



# Standard Test Method for Enhanced Performance of Combination Oven in Various Modes<sup>1</sup>

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## 1. Scope

1.1 This test method covers the evaluation of the energy and water consumption and the cooking performance of combination ovens that can be operated in hot air convection, steam, and the combination of both hot air convection and steam modes. The test method is also applicable to convection ovens with moisture injection. The results of this test method can be used to evaluate a combination oven and understand its energy consumption.

1.2 This test method is applicable to gas and electric combination ovens that can be operated in convection, steam and combination modes.

1.3 The combination oven can be evaluated with respect to the following (where applicable):

1.3.1 Energy input rate and thermostat calibration (10.2).

1.3.2 Preheat energy consumption and time (10.3).

1.3.3 Idle energy rate in convection, steam and combination modes (10.4).

1.3.4 Pilot energy rate (if applicable) (10.5).

1.3.5 Cooking-energy efficiency, cooking energy rate, production capacity, water consumption and condensate temperature in steam mode (10.6).

1.3.6 Cooking-energy efficiency, cooking energy rate, and production capacity in convection mode (10.7).

1.3.7 Cooking uniformity in combination mode (10.8).

1.4 The values stated in inch-pound units are to be regarded as standard. The SI units given in parentheses are for information only.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

D3588 Practice for Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels

F1217 Specification for Cooker, Steam

F1484 Test Methods for Performance of Steam Cookers

F1495 Specification for Combination Oven Electric or Gas Fired

F1496 Test Method for Performance of Convection Ovens

2.2 *ASHRAE Documents:*<sup>3</sup>

ASHRAE Guideline 2-1986 (RA90) Engineering Analysis of Experimental Data

ASHRAE Guideline 2-1986 (RA90) Thermal and Related Properties of Food and Food Materials

## 3. Terminology

3.1 *Definitions:*

3.1.1 *combination mode, n*—for the purposes of this test method, combination mode is defined as moist heat at 350°F (177°C) with the humidity and fan set to operate at their maximum settings, hereafter referred to as combi mode.

3.1.2 *combination oven, n*—device that combines the function of hot air convection (oven mode), steam heating (steam mode), and a combination of both to perform steaming, which includes low or high temperature steaming, baking, roasting, rethermalizing, and proofing of various food products. In general, the term combination oven is used to describe this type of equipment, which is self contained.

3.1.3 *condensate, n*—mixture of condensed steam and cooling water, exiting the combination oven and directed to a drain.

3.1.4 *convection mode, n*—for the purposes of this test method, convection mode is defined as dry heat only at 350°F (177°C) with the fan set to operate at the maximum setting.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee F26 on Food Service Equipment and is the direct responsibility of Subcommittee F26.06 on Productivity and Energy Protocol.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> See the ASHRAE Handbook of Fundamentals, available from the American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329.