



Standard Specification for Hot Water Sanitizing Commercial Dishwashing Machines, Multiple Tank, Rackless Conveyor Type¹

This standard is issued under the fixed designation F860; 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.

^{ε1} NOTE—Editorial corrections incorporated throughout in December 2018.

1. Scope

1.1 This specification covers multiple tank, automatic rackless conveyor type, commercial dishwashing machines.

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

1.3 *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

[A29/A29M Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought](#)

[A102 Specification for Ferrovandium](#)

[A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip \(Withdrawn 2014\)](#)³

[A276 Specification for Stainless Steel Bars and Shapes](#)

[A436 Specification for Austenitic Gray Iron Castings](#)

[A554 Specification for Welded Stainless Steel Mechanical Tubing](#)

[A582/A582M Specification for Free-Machining Stainless Steel Bars](#)

[B43 Specification for Seamless Red Brass Pipe, Standard Sizes](#)

[B75 Specification for Seamless Copper Tube \(Metric\) B0075_B0075M](#)

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

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

2.2 *Federal Regulation:*⁴

[OSHA Title 29](#)

2.3 *American National Standards:*⁵

[ANSI S1.4 Specification for Sound Level Meters](#)

[ANSI S1.13 Methods for the Measurement of Sound Pressure Levels](#)

2.4 *National Electrical Manufacturers Association Standards:*⁶

[NEMA ICS Industrial Controls and Systems](#)

[NEMA MG-1 Motor and Generators](#)

2.5 *National Fire Protection Association Standard:*⁷

[NFPA No. 70 National Electrical Code](#)

2.6 *NSF International Standards, Criteria, and Listings:*⁸

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

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

[NSF 29 Detergent/Chemical Feeders For Commercial Spray Type Dishwashing Machines](#)

[NSF Food Equipment and Related Products, Components, and Materials](#)

2.7 *Underwriters Laboratories Standard:*⁹

[UL 921 Commercial Electric Dishwashers](#)

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.

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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.

⁴ Code of Federal Regulations, Chapter XVII, Part 1910, available from Superintendent of Documents, Government Printing Office, Washington, DC 20402.

⁵ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁶ Available from National Electrical Manufacturers Assn., 2101 "L" Street, NW, Washington, DC 20037.

⁷ Available from National Fire Protection Assn., Batterymarch Park, Quincy, MA 02269.

⁸ Available from NSF International, 789 N. Dixboro Rd., Ann Arbor, MI 48105-9723.

⁹ Available from Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 1453 Electric Booster and Commercial Storage Tank Water Heaters

2.8 *American Society of Sanitary Engineering Standards*.¹⁰
ASSE 1004 Performance Requirements for Commercial Dishwashing Machines

3. Terminology

3.1 Definitions:

3.1.1 *commercial dishwashing machines, n*—machines that uniformly wash, rinse, and hot water-sanitize eating and drinking utensils.

3.1.1.1 *Discussion*—The machines shall be capable of removing physical soil from properly pre-scraped items and sanitizing multiple use eating and drinking utensils. These machines shall automatically convey 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, tank, door, spray assemblies, pump motors, controls, piping, valves, conveying mechanism, heating equipment, and accessories.

4. Classification

4.1 *General*—Dishwashing machines shall be of the following types, styles, classes, and 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.

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 (137.8 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 Size and Capacity (see Specification F861):

4.4.1 *Group A*—Minimum conveyor width 22.5 in. (571.5 mm) with an operating capacity of 5000 dishes per hour minimum.

4.4.2 *Group B*—Minimum conveyor width 26.5 in. (673.1 mm) with an operating capacity of 8700 dishes per hour minimum.

4.4.3 *Group C*—Minimum conveyor width 31 in. (787 mm) with an operating capacity of 11 800 dishes per hour minimum.

4.5 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

¹⁰ Available from ASSE International Chapter of IAPMO, LLC, 18927 Hickory Creek Drive, Suite 220, Mokena, IL 60448.

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 procurement documents:

5.1.1 Title, number, and date of this standard,

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

5.1.3 Length of load and unload sections (see 4.4),

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

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

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

5.1.7 Electrical power supply characteristics (current, voltage, phase, frequency) (see Section 8),

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

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

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

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

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

5.1.13 Manufacturing 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 performance or maintainability of individual component(s) of the overall assembly. The dishwashing machines shall meet the material design and construction requirements of NSF/ANSI 3.

6.1.2 *Corrosion-Resistant Steel*—Corrosion-resistant steel shall conform to the requirements of any 300 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 dish machine rinse system shall conform to NSF/ANSI 3.

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), 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 vibration, and so constructed as to prevent 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 be furnished with a loading and unloading section. The machine shall wash dishes by means of a water and detergent solution pumped from a tank and shall final rinse the dishes with fresh water from an outside source. The machine may include a pumped rinse prior to the final sanitizing rinse. Provisions shall be made to fill the wash and rinse tank either directly from the regular hot water supply with a hand valve or through the booster or solenoid, or both. The dishwashing machine shall have a conveyor belt suitable for handling eating and drinking utensils, the conveyor belt shall be protected by an adjustable slip clutch or other device. Means shall be provided for releasing or disconnecting the driving power, or the drive, in case of jamming. The conveyor belt shall be driven by a motor-driven gear reduction unit. The wash, pumped rinse, and final rinse treatment shall be controlled by means of the conveyor speed as determined by NSF/ANSI 3 for multiple tank conveyor type machines. The final rinse spray control shall have a positive return to the “off” position when there is no tableware in process to ensure the conservation of final rinse water. The machine shall be provided with tracks of corrosion-resisting steel not less than 0.070 in. (0.0027 mm) thick, or other corrosion-resisting material. Dishwashers shall have an inside working height of not less than 17½ in. (444.5 mm).

7.2 Conveyor Belt—The conveyor belt shall be of heavy duty construction adequately supported for added strength and rigidity. The conveyor belt shall be constructed of a suitable corrosion-resistant steel or corrosion-resisting material. The upright portion of the belt may be of corrosion-resistant steel or corrosion resisting material. When dishware contact surfaces occur, a nonmetallic, non-marking material shall be utilized. It shall be designed to accept dishes, cup and glass racks when used, and food service utensils. The conveyor will automatically stop if the operator should fail to remove sanitized items from the conveyor belt at the unload end.

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. See Specifications [A29/A29M](#), [A102](#), [A167](#), [A276](#), [A554](#), [B43](#), and [B75](#).

7.4 Piping and Fittings—Water, 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 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 (see Specification [A582/A582M](#)). All spray assemblies shall be removable without the use of tools and shall be easily cleanable or easily cleanable in place. Final sanitizing rinse spray assemblies, components, or both shall be removable for delimiting, descaling, and similar maintenance.

7.7 Tank—The tank shall be constructed of not less than 0.055 in. (0.0021 mm) corrosion-resistant steel 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. (0.0017 mm) thick, or other corrosion-resisting 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 shall be as close as is practical to the size of the scrap tray opening.

7.10 Access Door(s)—Access door(s) shall be provided for ease of machine cleanout. The door(s) shall be constructed of not less than 0.044 in. (0.0017 mm) thick corrosion resisting material shall be rigid and stiffened as necessary. Door safety catch(es) or equivalent means shall be provided to retain the door in the open position. The dishwasher shall automatically stop if the machine is in operation at the time the access doors are opened. For maximum operator safety, the door handles, when provided, shall be of insulated handle design. Doors shall be splash-proof and their exposed edges shall be smooth and formed to prevent canting or warping. One door assembly shall be furnished for each tank.

7.11 Legs (Feet)—The machine shall be rigidly constructed and have four or more legs (feet) made of 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.