



ENERGY STAR® Program Requirements Product Specification for Pool Pumps

Final Test Method Rev. Jan-2013

1 OVERVIEW

The following test method shall be used for determining product compliance with requirements in the ENERGY STAR Eligibility Criteria for Pool Pumps.

2 APPLICABILITY

ENERGY STAR test requirements are dependent upon the feature set of the product under evaluation. The following guidelines shall be used to determine the applicability of each section of this document:

- Section 6 shall be conducted on all eligible pool pump products.

3 DEFINITIONS

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

4 TEST SETUP

4.1 Input power

- A) All products shall be connected to a voltage source appropriate for the intended market, as specified in Table 1.
- 1) Pumps with a nameplate rated voltage not listed in Table 1 shall use the voltage and frequency combination, specified in Table 1, that is closest to the nameplate rated voltage.
 - 2) A pump rated for more than one voltage shall be tested using the higher voltage source.
 - 3) All nameplate rated voltages and the voltage used for testing shall be reported.

Table 1: Input Power Requirements for All Products

Market	Voltage	Voltage Tolerance	Maximum Total Harmonic Distortion	Frequency	Frequency Tolerance
North America, Taiwan	115 V ac or 230 V ac	± 1.0 %	2.0 %	60 Hz	± 1.0 %
Europe, Australia, New Zealand	230 V ac	± 1.0 %	2.0 %	50 Hz	± 1.0 %

Market	Voltage	Voltage Tolerance	Maximum Total Harmonic Distortion	Frequency	Frequency Tolerance
Japan	100 V ac	± 1.0 %	2.0 %	50 Hz or 60 Hz	± 1.0 %

4.2 Test Setup

- A) Ambient Temperature: Ambient temperature shall be from 65° F to 82° F.
- B) Relative Humidity: Relative humidity shall be from 10% to 80%.
- C) Power Meter: Power meters shall possess the following attributes:
 - 1) Measurement Accuracy: An accuracy of ± 1.5% of the measured value.
 - 2) Crest Factor: Possesses an available current crest factor of 3 or more at its rated range value.
 - 3) Minimum Frequency Response: 3.0 kHz
 - 4) Minimum Resolution:
 - a. 0.01 W for measurement values less than 10 W;
 - b. 0.1 W for measurement values from 10 W to 100 W; and
 - c. 1.0 W for measurement values greater than 100 W.
- D) Flow Rate Meter: Flow rate meters shall possess the following attributes:
 - 1) Measurement Accuracy: An accuracy of ± 1.5% of the measured value.

5 TEST CONDUCT

5.1 Test Requirements

- A) Test Speeds:
 - 1) Single-speed pumps shall be tested at the rated speed.
 - 2) Multi-speed pumps shall be tested at all rated speeds.
 - 3) Variable-speed and Variable-flow pumps shall be tested at the minimum, maximum, and Most Efficient speeds available. Manufacturers shall report all speeds tested.

- B) For each speed tested, the following values shall be reported for the Normal Operating Point corresponding to each of the three system curves (A, B, and C) listed below.
- 1) Motor nominal speed (RPM)
 - a. Motor nominal speed shall be the rated speed(s) for Single- and Multi-speed pumps and shall be the speed displayed on the pump controls for Variable-speed pumps.
 - 2) Rate of flow (GPM)
 - 3) Power (watts)
 - 4) Energy Factor (gal/Wh), calculated using Equation 1

Equation 1: Calculation of Energy Factor

$$EF = \frac{Q \times 60}{P}$$

Where:

- *Q* is the flow rate in GPM.
- *P* is the power in watts.

- C) A graph of the pump performance curve for each speed tested shall also be reported.
- D) The three system curves to be used are:

Equations 2, 3, & 4: Calculation of Pool Curves A, B, & C

Curve A: $H = 0.0167 \times Q^2$

Curve B: $H = 0.050 \times Q^2$

Curve C: $H = 0.0082 \times Q^2$

Where:

- *H* is the total system head in feet of water.
- *Q* is the flow rate in GPM.

6 TEST PROCEDURES

6.1 UUT Pre-Test Initialization

- A) Prior to the start of testing, the UUT shall be initialized as follows:
- 1) Set up the UUT per *American National Standards Institute/Hydraulics Institute (ANSI/HI) 1.6, Centrifugal Pump Tests; Section 1.6.5.5 Performance test setup*, using the “open or closed tank” setup described in *Figure 1.117*.
 - 2) Connect the UUT to its power source.
 - 3) Turn the UUT On and allow it to run for one hour before the first test is performed.
 - a. After this initial warm-up period is completed, pumps shall only be run for 30 minutes before subsequent tests.

6.2 Pump Flow Testing

- A) Perform the following steps for each pump speed tested, with the additional guidance included in Section 5.1 of this test method.

- 1) Increase the flow rate to maximum flow, Q_{Max} , by fully opening the test setup's control valve.
- 2) Increase the system head, by closing the control valve in the test setup, until the measured flow rate is within $\pm 2.5\%$ of the flow rate calculated for the Normal Operating Point of the pump at each of the Pool Curves (Curves A, B, and C), described in Section 5.1.D of this test method.
- 3) At each Normal Operating Point, set all measurement equipment to begin taking readings at a rate greater than or equal to one reading per second. Accumulate measurement values for at least one minute and record the average (arithmetic mean) value.

6.3 Standby Mode Testing

- A) Perform the following steps for all pumps that are shipped with a pump control or time clock that does not have a separate main power cord from the pump.
 - 1) Place the unit in Standby Mode.
 - 2) Wait five minutes to allow the unit to stabilize.
 - 3) Measure and report the true average power over the course of a five minute period.

7 REFERENCES

- 1) ANSI/HI 1.6:2000. Centrifugal Pump Tests
- 2) ANSI/APSP/ICC-15-2011. American National Standard for Residential Swimming Pool and Spa Energy.