



# Standard Specification for Convection Oven Gas or Electric<sup>1</sup>

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## 1. Scope

1.1 This specification covers forced air convection ovens for baking, roasting or rethermalizing which utilize gas or electrical heat sources, or both for cooking food in the commercial and institutional food service establishments. The units may have water and drain connections for adding moisture but do not have a dedicated steam only mode.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard may involve hazardous materials, operations, and equipment. 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>

- D3951 Practice for Commercial Packaging
- F760 Specification for Food Service Equipment Manuals
- F1166 Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities
- F1496 Test Method for Performance of Convection Ovens

### 2.2 ANSI Standards:<sup>3</sup>

- ANSI/NSF 2 Food Equipment
- ANSI/NSF 4 Commercial Cooking, Rethermalization and Powered Hot Food Holding and Transport Equipment
- ANSI Z223/NFPA 70 National Electrical Code
- ANSI/UL 197 Commercial Electrical Cooking Appliances

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee F26 on Food Service Equipment and is the direct responsibility of Subcommittee F26.02 on Cooking and Warming Equipment.

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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> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

ANSI B1.1 Unified in. Screw Threads (UN and UNR Thread Form)

ANSI Z21.41 Quick-Disconnect Devices for Use With  
ANSI Z21.45 Flexible Connectors of Other Than All-Metal Construction for Gas Appliances

ANSI Z83.11 Gas Food Service Equipment

ANSI Z1.4 Sampling Procedures and Tables for Inspection and Attributes

ANSI/NFPA 54 National Fuel Gas Code

2.3 *Military Standards:*<sup>4</sup>

MIL-STD-167/1 Mechanical Vibration of Shipboard Equipment (Type 1—Environmental and Type 2—Internally Excited)

MIL-STD-461 Requirements For the Control Of Electromagnetic Interference Characteristics of Subsystems and Equipment

MIL-STD-1399/300 Interface Standard For Shipboard Systems Section 300A Electric Power, Alternating Current

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *capacity*—the capacity of a convection oven is determined by the number of bake or sheet pans that it is designed to hold during cooking. For capacity classification, the minimum vertical clearance between each row of pans shall be 1 in. (25 mm).

3.1.2 *convection oven—as used in this specification*—a device that, with a heat source combines the function of circulating hot convection air in an enclosed cavity by means of an electric motor-operated fan or blower, for the purpose of baking, roasting or rethermalizing of food.

3.1.3 *moisture addition feature*—a convection oven that may have water and drain connections and is capable of adding moisture but does not have a dedicated steam only mode.

3.1.4 *oven cavity*—space within the convection oven in which food products are heated or cooked.

3.1.5 *pans*—containers used to hold the food product in the oven cavity.

<sup>4</sup> Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://dodssp.daps.dla.mil/>.

3.1.5.1 *full size*—bake or sheet pan is nominally 18 by 26 by 1 in. (457 by 660 by 25 mm).

3.1.5.2 *half size*—bake or sheet pan is nominally 18 by 13 by 1 in. (457 by 330 by 25 mm).

#### 4. Classification

4.1 Convection ovens covered by this specification are classified by type, style, size, class, grade, group, and mode. The capacity of the convection oven is determined by the number of pans to be used for the heavy-load cooking-energy efficiency test. Place the top oven rack so that it is a minimum of 2.75 in. (70 mm) from the top of the cavity. Place the bottom oven rack so that it is a minimum of 1-in. (25 mm) from the bottom of the cavity. Place the remaining oven racks in the oven such that adjacent racks are no closer than 2.75 in. (70 mm) from each other. Racks should be spaced as evenly as possible throughout the cavity. Count the number of racks. This is the maximum pan load for the heavy-load cooking tests.

##### 4.1.1 Type:

4.1.1.1 *Type I*—Table or Counter top units.

4.1.1.2 *Type II*—Table or Counter top units stacked 2 high.

4.1.1.3 *Type III*—Floor Installed or Roll-In units.

##### 4.1.2 Style:

4.1.2.1 *Style 1*—Electric Heated Convection Oven.

4.1.2.2 *Style 2*—Gas Fired Convection Oven.

##### 4.1.3 Size:

4.1.3.1 *Size i*—Half Size.

4.1.3.2 *Size ii*—Full Size.

##### 4.1.4 Class:

4.1.4.1 *Class a*—208 volts, 60 hertz, 1 phase.

4.1.4.2 *Class b*—208 volts, 60 hertz, 3 phase.

4.1.4.3 *Class c*—240 volts, 60 hertz, 1 phase.

4.1.4.4 *Class d*—240 volts, 60 hertz, 3 phase.

4.1.4.5 *Class e*—480 volts, 60 hertz, 3 phase.

4.1.4.6 *Class f*—120 volts, 60 hertz, 1 phase.

4.1.4.7 *Class g*—220 volts, 60 hertz, 3 phase.

4.1.4.8 *Class h*—230 volts, 50 hertz, 1 phase.

4.1.4.9 *Class i*—230 volts, 50 hertz, 3 phase.

4.1.4.10 *Class j*—400 volts, 50 hertz, 3 phase.

4.1.4.11 *Class k*—440 volts, 60 hertz, 3 phase (shipboard use).

##### 4.1.5 Grade:

4.1.5.1 *Grade A*—Standard Depth.

4.1.5.2 *Grade B*—Extended Depth.

##### 4.1.6 Group:

4.1.6.1 *Group a*—Minimum 3 half size bake sheets (for Type I, Grade A, Size i),

4.1.6.2 *Group b*—Minimum 6 half size bake sheets (for Type II, Grade A, Size i),

4.1.6.3 *Group c*—Minimum 5 full size bake sheets (for Type I, Grade A and B, Size ii),

4.1.6.4 *Group d*—Minimum 10 full size bake sheets (for Type II, Grade A and B, Size ii), and

4.1.6.5 *Group e*—Minimum 16 full size bake sheets (for Type III, Grade A, Size ii).

##### 4.1.7 Mode:

4.1.7.1 *Mode 1*—With moisture addition.

4.1.7.2 *Mode 2*—Without moisture addition.

#### 5. Ordering Information

5.1 An order for a convection oven(s) under this specification shall specify:

5.1.1 ASTM specification number and date of issue.

5.1.2 Quantity to be furnished.

5.1.3 Type.

5.1.4 Style—If Style 2, specify gas type (see 5.2.2).

5.1.5 Size.

5.1.6 Class.

5.1.7 Grade.

5.1.8 Group.

5.1.9 Mode.

5.2 The following options should be reviewed and if any are desired they should be included in the order:

5.2.1 When Federal/Military procurement(s) is involved, refer to the supplement pages.

5.2.2 Type of gas, if applicable: natural, propane or other (specify heating value in BTU/ft<sup>3</sup> specific density and constituents).

5.2.3 Electrical power connection if applicable - power cord with plug or conduit connection and size.

5.2.4 *Fan Speed*—single speed or multiple speeds.

5.2.5 A cool down switch to manually override the fan shut-off referenced in 7.5.6.

5.2.6 *Type of Controls*—Electro-mechanical, solid state or programmable/computer controlled.

5.2.7 *Interior Finish*—porcelain enamel or stainless steel.

5.2.8 When specified, with a quick-disconnect gas supply, an approved quick disconnect (socket and plug) conforming to ANSI Z21.41, and a flexible metal connector conforming to ANSI Z21.45 and consisting of a male pipe thread fitting on one end and a union with female thread on the opposite end shall be provided with the convection oven.

5.2.9 When other than manufacturer's standard, commercial, domestic packaging is required, specify packaging requirements (13.1).

5.2.10 When specified:

5.2.10.1 A certification to ensure that samples representing each lot have been either tested or inspected as directed and the requirements have been met.

5.2.10.2 A copy of the certification or test results, or both, shall be furnished to the purchaser.

5.2.11 When specified, additional accessories such as wire shelves, casters, oven stand, legs, wash-down hose assembly, and faucets shall be provided.

5.2.12 When specified, controls shall be waterproof.

5.2.13 When a drain is required for Mode 1 (4.1.7.1).

#### 6. Materials and Manufacture

##### 6.1 General:

6.1.1 Convection ovens shall conform to the applicable documents listed in section 2.2.

6.1.2 Materials used shall be free from defects, which would affect the performance or maintainability of individual components, or of the overall assembly.

6.1.3 Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice.

6.1.4 Use of used or rebuilt products is not allowed under this specification.

6.2 *Hardware and Fittings*—Unless otherwise specified, all hardware and fittings shall be corrosion-resistant or suitably processed to resist corrosion in accordance with the manufacturer’s standard practice.

6.3 *Threaded Parts*—All threaded parts shall conform to ANSI B1.1.

## 7. Physical Properties

7.1 Type 1 and Type 2 shall be capable of being mounted on legs or stand.

7.2 *Electrical Characteristics*—All electric convection ovens shall be designed for operation on nominal voltage ratings, frequency and phases as specified by electrical class (4.1.4).

7.3 *Door*—Provisions shall be made to limit dripping when opened. Gasket, when provided, shall be replaceable without the use of tools or with the use of simple tools such as a screwdriver or plier.

### 7.4 *Fan and Baffle:*

7.4.1 A motor operated fan or blower shall be provided to ensure forced air circulation within the oven cavity.

7.4.2 Fan shall be operated by a single speed or multi-speed motor.

7.4.3 Air baffle or fan guard may be provided to maintain uniformity of temperature within the oven cavity.

7.4.4 When provided, the baffle or fan guard shall be removable for cleaning of fan or blower.

### 7.5 *Controls:*

7.5.1 All convection ovens shall be provided with means to regulate the oven interior temperature.

7.5.2 The temperature regulating device shall be calibrated to maintain the temperature of air inside the oven within a tolerance of 25°F (13.9°C) from the set point (Section 10).

7.5.3 A timer to monitor the cook time may be provided. When provided, it shall signal the end of set cook time with an audible alarm and prevent continued heating of the air inside the oven cavity.

7.5.4 A core temperature probe may be provided. When provided, the device shall have an accuracy based on ANSI/NSF 2.

7.5.5 When control knobs, switches and indicating lights are located on the front panel they shall be recessed or otherwise protected from inadvertent changes or damage.

7.5.6 Each oven shall be provided with a door control switch that will de-energize the heating elements and the fan or blower circuit when the door is opened in any operating mode (see 5.2.5 for exception).

### 7.6 *Heating Elements:*

7.6.1 The electric convection ovens shall have heating elements arranged so that they will not intrude in the space intended for baking pans.

7.6.2 Heating elements shall be readily accessible for repair or replacement.

7.6.3 The terminals of the heating elements shall project a sufficient distance to permit easy access to the connections.

7.6.4 All internal wiring shall be free of stress or tension and, where required, shall be coated with high-heat resistant insulation to resist water and grease.

7.7 *Fuel System for Gas Convection Ovens*—The gas convection ovens shall be designed to operate on natural or propane gas. When specified (see 5.2.2) a separately furnished conversion kit shall be supplied.

### 7.8 *Standards and Compliance:*

7.8.1 Convection ovens and accessories shall conform to ANSI/UL No. 197 or ANSI Z83.11, as applicable and ANSI/NSF 4, ANSI/NFPA 54 and ANSI Z223/NFPA 70 as applicable.

7.8.2 All ovens intended for rethermalizing applications shall pass ANSI/NSF 4 requirements for rethermalizing ovens.

7.8.3 Proof of Compliance: Evidence of complying with ANSI/UL 197 or ANSI Z83.11 and ANSI/NSF 4 shall be a listing in a third party certification agency listing book, or a certified test report from a nationally recognized testing laboratory acceptable to the purchaser or appropriate labels attached.

7.8.4 Certification of compliance to the standards cited in this specification shall be provided, if required, in the purchase document.

7.9 Convection ovens shall be delivered assembled, ready for connection to electricity or gas piping, or both, as applicable.

## 8. Performance Requirements

8.1 *Performance Testing*—When specified in the contract or purchase order, performance testing shall be performed and reported in accordance with Test Method F1496.

## 9. Sampling and Quality Assurance

9.1 *Sampling*—When specified in the contract or purchase order, sampling for the inspection and tests contained in the main body of this specification shall be performed in accordance with ANSI Z1.4.

9.2 The convection ovens ready for shipment shall be measured and inspected by the manufacturer for compliance with this specification.

## 10. Testing Methods

### 10.1 *Thermostat Test:*

10.1.1 *Significance and Use*—This test determines compliance with 7.5.2-oven interior temperature variances from the thermostat setting.

10.1.2 The convection oven shall be connected to the specified power source. The thermostat shall be set at 350°F (177°C) and the convection oven allowed to operate until the temperature control has cycled “on” and “off” through at least three cycles at this setting. The convection oven cavity shall then have five temperature readings taken. The readings shall be taken 4 in. (102 mm) from each corner (measured in all three planes) and at the center of the oven cavity (that is, at the intersection of the diagonals from corner to corner). The high temperature at each point and the low temperature at each point