



Standard Specification for Heat-Sanitizing Commercial Dishwashing Machines, Multiple Tank, Conveyor Rack Type¹

This standard is issued under the fixed designation F859; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers multiple tank automatic rack-type commercial dishwashing machines.

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.

2. Referenced Documents

2.1 *ASTM Standards*:²

[A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications](#)

[B127 Specification for Nickel-Copper Alloy \(UNS N04400\) Plate, Sheet, and Strip](#)

[F760 Specification for Food Service Equipment Manuals](#)

[F861 Specification for Commercial Dishwashing Racks](#)

[F1920 Test Method for Performance of Rack Conveyor, Commercial Dishwashing Machines](#)

2.2 *Federal Regulation*:

[OSHA Title 29](#)³

2.3 *NSF International Standards*:

[NSF/ANSI 3 Commercial Warewashing Equipment](#)⁴

[NSF/ANSI 5 Commercial Hot Water Generating Equipment](#)⁴

[NSF/ANSI 14 Plastic Piping System Components and Related Materials](#)⁴

[NSF/ANSI 29 Detergent/Chemical Feeders for Commercial Spray-Type Dishwashing Machines](#)⁴

[NSF/ANSI 51 Food Equipment Materials](#)⁴

[NSF Listings-Food Equipment](#)⁴

2.4 *Underwriters Laboratories Standard*:

[UL 921 Commercial Electric Dishwashers](#)⁵

2.5 *ASSE International Standards*:

[ASSE 1004 Dishwashers](#)⁶

2.6 *Military Standard*:

[MIL-STD-129 Marking for Shipment and Storage](#)⁷

3. Terminology

3.1 *Definitions*:

3.1.1 *commercial dishwashing machines*—machines that uniformly wash, rinse, and heat sanitize eating and drinking utensils. The machines shall be capable of removing physical soil from properly racked and pre-scraped items, and sanitizing multiple-use eating and drinking utensils. These machines shall automatically convey racks of soiled dishes through the treatment stages of the machine, conveying them out at the clean end of the machine. The dishwashing machines shall consist of the following principal parts: legs, wash chamber, rinse chamber, tanks, doors, spray assemblies, pumps, motors, controls, piping, valves, conveying mechanisms, heating equipment, and accessories.

4. Classification

4.1 *General*—Dishwashing machines shall be of the following types, styles, classes, sizes, and capacity groups, as specified.

4.2 *Types*:

4.2.1 *Type I*—This machine shall be designed and supplied to accept the feeding of soiled tableware from the right side, when facing the front of the machine.

¹ This specification is under the jurisdiction of ASTM Committee F26 on Food Service Equipment and is the direct responsibility of Subcommittee F26.01 on Cleaning and Sanitation Equipment.

Current edition approved Aug. 1, 2015. Published September 2015. Originally approved in 1984. Last previous edition approved in 2009 as F859 – 09. DOI: 10.1520/F0859-15.

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 *Code of Federal Regulations*, Chapter XVII, Part 1910 available from Superintendent of Documents, Government Printing Office, Washington, DC 20402.

⁴ Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140.

⁵ Available from UL LLC, 333 Pflugsten Rd., Northbrook, IL 60062.

⁶ Available from ASSE International, 18927 Hickory Creek Drive, Suite 220, Mokena, IL 60448.

⁷ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

4.2.2 *Type II*—This machine shall be designed and supplied to accept the feeding of soiled tableware from the left side, when facing the front of the machine.

4.3 *Styles and Classes:*

4.3.1 *Style 1 (Steam Heated)*—Low-pressure steam (20 to 35 psi) (137.9 to 241.3 kPa) flowing pressure at point of machine connection.

4.3.1.1 *Class A*—Injectors.

4.3.1.2 *Class B*—Heat exchange coils.

4.3.2 *Style 2 (Electrically heated)*

4.3.3 *Style 3 (Gas-heated)*

4.3.3.1 *Class C*—Natural Gas.

4.3.3.2 *Class D*—LP Gas.

4.4 *Style 4 (Pre-Wash Unit)*—The dishwashing machine shall have a pump recirculated prewash unit. The automatic prewash unit shall be fitted to, or be a part of the dishwashing machine.

4.5 *Size and Capacity,*

4.5.1 *Group A*—19¾ by 19¾-in. (501.6 by 501.6 mm) (nominal) racks at 100 per hour minimum.

4.5.2 *Group B*—19¾ by 19¾-in. (501.6 by 501.6 mm) (nominal) racks at 234 per hour minimum.

4.5.3 *Group C*—19¾ by 19¾-in. (501.6 by 501.6 mm) (nominal) racks at 330 per hour minimum.

4.6 All dishwashing machines of the same classification, model, or material list designation furnished with similar options under a specific purchase order shall be identical to the extent necessary to ensure interchangeability of component parts, assemblies, accessories, and spare parts.

5. Ordering Information

5.1 Purchasers should select the preferred options permitted in this specification and include the following information in the procurement document:

5.1.1 Title, number, and date of this specification,

5.1.2 Type, style, class, and group machine required (see 4.1),

5.1.3 Noise level requirements, if other than specified (see 11.2),

5.1.4 When a service-supply valve is required (see 7.5),

5.1.5 When a standard 40°F (22°C) temperature rise steam, electric, or gas booster is required, or stipulate if the required temperature rise is more than 40°F (22°C) (see 7.14),

5.1.6 Electrical power supply characteristic (current, voltage, phase, frequency) (see Section 8),

5.1.7 When a detergent feeder is required (see 7.15),

5.1.8 When a rinse agent feeder is required (see 7.16),

5.1.9 Accessory equipment, such as end cowls with vent opening, or spare and maintenance parts required, as suggested by the manufacturer,

5.1.10 Treatment and painting if other than specified (see Section 10),

5.1.11 When energy consumption profiles, water consumption profiles, or productivity profiles are desired (see 12.3), and

5.1.12 Manufacturer's certification, when required (see Section 13).

6. Materials and Design

6.1 All materials shall be specified as follows:

6.1.1 Materials used shall be free from defects that would adversely affect the performance or maintainability of individual components of the overall assembly. The dishwashing machines shall meet the material design and construction requirements of NSF/ANSI 3, where applicable.

6.1.2 *Corrosion-Resistant Steel*—Corrosion resistant steel shall conform to the requirements of any 200, 300, or 400 series stainless steel specified in 2.1.

6.1.3 *Corrosion-Resisting Material*—Corrosion-resisting material is other than corrosion-resistant steel that is equivalent in the dishwasher application.

6.1.4 *Nickel-Copper Alloy*—Nickel-copper alloys shall conform to the requirements of Specification B127.

6.1.5 *Plastics*—All plastic materials and components used in the dishwashing machine rinse system shall conform to NSF/ANSI 14 or NSF/ANSI 51.

7. Construction Requirements

7.1 The dishwashing machine shall be complete so that when connected to the specified source of power, water supply, heating means (steam, electric, or gas), and drainage, detergent and rinse agent feeder as applicable, the unit can be used for its intended function. Dishwashers shall be rigid, quiet in operation, free from objectionable splashing of water to the outside of the machine. The machine shall be equipped with splash curtains to prevent excessive splash and spray carryover. Parts requiring adjustment or service, or both, shall be readily accessible from the front and side of the machine. The machine shall wash dishes by means of a water and detergent solution pumped from a tank and shall pump rinse the dishes under pump pressure prior to the final rinse of fresh water from an outside source. The final rinse spray may be pumped or fresh water rinse. Provisions shall be made to fill the wash and rinse tank either directly from the regular hot water supply or through the booster, or both. The fill shall be controlled with a hand valve or solenoid, or both. The dishwashing machine shall have a conveyor for handling 19¾ by 19¾-in. (501.6 by 501.6 mm) (nominal) racks. The conveyor shall be protected by an adjustable slip clutch or other equivalent device. Means shall be provided for releasing or disconnecting the drive power, or the drive in case of jamming. The conveyor shall be driven by a separate motor driven gear reduction unit. The final rinse spray control shall have a positive return to the OFF position when there are no racks in process to ensure the conservation of final rinse water. The machine shall be provided with tracks of corrosion-resistant steel or other corrosion-resisting material not less than 0.070 in. (1.8 mm) or equivalent die-formed material of 0.059 in. (1.5 mm). Dishwashers shall have an inside working height of not less than 17½ in. (444.5 mm) above the track.

7.2 *Conveyor*—The conveyor shall be of heavy-duty construction, and of a suitable corrosion-resisting material. It shall be designed to convey racks through the dishwasher automatically. See Specification F861.

7.3 *Piping, Tubing, Fittings, and Valves (Installation)*—Connections shall be readily accessible to facilitate installation

and maintenance. Piping, tubing, and valves shall be located, whenever possible, on the exterior of the machine.

7.4 Piping and Fittings—Water and steam piping and fittings shall be of corrosion-resisting material. Fresh water supply to the tank shall be discharged not lower than 2 in. (50.8 mm) above the maximum flood level rim, or an effective air gap or vacuum breaker shall be installed to prevent backflow. Backflow protection shall be in accordance with ASSE No. 1004. The drain and other plumbing connections shall be standard pipe or tubing connections. Drainage piping shall be corrosion-resisting material, or suitable heat-resisting plastic tubing with fittings. Drains may be joined into a single trunk line requiring only one connection or arranged to permit individual connections to the waste line.

7.5 Valves—Steam valves shall be corrosion-resisting material designed for steam applications and for a saturated steam working pressure of 50 psi (345 kPa). When specified, a separately packed service supply valve shall be provided for closing the supply of water to the dishwasher. The drain valve shall be permanently marked to show “open” and “closed” position and shall be lever-operated or wheel-operated, ruggedly designed for foot or hand operation except when drain valve closure is automatic. Fresh water rinse valves shall be reliable and fully automatic and suitable for 210°F (98.9°C) water. The manually operated valves, when used, shall be identified.

7.6 Spray Assemblies—All spray nozzles and spray arm manifolds shall be corrosion-resisting materials. All spray assemblies shall be removable without the use of tools and shall be easy to clean. Final sanitizing rinse spray assemblies or components, or both, shall be removable for deliming, descaling, and similar maintenance.

7.7 Tank—The tank shall be constructed of not less than 0.050 in. (1.3 mm) thick corrosion-resistant steel, Type 302, in accordance with Specification **A240/A240M**, or other corrosion-resisting material.

7.8 Overflow—The dishwashers shall have a readily accessible overflow drain in the tank. The overflow unit, or cover, when provided, shall be readily removable for cleaning.

7.9 Scrap Trays (Strainers)—Scrap trays of corrosion-resistant steel, not less than 0.044 in. (1.1 mm) thick, or other corrosion-resistant material shall be provided to prevent insoluble matter and large pieces of food residue from passing into the tank. The ledges on which the scrap trays rest shall be so designed that surfaces beneath the ledges are easily accessible for cleaning when the trays are removed. Any opening around or between scrap trays shall be held to a minimum, and as close as practical to the size of the scrap tray opening.

7.10 Access Door(s)—Access door(s) shall be provided for ease of machine clean-out. The door(s) shall be constructed of not less than 0.044 in. (1.1 mm) of corrosion-resistant steel or other corrosion-resisting material, shall be rigid and stiffened as necessary. Door safety catch(s) shall be provided for maximum operator safety on sliding doors. Doors shall be splashproof and their exposed edges shall be smooth and formed to prevent canting or warping. One door assembly shall

be furnished for each tank. A common door may be furnished for adjacent tanks, if such door is of sufficient width to provide the required access. Doors shall be provided with an interlock mechanism to prevent the spray of wash or rinse water when the door is opened.

7.11 Legs (Feet)—The machine shall be rigidly constructed and have four or more legs (feet) made of corrosion-resistant steel, or other corrosion-resisting material. Legs shall be adjustable, so that the height of the track may be varied from 34 to 35 in. (863.6 to 889 mm) above the floor.

7.12 Pump and Motor Assemblies:

7.12.1 Assemblies—The pump and motor assembly shall be mounted on the tank or on a rigid steel base. Rotary seals shall be provided for pump shafts and shall be removable for servicing.

7.12.2 Pump—Pump casings shall be cast iron or corrosion-resisting material and shall have a removable cover or inspection plate, or be of such a design as to permit ease of accessibility for inspection and removal of foreign items from the impeller and interior. The pump shall either be self-draining or equipped with means for draining. The shaft shall be of corrosion-resistant steel, properly aligned and supported. The impeller shall be corrosion-resisting material or iron alloy and shall be in dynamic balance. The pump shall have at least two ball or roller bearings, except that when the pump and motor are mounted on the same shaft, at least two ball or roller bearings shall be provided for the motor and pump. The pump suction intake shall be provided with a corrosion-resistant strainer or shroud.

7.13 Heating—Style 1, 2, and 3 machines shall be capable of maintaining required temperature levels in the tanks.

7.13.1 Style 1—Style 1 machines shall be suitable for operation with a steam supply flow pressure of from 20 to 35 psi (137.9 to 241.3 kPa). Temperature regulators (thermostats) shall be provided for maintaining the proper water temperature in the tanks. Low water protection shall be provided. Steam heat will be provided by tube type heat exchangers or steam injectors, or a combination of both. Check valves or vacuum breakers must be used on all injector-type heating units to prevent back siphoning. The minimum operating pressure shall be specified by the manufacturer and the maximum operating pressure shall not exceed 35 psi (241.3 kPa).

7.13.2 Style 2—Style 2 machines shall be equipped with electric heater elements and sheaths of 300 series corrosion-resistant steel or other corrosion-resisting material. They shall be provided with temperature regulators (thermostats) for maintaining the proper water temperature in the tanks. Low water protection shall be provided.

7.13.3 Style 3—Style 3 machines shall be equipped with a gas burner assembly including primary safety controls, shut-off valves, and flue suitable for operation with type of gas specified. They shall be provided with temperature regulators (thermostats) for maintaining the proper water temperature in the tanks. Low water protection shall be provided.

7.14 Final Rinse Booster—Final rinse booster heater will not be furnished as a part of the machine unless specified.