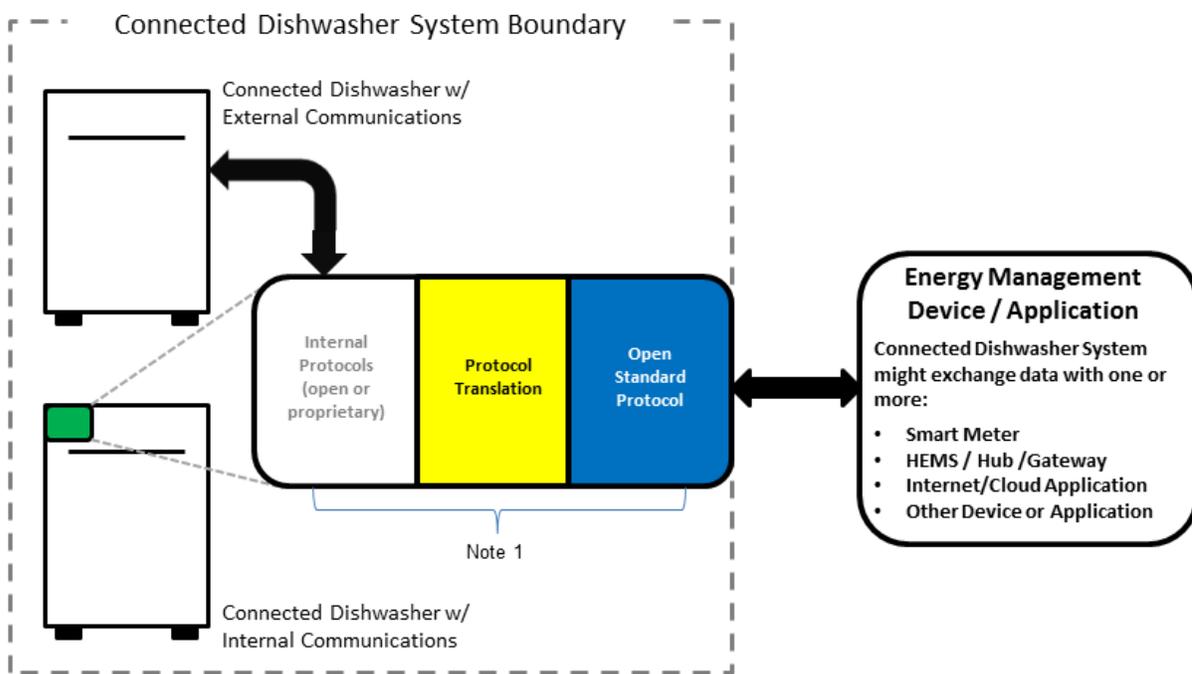
81 A. Connected Dishwasher System

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

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

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

96 **Figure 1.** Connected Dishwasher System Boundary – Illustrative Example



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

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B. Communications

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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:

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- a. Included in the Smart Grid Interoperability Panel (SGIP) Catalog of Standards,<sup>4</sup> 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).

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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:

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- 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

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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.

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C. Open Access

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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:

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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.

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<sup>4</sup> [http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PMO#Catalog\\_of\\_Standards\\_Processes](http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PMO#Catalog_of_Standards_Processes)

134 D. Energy Consumption Reporting

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

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

144 E. Remote Management

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

150 F. Operational Status, User Settings & Messages

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

161 G. Demand Response

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

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

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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 in accordance with 5G2a 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 that 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.

194 H. Information to Consumers

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

202 **6) Test Requirements**

- 203 A. One of the following sampling plans shall be used for certification to ENERGY STAR.  
204 1. A single unit is selected, obtained, and tested. The measured performance of this unit and of each  
205 subsequent unit manufactured must be equal to or better than the ENERGY STAR specification  
206 requirements. Results of the tested unit may be used to certify additional individual model variations  
207 within a Basic Model as long as the definition for Basic Model provided in Section 1, above, is met; or  
208 2. Units are selected for testing and results calculated according to the sampling requirements defined  
209 in 10 CFR Part 429, Subpart B § 429.16. The certified rating must be equal to or better than the  
210 ENERGY STAR specification requirements. Results of the tested unit may be used to certify  
211 additional model variations within a Basic Model as long as the definition provided above and in 10  
212 CFR Part 430.2 is met.  
213 B. When testing residential dishwashers, the test methods specified in Table 4 shall be used to determine  
214 ENERGY STAR certification:  
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**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 <sup>1</sup>
Water Consumption (gallons/cycle)	

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

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- C. Compliance with Connected functionality, as specified in Section 5, shall be through examination of product and/or product documentation. In addition, demand response functionality will be certified using the **TBD ENERGY STAR Test Method for Residential Dishwashers to Validate Demand Response** in order to be eligible for the connected allowance.

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### 7) Effective Date

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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.

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**Note:** EPA intends to finalize this Version 6.0 specification in April 2015. As such, the Version 6.0 Residential Dishwasher specification will take effect on January 29, 2016. As with other ENERGY STAR specifications, certification will be available once the specification is finalized.

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### 8) Future Specification Revisions

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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.