IAPMO PS 23-2021a

PUBLIC REVIEW DRAFT

Industry Standard for

Dishwasher Drain Airgaps

IAPMO Standard

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Preface

This is the ~~ninth~~ tenth edition of IAPMO PS 23, Dishwasher Drain Airgaps. This Standard supersedes IAPMO PS 23-2019, Dishwasher Drain Airgaps. The previous editions of this standard are: September 2021, February 2019, 2006, 2005, 2004, 1989, 1981, 1979, 1968

This Standard was developed by the IAPMO Standards Review Committee (SRC) in accordance with the policies and procedures regulating IAPMO industry standards development, Policy S-001, Standards Development Process. This Standard was approved as an IAPMO Industry Standard on September 13, 2021.

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(4) During its development, this Standard was made available for public review, thus providing an opportunity for additional input from stakeholders from industry, academia, regulatory agencies, and the public at large. Upon closing of public review, all comments received were duly considered and resolved by the IAPMO Standards Review Committee.

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- *(a) standard designation (number);*
- *(b) relevant section, table, or figure number, as applicable;*
- *(c) wording of the proposed change, tracking the changes between the original and the proposed wording; and*
- *(d) rationale for the change.*

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- *(a) the edition of the standard for which the interpretation is being requested;*
- *(b) the definition of the problem, making reference to the specific section and, when appropriate, an illustrative sketch explaining the question;*
- *(c) an explanation of circumstances surrounding the actual field conditions; and*
- *(d) the request for interpretation phrased in such a way that a "yes" or "no" answer will address the issue.*

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IAPMO PS 23-2021a
Dishwasher Drain Airgaps

1 Scope

1.1 Scope

This Standard covers dishwasher drain airgaps with single or multiple inlet ports intended for use with ordinary domestic type automatic dishwashers connected to the sanitary waste system, and specifies requirements for materials, physical characteristics, performance testing, and markings.

1.2 Alternative Materials

The requirements of this Standard are not intended to prevent the use of alternative materials or methods of construction provided such alternatives meet the intent and requirements of this Standard.

1.3 Terminology

In this Standard,

(a) "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy to comply with the Standard;

(b) "should" is used to express a recommendation, but not a requirement;

(c) "may" is used to express an option or something permissible within the scope of the Standard; and

(d) "can" is used to express a possibility or a capability.

Notes accompanying sections of the Standard do not specify requirements or alternative requirements; their purpose is to separate explanatory or informative material from the text. Notes to tables and figures are considered part of the table or figure and can be written as requirements.

1.4 Units of Measurement

SI units are the primary units of record in global commerce. In this Standard, the inch/pound units are shown in parentheses. The values stated in each measurement system are equivalent in application, but each unit system is to be used independently. All references to gallons are to U.S. gallons.

2 Reference Publications

This Standard refers to the following publications and, where such reference is made, it shall be to the current edition of those publications, including all amendments published thereto.

~~**ASSE International**~~
~~ASSE 1021~~
~~Drain Air Gaps for Domestic Dishwasher Applications~~

ASME International (The American Society of Mechanical Engineers)
ASME A112.18.1/CSA B125.1
Plumbing supply fittings

ASME A112.1.3
Air Gap Fittings for Use With Plumbing Fixtures, Appliances, And Appurtenances

Association of Home Appliance Manufacturers
AHAM DW-1
Household Electric Dishwashers

3 Definitions and Abbreviations

This Section is reserved for later use.

4 General Requirements

4.1 Materials

4.1.1 Dishwasher drain airgaps covered by this Standard shall be made of materials suitable for this use and compatible with dishwasher detergents and soaps.

4.1.2 Metals shall be of approved corrosion resistant types conforming to nationally recognized standards.

4.2 Temperature Range

All airgaps shall ~~comply with the requirements in Section 1.2.5, Temperature Range of ASSE 1021~~ be capable of operating at temperatures ranging from 4°C to 93°C (40°F to 200°F).

4.3 Backflow Prevention Requirement

Dishwasher drain airgaps with single or multiple inlet ports shall prevent backflow of waste water.

4.4 Workmanship and Finish

Dishwasher drain airgaps with single or multiple inlet ports shall be free of defects, burrs or blemishes which would affect appearance or serviceability.

4.5 Coating and Finishes

Coating and finishes shall comply with the requirements in Section 5.2, Coating, of ASME A112.18.1/CSA B125.1.

4.6 Flow Ways

~~All airgap flow ways shall comply with the requirements in Section 1.2.1.2, Flow Ways, of ASSE 1021~~ The inlet shall have a minimum cross sectional area of 8 mm (0.3125 in).
(The pressure side of the device shall be considered the inlet). Where the inlet flow ways are so constructed that a 8 mm (0.3125 in) diameter ball will pass completely through, or have a cross sectional area bigger than an 8 mm (0.3125 in) ball, it shall be considered as meeting this requirement. Fountain type devices shall be so constructed that portions of the device can be easily removed to allow removal of any accumulated dirt or obstruction from the flow ways which could block free flow.

4.7 Maintenance Accessibility

All Dishwasher drain airgaps shall be constructed so that the water passages may be cleaned from above the deck level.

4.8 Hose Connections

Hose connections shall comply with the following requirements ~~in Section 1.2.2, Size Range of ASSE 1021~~:~~.~~
Inlet hose connections shall be sized to fit nominal 16 mm (5/8 in) I.D. hose. Outlet connection shall be sized to fit nominal 22 mm (7/8 in) I.D. hose.

4.9 Critical Level Testing

All Dishwasher drain airgaps and relief openings shall be constructed to prevent the backflow of liquid waste when installed with the critical level at/or above the flood level rim of the fixture. The critical level shall be established by testing in accordance with Section 5.3 of this standard.

4.10 Flow and Pressure Ranges

All dishwasher drain airgap shall ~~comply with the requirement in Sections 1.2.3, Flow Range and 1.2.4, Pressure Range of ASSE 1021~~ operate at a pressure up to 35 kPa (5 psi).

4.11 Hose Heat Resistance

Any hose extending beyond the confines of the dishwasher cabinet shall conform to SAE-20 R4 Class R Grade IA for braided cloth heat resistant hose or AHAM Standard DW-1. For a particular size not specified in the Standard, the requirements may be extrapolated to arrive at the necessary value.

4.12 Clamps

Clamps for connecting the hose to the dishwasher drain airgap and the drainage connection may be conventional snap ring type, a worm driven stainless steel band, or other conventional type of equally corrosion resistant materials.

5 Testing Requirements

5.1 Passage Test

5.1.1 Single Inlet Port Units

5.1.1.1 Test Procedure

~~Units with a single inlet port shall be tested in accordance with Section 3.1, Water Flow Passage Test of ASSE 1021.~~The passage test for single inlet port units shall be conducted as follows:

The inlet flow ways shall be checked by passing a 8 mm (0.3125 in) ball propelled only by its own weight. This includes passing through the air gap opening to the atmosphere with inner cap removed.

Note: *For low flow rate devices or inlets use Section 5.6, and for low flow rate reverse osmosis (RO) devices or inlets use Section 5.7.*

5.1.1.2 Performance Requirements

Units with a single inlet port shall ~~comply with the performance requirements in Section 3.1, Water Flow Passage Test of ASSE 1021, or~~ pass the steel ball through the inlet port, or ~~that~~ the inlet port shall ~~has~~have a cross sectional area bigger than an 8 mm (0.3125 in) diameter steel ball.

5.1.2 Multiple Inlet Port Units

5.1.2.1 Test Procedure

For molded plastic units with more than one inlet port, verify that an 8 mm (0.3125 in) diameter steel ball can be freely passed completely through the unit from each molded inlet port and exit the common outlet port, or that each inlet port has a cross sectional area bigger than an 8 mm (0.3125 in) diameter steel ball

5.1.2.2 Performance Requirements

Units with more than one inlet port shall ~~comply with the requirements in Section 3.1, Water Flow Passage Test, of ASSE 1021~~ pass the steel ball through all inlet ports, or that ~~the~~ each inlet port shall~~has~~ have a cross sectional area bigger than an 8 mm (0.3125 in) diameter steel ball.

5.2 Capacity Test

5.2.1 Single Inlet Port Units

5.2.1.1 Test Procedure

~~Units with a single inlet port shall be tested in accordance with Section 3.2, Discharge Capacity Test of ASSE 1021.~~The capacity test for single inlet port units shall be conducted as follows:

(a) Install the device in an upright position;

(b) connect the inlet to a water supply with a minimum flow rate of 19 L/m (5 GPM) which shall be regulated to maintain a uniform pressure up to 35 kPa (5 psi);

(c) Install a pressure gauge at the entrance to the inlet connection;

(d) Provide means for measuring the flow of liquid through the device (Measurement can be by volume or weight);

(e) Conduct the test with water at 60°C ± 3°C (140°F ± 5°F);
(f) Start the flow through the device and gradually raise the pressure to 35kPa (5 psi);
(g) Observe and record the flow rate (here shall be no spillage of water from the device to atmosphere during this test); and
(h) Repeat this test five (5) times observing for any spillage.

Note: *This test does not apply to low flow rate devices or inlets, see Sections 5.6, and 5.7 for low flow rate tests.*

5.2.1.2 Performance Requirements

Units with a single inlet port shall ~~comply with the performance requirements in Section 3.2, Discharge Capacity Test of ASSE 1021~~ pass the required water volume at the indicated pressure and shall not show any spillage from the air gap device.

5.2.2 Multiple Inlet Port Units

5.2.2.1 Test Procedure

The capacity test for molded plastic units with more than one inlet port shall be conducted as follows:

(a) Connect and perform a flow versus pressure drop test separately on each inlet port using clear water and in accordance with the manufacturer's instructions.
(b) Apply clear water for 5 min concurrently to all the inlet ports in accordance with manufacturer's instructions and recommended flow rate(s).
(c) Using clear water, install and perform a separate pressure test in accordance with the manufacturer's instructions on each inlet port.
(d) Cap pressure at 172 kPa (25 psi) via an adjacent upstream shutoff valve for 5 min.

5.2.2.2 Performance Requirement

Whenever an inlet port receives a flow rate setting at 19 Lpm (5 gpm) then the corresponding pressure drop from the inlet port to the outlet port shall not exceed 34 kPa (5 psi). There shall be no visible water leakage or pressure loss as indicated by the pressure meter installed at the inlet port.

5.3 Critical Level Test

5.3.1 Single Inlet Port Units

5.3.1.1 Test Procedure

~~Units with a single inlet port shall be tested in accordance with Section 3.3, Critical Level Test of ASSE 1021.~~The critical level test for single inlet port units shall be conducted as follows:

(a) Install the device in a vessel as in Figure 1 with the inlet extended to a length of 1.07 m (42 in);
(b) measured from the lowest lip of an air vent port and cap or plug the open end;
(c) Reconnect the outlet of the device to the bottom of the reservoir; and
(d) Fill the reservoir with water to a level of 75 mm (3 in) above the top of the cap of the device.

5.3.1.2 Performance Requirements

~~Units with a single inlet port shall comply with the performance requirements in Section 3.3, Critical Level Test of ASSE 1021.~~The device shall drain the reservoir to a level that is at least 6 mm (1/4 in) above the critical level marked on the device.

5.3.2 Multiple Inlet Port Units

5.3.2.1 Test Procedure

For molded plastic units with more than one inlet port, perform this test separately on each inlet port.

5.3.2.2 Performance Requirements

In all cases, the actual critical level (C/L) location shall be a minimum of 6 mm (0.25 in) above the flood level (F/L) mark on the cover cap and a minimum of 32 mm (1.25 in) above the bottom edge of the installed cover cap.

5.4 Deterioration Test

5.4.1 Test Procedure

~~Units with a single or multiple inlet ports shall be tested in accordance with Section 3.4, Deterioration at Extreme Temperature Ranges Test of ASSE 1021.~~The deterioration test for single or multiple port units shall be conducted as follows:

(a) Install the device in a small iron or steel plate 6 mm (1/4 in) to 9.5 mm (3/8 in) thick, drilled to receive the device;
(b) Tighten the holding nut to 0.23 kg-m (20 lb-in) torque;
(c) Submerge the entire device in 93°C ± 1 °C (200°F ± 2°F) water for five minutes, and then within five 5 seconds, submerge the device in 4°C ± 1°C (40°F ± 2°F) water for a least three minutes;
(d) Repeat this test at least fifteen times. Observe for distortion, cracking or crazing, or other; and
(e) indications of damage.

5.4.2 Performance Requirements

~~Units with a single or multiple inlet ports shall comply with the performance requirements in Section 3.4, Deterioration at Extreme Temperature Ranges Test of ASSE 1021.~~The device shall withstand alternating water temperature changes without distortion, cracking or crazing, or any other indications of damage.

5.5 Resistance Test

5.5.1 Test Procedure

~~Units with a single or multiple inlet ports shall be tested in accordance with Section 3.5, Resistance to Detergents Test of ASSE 1021.~~The resistance test for single or multiple port units shall be conducted as follows:

(a) Setup the device in accordance with Section 5.4.1 (a) and (b);

(b) submerge the entire device in a solution of trisodium phosphate (soda ash) in distilled water;

(c) The solution shall be 15 g (0.5 oz) of trisodium phosphate to 1 liter (1 quart) of water;

(d) Immersion shall be for a period of 24 hours; and

(e) Repeat the test specified in sections 5.1, 5.2 and 5.3.

5.5.2 Performance Requirements

~~Units with a single or multiple inlet ports shall comply with the performance requirements in Section 3.5, Resistance to Detergents Test of ASSE 1021.~~The device shall meet the requirements of Sections 5.1, 5.2, and 5.3 without failing.

5.6 Flow Rate Test for Low Flow Rate Water Treatment Applications

5.6.1 Test Procedure

The Flow Rate Test for Low Flow Rate Water Treatment Applications shall be conducted as follows:

(a) Install the test specimen in a test apparatus capable of conducting the test and in accordance with the manufacturer's installation instructions.

(b) For each airgap device tested and for each inlet flowing pressure setting of:

  (i) 172 kPa (25 psi) and

  (ii) 345 kPa (50 psi).

(c) Cycle the ball valve 3 times (15 s open and 15 s closed constitutes one cycle)

5.6.2 Performance Requirements

There shall be no visible leakage from the test airgap device and the flow rates shall be no less than 1.9 Lpm (0.50 gpm) at 172 kPa (25 psi) setting.

5.7 Low Flow Rate Water Treatment Applications Test for Reverse Osmosis (RO)

5.7.1 Test Procedure

The low flow rate test for drain line airgap units shall be conducted as follows:

(a) Low flow rate drain line airgaps such as the type that are used in reverse osmosis (RO) applications, shall comply with the ~~requirements in Sections 2.1, Samples Submitted for Test and 2.2, Samples Tested and shall be configured with low flow inlet flow ways of ASSE 1021.~~ Following:

(i) Three devices of each size and model shall be submitted by the manufacturer. Tests shall be performed in the order listed on one device of each size and each model submitted.

~~(a)~~(ii) The testing agency shall select one of each type or model and size for the full test.

(b) Each sample shall be submitted complete with their own fittings and 914 mm (36 in) long 6 mm (0.25 in) O.D. polyethylene tubing installed and ready for testing per manufacturer instructions.

(c) A flow meter, pressure meter, and ball valve shall be installed adjacent to the up stream end of the 6 mm (0.25 in) O.D. tubing.

5.7.2 Performance Requirements

Each inlet for an RO connection shall also comply with the Flow Rate Test in Section 5.6 of this standard, and with Section 5.3, Back Siphonage Cross Flow Test of ASME A112.1.3. The Lowest of the Critical Level (C/L) locations as determined by the Critical Level Test in Section 5.3 of this standard and Section 5.1.2 of ASME A112.1.3 shall define the highest (F/L) marking location on the cover which is 6 mm (0.25 in) a minimum below the (C/L) location.

6 Markings and Accompanying Literature

6.1 Markings

Dishwasher Drain Airgaps complying with this Standard shall be marked with the:

(a) Manufacturer's name and/or trademark;

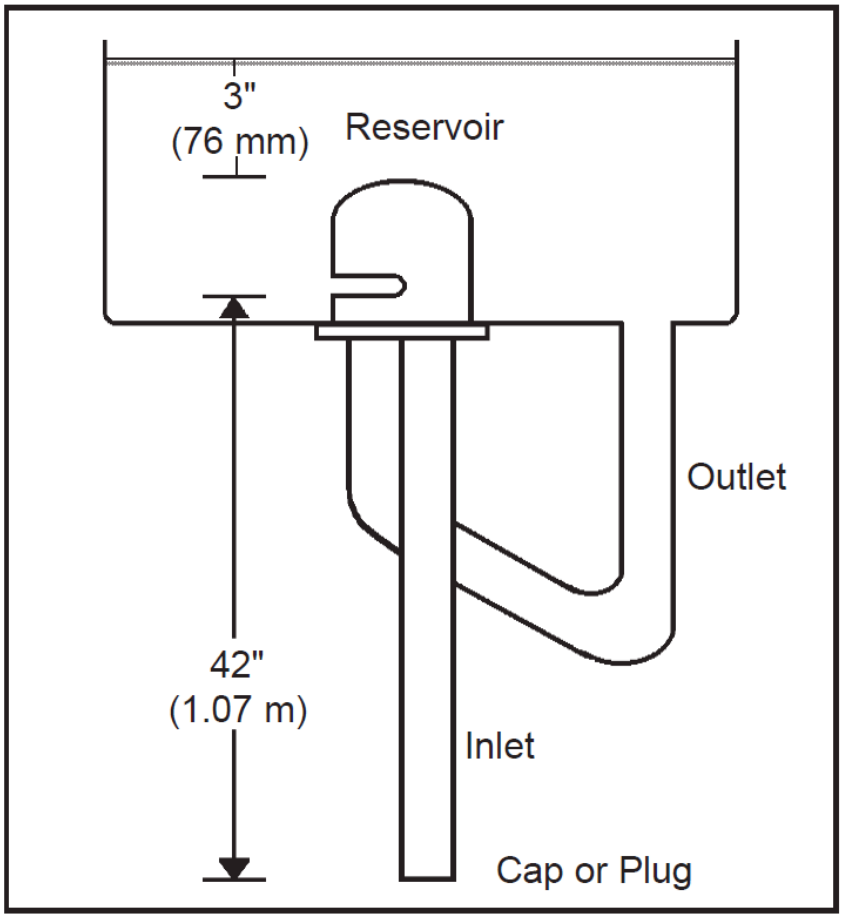
(b) Part number and/or identification number; and

(c) Flood level (FL or F/L) which shall indicate the position of the dishwasher drain airgap in relation to the flood level of the receptacle, as determined by Section 5.3.1, shall be placed on the cover cap. The flood level shall be 6 mm (0.25 in) minimum below the critical level as determined by the test according to Section 5.3.

6.2 Hose Markings

Attached hoses shall be marked at least every 305 mm (12 in) with the dishwasher manufacturer's or hose manufacturer's name, trademark or identification symbol. It shall also be marked with the Standard numbers SAE 20 R-4 or AHAM DW-1, whichever is applicable.

Figure 1
Critical Test for single Port Inlet Units
(See Section 5.3.1.1)



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