



ENERGY STAR® Program Requirements

Product Specification for Laboratory Grade Refrigerators and Freezers

Eligibility Criteria

Final Draft Version 1.0

1 Following is the Version 1.0 ENERGY STAR product specification for Laboratory Grade Refrigerators and
2 Freezers. A 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) Laboratory Grade Refrigerator (LGR): A refrigeration cabinet used for storing non-volatile
6 reagents and biological specimens at set point temperatures between 0 °C and 12 °C (32 °F
7 and 53.6 °F), typically marketed through laboratory equipment supply stores for laboratory or
8 medical use.
- 9 a) High Performance: A laboratory grade refrigerator product that is designed to support a
10 maximum peak variation in temperature no greater than 6 °C.
- 11 b) General Purpose: A laboratory grade refrigerator product that cannot support a maximum
12 peak variation in temperature equal to or less than 6 °C.
- 13 2) Laboratory Grade Freezer (LGF): A refrigeration cabinet used for storing volatile reagents
14 and biological specimens at set point temperatures between -40 °C and 0 °C (-40 °F and 32
15 °F), typically marketed through laboratory equipment supply stores for laboratory or medical
16 use.
- 17 a) High Performance: A laboratory grade freezer product that is designed to support a
18 maximum peak variation in temperature no greater than 10 °C.
- 19 b) General Purpose: A laboratory grade freezer product that cannot support a maximum
20 peak variation in temperature equal to or less than 10 °C.
- 21 3) Ultra-Low-Temperature Laboratory Grade Freezer (ULT): A freezer designed for laboratory
22 application that is capable of maintaining set point storage temperatures between -70 °C and
23 -80 °C (-94 °F and -112 °F).
- 24 4) Combination Laboratory Grade Refrigerator/Freezer: A product composed of two or more
25 refrigerated cabinets, one of which meets the definition of Laboratory Grade Refrigerator and
26 another that meets the definition of Laboratory Grade Freezer.
- 27 5) Portable Laboratory Grade Refrigerator/Freezer: A refrigerated cabinet used for transporting
28 perishable samples or products, and includes an integral battery or DC power cable to power
29 the refrigeration process when disconnected from AC mains.
- 30 6) Walk-in Laboratory Grade Refrigerator: A larger laboratory grade refrigerator that is either
31 built-in or composed of prefabricated sectional walk-in units.
- 32 7) Explosion Proof Refrigerator/Freezer: A product that is composed of a refrigerated cabinet
33 that prevents arcing both inside and outside the cabinet and is typically used when flammable
34 vapors are present, resulting in an explosive atmosphere during standard operation.

35 8) Incubators: A product used to control temperature and humidity often to support growing
36 bacterial cultures or providing suitable conditions for chemical and biological reactions.

37 B) Defrost-related Terms

38 1) Automatic Defrost: A system in which the defrost cycle is automatically initiated and
39 terminated, with resumption of normal refrigeration at the conclusion of the defrost operation.
40 The defrost water is disposed of automatically.

41 2) Variable Defrost: A system in which successive defrost cycles are determined by an
42 operating condition variable or variables other than compressor operating time. This includes
43 any electrical or mechanical device performing this function.

44 3) Manual Defrost: A system in which the defrost cycle is initiated and terminated manually.

45 4) Semi-Automatic Defrost: A system in which the defrost cycle is manually initiated and
46 automatically terminated, with automatic resumption of normal refrigeration at the conclusion
47 of the defrost operation.

48 C) Additional Terms:

49 1) AHAM Volume (V): The interior volume of the refrigerator or freezer as calculated by
50 ANSI/AHAM HRF-1-2008.

51 2) Cabinet Temperature: The average of all temperature measurements taken inside a product's
52 cabinet at any given time.

53 3) Peak Variance: The difference between the maximum and minimum temperatures measured
54 across all temperature measurement devices (TMD) over the course of a given measurement
55 period.

56 4) Refrigeration Cycle: The period of time starting when a unit's refrigeration system turns on,
57 through the time it turns off, and ending when the refrigeration system turns on again.

58 5) Stability: The difference between the maximum and minimum temperature measured by an
59 individual TMD over the course of the entire test period.

60 6) Test: A 24-hour period over which measurements are taken and energy use evaluated under
61 one set of conditions after the pull down period occurs as described in this test procedure.

62 7) Uniformity: The difference between the maximum and minimum temperature measured inside
63 of a unit's cabinet at any given time.

64 8) Solid Door: Less than 75% of the front surface area of the door is glass.

65 9) Glass Door: Greater than, or equal to, 75% of the front surface area of the door is glass.

66 10) Solid Door Cabinet: A laboratory grade refrigerator or freezer in which all outer doors on all
67 sides of the unit are solid doors. These doors may be sliding or hinged.

68 11) Glass Door Cabinet: A laboratory grade refrigerator or freezer in which all outer doors on at
69 least one side of the unit are glass doors. These doors may be sliding or hinged.

70 12) Mixed Solid/Glass Door Cabinet: A laboratory grade refrigerator or freezer in which all outer
71 doors on at least one side of the unit are a combination of solid and glass doors. A unit which
72 has all glass doors on one side and a combination of solid and glass doors on another is
73 considered a mixed solid/glass door cabinet.

74 D) Referenced Standards Organizations:

75 1) AHAM: Association of Home Appliance Manufacturers

76 2) ANSI: American National Standards Institute

- 77 E) Product Family: A group of product models that are (1) made by the same manufacturer, (2) have
78 the same measured interior volume, (3) the same number of external doors and (3) of the same
79 basic engineering design. Product models within a family can differ in the following
80 characteristics:
- 81 1) Configurability Characteristics: Characteristics such as internal ports and access holes,
82 drawer and shelf configuration, and other optional accessories.
- 83 2) Aesthetic Characteristics: Characteristics such as external finish, color, or door opening
84 orientation (left-opening versus right-opening).

85 **2 SCOPE**

86 **2.1 Included Products**

- 87 2.1.1 Products that meet the definitions LGR and LGF above are eligible for ENERGY STAR
88 certification.

89 **2.2 Excluded Products**

- 90 2.2.1 Products that are covered under other ENERGY STAR product specifications are not eligible
91 for qualification under this specification. The list of specifications currently in effect can be
92 found at www.energystar.gov/specifications.
- 93 2.2.2 The following products are not eligible for certification under this specification:
- 94 i. Products that meet the definitions 1.A.3 through 1.A.7 above; and
- 95 ii. Products which meet the incubator definition above, are marketed as incubators, or are
96 capable of temperature control above 15°C.

97 **3 QUALIFICATION CRITERIA**

98 **3.1 Significant Digits and Rounding**

- 99 3.1.1 All calculations shall be carried out with actual measured (unrounded) values. Only the final
100 result of a calculation shall be rounded.
- 101 3.1.2 Unless otherwise specified in this specification, compliance with specification limits shall be
102 evaluated exact values without any benefit from rounding.
- 103 3.1.3 Directly measured or calculated values that are submitted for reporting on the ENERGY STAR
104 website shall be rounded to the nearest significant digit as expressed in the corresponding
105 specification limit.

106 **3.2 Energy Efficiency Requirements**

- 107 3.2.1 Maximum Daily Energy Consumption Requirements: The maximum daily energy consumption
108 (MDEC), in kilowatt-hours per 24 hour period, shall be less than or equal to that specified
109 below:
110

Table 1: Maximum Daily Energy Consumption (MDEC) Requirements (kWh/day) for ENERGY STAR Certified Laboratory Grade Refrigerators	
Product Volume (in cubic feet)	Refrigerator
<i>General Purpose</i>	
$0 < V < 25$	$\leq 0.124 V + 2.0$
$25 \leq V$	$\leq 0.121 V + 2.07$
<i>High Performance</i>	
$0 < V < 25$	$\leq 0.184 V + 3.5$
$25 \leq V < 44$	$\leq 0.153 V + 4.28$
$44 \leq V$	$\leq 0.125 V + 5.5$

111 Note: V = AHAM volume, as defined in Section 1, in cubic feet (ft³).

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Table 2: Maximum Daily Energy Consumption (MDEC) Requirements (kWh/day) for ENERGY STAR Certified Laboratory Grade Freezers	
Product Volume (in cubic feet)	Freezer
<i>General Purpose</i>	
$0 < V < 15$	$\leq 0.033 V + 2.0$
$15 \leq V < 30$	$\leq 0.05 V + 1.75$
$30 \leq V$	$\leq 0.188 V - 2.375$
<i>High Performance</i>	
$0 < V < 22$	$\leq 0.09 V + 10$
$22 \leq V$	$\leq 0.426 V + 2.63$

113 Note: V = AHAM volume, as defined in Section 1, in cubic feet (ft³).

114 **Note:** EPA is adjusting the Maximum Daily Energy Consumption (MDEC) requirement for general
 115 purpose freezers to align the stringency of the Maximum Daily Energy Consumption (MDEC)
 116 requirements for freezers under 30 cubic feet with those of similarly sized refrigerators as the product
 117 types show a comparable opportunity for efficiency improvements. This change does not alter the
 118 number of products in the ENERGY STAR data set that can meet the general purpose freezer MDEC
 119 requirement.

120 **4 TESTING**

121 **4.1 Test Methods**

122 4.1.1 Test methods identified in Table 1 shall be used to determine qualification for ENERGY STAR.

123 **Table 1: Test Methods for ENERGY STAR Qualification**

Product Type	Test Method
All	ENERGY STAR Test Method for Laboratory Grade Refrigerators, Freezers, and Ultra-Low Temperature Freezers

124 **4.2 Number of Units Required for Testing**

125 4.2.1 Representative Models shall be selected for testing per the following requirements:

- 126 i. For qualification of an individual product model, the Representative Model shall be equivalent
- 127 to that which is intended to be marketed and labeled as ENERGY STAR.
- 128 ii. For qualification of a Product Family, highest energy consuming unit within that Product
- 129 Family can be tested and serve as the Representative Model. Any subsequent testing failures
- 130 (e.g., as part of verification testing) of any model in the family will have implications for all
- 131 models in the family.

132 4.2.2 A single unit of each Representative Model shall be selected for testing.

133

134 **4.3 International Market Qualification**

135 4.3.1 Products shall be tested for certification at the relevant input voltage/frequency combination for

136 each market in which they will be sold and promoted as ENERGY STAR.

137 **5 EFFECTIVE DATE**

138 5.1.1 Effective Date: The Version 1.0 ENERGY STAR Laboratory Grade Refrigerators and Freezers

139 specification shall take effect on **TBD**. To qualify for ENERGY STAR, a product model shall

140 meet the ENERGY STAR specification in effect on the model’s date of manufacture. The date

141 of manufacture is specific to each unit and is the date on which a unit is considered to be

142 completely assembled.

143 **Note:** The Version 1.0 specification will take effect upon finalization, anticipated in December 2016. EPA

144 has recently received energy performance data for ultra low temperature freezers (ULTs), and intends to

145 develop a Version 1.1 revision in 2017 to them into scope along with appropriate efficiency requirements.

146 5.1.2 Future Specification Revisions: EPA reserves the right to change this specification should

147 technological and/or market changes affect its usefulness to consumers, industry, or the

148 environment. In keeping with current policy, revisions to the specification are arrived at

149 through stakeholder discussions. In the event of a specification revision, please note that the

150 ENERGY STAR certification is not automatically granted for the life of a product model.