



Household Electric Dishwashers

ANSI/AHAM DW-1- 2010



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PREFACE

The Association of Home Appliance Manufacturers develops standards in accordance with AHAM's "Policy and Procedures Governing Technical Standards" which states:

"AHAM Standards shall be in the best interest, mutually, of consumers who use appliances, the industries which provide and service appliances, and other interested parties. They shall relate to actual use conditions and be technically and scientifically sound."

Use or observance of AHAM standards is voluntary.

AHAM standards are presented to the American National Standards Institute (ANSI) for recognition as American National Standards. This standard was so recognized on September 18, 2010 and bears the American National Standard designation ANSI/AHAM DW-1-2010.

This standard contains:

Test procedures that may be applied to any brand or model of household electric dishwashers. Results of tests in accordance with this standard may be publicly stated.

Recommended levels of performance which are considered important to include but which, necessarily, are recommendations only.

With regard to safety, AHAM recommends that all appliance products -- both major and portable -- manufactured or marketed in the United States be submitted to a Nationally Recognized Testing Laboratory (NRTL¹) for inspection and listing in conformance with the safety standards and procedures followed by such laboratories. The relevant standard for dishwashers is ANSI/UL 749, CAN/CSA C22.2 No. 167 "Standard for Safety, Household Dishwashers," latest edition.

AHAM welcomes comments and suggestions regarding this standard. Any standard may be reviewed and improved as needed. All standards must be updated or reconfirmed at least every five years. Any interested party, at any time, may request a change in an AHAM standard. Such request should be addressed to AHAM's president, and should be accompanied by a statement of reason for the request and a suggested alternate proposal.

¹ The Occupational Safety and Health Administration (OSHA) recognizes laboratories that have the necessary qualifications to perform safety testing and certification of specific products covered within a scope of recognition as Nationally Recognized Testing Laboratories (NRTL).

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1. PURPOSE

This standard establishes uniform, repeatable procedures or standard methods for measuring specified product characteristics of household electric dishwashers.

The standard methods provide means to compare and evaluate different brands and models of household electric dishwashers regarding characteristics significant to product use.

The standard methods and the recommended levels of performance are not intended to inhibit improvement and innovation in product testing, design or performance.

2. SCOPE

2.1 This standard only applies to automatic and non-automatic household dishwashers as defined in 3.7.3.

2.2 This standard includes definitions, methods for testing and evaluating dishwasher cleaning performance, a reference to testing for safety and methods of testing and recommended levels for inlet and drain tubing of household electric dishwashers of the types indicated. The standard also includes requirements for the dishwasher drain connection to a food waste disposer and references to energy and water consumption measurement methods.

This standard does not specify test methods for determining energy consumption, drying performance, sound levels or noise for dishwashers.

3. DEFINITIONS

3.1 Air Gap

3.1.1 Inlet Air Gap. A break in the inlet water flow to a dishwasher which, by venting to the atmosphere prevents reverse flow from the dishwasher to the house water supply.

3.1.2 Drain Air Gap. A break in the drain plumbing which, by venting to the atmosphere prevents reverse flow from the house drain plumbing to the dishwasher.

3.2 Coupler. A device used to connect a portable dishwasher inlet hose to a faucet. It may also position the drain line from the dishwasher over the sink bowl.

3.3 Cycle. A sequence of operations of a dishwasher which performs a complete dishwashing function. This may include any combination of washing, rinsing or drying operations.

3.4 Detergent. A cleaning agent manufactured for use in household electric dishwashers to aid in the removal of food soils by chemical means.

3.5 Dishwasher. A machine which washes, rinses and (when drying process is included) dries dishware, glassware and flatware and many cooking utensils by chemical, mechanical and/or thermal means.

3.6 Dishwasher Capacity. (also referred to as the “table setting capacity” of the household electric dishwasher) The number of place settings and serving pieces that may be placed in a dishwasher in accordance with 5.2.

3.7 Dishwasher Types

3.7.1 Installation

3.7.1.1 Built-In. A built-in dishwasher is a dishwasher which is permanently connected to the household water supply lines and may be installed to the electrical supply either permanently or with a power cord.

3.7.1.2 Portable. A portable dishwasher is a dishwasher which is not permanently connected to the household water and electric supply lines. It can be mounted on wheels and easily moved from one place to another in normal use.

This definition includes dishwashers intended to be used on a countertop or table.

3.7.1.3 Convertible. A convertible dishwasher is a portable dishwasher which has been specifically designed so that, with modifications, it may be “converted” or changed readily to be permanently installed, placed and used as any other built-in dishwasher.

3.7.1.4 Free-Standing. A free-standing dishwasher is a dishwasher of the built-in or convertible type provided with a top and side enclosure, installed as a free-standing unit instead of under the kitchen work surface or countertop, and may or may not be permanently connected to the household water and electric supply.

3.7.2 Loading

3.7.2.1 A front opening dishwasher is a type of a dishwasher with a front door or drawer opening through which the machine is loaded or unloaded.

3.7.2.2 A top opening dishwasher is a type of dishwasher with a top cover or lid that is raised to provide an opening through which the machine is loaded or unloaded.

3.7.3 Operation

3.7.3.1 An automatic dishwasher is one in which, after one setting of controls, performs a complete cycle and stops without further attention by the user.

3.7.3.2 A non-automatic dishwasher is one which requires some manual operation or resetting of the controls during the cycle in order to complete a cycle.

3.7.4 Size Classification

3.7.4.1 Standard. A dishwasher with a capacity of 8 place settings or more.

3.7.4.2 Compact. A dishwasher with a capacity of less than 8 place settings.

3.7.4.3 Undersink. A dishwasher intended for mounting under the sink area which has a capacity of less than 8 place settings.

3.8 Dispenser

3.8.1 Automatic. A device activated automatically, usually by electrical or mechanical means, which injects or dispenses measured amounts of detergent, rinse agent, etc., one or more times into the washing or rinsing solution at predetermined intervals throughout the dishwasher cycle.

3.8.2 Non-Automatic. A device, usually a fixed cup or cavity on the dishwasher door, cover or dish rack which injects or dispenses a previously measured amount of detergent, rinse agent, etc., into the washing solution at the beginning of the dishwasher cycle. The dispenser is emptied when the dishwasher door or cover is closed, or requires water circulation to flush the detergent from the dispenser.

3.9 Drain Methods

3.9.1 Gravity. Discharge water from the dishwasher is drained by gravity flow.

3.9.2 Pump. A motor operated pump is used to remove the discharge water under pressure from the dishwasher.

3.10 Etching. A permanent change to surfaces resulting in cloudiness, opacity, or dulling.

3.11 Filming. A non-permanent (removable) change to surfaces resulting in cloudiness, opacity, or dulling.

3.12 Flatware. Implements used in preparing, serving and eating food: i.e., knives, forks, spoons, ladles, etc.

3.13 Flatware Holder. Container for holding flatware in the dishwasher.

3.14 Heating Element

3.14.1 Open Type. A resistance material, or an assembly including such material used to generate heat electrically, designed to be used in air only.

3.14.2 Sheathed Type. Same as air type heating element except that construction is such that it is enclosed when immersed in water. Immersion heaters can be designed to operate in water only, or in both air and water in various parts of dishwasher cycle.

3.15 Interlock Switch. A switch in an electrical circuit of a dishwasher which opens or disconnects a supply or control circuit when the dishwasher is either unlatched or opened.

3.16 Place Setting. The dishware, glassware and flatware for one person. It consists of the items shown in Table 1.

Table 1

<u>Place Setting</u> (See Appendix A for Sources)	
Item	Company/Designation
<u>Dishware</u>	
1 cup-0.21 L (7 oz)	Arzberg/#3824732100
1 Saucer-14 cm (5.5 in)	Arzberg/#3824731100
1 dinner plate-10 in (26 cm)	Corning/Comcor®/#6003893
1 bread and butter plate-17 cm (6.7 in)	Arzberg/#8500217100
1 dessert bowl-13 cm (5 in)	Arzberg/#3820513100
<u>Glassware-Clear, No Pattern</u>	
1 ice tea glass-12.5 fl oz (355 ml)	Libbey/#551HT
<u>Flatware</u>	
1 knife-solid handle	Oneida/2619KPVF
1 dinner fork	Oneida/2619FRSF
1 salad fork	Oneida/2619FSLF
2 teaspoons	Oneida/2619STSF

3.17 Serving pieces. The dishware and flatware used for serving food, as shown in Table 2. Amount shown is for one standard dishwasher table setting. (See Appendix D.)

Table 2

<u>Serving Pieces</u> (See Appendix A for Sources)	
Item	Company/Designation
<u>Dishware</u>	
1 serving platter-9½ in. (24 cm) oval	Corning/Comcor®/#6011655
2 serving bowls-1 qt (1 L)	Corning/Corelle®/#6003911
<u>Serving Flatware</u>	
1 serving cold meat fork	Oneida/2865FCM(flight pattern)
2 serving spoons	Oneida/2619STBF

NOTE 1: Regarding 3.16 and 3.17: Acceptable alternative dishware is noted in Appendix E. When performing dishwasher comparability testing, the same type of place settings, serving pieces, and detergent (Section 4.1) must be used in each unit.

NOTE 2: Regarding 3.16 and 3.17: If it is found that place settings and serving pieces specified above and in Appendix E are no longer available, the user can contact AHAM for further assistance in identifying suitable alternatives.

3.18 Table Setting. A table setting is the total of all place settings plus the serving pieces. (See 3.16, 3.17 and Appendix D.)

3.19 Load. The load of the dishwasher is defined as the dishware, glassware, flatware and serving pieces as shown in Appendix D.

3.20 Power dry. A cycle option whereby forced air and/or heat is used to enhance the drying of the load.

3.21 Rack. Support for holding dishware and glassware in a dishwasher.

3.22 Rinse Agent. A chemical agent usually added to the last rinse water in a dishwasher which reduces the surface tension of water droplets, causing improved drainage from glassware, dishware and flatware to reduce water spotting and improve drying performance.

3.23 Vent. An opening or passage between the inside of the dishwasher and atmosphere to permit pressure equalization during washing and to permit ventilation during drying.

3.24 Water Fill Control System

3.24.1 Time Control. A fill system in which the amount of water used by the dishwasher is controlled by a valve that is (usually with a flow control device) open for a pre-determined time interval.

3.24.2 Sensor Control. A fill system in which the amount of water used by the dishwasher is controlled by a sensor.

4. GENERAL CONDITIONS FOR MEASUREMENTS

Conduct measurements under the following conditions:

4.1 Detergent². Use 0.5% concentration in pre-wash and main wash cycles of dry weight detergent as determined by water quantities. Carry-over water can be considered. Laboratories need to ascertain that the detergent is fresh and not a special test market detergent.

4.2 Machine Conditioning. Install dishwasher in accordance with the manufacturer's instructions. The dishwasher is to be at room ambient (refer to section 4.7) at the start of each test. The dishwasher is to be clean and free of all residue at the start of each test. To assure cleanliness of the dishwasher interior, run at least one (normal) cycles using dishwasher detergent, rinse agent and water, per Sections 4.1, 4.6 and 4.8.

After each test run, run the dishwasher through a normal clean up cycle without dishes but with detergent, rinse agent and water.

4.3 Dishware Conditioning, Preparation, and Storage. Before each test, the load is to be thoroughly clean with no remaining soil or residue. The dishware is to be free from cracks or other damage with the glaze in good condition. Glassware should be free of scratches. Flatware should be free of pits and deep scratches.

NOTE: New dishware should be thoroughly cleaned.

4.3.1 Conditioning. Then condition the load by machine washing in another dishwasher (not the test machine) using a normal cycle with dishwasher detergent and machine dry the load. Use of rinse agent is optional during this cycle.

² Use Cascade with the Grease Fighting Power of Dawn powder national formula or equivalent.

Precondition new load items or load items from storage in the same manner as above.
Alternate: Hand washing and drying may be used as long as no detergent residue remains.

4.3.2 Preparation. Dishes should be dry and at ambient temperature before soiling.

4.3.3 Storage. Store dishware and glasses in such a manner to prevent scratching and damage.

4.4 Electrical Supply

4.3.1 Frequency. Manufacturer's rated frequency $\pm 1\%$.

4.3.2 Voltage. Operate dishwasher at 120, 208 or 240 volts $\pm 2\%$.

4.5 Cycle. If the dishwasher is equipped with an automatic timer and cycle selector giving two or more automatic cycles, the cycle for normal soils indicated by the manufacturer is to be used. Record cycle used per 5.11.

If the dishwasher is not equipped with an automatic timer, operate it manually using the cycle indicated by the manufacturer for regular or normal soils.

4.6 Rinse Agent. Use the rinse agent recommended by the manufacturer. If no rinse agent is recommended, use Jet Dry™ liquid, unscented.

For dishwashers with an adjustable automatic dispenser, the setting shall be as shipped from the manufacturer. If the dishwasher is not equipped with a rinse agent dispenser and the manufacturer does not recommend a rinse agent, no rinse agent is to be used.

4.7 Room Ambient. Temperature is to be $75^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ($21\text{-}27^{\circ}\text{C}$) with a relative humidity (RH) of $35\% \pm 15\%$ throughout the test cycles (refer to 5.1).

4.8 Water Supply

4.8.1 Temperature. For a dishwasher that is intended to be connected to the hot water supply, the input water temperature shall be $120^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($49^{\circ}\text{C} \pm 1^{\circ}\text{C}$). For a dishwasher that is intended to be connected to the cold water supply, the input water temperature shall be $50^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($10^{\circ}\text{C} \pm 1^{\circ}\text{C}$).

4.8.2 Water Pressure. Maintain the pressure of the water supply at 35 ± 2.5 pound per square inch (2.5 ± 0.2 Bar).

4.8.3 Hardness. Water hardness should be between 0 and 85 parts per million (ppm) of CaCO_3 . Where necessary a cation exchange water softener may be used to maintain water hardness at this level.

5. DISHWASHER CLEANING PERFORMANCE EVALUATION METHOD AND PROCEDURE

5.1 Dishwasher Cleaning Performance - General. Execute this test a minimum of three times per dishwasher in order to minimize the effect of variables due to soiling, dishwashing, judging or other general condition variables. A new dishwasher will first go through at least one preconditioning normal cycles and then a cleanup cycle after each test run.

5.2 Load. The test load is to consist of 10 place settings minimum plus serving pieces for a standard dishwasher per Appendix D. For compact dishwashers, the test load is to consist of 6 place settings plus serving pieces per Appendix D. For undersink dishwashers, the test load is 7 place settings plus serving

pieces per Appendix D. The dishes are to be free from cracks or other damage with the glaze in good condition. Prepare all test load items as indicated in 4.3 before soiling which is to be done in accordance with 5.7 Application Method.

5.3 Soil Preparation Utensils Needed

- (1) One qt (1 L) saucepan with cover
- (2) One bowl for egg yolks
- (3) Several sets of measuring spoons
- (4) Three stiff bristle brushes with 1/2 inch (13 mm) wide by 1 inch (25 mm) long bristles.
- (5) Several rubber spatulas, 1 inch wide (Rubbermaid #2733 or equivalent)
- (6) Two glass measuring cups, 2 cup (470 ml) capacity
- (7) One Can opener
- (8) One stopwatch
- (9) One 1 qt (1 L) Tupperware® container, or equivalent, with cover
- (10) One wooden spoon
- (11) One aluminum clad stainless skillet, or equivalent
- (12) One drip coffee maker (minimum 4 cups) any brand
- (13) One round wire mask divided in fourths (optional)
- (14) One round wire mask divided in halves (optional)

5.4 Soiling Ingredients

The soiling ingredients sufficient for a ten place table setting are shown in Table 3. Adjust as necessary for fewer or more place settings. All references to teaspoon, tablespoon, and cup are to be level dry measurements.

Table 3

	<u>Item</u>	<u>Quantity</u>	<u>Description</u>
1)	Eggs	4 (50 g minimum weight each)	Fresh, Grade A, Large
2)	Corn	6 teaspoons (30 ml)	Green Giant™ Cream Style
3)	Oatmeal	5 teaspoons (25 ml)	Quaker Oats™ Instant, Regular Flavor (12 individual packages)
4)	Potatoes	13 teaspoons (65 ml)	Hungry Jack™ Instant Mashed
5)	Ground Beef Mixture	5 teaspoons (25 ml)	Round steak with all visible fat removed. Mix together 75% (by weight) round steak with 25% kidney suet; grind together twice
6)	Preserves	10 teaspoons (50 ml)	Smuckers™ Red Raspberry (with seeds)
7)	Coffee	4 tablespoons (60 ml)	Folgers™, "Classic Roast Decaf
8)	Peanut Butter	2 1/2 teaspoons (13 ml)	JIF™ Creamy
9)	Tomato Juice	1 cup (250 ml)	Campbell's™
10)	Margarine	1 tablespoon (15 ml)	Fleishman™ Corn Oil (6 g of fat per 14 g serving) not whipped
11)	Milk	2/3 cup (165 ml)	Carnation™ Nonfat Dry
12)	Salt	1/4 teaspoon (1.25 ml)	Morton™ Iodized
13)	Tomato Paste	12 oz can (355 ml)	Contadina™