



**ENERGY STAR® Program Requirements
Product Specification for
Residential Pool Pumps**

**Draft 2 Test Method
Rev. Aug-2012**

Summary of Comments on ENERGY STAR Test Method for Pool Pumps

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Author: Steve.Gutai Subject: Note Date: 12/17/2012 1:04:13 AM
60HZ pump should be tested at 230VAC as well.

1 **1 OVERVIEW**

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

4 **2 APPLICABILITY**

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

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

8 **3 DEFINITIONS**

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

11 **4 TEST SETUP**

12 **4.1 Input power**

13 A) All products shall be connected to an ac mains as specified in Table 1 below depending on the
14 voltage required by the pump. For any pump that can use a combination of the listed voltage
15 sources, test the pump using the higher rated voltage source.

16 **Table 1: Input Power Requirements for All Products**

Voltage	Voltage Tolerance	Maximum Total Harmonic Distortion	Frequency	Frequency Tolerance
115 V ac	+/- 1.0 %	2.0 %	60 Hz	+/- 1.0 %
230 V ac	+/- 1.0 %	2.0 %	50 Hz	+/- 1.0 %
100 V ac	+/- 1.0 %	2.0 %	50 Hz/60 Hz	+/- 1.0 %

17 **4.2 General**

- 18 A) Ambient Temperature: Ambient temperature shall be from 65° F to 82° F.
19 B) Relative Humidity: Relative humidity shall be from 10% to 80%.

- 20 C) Power Meter: Power meters shall possess the following attributes:
- 21 1) Crest Factor: Possesses an available current crest factor of 3 or more at its rated range
- 22 value.
- 23 2) Minimum Frequency Response: 3.0 kHz
- 24 3) Minimum Resolution:
- 25 i) 0.01 W for measurement values less than 10 W;
- 26 ii) 0.1 W for measurement values from 10 W to 100 W; and
- 27 iii) 1.0 W for measurement values greater than 100 W.
- 28 D) Measurement Accuracy:
- 29 1) Power measurements with a value greater than or equal to 0.5 W shall be made with an
- 30 uncertainty of less than or equal to 2% at the 95% confidence level.
- 31 2) Power measurements with a value less than 0.5 W shall be made with an uncertainty of less
- 32 than or equal to 0.01 W at the 95% confidence level.
- 33 3) Flow rate measurements shall be made with an uncertainty of less than or equal to 1.5% at
- 34 the 95% confidence level.
- 35 4) Pressure measurements shall be made with an uncertainty of less than or equal to 1.0% at
- 36 the 95% confidence level

37 5 TEST CONDUCT

38 5.1 Measurement Requirements

- 39 A) Reported Values: Values reported for each test performed in Section 6 shall follow the guidelines
- 40 presented in *Australian Standards (AS) 5102.1-2009, Performance of household electrical*
- 41 *appliances – Swimming pool pump-units, Part 1: Energy consumption and performance; Section*
- 42 *4.3.2: Number of readings and Section 4.3.3: Duration of readings.*
- 43 B) Steady Conditions: For conditions to be considered stable, conditions must meet the criteria set
- 44 forth in *AS 5102.1-2009, Performance of household electrical appliances – Swimming pool pump-*
- 45 *units, Part 1: Energy consumption and performance; Section 4.5 Stability of Operation.*

46 **Note:** The Measurement Requirements language above is identical to that published in the Draft 1 Test

47 Method. However, DOE and EPA did not receive comments on this proposal and encourage

48 stakeholders to provide feedback in their Draft 2 comments.

49 The standard used for pool pump testing by the California Energy Commission (CEC) does not include

50 any requirements for the duration of a reading and the number of readings to be taken for each reported

51 value. It also does not require steady state conditions to begin taking readings. The inclusion of Section

52 5.1 does not alter testing but ensures that values are more accurate and the test is more repeatable.

53 5.2 Test Requirements

- 54 A) Speeds for Testing:
- 55 1) Single speed pumps shall be tested at the only available speed.
- 56 2) Multi-speed pumps shall be tested at all possible motor speeds.
- 57 3) Variable-speed pumps shall be tested at the minimum, maximum, and most efficient speeds
- 58 available. Manufacturers shall report all speeds tested.

Author: Steve.Gutai Subject: Note Date: 12/17/2012 1:06:59 AM
 EPA explained in the last meeting the intension was to test at curve A only
 Author: Steve.Gutai Subject: Note Date: 12/17/2012 1:08:18 AM
 The ANSI/HI 1.6 is out dated and superceded by a new code. Please contact Farlow for this information.

59 **Note:** DOE has altered the speeds required for testing variable-speed pumps to align with the Association
 60 of Pool & Spa Professionals (APSP)-15 Standard for Energy Efficiency for Residential Inground
 61 Swimming Pools and Spas. DOE believes testing at these speeds will provide the most accurate
 62 representation of a pump's full range of efficiencies. DOE is interested in stakeholder feedback regarding
 63 this change. DOE is also interested in feedback regarding the differences (if any are present) between the
 64 speeds proposed here and those proposed for the CEESM Efficient Residential Pool Pump Specification.

- 65 B) For each speed tested, the following values shall be reported for the normal operating point
 66 corresponding to each of the three system curves (A, B, and C) listed below.
- 67 1) Motor nominal speed (RPM)
 - 68 2) Rate of flow (GPM)
 - 69 3) Power (watts and volt amps)
 - 70 4) Energy Factor (gal/Wh)
- 71 C) A graph of the pump performance curve for each speed tested shall also be reported.
- 72 D) The three system curves to be used are:

73 **Equations 1, 2, & 3: Calculation of Pool Curves A, B, & C**

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

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

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

77 *Where:*

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

80 **6 TEST PROCEDURES**

81 **6.1 UUT Pre-Test Initialization**

- 82 A) Prior to the start of testing, the UUT shall be initialized as follows:
- 83 1) Set up the UUT per *American National Standards Institute/Hydraulics Institute (ANSI/HI) 1.6,*
 84 *Centrifugal Pump Tests; Section 1.6.5.5 Performance test setup;* with the additional guidance
 85 in Section 5.
 - 86 2) Connect the UUT to its power source.
 - 87 3) Turn the UUT ON and allow it to run for one hour before the first test is performed.
- 88 a) After this initial warm-up period is completed, pumps need only be run for 30 minutes
 89 before subsequent tests.

90 **6.2 Pump Flow Testing**

- 91 A) Perform the following steps for each pump speed tested.
- 92 1) Measure and record the pump flow rate at maximum flow, Q_{Max} , in gallons per minute (GPM).
 - 93 2) Increase the flow from dead head (zero flow) to Q_{Max} in increments of Q , where Q is defined
 94 in Table 2 and depends on Q_{Max} .

