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Standard Specification for Portable Gasoline, Kerosene, and Diesel Containers for Consumer Use[1]

This standard is issued under the fixed designation F852/F852M; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification establishes performance requirements for portable gasoline, kerosene, and diesel containers intended for reuse by the consumer. This specification also covers reusable containers for gas/oil mixtures commonly used for two-cycle engines and reusable dual-compartment containers for separate gas and oil storage.

1.2 This specification is not a fire hazard standard, but a specification for portable gasoline, kerosene, and diesel containers for consumer use.

1.3 This specification defines performance requirements for systems that can effectively reduce fuel spillage and emissions when used in accordance with the manufacturer's (marked) warnings, operating instructions, and limitations of use. This specification does not provide assurance that systems meeting the requirements are suited to all fueling applications and conditions.

1.4 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems has the potential to result in non-conformance with the standard.

1.5 The following precautionary caveat applies only to the Test Method portion, Section 7, of this specification: *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* See Section 6 for additional precautionary information.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A370 Test Methods and Definitions for Mechanical Testing of Steel Products
B117 Practice for Operating Salt Spray (Fog) Apparatus
D471 Test Method for Rubber Property—Effect of Liquids
D638 Test Method for Tensile Properties of Plastics
D975 Specification for Diesel Fuel
D999 Test Methods for Vibration Testing of Shipping Containers
D2561 Test Method for Environmental Stress-Crack Resistance of Blow-Molded Polyethylene Containers
D3699 Specification for Kerosine
D4814 Specification for Automotive Spark-Ignition Engine Fuel
D5798 Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark-Ignition Engines
F839 Specification for Cautionary Labeling of Portable Gasoline, Kerosene, and Diesel Containers for Consumer Use
F2517 Specification for Determination of Child Resistance of Portable Fuel Containers for Consumer Use
F3326 Specification for Flame Mitigation Devices on Portable Fuel Containers
G153 Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

[1] This specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.10 on Standards for Flammable Liquid Containers.

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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.

G155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

2.2 *ANSI Standard:*[3]

B71.1b1977 Supplement to Safety Specifications for Power Lawn Mowers, Lawn and Garden Tractors, and Lawn Tractors

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *container, n*—main vessel of the PFC, intended to hold and carry fuel, including components permanently affixed to it and excluding removable spouts, closures, and other components.

3.1.2 *closure, n*—any combination of components that functionally seals any intended opening and prevents the stored fuel from escaping during storage and transport.

3.1.3 *diesel, n*—hydrocarbon/FAME mixture obtained from petroleum distillation and/or biomass processing, which may contain up to 20 % Bio Diesel, such as specified in Specification D975.

3.1.4 *filling opening, n*—opening intended to be used for the addition of fuel to the PFC, which may also be the same opening used for pouring.

3.1.5 *flame mitigation device, FMD, n*—device permanently installed in a container to prevent the propagation of an external ignition into the PFC.

3.1.6 *gasoline, n*—a hydrocarbons/alcohol mixture obtained from petroleum distillation and/or biomass processing, generally containing small amounts of additives, suitable for use as a fuel in spark-ignition, internal combustion engines per specifications such as Specification D4814 or D5798 (which may contain up to 85 % alcohol oxygenates, typically ethanol).

3.1.7 *kerosene, n*—hydrocarbon mixture obtained from petroleum distillation as specified in Specification D3699.

3.1.8 *portable fuel container, PFC, n*—single- or multi-compartment ~~plastic~~ vessel intended for use by consumers to transport gasoline, gas/oil mixtures (or separate compartments of gas and oil), diesel, or kerosene from their distribution points to the consumer's storage and use points, including all of the components intended for use on or with the container including those supplied by manufacturers other than the PFC manufacturer.

3.1.9 *pouring spout, n*—component through which the contents of the PFC can be dispensed.

3.1.10 *pouring vent, n*—part of the PFC enabling free entry of air to replace the liquid being poured out.

3.1.11 *rated capacity, n*—volume indicated on the PFC; may also be termed nominal capacity or maximum filling level.

3.1.12 *total volume, n*—rated capacity plus any remaining space within the PFC.

4. Requirements

4.1 *General*—The complete portable fuel container (PFC) system shall show evidence of good workmanship and meet the following requirements:

4.1.1 All PFC tests shall be conducted after closures are secured with torque values specified in Table 1.

4.2 *Color*—The PFCs intended for gasoline shall be predominately red in color. PFCs intended for kerosene shall be predominantly medium blue in color. PFCs intended for diesel containers shall be predominantly medium yellow in color. Pigments, coatings, or other means used to impart color shall not be affected by the intended fuel.

4.3 *Capacity*—The PFC rated capacity shall be a maximum of 25 L [6.6 gal].

4.3.1 The total volume shall exceed the rated capacity by at least 5 %.

4.3.2 Capacity shall be determined with the container and its contents at ~~23.5~~23.5 °C ± ~~2.5°C [74.5~~2.5 °C [74.5 °F ± ~~4.5°F].~~4.5 °F].

4.4 *Flame Mitigation*—In accordance with Specification F3326, a flame mitigation device shall be provided in each PFC opening.

4.5 *Child Resistance*—In accordance with Specification F2517, closures of each PFC opening shall be child resistant.

4.6 *Stability*—The PFC shall not upset when tested in accordance with 7.1.

4.7 *Handle*—The PFC shall be provided with a handle. The PFC shall not leak when tested in accordance with 7.2.

TABLE 1 Torque Requirements

Outer Diameter of Closure	Closing Torque, Nm [lbf·in.]
Less than 51 mm [2 in.]	2.8 [25]
51 mm [2 in.] and greater	5.6 [50]

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

4.8 *Drop Strength*—The complete PFC system shall not leak when tested in accordance with 7.3.

4.9 *Internal Pressure*—The PFC container shall not leak (bubble on the container) when tested in accordance with 7.4 at 207 kPa [20 psi] with closures installed.

4.10 *Heat Resistance*—The PFC container shall not leak when tested in accordance with 7.10. Any burning that occurs shall not continue for more than 5 s after the heat source is removed.

4.11 ~~*Durability:*~~ *Permeability—*

~~4.10.1 *Aging*—The material for the PFC container shall retain at least 70 % of its original tensile strength when tested in accordance with 7.5 (7.5.1 and 7.5.2).~~ The filled PFC shall not have a weight loss greater than 1 % when tested in accordance with 7.6.

~~4.10.2 *Permeability*—The filled PFC shall not have a weight loss greater than 1 % when tested in accordance with 7.6.~~

~~NOTE 1—Compliance with more stringent regulatory requirements (for example, from the California Air Resource Board (CARB) or the Environmental Protection Agency (EPA)) is acceptable proof of meeting the permeability requirement.~~

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4.12 ~~*Fuel Resistance:*~~ *Durability:*

4.12.1 *Container* ~~*Material*—~~*Material Fuel Resistance—*The PFC container material shall show no pitting, crazing, softening, bubbling, cracking, tackiness, or decomposition and the material shall retain at least 70 % of its tensile yield strength when tested in accordance with 7.7.1.

4.12.2 ~~*Pouring Spout and Closures*—~~*PFC Fuel Resistance—*There shall be no evidence of deterioration or leakage of the pouring spout and closures when tested in accordance with 7.7.2.

4.12.3 *Stress Cracking*—The PFC container, if made of blow molded polyethylene, shall not crack in 120 h when tested in accordance with 7.8.

4.12.4 *Corrosion Resistance*—This requirement applies only to metal PFCs or metal components of ~~the~~a PFC. No leakage shall be evident when tested in accordance with 7.9.

4.12.5 ~~*Heat Resistance*—~~*Aging—*The material of a plastic PFC container shall ~~not leak~~ retain at least 70 % of its original tensile strength when tested in accordance with ~~7.10~~7.5~~. Any~~ (7.5.1 ~~burning~~and 7.5.2~~that occurs shall not continue for more than 5 s after the heat source is removed.~~).

4.13 *Openings and Closures*—All openings in PFCs shall be provided with a means of closure. Closures shall not leak when tested in accordance with 7.11.

4.13.1 *Filling Opening*—The opening intended for filling the PFC shall have a minimum inside diameter of 31.7 mm [1.25 in.].

4.13.2 *Pouring Vent*—The PFC shall be provided with a vented pouring spout or other means for venting the container during pouring.

4.13.3 *Pouring Spout*—The opening intended for pouring shall have a pouring spout designed to permit gasoline, kerosene, or diesel to pour without leakage. PFCs shall not leak when tested in accordance with 7.12.

NOTE 2—Compliance with alternative regulatory requirements, for example from the California Air Resource Board (CARB) or the Environmental Protection Agency (EPA), is acceptable proof of meeting the requirement in ~~4.12.3~~4.13.3.

5. Markings

5.1 The PFC shall be labeled in accordance with Specification F839.

5.2 The PFC shall be clearly marked with at least one of the following:

5.2.1 The manufacturer's name,

5.2.2 The private labeler's name, and

5.2.3 An identifying symbol.

5.3 The PFC shall be marked with its rated capacity in litres and in U.S. gallons.

5.4 Marking durability shall comply with the applicable requirements of ANSI B71.1b1977.

5.5 Additional markings, for example, as required by other authorities, are permitted.

6. Precautions

6.1 Flammable and combustible fuels are used in some of the following tests. Cautionary standards for handling and disposal of hazardous materials need to be observed. Do not open containers containing fuel in the presence of an open flame or other source of ignition.

7. Test Methods

7.1 *Stability Test*—Fill a sample PFC with water at ~~23.5~~23.5 °C ± ~~2.5°C [74.5~~2.5 °C [74.5 °F ± ~~4.5°F]~~4.5 °F] to its rated capacity by volume. Secure the closures as in transportation and storage. Place the PFC in its intended storage orientation with

its base on an inclined plane forming an angle of 20° with the horizontal. During the test, rotate the PFC about its vertical axis so that stability can be checked with the sample facing any direction. Test at ~~90, 180, 270,~~90°, 180°, 270°, and 360°. Test in each orientation for 1 min.

7.2 *Handle Strength*—Fill a sample PFC with an equivalent weight of water at ~~23.5~~23.5 °C ± ~~2.5°C [74.5~~2.5 °C [74.5 °F ± ~~4.5°F]~~4.5 °F] to its rated fuel capacity. Secure the closures as intended for transportation and storage. One end of a 9.5 mm [0.375 in.] diameter manila rope about 2 m [6.5 ft] long shall be secured to a rigid point of suspension and the other end attached so as to distribute the load across the container handle. Suspend the PFC from the rope for 1 min, then raise it 305 mm [12 in.] from the suspended position and allow it to fall freely.

7.3 *Drop Strength Test:*

7.3.1 Fill the PFC to its rated capacity with water at ~~23.5~~23.5 °C ± ~~2.5°C [74.5~~2.5 °C [74.5 °F ± 4.5 °F] and secure the closures as intended for transportation and storage. Drop it, free fall, onto a flat, solid surface (steel plate or concrete). Using the same PFC, make drops in the following sequence: one drop on the bottom, one drop on a bottom corner, and one drop on a side. The distance of fall shall be 1.8 m [6 ft].

7.3.2 Repeat the test as in 7.3.1 using a different PFC filled with a blend of 50 % glycol and 50 % ~~water.~~ water at –18 °C ± 1 °C [0 °F ±2 °F]. Condition the PFC and its contents ~~cooled~~ at ~~–18~~–18 °C ± ~~1°C [0~~1 °C [0 °F ± ~~2°F]~~2 °F] for 1 h before testing. For these tests, the distance of fall shall be 1.2 m [4 ft].

NOTE 3—The location of the pouring spout is considered to be the front of the PFC. The side is considered to be approximately 90° to either left or right of the pouring spout area.

7.4 *Hydrostatic Pressure Test*—Fill a sample PFC with water at ~~40~~40 °C ± ~~3°C [104~~3 °C [104 °F ± ~~5°F]~~5 °F] to its rated capacity by volume and secure the closures as intended for transportation and storage. Condition the PFC and its contents at ~~40~~40 °C ± ~~3°C [104~~3 °C [104 °F ± ~~5°F]~~5 °F] for 60 min before testing. Increase the internal pressure to a gage pressure of 138 kPa [20 psi] and maintain for 5 min. Apply the pressure by inserting and securing an adaptor through a drilled hole in a flat, heavy section of the PFC container wall and not on a pinch-off or parting line.

7.5 *Aging Test*—Perform the following two tests on the PFC container material. In both tests, determine tensile strength in accordance with the conditions outlined in Test Method D638 using five specimens and a crosshead speed of 50 mm [2 in.] per minute.

7.5.1 *Test 1*—Test the specimen for 720 h (outdoor rating) in accordance with Specification G153 or for 1000 h (outdoor rating) in accordance with Specification G155. The test cycle for each method shall consist of 102 min of light followed by 18 min of light and spray.

7.5.2 *Test 2*—Suspend the test specimens in a circulating air oven at ~~87~~87 °C ± ~~2°C [189~~2 °C [189 °F ± ~~3.6°F].~~3.6 °F]. for 60 days.

7.6 *Permeability Test*—Fill the PFC to its rated capacity with Reference Fuel B (70 % *iso*octane and 30 % toluene by volume), as defined by Test Method D471 and secure the closures. Weigh the PFC accurately to the nearest 5 g [0.01 lb]. After storage for 60 days at ~~23.5~~23.5 °C ± ~~2.5°C [74.5~~2.5 °C [74.5 °F ± ~~4.5°F]~~4.5 °F] or 30 days at ~~40~~40 °C ± ~~2°C [104~~2 °C [104 °F ± ~~4°F],~~4 °F], reweigh the PFC and calculate the weight loss.

7.7 *Fuel Resistance Test:*

7.7.1 *PFC Container Material Immersion Test*—Condition at least 30 specimens, taken from untested PFC container, measuring about ~~125~~125 mm by 16 mm ~~[5~~[5 in. by 0.625 in.] at ~~23.5~~23.5 °C ± ~~2.5°C [74.5~~2.5 °C [74.5 °F ± ~~4.5°F]~~4.5 °F] for 18 h. Immerse specimens in each of the following solutions at ~~38~~38 °C ± ~~2°C [100~~2 °C [100 °F ± ~~4°F].~~4 °F]. Use the remaining ten specimens as a control:

7.7.1.1 *Flammable Fuels:*

(1) ~~CE25a,~~$CE25_A$, and

(2) ~~CE85a.~~$CE85_A$.

7.7.1.2 *Combustible Fuels:*

(1) ASTM Ref Fuel F (max 85), and

(2) FB25a.

7.7.1.3 *For Plastic Container Materials*—Following exposure for 60 days, remove ten specimens from each solution and test to determine tensile yield strength in accordance with Test Method D638 using a crosshead speed of 50 mm [2 in.] per min.

7.7.1.4 *For Metallic Container Materials*—Following exposure for 60 days, remove ten specimens from each solution and test to determine tensile yield strength in accordance with Test Method E8 of Test Methods A370.

7.7.2 *PFC Fuel Resistance Test*—Condition 3 PFCs complete with all components for 60 days in an enclosure with a controlled temperature of ~~40~~40 °C ± ~~2°C [104~~2 °C [104 °F ± ~~4°F],~~4 °F], as measured near the PFC. The PFCs shall be approximately half filled or to approximately 50 % of the length of the FMD with the solutions below, and the closures secured with the torque values specified in Table 1. Once each weekday during conditioning, temporarily remove the PFCs from the enclosure and shake so that the liquid will contact all surfaces.

7.7.2.1 *Flammable Fuels:*