



ENERGY STAR® Product Specification for Imaging Equipment

Eligibility Criteria Draft Version 3.2

1 Following is the Draft Version 3.2 ENERGY STAR Product Specification for Imaging Equipment. A
2 product shall meet all of the identified criteria if it is to earn the ENERGY STAR.

3 **1 DEFINITIONS**

4 A) Product Types:

5 1) Printer: A product whose primary function is to generate paper output from electronic input. A
6 printer is capable of receiving information from single-user or networked computers, or other input
7 devices (e.g., digital cameras). This definition is intended to cover products that are marketed as
8 printers and printers that can be field-upgraded to meet the definition of an MFD.

9 2) Scanner: A product whose primary function is to convert paper originals into electronic images
10 that can be stored, edited, converted, or transmitted, primarily in a personal computing
11 environment. This definition is intended to cover products that are marketed as scanners.

12 3) Copier: A product whose sole function is to produce paper duplicates from paper originals. This
13 definition is intended to cover products that are marketed as copiers, and upgradeable digital
14 copiers (UDCs).

15 4) Facsimile (Fax) Machine: A product whose primary functions are (1) to scan paper originals for
16 electronic transmission to remote units, and (2) to receive electronic transmissions for conversion
17 to paper output. A fax machine may also be capable of producing paper duplicates. Electronic
18 transmission is primarily over a public telephone system, but may also be via a computer network
19 or the Internet. This definition is intended to cover products that are marketed as fax machines.

20 5) Multifunction Device (MFD): A product that performs the core functions of a Printer and Scanner.
21 An MFD may have a physically integrated form factor, or it may consist of a combination of
22 functionally integrated components. MFD copy functionality is considered to be distinct from
23 single-sheet convenience copying functionality sometimes offered by fax machines. This
24 definition includes products marketed as MFDs and “multi-function products” (MFPs).

25 6) Digital Duplicator: A product sold as a fully-automated duplicator system through the method of
26 stencil duplicating with digital reproduction functionality. This definition is intended to cover
27 products that are marketed as digital duplicators.

28 7) Mailing Machine: A product whose primary function is to print postage onto mail pieces. This
29 definition is intended to cover products that are marketed as mailing machines.

30 8) Professional Imaging Product: A printer or MFD marketed as intended for producing deliverables
31 for sale, with the following features:

32 a) Supports paper with basis weight greater than or equal to 141 g/m²;

33 b) A3-capable;

34 c) If product is monochrome, monochrome product speed equal to or greater than 86 ipm;

- 35 d) If product is color, color product speed equal to or greater than 50 ipm;
- 36 e) Print resolution of 600 × 600 dots per inch or greater for each color;
- 37 f) Weight of the base model greater than 180 kg; and
- 38 **Five** of the following additional features for color products or **four** for monochrome products,
39 included standard with the Imaging Equipment product or as an accessory:
- 40 g) Paper capacity equal to or greater than 8,000 sheets;
- 41 h) Digital front-end (DFE);
- 42 i) Hole punch;
- 43 j) Perfect binding or ring binding (or similar, such as tape or wire binding, but not staple
44 saddle stitching);
- 45 k) Dynamic random access memory (DRAM) storage equal to or greater than 1,024 MB.
- 46 l) Third-party color certification (e.g., IDEAlliance Digital Press Certification, FOGRA
47 Validation Printing System Certification, or Japan Color Digital Printing Certification, if
48 product is color capable); and
- 49 m) Coated paper compatibility.

50 9) Remanufactured Imaging Equipment: Product that meets one of the product types defined in
51 Section 1.A)1-8)), which has been returned to a “like new” state of the base model, including
52 energy performance, by the manufacturer, utilizing new and/or reused components from the
53 original equipment manufacturer.

54 B) Marking Technologies:

- 55 1) Direct Thermal (DT): A marking technology characterized by the burning of dots onto coated print
56 media that is passed over a heated print head. DT products do not use ribbons.
- 57 2) Dye Sublimation (DS): A marking technology characterized by the deposition (sublimation) of dye
58 onto print media as energy is supplied to heating elements.
- 59 3) Electro-photographic (EP): A marking technology characterized by the illumination of a
60 photoconductor in a pattern representing the desired output image via a light source,
61 development of the image with particles of toner using the latent image on the photoconductor to
62 define the presence or absence of toner at a given location, transfer of the toner to the final print
63 media, and fusing to cause the output to become durable. For purposes of this specification,
64 Color EP products simultaneously offer three or more unique toner colors, while Monochrome EP
65 products simultaneously offer one or two unique toner colors. This definition includes Laser, Light
66 Emitting Diode (LED), and Liquid Crystal Display (LCD) illumination technologies.
- 67 4) Impact: A marking technology characterized by the formation of the desired output image by
68 transferring colorant from a “ribbon” to the print media via an impact process. This definition
69 includes Dot Formed Impact and Fully Formed Impact.
- 70 5) Ink Jet (IJ): A marking technology characterized by the deposition of colorant in small drops
71 directly to the print media in a matrix manner. For purposes of this specification, Color IJ products
72 offer two or more unique colorants at one time, while Monochrome IJ products offer one colorant
73 at a time. This definition includes Piezo-electric (PE) IJ, IJ Sublimation, and Thermal IJ. This
74 definition does not include High Performance IJ.

75 6) High Performance IJ: An IJ marking technology that includes nozzle arrays that span the width of
76 a page and/or the ability to dry ink on the print media via supplemental media heating
77 mechanisms. High-performance IJ products are used in business applications usually served by
78 electro-photographic marking products.

79 7) Solid Ink (SI): A marking technology characterized by ink that is solid at room temperature and
80 liquid when heated to the jetting temperature. This definition includes both direct transfer and
81 offset transfer via an intermediate drum or belt.

82 8) Stencil: A marking technology characterized by the transfer of images onto print media from a
83 stencil that is fitted around an inked drum.

84 9) Thermal Transfer (TT): A marking technology characterized by the deposition of small drops of
85 solid colorant (usually colored waxes) in a melted/fluid state directly to print media in a matrix
86 manner. TT is distinguished from IJ in that the ink is solid at room temperature and is made fluid
87 by heat.

88 C) Operational Modes:

89 1) On Mode:

90 a) Active State: The power state in which a product is connected to a power source and is
91 actively producing output, as well as performing any of its other primary functions.

92 b) Ready State: The power state in which a product is not producing output, has reached
93 operating conditions, has not yet entered into any lower-power modes, and can enter Active
94 State with minimal delay. All product features can be enabled in this state, and the product is
95 able to return to Active State by responding to any potential inputs, including external
96 electrical stimulus (e.g., network stimulus, fax call, or remote control) and direct physical
97 intervention (e.g., activating a physical switch or button).

98 2) Off Mode: The power state that the product enters when it has been manually or automatically
99 switched off but is still plugged in and connected to the mains. This mode is exited when
100 stimulated by an input, such as a manual power switch or clock timer to bring the unit into Ready
101 State. When this state is resultant from a manual intervention by a user, it is often referred to as
102 Manual Off, and when it is resultant from an automatic or predetermined stimulus (e.g., a delay
103 time or clock), it is often referred to as Auto-off.¹

104 3) Sleep Mode: A reduced power state that a product enters either automatically after a period of
105 inactivity (i.e., Default Delay Time), in response to user manual action (e.g., at a user-set time of
106 day, in response to a user activation of a physical switch or button), or in response to external
107 electrical stimulus (e.g., network stimulus, fax call, remote control). For products evaluated under
108 the TEC test method, Sleep Mode permits operation of all product features (including
109 maintenance of network connectivity), albeit with a possible delay to transition into Active State.
110 For products evaluated under the OM test method, Sleep Mode permits operation of a single
111 active network interface, as well as a fax connection if applicable, albeit with a possible delay to
112 transition into Active State.

113 D) Media Format:

114 1) Large Format: Products designed for A2 media and larger, including those designed to
115 accommodate continuous form media greater than or equal to 406 mm wide. Large-format
116 products may also be capable of printing on standard-size or small-format media.

1 For the purposes of this specification “mains” or the “main electricity supply” refers to the input power source, including a dc power supply for products that operate solely off dc power.

117 2) Standard Format: Products designed for standard-sized media (e.g., Letter, Legal, Ledger, A3,
118 A4, B4), including those designed to accommodate continuous form media between 210 mm and
119 406 mm wide. Standard-size products may also be capable of printing on small-format media.

120 a) A3-capable: Standard Format products with a paper path width equal to or greater than
121 275 mm.

122 3) Small Format: Products designed for media sizes smaller than those defined as Standard (e.g.,
123 A6, 4"x6", microfilm), including those designed to accommodate continuous form media less than
124 210 mm wide.

125 4) Continuous Form: Products that do not use a cut-sheet media format and that are designed for
126 applications such as printing of bar codes, labels, receipts, banners, and engineering drawings.
127 Continuous Form products can be Small, Standard, or Large Format.

128 E) Additional Terms:

129 1) Automatic Duplexing: The capability of an MFD or printer to produce images on both sides of an
130 output sheet, without manual manipulation of output as an intermediate step. A product is
131 considered to have automatic duplexing capability only if all accessories needed to produce a
132 duplex output are included with the product upon shipment.

133 2) Data Connection: A connection that permits the exchange of information between the Imaging
134 Equipment and one external powered device or storage medium.

135 3) Default Delay Time: The time set by the manufacturer prior to shipping that determines when the
136 product will enter a lower-power mode (e.g., Sleep, Auto-off) following completion of its primary
137 function.

138 4) Recovery Time: The time it takes for a device to return from a Sleep or Off Mode to a Ready
139 State.

140 5) Digital Front-end (DFE): A functionally-integrated server that hosts other computers and
141 applications and acts as an interface to Imaging Equipment. A DFE provides greater functionality
142 to the Imaging Equipment.

143 a) A DFE offers three or more of the following advanced features:

- 144 i. Network connectivity in various environments;
- 145 ii. Mailbox functionality;
- 146 iii. Job queue management;
- 147 iv. Machine management (e.g., waking the Imaging Equipment from a reduced power
148 state);
- 149 v. Advanced graphic user-interface (UI);
- 150 vi. Ability to initiate communication with other host servers and client computers (e.g.,
151 scanning to email, polling remote mailboxes for jobs); or
- 152 vii. Ability to post-process pages (e.g., reformatting pages prior to printing).

153 b) Type 1 DFE: A DFE that draws its dc power from its own ac power supply (internal or
154 external), which is separate from the power supply that powers the Imaging Equipment. This
155 DFE may draw its ac power directly from a wall outlet, or it may draw it from the ac power
156 associated with the Imaging Equipment's internal power supply. A Type 1 DFE may be sold
157 standard with the Imaging Equipment product or as an accessory.

- 158 c) Type 2 DFE: A DFE that draws its dc power from the same power supply as the Imaging
159 Equipment with which it operates. Type 2 DFEs must have a board or assembly with a
160 separate processing unit that is capable of initiating activity over the network and can be
161 physically removed, isolated, or disabled using common engineering practices to allow power
162 measurements to be made.
- 163 d) Professional Digital Front-end (DFE): A DFE which meets **all** of the following criteria:
- 164 i. Is sold with a product defined above as a Professional Imaging Product;
 - 165 ii. has processor performance per socket² equal to or greater than 20;
 - 166 iii. provides support for buffered memory (including both buffered dual in-line memory
167 modules (DIMMs) and buffered on board (BOB) configurations).
 - 168 iv. is packaged and sold with one or more ac-dc or dc-dc power supplies; and
 - 169 v. is designed such that all processors have access to shared system memory.
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- 171 e) Auxiliary Processing Accelerator (APA): A computing expansion add-in card installed in a
172 general-purpose add-in expansion slot of the DFE (e.g., GPGPU installed in a PCI slot).
- 173 6) Network Connection: A connection that permits the exchange of information between the Imaging
174 Equipment and one or more external powered devices.
- 175 7) Functional Adder: A data or network interface or other component that adds functionality to the
176 marking engine of an Imaging Equipment product and provides a power allowance when
177 certifying products according to the OM method.
- 178 8) Operational Mode (OM): For the purposes of this specification, a method of comparing product
179 energy performance via an evaluation of power (measured in watts) in various operating states,
180 as specified in Section 9 of the ENERGY STAR Imaging Equipment Test Method.
- 181 9) Typical Electricity Consumption (TEC): For the purposes of this specification, a method of
182 comparing product energy performance via an evaluation of typical electricity consumption
183 (measured in kilowatt-hours) during normal operation over a specified period of time, as specified
184 in Section 8 of the ENERGY STAR Imaging Equipment Test Method.
- 185 10) Marking Engine: The fundamental engine of an Imaging Equipment product that drives image
186 production. A marking engine relies upon functional adders for communication ability and image
187 processing. Without functional adders and other components, a marking engine cannot acquire
188 image data for processing and is non-functional.
- 189 11) Base Product: The most fundamental configuration of a particular Product Model, which
190 possesses the minimum number of functional adders available. Optional components and
191 accessories are not considered part of a base product.
- 192 12) Accessory: A piece of peripheral equipment that is not necessary for the operation of the Base
193 Product, but that may be added before or after shipment in order to add functionality. An
194 accessory may be sold separately under its own model number, or sold with a base product as
195 part of a package or configuration.
- 196 13) Product Model: An Imaging Equipment product that is sold or marketed under a unique model
197 number or marketing name. A product model may be comprised of a base product or a base
198 product plus accessories.

2 Processor performance per socket = [# of processor cores] x [processor clock speed (GHz)], where # of cores represents the number of physical cores and processor clock speed represents the Max TDP core base frequency for a given processor.

199 14) Product Family³: A group of product models that are (1) made by the same manufacturer, (2)
 200 subject to the same ENERGY STAR certification criteria, and (3) of a common basic design.
 201 Product models within a family differ from each other according to one or more characteristics or
 202 features that either (1) have no impact on product performance with regard to ENERGY STAR
 203 certification criteria, or (2) are specified herein as acceptable variations within a product family.
 204 For Imaging Equipment, acceptable variations within a product family include:

- 205 a) Color,
- 206 b) Housing,
- 207 c) Input or output paper-handling accessories,
- 208 d) Electronic components not associated with the marking engine of the Imaging Equipment
 209 product, including Type 1 and Type 2 DFEs.

210 2 SCOPE

211 2.1 Included Products

212 2.1.1 Commercially-available products that meet one of the Imaging Equipment definitions in
 213 Section 1.A) and are capable of being powered from (1) a wall outlet, (2) a data or network
 214 connection, or (3) both a wall outlet and a data or network connection, are eligible for
 215 ENERGY STAR certification, with the exception of products listed in Section 2.2.

216 2.1.2 An Imaging Equipment (except Professional Equipment) product must further be classified
 217 as either “TEC” or “OM” in Table 1, below, depending on the method of ENERGY STAR
 218 evaluation.

219 **Table 1: Evaluation Methods for Imaging Equipment (New or Remanufactured)**

| Equipment Type | Media Format | Marking Technology | ENERGY STAR Evaluation Method |
|----------------------------|----------------|---|-------------------------------|
| Digital Duplicator | Standard | Stencil | TEC |
| Mailing Machine | All | DT, EP, IJ, TT | OM |
| Multifunction Device (MFD) | Standard | High Performance IJ, DT, DS, EP, SI, TT | TEC |
| | | IJ, Impact | OM |
| | Large | High Performance IJ, DT, DS, EP, IJ, SI, TT | OM |
| Printer | Standard | High Performance IJ, DT, DS, EP, SI, TT | TEC |
| | | IJ, Impact | OM |
| | Large or Small | DT, DS, EP, Impact, IJ, SI, TT | OM |
| | Large | High Performance IJ | OM |
| | Small | High Performance IJ | TEC |
| Scanner | All | N/A | OM |

³ Product families may include remanufactured imaging equipment products, so long as they meet the requirements for a product family.

| Equipment Type | Media Format | Marking Technology | ENERGY STAR Evaluation Method |
|-------------------------------|--------------|--------------------|--|
| Professional Imaging Products | All | All | Production Efficiency (Section 3.4.3) and Ready Mode Power (Section 3.4.4) |

220 **Note:** With the publication of the Test Method for Professional Imaging Products, EPA has proposed new
 221 criteria for Professional Imaging Equipment, as outlined in Section 3.4. As such, professional products are
 222 no longer evaluated per the TEC evaluation method.

223 All Professional Imaging Products already certified through the TEC requirements in Version 3.0 or 3.1
 224 may retain their ENERGY STAR certification without the need for recertification. However, EPA
 225 encourages manufacturers to retest products per the ENERGY STAR Professional Imaging Equipment
 226 Test Method and submit obtained data so that they may be better compared against newly certified
 227 products.

228 2.2 Excluded Products

229 2.2.1 Products that are covered under other ENERGY STAR product specifications are not
 230 eligible for certification under this specification. The list of specifications currently in effect
 231 can be found at www.energystar.gov/products.

232 2.2.2 Products that satisfy one or more of the following conditions are not eligible for ENERGY
 233 STAR certification under this specification:

- 234 i. Products that are designed to operate directly on three-phase power;
- 235 ii. Standalone Copiers; and
- 236 iii. Standalone Fax Machines.

237 3 CERTIFICATION CRITERIA

238 3.1 Significant Digits and Rounding

239 3.1.1 All calculations shall be carried out with directly measured (unrounded) values.

240 3.1.2 Unless otherwise specified, compliance with specification limits shall be evaluated using
 241 directly measured or calculated values without any benefit from rounding.

242 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY
 243 STAR website shall be rounded to the nearest significant digit as expressed in the
 244 corresponding specification limit.

245 3.2 General Requirements

246 3.2.1 External Power Supply (EPS): Single- and Multiple-voltage EPSs shall meet the Level VI
 247 or higher performance requirements under the International Efficiency Marking Protocol
 248 when tested according to the Uniform Test Method for Measuring the Energy
 249 Consumption of External Power Supplies, Appendix Z to 10 CFR Part 430.

- 250 i. Single-voltage EPSs shall include the Level VI or higher marking.
- 251 ii. Multiple-voltage EPSs meeting Level VI or higher shall include the Level VI or higher
 252 marking.

- 253 iii. Additional information on the Marking Protocol is available
 254 at <http://www.regulations.gov#!documentDetail;D=EERE-2008-BT-STD-0005-0218>.
 255 iv. The above requirements shall not apply to any EPSs shipped with a Digital Front End (DFE).

256 3.2.2 Additional Cordless Handset: Fax machines and MFDs with fax capability that are sold
 257 with additional cordless handsets shall use an ENERGY STAR certified handset, or one
 258 that meets the ENERGY STAR Telephony specification when tested to the ENERGY
 259 STAR test method on the date the Imaging Equipment product is certified as ENERGY
 260 STAR. The ENERGY STAR specification and test method for telephony products may be
 261 found at www.energystar.gov/products.

262 3.2.3 Functionally Integrated MFD: If a MFD consists of a set of functionally integrated
 263 components (i.e., the MFD is not a single physical device), the sum of the measured
 264 energy or power consumption for all components shall be less than or equal to the
 265 relevant MFD energy or power consumption requirements for ENERGY STAR
 266 certification.

267 3.2.4 DFE Requirements for Non-Professional Imaging Products: The Typical Electricity
 268 Consumption (TEC_{DFE}) of a Type 1 or Type 2 DFE sold with an Imaging Equipment
 269 product at the time of sale shall be calculated using Equation 1 for a DFE without Sleep
 270 Mode or Equation 2 for a DFE with Sleep Mode. The resulting TEC_{DFE} value shall be less
 271 than or equal to the maximum TEC_{DFE} requirement specified in Table 2 for the given DFE
 272 type.

- 273 i. For Type 1 DFEs that meet the relevant TEC_{DFE} requirement, the DFE should be excluded
 274 from the TEC energy or OM power measurements.
 275 ii. For Type 2 DFEs that meet the relevant TEC_{DFE} requirement, the TEC value or Ready State
 276 power of the DFE should be subtracted or excluded from the TEC energy or OM power
 277 measurements of the Imaging Equipment product.
 278 iii. Section 3.3.2 provides further detail on subtracting TEC_{DFE} values from TEC products with
 279 Type 2 DFEs;
 280 iv. Section 3.5.2 provides further detail for excluding Type 2 DFE power from OM Sleep and Off
 281 Mode levels.
 282 v. Imaging Equipment products with DFEs that fail to meet these requirements may be certified
 283 without subtracting or excluding the DFE power from that of the Imaging Equipment product
 284 as a whole. The combined energy consumption of the DFE and the Imaging Equipment must
 285 be below the appropriate requirement.

286 **Equation 1: TEC_{DFE} Calculation for Digital Front Ends without Sleep Mode**

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$$TEC_{DFE} = \frac{168 \times P_{DFE_READY}}{1000}$$

288
 289 *Where:*

- 290 • TEC_{DFE} is the typical weekly energy consumption for DFEs, expressed in
 291 kilowatt-hours (kWh) and rounded to the nearest 0.1 kWh for reporting;
 292 • P_{DFE_READY} is Ready State power measured in the test procedure in watts.

293 **Equation 2: TEC_{DFE} Calculation for Digital Front Ends with Sleep Mode**

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$$TEC_{DFE} = \frac{(45 \times P_{DFE_READY}) + (123 \times P_{DFE_SLEEP})}{1000}$$

295
 296 *Where:*

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- TEC_{DFE} is the typical weekly energy consumption for DFEs, expressed in kilowatt-hours (kWh) and rounded to the nearest 0.1 kWh for reporting;
- P_{DFE_READY} is the DFE Ready State power measured in the test procedure in watts.
- P_{DFE_SLEEP} is the DFE Sleep Mode power measured in the test procedure in watts.

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Table 2: Maximum TEC_{DFE} Requirements for Type 1 and Type 2 DFEs

| DFE Category | Category Description | Maximum TEC_{DFE} (kWh/week) | |
|--------------|---|--------------------------------|------------|
| | | Type 1 DFE | Type 2 DFE |
| A | All DFEs that do not meet the definition of Category B will be considered under Category A for ENERGY STAR certification. | 7 | 3 |
| B | To be certified under Category B DFEs must have: 2 or more physical CPUs or 1 CPU and ≥ 1 discrete Auxiliary Processing Accelerators (APAs) | 12 | 3 |

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3.2.5 Default Delay Time Requirements for Non-Professional Imaging Products: Measured Default Delay Time to Sleep ($t_{DEFAULT}$) shall be less than or equal to the Required Default Delay Time to Sleep ($t_{DEFAULT_REQ}$) requirement specified in Table 3, subject to the following conditions:

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- When reporting data and certifying products that can enter Sleep Mode in multiple ways, partners should reference a Sleep level that can be reached automatically. If the product is capable of automatically entering multiple, successive Sleep levels, it is at the manufacturer's discretion which of these levels is used for certification purposes; however, the default-delay time provided must correspond with whichever level is used.
- Default Delay Time does not apply to OM products that can meet Sleep Mode requirements in Ready State.
- The Default Delay Time to Sleep may not be adjusted by the user to be greater than the Maximum Delay Times to Sleep Adjustable by the User, as specified in Table 4.

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Table 3: Required Default Delay Time to Sleep for OM and TEC Products

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| Monochrome Product Speed, s , as Calculated in the Test Method (ipm or mppm) | Required Default Delay Time to Sleep, $t_{DEFAULT_REQ}$ for MFDs, Scanners, Mailing Machines, and Digital Duplicators with Copying Capability (minutes) | Required Default Delay Time to Sleep, $t_{DEFAULT_REQ}$, for Printers and Digital Duplicators without Copying Capability (minutes) |
|--|--|--|
| $s \leq 10$ | 15 | 5 |
| $10 < s \leq 20$ | 30 | 15 |
| $20 < s \leq 30$ | 45 | 30 |
| $30 < s \leq 50$ | 45 | 45 |
| $s > 50$ | 45 | 45 |

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Table 4: Maximum Delay Times to Sleep Adjustable by the User

| All Devices with a Monochrome Product Speed, s | Maximum Delay Times for Sleep Mode Adjustable by the User (min) |
|--|---|
| s ≤ 30 | 60 |
| s > 30 | 120 |

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334 **3.3 Requirements for Typical Electricity Consumption (TEC) Products, Excluding**
 335 **Professional Imaging Products**

336 3.3.1 Automatic Duplexing Capability: For all MFDs and printers subject to the TEC test method,
 337 automatic duplexing capability shall be integral to the base product and duplex printing
 338 must be set as default for products with speed greater than those specified in Table 5.
 339 Printers whose intended function is to print on special single-sided media for the purpose
 340 of single sided printing (e.g., release coated paper for labels, direct thermal media, etc.)
 341 are exempt from this requirement.

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Table 5: Automatic Duplexing Requirements for all TEC MFDs and Printers

| Product Type | Product Speed (ipm) |
|--------------|---------------------|
| Color | s > 19 |
| Monochrome | s > 24 |

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345 3.3.2 Typical Electricity Consumption: Calculated Typical Electricity Consumption (TEC_{2018}) per
 346 Equation 3 or Equation 4 shall be less than or equal to the Maximum TEC Requirement
 347 (TEC_{MAX}) specified in Equation 6.

- 348 i. For Imaging Equipment with a Type 2 DFE that meets the Type 2 DFE maximum TEC_{DFE}
 349 requirement in Table 2, the measured energy consumption of the DFE shall be divided by
 350 0.80 to account for internal power supply losses and then excluded when comparing the
 351 product's measured TEC value to TEC_{MAX} and for reporting.
- 352 ii. For Imaging Equipment with a DFE that does not meet the DFE maximum TEC_{DFE}
 353 requirement, the measured TEC value must meet the TEC_{MAX} without any subtractions or
 354 exclusions for the DFE.
- 355 iii. The DFE shall not interfere with the ability of the Imaging Equipment to enter or exit its lower-
 356 power modes.

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Example: A printer's total TEC result is 24.50 kWh/wk and its Type 2 TEC_{DFE} value calculated in Section 3.2.4 is 9.0 kWh/wk. The TEC_{DFE} value is then divided by 0.80 to account for internal power supply losses with the Imaging Equipment in Ready State, resulting in 11.25 kWh/wk. The power supply adjusted value is subtracted from the tested TEC value: 24.50 kWh/wk – 11.25 kWh/wk = 13.25 kWh/wk. This 13.25 kWh/wk result is then compared to the relevant TEC_{MAX} to determine certification.

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- 364 iv. For printers, digital duplicators with print capability, and MFDs with print capability, TEC shall
 365 be calculated per Equation 3.

366 **Equation 3: TEC Calculation for Printers, Fax Machines, Digital Duplicators**
 367 **with Print Capability, and MFDs with Print Capability**

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$$TEC_{2018} = \left[5 \times \left(E_{JOB_DAILY} + (2 \times E_{FINAL}) + \left[24 - \frac{N_{JOBS}}{16} - (2 \times t_{FINAL}) \right] \times \frac{E_{SLEEP}}{t_{SLEEP}} \right) + 48 \times \frac{E_{SLEEP}}{t_{SLEEP}} \right],$$

369 *Where:*

- 370 • *TEC₂₀₁₈ is the typical weekly energy consumption for printers, digital*
- 371 *duplicators with print capability, and MFDs with print capability, expressed*
- 372 *in kilowatt-hours (kWh) and rounded to the nearest 0.01 kWh for reporting;*
- 373 • *E_{JOB_DAILY} is the daily job energy, as calculated per Equation 5, in kWh;*
- 374 • *E_{FINAL} is the final energy, as measured in the test procedure, converted to*
- 375 *kWh;*
- 376 • *N_{JOBS} is the number of jobs per day, as calculated in the test procedure,*
- 377 • *t_{FINAL} is the final time to Sleep, as measured in the test procedure, converted*
- 378 *to hours;*
- 379 • *E_{SLEEP} is the Sleep energy, as measured in the test procedure, converted to*
- 380 *kWh; and*
- 381 • *t_{SLEEP} is the Sleep time, as measured in the test procedure, converted to hours.*

- 382 v. For digital duplicators without print capability and MFDs without print capability, TEC shall be
 383 calculated per Equation 4.

384 **Equation 4: TEC Calculation for Digital Duplicators without Print Capability**
 385 **and MFDs without Print Capability**

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$$TEC_{2018} = \left[5 \times \left(E_{JOB_DAILY} + (2 \times E_{FINAL}) + \left[24 - \frac{N_{JOBS}}{16} - (2 \times t_{FINAL}) \right] \times \frac{E_{AUTO}}{t_{AUTO}} \right) + 48 \times \frac{E_{AUTO}}{t_{AUTO}} \right],$$

387 *Where:*

- 388 • *TEC₂₀₁₈ is the typical weekly energy consumption for digital duplicators*
- 389 *without print capability and MFDs without print capability, expressed in*
- 390 *kilowatt-hours (kWh) and rounded to the nearest 0.01 kWh for reporting;*
- 391 • *E_{JOB_DAILY} is the daily job energy, as calculated per Equation 5, in kWh;*
- 392 • *E_{FINAL} is the final energy, as measured in the test procedure, converted to*
- 393 *kWh;*
- 394 • *N_{JOBS} is the number of jobs per day, as calculated in the test procedure;*
- 395 • *t_{FINAL} is the final time to Sleep, as measured in the test procedure, converted*
- 396 *to hours;*
- 397 • *E_{AUTO} is the Auto-off energy, as measured in the test procedure, converted to*
- 398 *kWh; and*
- 399 • *t_{AUTO} is the Auto-off time, as measured in the test procedure, converted to*
- 400 *hours..*

- 401 vi. Daily Job Energy shall be calculated per Equation 5.

402 **Equation 5: Daily Job Energy Calculation for TEC Products**

403
$$E_{JOB_DAILY} = \frac{1}{4} \left[2 \times E_{JOB1} + (N_{JOBS} - 2) \times \frac{E_{JOB2} + E_{JOB3} + E_{JOB4}}{3} \right],$$

404 *Where:*

- 405 • *E_{JOB_DAILY} is the daily job energy, expressed in kilowatt-hours (kWh);*
- 406 • *E_{JOBi} is the energy of the ith job, as measured in the test procedure, converted*
- 407 *to kWh; and*
- 408 • *N_{JOBS} is the number of jobs per day, as calculated in the test procedure.*

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Equation 6: Maximum TEC Requirement Calculation

$$TEC_{MAX} = TEC_{REQ} + Adder_{A3} + Adder_{Wi-Fi}$$

Where:

- TEC_{MAX} is the maximum TEC requirement in kilowatt-hours per week (kWh/wk), rounded to the nearest 0.01 kWh/wk for reporting;
- TEC_{REQ} is the TEC requirement specified in Table 6, in kWh;
- $Adder_{A3}$ is a 0.05 kWh/wk allowance provided for A3-capable products; and
- $Adder_{Wi-Fi}$ is a 0.1 kWh/wk allowance provided for products with Wi-Fi enabled as shipped during the test..

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Table 6: TEC Requirement

| Color Capability | Monochrome Product Speed, s, as Calculated in the Test Method (ipm) | TEC _{REQ} (kWh/wk, rounded to the nearest 0.01 kWh/wk for reporting) |
|--------------------|---|---|
| Monochrome Non-MFD | s ≤ 20 | 0.226 |
| | 20 < s ≤ 40 | 0.018 × s – 0.152 |
| | 40 < s ≤ 60 | 0.025 × s – 0.439 |
| | 60 < s ≤ 135 | 0.049 × s – 1.903 |
| | s > 135 | 0.183 × s – 20.127 |
| Monochrome MFD | s ≤ 20 | 0.263 |
| | 20 < s ≤ 40 | 0.018 × s – 0.115 |
| | 40 < s ≤ 60 | 0.016 × s – 0.033 |
| | 60 < s ≤ 80 | 0.037 × s – 1.314 |
| | s > 80 | 0.086 × s – 5.283 |
| Color Non-MFD | s ≤ 20 | 0.275 |
| | 20 < s ≤ 40 | 0.032 × s – 0.397 |
| | 40 < s ≤ 60 | 0.002 × s + 0.833 |
| | s > 60 | 0.100 × s – 5.145 |
| Color MFD | s ≤ 20 | 0.254 |
| | 20 < s ≤ 40 | 0.024 × s – 0.250 |
| | 40 < s ≤ 60 | 0.011 × s + 0.283 |
| | 60 < s ≤ 80 | 0.055 × s – 2.401 |
| | s > 80 | 0.118 × s – 7.504 |

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3.3.3 Additional Test Results Reporting Requirements:

- i. DFE model name/number, Ready State power, Sleep Mode power, and TEC_{DFE} shall be reported for any Type 1 DFE sold with an Imaging Equipment product, including those not tested with the Imaging Equipment product as part of the highest energy using configuration per Section 4.2.1.iii.

3.3.4 Recovery Time: Recovery Time, t_{R_TEC} as calculated per Equation 7, shall be less than or equal to the Maximum Recovery Time, t_{R_MAX} , subject to the following requirements:

- i. For models with a shorter Default Delay Time to Sleep as found in Table 7, t_{R_MAX} shall be calculated per Equation 8.
- ii. For models with a longer Default Delay Time to Sleep as found in Table 7, t_{R_MAX} shall be calculated per Equation 9.
- iii. Models with a Default Delay Time to Sleep greater than any found in Table 7 shall not be subject to a Recovery Time requirement.

Example: A 25 ipm MFD with a default sleep delay of 40 minutes (acceptable per Table 3) but falling outside Table 7 is not subject to a recovery time requirement.

- iv. Recovery times from various modes (Active 0, Active 1, Active 2 times) shall be reported for all products tested using the TEC test method.

Equation 7: TEC Recovery Time

$$t_{R_TEC} = t_{Active1} - t_{Active0}$$

Where:

- t_{R_TEC} is TEC Recovery Time;
- $t_{Active1}$ is the time from Sleep Mode to the first sheet exiting the unit, in seconds, as measured per the test method; and
- $t_{Active0}$ is the time from Ready State to the first sheet exiting the unit, in seconds, as measured per the test method.

Table 7: Determination of Maximum Recovery Time

| Print Speed, s (ipm) | Maximum Default Delay Time to Sleep Values to Permit Applicability of Shorter Recovery Time in Equation 8. (minutes) | Maximum Default Delay Time to Sleep Values to Permit Applicability of Longer Recovery Time in Equation 9 (minutes) |
|----------------------|--|--|
| $0 < s \leq 5$ | $0 < t_{DEFAULT} \leq 5$ | $t_{DEFAULT} > 5$ |
| $5 < s \leq 10$ | $0 < t_{DEFAULT} \leq 10$ | $10 < t_{DEFAULT} \leq 15$ |
| $10 < s \leq 20$ | $0 < t_{DEFAULT} \leq 10$ | $10 < t_{DEFAULT} \leq 20$ |
| $20 < s \leq 30$ | $0 < t_{DEFAULT} \leq 10$ | $10 < t_{DEFAULT} \leq 30$ |
| $30 < s \leq 40$ | $0 < t_{DEFAULT} \leq 10$ | $10 < t_{DEFAULT} \leq 45$ |
| $s > 40$ | $0 < t_{DEFAULT} \leq 15$ | $15 < t_{DEFAULT} \leq 45$ |

Equation 8: Maximum Recovery Time for Models with Shorter Default Delay Times to Sleep, as Indicated in Table 7

$$t_{R_MAX} = \min(0.42 \times s + 5, 30),$$

Where:

- t_{R_MAX} is Maximum Recovery Time, in seconds;
- s is the product speed; and
- \min is the minimum function (i.e., the Maximum Recovery Time shall be the lesser of $0.42 \times s + 5$ or 30 seconds).

Equation 9: Maximum Recovery Time for Models with Longer Default Delay Times to Sleep, as Indicated in Table 7

$$t_{R_MAX} = \min(0.51 \times s + 15, 60),$$

Where:

- t_{R_MAX} is Maximum Recovery Time, in seconds;
- s is the product speed; and
- \min is the minimum function (i.e., the Maximum Recovery Time shall be the lesser of $0.51 \times s + 15$ or 60 seconds).

463 **3.4 Requirements for Professional Imaging Products**

464 **Note:** EPA analyzed the testing data of 47 professional imaging products (representing five
465 manufacturers), which was gathered per the ENERGY STAR Professional Imaging Equipment Test
466 Method by industry stakeholders over six months. The proposed criteria below are tuned to apply
467 comparable stringency towards products of different types (e.g., MFD vs. printer) and capabilities (e.g.,
468 production speed and color capability).

469 EPA proposes to remove TEC requirements for Professional Imaging Products due to two core concerns
470 about applying a TEC approach to professional-grade products: (1) the difficulty in approximating a duty
471 cycle for products that are used in a wide variety of environments and (2) unit operators' interest in
472 applying a metric that allows them to more accurately estimate the energy consumption for their specific
473 use case. . To replace TEC requirements, the Agency has developed the performance-based metrics
474 proposed in Sections 3.4.2 and 3.4.3. These metrics focus on how efficiently products perform the
475 functions that most influence total energy use.

476 3.4.1 Automatic Duplexing Capability:

- 477 i. For all Professional Imaging Products, automatic duplexing capability shall be present at the
478 time of purchase. Professional Imaging Products whose intended function is to print on
479 special single-sided media for the purpose of single sided printing (e.g., release coated paper
480 for labels, direct thermal media, etc.) are exempt.
- 481 ii. If a product is not certain to be bundled with an automatic duplex tray, the partner must make
482 clear in their product literature, on their Web site, and in institutional sales literature that
483 although the product meets the ENERGY STAR energy efficiency requirements, the product
484 only fully qualifies for ENERGY STAR when bundled with or used with a duplexer tray. EPA
485 asks that partners use the following language to convey this message to customers:
486 "Achieves ENERGY STAR energy savings; product fully qualifies when packaged with (or
487 used with) a duplex tray."

488 **Note:** EPA believes that Automatic Duplexing Capabilities are a common feature for Professional Imaging
489 Products and proposes to retain the requirements presented in Section 3.4.1 based on the notion that by
490 lessening the number of pages used to print a job, energy and cost savings will be realized. The Agency
491 does however seek industry feedback regarding how often duplexing capabilities are used with
492 professional products and on whether this requirement would exclude otherwise highly-efficient (efficient
493 in terms of the requirements presented in Sections 3.4.2 and 3.4.3) from being able to certify under
494 ENERGY STAR.

495 3.4.2 Production Energy Requirements: The Production Energy of Professional Imaging
496 Products shall be calculated per Equation 10 to be no greater than the applicable
497 Maximum Allowable Production Energy as indicated by Table 8.

498 **Equation 10: Production Energy of Professional Imaging Products**

$$E_P = E_T / I_T$$

500 *Where:*

- 501 • E_P is the production energy of the product, in terms of Watt-hours per Image;
- 502 • I_T is the average number of images produced during Steps 3, 5, and 6 of the
503 ENERGY STAR Professional Imaging Equipment Test Method as calculated
504 per Equation 11; and
- 505 • E_T is the average energy measured during Steps 3, 5, and 6 of the ENERGY
506 STAR Professional Imaging Equipment Test Method, as calculated per
507 Equation 12, in Watt-hours.

508

Equation 11: Average Number of Images, I_T

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$$I_T = \frac{I_3 + I_5 + I_6}{3}$$

510

Where:

511

- I_T is the average number of images produced during Steps 3, 5, and 6 of the ENERGY STAR Professional Imaging Equipment Test Method; and
- I_3 , I_5 , and I_6 are the number of images produced during Steps 3, 5, and 6 of the ENERGY STAR Professional Imaging Equipment Test Method, respectively.

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Equation 12: Average Energy, E_T

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$$E_T = \frac{E_3 + E_5 + E_6}{3}$$

517

Where:

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- E_T is the average energy measured during Steps 3, 5, and 6 of the ENERGY STAR Professional Imaging Equipment Test Method, in Watt-hours; and
- E_3 , E_5 , and E_6 are the energies recorded for Steps 3, 5, and 6 of the ENERGY STAR Professional Imaging Equipment Test Method, in Watt-hours, respectively.

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Table 8: Production Efficiency Requirements for Professional Imaging Products

| Applicable Professional Imaging Product Type | Maximum Allowable Production Energy (Watt-hour/Image) |
|--|---|
| Color | 0.42 |
| Monochrome | 0.67 |

524

Note: For professional imaging products, EPA understands that the energy used for image production is typically the largest contributor to energy use. This is because professional-grade products are typically subjected to much heavier usage patterns. The Agency thus proposes to use the Production Efficiency metric calculated through Equation 10 for product comparison as it quantifies the difference in efficiency between products in a way that has the added benefit of allowing users to estimate energy use based on their typical or expected production volume. The requirements outlined in Section 3.4.2 sets limits on how much energy should be consumed to produce each image to meet the requirements.

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Analysis of the data set shows sufficient differentiation between color and monochromatic products such that EPA is proposing separate requirements based on this product characteristic. EPA also investigated the impact of the proposed requirements on MFD and printer products and found no meaningful difference in the ability of either product type to meet the proposed requirements.

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3.4.3 **Ready Mode Power Requirement:** The Ready Mode Power of Professional Imaging Products shall be calculated per Equation 13 to be less than or equal to 900 W.

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Equation 13: Ready Mode Power of Professional Imaging Products

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$$P_{RM} = \frac{E_4 \times 60}{T_4}$$

539

Where:

540

- P_{RM} is the Ready Mode Power of the product, in Watts;
- E_4 is the Energy measured during Step 4 of the ENERGY STAR Professional Imaging Equipment Test Method, in Watt-hours; and

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- *T₄ is time recorded for Step 4 of the ENERGY STAR Professional Imaging Equipment Test Method, in minutes.*

545 **Note:** Given the higher expected use case of professional imaging products, EPA is proposing to focus
546 on Ready Mode Power requirements rather than Sleep Mode Power requirements, as sleep mode will be
547 encountered less frequently.

548 Section 3.4.3 thus outlines the proposed maximum allowable Ready Mode Power for Professional
549 Imaging Products. However, because the Agency believes that the contribution made by Ready Mode
550 Power towards overall energy use is still far below that of production energy, the Ready Mode criterion
551 has been developed to affect only those products with a measured power above the average (i.e.,
552 requirements for production will drive energy efficiency while the Ready Mode Power requirement serves
553 as a floor or backstop for Ready Mode performance).

554 EPA proposes a maximum allowable Ready Mode Power of 900 watts to encourage those products with
555 a measured Ready Mode Power above the market average to implement more energy-efficient solutions.

556 Analysis of the current dataset has shown that there is minimal difference in the average Ready Mode
557 Power between color and monochromatic products or MFD and printer products. As such, the Agency
558 proposes that this criterion be applicable to all products.

559 **3.5 Requirements for Operational Mode (OM) Products**

560 3.5.1 Multiple Sleep Modes: If a product is capable of automatically entering multiple successive
561 Sleep Modes, the same Sleep Mode shall be used to determine certification under the
562 Default Delay Time to Sleep requirements specified in Section 3.2.5 and the Sleep Mode
563 power consumption requirements specified in Section 3.5.3.

564 3.5.2 DFE Requirements: For Imaging Equipment with a Type 2 DFE that relies on the Imaging
565 Equipment for its power, and that meets the appropriate maximum TEC_{DFE} requirement
566 found in Table 2, the DFE power shall be excluded subject to the following conditions:

567 i. Ready State power of the DFE, as measured in the test method, shall be divided by 0.60 to
568 account for internal power supply losses.

569

- 570 ▪ Sleep Mode Requirements: If the resultant power in Paragraph i, above, is less than or
571 equal to the Ready State or Sleep Mode power of the Imaging Equipment product as a
572 whole, then the power shall be excluded from the measured Ready State or Sleep Mode
573 power of the Imaging Equipment product as a whole when comparing to the Sleep Mode
574 requirements in Section 3.5.3, below, and for reporting.

575

576 Otherwise, the Sleep Mode power of the DFE, as measured in the test method, shall be
577 divided by 0.60 and excluded from the Ready or Sleep Mode power of the Imaging
578 Equipment for comparing to the requirements, and for reporting.

579

- 580 ▪ Off Mode Requirements: If the resultant power in Paragraph i, above, is less than or
581 equal to the Ready State, Sleep Mode, or Off Mode power of the Imaging Equipment as a
582 whole, then the power shall be excluded from the Ready State, Sleep Mode, or Off Mode
583 power of the Imaging Equipment product as a whole when comparing to the Off Mode
584 requirements in Section 3.5.4, below, and for reporting.

585

586 Otherwise, the Sleep Mode power of the DFE, as measured in the test method, shall be
587 divided by 0.60 and excluded from the Ready State, Sleep Mode, or Off Mode power of
588 the Imaging Equipment for comparing to the requirements, and for reporting.

589

- 590 ii. The DFE must not interfere with the ability of the Imaging Equipment to enter or exit its lower-
 591 power modes.
 592 iii. Imaging Equipment products with Type 2 DFEs that fail to meet these requirements may be
 593 certified without subtracting the DFE power from that of the Imaging Equipment product as a
 594 whole. The combined energy consumption of the DFE and the Imaging Equipment must be
 595 below the appropriate requirement.

596

Examples: Product 1 is an Imaging Equipment product whose Type 2 DFE has no distinct sleep mode. The Type 2 DFE has measured Ready State and Sleep Mode power both equal to 30 watts. The measured Sleep Mode power of the product is 53 watts. When subtracting 50 watts (30 watts / 0.60) from the measured Sleep Mode power of the product, 53 watts, the resulting 3 watts is the Sleep Mode power of the product for use in the criteria limits below.

602

Product 2 is an Imaging Equipment product whose Type 2 DFE goes to sleep when the Imaging Equipment goes to sleep during testing. The Type 2 DFE has measured DFE Ready State and Sleep Mode power equal to 30 watts and 5 watts, respectively. The measured Sleep Mode power of the product is 12 watts. When subtracting 50 watts (30 watts / 0.60) from the measured Sleep Mode power of the product, 12 watts, the result is -38 watts. In this case, instead subtract 8.33 watts (5 watts / 0.60) from the measured Sleep Mode power of the product, 12 watts, resulting in 3.67 watts which is used in the criteria limits below.

609

610 3.5.3 Sleep Mode Power Consumption: Measured Sleep Mode power consumption (P_{SLEEP})
 611 shall be less than or equal to the maximum Sleep Mode power consumption requirement
 612 (P_{SLEEP_MAX}) determined per Equation 4, subject to the following conditions:

- 613 i. Only those interfaces that are present and used during the test, including any fax interface,
 614 may be considered functional adders.
 615 ii. Product functionality offered through a DFE shall not be considered a functional adder.
 616 iii. A single interface that performs multiple functions may be counted only once.
 617 iv. Any interface that meets more than one interface type definition shall be classified according
 618 to the functionality used during the test.
 619 v. For products that meet the Sleep Mode power requirement in Ready State, no further
 620 automatic power reductions are required to meet Sleep Mode requirements.

621

Equation 14: Calculation of Maximum Sleep Mode Power Consumption Requirement for OM products

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$$P_{SLEEP_MAX} = P_{MAX_BASE} + \sum_1^n Adder_{INTERFACE} + \sum_1^m Adder_{OTHER}$$

625

Where:

626

- P_{SLEEP_MAX} is the maximum Sleep Mode power consumption requirement, expressed in watts (W), and rounded to the nearest 0.1 watt for reporting;

627

- P_{MAX_BASE} is the maximum Sleep Mode power allowance for the base marking engine, as determined per Table 9, in watts;

628

- $Adder_{INTERFACE}$ is the power allowance for the interface functional adders used during the test, including any fax capability, and as selected by the manufacturer from Table 0, in watts;

629

- n is the number of allowances claimed for interface functional adders used during the test, including any fax capability, and is less than or equal to 2;

630

- $Adder_{OTHER}$ is the power allowance for any non-interface functional adders in use during the test, as selected by the manufacturer from Table 0, in watts; and

631

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- m is the number of allowances claimed for any non-interface functional adders in use during the test and is unlimited.

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Table 9: Sleep Mode Power Allowance for Base Marking Engine

| Product Type | Media Format | Marking Technology | | | | P _{MAX_BASE} (watts) |
|-----------------|--------------|--------------------|---------|------------|----------------|----------------------------------|
| | | Impact | Ink Jet | All Other* | Not Applicable | |
| Mailing Machine | N/A | | x | x | | 5.0 |
| MFD | Standard | x | x | | | 1.1 |
| | Large | | x | | | 5.4 |
| | | | | x | | 8.7 |
| Printer | Small | x | x | x | | 4.0 |
| | Standard | x | x | | | 0.6 |
| | Large | x | | x | | 2.5 |
| | | | x | | | 4.9 |
| Scanner | Any | | | | x | 2.5 |

641

* "All Other" category includes High Performance Ink Jet.

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Table 10: Sleep Mode Power Allowances for Functional Adders

| Adder Type | Connection Type | Max. Data Rate, r (Mbit/second) | Details | Functional Adder Allowance (watts) |
|------------------|--------------------------------|-----------------------------------|---|------------------------------------|
| Interface | Wired | $r < 20$ | Includes: USB 1.x, IEEE 488, IEEE 1284/Parallel/ Centronics, RS232 | 0.2 |
| | | $20 \leq r < 500$ | Includes: USB 2.x, IEEE 1394/ FireWire/i.LINK, 100Mb Ethernet | 0.4 |
| | | $r \geq 500$ | Includes: USB 3.x, 1G Ethernet | 0.5 |
| | | Any | Includes: Flash memory-card/smart-card readers, camera interfaces, PictBridge | 0.2 |
| | Fax Modem | Any | <u>Applies to MFDs only.</u> | 0.2 |
| | Wireless, Radio-frequency (RF) | Any | Includes: Bluetooth, 802.11 | 2.0 |
| | Wireless, Infrared (IR) | Any | Includes: IrDA. | 0.1 |
| Cordless Handset | N/A | N/A | Capability of the imaging product to communicate with a cordless handset. Applied only once, regardless of the number of cordless handsets the product is designed to handle. Does not address the power requirements of the cordless handset itself. | 0.8 |
| Memory | N/A | N/A | Applies to the internal capacity available in the Imaging Equipment for storing data. Applies to all volumes of internal memory and should be scaled accordingly for RAM. This adder does not apply to hard disk or flash memory. | 0.5/GB |

| Adder Type | Connection Type | Max. Data Rate, r (Mbit/second) | Details | Functional Adder Allowance (watts) |
|---------------------|-----------------|-----------------------------------|---|------------------------------------|
| Power Supply | N/A | N/A | Applies to both internal and external power supplies of Mailing Machines and Standard Format products using Inkjet and Impact marking technologies with nameplate output power (P_{OUT}) greater than 10 watts. | $0.02 \times (P_{OUT} - 10.0)$ |
| Touch Panel Display | N/A | N/A | Applies to both monochrome and color touch panel displays. | 0.2 |

644

645 3.5.4 Off Mode Power Consumption Off Mode power, as measured in the test procedure, shall
 646 be less than or equal to the Maximum Off Mode power specified in Table 81, subject to the
 647 following conditions.

- 648 i. For products that do not have an Off Mode, Sleep Mode power, as measured in the test
 649 procedure, shall be less than or equal to the Maximum Off Mode power.
 650 ii. For products that do not have an Off Mode or Sleep Mode, Ready State power, as measured
 651 in the test procedure, shall be less than or equal to the Maximum Off Mode power.
 652 iii. The Imaging Equipment shall meet the Off Mode Power requirement independent of the state
 653 of any other devices (e.g., a host PC) connected to it.

654

Table 81: Maximum Off Mode Power Requirement

| Product Type | Maximum Off Mode Power (watts) |
|-----------------|--------------------------------|
| All OM Products | 0.3 |

655

656 **Note:** Products intended for sale in the US market are subject to minimum toxicity and recyclability
 657 requirements. Please see ENERGY STAR Program Requirements for Imaging Equipment: Partner
 658 Commitments for details.

659 4 TESTING

660 4.1 Test Methods

661 4.1.1 When testing Imaging Equipment products, the test methods identified in Table 92 shall be
 662 used to determine certification for ENERGY STAR.

663

Table 92: Test Methods for ENERGY STAR Certification

| Product Type | Test Method |
|---|--|
| All Imaging Products, excluding Professional Products | ENERGY STAR Imaging Equipment Test Method, Rev. Nov-2018 |
| Professional Imaging Products | ENERGY STAR Professional Imaging Equipment Test Method |

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665 **4.2 Number of Units Required for Testing**

666 4.2.1 Representative Models shall be selected for testing per the following requirements for
667 products both sold as new and remanufactured.

- 668 i. For certification of an individual product model, a product configuration equivalent to that
669 which is intended to be marketed and labeled as ENERGY STAR is considered the
670 Representative Model;
- 671 ii. For certification of a product family that does not include a Type 1 DFE, the highest energy
672 using configuration within the family shall be considered the Representative Model. Any
673 subsequent testing failures (e.g., as part of verification testing) of any model in the family will
674 have implications for all models in the family.
- 675 iii. For certification of a product family that includes Type 1 DFE, the highest energy using
676 configuration of the Imaging Equipment and highest energy using DFE within the family shall
677 be tested for certification purposes. Any subsequent testing failures (e.g., as part of
678 verification testing) of any model in the family and all Type 1 DFEs sold with the Imaging
679 Equipment, including those not tested with the Imaging Equipment product, will have
680 implications for all models in the family. Imaging Equipment products that do not incorporate
681 a Type 1 DFE may not be added to this product family for certification and must be certified
682 as a separate family without a Type 1 DFE.

683 4.2.2 A single unit of each Representative Model shall be selected for testing.

684 4.2.3 All units/configurations for which a Partner is seeking ENERGY STAR certification, must
685 meet the ENERGY STAR requirements. For remanufactured products, the Partner must
686 748 assign the certified configurations an identifier in the model name/number that is
687 unique to 749 ENERGY STAR certified configurations. This identifier must be used
688 consistently in 750 association with the certified configurations in marketing/sales
689 materials and on the 751 ENERGY STAR list of certified products (e.g. model A1234 for
690 baseline configurations and 752 A1234-R for remanufactured ENERGY STAR certified
691 configurations).

692 **4.3 International Market Certification**

693 4.3.1 Products shall be tested for certification at the relevant input voltage/frequency
694 combination for each market in which they will be sold and promoted as ENERGY STAR.

695 **5 USER INTERFACE**

696 5.1.1 Manufacturers are encouraged to design products in accordance with the user interface
697 standard IEEE 1621: Standard for User Interface Elements in Power Control of Electronic
698 Devices Employed in Office/Consumer Environments. For details, see
699 <http://eta.LBL.gov/Controls>.

700 **6 EFFECTIVE DATE**

701 6.1.1 Effective Date: The Version 3 ENERGY STAR Imaging Equipment specification shall take
702 effect on **October 11, 2019**. To be certified as ENERGY STAR, a product model shall
703 meet the ENERGY STAR specification in effect on its date of manufacture. The date of
704 manufacture is specific to each unit and is the date on which a unit is considered to be
705 completely assembled.

706 6.1.2 Future Specification Revisions: EPA reserves the right to change this specification should
707 technological and/or market changes affect its usefulness to consumers, industry, or the
708 environment. In keeping with current policy, revisions to the specification are arrived at
709 through stakeholder discussions. In the event of a specification revision, please note that
710 the ENERGY STAR certification is not automatically granted for the life of a product
711 model.

712 6.1.3 Items for Consideration in a Future Revision:

713 i. **Three-phase Products**: These products are currently excluded from scope. EPA will
714 review this exclusion in a future revision.