



Standard Specification for Combination Oven Electric or Gas Fired¹

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1. Scope

1.1 This specification covers commercial combination, atmospheric pressure steaming, which includes low or high temperature steaming, baking, roasting, and rethermalizing forced-air electric and gas-fired ovens.

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 The following safety hazards caveat pertains only to the test methods portion, Section 8, of this specification: *This specification 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:²

- A36/A36M Specification for Carbon Structural Steel
- A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip (Withdrawn 2014)³
- A176 Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
- A276 Specification for Stainless Steel Bars and Shapes
- A366/A366M Specification for Commercial Steel (CS) Sheet, Carbon, (0.15 Maximum Percent) Cold-Rolled (Withdrawn 2000)³
- A569/A569M Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial (Withdrawn 2000)³

¹ 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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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

- D3951 Practice for Commercial Packaging
- F760 Specification for Food Service Equipment Manuals
- F1166 Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities
- F1217 Specification for Cooker, Steam
- F2861 Test Method for Enhanced Performance of Combination Oven in Various Modes

2.2 ANSI Standards:⁴

- ANSI B1.1 Unified Inch Screw Threads (UN and UNR Thread Form)
- ANSI/NSF 2 Food Equipment
- ANSI/NSF 4 Commercial Cooking, Rethermalization and Hot Food Holding and Transport Equipment
- ANSI/UL No. 197 Commercial Electric Cooking Appliances
- ANSI Z83.11 Gas Food Service Equipment

2.3 Military Standards:⁵

- MIL-STD-167/1 Shipboard Equipment (Type I-Environmental and Type II-Internally Excited)
- MIL-STD-461 Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
- MIL-STD-1399/300 Shipboard Systems Section 300A Electric Power, Alternating Current

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *combination oven, n*—as used in this specification, a device that combines the function of hot convection air or steam, or the 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.

3.1.2 *oven cavity, n*—portion or area of the combination oven in which food products are heated or cooked.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁵ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, or Acquisition Streamlining and Standardization Information System (ASSIST), which is the official source of all documents listed in the DoD Index of Specifications and Standards. The ASSIST can be located at <http://dodssp.daps.dla.mil/>.

3.1.3 *pans, n*—containers used to hold the food product in the oven cavity: a full-size bake or sheet pan is nominally 18 by 26 by 1 in. (457 by 660 by 25 mm), a half-size bake or sheet pan is nominally 18 by 13 by 1 in. (457 by 330 by 25 mm), a full-size steam pan is nominally 12 by 20 by 2.5 in. (305 by 508 by 64 mm), and a two-thirds size steam pan is nominally 13.875 by 12.750 by 2.5 in. (352 by 323 by 64 mm).

3.1.4 *steam generation, n*—as used in this specification, can be produced through three distinct methods which all conform to Grade classification in Specification **F1217**, 0 to 2.9 psig maximum compartment pressure.

3.1.4.1 *Method 1*—Injection refers to direct placement of water onto a hot surface in the cavity for steam production.

3.1.4.2 *Method 2*—Boiler or steam generator refers to a compartment outside the oven cavity through which water is heated for steam production.

3.1.4.3 *Method 3*—Water bath refers to a compartment inside the oven cavity through which water is heated for steam production.

4. Classification

4.1 Combination ovens covered by this specification are classified by type, style, size, class, grade, and group. The capacity of the combination oven is determined by the number of bake or sheet pans, or steam table pans, or both, the oven is designed for cooking or rethermalizing. For capacity classification, the minimum vertical spacing between pan supports shall be as follows: bake or sheet pans, 1 in. (25 mm); and steam pans, 2.5 in. (64 mm).

4.1.1 *Type:*

4.1.1.1 *Type 1*—Table, countertop, and stand mounted units.

4.1.1.2 *Type 2*—Floor and roll-in units.

4.1.2 *Style:*

4.1.2.1 *Style 1*—Gas-fired combination oven.

4.1.2.2 *Style 2*—Electric combination oven.

4.1.3 *Size:*

4.1.3.1 *Size i*—Half-size.

4.1.3.2 *Size ii*—Full-size.

4.1.3.3 *Size iii*—Two-thirds size.

4.1.4 *Class:*

4.1.4.1 *Class a*—208 V, 60 Hz, 1 phase.

4.1.4.2 *Class b*—208 V, 60 Hz, 3 phase.

4.1.4.3 *Class c*—240 V, 60 Hz, 1 phase.

4.1.4.4 *Class d*—240 V, 60 Hz, 3 phase.

4.1.4.5 *Class e*—480 V, 60 Hz, 3 phase.

4.1.4.6 *Class f*—120 V, 60 Hz, 1 phase.

4.1.4.7 *Class g*—230 V, 50 Hz, 1 phase.

4.1.4.8 *Class h*—400 V, 50 Hz, 3 phase.

4.1.4.9 *Class i*—440 V, 60 Hz, 3 phase (shipboard use).

4.1.5 *Grade:*

4.1.5.1 *Grade A*—Steam Generator/Boiler.

4.1.5.2 *Grade B*—Spritzer/Injector.

4.1.5.3 *Grade C*—Water Bath.

4.1.6 *Group:*

4.1.6.1 *Group a*—Minimum 3 half size bake sheets and 3 steam pans (for Type I, Size i).

4.1.6.2 *Group b*—Minimum 20 half size bake sheets and 20 steam pans (for Type II, Size i).

4.1.6.3 *Group c*—Minimum 5 full size bake sheets and 10 steam pans (for Type I, Size ii).

4.1.6.4 *Group d*—Minimum 12 full size bake sheets and 24 steam pans (for Type II, Size ii).

4.1.6.5 *Group e*—Minimum 3 2/3 size steam pans (for Type I, Size iii).

5. Ordering Information

5.1 Orders for combination ovens in accordance with this specification shall include the following information:

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 1, specify gas type (see **5.2.2**).

5.1.5 Size.

5.1.6 Class.

5.1.7 Grade.

5.1.8 Group.

5.2 The following options should be reviewed and, if 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/ft³ specific density and constituents).

5.2.3 When other than manufacturer's standard, commercial, domestic packaging is required, specify packaging requirements.

5.2.4 When special or supplementary requirements, such as inspections, options, accessories, modifications, changes for correctional facilities use, additional nameplate data, etc., are required.

5.2.5 When specified, certify that samples representing each lot have been either tested or inspected as directed and required. When specified, furnish a copy of the certification, or test results, to the purchaser.

5.2.6 When specified, with a quick-disconnect gas supply.

5.2.7 When specified, provide separate water inlets for treated water (typically used for steam generation) and for untreated water (typically used for condensate cooling).

5.2.8 When specified, provide accessories, such as wire shelves, casters, oven stand, multi-speed fan, wash-down hose assembly, and pre-heat bridge.

6. Materials and Manufacture

6.1 *General*—Combination ovens shall conform to the applicable documents listed in Section 2. Materials used shall be free of defects, which would affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and components incorporated in the work covered by this specification are to be new or fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. None of the above shall be

interpreted to mean that the use of used products are allowed under this specification unless otherwise specified.

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 *Design and Manufacture*—The combination oven shall consist of a water tight oven cavity, sealing type of door(s), blower, air-heater(s)/heat exchanger, steam generation, condensate discharge, over pressure and under pressure venting, as required.

7.2 *Doors*—The door(s) shall be insulated, with replaceable gaskets, and provision to limit condensate dripping on the floor or table top surface when opening.

7.3 *Fan*—A fan or blower shall be provided to ensure forced air circulation within the oven cavity. The impeller shall be corrosion-resistant.

7.4 Controls:

7.4.1 Provide the following control functions for the operation of the combination oven:

7.4.1.1 Mode selection, such as hot air (convection), steam, or combination.

7.4.1.2 Oven temperature; and,

7.4.1.3 Cook time.

7.4.2 Each oven shall be equipped with a door control switch that will de-energize the blower/fan circuit when the door is opened in any operating mode except cool-down.

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

7.5 *Air Baffle*—Each oven shall have a removable air baffle.

7.6 *Grease Filter*—Each oven may include a grease filter. If a grease filter is supplied, the filter shall be a removable type.

7.7 *Over Pressure Relief*—Over pressure relief shall be provided for the oven that is no greater than 0.6 psig (41 MPa)

7.8 Standards and Compliance:

7.8.1 The oven(s) shall conform to the requirements of ANSI/UL 197, ANSI Z83.11, and NSF/ANSI 4, as applicable. Acceptable evidence of meeting these requirements shall be a current listing mark, label, or symbol of a recognized independent testing laboratory and a current listing in the testing laboratory’s appropriate publication.

7.8.2 Provide certification of compliance with the standards cited in this specification, if required, in the purchase document.

8. Performance Requirements

8.1 *Performance Testing*—When specified, test the combination oven according to the Test Method **F2861**.

9. Sampling and Quality Assurance

9.1 When specified in the contract or purchase order, perform sampling, testing and quality assurance of finished combination ovens in accordance to the requirements specified by ANSI/UL 197 and ANSI Z83.11, as applicable.

10. Test Methods

10.1 Core Temperature Probe Test (Upon Request):

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

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

10.1.3 When specified an acceptable test report confirming compliance to **10.1.2** shall be furnished to the purchaser.

11. Product Marking

11.1 Each combination oven shall be provided with an identification plate(s) in compliance with ANSI/Z83.11 or ANSI/UL 197.

12. Instruction Material and Manuals

12.1 Each combination oven shall be furnished with an instruction manual and material, as may be required. Manuals shall comply with Specification **F760**.

13. Packaging and Package Marking

13.1 Combination oven shall be packaged and packed in accordance with the manufacturer’s standard commercial domestic packaging.

13.2 The package shall be marked showing the name of the product, model number, serial number, and manufacturer’s name.

13.3 When specified, packaging shall be in accordance with the requirements of specification Practice **D3951**.

14. Keywords

14.1 atmospheric steamer; baking oven; combi; combi oven; combination oven; convection oven; food service equipment; oven; roasting; steamer

**SUPPLEMENTARY REQUIREMENTS
FOR FEDERAL/MILITARY PROCUREMENT**

S1. Where provisions of this supplement conflict with the main body, this supplement shall prevail.

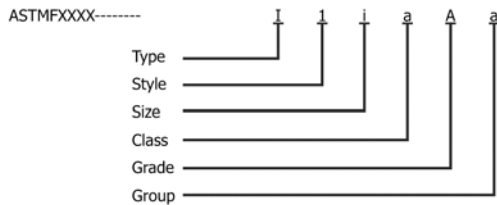
S2. *Manual*—A manual complying with Specification F760 and this Supplement shall be provided.

S3. *First Article Inspection*— When required, the first article inspection shall be performed on one unit. The first article may be either a first production 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.

S4. *Data Nameplate*—When required by purchaser, a nameplate shall contain the following:

- S4.1 National stock number (NSN), and
- S4.2 Government approved manual number.

S5. *Part Identifying Number*—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 Specification are as follows:



Type I	Table, countertop, or stand mounted units
Type II	Floor and roll-in units
Style 1	Gas-fired combination oven steamer
Style 2	Electric combination oven steamer
Size i	Half-size
Size ii	Full-size
Size iii	Two-thirds size
Class a	208 V, 60 Hz, 1-phase
Class b	208 V, 60 Hz, 3-phase
Class c	240 V, 60 Hz, 1-phase
Class d	240 V, 60 Hz, 3-phase
Class e	480 V, 60 Hz, 3-phase
Class f	120 V, 60 Hz, 1-phase
Class g	230 V, 50 Hz, 3-phase
Class h	400 V, 50 Hz, 3-phase
Class i	440 V, 60 Hz, 3-phase (shipboard use)
Grade A	Steam Generator/Boiler
Grade B	Spritzer/Injector
Grade C	Water Bath
Group a	Minimum 3 half size bake sheets and 3 steam pans (for Type I, Size i)
Group b	Minimum 20 half size bake sheets and 20 steam pans (for Type II, Size i)
Group c	Minimum 5 full size bake sheets and 10 steam pans (for Type I, Size ii)
Group d	Minimum 12 full size bake sheets and 24 steam pans (for Type II, Size ii)
Group e	Minimum 3 2/3 size steam pans (for Type I, Size iii)

S6. *Preservation, Packaging, and Package Marking*—When other than normal commercial practice or conformance to Practice D3951 is desired, state the preservation, packaging, and package marking requirements in the purchase order or contract.

S7. *Naval Shipboard Requirements:*

S7.1 *Electromagnetic Compatibility*—When specified, electric combination ovens shall be designed and equipped for electromagnetic compatibility in accordance with MIL-STD-461 for Class A4 surface ships and Class A5 for 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.

S7.2 *Inclined Operation*—When specified, the units shall operate satisfactorily, along with no spillage of product, when the combination oven is inclined for 30 s at an angle of 15° 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. For submarines, the angle of inclination shall be 30°.

S7.3 *Mounting*—The combination ovens shall be provided with (1) separate base, or (2) four removable legs suitable for bolting or welding to the deck. Legs shall be 6 ± ½ in. (152 ± 13 mm) long. Base and leg shall be fabricated from 300 series stainless steel and adequately reinforced.

S7.4 *Environmental Suitability*—Combination ovens shall be capable of withstanding ship’s vibration and motion. When specified, under normal operating conditions, test the unit in accordance with MIL-STD-167/1, Type I equipment. Secure the unit to the test machine in the same manner that it will be secured on board ship. Operate the unit without malfunction.

S7.5 *Access*—Unless otherwise specified, units for naval surface vessels shall pass through a 26-in. (66-cm) wide and 66-in. (168-cm) height 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.

S7.6 *Service Access*—Design the unit for access of all serviceable components from the front of the unit, or design the unit to slide out the entire oven to access the components.

S7.7 *Power*—Unless otherwise specified, supply equipment in 440 V, 60 Hz, 3-phase, 3-wire ungrounded system in accordance with MIL-STD-1399/300.

S7.8 *High Voltage Label*—On equipment rated 440 VAC or higher, affix a “Danger High Voltage” label to the equipment outer case assembly, on or adjacent to each service access cover adjacent to one of the fasteners, which secure the cover. Place the warning label near the high voltage components inside the equipment. Include on the label the following information, at the minimum:

S7.8.1 A warning of high voltage.

S7.8.2 The power supply must be disconnected before servicing.

S7.8.3 Access covers must be in place during use.

S7.8.4 Service should be done by authorized personnel.

S7.9 *Human Factors Criteria*—Use in the design human factors engineering criteria principles, and practices, as defined in Practice **F1166**.

S7.10 *Instructions*— Provide instructions for start-up, operation, and shut-down at a clearly visible location in front of the combination oven.

S7.11 *Manufacturer's Certification*—If the manufacturer has successfully furnished the same equipment on a previous contact 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.

S7.12 *Accessories*— Items, such oven stand, solid doors, wash-down hose assembly, etc., should be supplied as specified.

S7.13 *Fans*—Each oven compartment shall be equipped with a fan for forced circulation of heated air in the oven compartment. Fan shall have a minimum of two speeds. A panel mounted speed control, easily accessible by operator on front of the oven shall be provided.

S7.14 *Water Efficiency*—Each oven compartment shall use less than 5 gal (1.89 L) of water per hour. This requirement applies to both steamer and combination modes of use when tested in accordance with Test Method **F2861**.

APPENDIXES

(Nonmandatory Information)

X1. ADDED FEATURES

X1.1 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.

X2. RELATED STANDARDS

X2.1 *ASTM Standards*:

X2.1.1 Specification **A36/A36M**.

X2.1.2 Specification **A167**.

X2.1.3 Specification **A176**.

X2.1.4 Specification **A276**.

X2.1.5 Specification **A366/A366M**.

X2.1.6 Specification **A569/A569M**.

X2.2 *ANSI Standards*:

X2.2.1 *ANSI/NFPA 70*—National Electric Code

X2.2.2 *ANSI Z21.41*—Quick Disconnect Devices for Use with Gas Fuel

X2.2.3 *ANSI Z21.45*—Standard for Flexible Connectors of Other Than All-Metal Construction for Gas Appliances

X2.2.4 *ANSI/NFPA Z223.1*—National Fuel Gas Code

X3. ASSOCIATION AND GOVERNMENT ADDRESSES

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

GOVERNMENT

Standardization Documents Order Desk
DOCUMENTS
700 Robbins Ave.
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Philadelphia, PA 19222-5094

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