



ENERGY STAR® Program Requirements Product Specification for Residential Dishwashers

Eligibility Criteria Draft 2 Version 7.0

1 Following is the **Draft 2 Version 7.0** ENERGY STAR Product Specification for Residential Dishwashers.
2 A 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
5 identical to the definitions in the U.S Department of Energy (DOE) test procedure at 10 Code of
6 Federal Regulations (CFR) 430, Subpart B, Appendix C1 or in 10 CFR 430.2. When in conflict, the
7 definitions in the CFR take precedence.

- 8 A. Dishwasher¹: A cabinet-like appliance which with the aid of water and detergent, washes,
9 rinses, and dries (when a drying process is included) dishware, glassware, eating utensils, and
10 most cooking utensils by chemical, mechanical and/or electrical means and discharges to the
11 plumbing drainage system.
- 12 1. Compact Dishwasher²: A dishwasher that has a capacity of less than eight place settings
13 plus six serving pieces as specified in ANSI/AHAM DW-1-2010 (incorporated by reference;
14 see §430.3), using the test load specified in section 2.7 of 10 CFR 430, Subpart B,
15 Appendix C1.
- 16 2. Standard Dishwasher²: A dishwasher that has a capacity equal to or greater than eight
17 place settings plus six serving pieces as specified in ANSI/AHAM DW-1-2010 (incorporated
18 by reference; see §430.3), using the test load specified in section 2.7 of 10 CFR 430,
19 Subpart B, Appendix C1.
- 20 B. Basic Model¹: All units of a given type of covered product (or class thereof) manufactured by
21 one manufacturer, having the same primary energy source, and which have essentially identical
22 electrical, physical, and functional (or hydraulic) characteristics that affect energy consumption,
23 energy efficiency, water consumption, or water efficiency.
- 24 C. Consumer Product¹: Any product (other than an automobile, as defined in Section 501(1) of the
25 Motor Vehicle Information Cost Savings Act) which: (1) in operation consumes, or is designed to
26 consume, energy and (2) to any significant extent, is distributed in commerce for personal use or
27 consumption by individuals.

28 **Note:** In Draft 2, EPA will not move the key terms and their definitions from the connected criteria section
29 to the definitions section as proposed in Draft 1.

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

30 **2) Scope**

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

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

38 **Note:** EPA has updated the scope of included products to match that of the current specification,
39 ENERGY STAR V 6.0. The cleaning index threshold has been moved from Scope to the Test
40 Requirements section below.

41 **3) Certification Criteria**

42 A. Energy Performance Requirements

43 Annual Energy Consumption (*AEC*) shall be less than or equal to Maximum Annual Energy
44 Consumption (*AEC_{MAX}*).

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

Product Type	<i>AEC_{Max}</i> (kWh per year)
Standard Dishwashers	240
Compact Dishwashers	155

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47 B. Water Performance Requirements

48 **Table 3: Maximum Water Consumption**

Product Type	Water Consumption (gallons per cycle)
Standard Dishwashers	≤ 3.2
Compact Dishwashers	≤ 2.0

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

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

55 **Note:** In Draft 2, EPA is maintaining the proposed revisions to the minimum efficiency requirements for
56 residential dishwashers. The current ENERGY STAR criteria for residential dishwashers went into effect
57 on January 29, 2016, and ENERGY STAR market share is currently near 100%.

58 The EPA continues to support the connected criteria in Section 4 of this specification, and manufacturers
59 may still self-report their products as Connected if the models meet the criteria. EPA believes the
60 consumer value of connected appliances remains and that the market will reward the best
61 implementations. Further, with diminished returns for efficiency for dishwashers, providing a connected
62 adder is not in the best interest of the consumer. As such, EPA will not offer the connected adder to the
63 maximum for the Annual Energy Consumption for demand response capable residential dishwashers.

64 **4) Connected Criteria:**

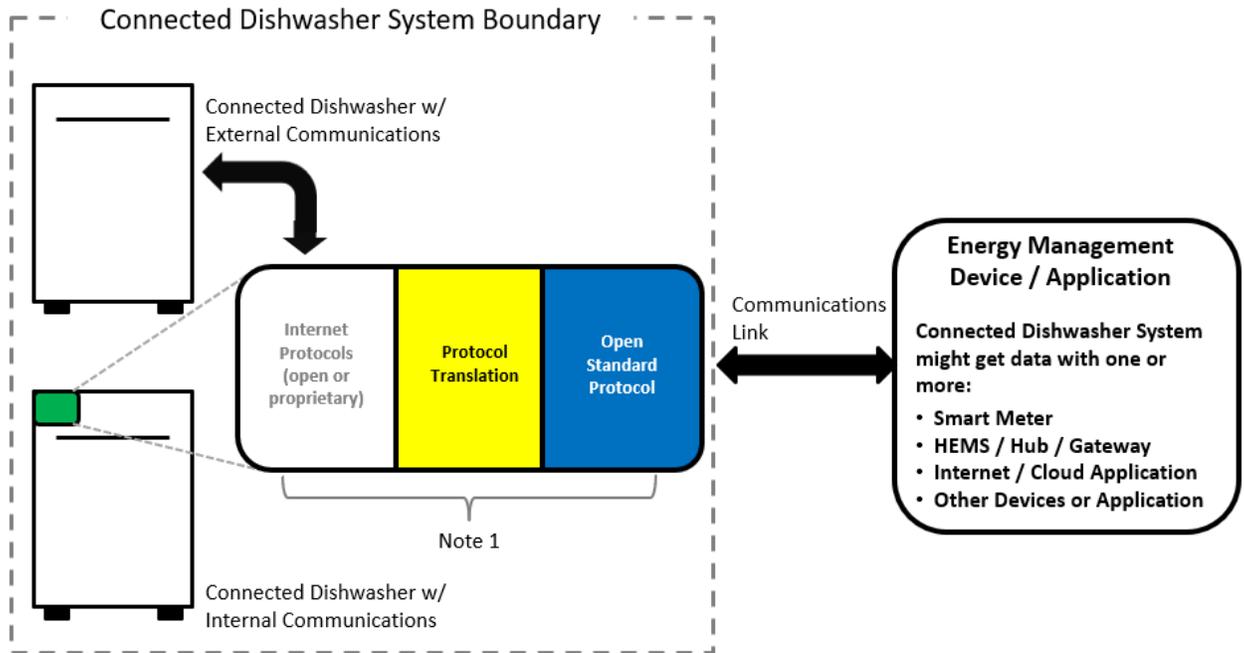
65 The following optional connected criteria are applicable to Included Products, Section 2.A, that meet
66 the definition of a standard dishwasher as defined in Section 1.A.1.

67 A. Connected Dishwasher System

68 To be recognized as connected and to be eligible for the connected allowance, a “Connected
69 Dishwasher System” (as shown in Figure 1) shall include the base appliance plus all elements
70 (hardware, software) required to enable communications in response to consumer-authorized
71 energy related commands (*not including third-party remote management which may be made*
72 *available solely at the discretion of the manufacturer*). These elements may be resident inside or
73 outside of the base appliance. This capability shall be supported through one or more means, as
74 identified in section 4.B.2.

75 The specific design and implementation of the Connected Dishwasher System is at the
76 manufacturer’s discretion provided it is interoperable with other devices via open communications
77 protocol and enables economical consumer-authorized third-party access to the functionalities
78 provided for in sections 4.D, 4.F, and 4.G. and the capabilities shall be supported through one or
79 more means, as identified in section 4.B.2. A product that enables economical and direct, on-
80 premises, open-standards based interconnection is the preferred option for meeting this
81 requirement, but alternative approaches are also acceptable.

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

Figure 1. Connected Dishwasher System Boundary – Illustrative Example

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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.

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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 4.D, 4.F, 4.G) must use, for all communication layers, standards:

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- a. Included in the Electric Power Alliance Catalog of Standards,³ 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:

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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

³<https://sepapower.org/knowledge/catalog-of-standards/>

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

114 C. Open Access

115 To enable interconnection with the product, in addition to section 4.B.1 that requires open-
116 standards, an interface specification, Application Programming Interface (API) or similar
117 documentation shall be made available to interested parties that at a minimum, allows
118 transmission, reception and interpretation of the following information:

- 119 1. Energy Consumption Reporting specified in section 4.D (must include accuracy, units and
120 measurement interval);
- 121 2. Operational Status, User Settings & Messages specified in section 4.F (if transmitted via a
122 communication link);
- 123 3. Demand Response specified in section 4.G.

124 D. Energy Consumption Reporting

125 To enable simple, actionable energy use feedback to consumers and consumer authorized
126 energy use reporting to third parties, the product shall be capable of transmitting energy
127 consumption data via a communication link to energy management systems and other consumer
128 authorized devices, services, or applications. This data shall be representative of the product's
129 interval energy consumption. It is recommended that data be reported in watt-hours for intervals
130 of 15 minutes or less, however, representative data may also be reported in alternate units and
131 intervals as specified in the product manufacturer's interface specification or API detailed in
132 Section 4.C.

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

136 E. Remote Management

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

142 F. Operational Status, User Settings & Messages

143 1. The product shall be capable of providing the following information to energy management
144 systems and other consumer authorized devices, services or applications via a
145 communication link:

- 146 • Operational / Demand Response (DR) status (for example: off, standby, cycle in
147 process, delay appliance load, temporary appliance load reduction).

148 2. The product shall be capable of providing the following information on the product and/or to
149 energy management systems and other consumer authorized devices, services or
150 applications via communication link:

- 151 • At least two types of messages relevant to the energy consumption of the product. For
152 example, messages for dishwashers might address performance issues or report energy
153 consumption that is outside the product's normal range.

154 G. Demand Response

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

160 1. *Delay Appliance Load (DAL) Capability*: The capability of the product to respond to a signal
161 in accordance with consumer settings, except as permitted below, by delaying the start of an
162 operating cycle beyond the delay period.

163 a. Default settings – The product shall ship with default settings that enable a response for
164 at least 4 hours.

165 b. Consumer override – The consumer shall be able to override the product's DAL response
166 before or during a delay period.

167 c. The product shall be able to provide a DAL response per consumer initiated operating
168 cycle, but is not required to provide more than three DAL responses in a rolling 24-hour
169 period (with a maximum of one 4-hour response per dishwasher cycle).

170 2. *Temporary Appliance Load Reduction (TALR) Capability*: The capability of the product to
171 respond to a signal by providing load reduction for a short time period, typically 10 minutes.
172 Upon receipt of signal and in accordance with consumer settings, except as permitted below,
173 the product shall restrict its average power draw during the load reduction period to no more
174 than 250 watts.

175 a. Default settings – The product shall ship with default settings that enable a response for a
176 time period of at least 10 minutes.

177 b. The product is not required to provide a response if the consumer selected wash cycle is
178 a cycle explicitly designed or primarily intended for sanitization, such as those in
179 compliance with NSF/ANSI Standard 184. The product user documentation and/or the
180 product itself must indicate that the cycle is designed or intended for sanitization.

181 **Note:** EPA encourages products to provide TALR responses in these cycles whenever
182 consumer expectations would not be impacted.

183 c. Consumer override – The consumer shall be able to override the product's TALR
184 response before or during a load reduction period.

185 d. The product shall be able to provide at least one TALR response during each consumer
186 initiated operating cycle.

187 Illustrative DR Examples:

188 1. The product receives a DAL signal with a 10-hour delay period. The consumer overrides
189 and starts a load. The product need not respond to subsequent DAL or TALR signals during
190 that cycle. However, after this cycle completes, the consumer must initiate a 2nd override in
191 order to start a second cycle without delay.

192 2. While running a cycle, the product receives and responds to a TALR signal. During its
193 response, the product receives a DAL signal with a 4-hour delay period. Since the consumer
194 has elected to override, the product does not need to respond to the DAL signal in the current
195 cycle. However, after this cycle completes, if within the DAL delay period; the consumer must
196 initiate an override in order to start a subsequent cycle without delay.

197 3. While running a cycle, the product receives and responds to a TALR signal. After its
198 response and within the same operational cycle, the product receives a second TALR signal.
199 Since the product is required to provide one TALR response per operating cycle, it does not
200 need to respond to the second signal.

201 H. Information to Consumers

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

209 **Note:** In Draft 2, EPA maintains the modest edits to the connected criteria section which updated the
210 language per the more recent appliance specifications' connected criteria. Having received no
211 substantive comments on these edits, EPA has left the proposed changes in the Draft 2.

212 **5) Test Requirements**

- 213 A. One of the following sampling plans shall be used for certification to ENERGY STAR.
- 214 1. A representative unit shall be selected for testing based on the definition for Basic Model
215 provided in Section 1 above; or
- 216 2. Units shall be selected for testing per the sampling requirements as defined in Table 4:

217 **Table 4: ENERGY STAR Sampling Requirements for Dishwashers**

Product	Code of Federal Regulations Reference
Residential Dishwashers	10 CFR § 429.20, which references 10 CFR § 429.11

- 218 B. When testing energy and water consumption of residential dishwashers, the per-cycle cleaning
219 index for the normal cycle, determined according to the Test Method specified in Table 5, must be
220 65 or higher for ENERGY STAR certification.
- 221 C. The following test methods shall be used to determine ENERGY STAR certification:

Table 5: Test Methods for ENERGY STAR Certification

ENERGY STAR Requirement	Test Method Reference
Energy Consumption (kWh/year)	10 CFR 430, Subpart B, Appendix C1*
Water Consumption (gallons/cycle)	
Cleaning Index	ENERGY STAR Test Method for Determining Residential Dishwasher Cleaning Performance (Rev. Feb-2014)

*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>

- 223 D. Compliance with Connected functionality, as specified in Section 4, shall be through examination
 224 of product and/or product documentation. In addition, upon publication of a final test method,
 225 demand response functionality shall be tested using the ENERGY STAR Test Method for
 226 Residential Dishwashers to Validate Demand Response. Once the final Test Method is published,
 227 it must be used to certify demand response functionality in order for a product to remain listed as
 228 having connected functionality on the Certified Product List, and to be eligible for any connected
 229 allowance.

230 **Note:** For Draft 2, EPA has amended the ENERGY STAR Testing Requirements section to specify that
 231 the per-cycle cleaning index for the normal cycle must be 65 or higher for ENERGY STAR certification.
 232 EPA has revised the threshold per-cycle cleaning index to 65 from 70 in reference to the cleaning
 233 performance analysis discussed in [DOE's Notice of Proposed Rulemaking \(NOPR\) for the test procedure](#)
 234 [for dishwashers](#) (86 FR 72738) published on December 22, 2021. EPA will update the ENERGY STAR
 235 specification for residential dishwashers to reference DOE's revised test procedure once it is required

236 Consistent with the ENERGY STAR Guiding Principles, EPA is committed to ensuring that the label is
 237 associated with products that deliver energy efficiency without compromise in performance. Guarding
 238 against performance trade-offs becomes more important as efficiency requirements become more
 239 stringent. Manufacturers have cautioned that if product performance does not meet consumer
 240 expectations, efficiency savings will be negated by the use of more intensive energy and water cycles or
 241 the increased instances of handwashing.

242 Cleaning performance in dishwashers has been part of the ENERGY STAR program through the
 243 ENERGY STAR Most Efficient criteria since 2015. Since the publication of the ENERGY STAR cleaning
 244 performance test method in February 2014, manufacturers have submitted 110 models to ENERGY
 245 STAR that include cleaning performance data with their certification.

246 **6) Effective Date**

247 The ENERGY STAR Residential Dishwasher specification shall take effect on **TBD**. To certify as
 248 ENERGY STAR, a product model shall meet the ENERGY STAR specification in effect on the date of
 249 manufacture. The date of manufacture is specific to each unit and is the date (e.g., month and year)
 250 on which a unit is considered to be completely assembled.

251 **Note:** EPA expects Version 7.0 to be effective 9 months after the Final specification is published.

252 **7) Future Specification Revisions**

253 EPA reserves the right to change the specification should technological and/or market changes affect
254 its usefulness to consumers, industry, or the environment. Revisions to the specification will be
255 arrived at through industry discussions. In the event of a specification revision, please note that the
256 ENERGY STAR certification is not automatically granted for the life of a product model.