



ENERGY STAR® Program Requirements Product Specification for Uninterruptible Power Supplies

Final DRAFT 2 Test Method

1 OVERVIEW

The following test method shall be used for determining product compliance with requirements in the ENERGY STAR Eligibility Criteria for Uninterruptible Power Supplies (UPSs).

Note: This draft may be revised prior to implementation as the final ENERGY STAR Test Method for determining product compliance with the future specification.

2 APPLICABILITY

The following test method is applicable to all products eligible for qualification under the ENERGY STAR Eligibility Criteria for UPSs, including:

- Single-phase and three phase UPSs, for home, small and medium business, and datacenter use;
- Static and rotary UPSs; and
- AC-output and DC-output UPSs.

3 DEFINITIONS

Unless otherwise specified, all terms used in this document are consistent with the definitions in the ENERGY STAR Eligibility Criteria for Uninterruptible Power Supplies.

4 TEST SETUP

A) Test Setup and Instrumentation: Test setup and instrumentation for all portions of this procedure shall be in accordance with the requirements in section J.2 of IEC standard 62040-3¹, unless otherwise specified in this section.

B) AC Input Power: The UUT shall be connected to the first (highest) compatible voltage and frequency combination specified in Table 1.

- 1) UUTs that are not compatible with any of the combinations listed in Table 1 shall be connected to their most typically used nominal voltage and frequency combination. The test voltage and frequency used for the test shall be reported.

¹ International Electrotechnical Commission (IEC). IEC standard 62040-3. "Uninterruptible power systems (UPS) - Part 3: Method of specifying the performance and test requirements." Ed. 2.0

Table 1: Input Power Requirements

Voltage*	Frequency
600 Δ VAC	60 Hz
600Y/346 VAC	60 Hz
480 Δ VAC	60 Hz
480Y/277 VAC	60Hz
415 Δ VAC	60 Hz
415Y/240 VAC	60 Hz
400 Δ VAC	50 Hz
400Y/230 VAC	50 Hz
208 Δ	60 Hz
208Y/120 VAC	60 Hz
200 VAC	50 Hz
100 VAC	50 or 60 Hz

* Note: Δ refers to the line-to-line voltage between delta-connected three-phase windings, while Y refers to the line-to-line voltage between Y-connected three-phase windings, where the line-to-neutral voltage (also used in single-phase testing) is $1/\sqrt{3}$ of the line-to-line voltage.

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26 C) AC Output Power: For AC-output UPSs, the output voltage waveform of the UUT shall have the same
27 characteristics as the input voltage, specified in Table 1 and section J.2 of IEC standard 62040-3

28 1) UUTs that have an output voltage different from the input voltage shall be tested at the highest
29 compatible output voltage. The test voltage and frequency used for the test shall be reported.

30 D) DC Output Power: For DC-output UPSs, the output voltage waveform of the UUT shall be the first
31 voltage and frequency combination specified in Table 2.

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Table 2: DC Output Power Requirements

Voltage*	Voltage Tolerance
380 VDC	+/- 1 %
48 VDC	+/- 1 %
60 VDC	+/- 1 %
24 VDC	+/- 1 %

33 **5 TEST CONDUCT**

- 34 A) If the UUT can operate in two or more distinct normal modes, conduct all parts of the test and report
35 all parameters listed in Appendix A in either:
- 36 1) The highest efficiency/lowest protection mode, or
37 2) The lowest efficiency/highest protection mode, as specified in the ENERGY STAR Eligibility
38 Criteria for UPSs.
- 39 B) Efficiency Measurements: Input and output power measurements for efficiency calculations shall be
40 performed on the UUT according to section J.3 of IEC standard 62040-3, with the following
41 exceptions.
- 42 1) Test the UUT at 100%, 75%, 50%, 25%, and 0% of the reference test load.
43 2) For the 0% loading condition (i.e., test load disconnected, but output inverter operational),
44 measure only the input power to the UUT.
45 3) Modular UPSs with output power that varies depending on the number of converters installed,
46 shall be tested twice, at both their minimum and maximum non-redundant (i.e.: N+0)
47 configurations.
48 4) Measure and record all the applicable parameters listed in Appendix A of this test method for
49 each test performed, including the performance characteristics in the tested modes, as specified
50 in section 5.3.4 of IEC standard 62040-3.
- 51 i) If all three parts of the output performance characteristics (AAA-BB-CCC) are not available or
52 applicable, report only the characteristics applicable for the UUT.
- 53 C) Power Factor Measurements: Measure the power factor of the UUT per section 6.4.1.5 of IEC
54 standard 62040-3, for each mode.

55 **Note:** EPA is concerned about the lack of specificity regarding the thermal stability of the unit under
56 test and the precision of the testing instrument as stated in IEC standard 62040-3. EPA welcomes
57 stakeholder feedback on these as well as any other testing issues that may need to be addressed to
58 ensure proper applicability and repeatability of the test method.