



UL 331B

STANDARD FOR SAFETY

Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil

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UL Standard for Safety for Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, UL 331B

First Edition, Dated February 5, 2015

Summary of Topics

This revision of ANSI/UL 331B dated October 1, 2020 includes the following changes in requirements:

– Revisions to 10-Day Moist Ammonia-Air Stress Cracking Test; Section [15](#)

– Clarifications to the Deformation Test; [12.2](#), [12.5](#), and [12.6](#)

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated July 31, 2020.

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UL 331B

Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil

Prior to the first edition, the requirements for the products covered by this standard were included in the Outline of Investigation for Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, UL 331B.

First Edition

February 5, 2015

This ANSI/UL Standard for Safety consists of the First Edition including revisions through October 1, 2020.

The most recent designation of ANSI/UL 331B as an American National Standard (ANSI) occurred on October 1, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

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INTRODUCTION

1 Scope

1.1 These requirements cover complete, self-contained strainer or filter assemblies intended for use with the fuels designated in [1.2](#). Although these devices are designated strainers, they may be either strainers or filters according to the common terminology of the industry.

1.2 Strainers and filter assemblies covered by these requirements are intended for use with one or more of the following:

- a) Diesel fuel, which includes renewable diesel, and diesel/biodiesel blends with nominal biodiesel concentrations up to 5 percent (B0 – B5) formulated in accordance with the Standard Specification for Diesel Fuel Oils, ASTM D975;
- b) Diesel/biodiesel blends and renewable diesel/biodiesel blends with nominal biodiesel concentrations from 5 percent up to 20 percent (B6 – B20) formulated in accordance with the Standard Specification for Diesel Fuel Oil, Biodiesel Blends (B6 – B20), ASTM D7467;
- c) Biodiesel (B99.9/B100) formulated in accordance with the Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels, ASTM D6751;
- d) Kerosene formulated in accordance with the Standard Specification for Kerosine, ANSI/ASTM D3699;
- e) Fuel oil (heating oil) formulated in accordance with the Standard Specification for Fuel Oils, ASTM D396.

1.3 These requirements do not cover the following:

- a) Strainers for handling liquids under cryogenic conditions;
- b) Strainers for marine use;
- c) Strainers for automotive fuel lines;
- d) Strainers for handling refrigerants;
- e) Strainers for use in such facilities as chemical, petrochemical, petroleum, and utility power plants;
- f) Strainers for use in fluid-power (hydraulic and pneumatic) applications;
- g) Strainers or filter assemblies for use with gasoline or gasoline/ethanol blends, which are covered under the Outline of Investigation for Strainers for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations Up to 85 Percent (E0 – E85), UL 331A
- h) Strainers or filter assemblies for use with LP-Gas, Natural Gas, Manufactured Gas, and Anhydrous Ammonia, which are covered under the Standard for Strainers for Flammable Fluids and Anhydrous Ammonia, UL 331.

2 Components

2.1 Except as indicated in [2.2](#), a component of a product covered by this standard shall comply with the requirements for that component.

2.2 A component is not required to comply with a specific requirement that:

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

2.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Units of Measurement

3.1 If a value for measurement is followed by a value in other units in parentheses, the first stated value is the requirement.

4 Undated References

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

CONSTRUCTION

5 General

5.1 A strainer shall include all of the components necessary for its intended function and installation, and shall be furnished as a complete assembly. Strainers may be one of two types:

- a) Removable assemblies, or
- b) Non-removable assemblies with removable strainer elements.

In this standard, the term strainer applies to both types, and requirements that apply to a specific type will designate that type in the text of the requirement.

5.2 The construction of a strainer shall be such that parts can be reassembled in the intended manner after being dismantled to the extent needed for servicing.

5.3 A strainer shall be constructed so that, when in its intended operating position, any air trapped within will not reduce the rate of liquid flow or the effective strainer element capacity.

5.4 A non-removable strainer employing a strainer element intended to be cleaned or replaced shall permit the removal of the element without disconnecting piping.

5.5 A strainer element shall be constructed so that joints or seals required to prevent fluid bypass of the element will be maintained.

5.6 A non-removable strainer shall be constructed so that when the screen or filter element is removed for cleaning, all foreign matter (sediment and dirt) will be removed or can be removed without the probability of any foreign matter being deposited in the outlet side of the strainer.

6 Materials

6.1 Metallic materials

6.1.1 General

6.1.1.1 A metallic part, in contact with the fuels anticipated by these requirements, shall be resistant to the action of the fuel if degradation of the material will result in leakage of the fuel or if it will impair the function of the device. For non-removable strainer assemblies for all fuel ratings covered by this standard, see the Long Term Exposure Test, Section [11](#). For removable strainer assemblies, the Long Term Exposure Test does not apply.

6.1.1.2 The exposed surfaces of metallic parts shall be resistant to atmospheric corrosion if this corrosion will lead to leakage of the fluid or if it will impair the function of the device. The material shall comply with the requirements in Atmospheric corrosion, [6.1.2](#).

6.1.1.3 Metallic parts in contact with the fuels anticipated by these requirements shall not be constructed of lead, or materials that are substantially lead. In addition, no coatings or platings containing lead shall be used, such as terne-plated steel.

6.1.1.4 With reference to the above requirements, metallic parts including metallic materials used to form fluid confining parts as well as metallic coatings, or plating that may be applied to a base material.

6.1.2 Atmospheric corrosion

6.1.2.1 Metallic material used for fluid confining parts shall be resistant to atmospheric corrosion. Ferrous materials of the thickness specified in the following items are acceptable for the preceding when uncoated:

- a) A casting having a wall thickness of not less than ¼ inch (6.4 mm) if shown by production test to be free of leakage, and
- b) Fabricated sheet steel parts having a minimum wall thickness of 0.093 inches (2.36 mm).

6.1.2.2 A protective coating shall provide resistance against atmospheric corrosion to a degree not less than that provided by the protective coatings specified in [6.1.2.3](#).

6.1.2.3 Cadmium plating shall not be less than 0.0003 inch (0.008 mm) thick, and zinc plating shall not be less than 0.0005 inch (0.013 mm) thick, except on parts where threads constitute the major portion of the area, in which case the cadmium or zinc plating shall not be less than 0.00015 inch (0.0038 mm) thick. Metallic parts are also considered to comply with [6.1.2.1](#) when they are protected against atmospheric corrosion by:

- a) Hot dipped, mill galvanized sheet steel complying with the coating designation G90 in Table I of the Specification for Sheet Steel, Zinc Coated (Galvanized) or Zinc-Iron-Alloy Coated (Galvannealed) by the Hot Dip Process, ASTM A653/A653M, or
- b) Coatings which have been determined to be equivalent to G90 under the requirements of the Standard for Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment, UL 1332.

6.1.2.4 A metallic material other than as described in [6.1.2.1](#) – [6.1.2.3](#) shall be painted or protected in a manner that has been determined to be equivalent.

6.2 Nonmetallic materials

6.2.1 General

6.2.1.1 A nonmetallic part in contact with the fuels anticipated by these requirements, shall be resistant to the action of the fuel if degradation of the material will result in leakage of the fuel, or if it will impair the function of the device.

6.2.1.2 Gaskets or seals shall comply with the requirements as outlined in Nonmetallic materials – material level, [6.2.2](#), and Nonmetallic materials – system level, [6.2.3](#).

6.2.1.3 Nonmetallic materials in contact with the fuels anticipated by these requirements shall not be constructed of the following:

- a) Polysulfide rubber;
- b) Ethylene propylene diene monomer (EPDM) rubber;
- c) Methyl-Methacrylate;
- d) Polyvinyl Chloride (PVC);
- e) Nylon 6/6; or
- f) Polyurethane.

6.2.2 Nonmetallic materials – material level

6.2.2.1 Seals shall be evaluated in accordance with the Standard for Gaskets and Seals, UL 157, modified as indicated in [6.2.2.2](#) – [6.2.2.4](#). If a specific material complies with these requirements, the material can be considered to be qualified for system level testing.

6.2.2.2 A seal shall be constructed of a material that is acceptable in accordance with the scope of the Standard for Gaskets and Seals, UL 157.

6.2.2.3 Seals shall be subjected to the Volume Change and Extraction Test in accordance with the Standard for Gaskets and Seals, UL 157, except for the following modifications:

- a) The test duration shall be 1000 hours;
- b) The applicable test fluids shall be as described in Supplement [SA](#); and
- c) For all materials, the average volume change shall not exceed 40 percent swell (increase in volume) or 1 percent shrinkage (decrease in volume). In addition, the weight loss shall not exceed 10 percent. There shall be no visual evidence of cracking or other degradation as a result of the exposure for any material.

6.2.2.4 Seals shall be subjected to the Compression Set Test in accordance with the Standard for Gaskets and Seals, UL 157, except for the following modifications:

- a) The test duration shall be 1000 hours;
- b) The samples shall be immersed, at room temperature, in the test fluids [see item (c)] while compressed for the entire test duration. No oven conditioning is required;
- c) The applicable test fluids shall be as described in Supplement [SA](#).

d) The recovery period shall consist of removing the sample from the compression device and immersing it in the applicable test fluid for 30 minutes at room temperature. The sample shall not be allowed to dry out due to exposure to air. The 30 minute immersion should use the same fluid as the test fluid for each sample.

e) For all materials, the average compression set is calculated and shall not exceed 35 percent.

Exception: This requirement does not apply to composite gasket materials as defined in accordance with the Standard for Gaskets and Seals, UL 157.

6.2.3 Nonmetallic materials – system level

6.2.3.1 For all materials used in non-removable strainer assemblies, gaskets, and seals that have been shown to comply with the applicable requirements for static seals in the Standard for Gaskets and Seals, UL 157, or with the requirements under material level tests shall be subjected to the system level tests after the Long Term Exposure Test, Section [11](#). Static seals shall be provided in accordance with [11.2.4](#).

6.3 Casting impregnation materials

6.3.1 Material level

6.3.1.1 Casting impregnation materials shall be evaluated at the material level in accordance with the requirements in the Outline of Investigation for Power-Operated Dispensing Devices for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations Up to 20 Percent (B20), Kerosene, and Fuel Oil, UL 87B.

6.3.2 System level

6.3.2.1 For non-removable strainer assemblies utilizing casting impregnation materials, the casting with the material applied as intended shall comply with the Long Term Exposure Test, Section [11](#). The casting shall not show indications of porosity leakage at any point during or after this test.

7 Bodies and Covers

7.1 An opening threaded for connection of pipe shall be threaded in accordance with the Standard for Pipe Threads, ANSI/ASME B1.20.1.

Exception: Strainers intended for use in installations where pipe fittings incorporate other than NPT type threads shall be permitted to be provided with pipe threads complying with a national pipe thread standard compatible with those fittings. The pipe thread type shall be identified in accordance with [17.1](#).

7.2 A strainer for attachment to pipe larger than 3-inch nominal size shall be provided with flanged pipe connections. Flanges shall conform to the appropriate American National Standard for pipe flanges and flanged fittings covering the material from which the flange is made, or shall be of a construction found by investigation to be equivalent for the specific application.

7.3 Cleanout and drain openings shall be closed by a standard pipe plug, a threaded, shouldered plug, or a wing-nut plug. The specified plugs shall be supplied with a seal to prevent leakage that is compatible with the intended fuel(s) as demonstrated by compliance with the performance requirements of this standard. A strainer shall have plugs that are constructed of materials in accordance with Materials, Section [6](#).

7.4 A strainer provided with a screwed cover shall employ either ground joints, gaskets, or O-rings acceptable for the purpose. If a gasket or O-ring is used, it shall be retained by the body, cover, or cap when the part is removed and shall not be damaged when the cover or cap is screwed in place.

7.5 A flat gasket employed with a bolted cover shall be cemented to the cover or body unless the construction is such that the gasket will be retained by either the body or cover when the cover is removed.

Exception: Cementing or retaining of the gasket is not necessary provided a complete set of new gaskets is furnished with each replacement cartridge for a strainer that employs a cartridge-type filtering element.

7.6 A plant fiber gasket shall not be less than 1/32 inch (0.8 mm) thick.

7.7 A cork gasket shall be graphited on one side, and when high pressures are involved, the other side shall be cemented in place so the gasket will not be blown out.

8 Stuffing Boxes

8.1 If packing is used to prevent leakage around a stem, and the construction is such that it is necessary for the user to adjust or renew the packing during usage or as wear occurs, a stuffing box complying with the requirements in [8.2](#) – [8.8](#) shall be provided.

8.2 A stuffing box shall be provided with a removable, shouldered, unthreaded follower gland, and shall have a nut or other means for adjusting the gland to maintain pressure on the packing.

8.3 A stuffing box gland shall be made of corrosion-resistant material in accordance with Materials, Section [6](#).

8.4 A stuffing box shall be fully packed prior to shipment of the strainer.

8.5 A spring-loaded follower gland shall employ a spring made of corrosion-resistant material, or of material provided with a corrosion-resistant protective coating. See Materials, Section [6](#).

8.6 If corrosion of a stem will cause damage to a packing or seal material and result in leakage, the stem shall be of a corrosion-resistant material. See Materials, Section [6](#).

8.7 A stem shall be constructed so that it cannot be completely withdrawn from the strainer by reverse rotation. Threads of a stem shall not enter a stuffing box recess.

8.8 A stem shall be of sufficient length to permit repacking the stuffing box without requiring the strainer to be dismantled.

9 Springs

9.1 The construction and application of a spring employed in a strainer shall be such that it is not likely to fail because of corrosion, fatigue, overstress, or wear, if failure of the spring will allow the strainer elements to become displaced.

PERFORMANCE

10 General

10.1 Except as otherwise indicated, representative samples of a strainer are to be subjected to the tests described in Sections [11](#) – [15](#).

10.2 If a series of strainers is to be investigated in which the bodies differ in size only, three representative samples are to be chosen to include the largest, smallest, and one intermediate size for each test fluid that is used. If a strainer having a single body size is being investigated, one sample is sufficient for each test fluid that is used. See [10.3](#).

10.3 All tests shall be performed using the test fluids specified for that test. No substitution of test fluids is allowed. When the test indicates that FB25a or B100a are to be used, the test fluid shall be prepared as described in Supplement [SA](#).

10.4 For non-removable strainer assemblies, the following test sequence outlines the order in which tests shall be performed. Tests included in this standard, but not included in the test sequence, can be performed in any order. The tests in the given sequence are to be performed on samples that were subjected to the Long Term Exposure Test, Section [11](#). Samples of the strainer are required for each applicable test fluid in accordance with [10.2](#), and the samples shall then be subjected to the sequence.

- a) Long Term Exposure Test, Section [11](#);
- b) Deformation and External Leakage Test, Section [12](#); and
- c) Hydrostatic Strength Test, Section [13](#).

10.5 For removable strainer assemblies, the Long Term Exposure Test, Section [11](#) is not applicable. All other tests shown in this standard may be performed in any order on samples as indicated in [10.2](#).

10.6 To reduce the effects of seal dry out due to removal of the test fluid during the test sequence in [10.4](#), the tests in the sequence shall be started within 4 hours of removal of the previous test fluid. If necessary to coordinate testing, the sample may be left filled with the most recent test fluid at room temperature until the next test is initiated. If the previous test used an aerostatic or hydrostatic source, the sample shall be filled with kerosene.

11 Long Term Exposure Test

11.1 General

11.1.1 The test outlined in [11.2](#) – [11.4](#) is to be performed on samples in accordance with [10.2](#) and [11.2](#). If the product is rated for use with diesel fuel, a diesel/biodiesel blend with a nominal biodiesel concentration of up to 20 percent (B20), kerosene, or fuel oil, then the test shall be performed using the FB25a test fluid. If the product is rated for use with a biodiesel (B99.9/B100), then the test shall be performed using the B100a test fluid. See Supplement [SA](#).

11.2 Samples

11.2.1 A sample of a complete strainer assembly is to be tested. All inlet and outlet openings of the samples shall be sealed in accordance with [11.2.3](#).

11.2.2 If platings or coatings are used internal to the assembly, additional samples may be used. See [11.4.2](#).

11.2.3 Closures shall be provided to seal off inlet and outlet openings in accordance with [11.2.1](#). These closures shall be fabricated of suitable materials. The closures shall be provided with a 1/4 inch NPT opening for connection to the test apparatus. All closures shall be installed by the manufacturer and provided with a torque rating. There will be no other adjustment to connections for the duration of the test.

11.2.4 Any O-rings, gaskets, or other sealing materials, shall be provided and installed by the manufacturer. These dynamic sealing devices shall be the same as those that will be used in the final product installation. Static seals shall be representative of the seals being used in the final product installation. If the sealing device or material is not considered part of the component under test, but will be provided in the end product at the time of installation, a representative seal shall be provided for the test.

11.3 Method

11.3.1 The sample is to be exposed to the applicable test fluid in accordance with [11.1.1](#). The test fluids shall be prepared using the instructions in Supplement [SA](#).

11.3.2 A quick connect device is connected to the 1/4 inch NPT connection at the inlet, and is used to fill the samples with the applicable test fluids. A source of pressure may be used to assist in filling or draining the samples, however, the pressure shall not exceed the rated pressure of the device under test. Once the samples are filled to exclude all air, they are closed off and sealed. The samples are then placed in the test chamber.

11.3.3 The chamber temperature is increased to $60 \pm 2^{\circ}\text{C}$ ($140 \pm 4^{\circ}\text{F}$). When the chamber reaches this temperature, the exposure period begins. The samples are exposed to the applicable test fluid at $60 \pm 2^{\circ}\text{C}$ for approximately 168 hours. At the end of this duration, the exposure period is halted and the chamber is allowed to cool. The samples are subjected to the rated pressure for one minute. The fluid is then drained from the samples, observed, and discarded. The samples are then immediately refilled with new test fluid and the chamber temperature is allowed to increase to $60 \pm 2^{\circ}\text{C}$ again. The total duration of the test shall equal 2,520 hours of exposure at $60 \pm 2^{\circ}\text{C}$.

11.3.4 At the end of the total exposure duration, the test fluid is left in the samples and the samples are removed from the chamber. The samples are then subjected to the appropriate test sequence as outlined in [10.4](#) and in accordance with [10.6](#). Prior to the initiation of the test sequence, the test fluid is to be drained and discarded.

11.3.5 If the device contains any parts or surfaces that are plated or coated, or if the device uses casting impregnation materials to eliminate porosity leakage, the plating, coating, or impregnation are tested both during and after this exposure. See [11.4.2](#) and [11.4.3](#).

11.4 Results

11.4.1 There shall be no leakage during this test. If leakage is observed at any point during the test, the test is to be stopped.

11.4.2 For platings or coatings, there shall be no softening of the plating or coating material. Compliance is checked by observance of the drained test fluid. There shall be no evidence of visible flaking or material. In addition, there shall be no substantial discoloration of the test fluid when observing the drained fluid. Discoloration is an indication of chemical attack on the plating or coating internal to the device. In order to determine that the base metal is not exposed, visual inspections shall be made. If the visual inspection requires examination of internal surfaces, the samples shall be cut open to determine compliance. If this is necessary, additional samples can be used to determine compliance with this requirement, such that the remaining test sequence will not be disturbed by cutting open samples.

11.4.3 For casting impregnation materials, the sample shall not show evidence of porosity leakage during or after the fluid exposure duration.

12 Deformation and External-Leakage Test

12.1 When tested as specified in [12.2](#) – [12.6](#), a strainer shall not leak, nor shall there be evidence of damage resulting from:

- a) The application of 1-1/2 times maximum rated pressure for 1 minute,
- b) The tightening of threaded parts used for care and servicing, and
- c) The turning effort exerted on openings threaded for piping.

12.2 Representative strainer assemblies are to be rigidly supported. Any bolts, pipe plugs, or threaded parts detached for care and servicing of the strainer are to be tightened with a torque wrench to the value specified in [Table 12.1](#) or [Table 12.2](#). Samples with threads other than those specified in [Table 12.1](#) or [Table 12.2](#) shall be torqued as specified by the manufacturer.

Table 12.1
Torque requirements for screws

American standard screw size	Torque,		I.S.O. screw size, mm	Torque,	
	lb-in	N·m		lb-in	N·m
–	–	–	4	7	0.8
No. 8	9	1.0	4.5	12	1.4
No. 10	15	1.7	5	19	2.7
1/4 inch	50	5.6	6	40	4.5
–	–	–	7	70	7.9
5/16 inch	100	11.3	8	100	11.3
–	–	–	9	130	14.7
3/8 inch	150	16.9	10	165	18.6
7/16 inch	200	22.6	12	230	26.0
1/2 inch	250	28.2	14	295	33.3
9/16 inch	300	33.9	–	–	–

Table 12.2
Torque requirements for pipe connections

Pipe size, nominal inches	Torque,	
	lb-in	N·m
1/8	150	16.9
1/4	250	28.2
3/8	450	50.8
1/2	800	90.4
3/4	1000	113
1	1200	136
1-1/4	1450	164
1-1/2	1550	175
2	1650	186
2-1/2	1750	198
3	1800	203

12.3 The sample strainer used in this test is to be rigidly anchored or otherwise supported. A length of Schedule 80 pipe is to be connected to a female pipe threaded section of the body, the male threads having first been lubricated with SAE No. 10 machine oil. Each pipe is then to be tightened to the torque specified in [Table 12.2](#).

12.4 The strainer is then to be subjected for 1 minute to a hydrostatic pressure of 1-1/2 times maximum rated pressure, but not less than 18 psig (124 kPa).

12.5 The strainer parts used for care and servicing of the strainer are then to be alternately removed and replaced 25 times, tightening each time with a torque wrench to the value specified in [Table 12.1](#) or [Table 12.2](#). Samples with threads other than those specified in [Table 12.1](#) or [Table 12.2](#) shall be torqued as specified by the manufacturer. The pressure test described in [12.4](#) is then to be repeated.

12.6 Any bolts or threaded parts used for care and servicing of the strainer are then to be tightened with a torque wrench to twice the value specified in [Table 12.1](#) or [Table 12.2](#). Samples with threads other than those specified in [Table 12.1](#) or [Table 12.2](#) shall be torqued to twice the value as specified by the manufacturer. The pressure test described in [12.4](#) is then to be repeated.

13 Hydrostatic-Strength Test

13.1 All parts of a strainer that are subjected to pressure during intended use shall withstand for 1 minute, without rupture or permanent distortion, a hydrostatic pressure of five times the maximum rated pressure, but not less than 60 psig (414 kPa).

13.2 All samples used in the Deformation and External Leakage Test, Section [12](#), are to be subjected to this test.

14 Element-Collapse Test

14.1 A strainer element shall not collapse when totally clogged and subjected for 1 minute to a differential hydrostatic pressure of 18 psig (124 kPa).

14.2 The strainer-element openings are to be closed with tape, lacquer, or other means. A hydrostatic pressure is then to be applied to exert the differential pressure between the inlet and outlet sides of the element.

15 Moist Ammonia-Air Stress Cracking Test

15.1 After being subjected to the conditions described in [15.2](#) – [15.3](#), a pressure-confining brass part containing more than 15 percent zinc shall:

- a) Show no evidence of cracking, delamination, or degradation; or
- b) Perform as intended when tested as described in [15.4](#).

15.2 One test sample of each size is to be subjected to the physical stresses normally imposed on or within a part as the result of assembly with other components. Samples with female tapered pipe threads, intended to be used for installing the product in the field are to have the threads engaged and tightened to the torque specified in [Table 12.2](#). Samples with female threads other than tapered pipe threads shall be torqued as specified by the manufacturer. Polytetrafluoroethylene (PTFE) tape or pipe compound are not to be used on any threads. Samples with male threads are evaluated as received.

15.3 The samples are then to be tested in accordance with Apparatus, Reagents and Materials, Test Media, Test Sample Preparation, (9.3 – 9.4), and Test Procedure (10.1 – 10.4) of the Standard Test

Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys, ASTM B858-06, except the pH level of the test solution shall be High 10.5 $\pm$ 0.1 and the exposure temperature shall be 25 $\pm$ 1°C.

15.4 After the exposure period, the samples are to be examined for cracks, delamination, and degradation using a microscope having a magnification of 25X. Pressure-confining parts exhibiting degradation as indicated in [15.1](#) as a result of the test exposure described in [15.2](#) and [15.3](#) shall withstand, without rupture, a hydrostatic test pressure of five times the rated pressure of the valve, for one minute.

MANUFACTURING AND PRODUCTION

16 General

16.1 The manufacturer shall provide the necessary production control, inspection, and tests. The program shall include the test described in [16.2](#).

16.2 Each assembled strainer shall be tested to determine that it does not leak externally at:

- a) An air pressure equal to the rated operating pressure, but not less than 18 psig (124 kPa), or
- b) A hydrostatic pressure of 1-1/2 times the rated operating pressure, but not less than 27 psig (186 kPa).

MARKING

17 General

17.1 A strainer shall be marked with the following information:

- a) The manufacturer's or private labeler's name or identifying symbol.
- b) A distinctive catalog designation to specifically identify the strainer.
- c) Strainer assemblies shall be marked to indicate the fuel rating for which they are intended. The marking shall be "Diesel Fuel" or "B5" for strainers rated for diesel fuel only; shall be "B20" for strainers rated for diesel fuel and diesel/biodiesel blends with nominal biodiesel concentration up to 20 percent (B0 – B20); shall be "B99.9/B100" for strainers rated for biodiesel fuel; shall be "Kerosene" for strainers rated for kerosene, or shall be "Fuel Oil" for strainers rated for fuel oil. The marking shall be prominently displayed. See [17.3](#).
- d) The direction of flow.
- e) The maximum working pressure or pressures for various fluids. See [17.3](#).
- f) Strainers constructed using pipe thread in accordance with the Exception to [7.1](#) shall be provided with a tag, label, or similar marking on the product or smallest unit package, identifying the pipe thread type for the installer. See [17.3](#).

17.2 A strainer assembly consisting of a base (head) unit and a separate replaceable spin-on type filter shall have the markings specified in [17.1](#) marked on the fixed base (head) unit, except as noted in [17.3](#). In addition, the head unit shall be marked with the model and/or catalog designation of suitable replacement spin-on type filters for which it has been evaluated.

17.3 The markings specified in [17.1](#) (c), (e), and (f), may be:

- a) Included as part of the strainer marking or on a tag attached to the strainer,
- b) Shown on the smallest carton in which the strainer is packaged, or
- c) Included in installation instructions provided with each strainer.

17.4 A disposable-type element or cartridge shall be marked with the manufacturer's or private labeler's name or identifying symbol and catalog designation.

17.5 A strainer with a disposable-type element or cartridge shall be marked to enable the user to identify the element or cartridge used therein. This may be accomplished by cross referencing the strainer catalog designation to the element catalog designation in the manufacturer's or private labeler's instructions provided with the strainer.

17.6 Markings shall be legible and permanent, such as afforded by a metal nameplate, decalcomania transfer, or waterproof marking ink.

17.7 If a manufacturer produces strainers at more than one factory, each strainer shall have a distinctive marking to identify it as the product of a particular factory.

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SUPPLEMENT SA – Test Fluids

SA1 Representative Aggressive Combustible Test Fuel Mixtures

There are two test fluids that are applicable for tests in this standard. The fluids are designated as FB25a and B100a. The Test fluids represent chemical and physical characteristics of the fuels covered in this standard. See [1.2](#). The aggressive biodiesel contains elements that are used to represent contaminants that can be found in actual use and are used to help represent the worst case test fluid.

The test fluid designations represent the following:

FB25a – An aggressive test fluid containing 25 percent biodiesel with aggressive elements:

F = Reference Fuel F (No. 2 Grade S500) in accordance with the Standard Specification for Standard Test Method for Rubber Property – Effects of Liquids, ASTM D471.

B = Biodiesel (100 percent Soy feedstock) in accordance with the Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels, ASTM D6751.

a = Aggressive components to be mixed with B to form B100 as an aggressive Biodiesel Stock.

B100a – An aggressive test fluid containing 100 percent biodiesel with aggressive elements:

B = Biodiesel (100 percent Soy feedstock) in accordance with the Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels, ASTM D6751.

a = Aggressive components to be mixed with B to form B100 as an aggressive Biodiesel Stock.

The aggressive biodiesel containing <0.5 percent volume combined water and decanoic acid shall be based on the approximate formula below (*) to achieve a final 1.00 ± 0.02 acid number of the mixture when measured in accordance with the Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration, ASTM 664.

0.2 percent volume acid water [2.60 g decanoic acid crystals/1000 g of deionized water](†)

The resulting solution, after mixing the above elements, shall have an acid number of 1.0 ± 0.02 . After the measurement is determined, an acid number not within the specification of 1.0 ± 0.02 shall be adjusted with additional biodiesel fuel or decanoic acid added until the acid number is 1.0 ± 0.02 .

These two fluids may be used to condition samples as noted in each specific test that indicates that these fluids are to be used. The test fluids are to be prepared just prior to use to minimize effects on the test fluid. The aggressive biodiesel is corrosive and changes can occur to the solution from interactions with the storage and transfer containers. Exposure to air and/or moisture may also affect the test fluid.

Products intended to be rated for use with diesel fuel or diesel/biodiesel fuel blends with nominal biodiesel concentrations up to 20 percent (B0 - B20) shall be evaluated using the FB25a test fluid as the only applicable test fluid. Products intended to be rated for use with biodiesel fuel (B99.9/B100) shall be evaluated using the B100a test fluid. For products evaluated using the FB25a test fluid or B100a test fluid, one sample is required to be conditioned in accordance with the test sequences in [10.4](#).

(*) Note: The formula is approximate since each source of biodiesel may have variations in specific gravity and initial acid number that require measurement and final adjustment as specified.

(†) Note: Decanoic acid crystals are insoluble in water, so are recommended to be finely ground and thoroughly mixed in the overall solutions before acid number measurements are taken.

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SUPPLEMENT SB – Strainers for Oil-Fired Heating Appliances

SB1 Scope

SB1.1 This supplement covers complete, self-contained strainer or filter assemblies intended for use with oil-fired heating appliances.

SB1.2 Except as noted, the requirements of this supplement is in addition to the requirements of Section 1 – Supplement [SA](#) of this standard.

SB2 Capacity

SB2.1 A strainer that is intended to protect the smallest orifice in oil burning equipment shall comply with the requirements in this section.

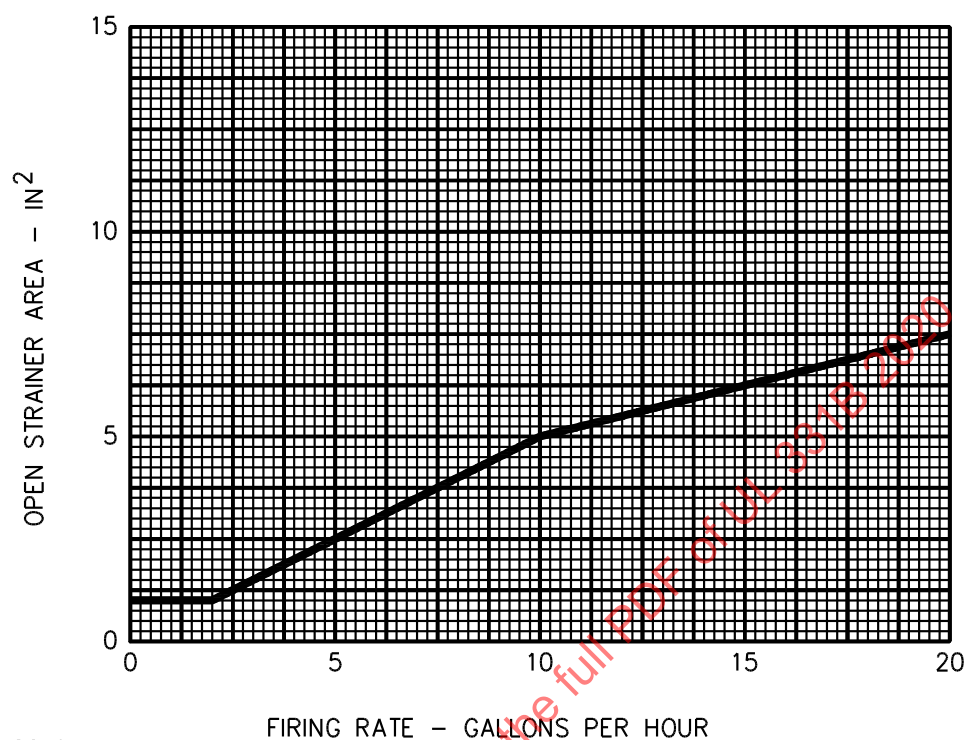
SB2.2 A strainer element of the wire cloth, perforated, or plate type shall have a maximum orifice (diameter) size or plate separation of:

- a) 0.027 inch (0.69 mm) if the strainer is intended for use with No. 1 or 2 grade fuel oil, and
- b) 0.056 inch (1.42 mm) if the strainer is intended for use with No. 4, 5, or 6 grade fuel oil service.

SB2.3 Each strainer assembly is to be rated for capacity in terms of the maximum firing rate of the burner equipment as expressed in gallons of fuel oil per hour (3.79 l/hr). For strainers employing wire cloth or perforated screens, [Figure SB2.1](#) – [Figure SB2.3](#) specify minimum areas of screen opening based upon the grade of fuel oil used and the firing rate of the equipment to be served.

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Figure SB2.1
Strainer area for No. 1 grade fuel oil



S2161

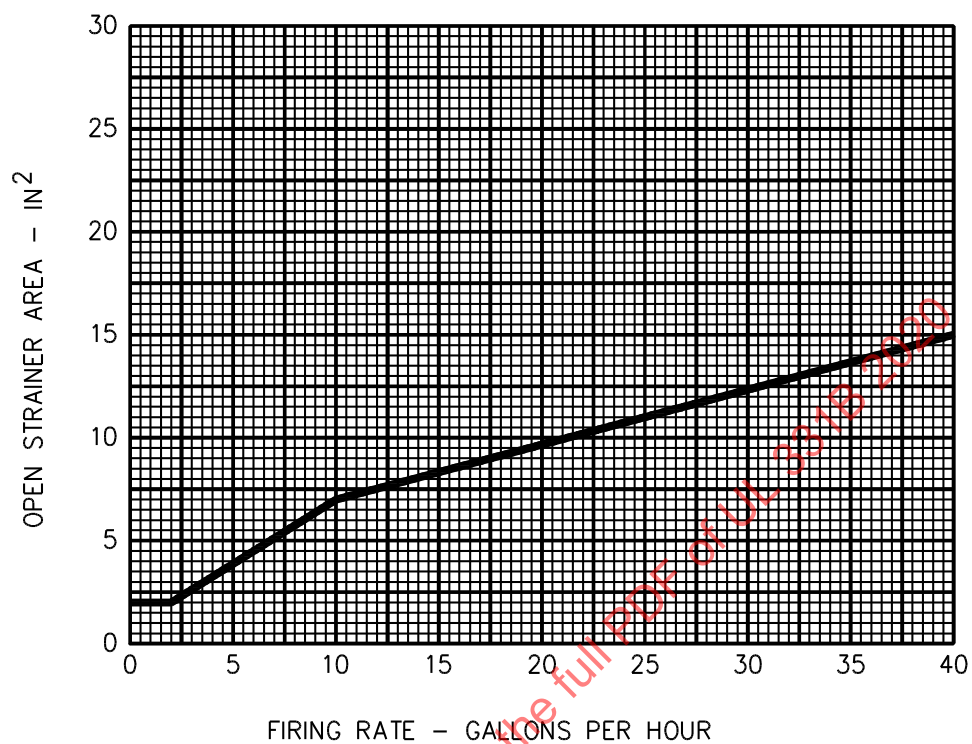
NOTES –

1) Fuel oils as designated by Specification for Fuel Oils, ANSI/ASTM D396-89

2) 2) 1 in² = 6.45 cm²

3) 3) 1 Gallon = 3.79 l

Figure SB2.2
Strainer area for No. 2 grade fuel oil



S2162

NOTES –

- 1) Fuel oils as designated by Specification for Fuel Oils, ANSI/ASTM D396-89
- 2) 2) 1 in² = 6.45 cm²
- 3) 3) 1 Gallon = 3.79 l