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An American National Standard

# Standard Specification for Hot Water and Chemical Sanitizing Commercial Dishwashing Machines, Stationary Rack Type[1]

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

## 1. Scope

1.1 This specification covers manually fed, spray-type, stationary rack, automatically controlled, hot water and chemical sanitizing 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.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 12, 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 and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:*[2]

A29/A29M Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for

A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

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

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

F1696 Test Method for Energy Performance of Single-Rack, Door-Type Commercial Dishwashing Machines

2.2 *Federal Regulations:*[3]

OSHA Title 29 Code of Federal Regulations (CFR) Chapter XVII, Part 1910

2.3 *American National Standards:*[4]

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:*[5]

NEMA ICS Industrial Controls and Systems

NEMA MG-1 Motors and Generators

2.5 *National Fire Protection Association Standards:*[6]

NFPA No. 70 National Electrical Code

2.6 *NSF International Standards, Criteria, and Listings:*[7]

NSF/ANSI 3 Commercial Warewashing Equipment

NSF 5 Commercial Hot Water Generating Equipment

NSF/ANSI 29 Detergent/Chemical Feeders for Commercial Spray-Type Dishwashing Machines

NSF/ANSI 51 Plastic Materials and Components Used in Food Equipment

NSF Listings–Food Equipment and Related Products, Components, and Materials

[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] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

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

[5] Available from National Electrical Manufacturers Assn., 2101 "L" Street, N.W., Washington, DC 20037.

[6] Available from National Fire Protection Assn., Batterymarch Park, Quincy, MA 02269.

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

2.7 *Underwriters Laboratories Standard:*[8]
UL 921 Commercial Dishwashers
UL 1453 Electric Booster and Commercial Storage Tank Water Heaters
2.8 *American Society of Sanitary Engineering Standards:*[9]
ASSE 1004 Commercial Dishwashers

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*
3.1.1 *commercial dishwashing machines, n*—machines that uniformly wash, rinse, and sanitize eating and drinking utensils.
3.1.1.1 *Discussion*—The machines shall be capable of removing physical soil from properly racked and pre-scraped items and sanitizing multiple-use eating and drinking utensils. The dishwashing machines shall consist of the following principal parts: legs, wash chamber hood, tank, doors, spray assemblies, pumps, motors, controls, piping, valves, heating equipment, and accessories. Machines may be either chemical sanitizing or hot water sanitizing.

## 4. Classification

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

4.2 *Category:*
4.2.1 *Category A (Hot Water Sanitizing Model)*—This machine uses hot water to sanitize the dishes and may be provided with an internal booster heater or an external booster heater.
4.2.2 *Category B (Chemical Sanitizing Model)*—This machine uses a chemical sanitizing rinse and must be provided with a chemical sanitizing feeder.

4.3 *Types:*
4.3.1 *Type I* (Straight-Through Model)—This machine is used in line with the table on each side.
4.3.2 *Type II* (Corner Model)—This machine is used in corner placement forming a 90° (1.57 rad) side.

4.4 *Styles and Classes:*
4.4.1 *Style 1* (Steam Heated)—Low pressure steam (10 to 15 psi (68.9 to 103.4 kPa)) flowing pressure at point of machine connection.
4.4.1.1 *Class A*—Injector.
4.4.1.2 *Class B*—Heat exchange coil.
4.4.2 *Style 2* (Electrically heated).
4.4.3 *Style 3* (Gas-heated):
4.4.3.1 *Class C*—Natural Gas.
4.4.3.2 *Class D*—LP Gas.

4.5 *Size and Capacity,* Racks of 19 ¾ by 19¾ in. (502 mm), nominal, racks at a minimum of 50 racks per hour. (See Specification F861).

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 standard;
5.1.2 Category, type, style, class, and size 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 7.4);
5.1.5 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 7.13);
5.1.6 Electrical power supply characteristics (current, voltage, phase, frequency) (see Section 8);
5.1.7 When a detergent feeder is required (see 7.14);
5.1.8 When a rinse agent feeder is required (see 7.15);
5.1.9 Sanitizing agent feeder requirements, if applicable (see 7.16);
5.1.10 Accessory equipment, 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 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.
6.1.2 *Corrosion-Resistant Steel*—Corrosion-resistant steel shall conform to the requirements of any 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 dishmachine rinse system shall conform to NSF/ANSI 3 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), 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 or

[8] Available from Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062.
[9] Available from American Society of Sanitary Engineering, P. O. Box 9712 Bay Village, OH 44140.

overflow of water to the outside of the machine. Parts requiring adjustment shall be readily accessible. Parts requiring service shall be accessible. 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. Provisions shall be made to fill the wash tank either directly from the regular hot water supply with a hand valve or through the booster, if provided, or solenoid, or both. The wash, dwell, and rinse cycles shall be automatically controlled. A light or equivalent shall be provided to indicate when the machine is in operation. Machines shall be provided with tracks of corrosion-resisting steel not less than 0.070 in. thick, or other suitable corrosion-resisting material. Dishwashers shall have an inside working height, including the door opening (or clearance) of not less than 16 in.

7.2 *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, A167, A276, A554, B43, and B75.

7.3 *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 material. Drains may be joined into a single trunk line requiring only one connection or arranged to permit individual connections to the waste line.

7.4 *Valves*—Steam valves shall be corrosion-resisting material designed for steam applications and for a saturated steam working pressure of 50 psi (344.6 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” positions 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.

7.5 *Spray Assemblies*—All spray nozzles and spray arm manifolds shall be of 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.

7.6 *Tank*—The tank shall be constructed of not less than 0.055 in. corrosion-resistant steel, or other corrosion-resisting material.

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

7.8 *Scrap Trays (Strainers)*—Scrap trays of corrosion-resistant steel, not less than 0.044 in. 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 held as close as practical to the size of the scrap tray opening.

7.9 *Access Door(s)*—Door and door frames shall be constructed of not less than 0.044 in. corrosion-resistant steel, or other corrosion resisting material, and shall be rigid and stiffened as necessary. Loading and unloading door(s) shall be counterbalanced and, when in the open position, shall electrically interlock the machine so that it cannot operate. Opening the door during operation shall automatically stop the machine. Door catch(es) shall be provided on inspection door(s) not counterbalanced. The chain-operated counterbalanced door(s), when provided, shall have the door chain fastened at the counter-weight by means of an idler pulley. Door(s) shall be splashproof and their exposed edges shall be smooth and formed to prevent canting or warping.

7.10 *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.

7.11 *Pump and Motor Assemblies:*

7.11.1 *Assemblies*—The pump motor 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.

7.11.2 *Pump* (see Specification A436)—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 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.

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

7.12.1 *Style 1*—Style 1 machines shall be suitable for operation with a steam supply flow pressure of from 10 to 15 psi (68.9 to 103.4 kPa). Temperature regulators shall be provided for maintaining the proper water temperature in the tank. Low water protection shall be provided. Steam heat will be provided by tube type heat exchangers, steam injectors, or a combination of both. The minimum operating pressure shall be specified by the manufacturer and the maximum operating pressure shall not exceed 15 psi (103.4 kPa).

7.12.2 *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 for maintaining the proper water temperature in the tank. Low water protection shall be provided.

7.12.3 *Style 3*—Style 3 machines shall be equipped with a gas burner assembly including safety pilots (or equivalent), shut-off valves, and flue suitable for operation with type of gas specified. They shall be provided with temperature regulators for maintaining the proper water temperature in the tank. Low water protection shall be provided.

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

7.13.1 *Steam Booster*—When specified, the dishwasher shall be provided with an adjustable automatic steam booster to raise the temperature of the final rinse water from either 110°F (43°C) or 140°F (60°C) to at least 180°F (82.22°C). The steam booster shall automatically maintain the required final rinse water temperature without producing steam within either the steam booster or the water supply piping from the steam booster to the machine. The steam booster shall be securely mounted as an integral part of the machine in a position that does not interfere with operation and permits attachment of tables or counters. Otherwise, the steam booster shall be furnished separately, mounted on its own legs and equipped with suitable fittings for connection into the final rinse water lines. Required valves and the temperature regulator shall be accessible and adjustable from the front of the machine. Valve and pipe unions shall be installed on the steam booster where the steam and water lines enter the unit. The final rinse water temperature shall be controlled by an automatic temperature regulator controlling the input of steam to the steam booster.

7.13.2 *Electric Booster*—When specified, the dishwasher shall be provided with an electric booster having all necessary controls for automatic operation to raise the temperature of the final rinse water from 140°F (60°C) to at least 180°F (82.22°C). The booster shall be designed to operate with the electric power characteristics specified. The electric booster shall be securely mounted as an integral part of the machine in a position that does not interfere with operation and permits attachment of tables or counters. Otherwise, the electric booster shall be furnished separately, mounted on its own legs and equipped with suitable fittings for connection into the final rinse water lines. Required valves and the temperature regulator shall be accessible and adjustable from the front of the machine.

7.13.3 *Gas Booster*—When specified, the dishwasher shall be provided with a gas booster having all the necessary controls for automatic operation to raise the temperature of the final rinse water from 140°F (60°C) to at least 180°F (82.22°C). The booster shall be designed to operate with the type of gas specified. It shall be equipped with suitable fittings for connection to the gas line and final rinse water lines. Required valves and the temperature regulator shall be accessible and adjustable from the front of the machine.

7.14 *Detergent Feeder*—When specified, an electric or electronic automatic detergent feeder conforming to NSF/ANSI 29 shall be separately packed with the dishwasher. The reservoir of the feeder shall be capable of holding a supply of dishwashing detergent adequate in normal dishwashing operation for one meal period.

7.15 *Rinse Agent Feeder*—When specified, a separately packed rinse agent feeder conforming to requirements of NSF/ANSI 29 shall be supplied with the dishwasher.

7.16 *Sanitizing Agent Feeder*—Specify a separately packed sanitizing agent feeder conforming to the requirements of NSF/ANSI 29 for the dishwasher.

## 8. Electrical, Steam, and Gas Equipment Requirements

8.1 The electrical and gas equipment shall meet the requirements of UL 921. The dishwasher shall operate on the power characteristics (current, voltage, phase, frequency) specified (see NFPA No. 70).

8.2 *Motors* (see NEMA ICS)—Motors shall comply with applicable requirements of UL 921. The horsepower ratings of the motors shall be adequate to meet the pump requirements of NSF/ANSI 3.

8.3 *Controls* (see NEMA MG-1)—All control equipment shall conform to UL 921 and be capable of operation in an ambient room temperature of 115 ± 9°F (46 ± 5°C).

8.4 *Wiring and Circuit Safety Devices*—All wiring and circuit safety devices shall be in conformance with UL 921. All wiring between the dishwashing machine components shall have provisions for completion at a recognized junction on the machine, except electric heaters and booster heaters requiring connections to the main electrical power supply.

## 9. Lubrication Requirement

9.1 Means for effective and adequate lubrication shall be provided when required. Lubricating points shall be readily accessible, and the dishwasher shall be lubricated with the proper amount of lubricant prior to delivery.

## 10. Treatment and Painting Requirements

10.1 Unless otherwise specified, the dishwasher shall be treated and painted in accordance with the manufacturer's standard practice. All surfaces of the machine, other than corrosion resisting materials, shall be protected against corrosion in the use environment and shall present a neat appearance.

## 11. Performance Requirements

11.1 *Performance Standards Compliance*—Dishwashing machines shall conform to the requirements of OSHA, UL 921, and NSF/ANSI 3. Detergent and rinse agent feeders, when specified, shall comply with NSF/ANSI 29. Electric and gas booster heaters, when specified, shall conform to NSF 5. Electric booster heaters, when specified, shall conform to UL 1453.

11.2 *Noise Level*—Unless otherwise specified, the noise level of the dishwasher only, when operating, exclusive of loading, unloading, and servicing, shall not exceed 80 dB at loading and unloading stations, measured at 5 ft above the floor and 2 ft away from the dishwasher (see ANSI S1.4 and ANSI S1.13).

## 12. Test Methods

12.1 *Operational*—Each machine shall be thoroughly tested in accordance with manufacturer's instructions to determine compliance with requirements of NSF/ANSI 3 and UL 921.

12.2 *Leakage*—No leakage shall occur when tested at pressures up to 125 % of the manufacturer's recommended supply line pressure.

12.3 *Performance Profiles*—See Test Method F1696.

## 13. Certification

13.1 Certification of compliance with the standards cited in this specification shall be provided to the purchaser if required in the purchase document.

13.2 *UL Listing*—Acceptable evidence of meeting the requirements of UL 921 shall be UL Listing, or UL Label, or a certified test report from a recognized independent testing laboratory, acceptable to the user.

13.3 *NSF Certification*—Acceptable evidence of meeting the requirements of NSF/ANSI 3 shall be a listing in the NSF Listings–Food Equipment and Related Products, Components, and Materials and the NSF mark on the finished dishwashing machine, or a certified test report from a recognized independent testing laboratory acceptable to the user.

## 14. Product Marking

14.1 *Machine Identification*—Identification shall be permanently and legibly marked directly on the dishwashing machine or on a corrosion-resistant material securely attached to the machine at the source of manufacture. Identification shall include the manufacturer's model, serial number, name, and trademark to be readily identifiable. In addition, information required by NSF/ANSI 3 and UL 921 shall be included on the dishwasher or on the data plate.

14.2 *Instruction Plate*—An instruction plate of corrosion-resisting material shall be attached to each machine at a height readily visible to the operator. The instruction plate shall list the required time and water temperatures for wash and final rinse.

## 15. Machine Manuals

15.1 The following information shall be supplied in the manuals:

15.1.1 Installation instructions,

15.1.2 Operating guide,

15.1.3 Maintenance and service procedures, and

15.1.4 Service parts list.

15.2 Manuals shall be in accordance with Specification F760.

## 16. Quality Assurance

16.1 Unless otherwise specified in the contract or purchase order, the manufacturer is responsible for the performance of all requirements as specified in this specification. Except as otherwise specified in the contract or order, the manufacturer may use his own or any other facility suitable for the testing of the machine requirements specified herein.

## 17. Keywords

17.1 automatic; chemical sanitizing; commercial; cycles; dishwasher; dishwashing; door; door type; hot water; rack; rinse; sanitizing; stationary rack; warewashing; wash

## SUPPLEMENTARY REQUIREMENTS

S1. When specified in the purchase order, supplementary requirements shall apply when this standard is used in government procurement of hot water or chemical sanitizing commercial dishwashing machines.