



Standard Specification for Deep-Fat Fryers, Gas or Electric, Open¹

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1. Scope

1.1 This specification covers commercial deep fat fryers which use electricity or gas as the heat source. These units also are known as fryers and are for use in commercial and institutional food service establishments.

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

1.3 *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:²

- D3951 Practice for Commercial Packaging
- F760 Specification for Food Service Equipment Manuals
- F1166 Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities
- F1361 Test Method for Performance of Open Deep Fat Fryers
- F2144 Test Method for Performance of Large Open Vat Fryers

2.2 ANSI Standards:³

- NSF/ANSI 4 Commercial Cooking, Rethermalization, and Powered Hot Food Holding and Transport Equipment
- ANSI/UL 197 Commercial Electric Cooking Appliances
- ANSI Z1.4 Sampling Procedures and Tables for Inspection by Attributes
- ANSI/Z83.11 Gas Food Service Equipment, Deep Fat Fryers

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

2.3 Military Standards (Supplementary Requirements):⁴

- MIL-STD-167/1 Mechanical Vibrations of Shipboard Equipment
- 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 *basket lift mechanism, n*—a device, provided as an accessory to a fryer, which, when activated, automatically lowers a basket of food product into the cooking medium, and automatically raises the basket after a preset cooking time has elapsed.

3.1.2 *electric open deep fat fryer, n*—appliance with an electric resistive heating element or elements, or electric induction type heating elements, inside or around a cooking vessel. The energy in the heating element(s) is transferred to the edible oils or fats in the cooking vessel which are in direct contact with the food product. The cooking medium is placed to such a depth within the cooking vessel that food product to be cooked is essentially supported by displacement of the cooking medium or a perforated container or wire woven basket immersed in the cooking fluid rather than by the bottom of the vessel. The temperature of the cooking medium is maintained automatically by a temperature controlling device at a level selected by an operator.

3.1.3 *fryer filter, n*—integral or adjacent optional accessory to the deep fat fryer that is used to provide filtration of edible oils or fats used in cooking.

3.1.4 *gas open deep fat fryer, n*—appliance that utilizes the heat released from the combustion of a gaseous fuel to heat edible oils or fats in a cooking vessel. The oils or fats in the cooking vessel are in direct contact with the food product. The cooking medium is placed to such a depth within the cooking

⁴ 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://dsp.dla.mil>.

vessel that food product to be cooked is supported essentially by displacement of the cooking medium or a perforated container or wire woven basket immersed in the cooking fluid rather than by the bottom of the vessel. The temperature of the cooking medium is maintained automatically by a temperature controlling device at a level selected by an operator.

4. Classification

4.1 Open deep fat fryers covered by this specification are classified by type, size, grade, style, and class.

4.1.1 Type:

4.1.1.1 *Type 1*, for counter top use.

4.1.1.2 *Type 2*, drop-in.

4.1.1.3 *Type 3*, floor-mounted, portable-castered.

4.1.1.4 *Type 4*, floor-mounted, stationary-leg.

4.1.2 Size:

4.1.2.1 *Size A*, 20-lb cooking capacity (fryers having a capacity of 20 to 29 lb).

4.1.2.2 *Size B*, 30-lb cooking capacity (fryers having a capacity of 30 to 49 lb).

4.1.2.3 *Size C*, 50-lb cooking capacity (fryers having a capacity of 50 to 74 lb).

4.1.2.4 *Size D*, 75-lb cooking capacity (fryers having a capacity of 75 to 99 lb).

4.1.2.5 *Size E*, 100-lb cooking capacity (fryers having a capacity of 100 to 124 lb).

4.1.2.6 *Size F*, 125-lb cooking capacity and higher.

NOTE 1—This specification does not purport to address all of the sizes that may be available, but it is an overview of the most common sizes used in the industry.

4.1.3 Grade:

4.1.3.1 *Grade 1*, stainless-steel cooking vessel and stainless steel exterior.

4.1.3.2 *Grade 2*, stainless-steel cooking vessel and coated carbon steel exterior.

4.1.3.3 *Grade 3*, carbon-steel cooking vessel and coated carbon steel exterior.

4.1.3.4 *Grade 4*, carbon-steel cooking vessel and stainless steel exterior.

4.1.4 Style:

4.1.4.1 *Style A*, fixed electric heating elements.

4.1.4.2 *Style B*, swing-up electric heating elements.

4.1.4.3 *Style C*, induction heating elements.

4.1.4.4 *Style D*, gas fired.

4.1.5 Class:

4.1.5.1 *Class 1*, without automatic basket lift mechanism.

4.1.5.2 *Class 2*, with automatic basket lift mechanism.

5. Ordering Information

5.1 An order for a fryer(s) under this specification shall specify the following:

5.1.1 ASTM specification number and date of issue,

5.1.2 Quantity to be furnished,

5.1.3 Type,

5.1.4 Size,

5.1.5 Grade,

5.1.6 Style, and

5.1.7 Class.

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

5.2.1 When Federal/Military procurement(s) is involved, refer to the supplementary requirements section at the end of this specification.

5.2.2 Electrical power supply characteristics of the fryer(s): voltage, frequency, phase, kW input or amp load, as applicable;

5.2.3 On gas fired fryers, (Style D), the type of gas the fryer is equipped for natural, propane, or other, (specify density, Btu/ft³, and constituents).

5.2.4 On gas fired fryers, (Style D), specify the desired ignition system as one of the following:

5.2.4.1 Standing pilot,

5.2.4.2 Automatic ignition system, or,

5.2.4.3 Other.

5.2.5 When a fryer filter is required, specify the following:

5.2.5.1 Whether the fryer filter is to be integral with the fryer(s) cabinet or mounted in an adjacent cabinet;

5.2.5.2 Whether the fryer filter requires heaters; and the

5.2.5.3 Electrical power supply characteristics of the filter including voltage, frequency, (typically single phase), and maximum amp load, as required.

5.2.6 When basket lift mechanism is required, (Class 2), specify the electrical power supply characteristics of the basket lift mechanism including voltage, frequency, (typically single phase), and maximum amp load, as required.

5.2.7 When a cover(s) is required;

5.2.8 Whether the temperature regulating thermostat is to be one of the following styles:

5.2.8.1 Hydraulically actuated style;

5.2.8.2 Solid state style; or,

5.2.8.3 Solid state computer style.

5.2.9 When a thermostat shunt bypass is required for bypassing the temperature regulating thermostat for the purpose of testing the high limit thermostat, specify the unique requirements of the thermostat shunt bypass and its associated indicators, as applicable;

5.2.10 When other than two half-size baskets are required;

5.2.11 On Type 4 fryers, when bolt down flanges are required, specify the number and size of holes in the flanges.

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

5.2.13 Specify when special or supplementary requirements, such as inspections, accessories, mounting patterns, utility connections, etc., are required.

5.2.14 When specified, the purchaser shall be furnished certification that samples representing each lot have either been tested or inspected as directed in this specification and the requirements have been met. When specified, a copy of the certification, or test results, or both, shall be furnished to the purchaser.

6. Material

6.1 *General*—Materials used in the construction of open deep fat fryers shall conform with the applicable provisions of NSF/ANSI 4 and ANSI/UL 197 or ANSI Z83.11.

6.2 *Cooking Vessel*—The cooking vessel shall be constructed of carbon steel (Grade 3 or 4), or stainless steel (Grade 1 or 2).

6.3 *Cabinet*—The cabinet shall be constructed of the following:

6.3.1 *Grades 1 and 4*—Stainless steel.

6.3.2 *Grades 2 and 3*—Coated carbon steel.

7. Design and Construction

7.1 *General*—Fryer(s) shall conform NSF/ANSI 4. Electric fryers, (Styles A through C) shall conform to ANSI/UL 197. Gas fryers (Style D) shall conform to ANSI/Z83.11. The fryers shall be delivered assembled and ready for connection to energy source. The height from the floor to the top of the cooking vessel for Types 3 and 4 fryers shall not exceed 37 in., (939.8 mm).

7.1.1 *Fryer Filters*—When specified, a fryer filter shall be provided for filtering of the used cooking medium. When specified, the fryer filter shall be supplied with heaters for keeping the cooking medium liquefied. The filter shall be either integral with the fryer(s) cabinet or mounted in an adjacent cabinet, as specified in the purchaser's order.

7.1.2 *Basket Lift Mechanism*—A Class 2 fryer shall be provided with an automatic basket lift assembly for lowering and raising the basket into and out of the cooking medium.

7.1.3 *Covers*—When specified, the fryer shall be supplied with a cover. Cover design shall be such that there is no permanent distortion as a result of normal use.

7.1.4 *Temperature Regulating Thermostat*—The temperature regulating thermostat shall be of the style specified by the purchaser's order.

7.1.5 *Thermostat Shunt Bypass*—When specified, a thermostat shunt bypass shall be included in the design of the control circuitry, for the purpose of testing the high limit thermostat. The bypass assembly shall be operated by pressing and holding a switch of the momentary type. When the switch is pressed, the primary control thermostat is rendered inoperative, allowing the cooking medium to heat to the point where the fryer's high limit thermostat is activated. The thermostat shunt bypass circuit shall conform to the applicable requirements of ANSI/UL 197.

7.1.6 *Heating Source—Electric Fryers (Styles A, B, or C)*—Elements are to be inserted into or around the cooking vessel.

7.1.6.1 *Styles A and B*—Heating elements of Styles A and B fryers shall be of the enclosed resistive type having high temperature corrosion resistant alloy sheaths.

(1) *Style A*—Heating elements of Style A fryers are to be fixed to the cooking vessel.

(2) *Style B*—Heating elements of Style B shall swing up out of the cooking vessel. Style B fryers shall have a device to hold or lock the heating elements in the raised position. When heating elements on Style B fryers are not designed to operate out of the cooking medium, an automatic cut off shall be provided to disconnect power to the elements.

7.1.6.2 *Style C*—Heating elements of Style C fryers shall incorporate inductive heating elements.

7.1.6.3 *Gas Fryers (Style D)*, are to be equipped to burn the gas specified. The ignition system shall be as specified in the order.

7.1.7 *Baskets*—Unless otherwise specified, the fryer(s) is to be provided with two half-size baskets. The length and exterior dimensions of the baskets are to be such as to allow both baskets to fit side by side in the cooking vessel. The baskets are to be equipped with handles. Baskets are to be fabricated of perforated sheet metal or woven or welded wire with materials as specified in 6.1. Spacing between wires is to be no greater than 0.25 in. (6.35 mm) for wire baskets. Holes for perforated baskets shall be no greater than 0.25-in. (6.35-mm) diameter.

7.1.8 *Proof of Compliance*—Evidence of compliance with ANSI/UL 197 or ANSI/Z83.11 and NSF/ANSI 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.

7.1.9 *General by Type:*

7.1.9.1 *Type 1*—Fryers of Type 1 shall be contained in a cabinet and designed for counter use.

7.1.9.2 *Type 2*—Fryers of Type 2 shall be designed to drop into a countertop cutout or a frame.

7.1.9.3 *Type 3*—Fryers of Type 3 shall be contained in a cabinet and mounted on a minimum of four casters. Unless otherwise specified, the front casters are to be provided with locking wheels, while the rear casters are to be of the locking or non-locking type.

7.1.9.4 *Type 4*—Fryers of Type 4 shall be contained in a cabinet and mounted on legs. Unless otherwise specified, legs shall be of the adjustable type. If legs with bolt down flanges are required, the size and number of holes shall be specified by the purchaser in the order.

7.1.9.5 *Controls:*

(1) *Thermostat*—The fryer(s) shall be provided with an adjustable thermostat for controlling the temperature of the cooking medium. The thermostat shall be of the type specified in the order: hydraulic, solid state, or solid state computer. The thermostat shall have an "OFF" position, or it may have a separate "ON/OFF" switch.

7.1.9.6 *Basket-Lift Mechanism (Class 2)*—Class 2 fryers shall be provided with an adjustable timing device or a manual switch for activating each basket. The timer shall be adjustable to at least a maximum of 15 min, with a minimum adjustment to at least 1 min.

7.1.10 *Drain*—Nonremovable cooking vessels, or removable cooking vessels without handles shall be provided with a draining means of at least 1-in. nominal pipe size.

8. Performance Requirements

8.1 When specified, a production model of the fryer shall be tested in accordance with the test method as identified below.

8.1.1 For deep fat fryers with capacity up to 35 lbs of fat, Test Method F1361 shall be used, however, the load size shall be adjusted based on the manufacturer's recommendation for nominal fryer size.

8.1.2 For deep fat fryers with capacity of 35 up to 50 lbs of fat, Test Method F1361 shall be used.

8.1.3 For deep fat fryers with capacity greater than 50 lbs and up to 60 lbs of fat, Test Methods **F1361** or **F2144** shall be used as specified.

8.1.4 For deep fat fryers with capacity greater than 60 lbs of fat, Test Method **F2144** shall be used.

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 fryers prepared for shipment shall be measured and inspected by the manufacturer for compliance with this specification.

10. Product Marking

10.1 Each fryer shall be provided with an identification plate in compliance with ANSI/UL 197 or ANSI Z83.11 as applicable.

11. Manuals

11.1 Specify the format and content of applicable manuals in accordance in Specification **F760**.

12. Packaging and Package Requirements

12.1 Fryer shall be packaged and packed in accordance with the manufacturer’s standard commercial domestic packaging.

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

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

13. Keywords

13.1 basket-lift; cooking medium; electric; filter; fryer; induction heating; resistive heating

**SUPPLEMENTARY REQUIREMENTS
FOR
FEDERAL/MILITARY PROCUREMENT**

S1. Provisions

S1.1 Where provisions of this supplement conflict with the main body, this supplement shall prevail.

S2. Manual

S2.1 A manual complying with Specification **F760** and the supplementary requirements shall be provided.

S3. First Article Inspection

S3.1 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.

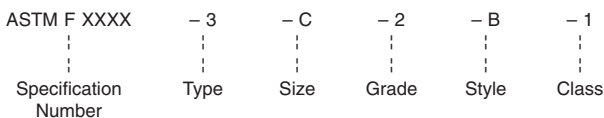
S4. Data Nameplate

S4.1 In addition to the manufacturer’s data plate, a nameplate shall contain the additional information:

- S4.1.1 National stock number (NSN), and
- S4.1.2 Government approved manual number.

S5. Part Identifying Number

S5.1 The following part identification numbering procedure is for government purposes and does not constitute a requirement for the contractor. The PINs to be used for items acquired to this specification are as follows:



The above is an example of the PIN for a Type 3, Size C, Grade 2, Style B, Class 1 fryer.

S6. Preservation, Packaging, and Package Marking

S6.1 When other than normal commercial practice or conformance to Practice **D3951** is desired, the preservation, packaging, and package marking requirements shall be stated in the purchase order or contract.

S7. Instruction Plate

S7.1 An instruction plate shall be made of corrosion resistant metal and shall be attached to the front of the machine. The instruction plate shall bear instructions for start-up, operation, and shutdown.

S8. Human Factors Criteria

S8.1 Human factors engineering criteria principles and practices, as defined in Practice **F1166**, shall be used in the design.

S9. Manufacturer’s Certification

S9.1 If the manufacturer has furnished successfully 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.

S10. Wiring

S10.1 When required, suitable shields or baffles shall be installed to prevent wiring from hanging into any areas where personnel or removable parts can contact them.

S11. Naval Shipboard Requirements

S11.1 *Electromagnetic Compatibility*—When specified, equipment shall be designed and equipped for electromagnetic compatibility in accordance with MIL-STD-461. The contractor shall furnish written certification that the equipment meets the emission and susceptibility requirements when tested in accordance with the test methods of MIL-STD-461.

S11.2 *Power*—Unless otherwise specified, all types of deep fat fryers shall operate on a 440 V, 3 phase, 60 Hz, 3-wire, ungrounded current as specified in MIL-STD-1399/300. The fryers shall be equipped with a step down transformer if the control circuit is other than 440 V.

S11.3 *Upper Temperature Limit Thermostat*—Navy fryers shall be equipped with an upper temperature limit thermostat to serve as a temperature limit switch. This thermostat shall not interfere with the normal operating thermostat but shall operate in the event of above-normal cooking medium temperature, closing when the cooking medium reaches a temperature between 430 and 460°F (221 to 361°C). It shall be nonadjustable and so constructed that in the event of its failure, it shall activate the shunt trip coil of an external disconnect breaker. The contacts of this thermostat shall be connected to a separate terminal block within the fryer housing.

NOTE S11.1—This secondary safety thermostat is intended for connection to a 120 V shunt trip coil of an external disconnect circuit breaker at the time of installation.

S11.4 *Primary Thermostat Shunt Bypass Assembly*—The Navy deep-fat fryer shall be provide with a thermostat shunt bypass assembly specified in 7.1.5 of this specification.

S11.5 *Guard Rails*—Floor- or deck-mounted deep fat fryers shall be provided with a stainless steel guard rail extending across the full width of the fryer front in the same plane as the fryer top. The guard rail shall be supported by brackets and extend 3 to 4 in. (76 to 102 mm) beyond the front of the fryer.

S11.6 *Access*—Deep-fat fryers for naval surface vessels shall pass through a 26-in. (660-mm) wide by 66 in. (1676-mm) high shipboard hatch. Fryers for submarines shall pass through a 25-in. (635-mm) diameter circular hatch. Major disassembly of a fryer intended for submarine installation is permissible.

S11.7 *Mounting*—Where required, fryers shall be provided with holes for mounting. The frame shall be provided with four symmetrically spaced, drilled or threaded, bosses or retaining

nuts for this purpose. Mounting bolt size shall be $\frac{3}{8}$ in. (9.5 mm) minimum for counter mounted fryers and $\frac{1}{2}$ -in. (12.5-mm) minimum for floor or deck mounted fryers. Fryers shall be provided with four type 300 series stainless steel round legs, each a minimum of 4 in. (102 mm) in length, for securing the fryer to the dresser or deck.

S11.8 *Environmental Suitability*—Deep-fat fryers shall be capable of withstanding ship's vibration and motion. When specified, the fryer, under normal operating conditions, shall be tested in accordance with MIL-STD-167/1 Type I equipment. The fryer shall be secured to the test machine in the same manner that it will be secured on board ship. The fryer shall operate without malfunction.

S11.9 *Inclined Operation*—When specified, deep-fat fryers shall operate satisfactorily on surface ships when inclined for 60 s at an angle of 15° each side of the vertical in each of two vertical planes at right angles to each other, with no spillage of fluid or product. For submarines the angle of inclination shall be 30°.

S11.10 *Label Plates*—Deep-fat fryers shall be provided with data-name plates, instruction plates, and high voltage warning plates (for 440 Vac models).

S11.10.1 *Data-Name Plates*—Fryers shall be provided with data-name plates complying with Section S4. The data-name plate shall be readily accessible from the front of the fryer when installed. The information specified in Section S4 shall be stamped, engraved, or applied by photosensitive means.

S11.10.2 *Instruction Plate*—Instruction plate shall comply with Section S7.

S11.10.3 *High Voltage Labels (440 Vac)*—A “Danger High Voltage” label shall be affixed to the equipment's outer case assembly, on or adjacent to each service access cover, and adjacent to one of the fasteners, which secures the cover. A voltage warning label also shall be placed near the high voltage components inside the equipment. The label shall include, but is not limited to, the following warnings:

S11.10.3.1 A warning of high voltage.

S11.10.3.2 Power supply must be disconnected before servicing.

S11.10.3.3 Access covers must be in place during use.

S11.10.3.4 Servicing should be done by authorized personnel.

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