



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

This standard is issued under the fixed designation F2092; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 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.

Current edition approved June 1, 2014. Published August 2014. Originally approved in 2001. Last previous edition approved in 2007 as F2092 – 01 (2007). DOI: 10.1520/F2092-14.

<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

shall be recorded for 15 min. These temperatures shall conform to the tolerances specified in 7.5.2.

10.1.3 The procedure described in 10.1.2 shall be repeated at 450°F (232°C) set point.

10.2 *Core Temperature Probe Test (Upon Request):*

10.2.1 *Significance and Use*—If equipped, this test verifies the temperature variance of the core temperature probe from the read out.

10.2.2 The core temperature test should be conducted according to ANSI/NSF 2.

10.2.3 When specified an acceptable test report confirming compliance to 10.2.2 shall be furnished to the purchaser.

**11. Product Marking**

11.1 Each convection oven shall be provided with an identification plate in compliance with ANSI/Z83.11 or ANSI/UL197.

**12. Manuals**

12.1 Each convection oven shall be furnished with an installation and operating instructions manual. Manual shall comply with Specification F760.

**13. Packing and Package Marking**

13.1 The convection oven shall be packaged and packed in accordance with the manufacturer’s standard commercial domestic packaging. The package shall be marked showing the name of the product, model number, serial number and manufacturer’s name. When specified, packaging shall be in accordance with the requirements of Specification D3951.

**14. Added Features**

14.1 Typically, features are added to basic models at an additional cost. Any options that are required can be written into the procurement contract as desired.

**15. Keywords**

15.1 baking oven; convection oven; cooking device; extended cavity oven; food service equipment; rethermalizing oven; roasting oven; roll-in oven

**SUPPLEMENTARY REQUIREMENTS**

Where provisions of this supplement conflict with the main body, this supplement shall prevail.

**S1. Manual**

S1.1 A manual complying with Specification F760 and Supplement shall be provided.

**S2. First Article Inspection**

S2.1 When required, the first article inspection shall be performed on one unit. The first article may be either a first production item or a standard production item from the supplier’s current inventory, provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

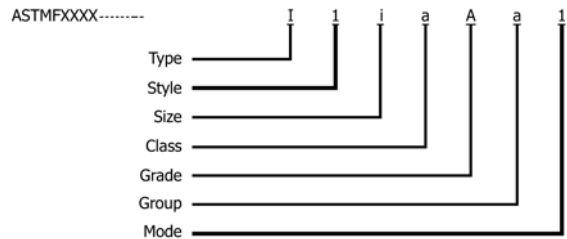
**S3. Data Nameplate**

S3.1 A nameplate shall contain the following:

- S3.1.1 National Stock Number (NSN), and
- S3.1.2 Government approved manual number.

**S4. Part Identifying Number**

S4.1 The following part identifying numbering procedure is for government purposes and does not constitute a requirement for the contractor. These classes are the same as those in Section 4. The PINs to be used for items acquired to this ASTM document are as shown below:



- Type I—For Counter or Table Top Use
- Type II—(2) Counter or Table Top Ovens Stacked
- Type III—For Floor Installed and Roll-In ovens
- Style 1—Electric Heated Convection Oven
- Style 2—Gas-fired Convection Oven
- Size i—Half Size
- Size ii—Full Size
- Class a—208 volts, 60 hertz, 1 phase
- Class b—208 volts, 60 hertz, 3 phase
- Class c—240 volts, 60 hertz, 1 phase
- Class d—240 volts, 60 hertz, 3 phase
- Class e—480 volts, 60 hertz, 3 phase
- Class f—120 volts, 60 hertz, 1 phase
- Class g—220 volts, 60 hertz, 3 phase
- Class h—230 volts, 50 hertz, 1 phase
- Class i—230 volts, 50 hertz, 3 phase
- Class j—380 volts, 50 hertz, 3 phase
- Class k—440 volts, 60 hertz, 3 phase (shipboard use)
- Grade A—Standard Depth
- Grade B—Extended Depth
- Group a—3 half size bake sheets



Group b—6 half size bake sheets  
 Group c—5 full size bake sheets  
 Group d—10 full size bake sheets  
 Group e—16 full size bake sheets  
 Mode 1—With moisture addition  
 Mode 2—Without moisture addition

## S5. Preservation, Packaging and Package Marking

S5.1 When other than normal commercial practice or conformance to Specification **D3951** is desired, the preservation, packaging and package marking requirements shall be stated in the purchase order or contract.

## S6. Naval Shipboard Requirements

S6.1 *Electromagnetic Compatibility*—When specified, electric convection ovens shall be designed and equipped for Electro-magnetic compatibility in accordance with MIL-STD-461 for surface ship and submarines. The contractor shall furnish written certification that the equipment meets the emission and susceptibility requirements when tested in accordance with test methods of MIL-STD-461.

S6.2 *Inclined Operation*—When specified, the units shall operate satisfactorily, along with no spillage of product, when the convection oven is inclined for 30 seconds at an angle of 15 degrees (30 degrees for submarines) on each side of the vertical in each of two vertical planes at right angles to each other. This test shall be run for 30 complete cycles in each of the two vertical planes.

### S6.3 *Mounting:*

S6.3.1 Type I and Type II Convection Ovens shall be provided with four removable legs suitable for bolting to the ship deck.

S6.3.2 Legs shall be fabricated from 300 series stainless steel tubing, with a minimum thickness of 0.071 in. (1.80 mm).

### S6.3.3 *Minimum Leg Lengths:*

S6.3.3.1 For Type I ovens,  $27 \pm \frac{1}{2}$  in. ( $686 \pm 13$  mm),

S6.3.3.2 For Type II ovens,  $8 \pm \frac{1}{2}$  in. ( $203 \pm 13$  mm), and

S6.3.3.3 Other leg lengths may be specified when ordering.

S6.4 *Interior Finish*—The interior finish of the oven shall be stainless steel or removable liners fabricated from stainless steel.

S6.5 *Environmental Suitability*—Convection ovens shall be capable of withstanding ship's vibration and motion. When specified, the unit, under normal operating conditions, shall be tested in accordance with MIL-STD-167/1, Type I equipment. The unit shall be secured to the test machine in the same

manner that it will be secured on board ship. The unit shall operate without malfunction.

S6.6 *Access*—Unless otherwise specified, units for naval surface vessels shall pass through a 26 in. (66 cm) wide and 66 (168 cm) high shipboard hatch without major disassembly. Equipment for submarines shall pass through a 25 in. (64 cm) diameter circular hatch. Major disassembly of an oven intended for submarine installation is permissible.

S6.7 *Service Access*—This unit shall be designed for access of all utility connections and major serviceable components from the front of the unit.

S6.8 *Power*—Unless otherwise specified, equipment shall be supplied in 440 volts, 60 hertz, 3 phase, 3 wire ungrounded system in accordance with MIL-STD-1399/300.

S6.9 *High Voltage Label*—On equipment rated 440 VAC or higher, a “Danger High Voltage” label shall be affixed to the equipment outer case assembly, on or adjacent to each service access cover adjacent to one of the fasteners which secure the cover. The warning label shall also be placed near the high voltage components inside the equipment. The label shall include, but is not limited to:

S6.9.1 A warning of high voltage.

S6.9.2 The power supply must be disconnected before servicing.

S6.9.3 Access covers must be in place during use.

S6.9.4 Service should be done by authorized personnel.

S6.10 *Human Factors Criteria*—Human factors engineering criteria principles, and practices, as defined in ASTM Specification **F1166**, shall be used in the design.

### S6.11 *Instruction Plate:*

S6.11.1 An instruction plate shall include instruction for start-up, operation and shutdown.

S6.11.2 The instruction plate shall be located at a clearly visible location in front of the convection oven.

S6.11.3 The instruction plate material shall comply with the same requirements as nameplate material per ANSI/UL 197.

S6.12 *Manufacturer's Certification*—If the manufacturer has successfully furnished the same equipment on a previous contract within the past three years further inspection will not be required. The manufacturer shall certify in writing that the equipment to be furnished is the same as that previously furnished and approved, and that no major design changes have been made to the equipment.

**APPENDIX****(Nonmandatory Information)****X1.****X1.1**

ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
ASTM	ASTM 100 Barr Harbor Drive W. Conshohocken, PA 19428
NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, MA 02269-9101
NSF	NSF International P.O. Box 130140 Ann Arbor, MI 48113-0140
UL	Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062
UNITED STATES GOVERNMENT	Standardization Documents Order Desk DOCUMENTS 700 Robbins Ave. Building #4—Section D Philadelphia, PA 19111-5094

*ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.*

*This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or [service@astm.org](mailto:service@astm.org) (e-mail); or through the ASTM website ([www.astm.org](http://www.astm.org)). Permission rights to photocopy the standard may also be secured from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; <http://www.copyright.com/>*