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An American National Standard

Standard Specification for Fabricated or Cast Automatic Self-Cleaning, Fuel Oil and Lubricating Oil Strainers[1]

This standard is issued under the fixed designation F 1567; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers automatic or continuously self-cleaning automatic strainers, or both, for use in fuel and lubrication oil systems. The strainer is designed to operate under positive pressure (discharge side of the pump). Strainers manufactured to this specification are suitable for use in any marine environment.

1.2 It is not the intent of this document to redefine existing filtration standards. The intent is to provide sound guidelines for purchasers and designers of lube oil and fuel oil systems. Nominal micron requirements and filter efficiencies shall be as agreed upon by the purchaser and manufacturer and stated in the purchase order document.

2. Referenced Documents

2.1 *ASTM Standards:*

D 3951 Practice for Commercial Packaging[2]

F 795 Practice for Determining the Performance of a Filter Medium Employing a Single-Pass, Constant-Rate, Liquid Test[3]

F 1199 Specification for Cast (All Temperatures And Pressures) and Welded Pipe Line Strainers (150 psig And 150°F Maximum[4]

F 1200 Specification for Fabricated (Welded) Pipe Line Strainers (Above 150 psig and 150°F)[4]

2.2 *ASME/ANSI Standards:*

ASME Boiler and Pressure Vessel Code: Section VIII Division 1,Pressure Vessels[5]

ASME Boiler and Pressure Vessel Code: Section IX, Welding and Brazing Procedures[5]

B16.5 Steel Pipe Flanges and Flanged Fittings (Including Ratings for Class 150, 300, 400, 600, 900, 1500, and 2500)[5]

B16.42 Ductile Iron Pipe Flanges and Flanged Fittings Class 150 and 300[5]

Y14.5 Dimensioning and Tolerancing[5]

2.3 *American Welding Society Standard:*

AWS D1.3 Structural Welding Code[6]

2.4 *MSS Standards:*

SP25 Standard Marking Systems for Valves and Fittings[7]

SP55 Quality Standards for Valve, Flanges and Fittings and Other Piping Components (Visual Method)[7]

2.5 *Federal Specification:*

PPP-F-320 Fiberboard: Corrugate and Solid Sheet Stock (Container Grade) and Cut Shapes[8]

2.6 *Military Specifications:*

MIL-P-116 Preservation, Methods of[9]

MIL-B-121 Barrier Material, Greaseproofed, Water Proofed, Flexible[9]

MIL-S-901 Shock Tests, H.I. (High Impact): Shipboard Machinery, Equipment and Systems, Requirements for[9]

MIL-P-15024 Plates, Tags and Bands for Identification of Equipment[9]

MIL-P-15024/5 Plates, Identification[9]

2.7 *Military Standards:*

MIL-STD-167-1 Mechanical Vibrations of Shipboard Equipment (Type I—Environmental and Type II Internally Induced)[9]

MIL-STD-740 Airborne and Structureborne Noise Measurement and Acceptance Criteria of Shipboard Equipment[9]

MIL-STD-2073-1 Material Procedures for Development and Application of Packaging Requirements[9]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *filter, or straining element*—the replaceable component in a strainer that performs the barrier separation of solid particles from flowing fluid. It shall be removable for cleaning and servicing.

3.1.2 *maximum allowable working pressure (MAWP)*—the highest internal pressure that the strainer can be subjected to in

[1] This specification is under the jurisdiction of ASTM Committee F-25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.13 on Piping Systems.

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[2] *Annual Book of ASTM Standards*, Vol 15.09.

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] *Annual Book of ASTM Standards*, Vol 01.07.

[5] Available from the American Society of Mechanical Engineers, Headquarters, Three Park Ave., New York, NY 10016–5990.

[6] Available from American Welding Society, 550 N.W. LeJune Rd., Miami, FL 33126.

[7] Available from Manufacture's Standardization Society of the Valve and Fittings Industry, 1815 N. Fort Myer Dr., Arlington, VA 22209.

[8] Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

[9] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

service. The maximum non-shock working pressure for which a strainer is rated by the manufacturer on its nameplate.

3.1.3 *maximum design temperature*—the maximum temperature for which a strainer is rated by the manufacturer.

3.1.4 *strainer*—a device which, when installed in a pipeline, provides a mechanical means of removing suspended solids from flowing liquid.

3.1.5 *Straining element open area*. The net effective open area of the clean element through which the fluid can pass.

4. Classification

4.1 Strainers shall be furnished as Type I fuel oil or Type II lubricating oil. The strainers may be either hydraulic, electric, or pneumatic operated.

5. Ordering Information

5.1 Orders for strainers under this specification shall include the following:

5.1.1 This specification number,

5.1.2 Operating and design requirements for flow rate, pressure, temperature, nominal micron rating, fluid type, and viscosity. ASME Section VIII Division 1 Code Stamp requirements.

5.1.3 Flanged end connections class and type drilling, that is, ANSI, DIN, and so forth.

5.1.4 Orientation of inlet and outlet connections (see 6.2.9).

5.1.5 Repair spare parts package (see 14.1).

5.1.6 Quality criteria and test plan requirements.

5.1.7 Additional test or supplementary requirements (that is, ship motions and attitude constraints, see 7.3 and S1).

5.1.8 Strainer element open area if greater than requirements in 6.2.6.

5.1.9 Any special seal requirements.

5.1.10 Any special control requirements, that is, differential pressure gages, valves, control panels, motors and so forth.

5.1.11 Certified drawing requirements showing maintenance envelope and mounting details.

6. Materials and Manufacture

6.1 The strainer shall be designed to remove contaminating or unwanted solid particles, or both, from fuel oil and lube oil. The self-cleaning action shall be automatic, and shall have the ability to backwash, when required, the filtered fluid through the filter element in segments such that the contaminating particles are flushed free of the filter element. The self-cleaning action of each unit shall be driven by a motor (electric, pneumatic, or hydraulic.)

6.2 *Components*—Each strainer assembly shall consist of a housing with a removable cover, inlet and outlet connections, filter/straining element(s), self-cleaning mechanism(s), controls, and a differential pressure gauge. The strainer unit shall have suitable supports. The cross-sectional flow area throughout the unit shall be equal to or greater than that of the piping to which the strainer is connected.

6.2.1 *Housing*—The strainer housing, cover, flanges, and other items which form the pressure boundary shall conform to the requirements of the ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, Pressure Vessels. Cast grey iron pressure retaining components shall not be used. Units requiring ASME stamp shall have it specified in the purchase agreement. The dirty oil inlet shall be located at the lower part of the body and arranged to help prevent contamination of the clean outlet side of the strainer during disassembly.

6.2.2 *Cover*—The removable cover shall be secured to the housing by threaded fasteners. Removal of the cover shall provide access to all internal components and shall not require unbolting the inlet and outlet strainer piping connections. Cover lifting devices with integral supports or lifting eyes shall be required for covers weighing more than 30 lb.

6.2.2.1 *Antispray feature*—The strainer cover shall contain a device to deflect fluid spray downward in the event of gasket failure. The spray deflector shall remain in position at all times when the cover is connected to the housing.

6.2.3 *Gasket*—The gasket or o-ring shall be capable of providing a positive seal under service and test conditions. The gasket shall be installed between the cover and strainer housing. This gasket shall be in place during the hydrostatic pressure test.

6.2.4 *Pipe and Flange Dimensions*—The inlet and outlet flanges shall be sized and drilled to conform with ANSI B16.5, Class 150 or 300, or as specified in the ordering data (see 5.1.3).

6.2.5 *Element Support*—The filter element support shall not permanently deform when the assembly of the filter element and element support is subjected to the strength of internals test (see 9.3.3). The element support shall be designed to facilitate easy removal of the filter element and element support as one assembly. The element support must satisfy the flow area requirements of 6.2.6.

6.2.6 *Filter Element*—The filter element may be furnished in any corrosion resistant material compatible with the fluid in service. The filter element shall be attached to the element support in such a manner that it can be easily removed and replaced from the element support. The straining element open area shall be at least two to four times larger than the area of the strainer discharge connection.

6.2.7 *Motor*—The self-cleaning action of each unit shall be operated by a motor included as a part of the strainer. This motor can be hydraulic, electric or pneumatic.

6.2.7.1 *Hydraulic motor*—A motor exhaust connection sized to meet the strainer hydraulic motor shall be provided. This motor exhaust connection shall also be suitable for venting air during the initial fill and pressurization.

6.2.7.2 *Electric motor*—Electric motors shall be fractional horsepower, TEFC, NEMA design B, with a continuous rated 1.15 service factor or equivalent. Voltage, phase and cycle rating shall be stated in the purchase document.

6.2.7.3 *Pneumatic motor*—Design type shall be agreed upon between the purchaser and manufacturer.

6.2.8 *Backflush Structure*—The backflush structure shall periodically or continuously clean all of the filter element by backflushing system fluid through the element. The structure shall clean the filter element in segments so as not to disrupt the system flow through the strainer at any time. All impurities separated shall be isolated from the filtered liquid and discharged. All shaft penetrations shall require seals suitable for oil service.

6.2.9 *Connections*—The inlet and outlet connections shall be flanged. The inlet and outlet shall be permanently marked and identified.

6.2.9.1 Drain connections shall be provided. These connections shall be furnished with caps or plugs.

6.2.9.2 The unit shall have a suitable means of removing sludge from the strainer when it is isolated from service or during normal operation.

6.2.10 *Lifting Attachments*—Each housing and the cover shall be provided with suitable sling attachment areas for lifting in a normal position. If lifting eyes are used, each eye shall have the capability to carry the total weight.

6.2.11 *Mounting*—Free standing strainers shall be mounted by feet attached to the housing. Each foot must be provided with a suitable hole to accommodate one hold-down bolt.

6.3 *Welding*—Welding for nonpressure-boundary components shall be in accordance with the AWS Structural Welding Code. Welding for pressure boundary components shall be in accordance with the ASME Boiler and Pressure Vessel Code.

6.4 *Treatment and Painting*—The exterior of the strainer shall be treated and painted in accordance with standard commercial practice.

6.5 *Material*—Ductile iron, bronze, carbon steel, and stainless steel materials used in the fabrication of the automatic self-cleaning strainer shall not affect nor be affected by petroleum products. Materials shall be in accordance with ASTM or ASME specifications. Dissimilar metal connections shall be designed to provide optimum corrosion protection.

6.6 *Seals*—Strainer seals shall be elastomers suitable for this service.

7. Operating Requirements

7.1 *Pressure*—The strainer shall be suitable for operation in the range of 0.21 to 1.03 MPa (30 to 150 psi).

7.2 *Temperature*—The strainer shall be suitable for operation between 15 to 120°C (60 to 250°F) unless otherwise specified in the ordering data (see 5.1.2).

7.3 *Shipboard Performance*—Strainers shall be capable of operating in accordance with all requirements of this specification when subjected to the purchase agreement specified ship motion and attitude constraints (see 5.1.7).

7.4 *Self-Cleaning Rate*—The pressure drop through the strainer assembly shall not exceed the manufacturer's maximum rated pressure drop during operation. Specifically, the self-cleaning mechanism shall be capable of maintaining the pressure drop below this value when contaminated fluid is being pumped through the strainer at the design flow specified in 5.1.2.

8. Workmanship

8.1 *Workmanship*—The strainer and its components shall be free from blow holes, porosity, hard spots, shrinkage defects and cracks. All surfaces shall be smooth and clean (reference MSS SP55). Where dimensions and tolerances affect interchangeability, operation, or performance or any combination thereof, they shall be held.

8.2 *Cleaning*—The strainer shall be cleaned of all extraneous material and dried.

9. Tests

9.1 Each strainer will have standard hydrostatic tests performed in accordance with Specifications F 1199 or F 1200 whichever is applicable. When specified as part of the purchase agreement, a detailed test plan may be submitted for approval. The performance, prototype and operational tests listed herein, shall be performed to prove the design. All strainers produced under this specification will meet these minimum requirements. Proof of test qualification shall be provided when specified in the purchase agreement.

9.2 *Test Extensions*—When the following conditions are satisfied, extension of a product test of one size to qualify another size is permitted (see Table 1):

9.2.1 Similar geometry and design characteristics.

9.2.2 Similar or stronger material than the tested unit.

9.2.3 Same pressure rating.

9.2.4 Similar or stronger end connections.

9.2.5 Similar sealing configurations.

9.2.6 Same mode of operation and operator attachment.

9.3 *Operational Tests*:

9.3.1 *Flow Capacity Test*—The test shall be performed in general accordance with Practice F 795. The pressure drop at the rated flow shall not exceed 0.07 MPa (10 psi) with a fluid viscosity of 250 SSU.

9.3.2 *Inclined Flow Capacity Test*—The flow capacity test in 9.3.1 will be performed at a list and trim angle of 30°.

9.3.3 *Strength of Internals Test*:

The filter elements shall be proven to withstand a minimum pressure differential of ten times the rated clean pressure differential or ⅓ of the maximum allowable working pressure (MAWP) of the housing, whichever is greater. The increased differential pressure shall be held or maintained for 30 min. The strainer assembly will then be disassembled and inspected. Any permanent deformation or signs of damage shall constitute failure of the test. When testing methods are not practical, calculations or finite element analysis methods may be used as objective evidence that the strength of internals meet the requirements. The acceptance of these methods is to be a matter of contract and will be specified in the purchase agreement.

9.4 *Self-Cleaning and Filtration Efficiency Test*—The test fluid shall be an SAE 40 weight lubricating oil. The liquids viscosity should be either 250 or 500 SSU. This shall be clearly stated on the test report. The test report contaminants shall be silica sand with a known granular size and distribution.

TABLE 1 Test Extensions[A]

Strainer/Filter Pipeline Size Tested, mm (in.)	Other Sizes Approved By This Test, mm (in.)
19 (¾)	¾ and smaller
50 (2)	25 (1), 32 (1¼), 40 (1½), 50 (2)
150 (6)	65 (2½), 80 (3), 100 (4), 150 (6)
200 (8)	200 (8)
250 (10)	250 (10)

[A] Above 250 mm (10 in.), test extensions methods shall be agreed upon between the purchaser and the manufacturer and should be specified in the purchase agreement.